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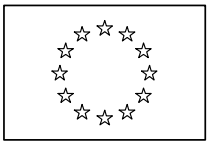

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GREEN PAPER

The European Research Area: New Perspectives

(Text with EEA relevance)

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GREEN PAPER

The European Research Area: New Perspectives

(Text with EEA relevance)

Summary

As we approach the review of the first three-year cycle of the renewed Lisbon Strategy for Growth and Jobs and the launch of the second cycle in 2008, it is a good time to assess progress made and discuss future orientations on one of its core elements – the European Research Area (ERA). In a changing world characterised by the accelerating globalisation of research and technology and the emergence of new scientific and technological powers – notably China and India – the European Research Area is more than ever a cornerstone for a European knowledge society. Such a society is one where research, education, training and innovation are fully mobilised to fulfil the economic, social and environmental ambitions of the EU and the expectations of its citizens.

The ERA concept combines: a European "internal market" for research, where researchers, technology and knowledge freely circulate; effective European-level coordination of national and regional research activities, programmes and policies; and initiatives implemented and funded at European level. Some progress has been made since the concept was endorsed at the Lisbon European Council in 2000. The European Research Area has become a key reference for research policy in Europe. However, there is still much further to go to build ERA, particularly to overcome the fragmentation of research activities, programmes and policies across Europe. The European Research Area that the scientific community, business and citizens need should have the following features:

– **An adequate flow of competent researchers** with high levels of mobility between institutions, disciplines, sectors and countries;

– **World-class research infrastructures**, integrated, networked and accessible to research teams from across Europe and the world, notably thanks to new generations of electronic communication infrastructures;

– **Excellent research institutions** engaged in effective public-private cooperation and partnerships, forming the core of research and innovation 'clusters' including 'virtual research communities', mostly specialised in interdisciplinary areas and attracting a critical mass of human and financial resources;

– **Effective knowledge-sharing** notably between public research and industry, as well as with the public at large;

– **Well-coordinated research programmes and priorities**, including a significant volume of jointly-programmed public research investment at European level involving common priorities, coordinated implementation and joint evaluation; and

– **A wide opening of the European Research Area to the world** with special emphasis on neighbouring countries and a strong commitment to addressing global challenges with Europe's partners.

Based on an assessment of the situation in these main areas, this Green Paper raises a number of questions on how to deepen and widen the European Research Area so that it fully contributes to the renewed Lisbon strategy. It intends to launch a wide institutional and public debate with a view to preparing initiatives for 2008.

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1. A NEW LOOK AT THE EUROPEAN RESEARCH AREA

Since the March 2000 Lisbon European Council endorsed the objective of creating a European Research Area (ERA), many initiatives have been launched. It is now time to assess what has been achieved so far and to reflect on what still has to be done to make ERA a reality.

Globalisation brings opportunities and challenges for the European Research Area (ERA)

A sense of urgency in revisiting ERA stems from the fact that globalisation of research and technology is accelerating and new scientific and technological powers – China, India and other emerging economies – are attracting considerable and increasing amounts of R&D investments[1]. These developments bring new opportunities for Europe and the world. At the same time, they raise the question of Europe's ability to sustain a competitive edge in knowledge and innovation, which is at the core of the renewed Lisbon Strategy for Growth and Jobs. Addressing this question will be a major issue for the next three-year cycle of the Strategy, to be initiated in 2008.

The EU and Member States have fully recognised that, together with high-quality education and lifelong learning and a supportive environment for innovation, ERA is essential to making Europe a leading knowledge society and thus creating the conditions for long-term prosperity. The ERA concept encompasses three inter-related aspects: a European 'internal market' for research, where researchers, technology and knowledge can freely circulate; effective European-level coordination of national and regional research activities, programmes and policies; and initiatives implemented and funded at European level[2].

Progress has been made in creating ERA

As detailed in the supporting Commission services working document, many actions have been taken to progress on these aspects, notably:

– The EU Research Framework Programme is explicitly designed to support the creation of ERA and its funding has been substantially increased, although less than initially proposed by the European Commission. New initiatives launched in conjunction with the 7th Framework Programme (2007-2013), such as the European Research Council, will have an important impact on the European research landscape. The future European Institute of Technology also has the potential to play a substantial role in creating world-class 'knowledge and innovation communities'.

– Initiatives have been launched to improve the coordination of research activities and programmes. They include the European Technology Platforms, through which industry and other stakeholders develop shared long-term visions and strategic research agendas in areas of business interest, and the bottom-up 'ERA-Net' scheme which supports the

[1] Commission staff working document SEC(2007) 412, Section 3.1.1.
[2] Commission staff working document, Chapter 1.

coordination of national and regional programmes[3].

– Policy coordination is addressed through the 'open method of coordination' and the use of voluntary guidelines and recommendations. This is stimulating a process of debate and reforms at national level, which has resulted in all Member States setting national R&D investment targets in the context of the overall EU 3% of GDP R&D investment objective and taking measures to improve their research and innovation systems[4].

– The EU has adopted a 'broad-based innovation strategy', which will improve the framework conditions for research and innovation[5]. In this context, a modernised Community framework for State aid for research and innovation[6] and guidance for a more effective use of tax incentives for R&D[7] were adopted in November 2006, a European patent strategy is being proposed to overcome the deadlock on the Community patent[8], and initiatives are being prepared to support the emergence of European 'lead markets' in promising technology-intensive sectors.

– EU cohesion policy and its financial instruments - the Structural Funds - give strong priority to the development of research and innovation capacities, particularly in less developed regions. Together with the priority given in most Member States' internal policies, this can help the whole of Europe to participate in and derive full benefit from the European Research Area.

...but much groundwork remains to overcome fragmentation of the public research base and…

These initiatives are valuable steps on which further progress can be built. But much ground work remains to be done to build ERA, particularly to overcome the fragmentation which remains a prevailing characteristic of the European public research base. Fragmentation prevents Europe from fulfilling its research and innovation potential, at a huge cost to Europeans as taxpayers, consumers, and citizens:

– Researchers still see career opportunities curtailed by legal and practical barriers hampering their mobility across institutions, sectors and countries.

– Businesses often find it difficult to cooperate and enter into partnerships with research institutions in Europe, particularly across countries.

– National and regional research funding (programmes, infrastructures, core funding of research institutions) remains largely uncoordinated. This leads to dispersion of resources, excessive duplication, unrealised benefits from potential spillovers, and failure to play the global role that

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3 Commission staff working document, Chapter 2.
4 Commission staff working document, Section 2.2.
5 COM(2006) 502, 13.9.2006.
6 OJ C 323, 30.12.2006, p. 1.
7 COM(2006) 728, 22.11.2006.
8 COM(2007) 165, 4.4.2007.

Europe's R&D capability would otherwise allow, notably in addressing major global challenges.

– Reforms undertaken at national level often lack a true European perspective and transnational coherence.

Europeans appear to be aware of these costs. According to a recent survey, 83% consider that there should be more coordination of research activities between the Member States of the European Union[9].

...to retain and attract more business R&D investment in Europe

Fragmentation of public research diminishes Europe's attractiveness for business as a location for R&D investment. The business sector is supposed to contribute two-thirds of the 3% of GDP R&D intensity target. Recent data suggests that EU-based companies have increased their global R&D expenditure by more than 5% in 2006, but this is still less than the rate of increase of R&D expenditure of their non-EU-based counterparts[10]. In fact, EU-based companies invest more in R&D in the US than US-based companies do in the EU and this transatlantic net outflow of R&D investments is increasing[11]. A substantial and sustained increase of business R&D investment is essential to break with the current stagnation of the EU's overall R&D intensity at 1.9% of GDP[12] and to progress towards national and EU targets.

Surveys[13] suggest that when investing in R&D, business primarily looks for:

– Favourable framework conditions for the commercialisation of technologies;

– Adequate numbers of well-trained and mobile researchers, responsive to the needs of industry; and

– An excellent public research base (research institutions and infrastructures) with strong interactions with industry.

While the EU's single market review[14] and initiatives stemming from the broad-based innovation strategy such as those mentioned above focus on the demand side for innovation, this Green Paper focuses on the factors affecting the performance of research systems in Europe, with a view to overcoming the fragmentation of efforts and policies, and ensuring that Europe makes the most of globalisation in science and technology.

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9 Eurobarometer: Europeans, Science and Technology, June 2005, http://ec.europa.eu/public_opinion.
10 2006 EU Industrial R&D Investment Scoreboard, http://iri.jrc.es/research
11 Commission staff working document, Section 3.3.1.
12 Commission staff working document, Section 3.3.1.
13 2005 EU Survey on R&D Investment Business Trends, http://iri.jrc.es/research
14 COM(2007) 60, 21.2.2007.

2. THE EUROPEAN RESEARCH AREA VISION

The European Research Area will deeply root knowledge in society and free Europe's knowledge potential in all its dimensions: people, infrastructures, organisations, funding, knowledge circulation and global cooperation

To establish a framework for discussion, align efforts and assess progress made, it is important to identify the main features of a fully realised ERA. Building on the key principles agreed unanimously in 2000, ERA should comprise:

1. **An adequate flow of competent researchers**. Researchers should be stimulated by a single labour market with attractive working conditions for both men and women, involving notably the absence of financial or administrative obstacles to trans-national mobility. There should be full opening of academic research positions and national research programmes across Europe, with a strong drive to recruit researchers internationally, and easy movement between disciplines and between the public and private sectors – such mobility becoming a standard feature of a successful research career.

2. **World-class research infrastructures**. Major infrastructures should be built and exploited in the form of joint European ventures. They should be accessible to research teams from across Europe and the world, with researchers working in Europe having access to international infrastructures and equipment in other parts of the world. These research infrastructures should be integrated, networked and accessed through the concomitant development of new generations of electronic communication infrastructures, both in Europe and globally.

3. **Excellent research institutions**. Across the entire EU, diversified research institutions should be embedded in the social and economic life where they are based, while competing and cooperating across Europe and beyond. They should be able to interact routinely with the world of business as well as to engage in durable public/private partnerships. Such partnerships should be at the core of specialised – mostly interdisciplinary – 'clusters' which would attract a critical mass of human and financial resources from across the world. The European Research Area should thus progressively structure itself along the lines of a powerful web of research and innovation clusters. Their reach should be amplified through 'virtual research communities' created by pooling and integrating activities and resources from different locations in Europe and beyond, using powerful computing and communication tools. Increasingly, clusters should form and expand through such virtual integration rather than geographical concentration.

4. **Effective knowledge sharing**. This should consist of: open and easy access to the public knowledge base; a simple and harmonised regime for Intellectual Property Rights, including a cost-efficient patenting system and shared principles for knowledge transfer and cooperation between public research and industry; innovative communication channels to give the public at large access to

scientific knowledge, the means to discuss research agendas and the curiosity to learn more about science.

5. **Well-coordinated research programmes and priorities**. This should include the joint programming, implementation and evaluation of public research investments at European level on issues that go beyond the capacities of individual countries. Common priorities should be identified through joint foresight, involving the scientific community, society and industry, and jointly decided and acted upon. In these and other areas, national and regional research programmes should offer confidence that the main principles governing applications for research funding are comparable across the EU and ensure the highest level of quality. They should together constitute a simple, transparent and coherent system of research funding based on various public sources (national, regional and European) and associated with private sources (including philanthropy and civil society organisations).

6. **A wide opening of the European Research Area to the world**. Special emphasis should be placed on the participation of neighbouring regions of the EU, as well as on developing multilateral initiatives to address global challenges with EU's partners.

In addition, three important concerns cut across all dimensions of the ERA:

– European research policy should be deeply rooted in European society. Besides the pursuit of scientific excellence, European research should support knowledge advancement and dissemination and underpin policies for sustainable development in fields of major public concern such as health, energy and climate change[15]. It should experiment with new ways of involving society at large in the definition, implementation and evaluation of research agendas and of promoting responsible scientific and technological progress, within a framework of common basic ethical principles and on the basis of agreed practices that can inspire the rest of the world.

– The right balance should be found between competition and cooperation. Researchers and research institutions should be stimulated by higher levels of competition on a European level to develop world-class excellence. At the same time, they should be engaged in stronger cooperation and partnerships across Europe and beyond to effectively address issues of common concern.

– Full benefit should be derived from Europe's diversity which has been enriched with recent EU enlargements. European countries and regions may build on their strengths by progressively developing specialisation in certain fields. However, they should be able to maintain or gain access to

[15] Commission staff working document, Section 3.3.1.

other specialist knowledge and S&T capacities in the rest of Europe and the world, notably through researcher mobility, knowledge sharing and the development of virtual networks and 'communities'.

Urgent action is required

The nature of research means that complex interdependencies exist between the above-mentioned features of ERA and with the cross-cutting dimensions, as will be seen below. Some features will take longer to establish than others, so that the ERA vision may not be fully achieved before 10 or 15 years – around 2020. However, this systemic nature of ERA dictates that urgent action should be taken to progress as quickly as possible on all fronts - all the more so given the strong leverage effect this will have on increasing private investment in research and innovation and promoting a more competitive knowledge-based economy.

Elements of the European Research Area vision

1. Are these the essential elements that the European Research Area should provide? Are there other elements which should be taken into account in the vision?

2. What should be the roles of EU, national and regional policies to establish such a European Research Area and take best advantage of the European dimension in the context of globalisation and national and regional specialisation?

3. What EU initiatives could best leverage overall public and private efforts to realise the vision?

3. MAKING ERA A REALITY

This section analyses the situation of European research with respect to the six main dimensions of the European Research Area. For each of them, a number of questions are raised to provoke an open discussion among all those who have a stake in research.

3.1. Realising a single labour market for researchers

Attractive careers and seamless mobility are essential for researchers…

…but far from being a reality

A key challenge for Europe is to train, retain and attract more competent researchers. Moreover, the seamless mobility of researchers across institutions, sectors and countries is even more important than for other professions: it is essential to better balance researcher supply and demand, particularly given their high specialisation and relatively low numbers; it constitutes one of the most efficient vehicles for the transmission of knowledge; and it is an increasingly important requirement for the development of skills and careers in science. Today, most researchers in Europe still find their opportunities curtailed by institutional and national boundaries, poor working conditions and narrow career prospects[16]. In practice, academic positions still remain largely reserved for national or even internal staff[17]. Transparent competition for recruitment is the

16 Commission staff working document, Section 3.2.3.

17 Despite case law of the European Court of Justice on the access of EU nationals to posts in the public sector.

exception rather than the rule. Mobility across borders or between academia and industry tends to be penalised rather than rewarded. Administrations do not usually allow researchers to receive or carry research grants across borders.

This is why so many European graduates and doctorate holders either move away from research careers or pursue research in countries where they find better opportunities – mainly in the US. At the same time, women remain under-represented, particularly in some fields of science and engineering and in positions of responsibility. Demographics also have a growing negative impact on the European research sector, with potential shortages of researchers in some areas due to the retirement of older generations and the associated loss of competence.

Work is required at all levels in the private and public sectors

It is thus essential to establish a single and open European labour market for researchers, ensuring effective "brain circulation" within Europe and with partner countries and attracting young talent and women into research careers. This requires efforts at all levels in the private and public sectors and by local, national and European administrations. The private sector should be encouraged to develop and expand opportunities for researchers. At the same time, public authorities and research institutions need to work to remove the legal, administrative and practical (e.g. linguistic) barriers to geographical and inter-sectoral mobility, improve employment and working conditions for researchers, reconcile professional, private and family life, and address gender and demographic issues.

Voluntary approaches result in slow progress

Many specific EU initiatives have also been taken to foster a more attractive European area for researchers[18], but progress remains very limited due to the voluntary nature of most of them and, in some cases, the lack of coordination with and between similar national and regional measures. For example, the European Charter for Researchers and the Code of Conduct for their recruitment are increasingly being supported, but this is a slow process and real progress will only happen once the endorsement of principles is followed by concrete implementation.

Considering further steps for the portability of social security provisions

As regards the portability of social security provisions, existing regulations to modernise and simplify the coordination of social security schemes are steps in the right direction. The same holds for the Commission proposal for a directive on improving the portability of supplementary pension rights. But the specific situation of researchers, who increasingly need to be mobile for large parts of their careers, typically through medium-term assignments or appointments, presents serious difficulties. This calls for better administrative cooperation between social security institutions[19] but also for further steps to be taken.

Improving the

It is also essential to further improve the education and continuous training

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[18] For example: Marie Curie grants, European Mobility Portal (http://ec.europa.eu/eracareers) and European Network of Mobility Centres, ERA-Link pilot initiative to network European researchers in the US, the EU 'scientific visa' directive and recommendations, etc.

[19] See Commission Green Paper on Labour Law - COM(2006) 708, 22.11.2006.

education and training of researchers

of researchers. Young researchers trained in Europe should be confident that their qualifications will be rewarding for their careers. European doctoral programmes and further training should meet stringent quality standards, fulfil the needs of both academia and business, and be recognised across Europe. Researchers at all levels should be trained in cross-disciplinary work and S&T administration, including knowledge transfer and dialogue with society.

Realising a single labour market for researchers

4. Is there a need for a more effective European framework to improve significantly the recruitment, working and geographical and intersectoral mobility conditions for researchers, including enforceable measures?

In particular:

5. How could the principles established in the European Charter for Researchers and the Code of Conduct for their Recruitment be effectively implemented, in order to develop fully the European dimension of research careers, including the trans-national opening of vacancies and funding opportunities for researchers?

6. Is there a need for a European framework to ensure portability of social security provisions for researchers across Europe?

7. How could 'flexicurity' principles (e.g. combining labour market flexibility with employment security) be applied to the researcher labour market?

8. How could we increase the numbers and quality of researchers in Europe by attracting young research talents, ensuring real equal opportunities for men and women and exploiting the experience and expertise of end-of-career researchers, for example in advisory and training roles?

9. Should joint approaches be developed to increase the coherence and impact of the various schemes aiming at networking European researchers abroad as well as foreign researchers in Europe? Similarly, is there scope to increase the coherence and impact of European and national schemes for international mobility of researchers (for example by jointly developing international 'Fulbright-like' fellowships)?

10. How could the specific education and training needs of researchers be addressed at all stages of their careers, starting with post-graduate and doctoral curricula, building on the Bologna process for higher education?

3.2. Developing world-class research infrastructures

Excellent research needs a range of high-quality research infrastructures (e.g. radiation sources for new materials, clean rooms for nanotechnologies, data banks for genomics and social sciences, observatories for earth sciences). European-level infrastructure can provide a service to the whole European research community. Due to high building and operating costs, it also makes sense to share much of this infrastructure.

Building on the Research Infrastructures Roadmap

A step towards better planning of research infrastructures at European level has been achieved with the creation of the European Strategic Forum on Research Infrastructures (ESFRI). In 2006, it established a European 'roadmap' for new and upgraded pan-European research infrastructures. Immediate priorities should be: to ensure that the roadmap effectively includes the bulk of planned and foreseen research infrastructures in Europe; to complement the roadmap in areas not yet adequately covered; to endorse its proposals at political level; and to mobilise the necessary funding.

Making the most of all sources of funding

Implementing the ESFRI roadmap would cost € 14 bn over 10 years. Despite the increase in funding allocated to infrastructures in the 7th research Framework Programme and the possibilities for infrastructure-support in less developed regions under cohesion policy programmes, the EU budget is not big enough to provide core financing for the construction of new pan-European infrastructures, in addition to supporting open access to infrastructures of European interest and stimulating their coordinated development and networking. The mobilisation of national, private and other sources of funding is essential. Attracting investment from industry is particularly important given its current low level of involvement, even for infrastructures of direct interest.

An appropriate legal structure may be needed

Another difficulty for setting up new forms of Pan-European research infrastructures is the lack of a legal structure allowing the creation of appropriate partnerships.

Further developing electronic infrastructures in Europe and the world

Several infrastructure projects proposed are of such a scale and scope that they would require cooperation at global level. Many of the infrastructures envisaged are of a distributed nature, composed of various elements integrated via electronic infrastructures including data repositories and high-speed networks such as GEANT and on grid technologies, which play an essential role by enabling these elements to operate together in ways that remove traditional constraints related to time, geography, discipline and institutions. It will thus be necessary to ensure coherent planning, parallel development and integration between European S&T infrastructures and new generations of electronic infrastructures, which should be further deployed across Europe, including peripheral regions. Europe should also continue with the extension to other continents of GEANT and grid electronic infrastructures, which constitute powerful instruments for international cooperation and the establishment of global research partnerships.

Developing world-class research infrastructures

11. How could the EU, on the basis of identification of needs by ESFRI, effectively decide on pan-European research infrastructures and their funding – the latter involving the Community (including possible synergies with EU cohesion policy instruments), Member States, industry, the EIB and other financial institutions?

12. Should a European legal framework be developed to facilitate, in particular, the emergence and operation of new forms of research infrastructures of pan-European

interest, including electronic infrastructures? What other policy and legal changes are necessary to encourage the private sector to invest more in research infrastructure?

13. Is there a need to define common and transparent principles for the management of, and access to, infrastructures of European interest?

14. How can the longer-term continuous improvement of research infrastructures be ensured, e.g. through S&T programmes associated with them and European electronic infrastructures?

15. Should a global forum on research infrastructures be created, involving third countries and international organisations, where Europeans could speak with one voice (as they did in the ITER project on nuclear fusion research)?

3.3. Strengthening research institutions

Universities and public research organisations perform more than 35% of all research undertaken in Europe. They are the primary source of both fundamental research and research on issues of public interest, as well as an important provider of applied research that helps to underpin business research and innovation. Strengthening research institutions is key to stimulating business R&D investment in Europe.

Research institutions face growing challenges in funding and organisation

However, their potential is not fully realised due to significant dispersion of resources and activities, insufficient links with business and society, and rigidities in their functioning[20]. To improve their role as research actors in a borderless ERA, they have to adapt to a changing and more demanding environment where, for example, competition for funding and talent is intensifying both within Europe and with third countries. Universities in particular, at the intersection of the European Research Area and the European Higher Education Area, face growing funding and organisational challenges.

More concentration and specialisation are necessary…

Most European research institutions lack critical mass and, within the confines of sub-optimal national systems, have difficulties meeting expectations with the resources available to them. While the average quality of European public research is good, in many institutions it is not up to leading world standards[21]. Therefore, some concentration and specialisation is necessary to permit the emergence of both European centres of excellence competitive on the global scale and a rich network of universities and public research organisations across the entire EU which excel in addressing research and training needs at national, regional and sectoral levels.

…which requires autonomy, professional management of research and

Such changes can happen only if research institutions, notably universities, are given autonomy to position themselves, cooperate and compete at European and international levels, and better link their research activities to the needs of industry and society. This must go hand in hand with growing professionalism in the management of research and adherence to more

[20] Commission staff working document, Section 3.2.1.
[21] Commission staff working document, Section 3.3.2.

accountability…

transparent standards of accountability. Reforms under way in many countries need to be completed and extended to the whole of Europe.

…linking public funding to output and performance…

In particular, the awarding of public funding should encourage these changes by increasingly taking into account output and performance factors. Innovative public-private partnerships also need to be stimulated further and a good balance found between institutional and competitive funding. With regard to the latter, the European Research Council will play an important role by having teams from universities and other research organisations compete for grants to fund the best 'frontier research' at European level.

…creating virtual research communities via information and communication technologies (ICTs)…

Research institutions should increasingly work in the context of European and global 'virtual research communities' associating public and private organisations. This will require a better collective exploitation of the opportunities offered by massive computing, information and communication infrastructures, which are becoming fundamental for moving the frontiers of research. Virtual research communities can also constitute a powerful vehicle to ensure the inclusion of researchers and students from all around Europe and other countries.

… and establishing virtual centres of excellence through strong and durable partnerships

Research institutions should also be encouraged to create 'virtual centres of excellence' in the form of strong and durable partnerships between themselves and with industry, going beyond the usual project-based cooperation. This is the purpose of 'networks of excellence' in the research Framework Programme. A lesson learnt under the 6th Framework Programme is that such durable partnerships are only possible between a very restricted number of partners pooling a significant volume of resources. Thus, they typically involve very large research teams, or entire labs or research units.

The 'knowledge and innovation communities' of the European Institute of Technology (EIT) will offer an attractive framework to create such partnerships. Other instruments such as structures shared by several institutions to pool research-management capabilities (including knowledge transfer, fund-raising and other key functions) could help to create virtual centres of excellence.

Strengthening research institutions

16. How can the resources of European research institutions be strengthened in the most cost-effective manner, in order to enable them to achieve excellence and compete on a world scale?

17. How can research actors be better encouraged to create world-class virtual centres of excellence, such as in the context of the proposed European Institute of Technology, the FP7 'networks of excellence' and national and regional initiatives, and to share structures that pool the research management capabilities of several institutions?

18. Is there a need for a European regulatory initiative to facilitate the creation of public-private partnerships?

19. How can the EU and Member States best stimulate the emergence of European and global virtual research communities, exploiting fully the potential of computing, information and communication infrastructures?

20. Should action be taken to develop: (i) principles for autonomy and for the management of research by research institutions, notably universities; (ii) shared criteria for the funding and assessment of research institutions, notably universities, giving stronger weight to linkages beyond academia, as well as to output and performance factors?

3.4. Sharing knowledge

Generation, diffusion and exploitation of knowledge are at the core of the research system. In particular, access to knowledge generated by the public research base and its use by business and policymakers lie at the heart of the European Research Area, where knowledge must circulate without barriers throughout the whole society.

Opening access to knowledge throughout Europe by exploiting the potential of ICTs

State-of-the-art knowledge is crucial for successful research in any scientific discipline. Reliable, affordable and permanent access to, and widespread dissemination of, scientific research results should therefore become defining principles for Europe's research landscape. The digital era has opened up numerous possibilities in this respect. Opportunities for progress can be seen, notably in the development of online libraries, repositories of scientific information and databases of publications and publicly funded research results. These should be integrated at European level and interlinked with similar databases in third countries. In particular, the system by which scientific information is published is pivotal for its validation and dissemination, and thus has a major impact on the excellence of European research[22]. Europe should stimulate the development of a 'continuum' of accessible and interlinked scientific information from raw data to publications, within and across different communities and countries.

Improving knowledge transfer between public research and industry

Knowledge transfer must improve in order to accelerate the exploitation of research and the development of new products and services. To that end, European universities and other public research institutions should be given incentives to develop skills and resources to collaborate effectively with business and other stakeholders, both within and across borders[23]. A major hindrance is the inconsistent, and often inadequate, rules and approaches for managing intellectual property rights (IPR) resulting from public funding. The Commission has identified good practice and models of knowledge sharing between the public research base and industry which will serve to inspire further action at both EU and national levels[24].

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22 See Commission communication 'Scientific information in the digital age: access, dissemination and preservation' - COM(2007) 56, 14.2.2007.

23 Commission staff working document, Section 3.2.4.

24 See Commission communication 'Improving knowledge transfer between research institutions and industry across Europe: embracing open innovation' - COM(2007) 182, 4.4.2007 - and accompanying staff working document SEC(2007) 449.

Breaking the deadlock on patent systems…

Patenting remains excessively complicated and costly in Europe, and fragmented litigation fails to provide sufficient legal certainty. Given the deadlock in negotiations on the Community patent, other options are being examined, including improving the current European patent system. The objective should be to offer cost-effective European patenting, mutually recognised with the other major patenting systems worldwide and backed by a coherent pan-European litigation system[25]. In addition, a number of R&D-specific issues, such as the grace period, joint ownership regimes and the research exception, should also be addressed in order to ensure consistent treatment across the EU.

…and addressing R&D-specific IPR issues

Thinking differently about communicating, discussing and teaching S&T knowledge…

Finally, to work efficiently and properly in full symbiosis with European society, ERA requires the development of new channels and innovative approaches for communicating and discussing science, research and technology, as well as a reinforced commitment of research actors to education and training activities. This would ensure that European citizens are well informed about all the issues at stake, and result in the spread of research approaches geared towards society's needs and aspirations and of a culture and spirit of innovation throughout society as a whole. Innovative approaches are also needed to improve the availability and uptake of relevant S&T expertise for evidence-based policy-making.

…and using it for policy-making

Sharing knowledge

21. Is there a need for EU-level policies and practices to improve and ensure open access to and dissemination of raw data and peer-reviewed publications from publicly funded research results?

22. What should constitute a European Framework for knowledge sharing between research institutions and industry based on identified good practice and models?

23. Are there specific R&D-related issues, such as the grace period, joint ownership regimes and the research exception that need to be looked at from a European perspective?

24. What conditions should be created to promote innovative approaches in the way that science and technology is communicated, taught, discussed and valued by Europeans, and taken up for evidence-based policy-making?

3.5. Optimising research programmes and priorities

Since 2000, a core objective of the European Research Area has been to ensure the coherence of national and regional research programmes and priorities on issues of European interest. Some progress has been made, but it falls far short of the ambition and potential in this regard.

Promoting common principles and

Further progress could take the form of common principles for peer review, quality assurance and joint evaluation of European, national and regional

[25] See Commission Communication 'Enhancing the patent system in Europe' - COM(2007) 165, 4.4.2007.

reciprocal opening of programmes to increase the efficiency and impact of public funding

programmes and agencies, which would help simplify and raise the efficiency and impact of research funding in Europe. Another step forward could be the reciprocal opening of corresponding national and regional programmes to participants from other Member States, particularly in the case of investigator-driven research. This would enable researchers to apply for funds in another Member State, with the aim to enhance excellence everywhere and increase the efficiency of funding allocation to the best research in Europe, reinforcing the impact of the European Research Council.

Regarding society-driven research, where research funding is focused on predetermined areas or topics of direct relevance to citizens, business or policy-makers, many issues are best addressed by research programmes in individual countries and regions, notably to build and expand their S&T capacities and respond to local needs. Interaction between such programmes may range from simple exchanges of information to close coordination. However, some issues can best, or even only, be addressed effectively through European and sometimes global research programmes, combining EU and national support as well as business and philanthropic funding.

Building on experience to improve programme coordination

The principal value of the actions undertaken since 2000 has been to demonstrate the potential and conditions for success, but also the limits, of programme coordination[26].

Since 2003, the bottom-up ERA-Net scheme has been providing support for the coordination of national and regional programmes. Other schemes specifically support cooperation between regions, such as the 'Regions of Knowledge' under FP7 and the 'Regions for Economic Change' of Cohesion Policy. As regards ERA-Net, the 'variable geometry' principle has facilitated the readiness of participants to embark on the partial integration of their respective programmes. However, the first years of the scheme have clearly demonstrated that a condition for success is the existence of well-defined and well-structured national and regional programmes and corresponding budgets.

This is also the lesson of the only attempt made up to now to coordinate national research programmes on a larger scale through Article 169 of the EC Treaty: the 'European and Developing Countries Clinical Trials Partnership' (EDCTP). This case shows that even when participating Member States have formally committed to pooling resources on a trans-national basis, this remains very difficult in practice.

Jointly identifying major societal challenges beyond national capacity

Efforts have also been made to identify jointly major challenges or opportunities relevant to all or many countries but requiring research efforts beyond individual national capacity, and on this basis to define broad research agendas. For example, the industry-led European Technology Platforms have defined European 'visions' and research agendas in their respective fields, and these are taken into account in the priorities of the

[26] Commission staff working document, Chapter 2.

European research Framework Programme. In some countries there are also plans to translate parts of these European research agendas into national priorities.

The visions and research agendas developed by the Technology Platforms centre on topics arising from business interest. They could contribute to a wider and complementary process of joint European and national research programming involving all stakeholders – research institutions, business, civil society organisations, etc. Such a process would allow European, national and regional research priorities to be based on the systematic identification of major societal challenges. Common foresight and technology assessment exercises carried out in close collaboration between national organisations and involving the participation of stakeholders and citizens could help structure and enrich such an approach. The recently launched initiative to develop a European Strategic Energy Technology Plan could be an interesting precedent[27].

Establishing joint programmes for society-driven research

Joint Technology Initiatives based on Article 171 of the EC Treaty represent a new way of establishing public-private partnerships in research at European level, ensuring the large-scale coordination of research efforts. Such initiatives have been proposed to implement research programmes covering parts of the research agenda of ETPs in a small number of cases where their scale and scope justify it. The first such initiatives are expected to be launched in the coming months.

In the medium-term perspective, a new approach could be envisaged for establishing and implementing joint programmes for society-driven research, with the following essential features to ensure their desired scale, efficiency and impact:

– Variable configurations depending on the priorities, competences and types of involvement of interested Member States and stakeholders;

– Priority setting and joint programming based on shared foresight exercises;

– Flexible funding mechanisms combining, as appropriate, grants with specific tax incentives to support business participation and other instruments such as pre-commercial procurement of R&D services;

– Common principles of implementation, notably with respect to peer review, ethical standards, exploitation of results, quality control, accountability and evaluation, and where appropriate a joint management structure.

[27] COM(2007) 60, 21.12.2007.

Exploiting the potential of intergovernmental research organisations

By their size and the nature of their activities, intergovernmental research organisations, such as those represented in the EIRO forum[28], help to increase the coherence, quality and delivery of European efforts in a number of research fields. The coherence between the activities of these organisations and with EU research and other policies is very important, both within Europe and in dealing with the rest of the world. In some cases, it could be increased by the Community becoming a member of these organisations, representing the collective interest of all EU and associated countries. In addition, inter-governmental networking structures such as EUREKA and COST could further contribute to the coherence of activities within the European Research Area.

Optimising research programmes and priorities

25. Should common principles be developed and used for peer review, quality assurance and joint evaluation of European, national and regional research programmes? Should these programmes be opened to participants from other Member States, and how?

26. Is there a need for shared principles for the accountability of public research funding, which would enhance simplification of rules and procedures and increase its effectiveness and efficiency?

27. What participative processes need to be put in place to enable public authorities to jointly identify and decide upon major societal issues requiring a pooling of resources and capacities?

28. On such societal issues of European or global dimension, how could principles and modalities be established and tested for joint programming of research, involving all stakeholders (research institutions, business, civil society etc.) and bringing together funding from EU, national, regional, business and philanthropic sources?

29. Should the European Community seek membership of intergovernmental research organisations?

3.6. Opening to the world: international cooperation in S&T

Making international S&T cooperation more central to the main external policy objectives of the EU

Science knows no boundaries and the issues that research is asked to deal with are increasingly global. The challenge is to make sure that international S&T cooperation contributes effectively to stability, security and prosperity in the world.

The European Research Area should therefore be open to the world, and also S&T cooperation with partner countries should be steered in a coherent and policy-driven manner[29]. A coherent approach towards international S&T cooperation, under the banner of global sustainable development, can assist

[28] CERN, EFDA, EMBL, ESA, ESO, ESRF, ILL. See http://www.eiroforum.org. The relationship between the EU and ESA is being discussed in the context of the 2003 EC-ESA Framework Agreement and the further development of European Space Policy.

[29] Commission staff working document, Section 3.1.2.

in building bridges between nations and continents.

Increasing coordination between the EU and Member States

A success story such as ITER shows that Europe can have the will and capacity for leadership to address global challenges with partners around the world. In other areas such as the environment, Europe is increasingly involved in global initiatives. But, generally speaking, such involvement is at present far from systematic and often poorly coordinated with that of Member States. As a result, both Europe as a whole and Member States individually are losing much of their potential impact on the global scene.

Closer coordination is necessary between the EU and Member States, for mutual benefit, as well as between S&T cooperation policy and other areas of external relations. Such coordination should be sought both in multilateral fora and initiatives as well as in bilateral cooperation with partner countries.

Designing a common approach with respect to…

Better coordination could be achieved by adhering to a common approach based in particular on the orientations set out below. The situations of individual partner countries may often call for a mix of these:

…neighbouring countries…

– With neighbouring countries, the objective should be to establish a borderless 'broader ERA', which would underpin and benefit from other elements of the European Neighbourhood Policy. This should entail the participation of our neighbours not only in the EU research Framework Programme[30], but also with the other dimensions of the European Research Area, such as the coordination of research programmes and infrastructures, enforcement of knowledge-sharing principles and seamless mobility of researchers.

…developing countries…

– With developing countries, cooperation should include a significant focus on strengthening their S&T capacity and on supporting their sustainable development in close liaison with development policy, while at the same time working with them as partners in global initiatives.

…and industrialised and emerging economies

– With industrialised and emerging economies, priority should be given to programmes of mutual benefit, particularly to address global challenges. S&T agreements have been concluded with many of these countries. The role of such agreements should be critically assessed notably as regards reciprocity and the important issue of IPR. In some cases, more specialised agreements have been concluded to foster cooperation in specific areas, for example in nanotechnologies with the US. These should be assessed with respect to their contribution to overall European and international research priorities and programmes. More joint calls for projects could be promoted in this context.

Jointly addressing global issues and regional needs…

Complementary to these broad orientations, the EU and its Member States should explore joint approaches to address global issues and regional needs specific to some parts of the world. International exchanges of researchers are a general issue that should be addressed with all partner countries.

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[30] See Commission Communication COM(2006) 274, 4.12.2006, on the general approach to enable European Neighbourhood Countries to participate to Community agencies and programmes.

...particularly in multilateral frameworks

Finally, multilateral initiatives should be preferred to bilateral initiatives in order to promote the coherence of S&T priorities and actions at international level. This notably involves work in the context of multilateral organisations such as UNESCO, OECD and the G8, in multilateral agreements such as the UN Framework Convention on Climate Change and the Cotonou Agreement, and with regional organisations such as the African Union, ASEAN and Mercosur.

Opening to the world: international cooperation in S&T

30. How can the European Commission and Member States work together to (i) define priorities for international S&T cooperation in close coordination with the other dimensions of external relations; (ii) ensure the coordinated and efficient use of instruments and resources; (iii) speak with one voice in multilateral initiatives?

31. How can the European Commission and Member States work together to explore the potential of initiatives for international research programmes on issues of a global dimension, involving the Community, Member States and third countries?

32. How should S&T cooperation with various groups of partner countries be modulated to focus on specific objectives? Should complementary regional approaches be explored?

33. How can neighbouring countries be best integrated into the European Research Area as part of the European Neighbourhood Policy?

34. How can the EU's bilateral S&T agreements be made more effective? Are there alternative or complementary instruments that can be used, such as joint calls for projects, involving where possible the Member States?

35. How can common European agendas for S&T cooperation be promoted in multilateral organisations and agreements as well as with regional organisations?

4. MOVING AHEAD: PUBLIC DEBATE AND FURTHER STEPS

Europe has an enormous research and development potential, which remains to be tapped. The Commission believes that the broad orientations outlined above have the potential to considerably strengthen the European Research Area, rendering it fit and capable to address the major challenges that Europe faces in an open world and to achieve the objectives of the Lisbon strategy.

The Commission launches a wide consultation and debate…

With this Green Paper, the Commission is launching a wide consultation and debate to discuss and specify these orientations and stimulate other ideas. To this end, the Commission:

– Invites the European Parliament and the Council, the European Economic and Social Committee and the Committee of the Regions to express their views on the orientations proposed for debate;

– Invites Member States to promote a wide debate at national and at regional level;

– Invites researchers and research organisations, higher education establishments, businesses, civil society organisations and citizens directly, to engage in the debate and to respond to the public consultation launched with this Green Paper[31].

…to help prepare future initiatives

On the basis of the results of the consultation and debate, the Commission intends to propose initiatives in 2008.

To accompany and support the debate, and to contribute to the preparation of proposals, the Commission will organise focused events and use external expertise to elaborate on the issues presented for debate in the Green Paper.

The Commission will also reform the European Research Advisory Board (EURAB) in order to enhance the role it plays in the realisation of a European Research Area. Part of its mandate should be to help the European Commission convene a regular 'assembly' of all stakeholders in European Research.

Finally, the Commission will support the development of data collection, analysis, monitoring and evaluation in order to strengthen the evidence base for the development of the European Research Area and to be able to measure the progress towards its realisation[32].

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31 http://ec.europa.eu/research/era. The public consultation will be open until 31 August 2007.

32 Building in particular on the European Statistical System, which will be addressed in a forthcoming Commission Communication on Statistics on Science, Technology and Innovation, as well as on the ERAWATCH information system on national research policies (http://cordis.europa.eu/erawatch) and on the EU Industrial Research Investment Monitoring (http://iri.jrc.es).