Rapport 8/95

Science and Technology in the EU – General Development and Relation to the Nordic Countries

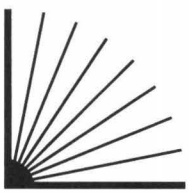
Hans Skoie (ed.)

Utredningsinstituttet
FOR FORSKNING OG HØYERE UTDANNING

Rapport 8/95

Science and Technology in the EU – General Development and Relation to the Nordic Countries

Hans Skoie (ed.)



Utredningsinstituttet
FOR FORSKNING OG HØYERE UTDANNING

Published by the Institute related to international research and cooporation (selected list)

De nordiske land og internasjonalt organisert forskningssamarbeid. En seminarrapport. NAVFs utredningsinstitutt, Melding 1977:2.

Steine, Arild (1977): *De skandinaviske land og CERNs storakselerator 300 GeV.* NAVFs utredningsinstitutt, Melding 1977:6.

Teknologi- og innovasjonspolitikk i noen andre land. I NOU 1981:30B: *Vedlegg til utredning om offentlig støtte til teknisk industriell forskning og utvikling i Norge.* Vedlegg 2.

Kyvik, Svein & Einar Ødegård (1990): *Universitetene i Norden foran 90-tallet.* Endringer i styring og finansiering av forskning. Nordisk Ministerråd, NORD 1990:89.

Skoie, Hans (1991): *Forskningsorganisasjon på regjerings- og forskningrådsnivå i noen OECD-land.* NAVFs utredningsinstitutt, Rapport 8/91.

ISBN 82-7218-342-0
ISSN 0804-6395

GCS AS - Oslo

Preface

In this report we publish four separate articles dealing with the S&T activities and policies in the European Union. The first one, which gives an overview of the engagement and policies in this area, was first published in Norwegian in our Report 5/93. The second article deals with EU and the so called third countries, while the last two articles focus on the Nordic countries and EU research. We are particularly grateful to Kristin Hauge at the Norwegian EU R&D Information Center, for being able to include her contribution to this report.

Oslo, December 1995

Johan Kristian Tønder

Contents

Part I
The EUs Engagement in Research and Technology - An Overview

Hans Skoie

Kristin Hauge

Research Co-operation between the European Union and Third Countries. The Past, the Present and the Future 51

Part II
EU and the Nordic Countries

Part I

The EUs Engagement in Research and Technology - An Overview

Hans Skoie

Research and Technology Policies in the EC - Developments and Future Perspectives[1]

1 Introduction

Today te EC budget includes substantial sums for research and technological development (RTD)[2], primarily through the so-called *Framework Programme for Research*. The Maastricht Treaty expands the formal basis for EC collaboration in this area. At the same time the Commission, with Jacques Delors in the lead, currently strongly supports increasing EC budget appropriations for research and experimental development (R&D).

The Economic Area Agreement means that the EC Framework Programme will be open for participation by EFTA member countries. Such participation in collaborative projects under the aegis of the EC also includes financial responsibilities, however. The ticket has to be paid for by the participating countries.

---

[1] This paper is based on a study conducted for the Norwegian Ministry of Education, Research and Church Affais in 1992 and published in the Institute' Report 5/93. The paper was also presented at a workshop in Rome Sept 24th, 1993 arranged by the European Association for Studies of Science and Technology (EASST) and the National Research Council in Italy.

The author wants to express his thanks to the many civil servants in the Commission in Brussels for most helpful information, documents and viewpoints.

[2] In EC documents "research and experimental development" - R&D - and "research and technological development" - RTD - seem to be used synonymously.

EC investment in R&D has always been *strongly directed towards technology and industry.* During the first phase the development of nuclear power for civilian use was dominant. Since then industrial orientation has been the "raison d'être" of this EC commitment. "To strengthen the industrial base of European industry", is the formal phrase in the Single Act. Within the Framework Programme funding today is officially limited to so-called precompetitive R&D, i.e. non-market R&D. However, the issue has often been raised of whether this limitation is clear-cut and still appropriate.

This article attempts to *survey* central matters of principle in the EC R&D collaboration; a short historical sketch will be presented, and important aspects of today's situation will be discussed as well as issues which may be expected to be on the agenda in the future. It is, of course, important to remember that developments in EC R&D collaboration will be strongly influenced by *general developments within the EC.* The course of the latter can in no way be taken for granted these days.

We wish to emphasize that we are only speaking about *explicit EC investment* in R&D in this article. Neither development contracts in connection with public procurement nor the many important regulations and standards which indirectly may have a strong influence on R&D - or which will come into force after the introduction of "the Single Market" - will be discussed.

The article is based on generally available literature, including EC documents and several conferences which have dealt with EC investment and policies in R&D, and interviews and discussions with many central actors in Brussels.

2 A short historical sketch

2.1 The formal basis for R&D collaboration

The main pillar of the European Community - the Economic Community - provided little basis for general engagement in R&D under the auspices of the Community from the start in 1957[3]. The Coal and Steel Community, however, and especially the European Atomic Energy Community - Euratom - the two other pillars of what today is called the European Community - did provide some bases. Euratom's objective was to develop and control *atomic*

[3] The Treaty of Rome had no general mentioning of research. However, in the agricultural area research was mentioned.

energy for civilian use in the original six Member States. This organization was an expression of the strong expectations held by many Western countries at that time with regard to nuclear power. Accordingly it initiated four large research laboratories, Ispra (Italy), Karlsruhe (Germany), Petten (the Netherlands) and Geel (Belgium), the Joint Research Centres (JRC) as they are now called - ie Community's research centres.

As we shall see, it was not until the so-called "Single European Act" in 1987 that research and technology received a more general treaty-like anchorage in the Community. But despite a limited formal base, the Community did undertake several initiatives in the R&D area during the first thirty years of its existence. We shall briefly turn to them.

2.2 Science policy - a matter for the EC?

In 1965 a central economic committee in the EC Commission (the Medium-Term Economic Policy Committee) established a subgroup for science and technical research policy, PREST. This group carried out important work and issued its first report in 1967. Manfredo Macioti, an EC civil servant who may be considered the historian of EC R&D, says that:

> This was the first comprehensive discussion of the benefits of and conditions for a European science policy, based on national policies, having clearly defined objectives and associated with innovation policy. Further impetus came with the Spinelli paper of June 1972 which contained the first proposals for a common policy for scientific research and technological development[4].

Macioti also mentions that these initiatives met considerable resistance in the Member States at the time. They were not prepared to delegate power to the Community's institutions in this area and thus many of the initiatives came to nothing[5].

In the 1970s attempts were made to achieve greater EC engagement in R&D. The topic was handled in several ministerial and government meetings. Ralf Dahrendorf, at that time a member of the Commission,

---

4 Macioti, Manfredo: Progress towards a Community Science. Policy and the Development and Management of the Community R&D Programmes. Address: Dublin 30.09.1975. (DG-XII/831/75-E) p. 1-2.

5 Op. cit. p. 2.

contributed particularly actively to this process. He supported "the development of science policies geared towards the objectives of the relevant sectors; the achievement of a balance between social concern (environment, health, urban developments, etc.) and economic objectives (industrial technology)"[6].The meeting of ministers in *January 1974* was especially important in this connection. Measures aimed at coordinating "national policies" for R&D as well as "EC actions in the field of science and technology" were requested. So-called future or "assessment-oriented studies" were also initiated[7].

During the follow-up "the Scientific and Technical Research Committee", *CREST,* with senior civil servants from all the Member States, was established. The Committee's main task was "to co-ordinate national research policies and assist the Commission in preparing proposals for projects of Community interest"[8] The Committee met regularly and until today it has continued to function as an important body.

Another important collaborative undertaking was the so-called *COST*, "European Co-operation in the Field of Scientific and Technical Research". The well-known French science policy actor and later Minister for Science, Pierrre Aigrain, chairman of PREST, took this initiative. The Committee identified seven sectors for concrete R&D collaboration in the so-called Aigrain Report. At the same time, non-members were invited to participate, and gradually this collaboration was extended to include nineteen European countries. In support of the Aigrain recommendation, government heads expressed "their readiness to continue more intensively the activities of the Community with a desire to co-ordinating and promoting industrial R&D in the principal sectors concerned, in particular by means of common programmes".[9]

In an early study on COST collaboration Aked and Gummett characterized "the COST mode of collaboration" as follows:

- an "à la carte approach" to participation, extended to non-EEC States

---

6 Op. cit. p. 2.

7 Op. cit. p. 2.

8 Op. cit. p. 2, 3.

9 Aked, N.H. and P. Gummett: Science and technology in the European communities: the history of the COST projects. Research Policy 5 (1976), p. 276.

- an agreed division of labour among participants
- an international rationalisation of resources already allocated at a national level
- the utilisation of existing national laboratories (in both the public and private sectors)[10].

It is worth mentioning that heads of government (the Council of Ministers) were primarily interested in *industrial research*, as their comments testify. However, in practice the COST programme was given a somewhat broader scope. It is important to remember that neither the coordination measures nor the joint programmes with participants from all Member States were introduced in COST. The central point was that EC countries as well as other participating countries *could choose to participate* in - and only in - the programmes which were of interest to them. COST may be viewed as an "à la carte menu" as stated by Aked and Gummett, and a road to cooperation on a broader European scale, i.e. with the EFTA countries in particular.

It is also worth mentioning that the R&D activity was to be carried out in public institutes and industrial laboratories, and not in new joint installations. "Joint support by public and industrial funds" was assumed[11]. The COST cooperation still exists and has been followed with considerable interest by most of the participating countries.

2.3 Limitations

Many factors have been of great importance to EC attempts to establish an R&D policy. First there was the general wish to generate a European Community characterized by collaboration in general - and accordingly also in R&D. Second, research and technology were generally regarded as cornerstones of economic growth in most of the postwar period. Countries which did not master these fields were expected to fall behind by analysts as well as by politicians. Assumptions about the "*technological gap*" between Europe and the United States - and later also Japan - were often part of such analyses and scenarios[12]. Many senior European politicians also argued

---

10 Op. cit. p. 271 and p. 272.

11 Op. cit. p. 277.

12 Servan-Schreibers famous book "Le Dèfi Americain" really started the debate in 1967.

along these lines - the best-known are President Charles de Gaulle and Prime Minister Harold Wilson[13].

In the light of all this, it is somewhat surprising that EC collaboration did not grow more strongly during the first thirty years. Obviously *opposition* was very strong. First, the EC was primarily an organization for economic cooperation, with detailed descriptions of the areas for collaboration given in the Treaty of Rome. Any "unauthorized" expansion of these collaborative measures was generally opposed and could be blocked by a veto from one or several Member States. Second, the cornerstone argument for research and technology can, naturally, also be used in defence of a national approach - if the EC was to continue to be a collection of national states. In any case, it was natural to retain power over such an important infrastructural measure. The "supranational" element of the EC, and views about it, were decisive.

Third, the different *views about industrial policy* held by Member States, played an important role. Throughout EC history many countries, with Germany in the lead, have objected to a state policy for industry as a matter of principle.[14] State intervention in this area is seen as inappropriate. This is in clear contrast to France and some other Member States who take a much stronger "dirigiste interventionist approach". Many science and technology policy issues have been stranded in the EC due to such disagreement about the degree of state and EC intervention in industry. This and the fact that the Treaty of Rome does not explicitly deal with industrial policy is strongly emphasized by policy analysts. Margaret Sharp is one of them. She points out that:

> What the Treaty of Rome did provide, however, was a range of policy powers which could be used to determine the regulatory framework and market conditions for European industry. Thus, competition policy, freedom of capital and labour movements, the right of establishment, customs union, harmonization of national laws, and state aids fell within

---

13 This is extensively documented in: Skoie, Hans: "Forsknings- og teknologisamarbeid i fellesmarkedet". Nordisk Forum 2/1972.

14 Peterson, John: Technology Policy in Europe: Explaining the Framework Programme and EUREKA in Theory and Practice. Journal of Common Market Studies, Vol. XXIC. No. 3, March 1991.

the Treaty's competence. But they were not subsumed under a general framework for industrial policy.[15]

Differing views about industrial policy mark the entire history of the EC. This naturally has important consequences for R&D policy. This is also clearly shown, not least by the continuous debate about so-called precompetitive research, to which we shall return.

2.4 Many failures

Another argument is also relevant in this connection. Collaboration is usually difficult. Since the collaborative EC measures in this area *not were particularly successful* during the first years, this contributed further to the lack of success. This is the conclusion which several analysts emphasize (Williams, Sharp, Layton, inter alia[16]. Even the EC civil servant Macioti has summed it up bluntly as follows:

> ... the record in sectors subject to Government intervention (energy, research, high technology, etc.) is unimpressive. Thus, for instance, much time and enormous effort have been devoted both at the national and international level to favour the development of strong nuclear, computer and aircraft industries in Europe. Yet, the results, broadly speaking, have been extremely meagre. In particular, starting with the late sixties, the record of European intergovernmental co-operation in science and technology has appeared (with some exceptions) as more and more doubtful. The failure of an integrated approach to nuclear energy, the misfirings of Europe in space, the fantastic escalation of the cost of aeronautical projects have spread uneasiness and disenchantment among policy-makers, industrialists and the scientific community. Public opinion and the trade unions have resented the uncontrolled mushrooming of costly projects for unintelligible science and dangerous

---

15 Sharp, Margaret and Shearman, Claire: European Technological Collaboration, Chatham House Paper, No 36, 1987 (London).

16 Williams, Roger: European Technology (the Politics of Collaboration), London, 1973).
- Sharp, Margaret: Europe - a renaissance? Science and Public Policy, Dec. 1991.
- Laytons, Christoper: European Advanced Technology (London, 1969).

technology, at a time when the quality of the social infrastructure was sadly lagging behind the material growth of Western Europe[17].

There are many indications that early EC ambitions for research and technology stood in no relation to actual political collaboration and integration. The distinction between the civilian and military aspects of atomic power was, for example, problematic - not least in the light of France's increasingly independent line in this area (e.g. "force de frappe").

3 The 1980s: A new approach emerges

3.1 Precompetitive research

At the end of the 1970s and the beginning of the 1980s there was growing concern in EC circles that "Europe was lagging behind the US and increasingly Japan"[18]. The diagnosis was that many European companies were not able to compete in a growing *global market* because they were too small and characterized by isolation within modest national markets. Moreover, they were weak as innovators due to tariffs and other forms of national protection. In view of this, thoughts about "a Single European Market" slowly emerged. Industrial research and technology received a central place in this development.

The Commission in Brussels wanted "to convert Europe's largely sheltered, national high-tech companies into competitive multinationals, with a Europe-wide marketing base". It was thought this would be possible by getting companies to collaborate on research and technology. This in turn might lead to "joint ventures" and contribute to the basis for a few *large European companies* "whose interests would lie with the Community, not with separate states"[19]. This would give research a central role in the Community - coupled to "high tech" and industry - not atomic power this time.

---

17 Macioti, Manfredo: Science and technology in the common market: A progress report. Research Policy 4 (1975), p. 108, 309.

18 This expression has been much used in EC research policy documents since the early 1980ies.

19 The quotations are found in McKenzie, Debora: The horizons of research: The future of cross-border R&D in the European community. (Forum Europe, 1992), pp. 6-8.

The Belgian Commissioner for Industrial Matters, Etienne Davignon, collaborated closely with representatives from large IT firms in Europe. This happened through the so-called "Big 12 Roundtable"[20]. There agreement was reached that the EC should "promote collaborative R&D schemes, co-operatively develop basic technologies, and try to develop common European standards". This was coined *precompetitive research engagement*, (the expression "prenormative" is usually used with the same meaning) - i.e., "working on ideas so far from marketable products, that companies can save money and effort by pooling R&D resources without giving away trade secrets".[21] Follow-ups soon started within the ESPRIT programme (the European Strategic Programme for Research and Development in Information Technologies) - the first of many EC programmes known by its acronym.

3.2 The Single European Act

The new R&D offensive in the Brussels apparatus led to a *treaty-like formalization* of EC R&D engagement in 1987. As mentioned previously, during the first thirty years the EC did not have a formal legitimate basis for handling matters related to R&D. In connection with the new *Single European Act* a new "Title VI: Research and Technological Development" was introduced. Article 130F reads as follows:

> The Community's aim shall be to strengthen the scientific and technological base of European industry and to encourage it to become more competitive at an international level. In order to achieve this it shall encourage undertakings, including small and medium-sized undertakings, research centres and universities in their research and technological development activities; it shall support their efforts to co-operation with one another, aiming, in particular, at enabling undertakings to exploit the Community's internal market to the full, in particular through the opening-up of national public contracts, the definition of common standards and the removal of legal and fiscal barriers to that co-operation.

---

20 McKenzie op.cit., and John Peterson. op. cit.

21 McKenzie op.cit. p. 7.

The *Industrial objectives* of the R&D engagement are clearly the central part. In following up "the Single Act" the Commission also launched several important directives. Some of these bear more or less directly on research and technology. According to Collins and Stein they are primarily about: "standards and technical regulations, State aid, public procurement, intellectual property rights and mobility of individuals". They also note that some R&D appropriations may be financed through "the Regional, Social and Agricultural Funds"[22]. As already mentioned, we shall not discuss this aspect of the EC in this article.

3.3 Framework programmes for research

As part of the EC planning process - and particularly the wish to simplify decision-making processes in the R&D areas in the beginning of the 1980s -the Commission began to develop *"Framework Programmes for research"*. This was explicitly mentioned in the new Treaty.

Holdsworth and Lake notice the following in this connection:

> What prompted the idea was a wish on the part of the Commission (and Parliament) to break away from the debilitating pattern of stop-start, *ad hoc* Council decision-making on research programmes and their funding. The hope was that, if the Council could be persuaded to agree to a blueprint research strategy, the building-blocks could be slapped into place rapidly thereafter, without the need for a perpetual return to debates over first principles and the eternal wrangles over money[23].

The first Framework Programme, according to the new procedure established in the Single Act, was put into effect for the period 1987-1991. It was, nevertheless called the *second Framework Programme* as R&D activities during the period 1984-1987 were seen as the *first*. Today, the third programme is being implemented and the fourth programme is being planned.

---

22 Collins, Peter, and Josephine A. Stein: Science and Technology and the Single European Market (in press).

23 Holdsworth, Dick, and Gordon Lake: Integrating Europe: The new R&D calculus. Science and Public Policy, Dec. 1988, p. 414.

It is worth noticing the centralized planning approach which characterize this work. A total amount for R&D is allocated and decided upon within the EC's total budget, and it is then distributed according to about fifteen main categories (fifteen in the third programme) within a zero sum procedure (cf. Table 3.). The EC Directorate for Research (DG XII) is a particularly central actor in this process. At the same time, the European Parliament has voiced a desire to play a stronger role in the decisions concerning R&D.

The Framework Programmes are funded through the EC's regular budget, thus all Member States contribute financially to the programmes according to the normal distribution principle within the EC. However, article 130L leaves the possibility for so-called "supplementary programmes" open - where participation occurs according to "the menu principle."

3.4 Eureka - the competitive arm

Eureka, the European Research Coordination Agency, is a French-inspired reaction to President Reagan's "Star Wars" initiative (SDI) - and particularly his 1985 attempts to engage European partners in this programme. President Mitterand took the French, initiative which was realized in close contact with large European companies[24] as a purely collaborative measure for *European industry*. In an analysis, John Petersen writes that the organization "from its origin.... primarily was viewed as a forum for pushing pre-competitive R&D already under way in Esprit closer to the market"[25].

He continues:

> Eureka's loose, decentralized industry-led structure was more a matter of necessity than choice. The support of the Big 12 was critical to the successful launch of the initiative, and these firms logically wished decision-making within Eureka to be based on commercial, not political criteria. The French could not push a government-led, *dirigiste* programme on partners sceptical of their "national crusade" (Shearman, 1986, p. 148) for new collaborative programmes and mindful of past French efforts to dictate their terms. Part of the French strategy in launching Eureka was to exploit even stronger EC Member State

---

24 Peterson, John, op.cit.

25 Peterson, John, op.cit.

suspicions about the wider agenda which lay behind the Commission's ambitious proposal in 1985 to spend 10 billion ECU on Framework's first phase. In short, both the launch of Eureka and the growth of Esprit illustrated how much public and private interests had become unified within European technology policy networks by the mid-1980s. But the period also revealed that the policy agenda of national governments and the Commission remained distinct[26].

Eureka was primarily organized as *collaboration between companies* using a "bottom up approach." The secretariat, which is very modest, views the initiation of projects based on strong company contacts as a primary task. Eureka is not an EC body. However, the organization is viewed as an important supplementary activity in relation to the traditional top-heavy approach which characterize EC's Framework Programme. The requirement is that at least two Member States must participate in a Eureka project. At present the largest Eureka programme is "Jessi" (Joint European Submicron Silicon Initiative). Interestingly enough, growing military collaboration (called Euclid collaboration) is developing parallel to the Eureka programme - this is also a result of the French 1985 initiative.

3.5 Euclid and the defence industries[27]

In the 1980s the European members of NATO have increasingly seeked to develop closer cooporation among defence industries in Europe.This has particularly taken place in the so-called Independent European Programme Group (IEPG). This group published in 1986 «the European Defence Industry Study» (EDIS). The competitiveness of these industries was the main focus in the study. In the chapter «Towards a Stronger Europe» it was stated that there are:

---

26 Peterson, John, op.cit. p. 279.

27 This account is primarly based on the following material:

- Oxford Research Group: Military R&D in Europe. Collaboration without control? Current Decision Report No. 11, October 1992.
- Ulriksen, Ståle. Våpenproduksjon og sikkerhetspolitisk integrasjon i Vest-Europa, Internasjonal Politikk 51 (2), s. 131-146, 1993.
- Gummet, Philip: Towards a European military-industrial complex. Paper for BISA Annual Conference Des. 1992.

many practical benefits if Europe's defence industries can organize themselves to remain strong against the growing competition. If not, this challenge would relegate Europe to a subordinate position to other, more capable technological nations.[28]

In 1988 the IEPG-Group lauched an action plan which also was approved by the defence ministers. The main idea was to open up the European market for defence equipment to all member states. At the same time a proposal for cooporation with regard to defence research was lauched. This initiative came from France, and the Euclid programme was also lauched «in order to develop and extend the European defence technology base». So far the Euclid programme has no common funding, but it has officially been stated that «common funding is the only long term solution». This programme is now in the process of being established. Norway do participate in the programme.

Parallell to IEPG, the European Defence Industries» themselves have established a working group - EDIG. This group has been recognized as «the designated forum to advice the IEPG on industrial matters.» In 1992, the IEPG was included in the Western Union (WEU).[29] Accordingly, the EC has come somewhat closer to military cooporation as the Maastricht Treaty recommended.

3.6 The relationship to EFTA countries and other European countries

There is considerable interest *in EC research collaboration* both within the EC and in several other European countries. This began with COST (European Cooperation in the Field of Scientific and Technical Research) in the 1970s. Conditions were set up in COST so that Non-member States could also participate. During the first phase early in the 1980s, several European countries, among them Norway, signed *bilateral agreements* with the EC concerning R&D. It is worth noticing that the EC has been especially willing to collaborate with EFTA countries.

In connection with the *negotiations* on the *European Economic Area Agreement* at the end of the 1980s and beginning of the 1990s, EFTA countries joined EC research collaboration within the third Framework

---

28 Oxford Research Group, op. cit.

29 Ulriksen, op. cit. s. 131.

Programme. Euratom collaboration was not seen as part of this - probably because such collaboration is regulated in a separate treaty[30]. At the same time, it is clear that real decision-making power concerning the main elements of the Framework Programmes remains within EC agencies. However, collaborating countries can participate and they do to som extent influence the programmes, e.g. through CREST meetings, etc.

In line with this it is worth mentioning that Eureka had participants from non-EC countries right from the start. Eureka also got its first eastern European member: when Hungary joined in 1992.

Several *central and eastern European countries* have shown considerable interest in R&D collaboration with the EC. Some bilateral agreements have already been signed. In the short term new EC initiatives aimed at supporting and maintaining R&D activities in eastern European countries are seen as particularly important. Also cooporation with the developing countries is seen as important.[31]

Obviously, the EC has the ambition to be a major actor *on the global scene* in research and technology - especially in relation to the USA and Japan. This applies to general industrial competition as well as to research and technological development as such. Both global investment and "cost sharing" has increasingly come on the agenda during recent years - and have been discussed, inter alia, in the OECD's new Megascience Forum. In this context the EC has made strong efforts to become a spokesperson for European interests[32].

---

30 Parr, Hugo - a member of the Norwegian negotiation team - says this in an interview with Forskningspolitikk 3/92.

31 See Kristin Hauges article in this report.

32 Science and Nature has reported regularly on this development.

4 The present situation

4.1 Dimensions

Table 1 below presents key figures on EC R&D spending. EFTA countries as well as the USA and Japan are included. The figures are based on OECD data which is collected according to the so-called the Frascati Manual.

Table 1 Key R&D figures for EU countries, EFTA countries and the USA and Japan. 1991.

Country	Total R&D expenditure		Publicly funded R&D as a pct. of total R&D	Defence R&D as a pct. of total publicly funded R&D
	NOK * per inhabitant	Pct. of GDP		
Finland	3100	2,1	40,9	1,3
Iceland	2000	1,2	69,7	0,0
Norway	3000	1,8	49,5	5,7
Switzerland **	5500	2,9	22,6	18,5
Sweden	4600	2,9	35,3	27,0
Austria	2500	1,5	46,5	0,0
Belgium ***	2600	1,7	27,6	0,2
Denmark	2900	1,7	39,7	0,6
France	4200	2,4	48,8	36,1
Greece	300	0,5	57,7	1,4
Ireland	1200	1,1	28,2	0,0
Italy	2200	1,3	46,6	7,9
Netherlands	3000	1,9	44,9	3,5
Portugal ***	500	0,6	61,8	0,9
Spain	1100	0,9	45,7	16,8
Great Britain	3200	2,1	35,5	44,8
Germany	4300	2,7	36,5	11,0
USA	5700	2,7	44,9	59,7
Japan	5600	3,1	18,2	5,7

* NOK= Norwegian Kroner.
** 1989 figures.
*** 1990 figures.
Source: OECD

We notice that the US (NOK 5700) and Japan (NOK 5600) spent most on R&D in 1991 measured in terms of spending per inhabitant, while the EU countries, Greece, Portugal, Spain and Ireland invested the least (NOK 300-1200). The total EU R&D expenditure is about 2 per cent of the total GDP - compared to 2.7 per cent in the USA and 3.1 per cent in Japan. Industry finances the largest percentage in Japan, followed by Belgium. The defence share is particularly high in the US (60 per cent), Great Britain (45 per cent), and France (36 per cent). However, in Sweden this percentage is also considerable (27 per cent). We also note that Sweden is the major spender while Denmark spends the least on R&D among the Nordic countries measured as per cent of the GDP.

Table 2 Spending on R&D in the EC budget in the period 1987-1993. (Million ECU)

	1987	1988	1989	1990	1991	1992 Budget + Carryovers	1993
Total Research	939.3	1 134.7	1 412.2	1 706.0	1 748.9	2 789.7	2 555.8
of which JRC	165.9	215.1	235.0	232.1	238.1	261.3	259.3

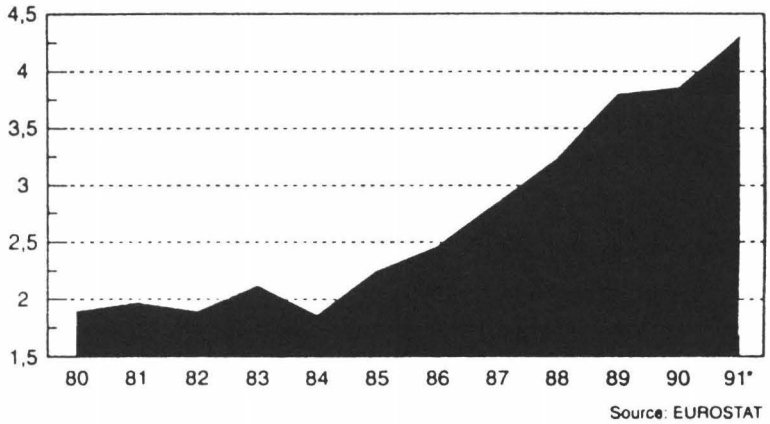
Source: DG-XII

We see that there has been *considerable* growth in the EC R&D budget during this period - from about 900 million ECU in 1987 to more than 2,500 million ECU in 1992-1993. The Table also gives the amount which went to the Joint Research Centres. Growth was considerably less here, from 160 million ECU in 1987 to about 250 million ECU in 1993. Accordingly, the relative share has declined from nearly 20 per cent to about 10 per cent during this period. In total, the EC budget for R&D makes up about 4 per cent of the EC's total budget.

Figure 1 shows EC R&D investment as a percentage of the total civil R&D budget for Member States during the period 1980-1990[33].

[33] EC Research Funding (Brussels 1992), p. 10.

E.C. FINANCING AS A % OF THE PUBLIC R & D BUDGET
IN THE TWELVE MEMBER STATES



The Figure shows that the EC's Framework Programme for research has a total expenditure of 5.7 billion ECU for the five-year period 1990-1994. (Another 0.9. billion ECU have now been added to this amount.) This makes up 3-5 per cent of the total R&D expenditure of all the Member States combined. In comparison to the publicly funded R&D expenditure this percentage doubles for most of the countries. The relative contribution to civilian research is even larger for countries which invest a lot in defence research.

4.2 The Third EC Framework Programme (1990-1994)

Table 3 gives the *focal areas* («line items») of the 1990-1994 Framework Programme. These areas and the attached budget figures are thoroughly discussed in the decision making process for the Programme. The most significant new in the third Framework Programme is the area "Human capital and mobility". Here there is a certain amount of support for basic research - in addition to special measures to increase the mobility of researchers within Europe.

The EC's programmes are mainly known by their acronyms. Many of these are well known among scientists and R&D administrators. They began with *Esprit* (information technology), *Race* (communications technologies) *Brite/Euram* (industrial technologies and advanced materials).

Except for the basic appropriation to the JCR, the funds are appropriated *on a contract basis*, on average 1 million NOK per participant. A condition is that the EC provides 50 percent of the project funds and that contract partners provide the other half. A further condition is that the projects are normally multi-national, i.e., that at least two laboratories from two Member States collaborate on the projects.

The contracts are announced in the Member States and competition for funding is usually fierce. Administrative personnel in the Commission play an important role even though advisory committees and individuals are used to a certain extent as expert consultants. There are three general advisory committees dealing with science and technology. We have already mentioned CREST - the Scientific and Technical Research Committee. There are also CODEST - Committee for European Development of Science and Technology - which works most with issues connected with basic research and the scientific infrastructure. The committee consists of *individual researchers* appointed by the Commission. The members of IRDAC - the Industrial Research and Development Advisory Committee - are also appointed individually. However, the main impression is that on the whole decisions are to a great extent taken by the Commission's administrative staff - there lies the real decision-making power. However, a peer review system for evaluating research proposals has gradually been introduced in some areas, and modifies this picture somewhat. Actually the Commission has also recently remarked that EC research and technology policies are developed in closed fora which are "very unreceptive to outside influences"[34].

---

[34] - Research after Maastricht: An Assessment. A strategy. COM(92) 682 (April 1992).
- Working document of the Commission concerning the Fourth Framework Programme of community activities in the field of research and technological development (1994-1998). COM 921 406 (Oct. 1992)

Table 3 The Third EC Framework Programme (1990-1994). Total budget

Focal areas	Million ECU	Proportion of total budget (per cent)
I. Enabling technologies		
1. Information and communications technologies	2 221	38.9
- Information technologies	1 352	
- Telecommunications	489	
- Development of technological systems of general interest		
2. Industrial and materials technologies	888	15.6
- Industrial and materials technologies		
- Measurement and testing		
II. Management of natural resources		
3. Environment	518	9.1
- Environment	414	
- Marine science and technology	104	
4. Life sciences and technologies	741	13.0
- Biotechnology	164	
- Agricultural and agro-industrial research (incl. fisheries)	333	
- Biomedical and health research	133	
- Life sciences and technologies for developing countries	111	
5. Energy	814	14.3
- Non-nuclear energies	157	
- Nuclear fission safety	199	
- Controlled thermonuclear fusion	458	
III. Management of intellectual resources		
6. Human capital and mobility	518	9.0
Total*	5 700	100.0

Source: Commission of the European Communities: EC Research Funding. A Guide for Applicants. January 1990.

* Including ECU 57 million for the centralized management of the dissemination and exploitation of research results, and ECU 550 million for the Joint Research Centre (JCR).

4.3 The Fourth Framework Programme

The Framework Programmes are, as mentioned, important planning and decision-making instruments in the EC. Work begins long before the programmes come into operation - it takes time to handle suggestions from Member States as well as from many EC subunits. The same pertains to the *decision-making phase within the EC.* "Consulting" the European Parliament also takes time. Recently the relationship to Parliament has revealed some rather strong disagreements concerning science and technology.

The main impression from the Commission's preparatory documents in connection with the fourth Framework Programme so far is that the Commission wants to invest more "aggressively" in the technological and industrial area than has been the case so far. This despite the fact that the Maastricht Treaty allows more scope for R&D investment - cf. point 5. below. Until now, signs in this direction are not much visible in the Commission documents[35].

In a 1992 document concerning future engagement the Commission begins with industrial developments in Europe and states that:

> In recent years .... European Industry has shown signs of weakness. The indicators are clear: Europe's competitive edge has been blunted. Its research potential is being eroded, and it is not in a strong position with regard to future technology. .....
> To sum up, the Community RTD effort is insufficient compared to the US and Japan. Europe is relatively strong in basic research. RTD directly related to industry turns out to be less developed than it is for our competitors[36].

The main problem, according to the document, is the *weak integration* of RTD and innovation activities "in an overall strategy which both exploits and orients them"....

> The conclusion which must be drawn is that the main problem for European enterprises is, basically, not the level of their RTD expenditure. It is rather their poor capacity to transform their RTD

---

35 COM, op. cit.

36 COM (1992) 682 p. 6 and 8.

activities into inventions, and their inventions into market shares and profits[37].

In his 1992 speech to the European Parliament President Jacques Delors was much concerned with the EC's industrial engagement. He argued that:

> ... two factors are decisive for Europe today if we are to keep pace with the leaders: human capital and technological skills. You may well say that it is for industry itself to realize this and to take appropriate action. And you would be right. I have no wish to reopen the industrial policy debate, which has already been dealt with in a Commission paper. I merely ask: can the Community stand by and simply watch these developments? The Commission is convinced that it can not. What is at stake is the Community's potential for growth and its entire future. There can be no lasting political influence without a competitive economy[38].

The Commission drew *two conclusions* in the 1992 document. EC RTD funding should be increased dramatically - and the activity should be more market-oriented - i.e. the demand for concentration on precompetitive activity should be reduced. At present, it does not seem easy to reach agreement on these issues however.

President Jacques Delors' budget package for 1992-1997 (Delors II) was very expansive, not least the RTD part[39]. But at the Ministers' Edinburgh meeting in December 1992 the Commission's and Delors' total *budget ambitions were reduced.* This also applied to the budget chapter for R&D according to the explanation which "the Presidency" of the Ministers' meeting issued immediately after the meeting. Here a *minimum and maximum budgetary ceiling* are given for R&D, cf. Table 4. which was prepared by the EC Commission after the meeting. It shows considerable reductions in relation to the Commission's prior recommendations.

---

37 COM (1992) 682 p. 14.

38 Bulletin of the European Communities Supplement 1/92.

39 EC-Press release, Dec 1992.

Table 4 EC budget for "Research after Edinburgh"

Fourth Framework Programme forecast (Million ECUs)	1994	1995	1996	1997	1998
50 per cent of sum for internal policies	0.0	2161.5	2260.0	2355.0	1570.0
67 per cent of sum for internal policies	0.0	2882.0	3013.0	3140.0	2093.0
Commission working document	550.0	3380.0	3770.0	4200.0	2800.0

Source: EC (Precidency, December, 1992.

The President's declaration contained the following:

> Community support for R&D should continue to focus on generic, precompetitive research and be of multisectoral application. EUREKA should remain the principal vehicle for supporting research activities which are nearer to the market and the Commission should bring forward proposals to improve the synergy between the Community's research activities and EUREKA. Improving the dissemination of results amongst enterprises, particularly small and medium-sized businesses, cost-effectiveness and coordination between national programmes should be priorities for Community action[40].

Furthermore, it states that "these conclusions should be reflected in the consideration and adoption of the 4th Framework Programme" together with the budget figures in Table 4. The most interesting point is presumably the continued emphasis of precompetitive character on the Framework Programme. This means that the Commission's wishes in the 1992 document were not followed up on this point - nor were those which argued for a fusion with EUREKA - the European Research Coordination Agency. Nor does the explanation signal any large changes concerning the direction of EC RTD investments.

The strong industrial orientation in the Edinburgh resolution also indicates that representatives of *other societal sectors* both within and outside the EC apparatus so far have not been successful in obtaining a stronger footing within the EC R&D budget. This pertains to research

[40] EC-Press release, Dec 1992.

connected to "new sectors", wishes to initiate stronger investment in basic research, and the social science disciplines in particular[41]. But the EC's strong industrial orientation and its thinking along mission lines do not seem to make purely disciplinary initiatives very likely at present[42]. However, it is clear that the relative distribution of funds between the EC's focal areas has changed somewhat over time - cf. Table 5 below.

Table 5 EC R&D investment - a comparison of the first three Framework Programmes

	I (1984-87) Per cent	II (1987-91) Per cent	III (1990-94) Per cent
Information and communications technologies	25	42	39
New industrial technologies and materials	11	16	16
Energy	50	23	14
Biotechnology	5	9	13
Environment	7	6	9
Human capital and mobility	2	4	9
Total cost, ECU billions	3.8	5.4	5.7

Source: Eurostat

5 Maastricht and Research

5.1 The general basis for collaboration

Following the introduction of the Single European Act in 1987, EC R&D collaboration became formalized. For the first time research was directly mentioned in the *Treaty*. The objective stated was: "strengthening the scientific and technological bases of Community industry" - in other words, research and technology in a broad sense was still not explicitly within *EC areas of cooperation* (cf. above §130F).

---

41 The European Science Foundation and the Social Science Division of the Foundation have been working hard in order to get the social sciences into the Framework Programme, e.g. the report Social Sciences in the Context of the European Communities, published by ESF in "The ESF and the Social Sciences" (Strasbourg, 1992). Also DG-XII has produced a memorandum: Integration and diversity: The dynamics of European societies - advocating research in the social sciences and humanities for the 4th Framework Programme. DG-XII H/BR 13.07.92.

42 Howard Newby in an interview in Forskningspolitikk 4/92.

Expanding the general EC collaboration areas in connection with the Union's goals in the Maastricht Treaty has naturally enough also had implications for research. Now EC research is explicitly legitimized in a broader sense than was explicit in the Single European Act. The Treaty covers this formally in that §130F received an important addition:

> The Community shall have the objective of strengthening the scientific and technological bases of Community industry and encouraging it to become more competitive at an international level, while promoting all the research activities deemed necessary by virtue of other Chapters of this Treaty.

The addition *"the research activities deemed necessary..."* are the keywords. It means that the EC can invest in research as an integral part of missions and policy sectors in line with the normal sectoral principle for R&D funding. If the EC expands its collaboration to new areas of society (sectors), there is a formal opening also for R&D collaboration in these new sectors if the Community deems such activity necessary.

The *principle of subsidiarity* was strongly emphasized in the EC research policy follow-up document after the Maastricht Treaty of 1992. It states that this principle:

> regulates the distinction, crucial both institutionally and politically, between national and Community actions. But where should the demarcation line be drawn? In areas of non exclusive Community competence, can Community actions be developed at will? Can they expand into any area? Or on the other hand, must they be linked to specific needs whose existence is necessary for them to be acceptable?
>
> The principle, gives ample scope for interpretation. In Article 3 B, qualitative expressions appear, such as: "In so far as"; "be sufficiently achieved"; "be better achieved". The interpretation is not always easy. However, the formula used in the Treaty contains two important criteria for Judgement, and we need to concentrate our attention on these. They relate to, firstly, the scale and, secondly, the effects of the relevant action. These two criteria are to be approached separately: one, or the other. They do not necessarily need to be present together.
>
> Subsidiarity is respected, and the Community can legitimately intervene, when the action can be better achieved at Community level

by reason of its scale or effects. These two criteria provide useful and important guidelines for the principle's practical application. An important remark of general relevance for the application of the principle of subsidiarity is called for here: the recognition of Community competence does not necessarily imply a budgetary intervention by the Community, which may also act in a regulatory or coordinating role[43].

Despite these discussions this issue has *not been resolved.* Concerning R&D one emphasizes that joint investment is particularly apt when the costs of projects are especially high (e.g., fusion research, when duplicate work means inefficiency, and when joint investment results in synergy ("value added"). However, cultural and political traditions are also very important. Attempts to make education an EC matter have apparently failed for the time being due to such conditions.

5.2 National research policy coordination?

Research policy in individual Member States has so far not been *coordinated by the EC* in other respects than follow from the results of the general collaborative measures. As mentioned, EC R&D engagement in recent years has been characterized by project funding within the Framework Programme and investment in the old Euratom research centre. Any direct coordination of research policy in Member States has not been attempted - "the coordination of national policies remains a promise", as stated openly in a Commission document from April 1992[44] .

However, the introduction of the Single European Act in 1987 set the basis for such coordination (§130 H). The Maastricht Treaty clarified this basis somewhat. In this connection the Commission says the following:

> The Maastricht decisions clearly alter this perspective. The coordination of national policies essentially ceases to be entrusted solely to the good intentions of Member States. The reworded Article 130 H provides: The Community and the Member States shall coordinate their research and

---

43 COM (1992) 682 pp. 32-33.

44 COM (1992) 682 p. 37.

technological development activities so as to ensure that national policies and Community policy are mutually consistent.

Although the concept of coordination remains unchanged, the subject and the object of the coordination have. The subjects are no longer the Member States amongst themselves, but the Member States on the one hand and the Community on the other hand. The object is no longer the national policies, but the national activities on the one hand and the Community activities on the other hand. One further difference emerges: mutual consistency between national policies and Community policy[45].

Furthermore, it is emphasized that this should mean that such coordination "ceases to be entrusted solely to the good intentions of Member States", and it is stressed that the new formulation presents *a great possibility*. But despite the fact that this document also discusses the principle of subsidiarity relatively thoroughly, comments are not made on the ambitious objective of accomplishing the coordination of Member States' national research policies in view of the subsidiarity principle. However, it is interesting that this type of coordination now receives so much attention in the Commission. The intention is obviously to give the EC "a true continental base".

5.3 The decision-making procedure

At the Maastricht meeting the Commission recommended a *simplified decision-making procedure* for measures concerning science and technology policies. This was not resolved at Maastricht, and so-called "co-decision" between the EC Parliament and a unanimous Council is the basis for the general measures relating to the Framework Programme. Individual programmes within the Framework Programme, in contrast, are decided by "simple consultation" with Parliament and majority decisions in the Council of Ministers. This seems a difficult and complex procedure.

Until now about 80 per cent of the EC's RTD activities fall under the Framework Programme. After Maastricht attempts have been made to *collect* all EC RTD activities within the Framework Programme[46].

---

45 COM (1992) 682 p. 37.

46 COM (1992) 682 p. 37.

Even if a further *centralization* within the EC takes place, the need for the integration of research and sectoral policy is emphasized[47]. The increased interest in industrial policy fits into this pattern. However, we should also mention that this interest is not mirrored in a radical reorganization of EC R&D engagement by the Commission. On the contrary, the following is emphasized:

> Three major handicaps prevent research policy from responding fully to current technological challenges. Contrary to Treaty recommendations, Community research has developed without any coordination of initiatives taken by the individual Member States. The procedures, which normally involve both the Council and Parliament, are too cumbersome. The effectiveness of a research programme is substantially reduced when over two years is required for its adoption. Although framework programmes must continue to provide a reference, greater emphasis needs to be placed on coherence and selectivity[48].

Obviously, the Commission is concerned about the time it takes to reach decisions in the R&D area. Actually, the procedure is explicitly called *"the most cumbersome procedure"*[49]. Nevertheless, it is not likely that the procedure will be changed in the near future. A consequence is presumably that the Commission has to start its planning procedures for the Framework Programme, etc., very early. Recommendations will, therefore, probably remain for a long time within the relevant EC decision-making bodies of the Member States before they are accepted.

6 Current issues

6.1 Coordination of the EC budget and the national budgets

Even though the coordination of research policies between the EC and Member States has not been realized, an important issue coupled to this has arisen in several Member States. This pertains to the practice of the "additionality principle". In short, how do the Ministries of Finance,

---

47 COM (1992) 682 p. 41.

48 COM (1992) 682.

49 COM (1992) 682 p. 51.

Industry, etc., in the Member States look upon the national appropriations and subscriptions which go to the R&D Framework Programme? Should these funds be regarded as *real additional appropriations* to the relevant national investment areas, or should they in practice be regarded as part of these? Is there harmonization in the sense that increases in EC investment result in corresponding reductions at home? Even if this is not recognized officially, in practice budgetary "weighing" and coordination of this type de facto occurs to a greater or lesser extent in several countries.

In connection with the first Framework Programme, it was common to say that EC subscriptions were *a real addition* to the respective national budgets. When negotiations on the European Economic Area agreement started, this was also the opinion of the Norwegian Government. Today the picture appears different in many Member States. Great Britain was probably the first to admit that this was occurring and that there *should be a real coordination* of national budgets and those of the EC for the respective areas[50]. In connection with increases in the EC R&D budget in December 1992, the British Ministry of Finance announced large reductions in the national R&D budgets - this led the "New Scientist" to remark that "Europe's gain is Britain's loss"[51]. This condition is obviously also an impulse behind the many national measures which have gradually been taken to "win the share back from Brussels". (National information offices, research attachés in Brussels, etc., have been introduced).

6.2 New missions and sectoral basis?

The Commission in Brussels handles most R&D matters within two Directorate-Generals, DG XII (Science, Research and Development) and DG XIII (Telecommunications, Information Industries and Innovation)[52]. The latter is particularly concerned with information technology, while DG XII is particularly concerned with R&D policy and funding. In practice it represents a mixture of a general research Ministry and a research funding agency with an element of traditional research council functions.

---

50 Findlay, Geoffrey: Internasjonal collaboration in Science and Technolgy in the United Kingdom. Nicholson, Cunningham and Gummett (London, 1990).

51 New Scientist 08.01.1993.

52 Also other DG's fund some R&D; e.g. Agriculture, Fishing and Transport.

To day the Commission consists of twenty-three Directorates General. The relationship between the general R&D Directorate (DG XII) and other Directorates has occasionally resulted in considerable tension and discussion. Wishes for a more decentralized and sectoral-based R&D organization obviously have spokesmen today, inter alia within the European Parliament[53].

The *zero sum game* approach in the Framework Programme and the DG XII model for research are somewhat controversial. This also pertains to the "mission/customer" basis included in the model. Both the central Commission funding model and the JRC centres are criticized in this connection. Holdsworth and Lake write that:

> It must be stressed also that the logic of customer sovereignty over research choice would mean that DG XII would be an executive service only - the research contractors working for research customers in the forms of DG V, VI, XI, etc. Taking it to its logical conclusion, applied science policy would be devolved to the separate policy area DGs, away from DG XII, and the Commission's applied research policy would become the sum of its agricultural, environmental, public health, nuclear safety, energy, etc.,applied research policies. This is already effectively the case in the USA and the UK, the leading exponents of the customer/contractor principle[54].

Nevertheless, until now this issue has not been seen as a guiding principle within the formation of EC R&D engagement. However, the weak sectoral connection of R&D has occasionally been brought to the forefront. The EC Commission and administration appear to *prefer the status quo*. However, some years ago a consultant firm suggested changing the EC's handling of R&D matters[55]. In this connection suggestions were made to amalgamate DG XII and DG XIII. Furthermore, suggestions were made to include a considerable proportion of the R&D activities in a separate "European Research Agency" - possibly located in Bonn (where there are gradually

---

53 Holdsworth, Dick, and Gordon Lake: Integrating Europe: the new R&D calculus. Science and Public Policy, pp. 4127-420.

54 Op. cit. p. 419.

55 Arthur Andersen Consulting, Brussel, Dec 1990.

expected to be many empty offices). But none of this has been realized so far - nor has DG XII been dissolved in line with the introduction of a more traditional sectoral policy for R&D.

Some interesting organizational changes may, however, be about to be introduced. The new distribution of areas of responsibility for the Commission from January 1st, 1993, means that research and technology in practice will be under *two different Commissioners,* i.e. two different authorities. The German Commissioner, Martin Bangemann, has been given responsibility for information technology (IT) in addition to the traditional industrial portfolio. The new Italian Commissioner, Antonio Ruberti, has responsibility for the rest of research, i.e., essentially DG XII activities as well as the portfolio for "training"[56]. At present it is difficult to say anything about the extent to which this represents a significant step in the direction of a stronger sectoral approach to R&D. However, this move could, of course, be merely the result of traditional political and personnel constellations which become apparent when there is a change of Commission members. However, it is probably not too far- fetched to assume that this development will have significant consequences for EC's S&T engagement and for DG XII in particular. Several journals have given considerable attention to this new development[57].

6.3 Evaluation and follow-up procedures

For a long time the EC has had its own *internal evaluation unit* for ex post follow-up. The unit engages a team of outside experts to carry out this work and the evaluation reports are generally publicly available.

As late as 1988 the EC received considerable praise for its evaluation procedures[58]. To day, in contrast, the evaluation procedures are coming in for some criticism. They are said to be *too internal* in two respects. First, it is claimed that the evaluation committees de facto have a tendency to limit themselves too much to purely disciplinary criteria, i.e., internal research criteria are primarily used as the basis for an evaluation. This is said to occur despite the fact that normally it is *applied research* which is under

---

56 EC Press release, Dec. 22, 1992.

57 The Economist, Nature and New Scientist.

58 Chabbal, R.: Organization of research evaluation in the Commission of the European Communities. (Commission of the European Communities, 1988).

evaluation. Such research should of course be judged in relation to the external results alluded to in the funding proposals.

Second, some critics think that the evaluation tasks are coupled too closely to the EC's policy and funding apparatus in DG XII. The issue of "*legitimacy*" arises, according to some observers. It is claimed that there is not enough independence. It is interesting that the Commission's follow-up document also emphasizes the need for improved programme evaluation in both respects. Evaluation activity must be better defined and implemented "enabling the transparency, the credibility and the efficiency of evaluations to be improved"[59].

6.4 Results so far?

Naturally, the results of EC R&D investment must be judged in relation to the *objectives* of these investments. Nevertheless, judging such results is not an easy task - nor is it easy to undertake well-founded and trustworthy evaluations. These problems are often discussed in the literature on evaluation.

Most of the EC R&D investment is of an *applied and strategic nature.* Basic research which aims at the "advancement of knowledge" is seldom funded. As a result of the appropriations to *precompetitive* activities in recent years, development work has also received less attention. At the same time, and to varying degrees, the goal has also been to *develop cooperation* between European researchers as a step towards the long-term goal of developing stronger general European cooperation and more powerful R&D organizations in European Member Countries. But this aspect of EC funding has received surprisingly little attention. A recent EC project carried out by Programme of Policy Research in Engineering, Science and Technology (PREST) in Manchester, England has studyied these issues. The preliminary results indicate that British researchers are rather satisfied with the EC collaboration[60].

As mentioned previously, there was strong agreement that the ECs and especially Euratom's R&D investments during the *1950s and 1960s* were not successful - on the contrary, they were to a great extent a failure. Neither the joint research centres nor the other ambitious investments yielded wortwhile

---

59 COM (1992) 682 p. 44.

60 Nature 17.12.92.

results and the general opinion was that this lack of success contributed strongly to the "poor image" of EC R&D and technology involvement for many years. McKenzie recently summed this up as follows:

> The 1960s were the age of high-profile European collaborations, under the aegis of the EC or otherwise, to produce the "technologies of the future". They included an unsuccessful first attempt to develop European space rockets, the beginnings of nuclear fusion, and the supersonic airplane, Concorde[61].

The *COST programme* was essentially of an applied nature in areas like transport, oceanography, metallurgy, the environment, meteorology, data and telecommunications, but the concept of collaboration here was completely different. An *"a la carte menu"* with participation on a project basis among Member States as well as several Non-member States was the basis for this programme. Actually, the programme was a mechanism for establishing cooperation with EFTA countries. Even though studies of the COST programme say little about its actual results, there are indications that this programme contributed towards a more positive attitude towards EC research collaboration[62].

The EC's *fusion programme* is a major effort which also has received special attention resulting in considerable press coverage. This programme represent large investments over a very long period of time. The European Parliament demanded that "a full feasibility study, including examination of the economic, engineering and environmental aspects of fusion, should be carried out by an entirely independent body"[63]. The Commission's refusal to do this obviously increased Parliament's interest in taking on a much stronger evaluating role in general in relation to R&D. However, fusion research is obviously a natural candidate for European wide cooperation, and is also seen by many as the only successful part of Euratom.

The *EC's joint research centres* still occupy attention today. The unsuccessful investment in nuclear power during the first years damaged the

---

61 McKenzie, op. cit. p. 5.

62 Aked and Gummet op. cit.

63 Ford, Glyn, and Gordon Lake: Evolution of European science and technology policy. (Science and Public Policy, Feb. 1991).

centres' reputations. Attempts were later made to reorganize the centres and to give them new missions - especially within energy, but also in other areas, such as the environment. This, along with other measures, was on a contract basis, with the intention of pushing this R&D effort closer to the market.

But this development still does not appear to have met its objectives. Many committees have been set up and evaluations undertaken in recent years. The European Parliament was particularly concerned about the lack of efficiency and results in the centres [64]. The *EC's own auditing agency* (the Court of Auditors) presented an analysis in 1991 with strong negative conclusions concerning their contribution to industrial development, etc.[65]. This resulted in the headline: "Europe's 'wasted billions'" on the front page of "The European" (07.06.1991). However, the auditors' methods relied heavily on patent statistics and this was criticized.

In contrast, the *Framework Programmes* from the middle of the 1980s give some appearance that the EC is headed in the right direction in this area. Findlay says that "few would now dispute that Community R&D has transformed the European R&D scene over the last ten years"[66]. But one may also say that it is *too early* to mention particular results or "to make firm judgements". The journal "Nature" recently voiced its disappointment in a leading article:

> ... the successive 'framework' programmes are a miscellany of ill-matched wishes: that innovative technology should prosper, that collaboration between companies and academic institutions should span European frontiers and that the mobility within Europe of technical people should be greater. In themselves the wishes are admirable, but it has never been seriously considered whether the framework programmes would meet those objectives. The practice of the past ten years is not encouraging[67].

---

64 Holdsworth and Lake, op.cit. p.

65 The Court of Auditors report was published in 1991 and among others the European report on the event July 7th, 1991.

66 Findlay, op.cit. p 278.

67 Nature June 6th, 1992.

The EC's own *programme evaluations* have so far not brought forth any material either which sheds light on or documents the result side in any convincing manner. As mentioned previously this has also resulted in criticism of the evaluation procedures/organization in the EC - it is claimed that they are not thorough enough. They concentrate too much on research per se - not on the expected results of a non-scientific nature, i.e. the very "raison d'être" of applied research[68].

In view of this, it is difficult to get a real picture of the outcome of EC R&D initiatives. The Commission's statements about European industry "increasingly lagging behind" indicate that the results may not have been particularly successful. Margaret Sharp from the Science Policy Research Unit at the University of Sussex (SPRU) recently concluded her article "Europe - a Renaissance?", as follows:

> Does Europe's technological performance in the 1980s justify those who suggest a renaissance in competitiveness? The answer is 'no'. While there has been a continuing strong performance in some sectors, such as pharmaceuticals and Eurospace, Europe's continuing poor performance in the key area of electronics means there remains a question mark over its long-term capabilities[69].

7 Future perspectives?

At present it seems particularly difficult to say anything about either the direction or the extent of future EC R&D engagement. This is a natural consequence of *the turbulence* which characterizes large parts of the world in which we live and not least the EC. The serious controversies which characterize EC collaboration in general, not least over the objectives for collaboration as shown in the debate about what «union» actually shall mean, are indeed fundamental. Naturally, this also means that EC R&D may be radically affected in the years to come.

To what extent the EC will develop in a more "*supranational*" direction, or whether the organization primarily will remain a collaborative effort among independent states is also of great importance. The 1992 debate

---

68 COM (1992) 682, p.44.

69 Sharp, Margaret: Europe - a renaissance? (Science and Public Policy, Dec. 1991, p.400).

following the Maastricht Treaty gives support to the view that the latter probably will be the case.

How far this collaboration will occur in *new sectoral areas* - in accordance with the Maastricht Treaty - is another central question. The Commission's President, Jacques Delors, has gone particularly far in indicating that security and defence collaboration should be established in the long run[70]. If this, or even only part of it is realized, a natural consequence will be that research collaboration will be established in the new areas mentioned in the Maastricht Treaty - including defence R&D.

The independence of Member States also raises the issue of how Member States will prioritize between national R&D investment on the one hand, and collaboration and Commission-directed initiatives in these areas on the other. As EC investment increases, so will demands for a budgetary "balance", as we mentioned previously. There are indications that Member States may be accepting the present level of investment under EC auspices because it only makes up a modest part of their respective *national investment.* EC investment is seen as so marginal that Member States are willing to accept it. Many view the present investment as stimulating, both nationally and internationally. One may expect different and prabably opposed reactions if the EC component is radically increased. In this connection it is interesting that the larger Member States, led by England, have reacted negatively to the expansion which has occurred in this area during recent years.

A fourth question which may be raised is whether the strong concentration on research and technology directed towards industry and energy will also continue to be dominant in the future. Here experiences with investments which have already been made will, of course, be of importance - as will developments in industrial policies in Member States and the EC generally. Interestingly enough "The Economist" has recently published an article which was very sceptical about industrial policy and urged President Clinton, among others, to take note of developments in Europe and especially in eastern Europe[71].

It is also interesting to look at developments in the *EC's organizational and decision-making structure* regarding science and technology. The

---

70 Delors, J., op.cit. p. 9.

71 The Economist 09.01.93.

demand that funding and decision-making be linked more closely to the EC's own sectoral agencies (the Directorates) has already been articulated. The chances are that we will see developments in line with those of most of the Member States which have resulted from a research-based society[72]. The distribution of the research portfolio to two Commission Members from 01.01.93 may also be interpreted in this direction.

The formal basis for *EC coordination* of Member States' R&D policies has, as mentioned, been established. The Commission has already established guidelines in the light of the new possibilities which are open. However, so long as the EC does not assume a clear supranational profile, this probably represents nothing more than wishful thinking in Brussels. Not surprisingly, the Edinburgh declaration contains no new initiatives in this direction.

One may also ask what impact the introduction of "*the single market*" will have on R&D. Collins and Stein say that it is too early to say to what extent there is any sense in talking about "a single market in science and technology"[73]. Findlay comments on the issue as follows:

> The emerging consensus is that the Single Market will have no dramatic or abrupt consequences for S&T in Europe. Rather it will accelerate the various processes of European integration already under way. Thus increased mobility for scientists as for other professions can be expected as qualifications become more widely accepted.. ..... Greater mobility of R&D funding can be expected as the various directives on procurement lead to greater competition between national R&D agencies. How far research agencies open their support schemes to other European nations remains to be seen, but increased mobility of individuals will contribute to a similar effect[74].

Findlay's remarks about national research agencies, etc., opening their support schemes to other EC Member States are, of course, very interesting and probably not often thought about.

---

72 Skoie, Hans;: Forskningsorganisasjon på regjerings- og forskningsrådsnivå i noen OECD land. NAVF-U. Rapport 8/91.

73 Collins and Stein. op.cit.

74 Findlay, op.cit. p. 281.

The conditions for successful international collaboration within science and technology are often overlooked. A first prerequisite is that collaborative projects are good on purely scientific or technological grounds. However, due to the close relationship between national interests, (e.g. the economy and defence), larger applied research and technology projects demand *real political agreement and coordination between participating countries*. This has often not been the case in Western Europe, which largely explains the poor collaboration results so far. It also partially explains why large international basic research projects are succeeding - they have no direct relation to the economy and defence.

In general one may say that large Western European nations have not been particularly willing to accept *the greater mutual dependency* which results from real collaboration based on specialization and the exchange of goods and services to achieve a common goal. Not until the latter occurs will the countries be able to obtain the full benefits of collaboration within one continent.

The article in "The Economist" on technology policy mention above also raise an interesting question - is a national or even continental technology policy possible in an age of dominating multinational firms which operate globally?

> Indeed, in world markets dominated by multinational companies, interventionist programmes of any sort aimed at strictly regional technological advance look increasingly out of date. Nor are they likely to lessen Europe's backwardness; that would be better done by the spur of competition (which means freer trade) and by co-operation between European firms and more advanced firms elsewhere. Even the most zealous Europeans should be considering a painful possibility: that the whole notion of purely European (or, Mr. Clinton might note, purely American) research is misconceived[75].

So far this question has not received much attention in studies of policies for science and technology.

---

75 The Economist 09.01.93.

Postscript fall 1995

The Fourth Framework Programme was approved in 1994. Its budget was increased significantly - partly because more EC activities were included in the programme, e.g. support for R&D in third countries. The programme is organized into four *activities* as shown in Table 5 below.

Table 5 The 4th programme broken down by *Activities*.

	Millions of ecus (current prices)
First Activity (Research, Technological Development and Demonstration Programme)	9 432
Second Activity (Co-operation with Third Countries and International Organizations)	540
Third Activity (Dissemination and optimization of Results)	330
Fourth Activity (Stimulation of the Training and Mobility of Researchers)	744
Total	11 046[76]

In terms of supporting research in entirely new areas in line with the new openings in the Maastricht Treaty, the changes are moderate. The new Programme gives room for somewhat more social science research, however. Line items for research for a European Transport Policy and Targeted Socio-economic Research are evidence of that. The last item includes:

- evaluation of the options for European science and technology policy;
- research work in two specific areas: research into the problems and opportunities for European integration; and research on education and training.

In Table 6, the First activity - the mainbulk of the Framework Programme - specifies.

[76] Additional 700 mill Ecu may be added at a later stage depending on further plans.

Table 6 The First Framework Activity specified according to program.

		Millions of ecus (current prices)
A. Information and Communication Technologies		3 405
1. Telematics	843	
2. Communication technologies	630	
3. Information technologies	1 932	
B. Industrial Technologies		1 995
4. Industrial and materials technologies	1 707	
5. Measurements and testing	288	
C. Environment		1 080
6. Environment and climate	852	
7. Marine sciences and technologies	228	
D. Life Sciences and Technologies		1 572
8. Biotechnology	552	
9. Biomedicine and health	336	
10. Agriculture and fisheries (including, agro-industries, food technologies, forestry, aquaculture and rural development)	684	
E. 11. Non-nuclear energy		1 002
F. 12. Transport		240
G. 13. Targered Socio-economic research		138
Totalt		9 432

The the last few years, the research councils in Europe have made efforts to increase their influence over the EC funds for R&D. The heads of the councils in the major countries now meet regularly within the so-called Eurohorc's organization. Also others have argued for a greater commitment by EC to basic research, universities and research infrastructure in general[77]. At the same time the Community has set up the European Science and Technology Assembly (ESTA) composed of 100 prominent members from the scientific community in order to advise the Commission on research matters. The assembly replaces CODEST.

In terms of policy, the Commission has also launched the document "Research and Technological Development. Achieving Coordination through

[77] See for example the Newssection in Nature, which regularly covers the issue.

Cooperation"[78]. In the introduction to this document, it is stated that the Community has

> two complementary basic instruments for research and technological development: the *Framework Programme* setting out all the Community's RTD activities and *coordination of national and European RTD policies.* While the encouraging experience built up over the last ten years has firmly established the concept of the Framework Programmes, the second instrument has remained largely a dead letter despite the recent initiatives .....

Furthermore the document says:

> The time has come to implement the Treaty on European Union in its entirety, i.e. to add a new dimension to the Community's RTD activities by taking coordination measures to make the national and Community policies more consistent and, thereby, make all the still overfragmented efforts more efficient.

The document also argue that, a distinction must be drawn between two concepts:

- *cooperation*, which is now accepted by everyone as the usual mechanism for Community action, with the obvious advantages of voluntary pooling of efforts and skills on a case-by-case basis;

- *coordination,* a mechanism which promises major advantages for increasing the efficiency of all RTD activities but which also imposes greater constraints and, hence, is harder to accept.

For this reason, the Commission proposes a progressive approach to achieve better coordination by intensifying cooperation at the various stages of drafting and implementing RTD policy.»

The document claims that the Union "must speak with a single voice on international bodies and in order to participate in world-wide programmes". Since the launching of the document, not much seems to have happened in

---

78 COM (94) 438 final October 10th, 1994..

this difficult area. To what extent the Fifth Framework Programme brings results in this direction - as envisioned, also remains to be seen.

In January 1995 Edith Cresson, former French prime minister, replaced Ruberti as Commissioner[79]. Her most noticeable act so far has been to appoint eight Task Forces in order to study and plan new activities to release the 700 mill ECU which might be added to the Framework Programme «at a later stage». This initiative is heavily oriented toward technology and industry[80] - the core of the earlier Programmes.

---

79 The division of labour with the Industry Commissioner, Mr Bangeman introduced in 1993, remained. Matters related to education, training, and youth remains within Cressons responsibility. The task force dealing with these matters are now organized in a separate directorate.

80 The Task Forces are: New Generation, Aircraft Multimedia and Educational Software, Car of Tomorrow, Vaccines and Viral Diseases, Trains and Railway Systems of the Future, Intemodal Transport, Maritime Systems of the Future, Enviromental technologies

Kristin Hauge

Research Co-operation between the European Union and Third Countries

The Past, the Present and the Future

1 Introduction

The intention of this report is to give an overview of the international research co-operation between the European Union (EU) and third countries i.e non-member states, in particular research co-operation with Eastern Europe and developing countries.

This report is largely based on official documents from the European Commission. Due to the fact that I worked as a scientific officer (detached national expert) in General Directorate XII in the European Commission during 1994 and 1995, I was able to closely watch the process that led to the Fourth Framework programme.[1]

The EU has a central position amongst the many actors in European science policy. Through its framework programmes, the EU intervenes both in the financing and the execution of Science and Technology (S&T). With a research budget of more than 12 billion ECUs for the next framework programme for research (1994-98), the European Commission - the executive arm of the EU - must be seen as an important player in European research policy. The fourth framework programme for research, which is the common research programme of the EU for the period of 1994 to 1998 - is probably the largest organised international research programme in the world today. In 1995 the Union will spend approximately 4 per cent of its budget on research, making it the fourth largest item of expenditure after agriculture

---

[1] I hereby would like to express my thanks to my colleagues in the European Commission (DG XII, Directorate B, International Scientific Co-operation), for stimulating discussions and commentst. In addition I would like to thank professor Hans Skoie, Institute for Research and Higher Education, and Mr Simen Ensby, science councellor at the Norwegian Delegation to the EU, for useful comments on previous drafts. I would also like to thank my employer, the Research Council of Norway, for making my secondment to the European Commission possible. Of course, any errors in this report are purely my own responsibility.

(50 per cent), structural funds (33 per cent) and aid to third countries (6 per cent).

During recent years, responsibilities of the Community concerning international research co-operation - i.e. research co-operation with non-member states - have significantly increased[2], and the Treaty of the European Union (TEU/Maastricht-treaty) has endorsed this principle.

A major bulk of the research budget - approximately 95 per cent of the total budget for the Fourth Framework programme for research - is still reserved for the members and associated countries of Western Europe - but there is reason to believe that the scientific and technical co-operation with third countries will further increase in the years to come. The research co-operation with the developing countries dates back to early eighties, while the research co-operation with the Eastern European countries increased after the fall of the Berlin-wall and the political upheavals in Eastern and Central Europe and newly independent states of former Soviet Union increased during the 1990`s. Other industrialised non-member countries - Canada and Austrialia - have recently signed agreements to enable them to participate in the scientific co-operation in the European Union. Israel is another example where the negotiations are nearly finalised. Contact has also been established with South-Africa concerning scientific co-operation.

The adoption of the European Parliament and the Council of Ministers on 26 April 1994 of the Fourth Framework Programme for Research, Technology and Demonstration (4FP) marks an important change as international scientific co-operation with non-member states is included into the overall science and technology strategy within the EU.

Whilst the general research policy of the European Union seems to a large extent to have been technology-driven and with the main aim of supporting the competitiveness of European industry through pre-competitive research co-operation, the developments concerning research co-operation with non-member states, especially with the Eastern European and developing countries have been more clearly linked to the external policies of the EU, and to the economic and development co-operation with non-member states. For instance for the Eastern European countries, the participation in the research co-operation with the EU may be seen as a tool

---

[2] With international R&D cooperation we mean cooperation between the EU and third countries (ie non-member states).

and a stepping stone to further economic and political integration. The rationale behind research co-operation with third countries will be further explored in this report.

To put the international research co-operation with non-member countries in perspective - and to better understand the changes that have occurred over time - it will be necessary also to give some presentations of the general characteristics of the overall changes in the research policy of the EU. The Treaty of the European Union broadens and deepens the European co-operation in general, sets the basis for a common foreign policy and extends in principle the scope of science and technology policy beyond the objectives of strengthening the competitiveness of European industry to support all Community policies within the guidelines set by the principle of subsidiarity.

The processes of deepening and widening the co-operation across sectors and borders, the present and future enlargement processes (-es) towards the North, the East and the South, and the strengthening of co-operation across the external borders are of particular interest. This evolution is expected to have important implications for all future policy areas of the European Community[3] (EC); including international RTD co-operation and will be further discussed in this report.

I will aim at capturing both lessons from the past as well as discussing the future of international research co-operation with third countries in the EU.

Chapter 2 presents the general framework of research co-operation of the European Union, its main objectives, as these are formulated in the Maastricht-treaty and the instruments for implementation.

Chapter 3 discusses the evolution of the European Unions scientific co-operation with third countries from the early days of the European co-operation and up till today. What sort of mechanisms for co-operation has evolved and what has been the driving forces behind these co-operative

---

[3] 1 November 1993 the European Union (EU) came into function. The Union consists however of three pillars, and where S&T is part of the 'pillar' now called European Community (former European Economic Community), to simplify the term EU will mainly be used.

schemes? These are some of the questions to be discussed. There seems to have been not one - but many - driving forces behind the research co-operation with third countries, and not one - but several - policies co-existing in this field.

Chapter 4 presents some of the implications of the Maastricht-treaty; as the principle of subsidiarity between research undertaken at national versus European level, the principle of economic and social cohesion within the European Union, the mandate for co-ordination of European research and the role of the different institutions in the decision making process. These elements are discussed in relation to the effects on international research co-operation with third countries.

Chapter 5 concentrates on the Fourth Framework Programme for research, technological development and demonstration (1994-98). The decision-making process, and the content of the programme, are both of interest here, especially in relation to the increased possibilities of third country participation. The Fourth Framework Programme in general and the part concerning international scientific co-operation with third countries in particular was a test case for the new co-decision procedure introduced in the Maastricht-treaty: The test case showed that the Parliament`s power had in fact been increased.

Chapter 6 discusses some of the future prospects for research co-operation with third countries. The future prospects are difficult to predict as they are linked to the whole future of the European Union. In particular the change of the external borders - with the three new members, as well as the new future members in the East and South will probably also influence the future directions of the research policy in the EU. This policy should also be seen in the perspective of more global trends of science and technology; for instance the growing efforts in the field of science in the Asia - Pacific region. What will be the future partners for co-operation in science and technology and what will be the content of this co-operation? How will the objectives of industrial competitiveness be balanced by additional concerns more related to social and ecological compatibility? These are some of the questions that will be discussed throughout the report.

2 The Research Co-operation in the European Union: A general framework

2.1 The objectives for research co-operation

Research policy did not figure as a priority area for the co-operation for the "founders" of the European Community.[4] Co-operation in science and technology played only a very small part. Apart from research carried out in the field of nuclear energy (EURATOM/EAEC Treaty) and research in coal and steel (European Coal and Steel Community/ECSC), initially the Community's RTD policy had no such foundation in the EEC Treaty (the Treaty of Rome). Community research was developed by means of article 235 (which enables the Council to adopt by unanimity decisions relating to matters of which the Treaty has no provisions) with the exception of agriculture and fishery research (which used article 43 or 41).

Although the Community started embarking on research activities in the late 1950`s, as indicated above, the concept of a European science and technology policy is of comparatively recent vintage. In the late 1970`s it was suggested that the Community should address directly the question of Europe`s perceived technological backwardness and the need to strengthen the competitiveness in relation to the US and Japan. The Community provided substantial financial support to encourage research related in selected technological areas. To satisfy the competition law of the Community, the work involved had to be pre-competitive.

It was not until 1987 that research and technological development became part and parcel of the responsibilities of the European Community. When the Treaty of Rome (1957) was revised with the adoption of *the Single European Act (1986) research was given a formal inclusion in the treaty.* The Treaty gave the Community explicit powers to carry out a common research and technological development (RTD) policy through articles 130f to 130q, see below.

The revised treaty also gave a formal basis for including third country participation in the research co-operation. Article 130g in the EC treaty mentions the promotions of *RTD collaboration with third countries and*

---

[4] For a more thorough presentation of the evolution of European research policy, see for instance Skoie 1994.

international organisations as the second of four actions of a general nature to be developed and implemented by the Community.

> Thus, along with its recognised power in the field of RTD, the EEC has excplicitly been assigned corresponding external competence. COM(90)256 Final

The Framework Programme was given a legal base in 130 i, in the EC treaty. However as indicated above there had been research co-operation in the previous years of the Community[5].

The Treaty of the European Union from 1992, broadens and deepens the political and economic co-operation, sets the basis for a common foreign policy and extends the scope of the EC science policy clearly beyond the objectives of strengthening the competitiveness of European industry.

In the field of research, the Maastricht-treaty both reinforces a series of policies already being conducted; and above all it makes substantial changes to the method of Community action. These are for instance the principles of subsidiarity and the increasing importance attached to the regional dimension (i.e. the need to increase the economic and social cohesion) in Europe.

The general objectives of the EU as described in article 2 of the Maastricht-treaty also apply to the scientific co-operation.

---

5 In many aspects however this cooperation has not been seen as too successful by several analysts (Williams, Sharp, Layton; cited in Skoie 1992). The senior official in the Commission, Manfredo Macioti sums it up in this way. .... *the record in subjects to Government intervention (energy, research, high technology, etc) is unimpressive. Thus, for instance, much time and enormous effort have been devoted both at the national and international level to favour the development of strong nuclear, computer and aircraft industries in Europe. Yet, the results, broadly speaking, have been extremely meagre. In particular, starting with the late sixties, the record of European intergovernmental cooperation in science and technology has appeared (with some exceptions) as more and more doubtful. (....) Public opinion and the trade unions have resented the uncontrolled mushrooming of costly projects for unintelligible science and dangerous technology; at a time when the quality of social infrastructure was sadly lagging behind the material growth of Western Europe.* (Macioti 1975).

> The Community shall (...) promote throughout the Community a harmonious and balanced development of economic activities; sustainable and non-inflationary growth respecting the environment (...) a high level of employment and of social protection; the raising of standard of living and quality of life; and economic and social cohesion and solidarity among Member States. (Article 2),

The EC-treaty further strengthens the role of Community RTD and widens the objective of the research. The article 130f of the EC treaty gives *the main objectives of the Community RTD*:

> The Community shall have the objective of strengthening the scientific and technological bases of Community industry and encouraging it to become more competitive at international level; while promoting all the research activities deemed necessary by virtue of other Chapters of this Treaty.

The last sentence implies that *research to support other policy areas of the EU* is a clear objective. Such policy-areas are for instance industrial policy, environment policy, development policy as well as regional policy and as an element in external relations.

The Commission communication *From the Single Act to Maastricht and beyond: The means to match our ambitions*' (COM (92) 2000) identifies three major priority areas for future Community action; i) its international responsibilities, ii) its cohesion, and iii) its competitiveness. The reasons for the external responsibilities of the Community is expressed in the following:

> Developing, on a balanced basis, the economic and political relations it has established with the rest of the world remains a constant objective. This means ensuring *a better interplay between external policy, commercial policy and development co-operation*; and co-ordinating the Community's activities with those of other economic or trade organisations (opcit p 15).

The Commission's *White Paper on "Growth; Competitiveness and Employment. The Challenges and Ways forward into the 21st Century"* was endorsed in December 1993 by the Heads of States and Governments in the European Council. The White paper underlines the need for RTD co-

operation. It puts research firmly on the political map of Europe, and gives a formal endorsement to proposals that would enlarge the common research programmes. It stresses the need for Europe to increase the level of its R&D effort from some 2 per cent of GDP at present to a level of 3 per cent closer to that achieved by the US and Japan.[6] The White Paper further recommends that the Community's research, external relations and commercial policies are made more compatible.

In Chapter 4 The Treaty of European Union and its implications for the international S&T co-operation with third countries, I will address some of these dimensions further.

The instruments for research co-operation: The framework programmes for research

The research co-operation in the EU is implemented through its framework programmes for research. As part of the EC-planning process - and particularly the wish to simplify decision-making processes in the R&D areas - the Commission began to develop multiannual "framework programmes for research (FP) during the 1980`s. With the first framework programme for research (1984 to 1987) initiatives were taken to co-ordinate the research activities.

The main aim of the second framework programme (which in formal terms was the first) lasted from 1987 to 1991, and had as its main aim to develop the technologies for the future, in particular in the area of information technology and electronics (ESPRIT, the European Strategic Programme for Research and Development in Information Technologies), materials (EURAM, European Research in Advanced Materials) and industrial technologies (BRITE, Basic Research in Industrial Technology for Europe).

The third framework programme for research from 1991 to 1994, focused in addition on activities relating to the dissemination of research findings (in particular through the SPRINT and VALUE programmes), live sciences and technologies including Life sciences for developing countries

---

[6] Such a large increase in spending seems improbable; given that member states have either frozen or cut research spending due to econonomic downturn. Nevertheless, the intention is that the private sector can make the difference. Companies in Europe fund just over half of all research spending in Europe; compared with more than three quarters in Japan.

(STD), environmental research and training and mobility activities (Human Capital and Mobility Programme).

The fourth framework programme for research is presently implemented and covers 1994 to 1998. The programme is presented under Chapter 5.

The EU has several means at its disposal to achieve its research and technology objectives

- joint research projects, based on partnership involving shared costs, whereby each partner assumes some of the risk since the Community covers only 50 per cent of all research costs. A typical Community project involves several researchers from several European countries, and third countries in specific areas. An effort is also made to involve the less industrialised Member States, in order to strengthen economic and social cohesion. See also under 4.2. In the evaluation and selection of proposals, panels consisting of scientists are used. Committees consisting of representatives from the member states assist the Commission in the management of the specific programmes.
- "concerted actions" whereby the Union only assumes responsibility for the co-ordination of research projects.
- its own research, carried out at the Joint Research Centre (JRC). The JRC has now staff employed at eight institutes on five sites; Ispra in Italy, Geel in Belgium, Karlsruhe in Germany, Seville in Spain, and Petten in the Netherlands.

All the programmes are now part of a strategy developed within the framework programmes which plan research efforts for a five year period. Each new programme overlaps with the previous corresponding programme to some extent, so as to ensure the continuity of research priorities and projects.

Before the Maastricht-treaty (Article 130 i), the scientific co-operation (including scientific co-operation with non-member countries) had been implemented through many different schemes and budget lines both within and outside the framework programmes for research; in 4FP all these activities are gathered. This implies that the agreed budget on the 4FP represents a total, upper limit on how much the EU may use on research during the budget period. Other budget lines may however be used for research-related research and research infrastructure, but not for research.

3 The Evolution of the European Union's scientific co-operation with third-member countries

During recent years, especially during the 1980's, the responsibilities of the Community concerning international research co-operation with third-member countries have increased, and the Treaty of the European Union has endorsed this principle.

The adoption of the Parliament and the Council on 26 April 1994 of the Fourth Framework Programme for Research, Technology and Demonstration marks an important change as international scientific co-operation with third countries is included into the overall RTD strategy.

I will in the following give a broad outline of the evolution of the research co-operation with third countries.

3.1 The first 25 years: Restricted research co-operation with third countries

The first years of the EC existence, the international co-operation with third countries were restricted. Since the end of the 1970's Sweden and Switzerland have participated fully in the Controlled Nuclear Fusion Programme. In 1971, the European Co-operation in the field of Scientific and Technical Research (*COST*) was established by a Ministerial Conference. Although COST is not a EC body it deserves specific mentioning as the European Commission provides the secretariat for the organisation. COST included the Community and the (European Free Trade Agreement) i.e. EFTA countries. COST performs a dual function. First it is a vehicle for carrying out "a la carte" action projects outside the Community programmes, and secondly it provides European countries that are not members of the Community an opportunity to participate in the COST programmes.

3.2 The first half of the 1980's: Research co-operation with developing countries increases

During the 1980`s research co-operation with third countries were intensified. Different patterns were followed for different countries or groups of countries. With the Single European Act, the Community was given a recognised power in the field of RTD. The promotion of co-operation with third countries also implies that the EC was given corresponding external competence. The establishment of research co-operation with developing countries was very much inspired by the II United Nations Conference on

Science and Technology for developing countries in 1979 (Vienna-conference). It was recognised that the Community's economic relations with *developing countries* had to be complemented with research activities.

Africa, Caribbean and the Pacific (the ACP countries)

In 1982 the *Science and Technology for Development* (STD) programme of the European Community was established (Council resolution 82/837) with the aim of mobilising science and technology in support of economic and social development in developing countries, in particular the countries of Africa, Caribbean and the Pacific. These countries had been included in the Lome-convention[7].

In reaching the decision the EC took account of urgent problems concerning food and health and the need to establish greater co-operation among scientists in the various Member states and the developing countries. It also aims to facilitate the introduction of a research dimension into the overseas development programmes supported by the Commission. The programme was clearly driven by the problems faced by the developing countries, and the role of science as a contributor to solve these problems.

Asia, Latin-America, and the Mediterranean (the ALaMed countries)

As general Community relations with the *Asian, Latin-American and Mediterranean* countries developed during the 1980's and economic co-operation agreements were concluded; it became desirable to strengthen S&T relations and to complement the STD programme which mainly covered the countries in Africa, the Caribbean and the Pacific. Several agreements covering economic co-operation where signed, and science and technology was a part of these agreements. The establishment of the European Community`s programme for *International Scientific Co-operation (ISC)* formed part of that broader co-operation. ISC was seen as

---

[7] The Lome-conventions regulates the relations with the ACP-countries (ie countries in Africa, Carribean and the Pacific) many of which are former colonial territories. The contribution is financed through the European Development Fund (dates back to 1958). The mechanism is not entirely a EU body, but is governed through the EU-ACP council. Other countries, like Asia, Latin-America and the Mediterranean, are not part of the Lome agreement but were instead linked to the Community through separate bilateral economic agreements where co-operation in research often were included.

an early tool in promoting economic development. Many of the countries for which this budget line was created are scientifically and technological advanced in certain areas, in particular the newly industrialised countries like south-east Asia, China, India, Brazil, Mexico, Argentina and Chile. An additional part of the ISC - programme started up in 1990, and focused on information technologies and communication technologies with the more advanced developing countries.

The ISC was made possible by the creation of a specific budget line by the Parliament - a so called action of promotion, assistance and support (APAS) to research co-operation. The amount of the budget was decided on an annual basis. The budget line has not been part of the previous framework programmes - and the EFTA countries have therefore not had access to this scheme of co-operation. The co-operation took place within the framework of bilateral agreements which the Community has signed with the developing countries of Latin America; Asia and the non-member countries in the Mediterranean (the AlaMed countries).

3.3 The last part of the 80's: The intensified research co-operation with the EFTA countries

After the Single Act Treaty from 1986, the scientific research grows in importance as this part of the EC co-operation is formalised in the Treaty. SEA also gave a formal base for including third country participation. Since the end of 1980's, S&T activities with third countries have been intensified in support of economic co-operation. Several bilateral and multilateral agreements which includes S&T co-operation were signed. Different patterns were followed for different countries or groups of countries.

The Community's relations with *Western European non-member countries* in the 80's were dominated by the opening up of the Framework programme to non-member participation. Third country participation in the Framework Programme began with the EFTA countries in the First and Second framework programmes for research and was made more systematic in the Third FP. The Treaty concluded in October 1991 between the EC and *the European Free Trade Area (EFTA)* on the creation of the European Economic Area (EEA) opened up strengthened possibilities of scientific co-operation with non-nuclear activities.

Some S&T relations were also developed with *non-European industrialised countries,* in particular *USA* and *Japan* during the 1980`s. In the end of the 1980`s a trade and co-operation agreement was signed

between the EC and *the Soviet Union*. This contained a reference to scientific and technological co-operation. Co-operation in the field of nuclear fusion existed already, and co-operation within the areas of nuclear safety, nuclear research, environmental and medical research were indicated as interesting areas.

In addition, the launching of the *EUREKA* mechanism in 1985 could be mentioned, although this is not a EU-body and was set up outside the Framework Programmes. The EU is only participating as a member. This is a pan-European programme of collaborative R&D involving firms, universities and research institutes who can gain funding for nearer market oriented R&D in advanced technologies. Projects may include partners from non-member states.[8]

3.4 The fall of the Berlin wall: The increasing importance of research co-operation with Eastern and Central Europe and the new independent states of former Soviet Union in the early 90`s

The first Commission strategy covering all third countries dates back to 1990. (Co-operation in Science and Technology with third countries. Com (90) 256 Final). The communication from the Commission to the Council underlines that scientific and technological co-operation with third countries has become a matter of increasing importance for and an essential part of the external relations of the Community.

Since 1989 the Union has as a result of rapid geo-political changes; focused its attention on the policies needed to support economic development, especially in *Central and Eastern Europe and the new Independent states of former Soviet Union*. The research co-operation did however also increase with other parts of the world During the early 90's this materialised also in strengthened co-operation in the scientific co-operation.

---

8 Eureka members: Austria, Belgium, Denmark, EU, Finland, France, Germany, Greece, Hungary, Italy, Ireland, Iceland, Luxembourg, Netherlands, Norway, Portugal, Russia, Slovenia, Spain, Sweden, Switzerland, Turkey, UK. The major themes are IT, communications, materials, medical and biotechnology, lasers, environment, transport, robotics and production automation and energy. An annual Ministerial Conference awards EUREKA status to new projects with the support of a high level Group of senior representatives of the member states.

The research co-operation with *Eastern and Central Europe* gained momentum from 1991\92 and onwards. The events in the late 1980s with the end of the Cold War, the democratisation of the *Central and Eastern European countries* and the break-up of the Soviet union caused immense changes in attitudes and policies. These changes also influences on the internal policies of the EU and an increase in Europe's influence in these areas. The Copenhagen European Council, in June 1993, made a declaration on relations with the countries of Central and Eastern Europe which have entered into association agreements with the EU. It asserted that they could become members of the Union as soon as they were able to assume the obligations of membership.

The developments of Central and Eastern Europe after 1989 opened up new perspectives to S&T policies of the Union. The economic assistance programmes of PHARE launched by the Community in 1990 to support economic reconstruction of Central Europe included also some activities relevant to research. The PHARE programme provides grant finance to support the process of economic transformation and to strengthen newly created democracies in Eastern and Central Europe, although the primary emphasis is not on science, activities related to science and technology have been supported.[9]

Another consequence of the events was that five of the specific programmes within the Third Framework programme was from 1992 open to collaboration with Central and Eastern European countries. These were environment, biomedical health, non-nuclear energy, nuclear-fission safety and human capital and mobility. In addition to the opening up of the Framework programme through the mechanism of *PECO*, another

---

[9] Poland: Sector reform programme for the science and technology sector. Romania: Support for restructuring the science and technology system in Romania. Slovenia: Support for the establishment of a coherent S&T policy in Slovenia. Bulgaria, Czech Republic, Hungary, Poland, Romania and Slovakia: Cooperation for Open Systems interconnecting Networking.

programme named *COPERNICUS* - which also started up in 1992 - covered the fields of industrial technologies and life sciences.[10]

Co-operation with *the New Independent States of former Soviet Union (NIS)* followed a similar pattern. The former Soviet Union developed enormous research capacities to support its military power[11]. To pursue the goals of reorienting research capacities to peaceful goals; the EU, the USA, the Japan and the Russian Federation established the International Science and Technology Centre (ISTC)[12]. In addition the European Commission, the Member states and some EFTAs created as an interim measure the International Association for the promotion of co-operation with scientists of the New Independent States (*INTAS*). INTAS was created under Belgian law and covers joint research projects from NIS countries (excluding the Baltic countries) and Member States of INTAS (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Switzerland, the UK plus the EU). The utilisation of INTAS as one mechanism for scientific co-operation beyond 1995 is subject to a decision by the Council of Research Ministers authorising the participation of the Community.Also starting in 1994; some of the specific programmes of the Third Framework Programme for research were opened to partners from the New Independent States. The Community's Technical assistance programme for the New Independent states and Mongolia (TACIS) includes support for science and technology when required. However, the primary emphasis is not on these areas. The research acitivities towards both the CEEC and the NIS were however implemented

---

10 The following countries were covered by the PECO and COPERNICUS (1992-1994) programmes: Albania, Bulgaria, Czech republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic and Slovenia. In the last call for proposal in 1994 the PECO was open to NIS countries on equal terms. In the COPERNICUS, however, they could participate together with at least two partners from two different Central and Eastern European countries and at least one partner from a Community Member State.

11 A trade and cooperation agreement between the EC and the USSR from the end of the 1980s did contain a reference to S/T collaboration to be developed. Contacts to start cooperation in the field of nuclear safety and research, and environmental research was underway from 1990. Com (90)256 Final.

12 The member states of the EEA can not participate in the cooperative efforts through the ISTC, as this is financed through TACIS. EEA member states do no have access to neither TACIS nor PHARE financed activities.

in coordination with the overall priorities set by the economic assistance programmes PHARE and TACIS.

The participation in *COST* has increased to 25 countries.[13] From 1991 onwards Central and Eastern European partners were admitted. In addition, institutions also from other third countries may participate in the networks of COST.

Anticipating the evolution of the political situation in the Mediterranean countries and the renewed Mediterranean policy (1992-1996), a new initiative, *AVICENNE*, was launched to support S&T co-operation in the fields of environment and health between the EU and *the Mediterranean non-member countries.*[14] The Mediterranean basin constitutes an area of strategic importance for the Union, and the peace and stability of the region are of the highest priority. This budget line was created by the Parliament in 1992; and is aimed at S&T co-operation with the non-member countries in the Mediterranean basin. The aim has been to strengthen links through mutually beneficial co-operation activities in the RTD field.

With effect from the first of January 1994, due to the conclusion of the EEA agreement, *Austria, Finland, Iceland, Norway and Sweden* participated

---

13 COST members: Austria, Belgium, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sween, Switzerland, the Netherlands, Turkey, UK. The secretariat of the Committee of Senior Officials anf ro Committees of a horizontal nature is provided by the General Secretariat of the Council of the EU. Secretariat for the Technical and Management Committees provided by the Commission of the European Communities.

There are currently over 100 COST network. Research is nationally funded, whilst Community funding is available for the network costs.

The aim of COST is to coordinate, at a European level, basic or precompetitive research nationally funded in the 25 memberstates. COST covers only the concerted actions and not the research itself. The Commission covers the coordination costs of the secretariat etc.

An evaluation of the COST-system is envisaged in 1995 and aims at:

- clarifying the interface between COST and the Community RTD projects,
- specify the role of the different partners (the relationsship between the Committee of the Senior Officials, Council, Commission, Parliament)
- examining the possibilites of expansion towards new themes and new members.

14 Until the 4FP the Avicenne depended on the cooperation budget (and not on RTD) and therefore belonged to the competence of DG I External Affairs, which handed over the administrative responsibility to DG XII Research.

in the Framework Programme for Research and could participate on equal terms as member countries in the research co-operation.

When it comes to *the integration of the Central and Eastern Countries* the European Council, which consists of the Heads of State of the Member countries (further on the functions of the European Council, see 4.3), which took place in *Copenhagen in June 1993* is of particular importance. This meeting agreed that the associated countries in Central and Eastern Europe "that so desire" shall become members of the European Union and that this accession shall take place as soon as an associated country is able to assume the obligations of membership by satisfying the economic and political conditions required. It was further agreed that the European Council, would welcome the possibility offered to associate countries to participate in the Community programmes under the Europe Agreements and invited the Commission to make proposals for opening up further programmes to the associated countries, taking as a point of departure those programmes which already are open for participation by the EFTA countries.

3.5 The mid-nineties: The Fourth Framework Programme and further strengthening of the research co-operation with third countries

The adoption of the Parliament and the Council on 26 April 1994 of the Fourth Framework Programme for Research, Technology and Demonstration marks an important change as international scientific co-operation is included into the overall RTD strategy as a specific activity, and not only as part of the overall scientific co-operation.

Following the decision of the European Council, see above, the co-operation of third countries in general is specified in the Council decision from 21 November 1994[15]. concerning the rules for the participation of undertakings, research centres and universities in research, technological development and demonstration activities of the European Community (794/763/EC). The decision did not go as far as indicated by the European Council, but did improve the access for participation for third countries. See further under 5.1; The Participation of third countries in the fourth framework programme for research.

---

[15] Council Decision of 21 November 1994 concerning the rules for the participation of undertakings, research centers and undertakings in RTD of the European Community (94/763/EC). The decision defines third country participation.

The enlargement of the EU from January 1995 of the new members Austria, Finland and Sweden leaves only Iceland and Norway as associated countries through the EEA.[16] *Switzerland* is not a member of the EEA, but is now negotiating closer participation in the research co-operation. *Lichtenstein* became member of the EEA in the last part of 1994.

When it comes to industrialised non-European countries, S&T agreements with *Australia* and *Canada* was signed in 1994.

The Council of Research Ministers agreed in late 1994 a negotiating mandate with *Israel* concerning EU-Israel collaboration. Under the terms of the mandate, Israeli scientists will be fully associated with all non-nuclear research programmes in the EC's 4FP. Israel will also make a contribution (like the EFTA-countries) to the Framework budget.

A scientific co-operation agreement with *South Africa* is also under consideration. These countries (when agreements are signed) are able to participate in parts of the Fourth Framework Programme.

3.6 The driving forces behind scientific co-operation with third countries

The driving forces behind the international research co-operation with third countries seems to have been many. There seem not to be one single clear objective or rationale - nor even one single policy - behind the research co-operation between the EU and non-member states, but several. One ought to bear in mind that these co-operative schemes have involved in different phases, as shown above, and have been motivated by differing objectives. This is partly due to the fact that not all countries are at the same stage of development nor are the geopolitical contexts similar.

Research to support other policy areas of the EU is a clear objective, as outlined above. See 2.1. Such policy-areas are for instance industrial policy, environment policy, development policy as well as regional policy and as an element in external relations.

Science as an instrument for economic development

The rationale behind co-operation in science with third countries in general must partly be sought in the general acceptance of *the important roles of science and technology in the development process*. New growth theory

---

[16] The association agreements implies that the countries contribute a contingency to the FP.

suggests that technological progress and economic growth is rather a function of accumulated investment in research and development and human capital than being an exogenous phenomenon. Technological change must therefore largely be seen as an endogenous process.

> New technologies do not originate outside the economic system and subsequently penetrate it. Rather the mechanisms and processes examined (....) show that technologies are invariably conceived, developed and diffused by means of long and costly investments. (Technology and Economy. The Key Relationships. OECD. Paris. 1992)

This implies that imported technology can not be seen as an alternative to indigenous R&D and other scientific and technological activities. Internal R&D are essential for the efficient import of technology. Otherwise the imported technologies can neither be understood, nor adapted to local conditions and resources; nor modified to meet local objectives; nor improved to keep pace with world competition; nor changed to cope with local conditions, regulations and hazards (Freeman and Hagedorn,1992).

Developing countries present a highly diverse situation in terms of the condition of science and technology. Some such as China and India have high developed scientific systems; others such as some of the members of the ASEAN have advanced to such a degree that in some areas they are more like industrialised countries. The countries with the highest RTD intensity in the Third World are also seen to be those which participate more frequently in international scientific and technological collaborative agreements. There are however still a large number of countries that are lagging behind in the science and technology-fields.

Given that science plays an important role in the development process, the scientific and technological evolution puts many developing countries at considerable disadvantage. The proportion of R and D that takes place in the Third World has conventionally been established to be less than 5 per cent. New estimates show that only about 2 percent of the worlds R&D takes place in the Third World if China and India are excluded (Freeman and Hagedorn 1992)

Science as a tool in strengthening the link to markets and technologies

International scientific co-operation may for instance be important in building *long-lasting relations between the EU and the third countries and their markets and technologies*. The role of science as an area for Community co-operation - and its evolution - is of interest in this respect. Scientific co-operation with third countries may be viewed in the context of strengthening the (pre-) competitive edge of European industry. Another motivation may be found in the *growing economic potential* of the developing countries - as markets for European goods etc. - where 4/5 of the world' s population live. For Europe S&T co-operation is an important instrument in providing a framework for wider cultural, educational, industrial and trade-related interactions between the EC and third countries.

Other aims are also evident, for instance related to other policy goals. The growing awareness of environmental problems and the need to foster *sustainable development* is also covered among the objectives for research co-operation with third countries.

> The objectives in the area of S&T co-operation in coherence with overall EC policy vis-a -vis (developing) countries are aimed at fostering sustainable development. (...) The reinforcement of S&T co-operation could and should play and important role in relations between the EC and developing countries. (COM(90)256 Final).

Another reason behind the EU-research co-operation with third countries and in particular with the least developed countries (LDCs) could be seen partly as based on *humanitarian reasons*, the need for strengthening the socio-economic development of these countries coupled with an acceptance of the important of the role of science in achieving this development.

The new industrialised countries: High scientific quality

Community scientists are interested in interacting with scientists in the new industrialised countries. It is worth remembering that more scientists work in developing countries than in the Community itself and that they often posses high scientific quality and important markets for products and technology. This is however also a two-way street. The rather contentious background of trade-related conflict between Europe and new industrialised countries, like South Korea, Thailand and Brazil, with their wish to expand

their market share in Europe, means that scientific co-operation within the high technology fields and related areas in basic science, where they are now competing with the Europe, may be difficult to develop.

The non-member countries in the Mediterranean basin: Research co-operation as a tool for achieving regional integration an stability

The so called *Avicenne programme* must be seen in light of the Renewed Mediterranean Policy (1992-1996) This budget line was created by the Parliament in 1992; and is aimed at S&T co-operation with Maghreb and other countries of the Mediterranean basin.[17] The aim has been to strengthen links through mutually beneficial co-operation activities in the RTD field and to strengthen the regional integration in the area. To achieve this, the establishment of a dialogue with decision-makers and researchers in these countries are necessary.

Three areas of mutual interest have been identified: waste-water treatment, primary health care and renewable energy.

Eastern and Central Europe: Research co-operation as a stepping stone for membership

The research co-operation with Eastern and Central Europe must be understood in relation to the overall EU policy towards these countries. The aim has been to help the countries in Eastern and Central Europe to rejoin the mainstream of European development and build closer political and economic ties with the European Union.

When it comes to the rationale behind the co-operation in science and technology, the co-operation must partly been seen as a stepping stone to further economic and political integration and as a preparation for membership. Strengthening of networks in science and education may also be of importance in this respect.

In the first communication from the Commission to the Council in 1990 the co-operation with Eastern and Central Europe were described as based on its responsibility to ensure stability in the European continent. It states that `a primary aim of co-operation should be industrial revival through

---

[17] Eligible Mediterranean countries are Algeria, Cyprus , Egypt, Israel, Jordan, Lebanon , Morocco, Malta, Occupied Territorries, Syria, Turkeyand Tunisia. Israel is by far the most frequent participant in the Avicenne cooperation.

technology` (Com(90)256 final. Cooperation in Science and Technology with Third Countries).

In addition, Eastern and Central Europe represents important markets for products and technologies from western Europe. These countries may however also pose threats to Western Europe concerning environmental pollution and nuclear waste etc. Research co-operation within these fields has also been stimulated.

In a study published by the European Commission in 1995[18] cooperation in science and technology in Eastern and Central Europe are linked to a new innovation belt linking Baltic and Mediterranean Europe and Western and Eastern Europe (by linking Florence, Szeged, Warsaw, Kaliningrad, Stockholm, Oslo, Hamburg, Nurenberg, Florence).

New independent states of former Soviet Union: Geopolitical and environmental security

During 1995 the European Commission presented a communication to the Council concerning the research co-operation with the new independent states of former Soviet Union.

The largest technical assistance programme (TACIS) towards the New Independent States and Mongolia states that its objectives are to develop societies based on political freedoms and economic prosperity. This is done by providing grant finance to support the process of transformation to market economies and democratic societies.

When it comes to the co-operation in science and technology in the previous programmes (INTAS, PECO and Copernicus and the ISTC, see 3.4), this must of course mainly be understood in its geopolitical context, where securing peace and economic development is in the forefront, as well as environmental protection.

In a recent statement from the Commission to the Council published in May 1995 on the future co-operation with the new independent states it is stated that the EU research co-operation should concentrate on priority topics such as environmental protection, nuclear safety, and space technology.[19]

---

[18] Eastern and Central Europe 2000. Final Report. 1995.

[19] "Brussels seeks tighter control over European funds for Russian science". Nature. 01.06.95.

4 The Treaty of the European Union and some implications for present and future international research co-operation

In the following I will address some important dimensions of the EU co-operation and the Treaty of the European Union (TEU or the Maastricht-treaty) and briefly discuss their future implications for international S&T co-operation with third countries.

With the Maastricht-treaty, the European Community underwent its second major constitutional revision. The Single Act, negotiated in 1985, was essentially designed to endow it with legal means for attaining the main political objective; completion of the internal market. The Maastricht-treaty took place against an entirely different background, where especially the potential enlargements were in the forefront.

The new Union Treaty has a particularly complex structure. It is based on three pillars:

i) the European Community (previously named the European Economic Community i.e. the Treaty of Rome, amended by the Single Act), which for instance includes co-operation in the field of science and technology
ii) the Common Foreign and Security Policy
iii) and Co-operation in the field of Justice.

In the field of science, the TEU both reinforces a series of policies already being conducted; and above all it makes substantial changes to the method of action. These are for instance the principles of subsidiarity and the increasing importance attached to the regional dimension (i.e. the need to increase the economic and social cohesion) in Europe, and the decision-making process.

4.1 The principle of subsidiarity

The principle of subsidiarity needs some further presentation as it is fundamental in the Treaty on the European Union (Article A in TEU). To some it is part and parcel of federalism, to others it is the opposite, as a brake on centralisation. Subsidiarity can be said to seek the reconciliation of national and central authority, as it entrusts to common institutions only those powers required to carry out tasks more satisfactorily than the states acting independently.

> Subsidiarity, properly practised, should defy the pro-and anti federalists alike; for it means striking a balance between intervention and abstention, allowing decision-making to settle at the most appropriate level. It is not a static principle but one which should allow for the ebb and flow of responsibility between regional, national and European authorities according to the need for Europeans to act alone or together at any moment. (Sir Leon Britton, Financial Times 29.3.94).

The subsidiarity principle is not new, but in the Maastricht Treaty the principle is made more restrictive. The subsidiarity principle puts the burden of proof on the Community institutions - especially on the Commission due to its right for initiating - for giving reasons for Community action.

The main argument for research at Community level - from a subsidiarity point of view - is supposedly research of regional importance and of such a scale that co-operation is necessary. Problems of global importance is also part of the picture, for instance the recent efforts of strengthening European research in global change as well as other areas related to environmental problems. The concepts of added value and mutual benefit are important in this regard.

Concerning international research co-operation, the argument of subsidiarity could be used to explain some of the changes in the co-operation with third countries. The more bilateral approach - as seen in the ISC - has been replaced by a multilateral and regional approach to co-operation. This may make sense; as bilateral co-operation are best managed by a nation to nation co-operation, and where an involvement of the Community is not a necessary prerequisite.

A profound problem with the subsidiarity principle however is how to clearly identify areas or tasks that the member states can do better individually than at Community level. It is therefore likely to be cited to justify the necessity for action by the Community at least as forcefully as it will be used to uphold the prerogatives of the member states. The definition of responsibilities or competencies are a truly political one.

To conclude, it may be said the question of subsidiarity primarily was developed to solve the internal relationship between the national levels and the EC/EU levels of competence, and that the question of subsidiarity has not really been solved in regard to international scientific co-operation.

4.2 Economic and social cohesion within the European Union

All Common policies should, according to the Maastricht-treaty, support social and economic cohesion through their formulation and implementation. Among these policy fields we also find the Science, Research and Technology policy. The reason for this may be stated as below:

> European integration is inconceivable without cohesion. An integration process which freezes certain geographical areas in a situation of marginalization and extreme specialisation will in general terms threaten not only growth and prosperity but also regional security within Europe (Hingel p. 139).

The strengthening of European cohesion is one of the objectives of the Community research and technology policy. The Commission issued in May 1993 a Communication on the subject "Cohesion and RTD Policy" (COM (93)203 Final). The relationsship between cohesion and research is here described as follows:

- the regional policy and actions of the Structural funds contribute to the development of regional capacities of less developed regions to participate in Community RTD programmes and actions
- whereas the Community RTD policies contribute to the reduction in disparities between regions as concerns research capabilities.

The interrelations between policy areas are one of the principles of the Treaty, and the complexity of the relation between the research policies and regional policies in view of strengthening the cohesion of the European Union could serve as an example of the increasing interdependence between policy areas. The effects on research policies - both concerning the European Union-programmes as well as the effects on the international research co-operation - still remains to be seen. It is however in "theory" clear that actions within the Framework Programme should reflect the need for cohesion. All four activities are asked to contribute; the first two in general; the latter two more specifically. (Com (93)203 Final).

The Communication from the Commission further states that the less developed regions in the EU will take advantage of some of the changes of emphasis which are proposed. As examples are mentioned the additions of new actions in the First (the research programmes directed towards member

states and EEA-countries and Second activities (research co-operation with third countries) in which less favoured regions perform well, such as

- the new accent within environment on the management of soils and water, and to prevent desertification
- the identification of new orientations for the agricultural sector and of rural development matters
- the use of renewable energies and the promotion of energy-efficient growth.

The most relevant opportunities appear, however, in the Third (dissemination of results) and Fourth Activities (mobility of researchers in Europe) of the Fourth Framework Programme. In addition funding from the Structural Funds are made available for research (i.e. covering infrastructure related to research) for less favoured regions.

As regards research and development, the treaty underlines the need for Community activities to be effective "throughout the Community" will cause greater attention to be paid to less developed regions of the Union. This consideration will, however; be coupled to the requirement that selected projects must be of high quality.

The question arises how the requirements of improving the *internal social and economic cohesion* in the European Union will affect scientific co-operation with third countries. The member states have differing relationsships and responsibilites towards different parts of the world due to historical links, for instance as results of colonial pasts, and also due to geopolitics. Most probably the international RTD as an component of the overall RTD policy will be strengthened, but the increasing gap between the North and the South of Europe may influence the will to increase the amount spent on international RTD.

4.3 Achieving co-ordination through co-operation

The Maastricht-treaty contains a provision urging the Union and its member states to achieve greater co-ordination in the research policies carried out in Europe. The Maastricht Treaty gives the Commission responsibility of co-ordinating research in Europe (Article 130i, 2), whereas its previous responsibility was simply for the encouragement of co-operation between member states and their research organisations.

With this in mind, the European Commission submitted a communication with the above mentioned title in 1994 (Com 94/438 Final). The measures recommended are in three areas:

The first area concerns *policy definition*. To facilitate this process, permanent groups will need to be set up at the ministerial level for consultation prior to action. Examples could be the newly established European Technology Assessment Network which will be established in the near future.

The second area is *execution of research activities*. The European Union`s research programs are to be designed so as to stimulate better co-ordination of programs defined and launched at the national level. The Commission has also proposed that in the future some research activities should be more flexible and complementary involving only some member states to participate or allow Union participation in programs that have been defined at the national level. Concern has been raised that this will encourage a "multi-speed" Europe in research and lead to an excessive centralisation of power in the hands of the Commission[20].

The last area, but not the least, is the area of *improving co-ordination in programs of international scientific co-operation* that involves European countries. The reason is that European countries would benefit from introducing greater coherence into their relationships with non-European countries.

> The European Union is only now trying to set up a genuine common foreign policy. As yet, there is no international scientific co-operation policy defined at the Union level, and any Union initiatives are in addition to the international co-operation activities of member states. (Ruberti et Andre, 1995)

To assist the Commission in its tasks of co-ordination, the European Science and Technology Assembly (ESTA) saw the light of day in 1994. The Assembly has an advisory role to the Commission and consists of 100 eminent scientists from all over Europe.[21]

---

[20] *Brussels suggests "variable geometry" research projects*. Nature 27.10.94.

[21] *Brussels seeks panel`s help to link European research*. Nature 15.09.94.

To conclude; there are clear signs of an increasing role of the Commission -the executive arm - in the co-ordination of European RTD. In the field of the EU's international RTD, the co-ordination will also be increased, both between research and other actions of the Union and between the international activities of the Union and the member states. This process do however depend upon the future willingness of the member states in providing the Commission with the necessary support in undertaking this co-ordination.

> In particular, the emphasis on product development has tarnished the EU`s image as an even-handed and balanced provider of support for science. (...)there is a substantial proportion of scientists who could not trust its mechanisms to deal with basic science, and there has recently been a proposal to increase the co-ordinating role of the European Science Foundation or create some other organisation outside the EU to do the job. (Herman 1994)

For some member states the strengthening of CREST - Comite de la Recherche Scientifique et Technique, which consists of national representatives and is advisory to both the Commission and the Council - to balance the powers of the Commission could perhaps be a more attractive option.

The European Science and Technology Assembly - may also be understood in this strive for strengthening the necessary legitimacy to be able to undertake this co-ordinating role.

When it comes to co-ordination of the international scientific co-operation, the task is presumably even more difficult to achieve than concerning the more internal research policy. Firstly, international scientific co-operation with third countries should also be based on a dialogue with these countries and proper mechanisms for undertaking such a dialogue need to be in place. At present, this do not seem to be the case. It may be stated that the international scientific co-operation with third countries are seen as an integral part of the Framework programme also when it comes to the priority setting mechanisms.

Secondly, the international scientific co-operation should also be seen in the perspective of the external policies of the EU - and especially the controversies concerning the implementation of the third pillar i.e the Common Foreign and Security Policy. Science and technology co-operation

with third countries are part of the first pillar, but are still seen in connection with other policy-areas, nobably the external policies of the EU. This whole process of co-ordination of policies also points to potential difficulties in co-operation with third countries in other areas.

4.4 The role of the institutions in the decision making process of the European Union

To shorten the long and tedious process of decision-making of the science budget, the Commission had suggested a simplified procedure for the Fourth Framework Programme.

> Three major handicaps prevent research policy from responding fully to current technological challenges. Contrary to Treaty recommendations; Community research has developed without any co-ordination of initiatives taken by the individual Member States. The procedures, which normally involve both the Council and Parliament; are too cumbersome; The effectiveness of a research programme is substantially reduced when over two years is required for its adoption. Although framework programmes must continue to provide a reference, greater emphasis needs to be placed on coherence and selectivity. (COM(92)2000 Final, p 11).

This was not however accepted in the Maastricht-treaty, where unanimity of the Council is necessary through the whole procedure and where the powers of Parliament was strengthened through a principle of "co-decision" between the Parliament and the Council. This procedure was used for the first time when the decision was taken on the 4FP.

With the Maastricht treaty the Parliament acquired rights of scrutiny and veto of the research budget. The Parliament is closely involved in selecting the broad policy framework programme for research adopted by joint decision-making and determining the criteria for participation, although requiring the Council to adopt the broad lines by unanimous decision makes this more of a paper than a real advance. If the procedure does not lead to an agreement, the Parliament can with an absolute majority vote disregard the common position of the Council. If this happens two times the budget procedure must start over again. The Commission retains the right to revise its proposals at any time before their adoption by the Council; but loses its

key position as "broker" of compromises, which it now shares with the Conciliation committee (in which it also takes part).

The Maastricht treaty on the European Union does not strengthen the powers of *the Commission* vis-a-vis the member states.

The Commission and the EP may be said to strengthen the supra-national aspects of the integration process.

The increasing use of majority voting in *the Council of Ministers* is also strengthening this aspect, although the most common form of decision making is still unanimity - as for science and technology - which is clearly balancing the inter-governmental aspects.

The *European Council*, which consists of Heads of State and Government in the member states, is mentioned in Article D of the Maastricht- treaty; but has no legal status in its own and no institutions. The role of the European Council is intergovernmental, but has been crucial in safeguarding the necessary momentum of the integration process. The European Council were involved in establishing a consensus on the budget of the Fourth Framework programme for research.

The *European Commission* consists of a political leadership and a supporting administrative organisation.[22] Many researchers have pointed to the fact that the Commissions role in forming policy is often under-estimated.[23]

---

[22] The main role of the European Commission (or the Commission of the European Communities as it is also called) can be seen as the 'watchdog' role ie ensuring that the provisions of the Treaty are applied. The Commission still has the prerogative as being the initator of legislation. and is often seen as the "motor" of European integration. The Commission in the narrow sense is a group of 20 commissioners, appointed by the governments of the member states. Although nominated by national governments the Commissioners are not appointed to act as champions of their national interest. Individual Commissioners head a particular subsection of the Commission. These subsections - or Directorate Generals - are organized along functional lines similar to national ministries or civil service departments, for example external relations or science. The term, the European Commission, may refer either to the political leadership i.e the College of Commissioners, or to the organisation as a while.

[23] Marks (page 407) draw as a conclusion of his study on the Structural Policy of the EC that the autonomous and mediating role of the Commission is crucial in understanding the policy-generating process. He stresses the emergence of multilevel governance in the European Community, characterised by co-decision across different levels of competence inside and outside the EC. See also Wallace (1990, 216) who states that "(t)he Council really consists of 12 member governments and the Commission. Any

Up to now political questions about how far and how fast the integration process should proceed have dominated the discussion with little regard to the "management deficit" of the Community institutions, in particular related to the Commission. The Commission in the broader sense is, by governmental standards and in comparison with its wide-ranging responsibilities, a small organisation of about 15.000 including 3000 interpreters (in comparison the Norwegian ministries including directorates consist of 17.000 persons).

> From this account it is hard to conjure up the terrifying image of a predatory and over-expanding "Brussels bureaucracy" that looms so large in anti-EC rhetoric. A more realistic picture is of an organisation that is under-resourced, under-staffed in many areas, over-stretched and inadequately managed. (Metcalfe s.121).

Paradoxically, for an organisation dedicated to integration and even of many named the 'motor' of European integration, the Commission is not itself well integrated. Vertical lines of authority within DGs are more strongly developed than horizontal links. This makes for over-centralisation and problems of co-ordination within; as well as between DGs. Especially in areas where the competence is divided between different general directorates, as for the research co-operation with third countries, this is evident.

---

practitioner of negotiation well recognizes the crucial power of the drafter of the texts, which remains the Commissions prerogative". Sandholz (1993, 242, 269) in his study of the Commissions role in deregulation the telecommunications sector, he found that

" the Commission played the leading role in promoting collective action ... the evidence clearly supports an independent role for the Commission." (All three cited from Matlary 1993). Matlary, Janne Haaland in her study of the ECs energy policy (cited after 1993,3) maintains that the focus on the Commission is warranted by the fact that very many of the empirical studies of integration in the present period conclude that this actor is a major one vis-a-vis the states as well as within the EC. In a study of integration in EC energy policy she e.g. found that this institution played a major role - "as architect of policy, creator of arena and participatory networks - which extends far beyond its formal role" (Matlary 1993). Others have pointed out the shortcomings of the Commission concerning the ability of actually administering and implementing the political decisions of the Community (Metcalfe 1992).

It could be stated that the European Commission; on which future performance depends so heavily, does not have a good record of administrative modernisation (Metcalfe s:120).

It is therefore interesting that the parliamentary group of the main German party, CDU, in its "Reflections on European Policy " in September 1994 mentions the *over-extension of the EU institutions* as one of the most important internal challenges the EU faces. This is also evident in the process leading up to the adoption of the 4FP as well as in the implementation of previous FPs.

5 The Fourth Framework Programme for Research: The process and the content

In the following I will give a general presentation of some of the institutional characteristics of the decision making process and the content of the Fourth Framework Programme.

The Council of Ministers adopted the Fourth Framework Programme on 26 April 1994. The compromise on the budget had then been reached. 12,3 billion ECUs are to be spend on research co-operation for the 4FP. (A further 0,7 billion ECU may be released by mid - 1996 depending on economic circumstances).

The 4th Framework Programme for RTD activities (1994-98) comprises *four main activities.*

First Activity	Research, Technological Development and Demonstration Programme	9432 million ECUs 86,9 % of 4FP
Second Activity	Co-operation with Third Countries and International Organisations	540 4,4 %
Third Activity	Dissemination and optimisation of Results	330 2,7%
Fourth Activity	Stimulation of the Training and Mobility of Researchers	744 6,0%

Decision of the European Parliament and the Council of 26 April 1994. Concerning the fourth framework programme of Europeand Community Activities in the field of Research and Technological Development and Demonstration (1994-98).

For a break down of the budget for the Second and the Third Framework programmes, see tables in Annex.

Each country contributes a percentage in relation to its GDP. (The Norwegian contribution is approximately 1,6 per cent of the total budget for the fourth framework programme).

5.1 The participation of third countries in the Fourth Framework Programme for Research

The co-operation of third countries is specified in the Council decision from 21 November 1994[24] concerning the rules for the participation of undertakings, research centres and universities in research, technological development and demonstration activities of the European Community (794/763/EC). Graphically, this may be presented like this:

Participation possibilities and financial support possibilities for non EU countries in the Fourth FP

Type of programme / **Type of country**	Type I Industrial and materials Agriculture and Fisheries Telematics Dissemination and Optimisation of results Training and Mobility	Type II Marine Sciences and Technologies Standards, measurements and testing Information technologies Communication technologies Transport Environment and Climate Non-nuclear energy Nuclear fission safety Biotechnology Socio-economic research Biomedicine
Associated countries EEA (Iceland , Norway, and Liechtenstein), Agreements with Switzerland and Israel are under negotiation	1. Can participate 2. Can receive financial contribution	Same as under Type 1

continued next page

[24] Council Decision of 21 November 1994 concerning the rules for the participation of undertakings, research centers and undertakings in RTD of the European Community (94/763/EC). The decision defines third country participation.

cont.

European Third Countries Central and Eastern Europe New Independent States Others (Cyprus, Malta, Switzerland, Turkey)	1 May participate if the participation in the project is in the interest of Community policies 2 The participation should normally be financed by resources of the third country concerned. No financing is available from the specific programmes in question. However, in order to facilitate participation of organisations from Central and Eastern European Countries, NIS, and Developing Countries, limited Community financial support might be made available, in areas and under conditions to be determined in the framework of the specific programme for Co-operation with Third Countries (INCO)	Same as under Type I
Non - European Countries *with* Science and Technology Agreement (Australia: in force, Canada: awaits ratification, South Africa: early contacts)	1 May participate if the participation is in the interest of Community policies, and if the activity of the relevant programme is covered by the Agreement 2 Shall not receive a financial contribution from the Community	Same as under Type I
Non - European Countries <u>without</u> Science and Technology Agreement	Cannot participate	1 May participate if the participation is in the interest of the Community policies and provided that it contributes effectively to the implementation of the programme, taking into account the principle of mutual benefit 2 Limited financial support might be available for developing countries in areas and under conditions to be determined in the framework of the specific programme on co-operation with third countries (INCO)

The table is produced by the Commission-services.

The EEA countries may participate in all 16 (excluding non-nuclear) programmes, whilst the organisations from European Third Countries may participate if the project is in the interest of the Community policies, and that some financing may be made available.[25] When it comes to non-European countries without Science and Technology agreement with the EU such countries may also participate on certain conditions. Developing countries and Eastern and Central Europe may receive funding following the conditions of the specific programme on co-operation with Third Countries and International Organisations. [26]

The EEA countries may participate in all (excluding non-nuclear) programmes. In addition the organisations and scientists from European Third Countries may participate if the project is in the interest of the Community policies, and that some financing may be made available.[27] When it comes to non-European countries without Science and Technology agreement such countries may participate. Developing countries and Eastern and Central Europe may receive funding in the conditions of the specific programme on co-operation with Third Countries and International Organisations. (See table in annex)

The programmes of relevance (in addition to the specific programme on research co-operation with Third Countries) are: Marine Sciences and Technologies, Standards, Measurement and Testing, Information technologies, Communication Technologies, Transport, Environment and Climate, Non-nuclear Energy, Nuclear Fission Safety, Biotechnology (pre normative research, biodiversity, social acceptance), Socio-economic

---

25 The European Third Countries are (CEEC) Albania, Bulgaria, Czech republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia, (NIS) Armenia,Azerbaijan, Belarus, Georgia, Moldova, Russia, Ukraine, (Others) Cyprus, Malta, Turkey.

26 The reason why some of the programmes still are closed for Third countries is not clear. One reason may be found in the competition argument; that these are areas where there exist harsh competition between Europe and other countries or that these are areas mainly focusing on Europe. None of these give, however, a very convincing answer. Another explanation is of course that the differences are guided more by the law of chance.

research (evaluation of S/T options), Biomedicine (except pharmaceutical research an biomedical technology and engineering).

5.2 The specific programme on research co-operation with third countries and international organisation (INCO)

After the budget compromise in April 1994, the specific programmes were decided upon by Council and Parliament during 1994. The specific programmes are decided upon by "simple consultation" with the Parliament and majority decisions in the Council of Ministers. The specific programme under Second Activity was decided on November 23 1994.

The Second Activity is divided into the following areas

A. Scientific and technological co-operation in Europe	*Budget allocation 1994-98 (in million Ecus)*	*In per cent*
1. Collaboration with other scientific and technological co-operation frameworks in Europe (for instance support to COST, EUREKA, international organisations like CERN, EMBL, ESA, ESO, ESF, ILL, ESRF etc)	46	8.5 %
2. Co-operation with Central and Eastern Europe and the new Independent States of the former Soviet Union (Joint Research Projects and concerted actions to achieve goals like - safeguarding the RTD potential - help solve important social ,economic and ecological problems - intensify cooperation in RTD fields where these countries are in the forefront	232	43 %
B. Co-operation with industrialised non-European third countries (concertation, dialogue on S/T, conclusion and implementation of cooperation agreements, distribution and utilisation of results etc)	30	5.5 %

C. Scientific and technological co-operation with developing countries (ie 1,85 per cent of 4FP) (Joint research projects and concerted actions within the following sectors: - sustainable management of renewable natural resources - sustainable improvement of agricultural and agro-industrial production - health research - additional sectors; information and communication technologies, non-nuclear energy, biotechnologies, materials and production technologies etc.	232	43 %
Total (4,4 per cent of 4FP)	540	100 %

Source: CEC. Specific programme decision November 1994. Workprogramme for Cooperation with Third Countries and International Organisations. 1995.

The two largest parts of the budget are directed towards research co-operation with developing countries and Central and Eastern Europe and newly independent states.

In the proposal from the Commission concerning the 4FP, the level for *international scientific co-operation with third countries* was set approximately to the same level as previously taken into account budget allocations within and outside the 3FP (790 mill ECU). The Council however proposed to cut this budget with almost 50 per cent. This was adjusted by the Parliament, which suggested 600 mill ECU. In the final agreement between the Council and the Parliament the budget for 2. activity was set to 540 MECU (including 10 per cent administrative costs).

If we compare what was available for third country co-operation through the Third and Fourth Framework Programme, where third country participation were formally included only through the Science and Technology program for developing countries (see tables in the annex), the figures indicates a substantial increase in funds available for third countries in the Framework programmes for research; 1,06 % in the First Framework programme for research, 1,5 % in the Second framework programme, 1,9 % in the Third Framework programme and to 4,4 % under the Fourth Framework programme. See tables in annex. If we however instead

compare the total funds available for research co-operation with developing countries and Eastern and Central Europe and New Independent States, including funds from other financial sources than the Second and the Third Framework programme, then the result is somewhat different as the table below indicates. [28]

Research co-operation with developing countries and Eastern Europe and New Independent states 1983-98: A tentative comparison (including funds from within and outside the framework programmes for research)

in million Ecu`s

	Developing countries (incl Mediterranean non-member countries)	Eastern Europe and New Independent States	
	Programmes STD,ISC, Avicenne and Inco	Programmes Copernicus, Peco, Intas and Inco	
1983-86	49		*49*
1987-90	153		*153*
1991-94	330	305	*635*
1995*-98	209	209	*418*

Source: Derived from programme information from the European Commission. This table is built on the figures in tables 1 to 7 in the annex.
* Formally the 4FP started in 1994, but with the first calls for proposals in March 1995. The expenditures on projects however will only start late in 1995.

[28] This may to some extent be compensated by the fact that research related activities - but not research itself may still be covered by other sources. The requirements that the Fourth Framework programme should contain all the research actitivities of the Community is based on Article 130i in the Maastricht-treaty, and this implies that the budgetary agreement also sets an upper ceiling for what may be used for research. This is however more complicated than it looks at first sight, as research related activities may be covered by other budgets.From 1995 all expenditures on research are to be covered by the Fourth Framework Programme, funding for research related activities and infrastructure may however be made available from other budgets (for instance from PHARE when it concerns Eastern and Central Europe and the Economic Co-operation Agreements when it concerns Asia, Latin-America and Mediterranean. For Africa, Carribbean and the Pacific funds additional to the 4FP for research activities may be available from the European Development Fund which is regulated by the Lome-agreement)

The table above must largely be seen as *an indication of trends* as the amounts indicated are not fully comparable. Some of the indicated programmes - for instance ISC, Copernicus and PECO - had annual budgets, while STD (1,2 and 3) and INCO are multiannual.

The table indicates that third country co-operation in science has been increasing steadily until the last period i.e. 1995-98, where the table shows a reduction in available funding.

This may of course be interpretated as a sign of a changing policy and a lack of willingness in the member states to continue the expansion of the research co-operation with third countries within the European Union, as some of the larger memberstates may be of the opinon that such relations largely should be built upon the bilateral co-operative schemes between the members and the third countries and not by increasing the competence of the European Union. Our main explanation is however more pragmatic and suggests that this reduction was largely due to specific circumstances arising from the introduced budgetary requirements of the Maastricht treaty - i.e the inclusion of APAS into the Framework programme - and that the inclusion of international scientific co-operation in the Fourth Framework Programme should be seen as an important political recognition of this area of co-operation.

The management and implementation of the research programmes

The management and implementation of the research programmes of the European Union is done through decisions taken by the European Commission assisted by programme committees for each programme. All programme committees are composed of representatives of the Member States, nominated by the Member State authorities.

For research co-operation with third countries two types of committees have been used, advisory and management committees, advisory committees and management committees. Both commitees are consisting of representatives of the member states. The associated EEA-countries are allowed to attend, to speak and to propose, but not to vote. For the APAS co-operation - i.e the co-operative schemes outside the Framework programmes - these did not have separate committees for the most part.

Advisory committee
In this case, the committee`s opinion on the Commission`s draft is recorded, and each Member state can ask to have its position recorded.

This type of committee was practised for STD 2 and STD 3 under the second and the third framework programme.

Management committee
In this case, the committee`s votes are weighted, and a qualified majority is required to adopt an opinion on the Commission`s draft. After receiving the committee`s opinion, the Commission adopts the measures. If these are not in accordance with the opinion of the committee, the Council must be informed and may take a different decision from the Commission within certain time limits.

For the 2 Activity the Council decided that the programme committee should be of management type, and not of an advisory nature. Committee consist of representatives from the member states and the associated countries (Norway and Iceland which have the right to speak and suggest, but not to vote). If the committee disagrees with the proposal from the Commission, and with a 2/3 majority - where the votes are weighted according to the size of the nature - rejects the proposal from the Commission, this may block a decision and the matter must then be solved by the Council. The Parliament had instead wanted the committee to be of an advisory nature; probably because this would to a larger extent reduce the power of the Council.

Concluding remarks: The roles of the Parliament, the Council and the Commission in the field of international scientific co-operation with third countries?
The existence of a Treaty obligation for the Framework Programme ensures a long-term commitment on the part of governments; which includes a commitment to funding. Given this long-term commitment; it is understandable that the process of negotiation should have been a careful one. The process do however seem to take too much time to enable a necessary overlap between the framework programmes as intended. The requirements of the Maastricht-treaty - that the Framework programmes shall contain all relevant activities that previously had a separate existence outside the Framework programmes - are understandable, as the decision set an

upper ceiling for the spending of research and avoid that the spending is increased through other means with little control from the member states.

One question which may be raised is however whether the current decision-making process allows for the necessary flexibility which is necessary to secure that the research undertaken is relevant in a changing political and economic environment. The previous established annual budget-lines outside the Third Framework Programme were to a large extent developed as a response from the Parliament to the changes in Eastern and Central Europe. This response would probably have been more difficult to achieve if the budgetary requirements for the Fourth framework programme had been implemented at that particular time.

If we compare the Third framework programme for research with the Fourth framework programme for research concerning allocations for third countries there has been an increase in funds for third country participation. If we however in this comparison add what was previously funded concerning research co-operation with third countries outside the Third Framework Programme - the so called APAS budget lines provided by the Parliament - the picture changes. Then there has in fact been a decrease in funds provided, as shown in the table under 5.2 and in the tables in the annex. Seen in the light of the Copenhagen meeting of the European Council in June 1993; the actual cut in the budget covering research co-operation with Eastern and Central European countries, is in fact rather surprising. In particular as the science co-operation may be seen as an important mechanism in preparing these countries for future membership. Our main interpretation is however more pragmatic and suggests that this reduction was largely due to specific circumstances arising from the introduced budgetary requirements of the Maastricht treaty (article 130i)- i.e the inclusion of APAS into the Framework programme - and therefore not necessarily the reflection of a change of policy towards third countries.

On budgetary matters it may however be said that the Parliament so far has been a more reliable ally for the Commission in the field of international research co-operation with third countries than the Council. The strengthened say of the European Parliament may therefore also strengthen the international research co-operation with countries outside Europe.

The Commission must be said to have contributed to the transparency of the negotiations with a series of Communications which have been the subject of comment and discussion from many quarters - governments; associations; individual companies, scientists in third countries; and research

organisations. It is interesting to compare this process with national policies in many European countries; few of which would probably have been subject to such extensive consultations. External evaluations of the previous programmes as basis for future decisions are an integrated part of this.

To conclude, the inclusion of international scientific co-operation in the Fourth Framework Programme marks an *important political recognition* of this area of co-operation, and was based on a joint understanding between the Council and the Parliament. When it comes to budgetary matters it is clear that the Parliament was in favour of higher budgets for the INCO-programme than the Council. The decision making process of the Fourth Framework programme - and in particular the international scientific co-operation with third countries - may be said to have been a test case for the new co-decision procedure; a test case which showed that the treaty did increase the Parliament`s power.[29] The Fourth Framework Programme contains a larger per centage directed towards the developing countries and the CEEC and NIS, than the Third framework programme.

6 Future prospects for research co-operation with third countries

The future prospects and contents of the research policy of the European Union is difficult to predict as it is linked to the whole future of the European integration process.

In the previous sections of this article we have only merely touched upon a range of important questions and issues; the importance of which will increase in the years to come. In this section we will aim at discussing some future challenges for the international research co-operation in the EU, seen in light of some internal and external factors.

The relative slow growth up to the beginning of the 1990s in scientific co-operation between the EU and third countries may partly be seen in the light of the relative slow expansion of the RTD co-operation in the European Community at large, both regarding the controversies concerning the competence of the Community in handling industrial policies - as science to a large part has been seen largely as a tool to stimulate industrial competitiveness - as well as controversies linked to the EC playing an

---

[29] *Euro-conflict over research cash.* The Times Higher Education Supplement. 25.3.94

independent role in foreign policy. Both these areas have relevance in the development of international research co-operation with third countries.[30]

6.1 Changing the external borders of the European Union and science as an element in external relations

The future potentials for the widening of the integration process is at the centre of the political debate about the European Union. The future enlargements of the European Union towards the North, East and possibly also to some of the present non-member countries of the Mediterranean will change the external borders of the Union and will probably also have effect on the content and direction of future policies in all areas, including science policy.

Before the recent enlargements of the European Union, nearly 30 countries had applied for EU membership, or had expressed a wish to become members sooner or later. Enlargement of the EU can have important effects on the EU's relations with the rest of the world and those of the new members because it upsets the delicate balance of Europe's external relations., as well as influencing other policy-areas, for instance international scientific co-operation.

Concerns have been raised from developing countries over the implications of the 1992 internal market and the developments in Eastern Europe for Community policies and relations with developing countries, for instance concerning S&T and industrial collaboration and investments.[31] In so far as the more advanced developing countries are concerned, these concerns in the S&T field seem to be exaggerated.

The Union can be said to have ordered its dealings with the rest of Europe - as well as with other parts of the world - as a layer of relationships.

---

30 The appointment of Edith Cresson as Commissioner for Science and Technology - a previous prime minister in France - has lead to speculations concerning a shift from precompetitive research towards industrial and social goals to give European industry a "shock" therapy. *Cresson tipped for EU research post.* Nature 27.10.94

The following statement by the previous commissioner Ruberti expresses another view in the following statement: «History has shown that the further we are from the market, the easier it is for European countries and companies to co-operate.» IRDAC-news, Winter 1994.

31 *The needs and possibilities for cooperation between selected and advanced developing countries and the Community in the field of science and technology.* Country report for India. Sast Project no 1, p 22.

Science seems to be seen as an important element in preparing countries for membership. Since 1992 the EU has negotiated and signed association agreements with six of the countries of Central and Eastern Europe - *Hungary, Poland, the Czech Republic; the Slovak Republic; Bulgaria and Romania.*

When it comes to membership the promises are made; in this context the Copenhagen meeting of June 1993 is of specific importance:

> The European Council today agreed that the associated countries that so desire shall become members of the European Union. Accession shall take place as soon as an associated country is able to assume the obligations of membership by satisfying the economic and political conditions required.

Albania has had a trade and co-operation agreement with the EU since 1992. Slovene is one of the more advanced Eastern European countries and its close contacts with many European countries - especially the new EU-member, and Slovenias principal trading partner, Austria - may make it possible for this country to join the EU somewhat sooner. So far however the membership is partially blocked due to a controversy with Italy.

Malta and Cyprus signed agreements with the EU in June 1995 to begin talks towards membership. Negotiations are set to start six months after the end of the Intergovernmental Conference in 1996.

After Malta and Cyprus, *the Visegrad-countries* (the Czech Republic, Hungary, Polen and Slovakia) are the most likely members, possibly joining around year 2000. Next on the waiting-list are the Baltic states[32], Bulgaria and Romania. All these countries have now association agreements with the EU. The new independent states of former Soviet Union must be in the outmost ring as far as EU membership is concerned.

Of all external relationships of the EU that with *Russia* may ultimately be the most important. The EFTA enlargement will give the Union a long and potentially unstable border with Russia and this will be paralleled in both the Baltic and Balkan regions. While Russia is not seen as a potential

---

[32] The three Baltic states signed association agreements with the European Union in June 1995. Estonia, Lithuania and Latvia are the only former Soviet republics that have secured such accords.

EU member, the nature of its long-term development may well determine the shape and pace of future European integration. Russia's agreement with the EU dates from 1993.

The three *Mediterranean candidates* that have applied for membership - Turkey, Cyprus and Malta - are associates of some years' standing. Turkey applied for membership in 1987, Malta and Cyprus applied in 1990. During 1995 the dialogues was strengthened with the signing of a free trade agreement with Turkey, membership seems however to be far into the future.

The economic, social and cultural (and scientific) relationships going beyond the external frontiers have clearly been on the agenda for some years as far as the south is concerned; and more especially *the Maghreb countries* on the western Mediterranean border (Algeria, Tunisia, Morocco; Libya and Mauritania). The economic, social and political situation is so explosive that southern Europe's near future itself must be viewed in the light of what is happening in Maghreb.

The Community's bilateral approach to the countries in the region was maintained until 1972[33]; when the Global Mediterranean Policy (GMP) was created, implying a treatment of the area as a whole. The GMP addresses not only trade; but also economic and financial co-operation issues; social questions, political dialogue and scientific and technical co-operation. In 1990 the Renewed Mediterranean Policy was created which enforced the contacts further.

With the Mediterranean countries the Union shares S/T topics related to common problems, involving energy, environmental needs to safeguard the Mediterranean Sea and intensify efforts to preserve renewable resources and to combat pollution, erosion; desertification, migration, public health etc.

---

[33] The only reference to EC-Maghreb relations in the Treaty of Rome appears in the annexes, which refer to special agreements with the Marocco, Libya and Tunisia. The first trade agreements were not signed with Marocco and Tunisia until 1969.

The scientific co-operation is recently suggested strengthened:

> Beyond free trade, the Union should be prepared to enter into wide ranging areas of co-operation with Mediterranean countries, for instance in science and technology. [34]

With the present presidency in the hands of the French - followed by Spain and then Italy - the probability that the Mediterranean dimension will be given increasing weight is expected for the next period.

When it comes to the relationship between the EU and countries beyond future members and neighbouring states, Asia is of particular interest in the scientific field. The rise of *Asia* is dramatically changing the world balance of economic power. By the year 2000, the World Bank estimates that half the total global growth will come from East and South East Asia alone. In a recent communication from the Commission[35], the need for strengthening relations were stressed. It was underlined that enhancing co-operation in the fields of science may have positive effects on the Union's economic presence in the region. The fields of information and communication technologies; industrial, and materials technologies and biotechnologies are mentioned as important areas where the co-operation should be strengthened.

As far as the African, Caribbean and Pacific (ACP) countries are concerned, the Community and the Commission signed the Fourth Lome Convention in December 1989. This gives the overall framework for co-operation activities with these countries. This framework gives particular weight to science and technology aspects in the fields of reinforcing national research capabilities; know-how and mastering of technologies.[36]

Although the southern Mediterranean is of great importance to Europe the question still remains whether increasing responsibilities is possible to achieve at the same time as enlargements with Eastern and Central European

---

[34] (Communication from Commissioners Marin, Britton and Van den Broek : *Communication de la Commission au Conseil et au Parlement Europeen sur le reenforcement de la Politique Mediterraneenne de l`Union Europeenne.* Le 13 Octobre 1994. O/94/346)).

[35] Com (94) 314 Final. *Towards a New Asia Strategy.* July 1994.

[36] The Lome convention is in budgetary terms a mechanism outside the European Union (financed by Europeean Development Funds).

countries are on the agenda. Discussions are currently taking place on the establishment of a free-trade area with the Maghreb countries, which will further increase the formal interactions. With the changing of the presidency of the Council, however; from the German (and their focus on the East) to the French and then the Spanish and the Italians, there are clear signs that the focus will shift somewhat towards the Mediterranean non-members. Security and immigration worries are the driving forces behind the EUs desire to build closer ties with its North African neighbours.[37] As regards Israel, its outstanding record in RTD and its links with European scientists make it a significant partner. A reinforcement is now underway through a co-operation agreement which foresees association with the non-nuclear specific programmes of the Fourth Framework Programme.

Scientific co-operation with third countries has been steadily increasing and has been taking on many different forms, as we have described more in detail in previous sectors of this paper. This process of different "layers" of co-operation in the scientific field is set to continue to match the increasing tendency of internationalisation of science, as well as the increasing "web" of co-operation agreements in various fields between the EU and other parts of the world.

6.2 Global trends of science and technology

The term "globalisation of research" covers both a thematic orientation (global problems like global change) and organisational implementation of the research (the increasing use of international "networking" and the internationalisation of the organisation of science policy).

Future prospects for the EU scientific co-operation must be seen in light of more general trends within the field of science and technology in the OECD area. Six trends in the OECD area are highlighted in the OECD's recent Science and Technology Policy Review and Outlook (1994):

i) Governments clearly attach great importance to science and technology but, as the recession continues, more and more countries are finding it increasingly difficult to maintain previous funding levels

---

[37] *Spain seeks Union to link to Maghreb*. The European 9-15 June 1995.

ii) Many countries show a shift in policy emphasis towards support for technology, with governments allocate funding to innovation so as to maintain industrial competitiveness and to stimulate growth

iii) Governments have made serious attempts to streamline their science and technology efforts by restructuring administrative bodies and setting priorities

iv) There is a growing emphasis on directing science and technology towards meeting the needs of the society, with higher expenditures on environmental and medical research

v) Geopolitical upheavals have helped modifications in science and technology policy; to address declining defence science and technology expenditures, and the focus of international co-operation has shifted towards central Europe and the new independent states of former Soviet Union; as well as the growing efforts in the Asia-Pacific region

vi) Scientific education and technical training initiatives are on the rise as efforts are increasingly devoted to knowledge-based economies.

Other studies of recent trends in science and technology seem to indicate a shift from a "traditional" approach to a "modern" approach i.e. from science only related to material aspects (material sciences) to a greater attention also to organisational, institutional and cultural aspects of science (technological practices), and a shift in the objectives from stimulating economic growth as the one and only concern to additional objectives as social and ecological compatibility. The changes also implies changed roles for the state and policy making; from direct control to a facilitator and context controller. (Schienstock 1994[38]). This implies that further change along these lines can also be expected also in other countries - where these changes have not already occurred - in the next decade.

The fact that similarities appear in the science policies of different countries seems to us due to the international nature of relations in science policy. One possible explanation is that it is not only scientific

---

[38] Scienstock G.,1994: *Technology Policy in the Process of Change: Changing Paradigms in Research and Technology Policy*? in Aichholzer G. and Scienstock G, 1994. Cited after European Report on Science and Technology Indicators 1994, EUR 15897.

knowledge that crosses frontiers but also the organisation of this production and the way the research system is regulated and used.(Ruivo 1994)

Since the mid-1980's transnational corporations have started performing some of their research activities in developing countries. The motives are partly technology related (gaining access to foreign science and technology resources) and cost related, as scientists in developing countries have substantially lower wages. It can be argued that large developing countries, such as Brazil; China and India, have dual technological environments. At one end, there are high-tech scientific talents, which shows complementarities with western countries. At the other end, a larger portion of the economy displays a low science and technology development. Transnational corporations are for instance attempting to use the former. To be able to reap positive benefits, the national science and technology system need to have the necessary strength to be able to benefit by building up the innovative capability in developing countries. [39]

6.3 Concluding remarks

The adoption of the Fourth Framework programme of research marked an important change as international scientific co-operation with third countries is included into the overall science and technology strategy within the EU.

The international research co-operation between the European Union and third countries should now be seen as an integrated - and permanent - part of the European research co-operation and possibly one which will increase and intensify in the years to come. The "layers" of co-operation between the EU and third countries have been evolving fast - and this trend seems to be continuing into the next century. The broadened scope of the co-operation will probably be reflected both in the number of countries participating in the co-operation as well as in themes to be covered.

There seems currently a trend in most industrialised countries of increasing preventive research i.e. (environment, health, climate, polar research) concerning major problems of society world-wide, at the expense

---

[39] *Emerging patterns of globalisation of corporate R&D and scope for innovative capability building in developing countries.* AS Prasada Reddy and Jon Sigurdson. Science and Policy. October 1994. Sarec.

of industrial research.[40] The question arises whether this trend will continue and expand also to other countries of the world as they reach higher levels of development. The research co-operation within the EU seems however still to be dominated by the main aim i.e. strengthening the industrial competitiveness. [41]

The increasing role of the European Parliament in the co-decision procedures of the EU may have as an effect that the international science and technology co-operation will be strengthened in the Fifth Framework programme compared to the Fourth. This may be counteracted by other processes, for instance the need to strengthen the social and economic cohesion within the existing Union, and in particular if the enlargements towards the East - and the South - proceed as foreseen. Growing social and economic disparities within and between countries and the costs of increasing the membership may curb the will to increase the research co-operation with third countries. Given the driving forces behind the research co-operation however, see part 3.6, as well as recent trends, an expansion is more likely.

The globalisation of research will strengthen the need for a continued research co-operation between the EU and the rest of the world. Research co-operation with third countries should thus be viewed as an instrument for stimulating economic and social development in an increasingly knowledge-based world.

---

[40] European Report on Science and Technology Indicators, 1994, p 131.

[41] Supplement 3/94 An industrial competitiveness policy of the European Union. *The Commission will ensure, in keeping with the commitment given in the Community's fourth framework programme (1994-98) that research policy takes fuller account of the need of the market notably by means of closer contact with the operators concerned.* (p 6).

References

CEC:Communication to the Council and the European Parliament on prospects for cooperation in science and technology with the New Independent States (NIS). Adopted by the Council 16.05.95. COM (95) 190

CEC:Cooperation in Science and Technology with Third Countries. COM (90) 256 final. Brussels, 13 June 1990.

Council Decision of 21 November concerning the rules for the participation of undertakings, research centres and universities in research, technological development and demonstration activities of the European Community. OJ No L 306/8 (94/763/EC)

Council Decision of 23 November 1994 adopting a specific programme of research and technological development, including demonstration in the field of cooperation with third countries and international organizations (1994-1998). OJ No L 334/109 (94/807/EC).

Council Decision of 21 November 1994 concerning the rules for the participation of undertakings, research centres and universitites in research, technological development and demonstration activities of the European Community. OJ No L 306/8 (94/763/EC).

European Union. Selected instruments taken from the Treaties. Book I. Volume I. 1993. Luxembourg. ISBN 92-824-1063-3.

CEC:Research and Technological Development. Achieving Coordination through cooperation. COM (94) 438 Final.

CEC:An industrial competitiveness policy for the European Union. Bulletin of the European Union. Supplement 3/94. COM(94)319 final.

CEC:Growth, Competitiveness, Employment. The challenges and ways forward into the 21st Century. White Paper. COM (93) 700 Final. Brussels, 5 December 1993.

CEC:Scientific and Technological Cooperation with Developing Countries and its Synergistic Relations with Development Funds. SEC (92)677 Final.

CEC:Second Commission Working Document concerning RTD policy in the Community and the Fourth Framework Programme (1994-98) of Community RTD Activities, COM (93) 276, final.

CEC:From the Single Act to Maastricht and beyond. The means to match our ambitions. COM (92)2000 Final. Brussels, 11 February 1992.

CEC:Experiences and carriers of Science and Engineering Fellows supported by the European Communities. EUR 12932 EN.

CEC:Evaluation of the EC Research Training Fellowship scheme (1968-89) and of the ISC Fellowship Scheme (1985-1989). EUR 12931 EN.

CEC: Research after Maastricht Supplement 1992 - SEC (92) 682, April 1992

CEC: Scientific and Technological Cooperation with Developing Countries and its Synergistic Relations with Development Funds. SEC (92) 677 Final.

CEC: Cohesion and RTD policy - synergies between research and technological development policy and economic and social cohesion policy. COM (93)203 Final

CEC: Cooperation in Science and technology between the European Union and the countries of Central and Eastern Europe on the one hand and the independent states of the former Soviet union on the other. CE/94/1627

CEC: Cooperation in Science and Research with Central and Eastern Europe. Studies 3. Final Report. June 1994. ISBN 92-826-9546-8. Luxembourg 1995.

CEC: Eastern and Central Europe 2000. Studies 2. Final Report. June 1994. ISBN 92-826-9547-6. Luxembourg 1995.

CEC: The European Report on Science and Technology Indicators 1994. EUR 15897. October 1994.

CEC: EC-funded Research and Technological Development. An insight into the handling of project proposals. An introduction to contract negotiation. January 1994. ISBN 9282670767

***

Archer, Clive and Butler, Fiona: *The European Community. Structure & Process.* Pinter Publishers. London. 1992.

Barnett, A: *Knowledge transfer and developing countries in Global Perspective 2010 -Tasks for Science and Technology.* Volume 10. FOP 326. June 1992. Forecasting and Assessment in Science and Technology. European Commission. DG XII.

Cafrany, Alan W. and Rosenthal, Glenda: *The State of the European Community. The Maastricht Debates and Beyond* , Lynne Rienner Publishers, Boulder; Colorado, 1993.

CDU/CSU: Document on the CDU/CSU Parliamentary Group in the German Bundestag on the future of European unification. Europe documents. 7 September 1994.

Edwards, Geoffry and Spence, David: *The European Commission.* Longman current Affairs. 1994.

European Social Observatory: *Synoptic analysis of teh Treaties before and after Maastricht.* Working Paper. 1994.

Fontaine, Pascal: *Europa i ti leksjoner.* Europeisk dokumentasjon. 1992.

Freeman C. and Hagedoorn, J: *Globalization of technology.* FOP 322. June 1992. A report for the FAST Programme. Commission of the European Community.

Hingel, Anders Joest, *Co-development across the EC's external policies* in Science, Technology and Social and Economic Cohesion in the Community. Overall Syntesis Report and Selected Reports. CEC. FOP 300. 1992/1993

Matlary, Janne Haaland: *The Commission as Policy-Maker: The Need to Venture Beyond State-Centric Integration Theory.* CICERO, Working paper 1995:5, Oslo

Matlary, Janne Haaland: *Now you see it; Now you don`t: Expose and Critique of Approaches to the Study of European Integration*, CICERO, Working paper 1993:7, Oslo

Metcalfe, Les: After 1992: *Can the Commission manage Europe?* Australian Journal of Publich Administration; Vol. 51, No. 1, March 1992.

Ruberti, Antonio and Andre, Michel: *The European Model of Research Cooperation.* Issues in Science and Technology. Spring 1995.

Ruivo, Beatriz: *'Phases' or 'paradigms' of science policy*? Science and Policy, June 1994.

Sørli, Ingunn: *Forskning og utvikling i EF - Retninger for nær framtid* (Science and technology in the EC - Directions for the near future) Fremtek notat, 14/93, Oslo September 1993, The Research Council of Norway.

Skoie, Hans og Østtveiten, Helge Strand: *EFs forsknings- of teknologisamarbeid - en generell oversikt og noen erfaringer fra små medlemsland*, (The scientific and technological cooperation of the EC - An overview and some experiences from small memberstates) Rapport 5/93, Utredningsinstituttet, The Research Council of Norway. The main article included in this volume.

Shoults, Tamsin: *Policies, Viewpoints and Debates on RTD and Social and Economic Chohesion in the Community Institutions.* FOP 239. Vol 15. CEC. Juni 1991.

Valentini, Giuseppe et Andre, Michel: *La science et la technique au service du developpement L'action de la Communaute Europeenne.* Mondes en Developpement, Tome 16; No 64; 1988, pp 63-68.

Warrant, Francoise: *Transnationalization of R&D: A tentative overview* (pp 59-88) in Muldur, U and Petrella, R; The European Community and the globalization of technology and the economy. 1994. EUR 15150 en.

Whiston, T.G. *Global perspective 2010 -Tasks for science and technology. A Synthesis report.* A report for the FAST-programme of the European Commission. August 1992. FOP 320.

Glossary

ACP Countries in Africa, Caribbean and the Pacific, covered by the Lome agreement

ALAMED Asia, Latin America and the Mediterranean countries, bilateral economic agreements

APAS Action of promotion, assistance and support outside the FP made available by the Parliament on an annual (but renewable) basis (ex ISC, Copernicus, Peco)

AVICENNE Research initiative to promote cooperation between EU and the Maghreb countries and (non-member) countries of the Mediterranean basis.

CEC the Commission of the European Communities (also referred to in the text as the European Commission or simply the Commission)

COM (xx)yy Official Commission document reference number

COPERNICUS Community action in support of the countries of Central and Eastern Europe and, from 1994,the New Independent States in the field of research.

COST (Cooperation Scientific et Technologique) European Cooperation in Scientific and Technical research

DC Developing country

EC the European Communities

EU the European Union

EFTA European Free Trade Association

EEA the European Economic Area

EUREKA European technological initiative to encourage cooperation between member countries and promote industrial competitiveness

FP Framework programme

GMP General Mediterranean Policy

INTAS International Association for the promotion of cooperation with scientists from the New Independent States

ISC International Scientific cooperation between the EC and the ALAMED countries

ISTC International Science and Technology Centre, aiming at reorient former Soviet Union military scientists to civil application

INCO International Cooperation (the second activity of the Community's Fourth Framework programme covering research cooperation with third countries and international organizations)

LDC's Less developed countries

MECU Millions of ECUss

NIC's Newly industrialised countries

NIS Newly independent states (of former Soviet Union)

OECD Organization for Economic Cooperation and Development

PECO (Pays d`Europe Centrale et Orientale) Countries of Central and Eastern Europe (participation of these countries in five specific programmes of the Third framework programme

PHARE Pologne- Hongrie: Aide a la reconstruction Economique. Community programme now covering the countries of Central Europe and Baltic States

RTD Research, technological development and demonstrationS&T Science and technology

STD Science and Technology for Development, programme for scientific cooperation with DCs

TACIS Commmunity programme for Technical Assistance to the Commonwealth of Independent States

TNCs Transnational corporations (or multinational corporations)

Postscript

The work with this report was finalized in early autumn 1995, but developments have since then taken place which may have impacts on the future research policy of the European Union and which underlines the issues raised in our report.

During late autumn 1995 the Commissioner for research, Edith Cresson, presented her views on the international scientific cooperation of the European Union. She proposed, in the communication (COM 95/489 Final) *Perspectives for International Cooperation*[42] *in Research and Technological Development* which was approved by the Council on the 18 October 1995, to focus the EU`s scientific cooperation on eight priority lines for action, including the strengthening of cooperation with Mediterranean countries and Central and Eastern Countries. The communication stresses the need to both increase industrial elements in the research cooperation with third countries as well as underlining the need to increase the external dimension of the research policy of the EU. The Communication also underlines that the amount put aside in the Fourth Framework Programme for research cooperation with third countries (4,4 % or 540 mill Ecus) are far from sufficient.

The action lines proposed are the following:

- Increasing industrial involvement in international science and technology cooperation
- Strengthening the external dimension in RTD policy
- Promoting cooperation in global inititatives
- Responding to needs of the least advanced countries
- Strengthening the role of the Community delegations in the international RTD cooperation
- Using external EU funds for RTD
- Additional funding -for the Mediterranean region from the revised 4FP, and
- for Central and Eastern Europe to support the pre-adhesion phase, as well as to encourage nuclear safety research, from the revised 4FP and the Euratom FP resources.

---

42 With International cooperation is meant cooperation with countries outside of the EU (and the associated states).

Concerning the revised 4FP this refers to the budget compromise from 1994 where the Council and the Parliament agreed on a budget of 12,3 billion Ecus for the next five years. In addition, agreement was made to put aside a reserve of 700 million Ecus for later consideration as a "top-up" financing of the Framework programme. A formal suggestion of the use of the additional budget is foreseen during the first half of 1996.

In a recent statement, the European Science and Technology Assembly (ESTA), which advises the European Commission in the field of Science and Technology gave its preliminary opinion on the so called Research/Industry Task Forces set up recently by the Commission, the the possible ECU 700 increase of the 4FP budget. In its opinion (from November 1995) on the increase of the budget the ESTA draws attention to three aspects, among them the need to strengthen international scientific cooperation:

> The recent emphasis on the EU`s Mediterranean policy is likely to result in additional pressure on the under-budgeted international scientific cooperation programme which already faces considerable (moral) commitments to the Central and Eastern European countries. It is in the interest of security (e.g.nuclear safety, environmental and demographic problems), as well as of access to and convenient communication with scientific and technological potential outside the European Union, that international cooperation be restored to a position of prominence and impact within the EU policies.

The discussions on the next and the fifth framework programme for research in the EU will gain momentum in 1996. A formal proposal from the Commission is expected in the last half of 1996. The fifth framework programme will take over from the Fourth and will take European Science into the next century.

Oslo, 08.12.95

Kristin Hauge

Tables Appendix

1. Research cooperation with Central and Eastern European Countries 1991-1994

in million Ecus

	COPERNICUS	PECO	
1991	5	-	5
1992	40	10	50
1993	70	17	87,70
1994	64	19	83

Source: CEC-services. Derived from programme documentation.
The European Report on Science and Technology Indicators (Eur 15897 EN)

2. Research cooperation with new Independent States 1991-1994

in million Ecus

	Copernicus	PECO	Nuclear Safety	Intas	Total
1991	-	-	3	-	3
1992	-	-	7	4	11
1993	-	-	7	21	28
1994*	3	3	11	20	37
					79

* CEC-services. Provisional amounts derived from programme documentation.
The European Report on Science and Technology Indicators (Eur 15897 EN)

3. Research cooperation with developing countries (incl Mediterranean non-members) 1983-1994

in million Ecus

	ISC	STD	Avicenne
1983	-	40.*	
1984	2		
1985	4		
1986	3		
1987	9	85**	
1988	16		
1989	15,0		
1990	28,0		
1991	39,0	126***	
1992	48,0	5,0	
1993	54,0		5,3+9,0
1994	53,0		5,3

Source: CEC-services, derived from programme documentationThe European Report on Science and Technology Indicators (Eur 15897 EN)

* STD 1 1983-87 (outside the First FP) equalised 1,06 per cent of the 1FP.
** STD 2 1986-1990 (part of the Second FP) equalised 1,57 per cent of the 2FP
*** STD 3 1990-1994 (part of the Third FP) equalised 1,9 per cent of 3FP

The ISC and Avicenne budgets were annual. The STD budgets were multiannual, and therefore the distribution of the budget varied within the five year period.

4. The Second Framework Programme for RTD (1987-1991)

Quality of life	6.9%
Towards a large market and an information and communication society	42.2 %
Modernisation of industrial sectors	15.7 %
Exploitation and optimum use of biological resources	5.2%
Energy	21.7%
Science and technology for development (STD2) 85 MEcus	*1.57%*
Exploitation of sea bed and use of marine resources	1.5 %
Improvement of European S&T cooperation	5.3 %
	100 % (5396 MECUs)

Source: CEC. The European Report on Science and Technology Indicators (Eur 15897 EN)T

5. The Third Framework Programme for RTD (1990-1994)

Information and communication technologies	37.7 %
Industrial and material technologies	15.1%
Environment	8.8 %
Life sciences and technologies *(incl STD3; Life sciences and technologies for DCs =126 Mecus i.e 1.9 %)*	12.6 %
Energy	15.9 %
Human Capital and Mobility	8.8 %
	100 % (6600 million Ecu`s)

Source: CEC. The European Report on Science and Technology Indicators (Eur 15897 EN)

Part II

EU and the Nordic Countries

Hans Skoie

The Nordic Countries and the S&T Programme in the European Union[1]

1 The Nordic countries - an introduction

Among the four Nordic countries[2] - Denmark, Finland, Norway, and Sweden - only Denmark is presently a member of the European Union (EU)[3]. However, in terms of S&T all the countries now participate actively in the EU Framework Programme. The creation of the European Economic Area (EEA) made it also possible for all the Nordic countries to participate in this programme.

Finland, Norway and Sweden have recently negotiated the terms of full membership in the Union, and one or more of the countries may become members in 1995. However, the membership issue is indeed controversial in all three countries, and may actually be turned down in the political ratification process now taking place. The sensitivity of the matter was demonstrated in full in 1972 when the Norwegian electorate said "no" to membership in a referendum. Also the present process includes a referendum in each country in the fall of 1994. In Table 1 we sum up the current situation for the four countries (fall 1994).

---

1 Article based on paper given at the Oxford Conference on EU Collaboration in R&D, Oxford, 11.-14.4.1994. To appear in the Conference proceedings.

2 Iceland is not included in this treatment.

3 In the fall of 1994, Finland and Sweden decided to join the Union, while Norway once more said no. Accordingly, the Nordic relations have changed significantly from January 1995.

Table 1 The Nordic countries - inhabitants and relation to the European Union in 1994.

	Inhabitants Mill	EU-relation in the fall of 1994		
		Membership	EEA	Remark
Denmark	5.1	Yes (1973)	-	Maastricht referendum (twice)
Finland	5.0	No	Yes	Referendum Oct. 94
Norway	4.2	No	Yes	Referendum Nov. 94
Sweden	8.6	No	Yes	Referendum Nov. 94
Total	22.9	-	-	-

2 The Nordic countries - R&D resources

The four Nordic countries have by and large been pursuing active policies in order to expand and direct public R&D expenditures toward a variety of national goals in the post war period. This essentially sectorial approach has also included an active government role in developing industrial policies - not least through public R&D investments.

A major difference in the public R&D spending pattern among the countries is, however, the considerable defence R&D spending in Sweden. This is revealed clearly in Table 2 which gives the public R&D expenditures according to three major objectives: advancement of knowledge, other civil objectives, and defence. Sweden has for long sought to back up its non-allied policy by domestic manufacturing of significant parts of their own military equipment - including fighter planes[4]. In the private sector, the strong R&D spending by industry is also noteworthy in Sweden.

An essentially sectorial approach to publicly funded R&D has been dominant in all four countries in the post war period. A mixture of research councils and technology agencies has played an important role on the funding side. A new reform of the funding system has now given Norway a more centralized funding pattern than the other countries[5] however.

---

4 Dörfer, Ingmar: *System 37 Viggen.* Arms, technology and the domestication of glory. Universitetsforlaget, Oslo, 1973.

5 The new structure was presented in a White paper to Parliament in 1992 (St.meld.nr. 43, 1991-92). A short presentation of the changes is outlined in Hans Skoie "A Mixed Bag of Norwegian Research Councils Becomes One" in Tell'us - Science in Norway, published by the Norwegian Research Council, February, 1994.

Table 2 Total public expenditure to R&D 1993 by three major objectives. Billion Swedish kroner (SEK).

Objective	Denmark	Finland	Norway	Sweden
Advancement of knowledge	4,3	3,0	4,3	8,9
Other civil objectives	2,8	5,4	4,6	5,1
Defence	0,1	0,1	0,5	4,5
Total	7,2	8,5	9,4	18,5

3 R&D expenditure - an international comparison

In Table 3 below we present key figures on R&D spending in the EFTA countries, the EU countries as well as the USA and Japan. The figures are based on OECD data collected according to the so-called "Frascati Manual".

We notice that the US (NOK 5700) and Japan (NOK 5600) spent most on R&D in 1991 measured in terms of spending per inhabitant, while the EU countries, Greece, Portugal, Spain and Ireland invested the least (NOK 300-1200). The total EU R&D expenditure is about 2 per cent of the total GDP - compared to 2.7 per cent in the USA and 3.1 per cent in Japan. Industry finances the largest percentage in Japan, followed by Belgium. The defence share is particularly high in the US (60 per cent), Great Britain (45 per cent), and France (36 per cent). However, in Sweden this percentage is also considerable (27 per cent). We also note that Sweden is the major spender while Denmark spends the least on R&D among the Nordic countries measured as per cent of the GDP.

Table 3 Key R&D figures for EU countries, EFTA countries and the USA and Japan. 1991.

Country	Total R&D expenditure		Publicly funded R&D as a pct. of total R&D	Defence R&D as a pct. of total publicly funded R&D
	NOK * per inhabitant	Pct. of GDP		
Finland	3100	2,1	40,9	1,3
Iceland	2000	1,2	69,7	0,0
Norway	3000	1,8	49,5	5,7
Switzerland **	5500	2,9	22,6	18,5
Sweden	4600	2,9	35,3	27,0
Austria	2500	1,5	46,5	0,0
Belgium ***	2600	1,7	27,6	0,2
Denmark	2900	1,7	39,7	0,6
France	4200	2,4	48,8	36,1
Greece	300	0,5	57,7	1,4
Ireland	1200	1,1	28,2	0,0
Italy	2200	1,3	46,6	7,9
Netherlands	3000	1,9	44,9	3,5
Portugal ***	500	0,6	61,8	0,9
Spain	1100	0,9	45,7	16,8
Great Britain	3200	2,1	35,5	44,8
Germany	4300	2,7	36,5	11,0
USA	5700	2,7	44,9	59,7
Japan	5600	3,1	18,2	5,7

* NOK= Norwegian Kroner.
** 1989 figures.
*** 1990 figures.

Source: OECD

4 The international R&D dimension in the Nordic countries

International cooperation in the S&T area has increasingly been recognized as an important matter in all the Nordic countries in recent years[6]. From the latter part of the 1980s the emphasis on internationalisation has been particularly strengthened, and also given much impetus for establishing a closer relationship in this area toward the EU.

In Table 4 we give available estimates for the public expenditures for organised international R&D cooperation in Norway according to geographical orientation. We notice that (Western) Europe represents the most dominant geographical target for such cooperation. Internal Nordic cooperation in this area is also significant, but considerably smaller. It may probably not be to far fetched to assume a rather similar pattern in all the four countries.

Table 4 Approximate Norwegian expenditure (public and private) for organised international R&D cooperation in 1994. By main geographical orientation. NOK millions.

Source	Nordic	Europe	Not specified	Total
Government ministries	20	390	470	880
Research councils	40	180	130	350
Industry	270	170	60	500
Total	330	740	660	1730

Source: Institute for Studies in Research and Higher Education, Oslo.

In terms of individual contacts by Nordic researchers abroad the geographical orientation has by and large been toward the Anglo-American sphere in the post war period. Table 5 illustrates this point in the case of Norway for foreign stays of one semester or more (sabbaticals, etc.) for

---

6 Det västeuropeiska forskningssamarbetet och Norden. En översikt. Nordiska Ministerrådet. FPR-publication nr.7 (1988). This report demonstrates this point clearly. The point is also emphasized in all White Papers on R&D etc. the four contries in recent years.

university researchers. Data for five Finnish university departments also show a similar orientation toward the USA. However, the pattern is less clear than in the case of Norway[7].

Table 5 Research visits (one semester or more) abroad by Norwegian university researchers. By region and field. Percentage of number of visits. 1991.

Region	Humanities	Social Scs.	Natural Scs.	Medicine	Technology
West Europe excluding the Nordic countries	47	30	21	20	21
North America	32	48	64	57	66
East Europe	2	2	-	1	1
Other	6	15	8	12	10
Nordic countries	13	5	8	11	3
Total	100	100	101	101	101
(N)	(198)	(192)	(445)	(160)	(122)

Source: Institute for Studies in Research and Higher Education, Oslo.

5 The Nordic countries and the EU dimension

Naturally, the Nordic countries were not involved in R&D cooperation in the European Union from the outset in the fifties and sixties, *i.e.* Euratom and the big technology projects which were launched by the EU or the big EU countries in various ways. Apart from Finland, membership and cooperation with CERN came into being from the outset in the early fifties, however

In the seventies the Nordic countries got involved in the COST programme. The "menu principle", the basic guiding principle for participation in this programme, made of course such participation much simpler and more attractive for non-members. The launching of the European Science Foundation (ESF) in the early seventies was also strongly

[7] Private communication from Erkki Kaukonen, Science Studies Unit, University of Tampere.

backed by most of the research councils in the Nordic countries - particularly in Sweden[8].

In the second part of the 1980s the Framework Programmes attracted considerable interest in the Nordic countries, and a mechanism for partial participation was developed already for the Second Framework Programme through bilateral agreements. The establishment of the European Economic Area meant further progress for the R&D area in this respect. Even long before the EEA agreement formally was reached in 1993, Finland, Norway and Sweden were allowed to participate in the Third Framework Programme with certain limitations. The arrangement also included active observer status in the CREST committee. The EFTA countries did not join Euratom, however. Actually, they worked deliberately to keep participation in this organization optional in the EEA negotations[9].

At the same time the European dimension in R&D cooperation was strengthened for the Nordic countries through membership in Eureka from the start of the organization in 1985[10]. In addition Denmark and Norway joined the Euclid programme for defence R&D organised by the European members of NATO in the end of the eighties.

6 The present situation

International R&D cooperation in science and technology has in general been seen increasingly as an important tool in order to remain competitive. Accordingly, the public authorities in the Nordic countries have in the last few years paid considerable attention to the EU S&T issue and sought to establish efficient cooperation which gives "value for money". The question of membership in the EU has, however, been the overall dominant rationale; cooperation in the R&D area has by and large followed by implications from this broad goal.

---

8 ESF: The Next Decade. A Reappraisal of ESF's Strategic Mission, ESF, Strasbourg, 1993.

9 Director General Hugo Parr, who took part in the negotiations on the Norwegian side, in an interview with "Forskningspolitikk" 3/92.

10 Peterson, John: High Technology and the Competitive State, 1993.

Not surprisingly, the authorities have been eager to establish information and service units in order to assist the R&D community in "coming to grips with Brussels" and to exploit the possibilities given in the Framework Programme.

In Table 6 we give the number of projects the Nordic countries presently (1994) are engaged in the Third Framework Programme by programme as well as engagement in Eureka projects in the periode 1986-91. We notice that Denmark, a full member has the highest score in the Framework Programme with 436 projects. The non-member countries participate in significantly fewer projects. In Eureka Denmark has the lowest number of projects. In relation to the population the number of projects is highest in Norway.

Table 6 Participation in the Framework programme and Eureka projects by country.

	Framework*	Eureka**
Denmark	436	77
Finland	99	87
Norway	131	119
Sweden	271	123

* CORDIS database.
** Eureka 1986-1991, p. 41.[11]

7 Future perspectives

7.1 EU - a new basis for international cooperation?

Whereas cooperation in research in the EU has so far chiefly been confined to industry and energy, the Treaty of Maastricht opens for such cooperation in all sectors of society. It also envisages coordination of the research efforts and research policies of member countries. The recent White Paper[12] issued by the Commission follows up the efforts to develop a joint research policy

[11] Eureka, 1986-1991, published by Eureka, Brussels, 1991.

[12] Growth, Competitiveness, Employment. The Challenges and ways forward in the 21st Century (Dec, 1993).

within the EU, and proposes that a start be made with the research councils. At the Summit at CORFU in June 1994, this policy also was emphasized[13].

The implications for developments in the research field in Europe of the striving towards union at Maastricht may be of great importance. Naturally, the new Treaty opens up opportunities for research cooperation in any political or social sector where it may be thought desirable. In contrast to the present concentration in the Single European Act on technical and industrial research, the scope now in principles extends from defence research to research in social areas (whatever is "deemed necessary" as stated in the Maastricht text). An equally interesting point is that coordination of the national "research policies" of member countries has now been embodied in the Treaty. The intention is to develop a research policy for the entire Union.

Will this in practice entail any radically new departures in the field of research? The answer depends very much on the movement, if any, toward a real political integrated union. If the EU really does develop in the direction of a union with clearly supranational elements, that will in all probability lead to much broader and far more extensive research cooperation between the member countries. Attempts will probably also be made to adjust national research strategies to a joint union strategy. As supranational cooperation extends into new "areas of policy", it will of course be just as natural as in any nation state to "make use of research" to realise political objectives, whether in the fields of welfare, energy, defence or whatever. The decisive issue will be in which sectors of society general EU consensus and cooperation can be reached.

The conditions for successful international cooperation in research and technology are often ignored[14]. One prerequisite is for a cooperative project to be well founded on scientific or technological ground. But because of their close relations with economics and defence, major projects in the fields of applied research and technology also presuppose genuine political agreement and coordination between the participating countries. In practice, such agreements have often been missing in Western Europe - this accounts to a great extent for the unsatisfactory results of cooperation in many such areas. But it also helps explaining the great success of several large

---

13 In the Communiqué.

14 Skolnikoff, Eugene B. in "Science, technology and American foreign policy". Camb., Mass, MIT Press, 1967, emphasizes this point strongly.

international basic research projects with no direct relation to defence, the economy, or industry[15].

In view of this experience, it has been argued that the EU ought to have begun by financing basic research and the infrastructure of universities instead of by promoting precompetitive industrial research. It could also have supported and contributed to the strengthening of Europe's cultural heritage and cooperation. A number of European research councils heads have recently been prominent among those expressing this view[16]. Interestingly enough, also Nordic actors have recently been recommending that EU funding be shifted towards universities, leaving industrial research funding to Eureka[17].

Generally speaking, the larger countries in Western Europe have so far been reluctant in practice to accept that countries are becoming more dependent on each other in consequence of cooperation based on division of labour and subcontracting aimed at a common good. Not until they do so will the countries be able to reap the benefits that cooperation within a continent ought to produce. That is what, in this context, lends interest to the efforts to achieve a supernational union. Existing research cooperation in EU, also reflects considerable tension from time to time, arising not least from the different views countries take on industrial policy, and especially of the role of the state.

Work in Brussels on matters relating to research has recently clearly been marked by the turbulence surrounding Maastricht and the Treaty. The plans in the new White Paper, and the Fourth Framework Programme for research, still remain to a surprising extent focused on technology and industry, which are regarded as the most important target sectors. Presumably this also reflects the difficulty in practice of agreeing on new fields of cooperation; it may be easier to step up cooperation in an area where it is already taking place than agree on something entirely new.

---

15 Williams, Roger: European Technology: the politics of collaboration. London, Croon Helm, 1973.

16 Such meetings of «the Eurohorcs» have been reported in Nature - *e.g.* February 18th, 1993.

17 Rolf Skår in an interview with "Forskningspolitikk", 1/1993. The preparation of the Fifth Framework Programme indicate so far that the Nordic governments may wish to change emphasis considerable in the programme - e.g. Forskningspolitikk 4/95.

But, according to the Commission's White Paper, Europe is still "lagging behind"[18]. More researchers and larger investments are called for. With public funds stretched to the limit, industry itself will have to dig deeper, encouraged among other things by tax relief. Meanwhile, research policies of member countries will have to be coordinated - which, confesses the White Paper, is scarcely happening today. Such coordination should begin with the agencies responsible for public funding, i.e. principally the agencies which provide support for industrial policy, and the research councils. In this connection, the White Paper recommends the establishment of several coordinating mechanismes under EU auspices. Within a union, of course, such coordination of the research and development activities of member countries is natural, though hardly easy to implement in practice. That will depend on the degree of real political integration and of the sticks and carrots available to Brussels at any given time.

7.2 The membership question

The degree of R&D cooperation with the EU countries will of course be influenced by the outcome of the political process in the fall of 1994 on the membership issue for the three Nordic countries still not members of the EU. If the answer should be no or the question be significantly postponed for one or more of the three countries, the EEA agreement would probably open for continued cooperation at the present level - i.e. a separate agreement for each Framework Programme would be established more or less along the same lines as for the Third Programme. There is also reason to believe that any country(ies) "left out" of the Union would like to keep "an R&D bridge" to Brussels. However, not necessarily at the same level as in the case of full member status.

The internal Nordic R&D cooperation would probably continue approximately at the present level. It has already been forcefully argued that a strengthened Nordic R&D platform may be particularly valuable in order to obtain the full benefit of the Framework Programme within the EU[19]. Furthermore, if the membership question should get a different outcome for

---

[18] Research after Maastricht: An Assessment. A strategy. COM (92) 682 (Brussels, April 1992).

[19] In the Annual Report for the Nordic Industrial Fund, Per Gjelsvik, the General Director, argues along these lines.

the four countries, deliberate efforts like research cooperation might be strengthened in order to avoid that the countries embark on very different routes politically and otherwise.

The demand for adjustments in national resources in view of comparable EU expenditures is also increasingly noticeable in the four countries these days (the question of "attribution"). Particularly the research councils and important segments of the research community may increasingly confront tension along this dimension, not least due to increased visibility of the EU funds. What was said by the politicians about the EU funds as "extra funding" in the early days of the process now have weakened considerably in practical politics in all four countries recently[20]. The result may well be that the research policy establishment may hesitate much more in the years to come in joining organised international R&D efforts - including Framework Programmes in the EU[21]. The issue of striking a balance between national and international commitments in the R&D area may actually become much more sensitive. The question of coordinating in practice the R&D effort within a policy for R&D in the entire Union would probably also meet considerable resistance in the Nordic countries. "Strengthening the co-ordination of the research policies of the Member States should, however, be in balance with the national objectives in science and technology... A strong national research system based on national needs and objectives is still essential", emphasized the Finish Government recently and is probably in tune with current thinking in the other Nordic countries[22].

---

20 In Norway such extra funds were also alluded to in Parliament. (Innst.S. No. 230, 1990-91, p.25).

The White Paper on membership in 1994 (St.meld. nr.40 (1993-94)) do, however, make no mentioning of such extra funds. In Finland the report "EC Research Strategy and Finnish S&T Policy" from the Interministerial Commission on Integration Matters Working Group, EC R&D (April 1993), it is stated that "Finland cannot fully support too sudden an increase of the EC research budget".

21 The scientific communities in the four countries seem to have accepted the EU funding of R&D to a large extent - probably influenced by growth in R&D budgets and an assumtion of "extra funds" might become available.

22 Op.cit. Also in Denmark an effort is now being made to study "the coordination" issue. Professor Peder Olesen Larsen has recently been appointed chairman of a ATV committee dealing with the issue.

7.3 Issues on the horizon

The increasing pressure on the public purse in the Nordic countries may definitely lead to greater emphasis on the results of R&D engagement within the Framework Programme in all countries. Signs in this direction are already obvious.

In the defense area interesting developments are already taking place. The four countries are about to sign a wide-raging agreement for coordinated and joint efforts in the area of production and procurement of military equipment[23]. Naturally, defense R&D is included in this connection. Up to now, the procurement policies of the Nordic countries have been very varied as a consequence of the security situation and the Cold War. How far the new arrangements will go, remains still to be seen, however.

The industrial angle to R&D cooperation as expressed in the Single Act seems not always to have been fully understood and appreciated in the R&D community as well as in many R&D policy segments in the Nordic countries. Accordingly, the extension of the scope of R&D cooperation in the EU as the Maastricht Treaty envisions probably has considerable support among the Nordic countries. At the same time the countries may soon be confronted with the difficult question of subsidiarity involved in this matter. The Finish policy report already mentioned stress the importance of this principle i.e. to support only projects that can be carried out more rationally, more cost-effectively and more efficiently at the European level, and which promise real added value as a result of cross-border co-operation[24]. However, there may be reason to believe that as long as the Brussels' R&D expenditures are relatively modest compared to national resources, the Nordic countries will support such an extension. Actually, their comments to the Fourth Framework Programme go in that direction. At the same time the overall question of establishing a much broader union is indeed more controversial in all the Nordic countries.

To what extent Western Europe is the right entity for the Nordic countries to cooperate extensively in research is another question which has emerged. The strong Nordic tradition in such cooperation with North

---

23 The essence of the issues involved is outlined by a Working Party Document, dated Stockholm, April 12th, 1994. (Rapport 2 avseende Nordiskt Framtida försvarsmaterialsamarbete). "The European" gave an interesting account of this development, July 1-7, 1994.

24 Op.cit.

America is often emphasized in this connection.Also Japan and the emerging R&D strongholds in other Asian countries are sometimes seen as important emerging partners. The European engagement should not de facto have the effect at the Nordic countries not are able to exploit these opportunities. In a nutshell that seems to be an important dilemma for all the small Nordic countries in the future.

Acknowledgments
This paper is closely connected to my study "EC Research and Technology Policies. Some Characteristics of its Development and Future Perspectives". A Norwegian version is published in Report 5/93 from the Institute for Studies in Research and Higher Education while an English version is being prepared for publication. For the present study I am grateful to Tore Grønningsæter, Erkki Kaukonen, Eski-Olavi Seppälä, Grete Ek Ulland, and Ole Wiig for supplying me with important material. I also thank Mats Ottoson and Ulla Ekberg for valuable comments to an earlier draft of this paper.

Jan Rune Holmevik

Pennies from Heaven?

A Study of Norwegian Industrial Experience with the 3rd EU Framework Programme[1] [2]

1 Introduction

The Norwegian Government has emphasised that Norway must be more active in international research collaboration in Europe. This was clearly expressed, inter al., in the State Budget for 1995 giving support for Norwegian participation in the 4th EU Framework Programme for research with 250 million NOK for this objective in 1995. Compared to 1994 this was an increase of 60 million NOK.[3]

Although investment has increased considerably, central authorities are concerned about the relatively modest Norwegian involvement in this area so far. This particularly pertains to the weak participation of industry. This is the background against which we have attempted to survey some of the experience that Norwegian companies gained while participating in the 3rd EU Framework Programme for research.

The first part of this article presents some key points of EU research activities in general, and the 3rd Framework Programme in particular, while the second part surveys Norwegian participation in the Programme, and some experience of selected companies.

2 EU R&D Activities

Investment in research and development (R&D) is a key element in the EUs technology policy. Activities in this area began in the 1960s and 70s, but it was first with the establishment of the common market that these activities gained more solid ground in the Commission. During the 1970s there were several attempts to arrange more systematic R&D efforts under the auspices

---

1 Report from a pilot project conducted for the Mininistry of Chuch, Education and Research.

2 Translated from Norwegian by Sue Ellen Walters in collaboration with the author.

3 Source: Government Budget Analysis 1995. Oslo: The Institute for Studies in Research and Higher Education. Report 5/95.

of the EC. The issue was raised at the highest levels in the Union, and according to Skoie (1993), the meeting of Ministers in January 1974 was particularly important as it was decided to initiate co-ordinated R&D activities for the whole community. One result of this conference was CREST (The Scientific and Technical Research Committee) which was given the task to "co-ordinate national research policies and assist the Commission in preparing proposals for projects of Community interest."[4] Another initiative was COST (Co-Operation Scientifique et Technologique). COST collaboration concerned 7 sectors: transport, oceanography, metallurgy, environment, meteorology, data and telecommunications. COST has existed since 1971 and is open to Non-Member countries; in 1994 25 states participated in it.

An important motivation for EU involvement in R&D has always been the fear of a "technology gap" between Europe on one hand and technological powers like USA and Japan on the other. One reason for this was, according to analyses at the end of the 1970s and beginning of the 1980s, that European companies were often greatly hindered by small national markets, and not adequately prepared to follow up the internationalisation of research which was increasing. These background factors gave rise to thoughts about a common market. Industrial research and technology development received a legitimate place, and information technologies and high-tech branches received strong support in order to make Europe more competitive internationally. Central authorities in the EU decided that the Union should go in for pre-competitive research involvement. This meant support for research that was "so far from marketable products, that companies can save money and effort by pooling R&D resources without giving away trade secrets."[5]

Until today the EU has had three Framework Programmes, and at the end of 1994 plans were being drawn up for the 4th Programme. The Framework Programmes have continually grown in importance and extent, and concerning the 3rd Programme, which is the subject of this article, it included 15 subprogrammes.

---

4 Skoie and Østtveiten (1993): EFs forsknings- og teknologisamarbeid - en generell oversikt og noen erfaringar fra tre små medlemsland. Oslo: Institute for Studies in Research and Higher Education. Report 5/93, p. 10. (EC Research and Technology Policies. Some characteristics of its development and future perspectives).

5 Quoted in Skoie and Østtveiten (1993), p. 14.

2.1 The 3rd Framework Programme: Extent and composition

There were six major programme lines in the 3rd Framework Programme. The total budget for the Programme was 6.6 million ECU, or about 55 billion NOK. The largest share of these funds went to information and communications technologies. As mentioned in the introduction, these fields received the greatest support from the start. Industrial and materials technology were also a major programme line, while non-nuclear energy was a third.

Table 1 3rd EU Framework Programme: Extent and Composition

3rd EU Framework Programme, 1991-1994	Mil. ECU	Percentage
Information and communications technology		
- information technologies	1532	23.2%
- communications technologies	554	8.4%
- telecommunications	430	6.5%
Industrial technology		
- production and materials technology	848	12.8%
- measurement and testing	159	2.4%
Environment		
- environment	469	7.1%
- marine science and technology	118	1.8%
Biotechnology		
- biotechnology	186	2.8%
- agriculture, agro-industrial res. & fisheries	377	5.7%
- biomedical and health research	151	2.3%
- life scs. & technologies for developing countries	126	1.9%
Energy		
- non-nuclear energy	262	4.0%
- safety and nuclear fission	233	3.5%
- controlled thermonuclear fusion	568	8.6%
Human capital and mobility	587	8.9%
Total	6600	100%

Source: NFR, EU Forskingsinfo, 23 February 1995.

Information technologies took place within the programme line ESPRIT (European Strategic Programme for Research and Development in Information Technology). This programme line began in 1982, and had a budget of 1,532 mil. ECU or about 1/4 of the budget of the 3rd Framework Programme. It contained 7 different subprogrammes. In September 1995 there were 23 projects in the Programme with Norwegian industrial representatives.

BRITE/EURAM (The Industrial and Materials Technologies Programme) was the second largest subprogramme. 15.2 percent of the budget in the 3rd Programme was used for this subprogramme. The objective of the programme was to improve the competitiveness of European industry through technological-scientific R&D. At the end of 1994 Norwegian industry was represented in 6 projects.

Another area with participants from Norwegian industry was JOULE, the programme for non-nuclear energies. The budget for this programme was 12 mil. ECU spread over two areas: 1) to develop new energy technologies which are economically competitive and environmentally friendly and 2) to develop methods to improve and make the use of energy more effective. At the end of the 3rd Framework Programme Norwegian industry was participating in 15 projects. The oil industry was the major representative.

RACE was the EU programme for communications technologies. The background for this programme was the assumed need for data and telecommunications in a continually more integrated Europe. The initiative for this programme was taken in 1987, and its overall objective was to create a European "Integrated Broadband Communication Network" within 1995. The programme was divided in two phases and RACE 2, during the period 1991-1994, had a total budget of 554 mil. ECU. Norwegian industry was represented with 5 projects in the programme.

A third programme with representatives from Norwegian industry was TELEMAT which is the EUs telecommunications programme (2 companies), MAST, the programme for marine science and technology (2 companies), and Environment also with representatives from two companies.

Table 2 3rd EU Framework Programme: A Nordic Perspective

Programme line	Progr.	Denmark	Finland	Norway	Sweden
Information and communications technologies					
- information technologies	ESPRIT	48	7	16	50
- communications technologies	RACE	16	17	7	14
- telecommunications	AIM	12	7	0	10
	DELTA	1	0	0	0
	DRIVE	5	2	6	17
	LIBRAR	5	0	2	1
	LRE	6	2	0	0
	ORA	7	1	0	0
Industrial technology					
- production and materials technology	BR/EUR	40	4	5	23
	AERO	8	1	1	8
- measurement and test.	BCR	5	0	0	0
Environment					
- environment	ENVC	61	14	35	38
- marine science and technology	MAST	24	1	12	2
Biotechnology					
- biotechnology	BIOTECH	18	2	1	10
- agriculture and agro-industrial research & fisheries	AIR	26	7	5	16
- biomedical & health research	STD	17	1	1	0
- life scs. & techn. for developing countries	BIOMED	7	2	0	3
Energy					
- non-nuclear energy	JOULE	61	21	21	39
Human capital and mob.	HUMCAP	69	10	19	39
Total		436	99	131	271

Source: Skoie, The Nordic Countries and the S&T programme in the European Union.

If we look at the relationship between the Nordic countries and participation in the 3rd Framework Programme, Norway was in third place in respect to number of projects. As mentioned, Norwegian involvement was particulary strong in environmental technology, marine science and technology, energy (especially oil and gas), as well as information technologies and telecommunications. It is not surprising that Denmark, which was the only Nordic EU member at the time of this survey, was the most active Nordic participant in the Programme.

2.2 Norwegian industrial involvement in the 3rd Framework Programme

As mentioned in the introduction, this article focuses on Norwegian industrial involvement in European research collaboration. Table 3 shows Norwegian industrial participation in the 3rd EU Framework Programme as of September 1994.

Table 3 Norwegian Industry in the 3rd EU Framework Programme as of September 1994

Programme	Project title	No.	Norwegian participants
ESPRIT	CHIP-SHOP Low-cost IC Prototyping Services for European SMEs	13	Nordic VLSI
ESPRIT	NEXUS - Network of Excellence in Multifunctional Microsystems	67	SensoNor a/s
ESPRIT	BIDREP, An integrated system for simultaneous bid preparation	7	ABB Corporate Research
ESPRIT	MARITIME - Modelling and reuse of information over time	9	A/S Veritas Research
ESPRIT	MARITIME - Modelling and reuse of information over time	9	METIS a/s
ESPRIT	PRODEX - Product model exchange using STEP	14	EPM Consultants a/s
ESPRIT	HIC - Heterogeneous Interconnect Project	6	Dolphin SCI Technology
ESPRIT	KACTUS - modelling knowledge about complex technical systems for multiple use	10	Statoil
ESPRIT	AMFIS - Application-oriented integrated multifunction interface systems	11	ABB Teknologi
ESPRIT	Multiprocessor architecture, connectivity routers and modelling	11	Dolphin Server Teknologi A/S

Programme	Project title	No.	Norwegian participants
ESPRIT	PERFECT - Process enhancement for reduction of defects	7	SIEMENS A/S
ESPRIT	SMILE - SPARC Macrocell and Interface Elements	12	Nordic VLSI
ESPRIT	OASIS - Object-oriented administrative systems development in incremental steps		Total Person-systemer A/S
ESPRIT	OASIS - Object-oriented administrative systems development in incremental steps		Daldata a/s
ESPRIT	OASIS - Object-oriented administrative systems development in incremental steps		Sparbanken Nord-Norge
ESPRIT	OOSDL - Object-oriented SDL in real time system engineering		Stentofon a/s
ESPRIT	DARE - Domain analysis for early reuse and evolution	2	ABB Teknologi
ESPRIT	Software engineering project management and metrication	3	David Livsforsikring
ESPRIT	Orchestra 1 - organisational change, evolution, structuring and awareness	12	Tascon, Oslo
ESPRIT	OMI/MACRAME Open microprocessor initiative/multiprocessor architectures: connectivity routes and modelling	10	Dolphin SCI Technology
ESPRIT	EUROPORT 2 - European Porting Project No. 2	44	STATOIL
ESPRIT	React II Environment and methodology for Real-time knowledge-based systems	8	Computas Expert Systems
ESPRIT	OMI/HIC High Performance Heterogeneous Interprocessor Communications	7	Dolphin Server Technology
RACE	TIM Tourism Information and Marketing	15	Troll Park
RACE	CIO - Co-ordination, Implementation and Operation of Multimedia Services	19	Siemens a/s
RACE	SCORE - Service Creation in an Object-Oriented Reuse Environment	14	ABB
RACE	EXPLOIT-Explanation of an ATM Technology Testbed for Broadband Experiments and Applications	15	Alcatel Telecom Norway a/s
RACE	SAINT - Satellite integration in the future mobile network		ABB Teknologi A/S
TELEMAT	ADEPT - Automatic Debiting and Electronic Payment for Transport	16	Micro Design

Programme	Project title	No.	Norwegian participants
TELEMAT	GAUDI - Generalized and Advanced Urban Debiting Innovations	23	Micro Design
TELEMAT	DETER - Detection, Enforcement and Tutoring for Error Reduction	9	Data Instruments
BR/EUR	Low Weight Vehicle - Properties of Aluminium Alloys for Body Structures	15	Hydro Aluminium
BR/EUR	Decision Making for Requalification of Structures	11	A/S Veritas Research
BR/EUR	Computer Aided Models for Process and Processing Optimisation of Polypropylene	8	Statoil Petrokjemi
BR/EUR	ECARP - Computational Aerodynamics	37	CFD Norway A/S
BR/EUR	MATSTRUTSES - Advanced materials and design procedures for large size SES (Surface Effect Ship) Structures	9	A/S Veritas Research
BR/EUR	Improved plasma sprayed thermal barriers for relevant combustor geometries using enhanced process control and better test techniques	11	Kvernes Technology
BR/EUR	Ultra high sensitivity integrated detection technology for cellular and bacteriological identification and control with bioselective polymers	5	Dynal A/S
BR/EUR	Towards a better design of pressure relief systems in chemical and petroleum industries	5	Det Norske Veritas
MILJØ	Development of biosensor for monitoring of bacteria in water		Aquateam A/S
MAST	Probabilitistic methodology for coastal site investigation based on stochastic modelling of waves and currents	9	Oceanor A/S
MAST	IMERSE	9	Geco Pratla, Stavanger
JOULE	Reservoir Engineering Project	10	Norsk Hydro, Bergen
JOULE	Seismic Tomography Based on Advanced 3-D Ray Tracing	6	Norsk Hydro
JOULE	Geosciences II: Stratigraphic Modelling and Inversion	10	Norsk Hydro, Bergen
JOULE	Integrated Basin Studies: Dynamics of the Norwegian Margin	24	Norsk Hydro, Bergen

Programme	Project title	No.	Norwegian participants
JOULE	Integrated Basin Studies: Dynamics of the Norwegian Margin	24	Statoil
JOULE	Integrated Basin Studies: Dynamics of the Norwegian Margin	24	Saga Petroleum
JOULE	Underground disposal of carbon dioxide	8	Statoils forsk.sent, Trondheim
JOULE	Development of Advanced Blades for Integration into Windturbine Systems	12	A/S Veritas Research
JOULE	Fast asymptotic 3-D Green's functions with application to seismic migration/inversion	7	Norsk Hydro, Bergen
JOULE	Fluid flow in dual permiability hydrocarbon reservoirs	4	IBM, Bergen, Environmental Centre
JOULE	An integrated geochemical and quantitative modelling approach for understanding and predicting secondary oil migration and trapping processes	3	Norsk Hydro, Bergen
JOULE	Atlas of Wave Energy Resource in Europe (WERATLAS)	7	Oceanor A/S
JOULE	Time-independent variations in effective in-situ stresses caused by changes in reservoir pressure	2	Norsk Hydro, Bergen
JOULE	External cost of fuel cycles. National implementation of hydropower and gas. EC/US project phase II	2	Environmental Consultants A/S
JOULE	Development and testing of a stand-alone small size solar-hydrogen power system	4	ABB Energi

Source: NFR EU Forskningsinfo. Comments: There is a lack of data for some actors. The 3rd column shows the number of partners in a consortium.

Table 4 shows the relationship between Norwegian and Swedish industrial participation measured in number of projects.

Table 4 The Relationship between Norwegian and Swedish Industrial Participation

Programme	Norway	Sweden
ESPRIT III	23	31
RACE	5	15
TELEMAT	3	22
BRITE/EURAM	8	41
MILJØ	1	3
MAST	2	0
JOULE	15	22
Total	57	134

Source: NFR EU Forskningsinfo and EUs FoU-program: Kartläggning och analys av svenskt deltagande - erfarenheter, råd och information. NUTEK Analys, 1994.

As can be seen from Table 4, Norwegian industry has only been modestly involved in international research collaboration under the auspices of the 3rd Framework programme. There may be many reasons for this. It might be that the pre-competitive character of the Framework Programme meant that it was not so attractive for commercial participation.

It could also be that the costs of participating, both in the form of relatively high expenditure in the application phase and the great risk of being rejected meant that it was not interesting to participate in the Framework Programme. The lack of knowledge about international research collaboration and the application procedure may also have played a role. It is decisive for participation in EU research collaboration that one is able to present an international consortium of applications. If the applications are weak to begin with concerning international orientation, and this is due to little experience from international collaboration on the part of the applicant, this may also explain why relatively few applied. Another factor might be the structure of Norwegian industry more generally. In an international perspective, most Norwegian companies are very small, and few have their own research departments. Much of the work that is the basis for product development was done at technical-industrial research institutes such as SI (Center for Industrial Research) and SINTEF (The Foundation for Scientific and Industrial Research at the Norwegian Institute of Technology). Perhaps the majority of Norwegian companies operate within branches where R&D traditionally has not been given much attention.

3 Experience with the 3rd Framework Programme

In order to shed light on some of these issues we have done interviews with a selection of companies who have participated in the 3rd Framework Programme. We were primarily interested in their experience in different phases of the projects which they participated in. How did they experience the role of governing bodies and did they think that their participation was useful?

3.1 Selected interviewees and how they were chosen

The selection of companies was done in collaboration with representatives from the Norwegian Value Relay Centre at the Research Council of Norway (NFR). We were particularly interested in capturing experience across branch and company types, size and geographical location. After a thorough look at the different companies, we decided to concentrate on six, all of which had participated in at least two projects within the 3rd Framework Programme. A list of the six companies is presented at the end of this article.

In order to have a wide range of experience, we chose to contact the leaders of the different projects at these six companies. The interviews were carried out in January 1995, and in the following we have summed up some of the most important reflections of these companies while participating in the 3rd Framework Programme.

3.2 Experience of different companies

Dolphin Interconnect Solutions

Dolphin Interconnect Solutions is a company which specialises in the development of components and technical solutions for the international computer industry. This company started in the milieu around Norsk Data and Dolphin Server Technology, and it has 25 employees today.

Dolphin Interconnect Solutions has participated in two projects within the 3rd Framework Programme: HIC - Heterogeneous Interconnect Project (ESPRIT) and OMI/MACRAME - Open microprocessor initiative/ multiprocessor architectures, connectivity, routers and modelling (ESPRIT). The HIC project started in June 1994 and was the company's first EU project. The reason why the company chose to invest in an EU research project was that it had new and promising technology, but few resources. Marketing the new technology was expensive and securing private funding was difficult. By coupling itself to ESPRIT, the company was able to spread

information about its technology in a relatively cheap way. Receiving support from NFR during the application phase was decisive for the company as the procedure was perceived as complicated and expensive. Particular emphasis was placed on the importance of receiving, inter al., travel expenses in connection with meetings abroad, etc.

Another reason why the company chose to invest in an EU research project was the availability of information. This pertained to new information on R&D, but also more business-oriented information such as market analyses, etc.

Concerning the other roles of NFR, Kåre Løchsen said that the Council contributed important information through its newsletter. This made it easier to know when new programme funds were announced. He also mentioned that NFR should focus on making it easier for new companies to participate. After first getting a foot in the door, one can use the contact network which has gradually been built up in order to advance. Dolphin Interconnect Solutions participated in four consortiums who all were rejected in their first application round. The two projects mentioned above happened because the company was recommended in Brussels by a bureaucrat who thought they would fit in well with the project they are now participating in. English project leaders were interested, not only because Dolphin had interesting technology, but because they were cheap collaboration partners as NFR was paying the bill.

About the work itself, Løchsen mentioned that one of the problems they had was that the projects often developed in directions which they did not always want, and that this was bothersome from a commercial point of view. In order to counterbalance this, they wanted to invest more in projects which they had initiated themselves, perhaps in collaboration with SINTEF which would be useful administratively.

For Dolphin Interconnect Solutions, participation was a valuable experience in international research collaboration, even though the company had been involved in international relations for several years. The company expanded its competence through the two projects in which it participated in regard to how collaboration functions, as well as collecting experience for further work, and as a basis for more active future involvement. Løchsen also stressed that Dolphin learned a lot from the experience in that they had gained valuable insight about their partners in technology and strategy along side new connections in important European industrial concerns.

ABB Teknologi

Asea Brown Boweri (ABB) is a typical representative of the other main category of Norwegian companies' participation in EU research programmes, namely, a large company with its own research department. Under the 3rd Framework Programme ABB has participated in the following projects: BIDREP - An Integrated System for Simultaneous Bid Preparation (ESPRIT), SCORE, Service Creation in an Object-Oriented Reuse Environment (RACE), SAINT, Satellite Integration in the Future Mobile Network (RACE), Development and testing of stand-alone small size solar-hydrogen power system (JOULE).

A main reason why the concern participated in the 3rd Framework Programme was the possibility to achieve insight into the evaluation of new technology. In other words, participation in European research collaboration gave the company a chance to try out new technological solutions in a reasonable and cost effective way. Another important reason was to find new collaboration partners. The company received information about the possibilities of the 3rd Framework Programme partly from NFR and partly from the EU. The EU information database CORDIS was particularly important.

The company had no particular goals for administering large EU projects as they involve relatively high administrative costs, but attempts were made to actively find a programme and projects whose content was as similar to the company's main areas as possible. ABB is generally well satisfied with its involvement in the 3rd Framework Programme, and it had a positive impression of the role of NFR concerning special support measures in the application phase which they too felt were complicated. ABB views participation in the EU Framework Programmes as important to build up competence in the company, as well as support for more long-term research which would otherwise be difficult to become involved in.

Oceanor A/S

Oceanor A/S in Trondheim has participated in two research programmes in the 3rd Framework Programme: Probabilistic methodology for coastal site investigation based on stochastic modelling of waves and currents (MAST) and Atlas of Wave Energy Resource in Europe (JOULE).

Oceanor began its first project more or less accidentally through a Portuguese contact person who had previously been at SINTEF/NTH in Trondheim. Stephen F. Barstow at Oceanor contacted this person and

proposed an EU project when information about MAST was issued, but later this Portuguese person put together his own consortium and Oceanor was asked if it wanted to participate. The reason why the company was judged to be an interesting collaboration partner was that, according to Barstow, it could offer unique data material which no one else in Europe had.

Another reason for participating in the project was above all the desire to take part in international research collaboration. Oceanor received help from NFR during the application phase and that the Council financed 50 prosent of the costs was decisive for participation.

Barstow said that they were not particularly satisfied with the usefulness of the first project. A large and not very effective consortium bears most of the blame for this, and it took a long time before the project actually got under way.

The other project (JOULE) was commercially more interesting. The object here was to develop a data atlas with European wave statistics. This project was viewed more like direct marketing for the company, and it was used to give it a strategic and correct position in relation to the market. This project was also directed by a Portuguese leader, and Oceanor joined an already established group. That Oceanor was already in one project group made it much easier to play a role in an established network. However, it was NFR which encouraged Oceanor to establish contact with the Portuguese-led consortium. Other than this encouragement, there was little assistance from NFR.

The main impression of the projects, particularly the first one, is that they were not especially effective, and that the job probably could have been done more efficiently in Norway according to Barstow. Nevertheless, a positive condition was that through collaboration the company gained access to valuable data which it otherwise would not have had access to. As such, Oceanor did not have the ambition to initiate and direct its own project. Their impression was that there was no general interest in that since the overheads are normally high and there is a lot of administration connected to a controlling role.

Nordic VLSI

Nordic VLSI is a company very similar to Dolphin Interconnect Solutions, concerning both branch type and size. The company participated in two projects within ESPRIT: CHIP-SHOP - Low-cost IC prototyping Services for European SMEs and SMILE, SPARC Macrocell and Interface Elements.

The CHIP-SHOP project was directed towards product development. It was a large project with 12 collaboration partners from all over Europe. Despite its size, Nordic VLSI was the only industrial partner. Above all the project was interesting to the company because it allowed them to try out new technology through cheap prototypes. The CHIP-SHOP project gave Nordic VLSI the chance to test and verify the prototypes at 1/10 of the cost of production. In other words, the starting point was similar to the case of ABB. In contrast to ABB, Nordic VLSI was only concerned with construction, production was contracted out of house. The CHIP-SHOP project was initiated by a European research institute. This institute knew for quite some time that Nordic had worked on similar problems and it therefore took the initiative to ask whether Nordic VLSI was interested in participating as two partners had left the consortium. At the time that Nordic joined, the project had already received funding. Odd Rønning at Nordic VLSI thinks a vital reason why Norwegian partners were seen as attractive was because they had substantial financial backing from Government sources.

The company had been involved in projects under the auspices of the Nordic Industrial Fund, and already during the second Framework Programme it had been considered as a potential subcontractor. It did not matter that Norway was not a member of the EU. Investment in research collaboration under the EU was thus a natural continuation of the company's long-standing international involvement.

Rønning says that Nordic VLSI would not have applied without knowing the system from the inside, and the experience gained was that political considerations as well as personal contact networks influenced competition in an unfortunate direction. Rønning also stressed that once you get in the door, it is much easier to continue because one then knows whom one should contact, in other words, it is then easier to expand contacts that one has built up oneself. Nevertheless, Rønning knows that the application phase in the 3rd Framework Programme was considered complicated and expensive, and that cost and fear of being rejected meant that many smaller companies did not even bother to apply.

The SMILE project concerned the development of a project which was more in line with the company's investment area. The reason that Nordic joined the project was that another partner withdrew. Nordic had collaborated with a French firm which established contact and invited it to be a member. Several industrial partners participated in this project. One negative consequence, it was difficult to support one's own interests at the

cost of the joint interests in the project. Researcher interests were the primary driving force in the CHIP-SHOP, and at times this could also steer the project off course.

Furthermore, Rønning said that Nordic had thought of taking on co-ordinating responsibility, but they would then want a small, preferably Nordic consortium. The reason for this, he says, is that it is an advantage to have partners with a common cultural background and joint interests. Moreover, large consortiums are not very effective. They need a lot of administration and do little research.

Overall he views Nordic's participation as positive and the technology which was developed during the project was sold at a profit. The project resulted in a net gain for the company. Rønning has the impression that ESPRIT has become more and more like EUREKA, less pre-competitive and more market oriented.

Nordic performs in-house R&D and on contract for others. However, most of the company's own R&D takes place in international research projects under ESPRIT and EUREKA. The ESPRIT project, especially, has given the company the opportunity to increase flexibility in product development as they have more chances to experiment than they otherwise would have had. The relationship to NFR has been positive. NFR held good information meetings, courses in application procedures and gave economic support for research institutes so that small and medium-sized companies could also participate, concluded Rønning.

Micro Design

Micro Design is another high-tech firm which has been involved in two research projects under the 3rd Framework Programme: ADEPT - Automatic Debiting and Electronic Payment for Transport (TELEMAT), GAUDI - Generalized and Advanced Urban Debiting Innovations (TELEMAT).

Through its engagement in the 3rd Programme Micro Design has had the opportunity to demonstrate and test new technology in collaboration with customers and potential buyers. Thus they have been able to gain valuable information about competitors and potential customers.

For a small company, like Micro Design, participation in large projects with competing partners can be problematic as one has to keep one's cards hidden due to the competitive situation. Involvement in the 3rd Framework Programme was perceived as an important experience in participation in international research collaboration. The company got a good start and

gained much experience which is of value for participating in the 4th Framework Programme.

Considering professional usefulness, impressions are more varied. The company gained some new knowledge, but much less than they had wished. Domestic R&D contracts are according to our informant, Morten Bjerkholt, more cost effective and fruitful than EU projects.

Concerning other experience, Bjerkholt stresses the importance of small firms, and the necessity of co-ordinating EU investment with a firm's own product development strategies. There is no point in participating at all costs, he emphasised.

Micro Design was assisted by NFR during the application phase and it received general information about EU R&D. The Export Council in Brussels was also helpful in recommending partners and establishing contacts. Regarding measures which authorities can initiate to make it easier for Norwegian industry to participate in international research collaboration, Bjerkholt stressed a more active role, i.e. commissioning projects and getting partners acquainted, intensive help during the application phase (it is difficult for small firms to find partners, especially if this is their first application); Norwegian authorities and industry must work together to define and initiate projects; this will have a synergetic effect on national and international R&D projects.

Norsk Hydro Bergen

The last company where we interviewed was the research centre of Norsk Hydro in Bergen. Hydro is the most central Norwegian actor within European research collaboration, and it has been involved in the following projects in the 3rd Framework Programme: Reservoir Engineering Project (JOULE), Seismic Tomography based on Advanced 3-D Ray Tracing (JOULE), Geosciences II: Stratigraphic Modelling and Invention (JOULE), Integrated Basin Studies: Dynamics of the Norwegian Margin (JOULE), Fast Asymptotic 3-D Green's functions with application to seismic migration/inversion (JOULE), An integrated geochemical and quantitative modelling approach for understanding and predicting secondary oil migration and trapping processes (JOULE), Time-dependent variations in effective in-situ stresses caused by changes in reservoir pressure (JOULE).

The central driving force behind Hydro's research involvement in these areas has been Bill Martin. He says that an important motivation for Hydro has been to reduce R&D expenditure for all partners (i.e. finding partners

who can share costs), build strategic alliances, make R&D investment more cost effective in general, and monitor new technology in relevant areas for the company.

Martin also mentioned that EU projects are more multi-disciplinary and collaborative than in Norway. He judges this as very positive for an environment in which individual scientists often work alone. He also stresses that Hydro works in a global branch which makes it absolutely necessary to be internationally oriented, and an important reason why the EU is viewed as interesting is that the oil industry has experienced a shifting focus from USA towards Europe the last few years.

Hydro has been interested from the start in the EU Framework Programmes, in doing collaborative projects and in taking on leadership responsibility. This greatly increases the chances to carry out projects of considerable interest to the company. Today Hydro is the Norwegian co-ordinator for Geosciences II.

Martin also mentioned that he had mixed feelings about NFR. Bureaucratisation with quarterly reporting made the work cumbersome for a period. Trouble concerning the introduction of the European Economic Area Agreement resulted in problems with funding cuts from NFR. Hydro had to carry the brunt of these financial problems itself. However, Hydro has not given up ambitions to become an important actor in the European research arena, and the impression from a visit to Bergen was that a very professional organisation has been built up.

3.3 Some observations

In this report we have attempted to shed light on the experience of some Norwegian companies' participation in European research collaboration. As will be seen, it is difficult to draw any definitive conclusions, however, some common characteristics are apparent.

First, it is clear that most participants perceived their involvement as positive, they wanted to take part in international collaboration, and to gain a foothold for further involvement. Most of those we spoke to were positive regarding the role of NFR during the application phase, as an information centre en route, and in preparation for the 4th Framework Programme.

Concerning actual projects, and the usefulness of these, experience was much more varied. Some firms, e.g. Nordic VLSI could show economically positive results, but this was an exception. Some said that participation in the 3rd Framework Programme resulted in the acquisition of valuable

knowledge about new technology, while others were less sure about this. Participation was motivated by the wish to test new technology cheaply, which some had positive experience with, while for others network building was the primary motive. Many also pointed to the problems which large concerns have concerning inefficiency. There were collaborative problems in regard to Southern European partners; high travel expenses for meetings in that part of Europe were also mentioned as problematic.

List of interviewees in this project:

Interview date	Company	Interviewee
5/1/95	Dolphin Interconnect Solutions	Kåre Løchsen
6/1/95	ABB Teknologi	Terje Røste
11/1/95	Oceanor A/S	Stephen F. Barstow
11/1/95	Nordic VLSI	Odd Rønning
12/1/95	Micro Design	Morten Bjerkholt
16/1/95	Norsk Hydro Bergen	Bill Martin Tor Bu

De siste publikasjoner fra Utredningsinstituttet for forskning og høyere utdanning

Rapporter:

8/94 **Statsbudsjettet 1995**

En oversikt over bevilgningsforslag, nye stillinger og prioriteringer som berører universiteter, høgskoler, forskningsråd og institusjoner med forskning

I denne rapporten gir vi en oversikt over forslaget til statsbudsjett for 1995 med hensyn til bevilgninger, nye stillinger og prioriteringer som berører universiteter, høgskoler, forskningsråd og institusjoner med forskning. Analysen er foretatt med utgangspunkt i St.prp. nr. 1 (1994-95).

Rapporten belyser endringer i bevilgninger og prioriteringer innen forskning og høyere utdanning i forhold til fjorårets budsjett. Det er lagt vekt på å gjøre tallene sammenlignbare ved å korrigere for overføringer mellom ulike kapitler og poster. Omtale av nye tiltak og nye prinsipper og prioriteringer vies særlig oppmerksomhet.

Kr 70,-

9/94 Terje Bruen Olsen:
Norske doktorgrader i tall - med særlig vekt på tiårsperioden 1984-93

Den første norske doktorgrad ble utstedt i 1817. Siden da er det avlagt nærmere 6 000 doktorgrader i Norge. Særlig i de senere år har "doktorgradsproduksjonen" vært stor. Det utstedes nå om lag 500 doktorgrader per år. Dette er mer enn dobbelt så mange som for ti år siden.

I denne rapporten gir vi en oversikt over avlagte doktorgrader ved norske lærersteder. Materialet bygger på Utredningsinstituttets register over norske doktor- og lisensiatgrader. Vi ser også på doktorandenes kjønn og alder, og på tidsspennet mellom embetseksamen og doktorgrad. Hele tidsrommet 1817-1993 er dekket, men hovedvekten er lagt på tiårsperioden 1984-93. Doktorgrader blant forskerpersonalet gis spesiell omtale.

Kr 70,-

10/94 Bjørn Stensaker og Rita Karlsen:
Å vurdere kvalitet?
En studie av den eksterne evalueringen i økonomisk-administrativ utdanning

Denne rapporten er en videreføring av det arbeidet som ble påbegynt ved rapporten: Å organisere kvalitet? (NAVFs utredningsinstitutt, Rapport 9/93).

Rapportens generelle del gjennomgår bakgrunn og metode for eksterne evalueringer - Peer rewiev: Metoden settes inn i et større utdanningsmessig og samfunnsmessig perspektiv, og ulike fordeler og ulemper ved metoden diskuteres. I et eget kapittel går man gjennom prosedyrer for utnevning og gjennomføring av en ekstern evaluering.

Rapportens spesielle del er en presentasjon av den eksterne evaluering som ble gjennomført ved evalueringen av økonomisk-administrativ utdanning. Det drøftes hvordan prosessen har forløpt, samt at de sakkyndiges rapporter analyseres. I slutt-kapittelet oppsummeres evalueringen av økonomisk-administrativ utdanning: Hva kan man lære av prosessen?

Kr 80,-

11/94 **Kandidatundersøkelsen 1993**
Kandidater med høyere grad og DH-kandidater. Graduate Survey 1993.

For de nyutdannede kandidatene med høyere grad tar det stadig lenger tid å få arbeid etter endt utdanning, og andelen arbeidsledige et halvt år etter eksamen øker. Det er imidlertid store forskjeller mellom utdanningsgruppene. Av de nyutdannede DH-kandidatene har en høy andel studier som hovedbeskjeftigelse et halvt år etter eksamen. Selv om mange på denne måten utsetter sin inntreden på arbeidsmarkedet er ledigheten et halvt år etter eksamen relativ høy.

Personer som skal inn på arbeidsmarkedet for første gang vil være særlig følsomme overfor endringer på arbeidsmarkedet, og undersøkelsen av de nyutdannede kandidatene et halvt år etter eksamen bidrar til å gi et bilde av situasjonen på dagens arbeidsmarked. I den foreliggende tabellrapporten presenteres omfattende statistikk fra undersøkelsen av kandidatene. I rapporten "Utdanning og arbeidsmarked 1994" er resultatene for de ulike utdanningsgruppene nærmere omtalt.

Kr 80,-

12/94 Randi Søgnen:
Dynamisk treghet
Endringsprosesser i NAVFs råd for medisinsk forskning (RMF) 1975-1993

Rapporten retter søkelyset mot fagpolitiske omstillingsprosesser i det tidligere Rådet for medisinsk forskning (RMF) i NAVF. Studien dekker perioden fra midten av 70-tallet til begynnelsen av 90-tallet - til de første spede erfaringer med etterfølgeren, Området for medisin og helse (MH) i Norges forskningsråd i 1993.

Framstillingen beskriver og analyserer primært den helsefaglige omleggingen i RMF - fra et fagråd hovedsakelig for de basale medisinske fag til et bredt helseforskningsråd. Hovedsiktemålet med studien er å vinne innsikt i graden av og betingelsene for de fagpolitiske endringsprosessene.

I analysen blir RMF betraktet som en institusjon der fagrådets mål og virkemidler så vel som dets historie, tradisjon, grunnleggende interesser og verdier blir viet oppmerksomhet.

Kr 80,-

13/94 Erik Knain:
Sentre og randsoneinstitusjoner ved norske universiteter og vitenskapelige høgskoler

I de senere årene har det utfra forskjellige motiver blitt opprettet en rekke sentre og institusjoner med nær tilknytning til universiteter og vitenskapelige høgskoler. Enkelte enheter er integrert i den ordinære strukturen ved lærestedet, mens andre er klart adskilt fra lærestedet.

De enkelte lærestedenes FoU-utførende randsoner er klassifisert etter tilknytningsform og ulike randsonekriterier. Rapporten beskriver trekk ved randsoneenhetenes organiseringsformer, virksomhet, grunnbevilgninger og faglig personale.

En kort beskrivelse av de enkelte randsoneenhetene inngår i rapportens katalogdel.

Kr 80,-

14/94 Svein Kyvik & Olaf Tvede (red.)
Mobilitetsmønstre blant norske forskere

Mange hevder at mobiliteten i det norske forskningssystemet er for lav. Det er for liten utveksling av personale internt mellom de høyere utdanningsinstitusjonene, mellom universiteter og høyskoler på den ene siden og de frittstående forskningsinstituttene på den andre siden, og mellom disse forskningsstedene og industri, næringsliv og forvaltning. I tillegg blir det hevdet at for få forskere foretar lengre studie- og forskningsopphold ved utenlandske institusjoner.

I denne rapporten legger vi frem materiale som belyser viktige sider knyttet til spørsmål om mobilitet.

- I kapittel 1 ser vi på hovedtrekk ved forskermobiliteten i perioden fra 1977.
- I kapittel 2 foretar vi nærmere analyse av mobilitetsmønstrene i perioden 1989-93.
- I kapittel 3 og 4 har vi undersøkt hvilken yrkesbakgrunn personalet i henholdsvis universitets- og høgskolesektoren har.
- I kapittel 5 stiller vi spørsmål om regional tilknytning - hvor en har vokst opp - har betydning for mobilitetsmønsteret - hvor en senere slår seg ned.
- I kapittel 6 undersøker vi omfanget av forskningsopphold og forskningserfaring fra utlandet.
- I kapittel 7 ser vi nærmere på professor -II ordningen.

Kr 80,-

1/95 Hans Skoie, Thomas Nygaard og Randi Søgnen (red.)
Norsk forskning mot sekelskiftet - en seminarrapport

Norsk forskning påvirkes for tiden av en rekke nye impulser - ikke minst omorganiseringer både på det forskningsutførende- og det finansielle plan. De siste statsbudsjetter vitner om kjørligere vinder for forskning samtidig som studentøkningen fortsetter. Norsk økonomi er fortsatt preget av betydelig arbeidsløshet og en oljeproduksjon som etter hvert vil gå nedover. Også internasjonalt er impulsene andre - den kalde krigen er over, globaliseringstendensene øker - det samme gjør kampen mellom de store handelsblokkene (USA, EU, Det fjerne Østen.) Tilsier denne utviklingen justeringer i hovedlinjene i norsk forskningspolitikk? Dette spørsmålet ønsket Utredningsinstituttet å sette under debatt - ikke minst i lys av at Norges forskningsråd nå ha lagt fram sin strategiplan for norsk forskning. Det skjedde ved et stort kveldsseminar ved Utredningsinstituttet 18.01.95

I denne rapporten publiserer vi innledningene fra 6 sentrale aktører i norsk forskning og et referat av debatten. I del II publiserer vi en del artikler og foredrag som belyser seminarets hovedtema.

Kr 80,-

2/95 Lisbet Berg:
Examen philosophicum: Studietilknytning, innsats og resultat for ulike grupper av begynnerstudenter ved Universitetet i Oslo

Hvordan er det å være begynnerstudent ved Universitetet i Oslo i første halvdel av 1990-årene? Er det spesielle grupper av studenter som tilpasser seg universitetet bedre enn andre? Gjennom en spørreskjemaundersøkelse blant examen philosophicum studentene ved Universitetet i Oslo høsten 1993 har vi blant annet belyst følgende problemstillinger:

Har økt konkurranse om studieplassene ført til at studenter som har foreldre med høyere utdanning klarer seg bedre enn andre på universitetet? Gir dette seg eventuelt utslag i resultatene til examen philosophicum?

Ikke alle examen philosophicum-studenter har søkt eller fått studieplass ved fakultetet, og bare noen påbegynner fagstudiet første semester. Skyldes ulik tilknytning til universitetet ulike ambisjoner, preferanser og valg knyttet til evner, kjønn, sosial og geografisk bakgrunn? Eller er det fakultetenes ulike rammebetingelser med ulike forventninger og ulikt faglig tilbud som styrer begynnerstudentenes valg om å påbegynne fagstudiet eller ikke?

Hvor intensiv er studiestarten? Gir examen philosophicum et skjevt bilde av hvor stor innsats et universitetsstudium krever? Er det gunstig å påbegynne fagstudiet samtidig med examen philosophicum? Har studentenes tidsbruk sammenheng med evner, kjønn, sosial og geografisk bakgrunn, eller fakultetenes ulike rammebetingelser?

Kr 80,-

3/95 Nina Sandberg og Nils Vibe:
Alle kan ikke bli frisører
Søkning og opptak til videregående opplæring. Evaluering av Reform '94: Underveisrapport våren 1995.

Utredningsinstituttet er sammen med seks andre forskningsinstitusjoner engasjert i evalueringen av Reform 94. Instituttets arbeid er innenfor evalueringsområdene Dimensjonering og kapasitet og Gjennomstrømning og kompetanse. Evalueringsarbeidet er planlagt å være ferdig i 1998.

I denne underveisrapporten presenteres resultater fra analyser av undervisningstilbud, søkning og opptak til grunnkursene i videregående skole for skoleåret 1994-95, det første året etter innføringen av Reform 94. I tillegg ser vi på det tilbudet som planlegges for skoleåret 1995-96.

Reformens mål om å gi all ungdom som ønsker det et tilbud om videregående opplæring innenfor tre ønsker ser ut til å være oppfylt. 94 prosent av 16-åringene fikk innfridd sitt førsteønske om grunnkurs. Grunnkursene i musikk, dans og drama og i idrettsfag hadde størst oversøkning blant 16-åringene, og bare 75 prosent kom inn her.

Innføringen av rett til tre års videregående opplæring for de som kommer rett fra grunnskolens 9. klasse har ført til at voksne søkere kommer dårligere ut etter innføringen av reformen. Dette forsterkes av at det har blitt foretatt en kraftig reduksjon i tilbudsomfanget. Det er særlig på grunnkursene i helse- og sosialfag og formgivningsfag av 16-åringene fortrenger de voksne søkerne.

Kr 90,-

4/95 Rolf Edvardsen:

Yrkesvalgmotiver

Resultater fra en undersøkelse om 16- og 18-åringers utdannings- og yrkesplaner i 1991.

De unges motiver ved valg av utdanning og yrke er mange og sammensatte. Enkelte motiver er felles for nesten alle. De fleste ønsker en sikker og varig jobb som skal være interessant og hvor de kan utnytte sine spesielle evner. Gode forhold til kolleger og overordnede vektlegges også av de fleste.

I tillegg er det trekk ved ulike jobber som enkelte tiltrekkes av, andre ikke. Noen kan ønske å arbeide med tall. Andre vil lede og bestemme. Flere gutter enn jenter ønsker å arbeide med maskiner og verktøy, mens flere jenter enn gutter ønsker å arbeide med mennesker. Dette gjenspeiler seg i de unges yrkespreferanser.

Rapporten ser også på sammenhengen mellom fag som en liker best på skolen og yrkespreferanser, samt hvilke karakterer en oppnår i slike fag.

Kr 90,-

5/95 Ole Wiig:

Forskning og utviklingsarbeid. Bevilgninger over statsbudsjettet 1980-95

Siktemålet med rapporten er å gi en beskrivelse av hovedtrekk ved bevilgningene til forskning og utviklingsarbeid (FoU) over det norske statsbudsjettet, og utviklingen i disse. Rapporten omhandler perioden 1980-95, med hovedvekt på årene fra og med 1983. Den er basert på data fra analyser som årlig utføres av Utredningsinstituttet for forskning og høyere utdanning og tidligere av Forskningsrådenes statistikkutvalg.

Kr 80,-

6/95 **Statsbudsjettet 1996**

En oversikt over bevilgningsforslag, nye stillinger og prioriteringer som berører universiteter, høgskoler, forskningsråd og institusjoner med forskning

I denne rapporten gir vi en oversikt over forslaget til statsbudsjett for 1996 med hensyn til bevilgninger, nye stillinger og prioriteringer som berører universiteter, høgskoler, forskningsråd og institusjoner med forskning. Analysen er foretatt med utgangspunkt i St.prp. nr. 1 (1995-96).

Rapporten belyser endringer i bevilgninger og prioriteringer innen forskning og høyere utdanning i forhold til fjorårets budsjett. Det er lagt vekt på å gjøre tallene sammenlignbare ved å korrigere for overføringer mellom ulike kapitler og poster. Omtale av nye tiltak og nye prinsipper og prioriteringer vies særlig oppmerksomhet.

Kr 70,-

7/95 Ingvild Marheim Larsen:
Universitetenes forskningspolitikk

Rapporten kartlegger og analyserer universitetenes arbeid med å utvikle en institusjonell politikk for forskningen. Studien belyser politikkens innhold så vel som de strukturelle ordningene som er etablert for å utvikle og målbære forskningspolitikken. Universitetene som forskningspolitiske aktører og universitetenes forhold til andre forskningspolitiske enheter er noen av temaene rapporten tar opp.

I analysen spør vi om universitetene har utviklet en institusjonspolitikk for forskningen og om det forskningspolitiske arbeidet utfordrer tradisjonell universitetsforståelse.

Kr 90,-

Annet:

Utdanning og arbeidsmarked 1995
Redaktører Jane Baekken og Thomas Nygaard

"Utdanning og arbeidsmarked" er en årlig rapport fra Utredningsinstituttet for forskning og høyere utdanning skrevet med særlig tanke på å gi informasjon til utdanningsplanleggere, studie- og yrkesveiledere og andre rådgivere for ungdom.

Rapporten tar opp aktuelle spørsmål innen utdanning og arbeidsmarked og belyser disse. Resultater fra undersøkelser utført ved instituttet danner grunnlaget for analysene.

Årets rapport ser bl.a. på endringer i unges utdannings- og yrkesplaner, situasjonen for nybegynnerstudentene, kvalitetsbegrepet i høyere utdanning, overgangsproblemer fra utdanning til arbeidsmarked og den fremtidige tilgangen på akademikere.

Kr 90,-

FoU-statistikk og indikatorer. Forskning og utviklingsarbeid. 1995

Dette er en tabell- og figursamling som inneholder statistiske opplysninger om norsk forskning og utviklingsarbeid (FoU). Hovedtyngden av publikasjonen er viet resultater fra den FoU-statistiske undersøkelsen for 1993 og bygger på innsamlet materiale fra FoU-utførende institusjoner i universitets- og høgskolesektoren, næringslivet og institutt-sektoren. Undersøkelsene er basert på internasjonale retningslinjer anbefalt av OECD, og er blitt gjennomført hvert annet år siden 1963.

I tillegg er det denne gang tatt med anslag for FoU-bevilgninger over statsbudsjettet og statistikk over doktorgrader. Dessuten er det sammenstilt en del materiale fra internasjonale databaser. Dette gjelder særlig opplysninger om FoU-ressurser fra OECDs databank, men det er også tatt inn enkelte bibliometriske data.

Gratis

FoU-statistikk 1993

Dette informasjonsbladet gir en oversikt over hovedtrekk ved den norske FoU-innsatsen. En mer detaljert og omfattende presentasjon av tallmaterialet fra undersøkelsen finnes i tabellsamlingen "FoU-statistikk og indikatorer. 1995".

Gratis

R&D Statistics 1993-95

Engelsk versjon av informasjonsbladet "FoU-statistikk 1993".

Gratis

R&D-trends

Dette er et informasjonsblad fra Nordisk Industrifond som tematiserer ulike sider ved den nordiske FoU-virksomheten.

No 1:1992:	Nordic R&D Facing the Nineties
No 2:1992:	Science and Technology Indicators for the Nordic Countries.
No 1:1994:	R&D in the Nordic Countries 1991
No 2:1994	Industrial structure and R&D in the Nordic countries
No 3:1994	Nordic trade in R&D-intensive products

Gratis

Nordisk FoU-statistik för 1991 och statsbudgetanalys 1993

Nordisk Industrifond, NI rapport 7:1993.
Tabellsmalingen inneholder sammenlignende oversikter over forsknings- og utviklingsarbeidet i Danmark, Finland, Island, Norge og Sverige i 1991.

De data som inngår i tabellsamlingen er samlet inn av de ulike nasjonale organer, hvor Utredningsinstituttet er leverandør av det norske materialet.

Gratis

I tillegg foreligger gratis årsmelding med prosjektoversikt for 1994 samt komplett liste over instituttets publikasjoner.

Abonnement på samtlige rapporter gir 25 % rabatt.

Bestilling sendes:
Utredningsinstituttet for forskning og høyere utdanning
Munthes gate 29
0260 Oslo

Telefon: 22 92 51 00
Telefax: 22 43 89 70

Science and Technology in the EU – General Development and Relation to the Nordic Countries

This report gives an overview of the EU engagement in the research and technology. A brief historical account is included, as well as a discussion of future perspectives in this area in view of the broader R&D cooperation which the Maastricht Treaty opens for.

The EU engagement toward "third countries" is dealt with in a separate article. An account of the Nordic countries and their relation to the EU in this area is also included. Finally, a pilot study of the Norwegian experience with the Third Framework Programme is dealt with in a separate article.

Utredningsinstituttet
FOR FORSKNING OG HØYERE UTDANNING
Munthes gate 29, N-0260 Oslo. Tlf.: 22 92 51 00. Faks: 22 43 89 70

Institute for Studies in Research and Higher Education