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January 2008

CREST report on the
Internationalisation of R&D
Facing the Challenge of Globalisation:
Approaches to a Proactive International Policy in S&T

CREST
European Union Scientific and Technical Research Committee

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Preface

The report presents a summary of the main issues raised and recommendations given in the **Analytical Report on 'Policy Approaches towards S&T Cooperation with Third Countries'** published in December 2007 by the **CREST Expert Group on 'Internationalisation of R&D - Facing the Challenge of Globalisation: Approaches to a Proactive International Policy in S&T'**.

The Expert Group operated within the framework of the third cycle of the Open Method of Coordination for the implementation of the action lines of the 2003 European Commission Communication 'Investing in Research: an Action Plan for Europe' (also called the '3% Action Plan').

The following 21 European Union Member States and countries associated to the European Framework Programme for Research and Technological Development participated in the activities of the Expert Group: Austria, Belgium, Czech Republic, Denmark, Germany, Greece, Finland, France, Ireland, Iceland, The Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Seven meetings of the Expert Group were held between February and November 2007. The chair of the Expert Group was Jörn Sonnenburg (International Bureau of the German Federal Ministry of Education and Research at the German AeroSpace Centre). The rapporteurs were Arie van der Zwan (Ministry of Economic Affairs, The Netherlands) and Peter Teirlinck (Belgian Science Policy Office).

The European Commission's Directorate General for Research provided valuable contribution to the work through Peder Christensen (Unit C.3) and Heiko Prange-Gstöhl (Unit D.2). Jan Nill and Gaston Heimeriks from the Institute for Prospective Technological Studies (IPTS) at the Joint Research Centre of the European Commission provided analytical support to the work of the Expert Group as part of the ERAWATCH project. Klaus Schuch (Centre for Social Innovation, Austria) and Sylvia Schwaag Serger (Swedish Institute for Growth Policy Studies) provided analytical support as external experts.

Results of the Expert Group on Internationalisation of R&D

Background

Globalisation is an overarching 'mega-trend', which will increasingly shape the world during the next decades. It will sustain world economic growth, raise world living standards and substantially deepen global interdependence. At the same time, it will generate enormous economic, demographic, environmental, energetic, cultural, security and consequently political convulsions. Although the overall benefits are expected to be positive, the net benefits of globalisation will not necessarily be global.

Europe, its Member States (MS) and the countries associated (AC) to the European Framework Programme for Research and Technological Development (FP) are challenged by globalisation in research and development (R&D), which remarkably transcends the former focus on the Triad regions (the US, the EU and Japan). New emerging countries appear on the international science and technology (S&T) scene, notably the BRICS countries Brazil, the Russian Federation, India, China and South Africa. This causes new opportunities for knowledge and technology acceleration including the promise to develop and penetrate new markets, but it also increases the competition for scarce resources, e.g. human capital, leading research infrastructures and foreign direct investments (FDI) in R&D. A new division of labour develops at world scale and also affects the sphere of S&T. The key question is how to benefit most from this phenomenon and how to reduce at the same time the risks related to the globalisation process.

Applying the Open Method of Coordination (OMC), it was one of the objectives of the CREST Expert Group on 'Internationalisation of R&D' to take stock of the strategies and activities of the EU MS and AC towards the ongoing trends in internationalisation of R&D.

In particular, the mandate of the CREST Expert Group was

1. to collect and present MS/AC policy approaches to internationalisation of R&D and innovation;
2. to identify good practice, pending questions and problems related to the development and implementation of a proactive internationalisation strategy based on national and Community experiences;
3. to analyse the lessons learnt from coordinated multilateral initiatives like the horizontal ERA-NETs and to develop scenarios for future multilateral approaches of MS based on the OMC and building on national and Community instruments;
4. to develop recommendations related to the international cooperation dimension in S&T of both MS/AC and, if appropriate, also for Community activities.

These tasks have been fulfilled by a work programme which employed a variety of analytical and discursive methods. It was firmly build on the commitment of the members of this CREST Expert Group and their readiness to data provision,

information exchange, in-depth discussion and mutual learning. The process was structured and evidence-based by empirical investigations (two questionnaire-based inquiries), desk research of policy documents and statistics dealing with the issue of internationalisation of R&D and targeted information inputs from the European Commission and external experts.

The main results, trends, conclusions and statements of this work, which are elaborated in full length in the Analytical Report on 'Policy Approaches towards S&T Cooperation with Third Countries' are summarised as follows.

Drivers of Internationalisation of R&D

In the field of S&T, globalisation enhances a tendency for higher reliance on external sources, international collaboration and networking. The greatest benefits will accrue to those countries that can most efficiently access, adopt and exploit new technologies developed at whatever geographical scale, also world-wide.

In front of this background, internationalisation in R&D is driven by the aim

- ∞ to strengthen research excellence and innovation performance by a better access to foreign sources of knowledge and by increased global cooperation between research organisations and innovation networks to jointly develop and exploit new knowledge and technologies based upon comparative factor advantages (in terms of knowledge and technologies);
- ∞ to increase the attractiveness of Europe on the worldwide R&D market, to successfully compete for R&D contracts and services and to attract more foreign investments in R&D as well as the best and most creative 'brains';
- ∞ to prepare the domestic ground for successful European innovations abroad;
- ∞ to respond to global problems, international commitments and to foster the role of the EU as a community of values.

Usually, three modes of internationalisation in R&D are distinguished ⁽¹⁾:

- ∞ International R&D cooperation between partners in more than one country to generate new scientific knowledge and technological know-how, whereby each partner retains its own institutional identity and ownership remains unaltered (e.g. the case of FPs or bilateral intergovernmental S&T programmes);
- ∞ International generation of knowledge and innovations carried out by multinational enterprises which create innovations across borders by building up research networks including the establishment of new R&D units in the host country or the acquisition of foreign R&D units, i.e. FDI in R&D;
- ∞ International exploitation of innovative know-how and technologies through means of trade, granting of licences and patents, reverse engineering etc.

There are, however, problems interfering against the driving motivations, like insecure intellectual property regimes, unbalanced brain circulation flows, the relocation of FDI in R&D from Europe to other regions (notably Asia) etc. Thus, new concepts need to be developed and tested and efforts (and funds) invested

⁽¹⁾ Archibugi, D. (2001): European Innovation System. In: Fischer, M.M. and Fröhlich, J. (eds): Knowledge, Complexity and Innovation Systems. Berlin, Heidelberg, New York: Springer, pp. 58-75.

- ∞ to upgrade the impact of international S&T collaboration of S&T institutions in Europe;
- ∞ to facilitate the international mobility of researchers according to individual career paths through the introduction of more comprehensive brain-circulation concepts;
- ∞ to enhance spillovers from FDI in R&D to the relevant European research communities, irrespective of whether these FDIs are implemented abroad by European companies or domestically by foreign companies;
- ∞ to provide better (regulatory) conditions for national S&T institutions and innovative firms to better access foreign knowledge on the one hand and to exploit domestic knowledge in Third Countries in a fair manner on the other hand.

Evidently, to overcome these challenges structural adjustment costs will occur and multilevel dialogues and new governance modes will have to be established which will transcend the traditional S&T frame towards other policy domains (like economic, trade and labour-market policy, development policy, environmental policy, education policy etc.) as well as towards non-political stakeholders (autonomous universities, autonomous research organisations, companies, philanthropic associations, non-governmental organisations, etc.). This also calls for a revisiting of national innovation policy instruments in light of the differing impact that the internationalisation of S&T has on their relative efficiency and efficacy.

The accelerated internationalisation of R&D is very differently absorbed by the MS/AC, depending – at least partly – on each country's current position on the global R&D map. But also the European Research Area (ERA) will have to prove itself in a world of globalisation increasingly shaped by open innovation approaches of the business enterprise sector. More systemic policy answers towards the internationalisation of S&T are needed. A first major challenge exists in investigating how the negative effects of globalisation can be addressed without diminishing the benefits of globalisation. In this respect, a key question refers to fair global rules (e.g. relating to intellectual property rights [IPR], technical and social standards, trade and investment, etc.) and the soundness and compatibility of national policy responses. A second challenge involves the S&T responsibility towards global challenges and the specific S&T problems of the developing world. As regards the latter, there is a need for more coordination of policy initiatives between the field of S&T policy and Official Development Assistance (ODA) on the one hand and between countries/regions on the other.

Policy Objectives and Strategies of Member States and Associated Countries towards the Internationalisation of R&D

The major objectives of MS/AC regarding internationalisation of R&D towards Third Countries can be subsumed in three bullet points:

- ∞ The objective to increase the quality and absorption capacity of domestic S&T through international S&T partnerships allowing access to foreign knowledge and S&T resources (this subsumes the explicit aim to support 'excellence' but also the less ambitious aim to push-forward the internationalisation of domestic R&D and, thus, to raise the quality and absorption level in general);

- ∞ the objective to gain access to new markets and to increase the own innovation system's competitiveness (in this respect internationalisation of R&D is very often perceived as an important complementary approach to other international economic activities);
- ∞ the readiness to engage in solving global problems which cannot be tackled in an efficient way by an individual country (in this sense a certain commingling with the strategy for sustainable development and the global development goals deriving from development cooperation, e.g. Millennium Development Goals, can be observed).

It can be roughly summarised that all three dimensions have been almost equally perceived as important objectives for the internationalisation of R&D with Third Countries. Also, it turned out that these objectives are not exclusive as most MS/AC have mixed objectives of their internationalisation policies in the field of S&T. Most priority, however, is addressed to the issue of facilitating access to foreign markets and raising competitiveness.

Alternatively, the objectives can be distinguished into those focussing on enhancing the national attractiveness ('inward objectives') and those focussing on connecting to research in Third Countries ('outward objectives').

The 'inward objectives' include

- ∞ the objective to attract expatriate and foreign researchers;
- ∞ the objective to attract inward FDI in R&D;
- ∞ the objective to promote national science abroad;
- ∞ a set of objectives related to 'cleaning/preparing the own house' (e.g. in order to offer ideal conditions for research cooperation in a broad range of S&T fields, to continuously develop adequate innovation environments, to turn research into new technologies, innovation and entrepreneurship, to enhance the knowledge society and to provide world top-level education).

The 'outward objectives' relate to

- ∞ higher involvement in international cooperation and the enhancement of bilateral and multilateral S&T relations (including the establishment of new ones);
- ∞ connecting domestic research(ers) into global S&T activities (either in general or focused at frontier or strategic research areas or focused at excellence and greater valorisation, partially complementing and underpinning trade and investment linkages);
- ∞ enhancing international mobility of researchers;
- ∞ opening the national research programmes to researchers from Third Countries.

Ten of the 21 European countries which provided information on the policy objectives towards internationalisation of R&D indicated that they already have a comprehensive national strategy on internationalisation of R&D. An impressive number of eight of the remaining twelve countries stated that they are in process of developing one. In addition, many countries envisage new initiatives, which underpin the dynamic with respect to internationalisation and globalisation of R&D. These

planned new initiatives encompass a wide field ranging from far-reaching generic approaches (e.g. to emphasise globalisation as a horizontal priority topic) to more technical, instrumental ones. Frequently, indications on envisaged initiatives derive from the wish to implement the existing (very often new) international strategies on S&T and to make them operational (e.g. by developing implementation respectively action plans). Also, an assessment of the results and the impact of the developed strategies is an issue envisaged by a few MS/AC.

Priority Setting in International S&T Policies

The issue of priority setting was discussed along two dimensions: first, selecting priority partner countries and, secondly, selecting priority themes for international R&D cooperation. The criteria for the selection of priority partner countries and respective thematic priorities can be classified along scientific, political and economic criteria.

As regards the identification of partner countries, six selection categories can be distinguished (by rank order):

- ∞ Expected scientific benefits including improving quality and excellence;
- ∞ political reasons including solving societal problems and contributing to development goals;
- ∞ gaining access to (new) markets, competition and innovation aspects;
- ∞ human factors (immigration of knowledge workers, brain drain, brain gain and brain circulation);
- ∞ promotional activities for the national science system;
- ∞ geographical, historical, linguistic and cultural ties.

It needs to be underlined that in case of a partnership with Third Countries, the common ground is given by mutual interest and a mutual net benefit of the different countries involved. Here, the criteria mentioned above need to be applied by both/all partners and the various perspectives need to be considered. This basic principle is considered as one of the assets of any cooperation.

Regarding the scientific criteria MS/AC mentioned the present and future S&T potential in the partner country including the potential for partnerships in high-tech domains, the striving for excellent research on the basis of cooperation with leading R&D centres, benefits for joint participation in FPs and better access to large international research infrastructures.

The main political aspects relate to foreign policies and instruments like bilateral agreements and umbrella agreements which can act as 'opportunities to get windows opened', capacity building in less developed countries, responsibility sharing for global issues and respecting IPR and ethical rules as well as cultural and historical ties.

Economic criteria refer to the future growth potential of the partner country reflected through the partner countries' position on the various scoreboards (trend chart, global competitiveness report) as an example of a more evidence-based approach.

Another selection criterion is the assessment of already existing cooperation relations of research organisations. However, data mining for this issue becomes increasingly difficult due to the increased autonomy and diversity of the involved organisations. Desirable metrics for evidence-based decision-making are not always available and, moreover, existing metrics do not necessarily reflect the current (and expected future) performance of certain countries (such as China or India). Thus, systematic information gathering on S&T in Third Countries is important. Most MS/AC collect information systematically and use a variety of tools for this purpose. The four most frequently mentioned measures are embassies in Third Countries, regular bilateral workshops, national liaison offices in Third Countries and systematic analysis of the participation of domestic research teams with foreign partners in international programmes (especially FPs). Cooperation in information collection with other MS/AC does not happen frequently.

It should be noted that a lot of countries stressed that many forms of official international S&T cooperation are the result of individual contacts between researchers and research organisations, without any government strategy behind it. In some countries, and only recently, this bottom-up process has been complemented by more strategic top-down processes.

Across Europe, China and the USA are most often mentioned as partner countries. Many MS/AC mentioned additionally Japan and the (other) BRICS countries. Historical ties are still important in selected partner countries. This preference is in line with existing research that indicates the importance of geographical, cultural and linguistic proximity as important factors for establishing collaboration. It should, however, not be forgotten that overall international cooperation is still dominated by intra-EU collaboration.

The prioritisation or top-down selection of scientific topics for R&D cooperation with Third Countries is not very much expressed. Half of the interviewed MS/AC did not consider a thematic prioritisation as really relevant, which could be – at least partially – explained by the bottom-up character of some international schemes. Among the countries which provided more specific answers in terms of thematic priorities, in some cases a certain orientation towards the scientific needs and priorities of the partner countries could be detected. This is especially true as regards developing countries. In general, the thematic range of scientific cooperation is quite broad and only a few obvious thematic specialisations can be identified.

Influential Policies and the Strategy Development Process

Next to S&T policy other policy areas influence the internationalisation of R&D. These policies include (by rank order) foreign policy (partly in some countries also because of its competence in ODA), followed by economic and labour market policy, development policy and – with some distance – environmental policy. In all but a few MS/AC, the coordination of the development of the national strategy for the internationalisation of S&T lies within the authority of either the relevant science ministry or another national S&T body (e.g. a council for S&T). S&T internationalisation strategies were or are mostly developed cross-governmentally, often by inclusion of important stakeholders with representative functions. Universities and non-university research organisations (or their institutionalised representation bodies) were almost always included. Business organisations were a little less involved and were also perceived as comparatively less important. Very

high priority levels were attributed to the inclusion of S&T councils and other R&D advisory bodies as well as research funding agencies.

The implementation of the S&T internationalisation strategies is very often organised by division of labour across different organisational constituencies: ministries, public agencies, science organisations and research councils (in rank order). Business organisations are usually not involved in the implementation of the strategy.

As regards the connection between science and development policies a clear trend towards more coordination can be detected in some countries, especially in fields like agriculture, water, energy, biotechnology, climate change and health. However, the responsibilities concerning development and research policies are distributed among various ministries and agencies. There are potential goal conflicts in terms of different geographical foci, different thematic foci and different approaches. Some countries seem to be quite advanced in the effort to combine scientific excellence and development goals while others only start to look for synergies.

Monitoring and Evaluation of S&T Policy Implementation

Around 60% of the MS/AC who responded to the questionnaire confirmed that they monitor and/or evaluate the implementation of national policy measures supporting the internationalisation of S&T. Of those countries that do not monitor or evaluate, all but two replied that they plan to establish such activities.

The scope of the monitoring activities, however, varies and formal evaluations are less frequent – with the repeatedly mentioned exception of the evaluation of the participation in European FPs. 70% of the monitoring countries which responded to the survey use internal evaluation panels and units as evaluators. Other types like external evaluation panels and contracts for evaluation studies with independent organisations are less frequent.

The aspects most often evaluated are the number of participants, the budget and, in case of joint initiatives, the national returns. Around half of the monitoring countries evaluate the impacts and effects of the measures. Explicitly mentioned elements of such an evaluation include the degree of achievement of the goal of the measure, the achieved S&T results and the resulting cooperation structures. Information provided on the applied evaluation methods is scarce; some examples include the analysis of international and national databases and the use of questionnaires for the ex-post evaluation of projects and programmes. Only a few relevant evaluation reports are publicly available.

National Policy Measures towards International Cooperation of S&T Institutions

International S&T collaboration of research institutions has significantly increased in the last decade. Despite the fact that the majority of internationalisation activities occur on a bottom-up-basis, it is a regular practice of the MS/AC to support the internationalisation of S&T organisations established in their respective countries with a variety of policy measures. The growing importance of international cooperation is reflected by the high number of MS/AC which have intensified existing schemes and or initiated or plan new initiatives. This characterises a trend to treat

the issue of internationalisation of R&D not anymore as just a pure 'add-on'-activity but as an emerging pillar of S&T policy-making itself.

The overall rationale behind the existing policy support measures is oriented towards a reduction of transaction costs for the participating (national) institutions, which result from international cooperation and asymmetric information. Measures in this respect include on the one hand 'small scale funding' to cover for instance travel costs within international collaborative R&D projects and on the other hand information support services, including legal and technical advice, research promotion activities, partner search support, matchmaking etc. to reduce additional information-related transaction costs. Another important approach is the permission of participation of foreign institutions in national R&D programmes, usually without funding. A trend towards more thematically focussed initiatives, mostly based upon national strengths, which are increasingly differentiated by target countries, can be observed. Small scale initiatives, which by now have usually centred on mobility, are more and more complemented by genuine research promotion activities to add critical mass and momentum to the internationalisation activities of R&D organisations.

National Policy Measures towards the International Mobility of Individual Scientists

The stimulation of international in- and outward mobility of individual scientists is one of the classical arenas of international S&T cooperation policies, not only because mobility measures can also be implemented if available budgets are constrained. With the increasing acknowledgment of the crucial role of human resources for successful R&D and innovation, the issue of international mobility has received renewed attention also from a more exploitation-oriented perspective. The rationale behind is based on the insight that knowledge cannot be entirely codified and thus, in principle, accessed each and everywhere.

In front of this background, it is not surprising that 19 of 21 responding countries have national policy measures in place to enhance the mobility of researchers through governmental funds. In addition, bottom-up initiatives of agencies and other stakeholders exist. Most MS/AC target all types of mobility ('brain attraction', 'brain retention', 'brain connection' and 'brain circulation') with similar and usually high priority. A focus on brain circulation is often a top priority in countries with a rather high R&D performance, while attraction and retention of researchers is more frequently identified in countries with a less developed R&D system in order to catch-up. In general, however, a need, especially at the intra-European level, towards more comprehensive and balanced 'brain circulation' models rather than concentrating only on 'brain attraction' can be observed.

From the viewpoint of policy measures, four types stand clearly out in terms of frequency:

- ∞ The enhancement of individual mobility under S&T agreements;
- ∞ the provision of incoming fellowships;
- ∞ the provision of outgoing fellowships;
- ∞ measures aimed at raising the attraction of domestic universities and research institutes.

These policy measures are complemented by other important ones, which are, however, not so frequently in place, such as the provision of return programmes or measures to decrease the administrative burden to obtain working permits. Many of the new or planned initiatives of MS/AC focus on mobility measures towards Third Countries, because intra-European mobility is to a certain extent perceived as being already covered under the FP. Joint European initiatives, such as the creation of researcher's mobility portals, the ERA-MORE-initiative or the implementation of the EU Directive 2005/71/EC ('visa package') are often mentioned as successful measures in this respect.

National Policy Measures towards Foreign Direct Investment in R&D

R&D has for a long time been one of the least mobile activities of multinational enterprises due to different factors of local 'stickiness'. Current evidence on flows of R&D suggests, however, that the global R&D business environment has changed due to intensified global competition and the need to innovate more quickly at different scale and scope. At the same time, barriers to the dispersion of R&D have decreased due to rapid developments in ICT and international regulation progresses. This results in emerging patterns of globally distributed R&D networks which are increasingly connected to the concept of 'open innovation'. At the same time, there are signs of a declining interest for inward FDI in R&D in Europe (especially by US-based companies) and an increasing competition by emerging economies (especially China).

As a result, both inward and outward FDI in R&D is high on the political agenda of most MS/AC, although the R&D part is usually included in more general FDI policies. Most of the MS/AC have recently put in place or revised their policies with the aim to increase the country's attractiveness for inward FDI. The most frequently applied policy measures include the promotion of local strengths abroad and the active recruitment of foreign companies, cluster policies to attract FDI in R&D, administrative support for foreign investors, provision of infrastructure, direct financial support and fiscal incentives.

Although only a limited number of countries have specific policy instruments in place to stimulate spillovers from FDI in R&D to the domestic (or local) R&D environments, there is a rising awareness to innovate policy measures in order

- ∞ to take advantage of inward FDI in R&D by means of embedding (former) high-tech enclaves with little knowledge diffusion in the local environment and to generate spillovers without hollowing out the local research base;
- ∞ to capture the scientific benefits of outward FDI in R&D (back) to domestic R&D environments;
- ∞ to adapt policy measures to the rationale of knowledge competition rather than cost competition.

Policy Measures towards the International Exploitation of Knowledge

The policy objective as regards the international exploitation of knowledge is to find a balance between protection and dissemination of knowledge. A large group of MS/AC have a balanced view on the international exploitation of research. Some have an open view and an almost equally big number has no clear opinion (yet) on this matter. No MS/AC has a closed approach. Among the countries with a balanced view, regulatory interventions in the field of IPR protection and exploitation are usually made on a case-by-case basis (e.g. in certain high-tech domains). Most common, however, is the inclusion of IPR regulations in S&T and other relevant bilateral agreements. Specific measures to promote protection of knowledge generated by domestic universities and research centres are perceived with an increasingly important priority, but concrete measures are still rare.

A few MS/AC put a special focus on knowledge and technology (usually under the context of competitiveness and exploitation) within general programmes aiming at promoting the internationalisation activities of their domestic companies. There are few cases with respect to developing countries, where governments of MS/AC also encourage a shared utilisation of new domestic knowledge in and with partners from developing countries. As regards the enhancement of domestic exploitation of knowledge produced in Third Countries only a few MS/AC have policy measures in place, mostly through means of technology licensing from abroad and international knowledge and technology scouting activities.

From a policy perspective, the issue of international exploitation of knowledge seems to be in an experimentation stage, confronted with insecurity and complexity, not at least because of the lack of reliable data, the need to cooperate across different policy spheres and the private ownership of many of the ongoing activities. There is, however, growing awareness that comprehensive measures are needed to enhance the domestic exploitation of knowledge produced in Third Countries and the exploitation of domestic knowledge on international markets. Possible ways to go into this direction include a stronger promotion of the rationale of the model of open innovation within funding programmes to provide more flexibility on how to use the granted money, to support measures designed to identify and acquire technologies and licences from abroad and to cooperate in a sustainable way with developing countries in the field of technology transfer and technology development for the mutual benefit of both partners involved.

Present State of Trans-National Coordination of S&T Policies towards Third Countries in the European Research Area

Trans-national coordination of MS/AC towards Third Countries in the field of S&T is already being practised. Around three quarters of the MS/AC which responded the questionnaire apply mechanisms for trans-national coordination of S&T policies towards Third Countries. In addition, 60% perceive a strong or even very strong need for enhanced trans-national coordination. Two countries reported that they do not have any further need for trans-national coordination, one country reported a weak need and an indifferent assessment was given by three countries. The majority of respondents, however, indicated a strong need for coordination.

The major objectives for applying trans-national coordination are

- ∞ to share expertise and experience in order to gain information as well as to learn lessons in view of the challenges of international S&T cooperation;
- ∞ to undertake joint activities and to share efforts.

The latter objective is very often pursued under European initiatives.

In general, trans-national coordination is perceived as a means to strengthen and to add critical mass to national efforts, to overcome segmentation of singular activities, to avoid duplication of efforts and to increase the impact. The potential benefit of using already available resources of other MS/AC (e.g. agencies, strong research teams, specific equipment) to implement own national ideas or projects, e.g. in Third Countries, was not addressed yet.

In terms of coordination instruments, Community instruments were highlighted to be of most importance. Those instruments were partly introduced under FP6 (such as ERA-NET) and are presumably even strengthened under FP7 (Coordination and Support Actions [CSA], ERA-NET/ERA-NET plus and INCO-NET). 18 MS/AC reported that they participate in Community instruments which support the coordination of MS' activities in the field of international cooperation with Third Countries (ERA-NET, Specific Support Actions [SSA]). The second most often used coordination instrument is the one of sporadic bilateral consultations. Only seven countries make use of S&T counsellors to apply trans-national coordination and only three cases reported on regular bilateral consultations.

Reflection on Community Instruments to Enhance Policy Coordination of Member States and Associated Countries

The Community instruments are in general perceived as the most successful coordination instruments, because they stimulate learning and generate outcome and – from a more practical point of view – because they are tangible and provide an EU-label as well as funding, resources and commitment. MS/AC emphasised the importance of ERA-NETs and SSA, but slightly more of ERA-NETs. Values attributed to SSA include 'flexibility', 'effectiveness' and 'door-opener for international contacts and experience'.

However, it should be stated that the majority of FP6 ERA-NET activities were not meant for the development of the international dimension of the ERA. Six out of 71 Coordination Actions (CA) have an explicit focus on international cooperation (three regional ERA-NETs and three thematic ERA-NETs). There is room for a more extended use of ERA-NETs. Joint initiatives in strategic research areas with programme owners in highly industrialised countries (USA, Japan, Canada) as well as joint initiatives with candidate and neighbouring countries (e.g. Mediterranean countries, Black Sea countries) are still missing. Complementing the ERA-NET scheme, there are some SSA and CA respectively CSA under FP6 and FP7, which are dealing with mapping and structural S&T issues in and with Third Countries. The knowledge obtained under these projects has, however, not been fully exploited yet. For this purpose special new information and dissemination channels should be developed.

In addition to the proven instruments, there is much expectation in the MS/AC related to the new INCO-NET instrument allowing a systematic bi-regional dialogue with major regions of the world. It is acknowledged that existing coordination

instruments like the Monitoring Committee for the S&T cooperation with the Mediterranean partner countries (MoCo) and the Steering Platform on Research with the Western Balkan Countries will be strengthened through providing operational and knowledge-based tools. For other regions, such a dialogue structure can be enabled through the INCO-NET mechanism for the first time.

Finally, there are a number of Community instruments which are so far not well harmonised with MS activities including the S&T agreements between the EU and selected partner countries, the network of EU science counsellors in distinguished Third Countries and the participation of the EU and its MS in international organisations. Here, the respective Community instrument could play a better integrative role to provide at least to some extent an umbrella for activities of the MS.

Member States' and Associated Countries' Strategies towards International Organisations

From all international organisations (apart from the EU), the OECD was generally perceived as the most important international body influencing S&T policy shaping, especially – but not only – from the OECD members among the interviewed MS/AC. UNESCO was mentioned as frequent as the OECD, but the priority value assigned to UNESCO is considerably lower than the one for the OECD. Although the influence of UNESCO is below average in general, it is usually significantly higher among the new EU MS and AC. All other international bodies rank with descent interspace, out of which FAO, IAEA and UNIDO are most often mentioned. Quite a high priority is assigned from a handful of MS/AC to WHO and – by countries which are members – to G8/Carnegie Group.

The human resources approach of the MS/AC towards an active participation in relevant international S&T bodies varies considerably. There are some countries which implement a wide spectrum of measures in this respect ranging from awareness raising on job opportunities to secondments of national experts paid by national funds. Other countries focus more on selected specific measures or assign a lower priority to this issue in general. Among the applied instruments an active delegation approach is ranked with highest priority, because of the personal and institutional increase of experience and knowledge. In addition, delegation enables the receipt of first-hand information and, thus, among other things, an early awareness on emerging new initiatives. Another important issue is to participate in decision-making processes as well as to learn from experience of other countries. It has also been mentioned that an inclusion in decision-making processes of international S&T organisations increases the commitment and ownership at home (i.e. within the national policy-making processes). In terms of assigned priority, this instrument is followed by the instrument of seconding national experts paid by national funds and measures to provide practical assistance to those experts who will take over jobs in international organisations. The strategic value of seconding experts paid by national funds lies in the proximity to national interest and priorities. The still existing close link of seconded experts with and through their home institutions is seen as a major institutional asset in this respect.

Only a handful of countries reported that major changes in policy measures for a proactive participation in international organisations were implemented in the last years. The emphasis on new measures seems to be rather a result of a general

process of allocating higher awareness to the issue of internationalisation of S&T than a singular response to S&T relevant international organisations.

Lessons Learnt from and Barriers for Cooperation and Coordination

In general, there is a clear tendency of the MS/AC for a closer cooperation at S&T policy level towards Third Countries, but cooperation and coordination needs to be built on national interests and to prove clear benefits for all parties involved. So far, this process has been driven by new Community instruments. However, there is still much room for improving the coordination of S&T policies starting with a more extensive and strategic use of established Community instruments (which to some extent still require some reshaping to meet the particular needs of international cooperation) and building on new instruments like, most prominently, the INCO-NET mechanism. In addition, the potential of policy coordination initiated by MS and AC in variable geometries without using Community instruments needs to be explored building on national interests, instruments and funding. In general the analysis shows that harmonisation and consistency of the activities of the MS and the European Commission could be further enhanced for implementing a leading role of Europe in the process of globalisation and in global problem solving. Here, the interrelationship of S&T agreements of the Community and the MS, the interaction between the EU delegations abroad and MS' embassies and the participation in international organisations are three pillars of major importance.

Despite a generally benevolent attitude, barriers for trans-national coordination also exist. Most often mentioned are four dimensions in this respect:

- ∞ Differences in national legislations and administrative regulations which make the implementation of trans-national activities more difficult;
- ∞ the lack of coordinating capacities and resources;
- ∞ the lack of awareness of national stakeholders on the importance of a coordinated approach towards Third Countries;
- ∞ other centrifugal factors based on competition between MS/AC or specific geographical, linguistic and cultural ties which rather call for unilateral than coordinated bi- or multilateral interventions.

Other obstacles refer to a general but conscious reluctance against any forced coordination, no clear and measurable outcomes and recognition of benefits yet (input-output ratio, spillover effects from international S&T cooperation), the lack of knowledge on areas of common interest with other MS/AC and cultural differences.

Enhancing Coordination of S&T Policies of Member States and Associated Countries towards Third Countries

Building on the analytical part of the full Analytical Report of the CREST Expert Group on 'Policy Approaches towards S&T Cooperation with Third Countries' and the OMC discussions, the following actions are proposed:

1. Identifying the relevant targets for coordination activities

Cooperation and coordination should build on common interest and mutual benefit and seem to be possible in areas where a number of MS/AC share common goals such as research aiming at solving particular problems of developing countries or problems of global impact, the transfer and promotion of European S&T standards and models, joint access to scientific resources in Third Countries as well as development and use of S&T infrastructure built around particular resources of Third Countries and in spheres where research is simply better implemented through collaborative research efforts than through national efforts only.

2. Raising awareness of the needs and benefits of coordinated S&T policies towards Third Countries

There are manifold addressees for awareness raising initiatives in this respect ranging from domestic S&T policy makers to the interested public. It is important to identify and disseminate good practice, preferentially based upon evaluations, via tailor-made instruments.

3. Establishing and improving instruments for a better coordination of activities

There are certain mechanisms and Community instruments already available and accepted to share and disseminate information, such as the CREST OMC Expert Groups, ERAWATCH, the new INCO-NET platforms etc. However, there seems to be room for continuous improvement and the need to discuss the implementation of efficient management procedures and infrastructures for joint (programmatic) efforts of MS/AC towards or with Third Countries (eventually based on Art. 171/172). As regards practical opportunities for international collaboration of researchers from MS/AC with colleagues from Third Countries there are – apart from the presumably rare practical cases of international participation in Community instruments, a few specific initiatives or programmes of a group of MS/AC and Third Countries (such as Black Sea Economic Cooperation [BSEC] or the Northern Dimension) and some opportunities under other international programmes – almost no appropriate frameworks. Lessons from existing bilateral schemes need to be learned and expanded towards programmatic multilateral approaches. Here, not only funding programmes are addressed (e.g. via ERA-NETs), but also other essential elements such as joint agenda setting, mobility aspects, intellectual property regulations and good governance in international S&T cooperation.

4. Implementing a proactive approach in international S&T initiatives

Referring to the economic and scientific capacity of the ERA, there is the potential to play a strategic role in international S&T initiatives implemented for instance at OECD or UN level. Here, building on European values and common objectives of its MS, the global challenges should be addressed in first line, but additional European S&T agendas might be covered as well under the precondition that the MS share a common interest, which has to be explored and shaped by preceding strategic consultation processes.

5. Ensuring coherence towards developing countries and development policies

As regards synergies between S&T policy and development policy there seems to be more multi-level effort to assure coherence, consistency and synergy and to avoid duplications. Building S&T capacities in developing countries and implementing dedicated activities of 'research for development' should play a self-evident and prominent role in the MS' strategies to reach their ODA budget goals. By complementing and supporting MS' activities, the relevant Community instruments, most prominently the instruments of foreign assistance, need to be strengthened as well in this respect.

6. Ensuring harmonised and consistent activities of MS and the European Commission

One of the present weaknesses of the ERA is its still existing fragmentation in many respects. To overcome these deficit mechanisms should be implemented to ensure synergies of S&T agreements of the Community and its MS, to build a living network of the EU delegations abroad and MS' embassies and to identify areas of clear benefit of coordination between MS and the European Commission in international organisations.

7. Establishing a sustainable strategic dialogue on internationalisation of R&D

In order to support the development, implementation and evaluation of an internationalisation strategy for the ERA addressing both national level (through mutual learning) and Community level (through coordinated efforts), a strategy forum on international S&T cooperation with high-level representatives of the MS/AC and the European Commission with an adequate support should be considered. The mandate of such a forum might cover

- ∞ defining and regularly adapting specific common objectives of the MS and respective priorities for Community action for S&T cooperation with Third Countries;
- ∞ monitoring the implementation of respective activities of international cooperation at Community level with respect to consistent and coordinated approaches of MS and European Commission measures;
- ∞ proposing actions to the MS and the European Commission;
- ∞ exchanging information on strategic issues of S&T cooperation towards Third Countries at MS/AC and Community level.

Summary

In summary, addressing the activities of the CREST Expert Group on 'Internationalisation of R&D' it is proposed that MS, AC and the European Commission consider the Expert Group's Analytical Report 'Policy Approaches towards S&T Cooperation with Third Countries' and its recommendations for further developing R&D internationalisation strategies both at national and Community level and draw conclusions for appropriate policy actions including amongst others

- ∞ the provision of an appropriate umbrella to proceed with and deepen the strategic discussion on internationalisation of R&D resulting in a **wider Community Strategy for internationalisation of R&D** embedded in other Community policies;
- ∞ the implementation of dedicated discussion forums on key policy issues including those questions mentioned above;
- ∞ the preparation of a better and transparent analytical ground for political decision-making at MS/AC and Community level.

Along that line, MS/AC and the European Commission should jointly take necessary action to further analyse the setting-up of a high-level **European strategy forum on internationalisation of R&D** for developing, implementing and monitoring the international dimension of the ERA on a regular basis.

Existing instruments at Community level such as the European Framework Programme for Research and Technological Development should be applied as much as possible to further develop international S&T cooperation.

The full Analytical Report elaborates all the issues addressed above in more detail and complexity. It refers to specific experiences and activities of MS/AC and it features good practice examples in highlighted boxes. The Analytical Report also includes some essential annexes on lessons learnt from the S&T cooperation of MS/AC with China and the reflections of the CREST Expert Group on the Green Paper 'The European Research Area: New Perspective'.

Summary of Recommendations

S&T Policy Strategies at the Level of Member States and Associated Countries

(Chapter 3 of the Analytical Report)

Building on analytical work and the OMC discussion, it is recommended that policy makers in Member States and Associated Countries:

- i. develop comprehensive internationalisation strategies as integral part of national S&T policy. This would include national (core) objectives and priorities in order to make optimum use of the benefits and to properly address the challenges of globalisation. It covers the links to other relevant policies and requires national coordination between the different stakeholders involved.
- ii. develop a methodology and establish an evaluation system for policy measures towards the internationalisation of R&D covering ex-ante evaluation, monitoring and impact assessment. Here, appropriate quantitative and qualitative indicators need to be developed. A European approach could be considered to allow benchmarking of national internationalisation performance.

S&T Policy Measures at the Level of Member States and Associated Countries

(Chapter 4 of the Analytical Report)

It is recommended that policy makers in Member States and Associated Countries:

Fostering international cooperation of S&T institutions (section 4.1)

- iii. scale up available bilateral funding schemes for the internationalisation activities of R&D organisations through direct funding of collaborative research in addition to small-scale mobility-based networking measures.

Stimulating international mobility of individual scientists (section 4.2)

- iv. develop more advanced instruments to foster a balanced brain circulation (considering multilateral schemes).

Attracting and making use of Foreign Direct Investments (section 4.3)

- v. improve instruments which allow national S&T institutions and innovative firms to raise the full potential of spillover effects from inward and outward FDI.

Setting the frame for the international exploitation of knowledge (section 4.4)

- vi. set a regulatory frame and support (incl. funding) activities of national S&T institutions and innovative firms allowing on the one hand better access to foreign knowledge and on the other hand a fair exploitation of domestic knowledge in Third Countries.

Coordination of R&D Policies towards Third Countries between Member States and Associated Countries

(Chapter 5 of the Analytical Report)

It is recommended that policy stakeholders from Member States/Associated Countries and the European Commission:

Identifying the relevant targets for coordination activities building on common interest and mutual benefit

- vii. work out a specific agenda with priorities for coordinated actions of Member States and Associated Countries towards and with Third Countries in non-competitive areas through a strategic dialogue process involving the European Commission as well and including Third Countries where relevant.
- viii. identify barriers and threats for S&T cooperation with Third Countries and develop joint strategies to overcome them, e.g. through coordinated policy approaches in terms of a common Community framework (addressing among other issues IPR, mobility aspects, access to S&T infrastructure and resources).

Raising further awareness of the needs and benefits of coordination of S&T policies towards Third Countries

- ix. identify and disseminate information on success stories of coordination activities taking into consideration
 - the outcome of an evaluation of existing coordination instruments at Community level (linked to recommendation xiv);
 - national approaches to enhanced coordination with other Member States/Associated Countries;
 - joint activities in international organisations.
- x. encourage a debate at ministerial level on the topics and instruments of enhanced coordination of S&T policies towards Third Countries.

Instruments for a better coordination of activities

- xi. systematically extend ERAWATCH to major Third Countries and increase its efficiency through linking it with existing information services in Member States/Associated Countries and up-coming services to be developed under the INCO-NET scheme.

- xii.** increase transparency on opportunities for trans-national coordination of S&T policies and coordinated joint S&T activities within European and international organisations, programmes and initiatives. It is proposed to develop and update a 'Directory of European and International Organisations', describing their coordination instruments and listing contact persons from the Member States and the European Commission.
- xiii.** develop a light but standardised system of indicators and databases through a coordinated effort to capture and assess the diverse policy measures related to the internationalisation of R&D in order to generate comparable statistics and evidence-based knowledge for decision-making processes (linked to recommendation ii).
- xiv.** contribute to the mid-term evaluation of FP7 through establishing an Assessment Group on coordination instruments for S&T cooperation measures with Third Countries and come up with recommendations for optimising Community instruments and assuring their sustainability.
- xv.** analyse the interest of Member States/Associated Countries to establish a joint programme management institution for implementing multilateral funding activities targeting Third Countries and, together with the European Commission, exploit options of applying Art. 171.

It is recommended that policy stakeholders from Member States and the European Commission:

Implementing a proactive approach of the EU in international S&T initiatives through enhanced and coordinated participation in international organisations

- xvi.** set-up a strategic dialogue between Member States and the European Commission. This dialogue would identify and regularly update common priorities and relevant emerging topics, which are of joint interest for European initiatives in international organisations. If appropriate, it could provide a process for ad-hoc consultation between Member States and the European Commission.
- xvii.** entrust the European Commission with the participation in international organisations complementing Member States' participation – but not replacing them. If appropriate and legally possible, the European Commission could represent the Community on the basis of positions previously agreed by the Member States on a case by case basis. The European Commission should report on their respective activities to the Member States.

Ensuring coherence and complementarity of European S&T policy towards developing countries and development policies at Member States and Community level

- xviii.** increase transparency through establishing a database of ongoing and past activities of 'research for development' at Member States/Associated Countries and Community level (emphasis on Development Cooperation and Economic Cooperation [DCEC] and European Neighbourhood Policy [ENP] instruments).

- xix.** work out a policy document on 'S&T and development policies' incl.
- synergies of S&T and development policy objectives towards Africa, South-East Asia, Latin America and the Caribbean;
 - recommendations on how to link instruments of S&T policy and development policy at Member States and Community level in order to exploit synergies;
 - criteria and respective proposals for joint activities of Member States/Associated Countries;
 - scenarios, how to use ODA money for the upgrading of S&T structures in developing countries (through capacity building, institution building and research for development measures).
- Here, the up-coming activities within the bi-regional dialogues implemented through the INCO-NET scheme should be considered.
- xx.** coordinate S&T-related activities towards developing countries at Member States/Associated Countries and Community level through establishing a 'Global INCO-NET' as a dialogue forum of respective stakeholders involving wherever appropriate stakeholders from developing countries.

Ensuring harmonised and consistent activities of Member States and the European Commission

- xxi.** establish an ad-hoc Expert Group of representatives of Member States and the European Commission Services:
- to analyse the relevance, practicability and impact of present S&T agreements at Member States and Community level and the need for a legal frame for S&T cooperation (in view of EU interest, barriers and threats for cooperation with Third Countries to be identified according to recommendations vii and viii);
 - to define the future complementary role and content of Community S&T agreements in relation to Member States' S&T agreements with Third Countries.
- xxii.** make optimum use of the established consultation mechanism between the Member States and the European Commission in the negotiation phase of new Community S&T agreements and set-up a mechanism for an enhanced information exchange and coordination between Member States and the European Commission on implementing ongoing S&T agreements.
- xxiii.** set-up Terms of Reference for local networks of European Commission, Member States' and Associated Countries' science counsellors in Third Countries organised with secretarial support of the EU Delegation aiming at sharing information and good practice as well coordinating efforts (if appropriate).

Establishing a sustainable strategic dialogue between Member States, Associated Countries and the European Commission on internationalisation of R&D

xxiv. set-up a strategy forum on international cooperation with high-level representatives of the Member States, Associated Countries and the European Commission in an appropriate form (i.e. by CREST) for developing, implementing and monitoring the international dimension of the ERA with adequate support (see also recommendations vii and viii).

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This summary report gives an overview of the main results and recommendations presented in the analytical report 'Policy Approaches towards S&T Cooperation with Third Countries' published by the CREST Expert Group on 'Internationalisation of R&D' in December 2007.

Applying the Open Method of Coordination, the Expert Group was established at the beginning of 2007 to take stock of the policies, strategies and measures adopted at national level for R&D cooperation with Third Countries (with China as a pilot case). A short paper with the recommendations prepared by the Expert Group was adopted by CREST at its meeting on 7 December 2007.

The Working Group will proceed with its work in 2008. The focus will then be put on the policy approaches and objectives of cooperation in R&D with Russia, India and Brazil. In addition, options for joint or coordinated measures of Member States, Associated Countries and the European Commission will be identified and analysed.

This report can be downloaded at:

http://ec.europa.eu/invest-in-research/coordination/coordination01_en.htm



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