Danish Council for Research Policy

Contribution to the debate on a future European research policy

BACKGROUND NOTE

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28 May 2004

This background note supplements the Danish Research Policy Council's publication "Contribution to the debate on a future European research policy". The publication can be downloaded from www.vtu.dk/
or is available free of charge on request to:
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In January 2004, the Danish Council for Research Policy decided to initiate a debate on the preparation of the Seventh Framework Programme. On 9 March, the Council held a dialogue meeting with key stakeholders, and the Council subsequently initiated a hearing of universities, government research institutes, research councils and interest organisations in order to obtain their assessments and proposals for the framework programme. The feedback (in Danish only) received by the Council is found at www.vtu.dk/

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Preface

One of the tasks of the Danish Council for Research Policy is to give general advice on the interaction between Danish and international research activities. Research cooperation within the European Union (EU) is constantly increasing in both scope and significance. Ensuring maximum benefit from the European cooperation within the area of research and technological development is a huge research political challenge.

EU's Seventh Framework Programme for Research and Technological Development (FP7) is to be implemented in 2007. The present Sixth Framework Programme (FP6) provides the foundation for the next programme. FP6 has only been operational for 18 months; however, the framework programme, its objectives and instruments are objects of a continuous debate. The Danish Council for Research Policy wants to contribute to this debate and give advice to the Minister for Science, Technology and Innovation, the Government and the Danish Parliament on key issues related to the preparations of the framework programme negotiations, in Denmark as well as in the EU. The Council also would like to encourage research institutions, companies and organisations to participate actively in the discussions and preparation of FP7.

This March, the Council initiated a broad hearing of research institutions, interest organisations and government departments. The many responses received by the Council constitute an important basis of the Council's own considerations and recommendations in this publication. The Council would like to thank everybody who has contributed with recommendations and suggestions.

The Council's assessments and recommendations are intended to initiate a broad and constructive debate in Denmark, a debate which in the next few years will help to establish a seventh framework programme with rich opportunities and challenges for Danish research entities in both the private and the public sectors.

Copenhagen, 28 May 2004

Bruno Hansen
Chairman

Executive summary

The future European research policy and the Seventh Framework Programme must focus on the following areas:

The targeted research cooperation in thematic priorities must be adapted to the current challenges for Europe, and emphasis must be put on promotion of interdisciplinary, integrated activities.

- The thematic priorities in the framework programme must be adjusted so that current challenges are reflected in the research activities.
- The European Commission should ensure that the research activities within the thematic priorities are coordinated.

Increased emphasis must be put on the enhancement of society's application and utilisation of research, including for technological development and increased activities in trade and industry, particularly in the small and medium-sized enterprises.

- Steps should be taken to establish technology platforms within areas of particular importance to Europe's development.
- Promotion and support of one-to-one partnerships between one company and one university across borders should be made possible.
- Relatively more resources should be spent on projects suitable for participation of small and medium-sized companies.

A specific emphasis must be put on basic research as a supplementary element in the European research policy in order to promote excellence in European research.

- Within FP7, significant support for basic research must be given by setting up a European basic research council/foundation.
- A European research council is to support basic research based on the excellence, quality and originality of the research and the applicants. Quality assessments must take place on the basis of peer-review, also by involving expertise from outside Europe.

Efforts must be increased to strengthen recruitment, education and mobility and to create more attractive career opportunities for researchers in Europe.

- In all activities under FP7, education for researchers must be incorporated. All research projects must include an element of education.
- Greater emphasis must be put on mobility of researchers.
- Supporting the setting up of more joint European researcher education courses is recommended.
- Special efforts must be made to ensure high quality in the education courses offered, e.g. by requiring that education activities take place in connection with highly qualified and comprehensive research environments such as schools for researchers or similar.

Access to research infrastructures must be improved for European researchers, and great emphasis must be put on cooperation on the establishment of the necessary infrastructures.

The framework programme should stimulate coordination and joint activities at the national and regional levels with a view to developing a joint knowledge base for development of policies.

- ERA-NETs are to be used as incubators for development of future initiatives in areas in which Europe has a leading position or in which a basis for utilising research and technologies can be created.

Administrative simplification of the framework programme must be ensured, and the instruments of the programme must be used in a more flexible way.

- The number of participants in projects and networks must not be decisive, and it must be possible to support networks and projects with both many and few participating parties.
- Choice of instruments and the specific adjustment of the size of a project or network must depend on a specific assessment of the purpose and potential of the activity and of the nature of the research task. A specific distribution of the resources to be spent on the various instruments should not be laid down, as allocation of resources should take place after open competition identifying the projects or networks that best fulfil the objective of the activity.
- Greater emphasis must be put on user-friendliness in connection with application procedures and processing of grants. If appropriate, a two-step quality assessment should be used: First a pre-qualification and then an actual application round.
- The scientific assessment of applications must be based on open criteria and transparent processes.
- The documentation requirements of applications should be differentiated depending on the purpose, organisation and budgetary frame of the activities applied for. Local handling of grants for projects and networks and flexibility in the administration of the framework programme should be improved.
- The European Commission should consider the introduction of a kind of authorisation to research entities and companies as a general guarantee of the entity's or company's administrative seriousness and ability to handle grants.
- Cooperation with countries outside Europe should be strengthened, in particular as regards education and mobility for researchers.

A significant increase in the joint European resources for research and development must be realised to ensure fulfilment of the objectives of the framework programme.

- Denmark should seek to obtain total research activities corresponding to at least 3 per cent of the gross domestic product by 2010.
- Denmark should insist on a considerable increase in the resources set aside for FP7 compared with FP6. A doubling of the total budget will have a significant positive impact on society and trade and industry in Europe.

The continued debate over the future European research policy should be as broad and open as possible. The specific efforts, e.g. under the thematic priorities, must be developed in a process in which the stakeholders

participate actively. In parallel with this debate, the specific research activities should be prepared. Experience shows that planning and preparation of projects and networks should be started long before the commencement of the framework programme and the announcement of the individual activities. Therefore, Danish research institutions and companies should utilise the time until 2007 for preparing their participation in the next framework programme. The Danish aid schemes established in order to promote the participation in the present framework programme could usefully be extended to cover the preparations for the participation in the next framework programme as well.

It is vital to the research policy debate and to the planning of the research efforts that there is a solid knowledge base that takes its starting point in valid statistics of Danish research entities' applications and participation in the framework programme in general and in the individual activities. The Ministry of Science, Technology and Innovation should therefore improve the statistic follow-up on the framework programme on Denmark's part, and the information gathered should be communicated to relevant Danish stakeholders.

1 The importance of European research cooperation

Denmark will have to focus on research as an important foundation for education, production and service in both the public and private sectors. The ambition of creating a strong knowledge-based society enjoys widespread support in Denmark.

Realisation of such an ambition requires comprehensive international cooperation on research and technological development. Europe is increasingly becoming a centre for such cooperation, which takes place in many areas, both by way of cooperation directly between individual researchers and institutions, cooperation under the EU Framework Programme for Research and Technological Development and cooperation in the various European research organisations, e.g. European Organization for Nuclear Research (CERN), European Space Agency (ESA), European Southern Observatory (ESO), European Molecular Biology Laboratory (EMBL) and EUREKA[1].

All these areas of cooperation complement research and innovation in Denmark. Research policy should be planned in such a way that national research and development (R&D) interact with research carried out in other countries in order to increase both quality and society's benefits from the activities. European research must provide a significant contribution to the development of culture, education, trade and industry, welfare and environment in Denmark and in the rest of Europe.

Strong European research cooperation is crucial to the strengthening of Europe's competitiveness. Europe ranks lower than the US in terms of gross domestic product (GDP) per inhabitant, productivity and economic growth. Also, Europe is lagging behind the US when it comes to investments in R&D. If Europe is to regain the lost competitiveness, massive efforts must be made to strengthen the R&D investments. Such efforts do not necessarily need to copy, for instance, the American research policy. It is essential that Europe is capable of developing a model for research cooperation based on European conditions and possibilities.

At the same time, it must be ensured that research results and new knowledge are communicated to the companies. European research cooperation should be structured to ensure that the companies – in particular the small and medium-sized enterprises[2], which employ most of the employees in Europe – gain optimum opportunities for developing their R&D, e.g. through more comprehensive interaction with public research institutions.

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[1] EUREKA is the European research coordination agency focusing on market-oriented, industrial research and development initiatives.

[2] In the EU, small and medium-sized enterprises (SMEs) are defined as enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million, cf. Official Journal of the European Union L 124/39 of 20.5.2003.

2 Challenges to future European research policy and to FP7

In the EU, research cooperation has been structured in framework programmes since the beginning of the 1980s. The common research effort in the EU must reflect the challenges that Europe is currently facing. Consequently, the framework programmes have developed as regards structure, priorities and volume. The present Sixth Framework Programme for Research and Technological Development (FP6) was launched in 2003 and will run until the end of 2006. A new framework programme – the Seventh Framework Programme (FP7) – will be launched in 2007, and the political decisions concerning the purpose, contents and budget of the programme will be taken in 2006. There is an ongoing process with assessment of and debate over the present effectiveness of the current framework programme, and in this way each framework programme provides the foundation for the next.

Danish research entities have always participated actively in the framework programmes. When discussing the significance of the EU framework programme to Denmark, focus tends to be put on grants to Danish framework programme participants. However, the perspective should be broader. A Danish participant in a framework programme project or network gains access to competences and results that by far exceed the value of the direct grant to the Danish partner.

An example: After the first application rounds under the 6FP thematic priority "Life sciences, genomics and biotechnology for health", 29 projects with Danish participation received grants. The direct grant to the Danish partners amounts to approx. 18 million EURO (DKK 133 million), whereas the total grant to the 29 projects amounts to 215 million EURO (DKK 1.6 billion). Within the same thematic priority, Danish research institutions and companies participate in eight networks of excellence with a total grant of 71 million EURO (DKK 530 million). The Danish yield of EU's framework programmes must to a greater extent been seen in relation to the professional and social possibilities achieved through the participation in such multinational projects and networks.

The hearing responses received by the Council reflect some of the experiences with FP6 that the Council has sought to incorporate in the continued development of the European research cooperation.[3] The transition from the Fifth to the Sixth Framework Programme in 2003 led to relatively extensive changes in structure and instruments.[4] From the hearing responses, it clearly appears that it takes time for research environments and companies to relate to new themes, instruments and routines in the framework programmes. Therefore, changes to be introduced in a new framework programme must be

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[3] The hearing responses (in Danish only) can be accessed at www.vtu.dk/ (Råd og udvalg)

[4] Appendix 2 contains an overview of FP6. Appendix 3 contains an overview of the instruments of FP6.

considered thoroughly. Many hearing responses underline the need for a certain continuity between FP6 and FP7; however, strong arguments in favour of adjustments of the thematic priorities and the form of the instruments are also put forward. Reduction of the administrative burdens in connection with application for and administration of grants is a recurring theme in the hearing responses.

Several hearing responses comment on the necessity of adding a strong basic research dimension to FP7 by way of a European research council. Many hearing responses emphasise strengthened efforts towards researcher education and mobility in 7FP. Also, the responses comment on the possibilities of supporting technological initiatives.

The Council is aware that caution must be shown when drawing conclusions on FP6 just 18 months into the entire four-year period. In 2005, the European Commission will carry out the five-year evaluation of the framework programme covering parts of the FP5 and parts of FP6, which will intensify the debate over the preparations for FP7. However, on the basis of the experiences with the framework programme so far, a bid for the issues to be emphasised by Denmark in the debate over the future European research policy and over the preparations of FP7 can be made.

The concept of the European Research Area, ERA, was launched in 2000 in the EU. Being a political project, ERA is based on a recognition of three research political problems in Europe: the insufficient financial resources in the field, the absence of a climate that promotes research and utilisation of research results as well as fragmentation of activities and spreading of resources. The activities launched in order to develop ERA, including FP6, include efforts to establish a "single market" for research, an area for free exchange of knowledge, researchers and technologies with the purpose of establishing increased cooperation, more stimulating competition and better distribution of resources. The Council finds that the ambition to realise ERA should continue to be the central element in the European research policy in the coming years and also in the preparations of FP7. The future European research policy should aim at:

- Strengthening the basis of the European Research Area (ERA);
- Contributing to integration and strengthening of research activities in Europe; and
- Increasing the benefit to society through increased focus on commercial utilisation of research in Europe, etc.

In the treaty establishing the European Community, it is stated that 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 the Community's policy in other areas.

To fulfil this objective, research efforts that can lead to improved conditions of living, competitiveness and environment in Europe must be emphasised. A joint European effort is first of all needed to strengthen the areas in which

Europe is so advanced that it can maintain or improve a global leading position. Considerable synergy could be created through European research cooperation based on national research and business activity as basic competence accumulation and research still mainly take place nationally subject to national prioritisation.

Increasing research activities is a joint European goal. The ambitions of the Lisbon process and the Barcelona objective must be maintained. This requires allocation of significant resources for research and development activities. Making plans for an increase in private and public research in the coming years is first of all a national task. Accordingly, Denmark should seek to obtain total research activities corresponding to at least 3 per cent of the gross domestic product by 2010.

All over the world, focus on research and innovation as crucial driving forces for development of society has increased. The political debate in Europe clearly shows that R&D activities play an important role in the national strategies for increased growth and development. The debate also reveals that the ambitions in connection with the European research cooperation are increasing. The resources of FP7 should therefore be much larger than that of FP6. A doubling of the total budget will have a significant positive impact on society and trade and industry in Europe.

Because of the current situation for research and development cooperation in Europe, European research cooperation should, in the opinion of the Council, focus on the following areas, which call for intensified European efforts:

- The targeted research cooperation in thematic priorities must be adapted to the current challenges for Europe, and emphasis must be put on promotion of interdisciplinary, integrated activities.
- Increased emphasis must be put on the enhancement of society's application and utilisation of research, including for technological development and increased activities in trade and industry, particularly in the small and medium-sized enterprises.
- A specific emphasis must be put on basic research as a supplementary element in the European research policy in order to promote excellence in European research.
- Efforts must be increased to strengthen recruitment, education and mobility and to create more attractive career opportunities for researchers in Europe.
- Access to research infrastructures must be improved for European researchers, and great emphasis must be put on cooperation on the establishment of the necessary infrastructures.
- The framework programme should stimulate coordination and joint activities at the national and regional levels with a view to developing a joint knowledge base for development of policies.
- Administrative simplification of the framework programme must be ensured, and the instruments of the programme must be used in a more flexible way.

- A significant increase in the joint European resources for research and development must be realised to ensure the fulfilment of the objectives of the framework programme

In the following, the Council elaborates on these items with special reference to the preparations of FP7.

3 Deliberations on the framework programme instruments

FP7 must have a structure and apply instruments that support the individual objectives of the programme. At the same time, it is important to add flexibility to structure and instruments in order to make the programme useful for supporting research efforts with very different purposes and within very different areas. Both structure and instruments must be able to accommodate possibilities of and needs for promoting research at different development stages and of different scopes.

The instruments in FP7 must be adjusted to the targets defined for both the framework programme as such and for the individual axes. In FP6, several new instruments, e.g. Integrated Projects (IP) and Networks of Excellence (NoE), were introduced. Many of the hearing responses received by the Council comment on exactly these two instruments and Specific Targeted Research Projects (STREP) in FP6. In particular, Danish research institutions' and companies' possibilities of exploiting the new instruments and of participating in large projects and networks are commented on. In some hearing responses, it is stated that NoEs and IPs generally include too many partners, and that this often makes work within these bodies too blurred professionally and administratively cumbersome. With large networks there is also a tendency to support only one network of excellence within each thematic priority.

The Council has noted the comments of the hearing responses on this aspect. Danish institutions and companies, which are typically relatively small, may find it difficult to assert themselves within large projects and networks. At the same time, it must be maintained that the framework programme is to address themes and problems that typically require cooperation between several parties.

In general, greater flexibility in the application of the framework programme instruments is called for. The number of participants in projects and networks must not be decisive, and it must be possible to support networks and projects with both many and few participating parties.

FP7 must provide flexibility as regards the instruments to be used within the various focus areas. This means that within one thematic priority it may be expedient to put the main emphasis on integrated projects with many participants, whereas a relatively high share of projects with fewer participants may be more appropriate in another area. Similarly, the programme must offer flexibility as regards choice of instruments depending

on the research or activity area in question. Within one area of activity it may be most suitable to establish networks, whereas in another area the activity should be based on projects.

The purpose of an activity must always determine the type and form of the instruments. The nature and development potential of the research activity must determine the choice of instruments in relation to the necessary and adequate critical mass for the activity. Solving certain research tasks requires an effort from many cooperating entities, which each possesses competences and resources that need to be capable of interacting in the project. Other tasks can be solved through cooperation between a smaller number of parties.

The Council recommends that IPs and NoEs be continued as central instruments, but that flexibility be introduced as regards the number of participating parties. A specific limit for the number of participating parties should not be laid down. Typically, the number of partners in an IP might be about 5-10, and the number of partners in a NoE somewhat higher. The number must, however, be variable depending on the research theme and purpose.

Some hearing responses request the Council to recommend a general budgetary balance between resources to large and small projects. The reason is that it will help to ensure that more of the resources go to areas and activities in which Danish interests can achieve a better position. The Council does, however, not find it expedient to lay down a specific distribution of resources to be spent on IP/NoE and STREP, respectively. As mentioned above, choice of instruments and the specific adjustment of the size of projects or networks must depend on a specific assessment of the purpose and potential of the activity and of the nature of the research task.

The Council considers it important that FP7 is aimed at strengthening the research activities of companies, particularly the small and medium-sized enterprises, and their cooperation with public research institutions. This target can be achieved through more deliberate utilisation of the existing instruments, e.g. STREP, CRAFT (Cooperative Research Action for Technology) and Collective Research. Relatively more resources should be spent on projects suitable for participation of small and medium-sized enterprises.

In FP7, great importance must be attached to the promotion of the establishment and growth of small and medium-sized enterprises on the basis of research-based innovation. Therefore, how to incorporate measures to promote basic studies and other pre-competitive activities in small and medium-sized companies as part of, for instance, integrated projects in the framework programme should be considered. The programme of the

American Government, Small Business Innovation Research (SBIR)[5], might be useful as a model for such activities.

The European Research Area should be developed into a well-functioning market in which a company in one country can find and commence cooperation with a research environment at a university in another country or similar. Such forms of cooperation are already used, and FP7 should contribute to stimulating the small and medium-sized enterprises' incentive to cooperate directly with the best research entities without considering the national borders in Europe. This would, for instance, be relevant in connection with business-oriented education of researchers, cf. the Danish Industrial PhD Initiative. Promotion and support of one-to-one partnerships between one company and one university across borders should be made possible. Only one-to-one partnerships with a strong European dimension should be eligible for support.

The ERA-NET instrument was introduced in FP6. The purpose of an ERA-NET is to create networks between parties from different countries. These networks are to form the basis of coordination and development of joint activities in the long run. By bringing the parties together in the network, efforts can be made to achieve a final result that will lead to better research and potential new activities carried out at national, regional or European level. The Council finds that an ERA-NET should function as an incubator for future activities that can be generated from the network.

Formal requirements concerning applications, quality assurance and terms of grants

The Council is of the opinion that the framework programmes must improve the conditions of research and reduce the administrative burden to the participating parties as much as possible. At the same time, the high scientific quality requirements must be maintained, and the quality assessments must be based on open criteria and transparent processes.

There is much competition for the framework programme grants. This contributes to improving the quality of the applications, but the great number of applications means that many applicants may see the preparation of an application as waste of resources. In some hearing responses, it is stated that the formal requirements and routines in connection with applications and grants should be revised in order to simplify the administrative burden related to applications and processing of grants.

Within many activities under the framework programme, using a two-staged quality assessment will be an advantage: First a pre-qualification and then an actual application round among the qualified applicants. This will reduce

[5] Small Business Innovation Research (SBIR**)** is an American federal programme administered by ten departments/agencies with the purpose of producing early-stage financing for research and development in small technology companies (or individual entrepreneurs).

many applicants' scientific and administrative costs for preparing comprehensive applications with only minor chances of being accepted.

Increased differentiation as regards the formal documentation requirements of the applications depending on the purpose, organisation and budgetary frame of the activities covered by the applications should also be considered. The documentation requirements of an application should be reasonable considering what the applicant actually applies for. The European Commission has emphasised a more decentral processing of grants for projects and networks. Such flexibility and decentralisation of the administration of the framework programme should be improved.

The Council also finds that the European Commission should implement simplifications as regards the documentation needed for each application. After a first scrutiny of applications, the European Commission might assign a kind of authorisation to research institutions and companies. This authorisation should subsequently be considered a general guarantee of the institution's or company's administrative seriousness and ability to handle grants.

Cooperation with countries outside the EU

The framework programme currently comprises all the 25 Member States in the EU and a number of other countries, e.g. Norway, Iceland and Israel. On certain terms, the programme is open to third countries. The Council would like this possibility to be extended in FP7, and emphasis must be put on the mutual benefits of such cooperation. Especially as regards recruitment, education and mobility for researchers, there are exciting perspectives in focusing on countries like Russia, India, China and Brazil.

4 Deliberations on the framework programme structure

The framework programme structure must be based on elements that together support the objectives of the programme. Based on experience from FP6 and the necessity of adaptation to new, recognised needs for promotion of research and innovation in Europe, the Council recommends that the following six elements or axes be central in FP7:

- Promotion of European partnerships within thematic priorities;
- Promotion of technological development through partnerships between companies, especially small and medium-sized enterprises, and public research institutions;
- A specific emphasis on basic research;
- Strengthening career opportunities, recruitment, education and mobility for researchers;
- Development of research infrastructures;
- Support to and coordination of EU and national policies.

Together, these six axes will be able to accommodate activities that will contribute to the realisation of the general objectives of the framework programme. For each axis, purpose and instruments must be defined as

described in the following sections. The axes must be closely related. Typically, activities related to recruitment of researchers, infrastructures and technological development may be part of several axes.

4.1 Promotion of European partnerships within thematic priorities

The Danish Research Policy Council finds that the thematic priorities of the framework programme must reflect issues considered vital to the welfare and prosperity of the population in Europe in both the short and the long run. Welfare is to be understood in a broad sense as the term implies elements related to the quality of life of the individual citizen, including health, work and environment.

Great attention is paid to the thematic priorities of the framework programme. The thematic priorities must be seen in relation to the basis of research cooperation in the EU laid down in the treaties. In the treaty it is stated that 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 the Community's policy in other areas.

FP6 includes seven thematic priorities:
- Life sciences, genomics and biotechnology for health
- Information society technologies
- Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices
- Aeronautics and space
- Food quality and safety
- Sustainable development, global change and ecosystems
- Citizens and governance in a knowledge-based society

The Council finds that these themes should be adjusted in FP7 to reflect the current challenges in the research activities within the prioritised areas. From a general point of view, there are, in the opinion of the Council, several reasons for continuing the seven thematic priorities with adjusted contents. These priorities comprise central issues for society and important challenges to research. Under FP6, several projects and networks have been and will be initiated within the seven areas, and continuing these activities for a longer period than the lifetime of FP6 should be possible. This point of view is broadly supported in the hearing responses received. Besides, it may, according to the Council, be difficult to obtain political support from the EU Member States for major adjustments of the thematic priorities.

The thematic priorities must be based on the principle that the design of projects and networks are to be determined by the current issues. The research themes must be problem driven, not field or discipline driven. In the hearing process, the Council asked for viewpoints and suggestions concerning the thematic priorities. From research institutions, research councils and organisations, the Council has received a number of specific recommendations

concerning changes and additions to the thematic priorities in FP6. According to the Council, certain guiding principles and elements for the adjustment of the thematic priorities should be laid down at this time. In Appendix 1 to this report, the Council outlines its considerations concerning such adjustments. The specific efforts under the thematic priorities must be developed in a process in which the stakeholders participate actively.

Initiating research in the area between the thematic priorities must be possible, and initiating research that covers two or more of the thematic priorities must also be possible. Flexibility to take initiatives related to problems occurring more or less acutely in Europe must also be incorporated. The measures against the BSE[6] outbreaks in the 1990s constituted such a problem, which required a fast and coordinated effort from the European research environments. Within the framework programme, being able to handle intensified research efforts on, for instance, the security of Europe might be required sometime in the future. This action area might comprise research in a broad range of themes such as bioterrorism, security policy, development studies and jurisprudence.

Another interdisciplinary perspective that should be incorporated in the framework programme is related to change processes in trade and industry and in the working life linked with conditions for innovation and business development in Europe. This concerns the roles of the education institutions, the form of knowledge dissemination and life-long learning as well as cultural aspects of the development of the high-tech society. These are problem areas that to a very large extent call for interdisciplinary research.

It is important that the European Commission coordinates all the initiatives, i.e. both between the thematic priorities and between these themes and other activities within the framework programme.

4.2 Promotion of technological development through partnerships between companies and public research institutions

To a wide extent, cooperation between companies and public research institutions takes place within the framework programme. Especially within the thematic priorities, several projects (IP and STREP) are carried out with the participation of parties from the public and private sectors. These forms of cooperation must be further developed in FP7. Besides, it would be desirable to develop forms of cooperation where efforts are made to identify problems within specific areas that can only be solved by involving a wide circle of stakeholders. This may take place by setting up “technology platforms” within areas with a recognised European need, problem or challenge.

The Danish Council for Research Policy defines “technology platform” as “*a major, pan-European, mission-oriented initiative aimed at strengthening*

[6] BSE – Bovine Spongiform Encephalopathy, sometimes known as "mad cow" disease.

Europe's capacity to organise and to deliver innovation – strengthening the European-wide innovation process. The platform will bring together relevant stakeholders to identify the innovation challenge, develop the necessary research programme and implement the results".[7]

From a Danish point of view, the following areas would be suitable for development of technology platforms:

- Food production, including
    - Strengthened food research (biotechnology, etc.) with a view to dealing with nutritional and obesity problems;
    - Development of maritime technologies with a view to targeting the catch activities combined with new types of control that will encourage less discarding of fish, which may ensure sustainable development of fish stocks in the sea;
    - Problems concerning animal vaccines and transmission of contagious diseases from animals to human beings.
- Biotechnology – Medicine, including:
    - Continued development of the European New Safe Medicines Faster initiative that is aimed at providing safer and more efficient medicine for certain chronic illnesses such as cancer, cardiovascular diseases, immunological diseases and diabetes.
- Environment technology, including
    - Development of new building materials, building methods and production methods that can reduce the CO^2 load from the high energy consumption required for heating and cooling of buildings;
    - Solution of the EU's CO^2 problems through research in energy technologies, including sustainable sources of energy, energy saving and efficient technology, fuel cells, solar cells and highly efficient fossil-based power and combined heat and power technologies;
    - Systems and technologies for the promotion of environmentally sound production and for environmental control.
- Future energy supply, including
    - Wind energy and sustainable energy systems.
- Construction, including
    - Development of technologies, methods and components for intelligent control of the indoor climate in buildings and building structures with a view to reducing health nuisance and optimising both productivity and comfort.
- Healthcare and treatment, including:
    - Development of medical and medical technical technologies for improving the conditions of living for the still larger proportion of senior citizens in the population.

The Council has not undertaken a thorough assessment of potential themes for technology platforms. In dialogue with Danish stakeholders, the Ministry of

[7] European Union Research Advisory Board (EURAB) – Working Group on European Technology Platforms, January 2004.

Science, Technology and Innovation must seek to uncover the specific possibilities of developing the basis of technology platforms within areas of particular importance to Denmark.

4.3 A specific emphasis on basic research

According to the European Commission, basic research is given a low priority in the European research system.[8] On the basis of this recognition, an initiative to create a European Research Council (ERC) has been taken. A report prepared by a European expert group includes an assessment of the need and a suggestion for the establishment of such a council.[9]

In the hearing responses, the proposal for setting up a European research council for basic research within all research areas is widely supported. The Danish Council for Research Policy finds that this will have a major impact on knowledge accumulation and the basis of growth for European research, which will make Europe more attractive to researchers at the highest international level. A strengthening of basic research is also to be seen as a tool in connection with higher education, including education of researchers and recruitment for research in Europe.

The Council recommends that, in addition to basic research carried out under the thematic priorities of FP7, significant efforts be made to promote basic research based on the excellence, quality and originality of the research and the applicants. Quality assessments must take place on the basis of peer-review, also by involving expertise from outside Europe. Support should be provided to projects with partners located in different countries and individual researcher groups.

In addition to these general considerations, there are a number of issues concerning the organisation and working methods of a European research council, which must be considered more specifically. In the following, some of the issues are briefly described.

Researcher-initiated research must arise from the researchers' own interests, ideas and proposals for research projects. Some of the hearing responses received by the Council states that no types of limitations as regards eligible research areas should be laid down for ERC. Some hearing responses also underline that ERC should be able to support purely national projects as well as projects with broad European participation, preferably also with participation from non-European countries. The Council finds that an ERC working on such a basis is very likely to receive ten thousands of project proposals from researchers in 30-40 countries that will probably participate in FP7. This is bound to lead to a low success rate for the applicants and

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8 Communication from the European Commission. 14.1.2004.

9 The European Research Council – *A Cornerstone in the European Research Area. Report from an expert group.* Ministry of Science, Technology and Innovation, December 2003.

considerable frustration because of time “wasted” on the preparation of applications that fail to achieve support.

In the future debate over ERC, discussing whether the council’s way of working must comprise mechanisms to limit the number of applications is absolutely necessary. Such mechanisms might include pre-qualification/call for expressions of interest, requirements concerning project size or thematic limitations. Such types of limitation will all be problematic and controversial, however, the problems need to be realised.

The interaction between ERC and the national research councils and foundations should be based on pragmatic cooperation. One expedient way of dividing tasks between the national level and the European level could be achieved if the national research councils supported the new and/or smaller initiatives, and the European council supported larger initiatives which are “unique” in the individual country and which might therefore benefit from a European participation/interaction.

The setting up of a European research council/foundation constitutes a specific commitment to basic research as such. Besides, within the thematic priorities in FP7 it must also be possible to support basic research when this supports the accumulation of knowledge within the themes defined. Support for basic research in this context should, however, not be related to a future European research council.

4.4 Strengthening of career opportunities, recruitment, education and mobility for researchers

Making it more attractive to become and be a researcher in Europe is a huge challenge. We must make more young people choose a researcher career, make more young people finish formal researcher training, and ensure that we can offer interesting challenges and competitive working conditions in Denmark and Europe. Efforts to ensure the basis of growth for research must receive top priority in European research cooperation. Education, career opportunities and mobility for researchers must be part of all activities under FP7.

The most efficient instrument for the development of the European Research Area probably lies in the encouragement of a “Europeanisation” of the research culture. New generations of researchers must be influenced by joint European values in relation to research and in relation to the importance of research to the social development. FP7 must help to ensure that doing research in Europe becomes attractive and that excellence and getting merits are in focus and are appreciated.

A good, common research culture can only be developed if efforts are made to create an attractive and efficient labour market for researchers in Europe. Many researchers stay in other countries for briefer or longer periods of their careers. In all contexts, FP7 should help to ensure that researchers can develop their careers across national borders, across research institutions and across

the public and private sectors. This is such an important challenge that defining a joint European strategy for stimulation and organisation of researcher careers in Europe should be considered.

Several hearing responses received by the Council underline the importance of European mobility programmes and cooperation on education of researchers. Many hearing responses advocate a strengthening of the Marie Curie programme focusing on grants, networks and researcher schools. This point of view is fully supported by the Council.

Today, the quality of education in Europe varies significantly. Getting an overview of the levels for masters and PhD programmes in the various countries and institutions is often difficult. As part of the efforts to increase the mobility of researchers and other academic resources the transparency of the education systems of the various countries, including the education system for researchers, should be improved.

In some hearing responses, it is noted that research students in most European countries are considered students, whereas in Denmark they are employees. Such differences may create obstacles to mobility, both to the individual who wants to stay abroad and to the host institutions. The Council does not have sufficient information at its disposal to deal with this specific problem; however, the problem should be dealt with by Ministry of Science, Technology and Innovation.

Supporting the setting up of more joint European education courses for researchers is recommended. This will contribute to improving the quality of the national education programmes for researchers. At the same time, special efforts must be made to ensure high quality in the courses offered, e.g. by requiring that researcher education activities take place in connection with highly qualified and comprehensive research environments such as schools for researchers or similar.

4.5 Development of research infrastructures

Within FP6, European researchers' access to research infrastructure (e.g. large technical installations, laboratories, special equipment, databases, biological material, etc.) in other EU countries is improved. In the opinion of the Council, such activities should be continued under FP7; however, developing more expedient forms of cooperation on the establishment of the necessary infrastructures must be greatly emphasised. This also applies to establishment of decision-making processes that can match the US and Japan in terms of efficiency and rapidity.

Examples of infrastructure considered particularly important to Denmark are systems for synchrotron radiation, neutron sources, linear collider and experimental propagation houses. The Council stresses that further assessment of initiatives to promote Danish interests as regards infrastructures will require close cooperation between the Ministry of Science, Technology and Innovation, the involved research institutions and the research councils. It is

emphasised that infrastructures also comprises databases and, for instance, biologic material.

4.6 Support to and coordination of EU and Member State policies

The idea of a European research area comprises an ambition to stimulate and support coordination and joint activities at the national and regional levels with a view to developing a joint knowledge base for development of policies. Such activities should continue to receive support under FP7.

Under FP6, a number of ERA-NETs have been established with the purpose of creating networks between parties from different countries. These networks are to form the basis of coordination and development of joint activities in the long run. An important aspect of the networks is the fact that they can react quickly and efficiently to new opportunities and needs within research and innovation.

The Council finds that FP7 should include activities corresponding to FP6's ERA-NET. At present the Council is not able to indicate special Danish areas of interest in connection with networks. However, it should be emphasised that the networks may, in many contexts, be used as incubators for development of future activities in areas in which Europe has a leading position or in which a basis for utilising research and technologies can be created.

5 The continued work on the political and academic preparations for FP7

In the summer of 2004, the European Commission intends to publish a communication on the development of future cooperation on research and technological development in Europe.[10] This communication will be a contribution to the debate that will take place in the next 1-2 years over the formulation of and budgets for FP7. The Commission's communication is not a draft FP7; it is a proposal for discussion of central issues that will be part of the Commissions draft FP7. The draft FP7 is expected to be presented by mid-2005. The debate over this draft will then run until the framework programme is adopted by the Member State in the Council of Ministers and by the European Parliament by mid-2006.

The debate in Denmark over FP7 should be as broad and open as possible. All stakeholders in the public and private sectors must have the chance to present their viewpoints and proposals. The political decision-makers must at specific times make certain choices to ensure that the Danish prioritisations do not appear as lists of randomly selected wishes and proposals. The Ministry of Science, Technology and Innovation is responsible for the planning of the

[10] Communication from the Commission. *Science and technology, the key to Europe's future – Guidelines for future European Union policy to support research.* COM(2004) 353

future process, and the Danish Council for Research Policy is prepared to advice the Ministry in this matter.

In parallel with the debate over the formulation of FP7, the specific research activities should be prepared. Experience shows that planning and preparation of projects and networks should be started long before the commencement of the framework programme and the announcement of the individual activities. Therefore, Danish research institutions and companies should utilise the time until 2007 for preparing their participation in FP7, even though such planning activities will be influenced by certain elements of uncertainty as regards the specific form of the framework programme.

Preparation of applications for the framework programme is time and cost consuming. National support programmes must be available for this stage. In Denmark, especially two schemes are relevant:

- The Ministry of Science, Technology and Innovation has established a pool from which small and medium-sized enterprises can receive co-financing for some of their expenses in connection with the preparation of an application for FP6.
- The research councils have together established a START support scheme aimed at promoting Danish public and semi-public research institutions' participation in FP6. The applicant must have a significant coordinating function in connection with the planned EU application, e.g. within networks of excellence and integrated projects.

Both these schemes contribute to promoting Danish participation in the framework programme, and such schemes should be continued under FP7. Already at this point, making resources available for preparation of projects and networks under FP7 is called for. If Danish environments and companies are to assert themselves in the future framework programme, the preparations must be commenced before the programme has been laid down in every detail. The current Danish aid schemes established in order to promote the participation in FP6 could usefully be extended to cover the preparations for the participation in FP7 as well.

In line with the efforts to make the framework programme user-friendlier, the information and support functions in Denmark should be enhanced. The Ministry of Science, Technology and Innovation should ensure that research institutions' and companies' experiences with obtaining information about the framework programme and its possibilities are incorporated in the work to improve both information and services to Danish stakeholders.

There is a great need for constant preparation and updating of statistics on the Danish participation in the framework programme. Several stakeholders have requested this type of information. It is vital to the research policy debate and to the planning of the research efforts that there is a solid knowledge base that takes its starting point in Danish research entities' applications and participation in the framework programme in general and in the individual activities. Such information forms the basis of any Danish initiatives to promote the participation and/or adjustment of priorities at a national level

and within European cooperation. The Ministry of Science, Technology and Innovation should therefore improve the statistical follow-up on the framework programme and ensure that the information gathered is communicated to relevant Danish stakeholders.

Appendix 1 – Assessment of thematic priorities

In the following, brief descriptions and assessments of the thematic priorities of FP6 and the changes recommended by the Council are given.

I Life sciences, genomics and biotechnology for health

This priority focuses on the elements that form the basis of the healthy life. Research activities should cover a broad field with emphasis on the challenges to health and welfare in Europe. Compared with the rest of the world, Europe benefits from certain research advantages in that the population is relatively homogenous and that the patient material is well-characterised through comprehensive use of register data, etc. This provides good possibilities of studying the emergence of illness in the population.

The current research challenges are found within epidemiology, prevention and environmental stress. Challenges are related to life style and environmental stress, including low physical activity, eating habits and obesity as main causes of cardiovascular diseases and diabetes. In this area, social, cultural and ethical perspectives must be part of the research effort.

Denmark carries out many research activities, and many companies work on the development of pharmaceuticals. Under the heading "New Safe Medicines Faster" comprehensive research activities have been initiated under FP6. In the opinion of the Council, these activities should continue under FP7 focusing on, for instance, development of pharmaceuticals adapted to the individual.

Other central areas under this thematic priority should be research in molecular biology and cell biology, genomics, translational research[11], cancer research, early diagnosis, immunology, vaccines, allergy and brain research. Also animal health should be incorporated in this perspective.

Denmark has good research environments within this thematic priority, and the business community within this area is successful.

II Information society technologies

The thematic priority "Information society technologies" represents a continuation of activities under FP6. The area is very broad, and the purpose should still be to encourage development of technology and applications central to the development of the information society. These efforts are to strengthen the competitiveness of Europe's trade and industry and give the citizens the chance to realise the full benefits of the development of the

[11] *Translational research* deals with "translation" or transfer of basic biomedical knowledge to prevention or new forms of treatment.

knowledge society. Focus should be put on research themes that can only be carried out through multinational participation.

Commercially, it is very much a question of technology driven development, i.e. that new technological possibilities create demand that drives the development of both technical production and services. The convergence of technologies and services – media convergence – is an important research theme. Research activities must to a high degree embrace social scientific and humanistic scientific perspectives, e.g. concerning communication culture, language and technology and problems related to securing of the citizens' access to relevant knowledge in the paperless society.

Information and communication technologies and related issues constitute an interdisciplinary theme with relations to all other themes.

III Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices

Nanosciences are a relatively new area with a great potential, and much emphasis should be placed on basic nanophysics. Nanotechnologies and nanosciences will have an impact on many areas of society, and many companies are interested in training their staff in nanosciences and the many nanotechnological applications.

From a Danish point of view, focusing on nanotechnologies and nanosciences in relation to more areas of application in FP7 would be desirable, e.g. development of materials with new properties, identification and application of ingredients and adjuvants in food production, nanopharmaceuticals, intelligent pharmaceuticals and nanodiagnostics (early diagnosis) and nanotoxicology.

Development and application of nanotechnologies are in many ways closely linked with biotechnology and information and communication technologies. This applies within the health area and to the efforts to create a more sustainable society in cleaner surroundings.

This thematic priority should receive high priority as research in the area is successful in Denmark and there are great commercial perspectives.

IV Aeronautics and space

Commercially and in terms of research the theme of aeronautics and space represents a small area in Denmark. Some research entities and companies are, however, interested in the thematic priority under the framework programme. Danish interest concerns satellite cooperation and the possibilities of developing technologies that can be used for other purposes than aeronautics.

The public generally pays much attention to space technology, and this helps to promote the general interest in natural sciences and technology.

V Food quality and safety

The population is very interested in food quality and safety in relation to illnesses etc. To a significant extent, research activities should focus on issues related to the consumers' perspective. In this connection, food production should emphasise the impact of food on the human organism (fork-to-farm). The influence of cultural and social aspects on consumer behaviour and eating habits should also be considered. The area is to a high degree interdisciplinary, and the efforts within this thematic priority must be seen in relation to other thematic areas, e.g. the health area, information technology and nanotechnology.

Denmark has great commercial and research-related interests in the food area, and Danish research institutions and companies benefit significantly from the participation in FP6. Naturally, the area should receive high priority in FP7.

Within this thematic priority, focus must be put on nutritional quality, eating quality, raw materials and food quality, healthy lifestyle and healthy food. Much emphasis should be placed on issues concerning quality of both animal and vegetable food. Research must also be carried out in basic areas, e.g. genomics and biotechnology (plants, animals, microorganisms, food) and in systemic biology, nutrigenomics and metabonomics. The theme should also cover research and development within production and distribution processes, process control, packaging and consumer behaviour.

VI Sustainable development, global change and ecosystems

The thematic priority "Sustainable development, global change and ecosystems" is a very heterogeneous research area under FP6. There is a greater need for adjustment and structuring of the activities under this priority than under many of the other thematic priorities.

In the opinion of the Council, this thematic priority should under FP7 pay greater attention to energy issues. The future energy supply represents a large and comprehensive package of problems in which many Danish research environments and companies show great interest. Denmark possesses considerable internationally competitive competence within oil and gas, the main energy sources in society. Denmark also has strong research entities within the field of sustainable energy by way of wind power, solar energy and hydrogen energy. Exploitation of the various types of energy should be incorporated as a main area under the thematic priority in FP7.

Great benefits to society can be realised through intensified research and development activities within construction technology, indoor climate, climate systems, low-energy building, materials research and catalytic converters. There is a great potential in production technology research and development for improving the efficiency and environment of companies, and Danish enterprises are very interested in this area.

One central area under this thematic priority should be environmental and climate changes, including long-term changes to the environment, climate research, marine research, hydrogeography, freshwater environment, glaciology and earth systems science. Research in the hydrography and environmental condition of the Baltic and arctic research may be areas of special value to Denmark. Also research in urban environment and non-monetary valuation of natural values should be considered.

Environmentally correct handling of waste, discharge water and chemicals constitute significant problems to modern society. At the same time, there is a great financial potential in environment-related companies that develop services, systems and technologies for waste handling and recycling.

Issues related to international policies and legislation should be emphasised under this thematic priority. Similarly, ethical aspects related to globalisation and sustainability should be incorporated.

This thematic priority interfaces with many of the other thematic priorities. This applies, for instance, to the question of agriculture and food production from a global perspective, problems with chemicals and the entire health area. Research activities focusing on the conditions for a sustainable and competitive Europe in the global economy should be incorporated into the thematic priorities.

VII Citizens and governance in a knowledge-based society

Global development has shown vulnerability in the political processes. The relationship between individual and society, between religion, culture and politics is an important theme for research with a view to strengthening European integration, welfare development and security. The purpose of this priority must be to form a basis for society based on central values in European culture and politics.

This thematic priority must be continued from FP6; however, the specific contents should be adjusted in relation to the current challenges in Europe. In this context, challenges and solutions in the welfare area is a central theme. Research efforts within this area should be aimed at identifying and determining the effects of public measures and efforts in the welfare area, just as it should be ensured that the efforts do not claim more resources than necessary. Focus can be put on the connection between the various levels of the welfare systems and the interaction between public and private welfare services.

Other current themes are linked with the security and safety of the citizens and states, including legal rights, with the experience society as a phenomenon and its possibilities and with the development of new forms of governance in companies (Corporate Management and Innovation Management). Under this thematic priority, cross-border comparative analyses of cultural and social aspects will be important.

Appendix 2 – Structure of 6th Framework Programme

<table>
<tr><td colspan="8">Integrating European Research</td></tr>
<tr><td colspan="7">Priority thematic areas</td><td colspan="2">Anticipating S/T needs</td></tr>
<tr><td rowspan="4">Life sciences, enomics and biotechnology for health</td><td rowspan="4">Information Society Technologies</td><td rowspan="4">Nanotech. and nanosciences, knowledge-based multifunctional materials, and new production processes and devices</td><td rowspan="4">Aeronautics and space</td><td rowspan="4">Food quality and safety</td><td rowspan="4">Sustainable development, global change and ecosystems</td><td rowspan="4">Citizens and governance in a knowledge-based society</td><td>Research for policy support</td><td>Frontier research, unexpected developments</td></tr>
<tr><td colspan="2">Specific SME activities</td></tr>
<tr><td colspan="2">Specific international cooperation activities</td></tr>
<tr><td colspan="2">Joint Research Center – JRC – activities</td></tr>
<tr><td colspan="4">Structuring of ERA</td><td colspan="2">Strengthening the foundations of ERA</td></tr>
<tr><td>Research and innovation</td><td>Human resources and mobility</td><td colspan="2">Research infrastructures</td><td>Science and society</td><td>Coordination of research activities</td><td>Development of research/ innovation policies</td></tr>
</table>

Appendix 3 – Types of projects/modalities

Integrated Projects **(IP) –** aim at generating knowledge to increase Europe's competitiveness or solving major societal needs. (Average 3-5 years, 5-20 M € pr. IP)

Network of Excellence **(NoE) –** durable integration of research capacities/ restructuring and reshaping the way research is carried out in Europe. (Average 3-7 years, 5-20 M € pr. NoE)

Specific Targeted Research Projects **(STREP)** – research, demonstration, or innovation projects, same objectives as for IP. (Average 2-4 years, 1-3 M € pr. project)

Co-ordination Action **(CA) – networking and coordination of research and innovation.** (Average 2-4 years, 1-2 million € pr. CA)

Specific Support Actions **(SSA)** – activities supporting the policy objectives and complementing the funded research such as workshops, conferences, studies, etc. (Average 6 months- 4 years, 0.1-0.5 M € pr. SSA)

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About the Danish Council for Research Policy

The Danish Council for Research Policy advises the Minister for Science, Technology and Innovation on issues concerning research policy. The Parliament and other ministers may also ask the Council's advice. Advice may be given upon request or on the Council's own initiative.

The tasks of the Council include giving general advice on Danish and international research policy for the benefit of society including advice on:

- The framework of research
- Appropriations for research
- Major national and international research initiatives
- Development of national research strategies
- Denmark's role and position in international research cooperation
- Researcher education and recruitment