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International learning amongst innovation agencies

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Executive Summary

The present report explores seven practices of cooperation and exchange of knowledge in the field of science, technology and innovation (STI) amongst European and Asian innovation agencies. The cases were identified from an initial survey of some 20 cases. The seven practices covered in this report are summarised in the following table.

Country	Partners	International Learning Practice
China	Ministry of S&T, TORCH (China) and CDTI (Spain)	CHINEKA Programme on industrial technology co-development and technology transfer
China	Ministry of S&T (China) and Tekes (Finland)	Nanotechnology Strategic Mutual Collaboration Initiative (NAMI)
India	Department of Biotechnology (India) and Tekes (Finland)	Medical Diagnostics and Fellowships
India	Department of Biotechnology (India) and Research Council of Norway (Norway)	Development of Human Vaccines
Japan	Japan Science and Technology Agency or JST (Japan) and VINNOVA (Sweden)	Multidisciplinary Bio
Singapore	A*STAR (Singapore) and Tekes (Finland)	Infocom and Media technologies
Indonesia	Ministry of Energy, Mineral Resources and Mining (Indonesia) and SenterNovem (Netherlands)	Bilateral Energy Cooperation on Micro Hydro, Geothermal Energy and Biogas

The main task of this report is to scrutinise these seven practices in depth concerning the following: their organisation and finance; their content, learning effects, and role distribution among the participating innovation agencies (including who is taking the lead and which partner contributes most knowledge and experience to the cooperation); their purposes and results achieved; and their effectiveness and value added to stakeholders.

In addition, the report assesses the scope for European policy makers to expand these kinds of practices and the lessons to be learned for European innovation agencies from the practices.

The seven practices – together with the literature on innovation learning – clearly show that Asia is emerging as an important knowledge and human resource hub, particularly countries such as China, India, Japan, Singapore and South Korea. As the structure of innovation becomes increasingly globally dispersed and open, the importance of international learning from and cooperation with Asian peers has become progressively more important to European policy makers. Furthermore, since Eurasian cooperation amongst innovation agencies is not yet a widespread phenomenon, there is much scope for expanding this kind of practice in the near future. It is evident that the practices explored are in their initial stages, and they are considered important by European agencies as they involve various new experiences of learning to enhance effectiveness in innovation support via international cooperation. It is apparent from the cases explored that finances are shared equally between European and Asian partners, and that the practices are organised mainly by public research and innovation agencies, with a potential to also involve business enterprises and firms in future. While large Asian markets in India and China are certainly getting the most attention in European policies, the practices explored show that other countries are also becoming more and more visible for their learning experiences in various domains, such as information and communication technology (ICT), software, hardware, biotechnology and nanotechnology. In sum, Asia is increasingly seen as a place that offers intellectual human resources and location advantages for European innovation agencies and their stakeholders.

Introduction: International learning amongst innovation agencies from Europe and Asia

Learning from third parties and mutual learning has long been recognised as an important ingredient for successful innovations and as an important means to support innovations. This argument is backed not only by practitioners, but also by the literature on economics of technical change and innovation studies. Studies on national innovation systems have recurrently drawn attention to concepts such as 'learning by interaction' and 'learning by doing'. Further, these studies underlined the importance of strengthening national technological capabilities in a systemic mode of organisational structure by bringing together all important actors (universities, research and development or R&D labs, business enterprises, policies and incentives, among others) to interact with each other so as to bring out dynamism in the innovation system. As a consequence of the emphasis that is often placed on localised learning and cooperation, as well as clustering effects, actors and agencies may tend to look for cooperation and learning within national boundaries and through comparisons with nations in proximity or having similar sociopolitical and or socioeconomic features. However, less attention has been paid to international learning from actors located in more distant countries and regions.

The rise of globalisation and increasing interdependence of countries across regions in trade, finance, economy and flow of services and goods have brought about significant changes in the nature and form of international dependence to S&T enterprise, particularly R&D and innovation structures. In this new phase of globalisation, R&D and innovation have become globalised and the process of networking across nations and countries with a variety of actors is assuming considerable importance. Therefore, in the wake of globalisation and considering the fact that the best of class may not necessarily be found among European peers, exploring learning and knowledge exchange possibilities with innovation agencies outside Europe gains in relevance.

From a European perspective, three recent developments have brought international learning into sharp focus, as explained below.

a) In the current phase of globalisation, the process of innovation is becoming more and more globally dispersed across various geographical regions and is now extended to emerging Asian economies ('global economy'). The significance of these emerging Asian economies goes beyond large markets and human resources to intellectual endowments of increasing R&D effort and knowledge being produced in these regions.

b) In contrast to earlier trends in the 1990s, the scope of many innovating actors like small to medium-sized enterprises (SMEs) is global from the outset (the rise of the 'born global' phenomenon). Trade, sales, production and R&D are becoming more and more global without being confined to a limited geographical area and innovation is increasingly becoming a networked and cross-border affair (rise of the 'network economy'). As such, globalisation has brought about changes in the way firms, particularly SMEs, position their strategies. The traditional view on how companies go abroad and internationalise is that companies increase their area of business in the form of rings around their headquarters and then sequentially enlarge the size of these rings (globalisation as 'rings on the water'). However, during the last decade, one can witness new companies emerging instantly as global firms. Software firms such as Infosys, Satyam and Tata Consultancy Services in India, and hardware and telecommunication firms such as Huawei in China are good examples of this phenomenon.

c) The globalisation and rising research costs in Europe and North America have led several transnational corporations (TNCs) to move their R&D activities including the establishment of R&D centres and innovation-bound activities outside Europe, particularly to China, India and Singapore ('outsourcing' and 'off-shoring' tendencies). Today, more than 15% of R&D expenditure occurs outside the country where companies are registered and have their headquarters, and patenting abroad accounts for about 20% for France and the UK, which demonstrates that many companies invest in R&D and patent their products and services outside their home country. A very recent phenomenon becoming more frequent is the distant off-shoring of R&D activities, i.e. the location of R&D activities and innovation outside Europe (40% of European companies). Moving beyond Europe, 14 US TNCs obtained over 500 US patents from their joint and stand-alone R&D laboratories located in India between 2002 and 2006.

Together with these developments, the rise of Asia in the 21st century, particularly the rapid knowledge and economic growth of countries with large economies like China and India, have enlarged the scope and challenge in international collaboration in R&D and innovation, which in turn underpin the importance of international learning.

The corporate model of R&D pursued within home country locations and physical boundaries of the corporate firm in Europe and North America is fast eroding (*The Economist,* 3 March 2007). The Internet and telecommunication revolutions have further dismantled geographical barriers, creating a new innovation potential at different levels of the value chain (towards 'open innovation'). Until the early 1990s, this was mainly restricted to industrially advanced countries, but during the last decade and a half, the emerging economies of Asia have also come to occupy a significant place in these trends. While Japan, South Korea and Taiwan have already been on the 'radar' of European actors for a longer period of time, now China, India, Singapore and to lesser extent Indonesia and Malaysia have also emerged as important players and destinations for internationalisation of R&D and globalisation of innovation during the last decade. As the recent *World Investment Report* (2005, p. 139) notes, 'the rise of developing Asia and Oceania has been the most dramatic development in the global landscape of R&D. Some economies in the region have been able to capture a broad range of R&D functions from TNCs, including innovative R&D and basic research'. Further, as *World Investment Report* (2005) data reveal, of the 885 R&D-oriented greenfield foreign direct investment (FDI) projects announced in the period from 2002 to 2004, 75% (723 projects) were cornered by India and China. These countries are host to some 800 leading global TNCs, which are operating R&D centres or R&D-based firms mainly in ICT, biotechnology, pharmaceuticals, telecommunications and automobiles. During the last decade, Bangalore, India's Silicon Valley, Hyderabad's high-technology city, Beijing's Zhongguancun Haidian Science Park and Shanghai's Pudong New District are host to some 500 global companies that have opened up R&D centres. These cities have emerged as global R&D and innovation hubs or networks with horizontal and vertical integration to globally dispersed TNCs. A United Nations Conference on Trade and Development (UNCTAD) survey of the largest R&D spenders confirmed the growing importance of Asian economies as the most favoured R&D destination of foreign locations: China (3rd position), Japan (5th position), India (6th position) and Singapore (9th position) figured in the top 10 countries in this survey (see *World Investment Report 2005*, p.133).

Recognising the growing importance of these Asian countries, a number of European innovation agencies have initiated bilateral knowledge exchanges, exploring learning and partnership based collaborations and initiatives with Asian countries. The rationale behind this kind of support behaviour is multifold.

a) To invest in international learning relationships facilitates tapping into distant knowledge pockets, particularly if it is set up in collaboration with agencies from emerging markets such as in India and China.

b) In addition, cooperating with agencies outside Europe can result in SMEs finding it easier to detect and enter lead markets abroad. In general, they may become more market responsive through exposure to and by acting on foreign markets.

c) Moreover, it extends the possibilities for (distant) technology transfer. Most importantly, international technology transfer in new technologies in health, ICT and biological sciences is not just an adoption of foreign technology to suit the local situation. Technology transfer processes have become a process of systemic innovation, where technology transfer is becoming more and more embedded in techno-social, environmental and techno-economic contexts.

In summary, there is a possibility that innovation agencies can help add value to local businesses. By working with peers outside Europe, they can act as pipelines of global knowledge to be sourced by local firms.

In general, international cooperation between innovation agencies takes place mostly in the form of exchange of information (20%), and the analysis of common strategic issues for the innovation agencies involved (15%). Less work is ongoing in terms of implementing joint innovation activities (10%) and the setting up and development of mutual programmes (6%). Furthermore, it appears that cross-border learning exercises are often launched on an ad hoc basis, and that delegations often visit one other to study policies and agencies in a country of interest. Often, these visits are non-committal, serve information purposes in the first place, and do not necessarily lay the foundation for structural cooperation. Also, the learning effect often remains limited to the people that participated in the visits, without further institutional and public-private spillovers. In terms of partner choice, both historical ties and geographical proximity frequently determine the choice of a partner.

A survey conducted by the author of the present document on this kind of innovation support initiative identified some 20 STI cooperation projects between European and Asian research and innovation agencies. This survey aimed to:

a) provide an inventory of examples of international learning practices amongst innovation agencies in Europe and Asia;
b) provide information on the cooperation themes and areas, type of institutions and firms (SMEs or high technology firms) involved, period of cooperation, etc.

Based on the initial inventory, the present report conducts a closer inquiry into the seven practices that are summarised in the following table.

Country	Partners	International Learning Practice
China	Ministry of S&T, TORCH (China) and CDTI (Spain)	CHINEKA Programme on industrial technology co-development and technology transfer
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India	Department of Biotechnology	Medical Diagnostics and Fellowships

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With regard to these seven practices, the remainder of the report will provide information on various features, such as:

a) organisation and finance of practices;

b) content and activities of learning practices, including who is taking the lead;

c) purposes and results achieved;

d) effectiveness and value addition to stakeholders;

e) scope of European policy for expanding the range of practices;

f) point of gravity in terms of knowledge and experience;

g) lessons to be learnt by European agencies.

Please note that this report is based on readily available secondary information via relevant websites and on a limited set of telephone interviews with representatives of the research and innovation agencies involved in the different practices.

The next section of this report will present details on the respective seven practices between European and Asian research innovation agencies.

Practice: 1

CHINEKA Programme: Industrial technology co-development and technology transfer projects between Chinese and Spanish companies

(1) Organisation and finance of practices

The programme was initiated in December 2003 and a memorandum of understanding (MOU) was signed between China's High Technology Industry Development Center (TORCH) and Spain's Industrial Technology Development Center (CDTI). This was followed by an Addendum of the Bilateral Industrial R&D programme in May 2005. The first CHINEKA project was certified in April 2006.

The practice is jointly governed by **China's** Ministry of Science and Technology and **Spain's** Ministry of Industry, Tourism and Trade, and executed jointly by China's TORCH and Spain's CDTI. The joint effort is to promote international bilateral technology cooperation projects between companies of China and Spain, under the **CHINEKA Programme**.

China's TORCH and Spain's CDTI identify and select the projects and participants. Once the project is selected and approved, Spanish participants may apply to CDTI for loans and grants. Chinese participants may apply for funding to the **Innovation Fund** of the Ministry for Small and Medium Technology-Based Enterprises, according to its requirements. The selected project should involve at least one Chinese company and one Spanish company. Additionally, technological institutions of both countries may be also incorporated into the project. The Chinese company must be an enterprise registered in China, and the capital from Chinese companies (including Hong Kong and Taiwan) should exceed 50% of the total, except for the enterprises of Chinese Overseas Scholars. The participants should self-finance part of the cost of the project. A cooperation document should be signed between partners.

For the Spanish part, CDTI will grant financing to the approved projects under preferential conditions. This means a soft credit of up to 75% of the Spanish allowance, and a period of amortisation of up to 10 years, as well as the possibility of a non-reimbursable tranche of 25% of the credit granted by the CDTI.

(2) Content and activities of learning practices (including who is taking the lead)

The main content of the cooperation should concern technology co-development and technology transfers**.** Chinese enterprises should enjoy the intellectual property rights of the achieved developments by themselves and technology transfers under the bilateral agreement.

By May 2008, seven joint projects were approved, mobilising more than EUR 20 million (66% in Spain and 34% in China). This indicates that Spain is taking the lead in terms of joint financing of R&D leading to innovation.

(3) Purposes and results achieved

The main purpose of the practice is to foster international cooperation in science and technology (S&T) between China and Spain, and to initiate joint R&D projects in new technologies such as ICT, biotechnology, nanosciences and nanotechnologies leading to innovation. The purpose is also to target international markets and synergise innovation efforts. It is too early to comment on the results other than to note that international cooperation and partnerships between public and private firms and institutions have been well grounded over the last five years.

(4) Effectiveness and value added to stakeholders

Spanish firms and institutions foresee a large market and potential for technology commercialisation – more than their Chinese counterparts.

(5) Scope for European policy to expand this kind of practice

Joint projects have been conducted in the areas of biotechnology, construction, energy, information technology (IT) and machinery. Both partners foresee a considerable scope for expansion of activities and exchange of professionals working on various joint projects. The Spanish institutions and firms foresee the encouragement of cross-border knowledge transfer, including that from FDI opening up through this initiative.

(6) Point of gravity in terms of knowledge and experience

The point of gravity in terms of knowledge in new S&T areas such as nanotechnology and potential future markets is in China, as it is emerging as one of the world's important R&D locations.

(7) Lessons to be learnt by European agencies

China and India are emerging as important global R&D and innovation centres with large markets. The stakeholders in Spain would like to exploit synergies and complementarities for world markets in future through S&T cooperation.

Practice: 2

China-Finland Nanotechnology Strategic Mutual Collaboration Initiative (NAMI)

(1) Organisation and finance of practices

The nanotechnology initiative is organised jointly by China's Ministry of Science and Technology and the Finnish Funding Agency for Technology and Innovation (Tekes), Finland. Finland is the first country to sign a national-level strategic cooperation agreement with China on nanotechnology.

The Tekes FinNano Programme has a budget of more than USD 90 million, while the Finnish technology programme on functional materials has a budget of over EUR 200 million. China's investment in nanotechnology from government funding stands at about USD 160 million.

In the joint projects, each partner government will fund the respective projects on an equal basis.

(2) Content and activities of learning practices (including who is taking the lead)

The research activities in the initiative will focus on nano-information materials, nano-energy and environmental materials, nanodevices and sensors, nanomedicine, nanopharmacy and biomedical engineering, nanofabrication and nanometrology, characterisation of nanostructures, nano-optics and plasmonics, as well as modelling and simulation of nanostructures. The joint projects aim at increasing the competitiveness of industrial sectors in the two countries. The industries include ICTs, pulp and paper, chemicals, metals and other materials, diagnostics and healthcare. The production of energy using new technologies such as solar cell and fuel cells is under consideration.

Both countries have invested large sums of money in nano S&T but the Chinese seem to have a lead both in R&D and industrial potential.

(3) Purposes and results achieved

The NAMI Programme aims to establish a strong and beneficial collaboration framework between Finnish nanotechnology researchers with their Chinese counterparts, as well as to create a solid platform and find suitable links for transnational cooperation projects between companies and research units from both countries. The joint initiative began in 2007, and consequently it is too early to comment on any results. The purpose of the collaboration and initiative is quite clear: to become global leaders in nanotechnology and innovation, and to gain a competitive edge in nano-based products.

(4) Effectiveness and value added to stakeholders

It is too early to comment on effectiveness. However, in terms of value addition to stakeholders, both parties involved foresee considerable value addition in terms of international partnering and networking for global competitiveness in new technologies. More than China, the value addition to Finland is quite apparent as it is dealing with a larger economy with enormous future potential. Foreseeing this potential, Tekes opened two offices in Beijing and in Shanghai.

(5) Scope for European policy to expand this kind of practice

There is great scope for European policy expansion in Asia in the future, as China, India, Japan and Korea have large R&D initiatives in the field of nanotechnology

(6) Point of gravity in terms of knowledge and experience

Compared to Finland, the point of gravity in terms of knowledge and experience seems to be in favour of China. Currently, some 30 institutions are engaged in basic nanotech research in China. These include the Chinese Academy of Sciences (CAS) Physical Institute, the CAS Chemical Institute, the CAS Solid Physics Institute (Hefei), Tsinghua University (Beijing), Beijing University, Hangzhou University, Nanjing University, and several universities in Shanghai. In addition, Shanghai, Beijing, and Shenzhen have each created their own nanotech centres, uniting local R&D structures. In terms of basic nanotech R&D, China has reached the most advanced levels in the world, even rivalling the capacities of the US.

Even so, the scientific output of Chinese scientists working in nano S&T is becoming ever more significant. According to the Scientific Citation Index (SCI), CAS ranked fourth in the world in total number of citations among those institutions and universities that published more than 100 nanotechnology papers from 1992 to 2002. Another recent analysis of nanoscience productivity around the world ranked China top for the first eight months in 2004. According to the SCI in 2007 and 2008, scientists from China now rank second only to scientists in the US in terms of the number of articles in international peer-reviewed publications in nano S&T. The number of companies in China focusing on nanotechnology now exceeds 600. That compares to less than 25 in 1990 and just over 200 in 2000.

(7) Lessons to be learnt by European agencies

It is clear that China is at the forefront of knowledge advancement in the fields of nanoscience and nanotechnology systems with immense innovation potential, as the research 'ecosystem' in this area includes over 600 firms. European agencies, particularly Finnish S&T agencies, should initiate graduate, post-doc and faculty exchange programmes which could offer various lessons of learning in science relating to the nano field. Together with exchange programmes, joint seminars and workshops must be considered an important part of the agenda for international cooperation between European and China in the nano field. Finnish S&T agencies could identify various R&D programmes being undertaken in China and then enter into strategic innovation partnerships rather than working on 'parallel R&D and innovation streams'. This will avert duplication and result in the optimisation of innovation efforts. Considering the available science and technology fields, it is rather surprising that China has taken a world scientific lead in nanotechnology as compared to several advanced European countries. How has this come about? What is there in the Chinese science system and related culture that gives this country the edge in this particular field? How is the science system in the nano field connected with firms and enterprises? Are there partnerships between research/university and industry? Exploring such questions will enable us to understand the Chinese S&T system and modes of laboratory life.

Practice: 3

Tekes and SITRA, Finland and India S&T Programme
(Medical Diagnostics and Fellowship Programme)

(1) Organisation and finance of practices

There are two programmes involving cooperation between Finnish and Indian institutions and firms. The first is between the Department of Biotechnology (DBT), the Academy of Finland and Tekes, which jointly launched a trilateral joint programme to promote Finnish-Indian collaboration in the field of medical diagnostics in 2008 and 2009. The second is the information exploration and Fellowship Programme launched by SITRA in 2006 and 2007.

The programme in **medical diagnostics** will jointly select projects and successful projects will be funded by the Academy of Finland or by Tekes in Finland, and by DBT in India. The programme as a whole is organised and executed simultaneously by the three S&T and innovation agencies involved. A project may consist of two components, one of which is funded by the Academy of Finland and DBT, and the other by Tekes and DBT. It is envisaged that the two partners will equally bear the project costs. The joint projects must meet the requirements of the actual funding organisations. The research projects are funded for a maximum period of three years.

The information exploration and Fellowship programme was allocated EUR 200 000 and another EUR 1 330 000 of SITRA Fellowships funding during 2007 and 2008. The programme is organised by SITRA, Finland.

An important supporting action in the organisation of the Fellowship Programme during its first year was the presence of the head of SITRA's Indian programme in India, visiting many of the country's most important universities and research institutes and increasing local researchers' awareness of Finland and the SITRA Fellowship Programme.

(2) Content and activities of learning practices (including who is taking the lead)

The medical diagnostics programme involves both basic and applied research leading to innovation. All the three S&T and innovation agencies are taking an equal lead. In the area of medical diagnostics, biotechnology and software applications in ICT, India provides much potential in the context for intellectual human resources. India has a larger institutional base in biotechnology and a larger network of medical institutions and hospitals, which are vital factors for research in medical diagnostics.

In the case of SITRA's Fellowship funding, it is available to Masters-level students and post-doctoral researchers. Representatives of Finnish institutions wishing to invite an Indian researcher to Finland or send a Finnish researcher to India are applying for funding to enable mobility among researchers.

The best universities in India, such as the Indian Institute of Technology and the Indian Institute of Science, are globally renowned for their expertise in a variety of fields. However, Finland has not traditionally been a country that students from these universities would prefer, or compete over, as a place for doctoral or postdoctoral studies. It is hoped that the SITRA Fellowships Programme will contribute towards eliciting a change in this direction of attracting talents from India. The lead for the Fellowship Programme is taken by SITRA, Finland.

(3) Purposes and results achieved

In the case of medical diagnostics, it is too early to comment on results.

In the case of SITRA Fellowship Programme, so far out of 100 applicants 37 Fellowships have been granted to scholars in both countries.

(4) Effectiveness and value added to stakeholders

It is rather too early to comment on the effectiveness of the practices. However, in terms of value addition to stakeholders, institutions and firms in Finland envisage a large potential of market-related and intellectual benefits in both practices. In the case of SITRA Fellowship Programme, it is perceived as creating e a new window for Indian students' mobility, which was previously by and large focused on the US and the UK. Hence, this is deemed to be a good new beginning for Finland.

(5) Scope for European policy to expand this kind of practice

Finland, in the last three to four years, has realised that the future scope and source of internationally competitive science-based innovation and wealth from knowledge is no longer confined to national boundaries, but is globally dispersed. Secondly, it also recognised that India and China are emerging as important destinations for cross-border international cooperation and innovation centres in Asia. For instance, Nokia's manufacturing and R&D facility in Chennai employs some 1 100 professionals and by 2009, Nokia had invested over EUR 180 million. SITRA and Finland consider India to be a very important global player in STI and they are set to expand cooperation in S&T and other cultural and knowledge activities in future. This follows from SITRA large commissioned study (*The New Geography of innovation: India, Finland, Science and Technology*, SITRA, Helsinki, 2006, 52 pp.) to expand the scope of Finland's S&T policies for innovation at global level with India.

(6) Point of gravity in terms of knowledge and experience

Both in medical diagnostics and intellectual human resources (SITRA fellowships) practices, the gravity in terms of knowledge and experience seems to be located in India. In the former, India has much more knowledge, a larger S&T biotechnology base, and a wider network of hospitals compared to Finland. Moreover, highly educated professionals are available at competitively low costs. The Indian intellectual diaspora, which is spread out worldwide, is estimated at four times the population of Finland.

(7) Lessons to be learnt by European agencies

In a globalised era, innovation is gradually shifting away from north to south. In other words, it is shifting from hierarchically structured corporate R&D in the north to horizontally dispersed locations in the south. India and China are emerging as important global knowledge centres and innovation hubs. Even though these countries do not yet command all the new technologies at the frontier, they are endowed with human resources and vast talent potential coupled with enormous expanding markets. The main lesson to be learnt by European agencies is to expand their international S&T and R&D programmes, both in the public research arena, and in business enterprises in India.

Practice: 4

Indo-Norwegian Collaboration on human vaccination

(1) Organisation and finance of practice

The practice is jointly organised in Norway and India under their public research institutions, namely, The Research Council of Norway (RCN) and the DBT, respectively. Both institutions created a joint mechanism to set up a call for projects in India and Norway and govern selected research projects.

Under the proposed collaborative effort, both RCN and DBT are planning to provide financial support to promote development of the vaccination sector in India and Norway. The effort is also focused on creating a foundation on which the two countries may cooperate in marketing new discoveries and related product/process development. A maximum allocation of NOK 30 million (USD 5 million) will be available from the programme for Global Health and Vaccination Research (GLOBVAC) to fund the activities proposed by the Norwegian researchers, while costs proposed by the Indian investigator(s) will be provided by the DBT.

(2) Content and activities of learning practice (including who is taking the lead)

The practice (that is, the joint research project) is defined as research aiming at providing existing and improved vaccines for marginalised populations, especially children, in low- and middle-income countries. It includes epidemiological studies, the development and evaluation of new or improved vaccines, implementation of vaccination strategies, and studies to measure the costs and outcomes of such strategies.

The practice focuses particularly on neglected diseases and health problems and has prefixed thematic areas where Norway and India are strongly involved in health programmes and research, and areas where both countries have the capacity and competence to be at the international forefront. The roadmap points out the case of HIV/AIDS, respiratory and enteric infections, tuberculosis, influenza, meningococcal disease and the human papillomavirus (HPV) as the thematic areas identified for further research.

From the Indian perspective, the collaboration is likely to provide a space for studies including development of diagnostic tools and identification of the need for vaccination programmes based on epidemiological studies, development of new candidate vaccines and identification of optimal formulations and immunisation regimens for new and existing vaccines, development of methods to assess vaccine-induced protection (immune correlates), toxicity and side-effects, determination of impact of vaccination, including protective efficacy and effectiveness for relevant outcome parameters and the development of national surveillance systems, etc. The studies undertaken in the programme will also focus on increasing availability and ensuring equitable coverage of existing vaccines and stimulation of technology transfer to low- and middle-income countries, including improved strategies for cost-effective production of vaccines and the development of trial sites, according to a DBT source.

The lead is taken by Norway as the country launched a programme for Global Health and Vaccination Research (GLOBVAC) in 2005 and 2006, and the programme with India is part of Norway's global health efforts, which are shared by Indian institutions and government.

(3) Purposes and results achieved

While it is too early to comment on results achieved, the purpose of the programme is very clear: to address the disease and health problems through the development of appropriate vaccines for low- and middle-income countries, and at the same time to partner with the objective to take a technological lead in global health problems.

(4) Effectiveness and value added to stakeholders

It is indeed a win-win situation for both stakeholders, as both have developed considerable scientific research capacities to become competitors in vaccine development and its commercialisation at a global level. The innovation value chain in vaccine development and commercialisation stretches beyond the narrow confines of the R&D laboratory into pilot plant production, hospitals and clinical networks, target populations, the pharma industry and an enabling ecology with educational and intellectual institutions. In an area of vaccine development for low- and middle-income countries at global level, both stakeholders share and command different components of the value chain. Towards this end, value addition to Norwegian global vaccine research programme is considerable, as India provides a large network of hospitals and health professionals and vast potential ground for epidemiological studies including clinical trials. More than any other aspect, vaccine production in India can be undertaken at a small fraction of a cost per unit compared to Norway.

(5) Scope for European policy to expand this kind of practice

There is a vast potential for expansion of Norwegian and European policy in health and vaccine development in partnership with countries such as India.

(6) Point of gravity in terms of knowledge and experience

Beyond the cost effectiveness in producing vaccines in countries like India, the country has the fifth-largest pharmaceutical industry in the world. In the last few years, the Indian pharmaceutical sector has progressed from reverse engineering in drug manufacturing to drug discovery and its commercialisation. India has a vast higher educational and research base in chemical, biological and biomedical sciences. All these factors suggest that the future of gravity in terms of knowledge and experience is with India insofar as the production of health-related vaccines are concerned.

(7) Lessons to be learnt by European agencies

The Norwegian and Indian collaboration in vaccines is a clear example of how other European-based innovation agencies can benefit in globally targeted vaccine R&D and its commercialisation. The vast Asian market in health opens a new window of opportunity for the next generation of vaccines. In a number of ways, the scope for overcoming the current economic downslide is considerable for European science and innovation agencies to foster and promote collaborative research in biomedical and related areas.

Practice: 5

VINNOVA, Sweden and JST, Japan – Multidisciplinary Bio programme

(1) Organisation and finance of practices

While the overall collaboration and organisation of projects under the programme are coordinated by joint Swedish and Japanese institutions (VINNOVA, the Swedish Governmental Agency for Innovation Systems and the Japan Science and Technology Agency, JST), projects are executed by universities, firms and institutions selected for specific projects.

For Japanese applicants, the projects are funded from Japanese sources for three years for each selected project, not exceeding JPY 30 million. For Swedish applicants, each selected project is also funded up to three years for SEK 210 000.

(2) Content and activities of learning practice (including who is taking the lead)

The six ongoing projects under this collaborative programme reflect frontiers in biology involving areas such as nano-biology, systems biology, gene networks and mechanobiology. Both Sweden and Japan are leading countries in the world in life sciences, and research groups in both countries are competitive at global level. The major aim of the joint programmes is to strengthen collaboration and tap into each other's strengths. For instance, much of life sciences research in Japan is organised in firms and institutions, while in Sweden it is mostly based in the universities. Thus the industrial applications in Japan and frontiers in the academic institutions are the two leading edges in this practice. Both partners can be said to be on an equal footing in this respect.

(3) Purposes and results achieved

The main purpose is to work together on joint projects in frontier areas of biology; in March 2009, the fourth call for proposals was jointly issued. Up to 2008, nine major joint projects had been completed, and the results were considered quite satisfactory by both sides.

(4) Effectiveness and value added to stakeholders

While the Japanese are likely to benefit from the long experience of venture capital and dedicated biotechnology firms of Sweden, the latter will benefit from the 'fusion research' mode of knowledge production from Japan which is emphasised in the universities much more than Sweden. For Japan, the major source of value addition is the Swedish experience of clinical trials.

(5) Scope for European policy to expand this kind of practice

Japan and other leading Asian economies such as those of China, India, Singapore and South Korea have emerged as major R&D knowledge hubs in biological sciences, and governments in these countries have invested large amounts of money in recent years. There is a good scope for expanding European policies in collaboration in biomedical and biological sciences to create 'new' transnational innovation networks. Different countries offer different opportunities of scope and value for European science and innovation agencies.

(6) Point of gravity in terms of knowledge and experience

Life sciences innovation and growth in Japanese industry and society are considered quite important from a long-term perspective. Along with IT, nanotechnology and materials technology, and environment, life sciences is one of four priority fields in the overall national government policy for S&T established in the Third Basic Plan for Science and Technology, which covers the period from 2006 to 2010. In life sciences under this plan, the highest priority is being put on creating more effective bridges between basic research and clinical research and practice, as well as on creating a more effective infrastructure for clinical trials. Connecting basic research to the innovation value chain in the biomedical area which involves translational and clinical trials and its effective networking is a weak area in the case of Japan. Sweden has much longer experience in networking in clinical trials and commercialisation of R&D in life sciences.

Promotion of life-science-related research and innovation in Japan appears to include a broader target group of researchers as well as of companies than in Sweden. The need to promote research in 'fusion fields' such as nano-biotechnology is often emphasised in Japan. As is well known, much of the cutting-edge research and innovation in biology frontiers is happening at the intersection of different disciplines or what is being characterised as 'fusion fields' or 'converging fields'. The Swedish system of research funding has so far tended to pay relatively less attention to support of research and innovation in 'fusion fields'. It also appears that some of the leading Japanese universities are putting a higher priority on developing internal organisational mechanisms for combining engineering, medicine and basic life sciences than their counterparts in Sweden. The point of gravity in 'fusion fields' is with Japan.

During the last decade, the desirability of a dynamic sector of newly created venture companies has become widely recognised in Japan, and great efforts have been made to stimulate the creation of such firms. Japan will take more time to build up the necessary management competence and culture to grow large dedicated biotech firms compared to Sweden, which has longer experience with the development of biotech ventures than Japan. Thus the point of gravity in this domain is with Sweden.

(7) Lessons to be learnt by European agencies

Even though the Japanese R&D system in biopharma is weaker than the Swedish one, Japan is investing large sums in biopharma R&D and Japan has an edge over Sweden in medical electronics and ICT hardware which interfaces with nano-biotechnology and other related biofields. Much of this innovation is taking place at the intersection of several disciplines: physical, biological, electronic, soft sciences and applied sciences, among others. In other words, Japan is moving forward quite rapidly in innovation frontiers relating to biological sciences, which offer a window of learning for European agencies. Secondly, the context of research and innovation in Japanese organisations and institutions is quite different from those found in the western R&D-based institutions such as in Sweden. When R&D and innovation becomes internationalised and globalised by increasingly shifting from Sweden to Asian countries and institutions for example, collaborative ventures and joint programmes, such as the 'interdisciplinary bio programme', could offer lessons and advantages in R&D and innovation from Asian environments.

Practice: 6

Tekes, Finland and Singapore: Infocom and media technologies

(1) Organisation of practice

VTT, the Technical Research Centre of Finland and Singapore's Agency for Science, Technology and Research (A*STAR) research institutes, namely, the Institute for Infocomm Research (I^2R) and Singapore Institute of Manufacturing Technology (SIMTech), entered into collaboration by signing a MOU in 2006 in the field of infocom and media technologies. The joint projects under the collaboration are organised and facilitated by Tekes and A*STAR.

VTT has been in existence for 50 years – it is the biggest multi-technological applied research organisation in northern Europe. It provides high-end technology solutions and innovation services. VTT is a non-profit-making research organisation and some 2 800 professionals work at this centre.

I^2R and SIMTech are the two leading Singapore institutions in media technologies.

(2) Content and activities of learning practices (including who is taking the lead)

Finland is already well known worldwide for mobile technology, and has developed globally competitive innovation capacity in wireless communications. From Singapore's perspective, the MOU is seen as a foundation from which to boost the efforts of infocom and media technology clusters and industry (known as Fusionopolis), and exchange of scientific ideas and talents from Finland. The Singaporean infocom industry is worth some SGD 45 billion, which till 2007, was growing at the rate of some 6%. Given the leadership of Finland in wireless innovation and commercialisation, it is clear that Singapore is taking the lead in the practice to foster collaborative efforts.

(3) Purpose and results achieved

The purpose from the Singaporean perspective is gain access to Finland's advanced technology in wireless and other related technologies, to acquire training of Singaporean professionals in advanced technologies through exchange programmes, etc. From the Finnish perspective, Singapore is a multicultural society, strategically located in business terms in east Asia, south-east Asia and south Asia.

(4) Effectiveness and value added to stakeholders

Tekes and A*STAR, as well as researchers, scientists and engineers from the research institutes of both countries, will be collaborating on R&D projects, focusing initially on the application of 'infocomm' and media technologies (ICMT) in healthcare services. Other potential R&D projects in the collaborative pipeline are as follows: mobile entertainment and radio frequency identification (RFID) technologies and applications, intelligent homes, digital media, ubiquitous computing, sensor networks, and nanotechnology. In addition, A*STAR and Tekes will also engage in discussions to co-develop R&D roadmaps in areas of mutual interest, such as interactive computing and mobile technologies and health-related systems.

Globally, 'greying' populations and widespread chronic diseases, are rapidly increasing healthcare costs, and placing more and more demands on healthcare systems and professionals. Infocom and media technologies are a viable option that can be applied to healthcare systems to restrain costs and manage the stresses on healthcare systems and professionals. Timely availability of medical data will provide opportunities for early intervention, and can greatly speed up the treatment and feedback cycle, thus allowing for highly personalised healthcare. Within this framework, patients may be discharged earlier, thereby alleviating the strain on healthcare systems. Additional benefits include improved efficiency, potential cost savings and greater scalability for the medical service provider, while delivering the same quality of patient care.

A MOU between A*STAR and Tekes will lead to the vibrant exchange of scientific ideas and talents, joint R&D road mapping in mutual areas of interest, joint scientific projects, technology transfer, and commercialisation of research and manpower training, resulting in a win-win partnership.

(5) Scope for European policy to expand this kind of practice

According to a NASSCOM ((National Association of Software Service Companies) the premier trade body and 'voice' of the Indian IT industry) and Booz, Allen and Hamilton report (2006) on off-shoring engineering services, the next frontier in engineering services and potential for innovation and commercialisation for global European and North American companies will be shifted to Asia in the next decade (2006-2016). Given the globalisation of innovation and the globally dispersed networked innovation structures evolving in ICT, telecommunication and media-based technologies, the scope of European agencies to expand this kind of practice to Singapore and other Asian regions is worth serious policy attention. There are already clear indications of this new development, as the Finnish Nokia has already expanded its research and innovation activities to India and China. For instance, Nokia has already invested USD 200 million for a manufacturing plant in Chennai. This is something that is not specific to Nokia; it can also be seen through the expansion of European and North American ICT and media infocom firms in India, such as Alcatel, LG, Siemens, Ericsson, Flextronics and IBM. Other examples of ICT and media technology companies with significant software R&D operations in India are TietoEnator and Telelogic (both from Sweden).

(6) Point of gravity in terms of knowledge and experience

It is clear that the point of gravity in terms of knowledge and experience lies in Finland, but the locational advantage for innovation and marketing lies on the Singaporean side. Hence it is a win-win situation for both parties.

(7) Lessons to be learnt by European agencies and benefits to stakeholders

Much of the effectiveness and value addition in media and infocom technologies in the future is likely to be determined by the skill base of human resources, and the locational advantages for marketing and regions with high-skilled low-wage advantage. Secondly, the effectiveness of value addition also depends on how infocom and media technologies are received and diffused in markets and societies of non-western cultures. On both these counts, Singapore agencies enjoy a considerable advantage. On the other hand, advances in infocom and media technologies are quite capital intensive and effectiveness depends on R&D bases, capital, resources and experience. Finland has a number of advantages on this score with firms such as Nokia.

Most European countries, particularly the Nordic countries, are facing severe shortages in science and engineering graduates in industry and service sectors, and given the demographic structures, this shortage is likely to continue in the future. With the shortage in the human resource skills, home-based corporate R&D in European countries will have to look outside Europe for resources to draw skills for R&D.

In media and infocom technologies, understanding the culture of users and new markets, particularly in Asia, matters a lot for European agencies. With India and China predicted to have approximately 1 billion people with mobile phones by 2010, both countries are going to be 'hot spots' for global innovation and commercialisation of media technologies.

Practice: 7

Bilateral Energy Cooperation between Indonesia and Netherlands (BECIN)

Partners

SenterNovem, the agency of the Dutch Ministry of Economic Affairs involved in innovation and sustainability, coordinates the Dutch government's policy on technology and cooperation. SenterNovem has initiated cooperation and collaborative projects with Indonesian Ministry of Energy and Mineral Resources, the National Development Planning Agency's or BAPPENAS' Directory for Energy, Mineral Resources and Mining, and has supported the Indonesian government and non-governmental organisations (NGOs) on three major programmes in the following areas over the last two to three years: a) mini and micro hydro power projects, b) geothermal energy, and c) the Indonesia Domestic Biogas Programme (IDBP).

(1) Organisation and finance of practices

Whilst the overall cooperation is organised and coordinated by Dutch government through SenterNovem and the Indonesian Ministry of Energy and Mineral Resources, the three projects are implemented by different agencies.

a) The Mini and Micro hydro power project is implemented by the Directorate-General for Electricity and Energy Utilization (DGEEU) in Indonesia together with the German Technical Cooperation (GTZ) and SenterNovem under the global German-Dutch Energising Development Programme, which aims to implement almost 100 schemes by mid-2009.

The Dutch embassy, under the bilateral programme for renewable energy, provides substantial funding to Green PNPM, the Government of Indonesia's Community Empowerment Programme, Program Nasional Pemberdayaan Masyarakat, for the implementation of some 300 schemes. Further, strategic technical and financial support to the mini and micro hydro power (MHP) sector in Indonesia is provided through:

i) a block grant for MHP projects under the Green PNPM facility managed by the World Bank;

ii) a technical support unit accompanying the block grant and strengthening local capacity to build and operate sustainable hydro power schemes;

iii) an elaborate national capacity development programme to consolidate and expand know-how and expertise on mini and MHP in Indonesia.

Though funded by the Netherlands, components ii and iii will be implemented by the German GTZ.

b) The Geothermal Energy Programme is implemented by SenterNovem and BAPPENAS' Directory for Energy, Mineral Resources and Mining.

Since December 2008, technical assistance has been provided by an international expert working directly with BAPPENAS' Directory for Energy, Mineral Resources and Mining, and supporting the Government of Indonesia (GoI) in resolving major bottlenecks in the further development of the sector. In addition, a trust fund with the World Bank is being established to provide technical support to strengthen Pertamina Geothermal Energy's capacity to speed up the redevelopment of brown fields.

c) The IDBP is implemented by the Indonesian DGEEU in collaboration with the Dutch Humanist Institute for Development Cooperation (Hivos) and the Netherlands Development Organisation (SNV).

In 2008, SNV, at the GoI's request, carried out a feasibility study for the IDBP. This study was financed by the Dutch government. Implementation of the IDBP will take place in the period from 2009 through 2011. The Dutch Government is co-funding the IDBP as part of its sustainable energy programme. The IDBP will contribute 25% of the costs of the plants (buydown); the remaining costs will have to be borne by the users, out of their own means or by acquiring a loan.

(2) Content and activities of learning practices (including who is taking the lead)

In all three projects, the Dutch government and SenterNovem are taking the lead, encouraged by the support given by Indonesian government. Content and activities are as follows for the three projects.

a) Mini and Micro hydro power project

Interlinked with Green PNPM, a Technical Support Unit (TSU) will be established to help ensure quality and sustainability of the hydro schemes. This will attempt to integrate best practices in sustainable hydro power into future PNPM mainstream activities, i.e. to build and strengthen capacity on the ground. The reason for this special TSU is that the technically, logistically and institutionally relatively complex MHP solutions require assistance beyond the level commonly provided in a community-driven development (CDD) programme like PNPM. The implementation of small-scale 'village utility' projects such as MHP schemes differs significantly with regard to design, construction and management from a simple bridge, for example, or any other piece of 'static' village infrastructure, which represent more standard PNPM-implemented projects.

In parallel, MHP will be extended into a new phase in which consolidation and institutionalisation of MHP know-how and experience in Indonesia will be targeted. Meanwhile, many initiatives have already been developed in this field and subsequently many MHP knowledge institutions and organisations have been founded in Indonesia by the government and other parties. Examples are the United Nations Development Programme (UNDP)-supported Integrated Microhydro Development and Application Programme (IMIDAP) and the GoI's DME (Desa Mandiri Energi – Energy Self Sustaining Villages) Programme. What is imperative now is to disseminate and exchange know-how and experience throughout the country, and to consolidate best practices when developing and implementing sustainable mini and micro hydro schemes. This component will start in the fall of 2009 with an in-depth sector analysis, and needs assessment.

b) Geothermal Energy Programme

SenterNovem directly supports BAPPENAS in its coordinating role through seconded expertise and by bringing together specialists both from within and outside Indonesia, notably from the Philippines, to actively work with all stakeholders to translate the political will of the GoI into an enabling business environment for geothermal development.

Also, the Netherlands Embassy, with the assistance of SenterNovem, is working closely together with the World Bank in supporting Pertamina Geothermal Energy, a subsidiary of the state-owned oil and gas company Pertamina, with technical assistance to strengthen its technical and managerial capacity to carry out the preliminary and actual work to build up to three geothermal power plants. A World Bank loan to PGE is under preparation.

c) Biogas IDBP programme

In the first year of the programme in 2008, IDBP started activities in four selected provinces on Java where many livestock farmers supplying the meat industry are located. After the second year, the programme will be extended to four other provinces. Criteria for the selection of provinces are a stable government, the presence of sufficient craftsmen and masons, plus vocational training institutes to guarantee sufficient manpower for construction and maintenance in the long run. Another criterion is the existence of local micro-finance institutions (or local branches of national institutions) to provide loans for biogas plants.

(3) Purpose and results achieved

The main purpose of the Indonesian-Dutch programme and cooperation is promote sustainable development with a focus on alternative energy. Indonesia has appropriate natural sources and endowments, which need to be appropriately exploited for the benefit of the country and the world as a whole. For instance, Indonesia has the world's largest resources of geothermal energy resources, but only 3% of it is exploited or used.

In terms of results achieved, all the three are large programmes involving different public, private and international agencies such as the World Bank and NGOs. All the serious and systematic feasibility studies undertaken are quite promising and all the projects are in the beginning implementation phase.

(4) Effectiveness and value added to stakeholders

It is too early to comment on the effectiveness. However, in terms of value addition, both parties involved and other stakeholders are likely to benefit and add value to their experience.

In the case of Indonesia, beyond the funding of projects there is a direct value addition as it will gain access to a number of windows of opportunity, both intellectual and technological, as well as advances in the energy field and sustainability through the coordination of SenterNovem. Without this, this kind of exposure and connectivity would not have been possible at all.

In the case of the Dutch government, SenterNovem and other NGOs, Indonesia provides an important 'testing ground' or 'social laboratory' which is likely to throw up a number of learning experiences for other developing countries.

(5) Scope for European policy to expand this kind of practice

This practice is very important as it provides a very useful test case for the expansion of European policies on sustainable development and Millennium Development Goals (MDGs).

There is indeed a tremendous scope for the expansion of similar policies by other European agencies in south-east Asia.

(6) Point of gravity in terms of knowledge and experience

Indonesian projects provide an important source of knowledge and experience for both parties as well as to the world in sustainable development experience in alternative energy development in developing countries. The Netherlands is indeed a leader in several alternative and clean energy and water technologies, and hence the gravity lies with Netherland.

(7) Lessons to be learnt by European agencies

Indonesia provides an important testing ground or a 'laboratory of alternative technology' for the expansion of European agencies in climate-related and green technologies in Asia. In terms of socioeconomic scale, alternative energy technologies in Indonesia – as elsewhere in most part of Asia – provide a potential testing ground for small-scale energy technologies. This is indeed an important experience for the commercialisation of alternative technologies on a larger scale in Asia.

In south-east Asia, alternative and green energy technologies will be an important factor in the future development process in which governments and NGOs will play an important role. Implementing projects and distribution of benefits is by and large determined by organisational skills in bringing together different stakeholders to bear upon a specific project. Moreover, in a situation of resource scarcity, the issue of optimal use of resources and skills is going to be an important factor for the success of these alternative energy projects in south-east Asia. Therefore, this Indonesian project is likely to provide a number of lessons of experience in terms of these and other factors for European agencies.

Synthesis and Concluding Remarks

This study has drawn information from learning practices on seven cases from Europe (Finland, the Netherlands, Norway, Spain and Sweden) and Asia (China, India, Indonesia, Japan and Singapore) centred around nanotechnology, medical science, biotech, media technologies, ICT, geothermal energy and biogas energy. The shortlist below presents an overview of learning points that follow from their screening.

a) The cases reviewed show that the matching amongst companies and researchers who are interested in the same kind of innovation domains is important. Agencies offer 'a carrot on a stick' to companies and researchers that have the desire to partner with peers abroad and to internationalise ('carrot-stick synergies').

b) Cooperation resulting from these Eurasian learning practices are centred on mainstream actions, such as funding of mutually interesting projects, undertaking a common research programme and exchange of ideas and talent, rather than jointly developing innovation support measures. The focus is also more on S&T than on innovation. In addition, cooperation among the Eurasian learning practices exposed are more about learning through cooperation than about benchmarking and learning from Asian versus European practices.

c) In the cases explored, the finances for R&D and innovation practices are met on an equal basis by collaborating partners (countries).

d) The supply chain problem of skilled technical and scientific personnel is unlikely to be solved entirely from a domestic (intranational) location perspective in Europe. Moreover, skill shortages in Europe, particularly in science and engineering graduates in European society, are forcing market actors and innovation agencies and institutions to look beyond Europe. Especially the Nordic cases treated in this report show that China, India and Singapore are being focused on in their collaboration for training and skill supply purposes. As an example, Nokia has placed a core staff team to work with 30 professors and 50 students at the School of Information Science and Technology at Tsinghua University in Beijing. IBM and other ICT-based firms in India have set up similar arrangements with institutions and universities in Bangalore and Delhi.

e) Most of the practices in the cases selected have been initiated in the last five or six years and they are in the initial phase of collaboration. Hence, it is too early to make any assessment on the nature of results achieved. Nevertheless, it may be pointed out that the survey has revealed signs of value added for the European and Asian innovation agencies. Also, in the specific case of collaboration between Indonesia and the Netherlands in sustainable and alternative energy, the Indonesian experience is likely to provide considerable learning experiences for other Asian countries. Evidently, further detailed case studies are needed to fully track the value addition of international learning for the European (and Asian) innovation agencies involved.

Scope and value of international learning in view of economic downturns

Regarding the question of whether it is useful to promote international learning and what the critical success factors are, there is a clear indication that there are more arguments in favour than against. From the above-mentioned cases, some critical success factors can be identified that support the promotion of international learning. The first and possibly the most important factors are that governments should back up the initiatives undertaken by agencies, but that at a later point the implementing actors need to develop field level action plans. Secondly, there is a need for dedicated resources as the learning practices otherwise could easily come to a stop, in particular if political or economic priorities change. Especially for exchange relationships conducted in the longer term, there is a need to set and meet (intermediate) milestones to get and keep things going.

It is also important to consider the role of international learning between innovation agencies in the context of the current economic and financial circumstances. In a globalised context, problems like the economic crisis impact on almost all parts of the world. Given that these kinds of crises are a global phenomenon, they also require a global solution to be dealt with. Additionally, with innovation becoming a global and networking affair, international learning networks also become more relevant for supporting innovation. International learning can also help companies to be more present on a wider geographical scale, thus spreading their risks due to different outlet and sourcing channels. This can also contribute to mitigating the effects of economic downturns.

Our limited exploration has also revealed some other illustrations of how Eurasian cooperation and learning can lead to value creation.

a) It is important to be aware of the 'prime comer' advantages for European companies if European-based innovation agencies pave the way for a particular country and field of R&D and innovation. Existing practices explored generally reveal MOUs, joint projects and programmes and initiatives. These joint projects are physically located in the respective countries on a particular theme. The mode followed by TNCs operations in

India and China with joint laboratories, for instance IBM, Adobe, General Electric laboratories in New Delhi and Bangalore or the Indo-French Centre for the Promotion of Advanced Research (IFCPAR, or CEFIPRA in French) in New Delhi, are good examples here.

b) Closely linked to the above is the fact that global outsourcing of R&D in Europe is assuming considerable significance in the current economic downturn. Companies such as IBM, Philips, Novartis, Nokia, and Procter and Gamble no longer rely on in-house R&D to support innovation. They have located joint and stand-alone R&D centres in Asia. There are various 'push' (high wages for R&D and clinical costs) and 'pull' (high-skilled low-wage advantage and S&T and innovation clusters) factors amongst Asian and European countries, which are driving European multinationals and innovation agencies to look beyond Europe to Asia. Tekes from Finland and FINPRO (a global expert network established by Finnish companies), the Danish Agency for Science and Innovation, Innovation Norway and VINNOVA from Sweden have commissioned special teams to establish Nordic innovation centres in Asia. These agencies are becoming increasingly oriented towards the 'open innovation model' as it is likely to lead to value addition: a) for better product development; b) for meeting human resource needs; and c) for effective R&D for linking to context-based innovation; and d) for adapting and tapping into local needs and demands.

c) Eurasian innovation cooperation and learning initiatives seem to be important for European actors to understand the social and cultural diversities linked to all kinds of innovation and science fields. Furthermore, large technological systems are enmeshed with social, cultural and contextual features, which are also relevant factors when applying technologies in innovation processes.

d) The contexts of research and innovation in Asia are likely to open up a number of useful insights and learning practices. One such important practice is demonstrated by the multidisciplinary bio-programme between Japan and Sweden, which draws attention to 'fusion fields' or 'converging fields' of innovation. Much cutting edge new knowledge and innovation is taking place at the intersection of disciplines, actors and agencies networked on research and innovation programmes in new technologies.