Elke Dall, Hanna Scheck,
Marion Steinberger, Hans Westphal (Eds.)

Korea and Europe – Meeting through science

Exploring the opportunities of R&D cooperation with KORANET

2nd Edition

KORANET

Korean scientific cooperation network with the European Research Area

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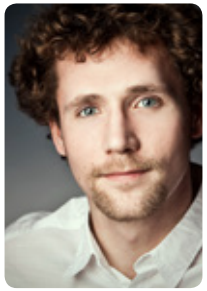
Content

Preface



Dear Readers,

This 2nd edition of the KORANET publication "Korea and Europe – Meeting through science" summarises the results of a more than a four year long endeavour to better connect the research and innovation landscapes of Europe and Korea through fostering communication and joint activities, thus, improving mutual understanding.

A common European Research Area is still in the making and at present, bilateral activities between single European countries and Korea still prevail. Nonetheless, during the FP7-funded project KORANET we – science managers from Korea and different European countries – were able to demonstrate how beneficial multilateral approaches are in many respects. Despite the economic crisis, additional funding was made available, efficient funding mechanisms were developed and successfully implemented, new person-to-person contacts were established and guided into collaborative research activities. Data about the respective innovation systems were obtained, analysed and assessed to support evidence-based decisions. The publication is intended to present a compilation of KORANET's achievements and lessons learned and can, thus, be read as a testimony of the added value of multilateral approaches.

We have already left the phase of fundamental questions about the strategic purpose of Korean-European collaboration. Today, there is a widespread willingness to cooperate and there are many striking arguments for the mutual benefits of joint collaboration. Hence, the value and need for both bilateral and multilateral cooperation between Korea, the European Union, its member states, and associated countries is not only unquestioned but a vital interest of all. All analytical and statistical evidence proves that collaboration is beneficial for all partners – not only in academic research but also when it comes to applied technological cooperation. Finally, we have proved that multilateral collaboration efforts can be organised efficiently even though manifold opinions had to be brought together. With the implementation of two funding programmes we clearly demonstrated cost and effort-efficient cooperation instruments.

Thus, a solid basis has been created and with the knowledge we have today the next steps should be ambitious. What has been developed, examined and monitored during different projects needs now to be

transferred into a continuous trilateral policy approach and jointly governed collaborative programmes, by the Korean Government, the European Commission, the European member states and partner countries.

Taken together with other recent documents elucidating the Korean-European partnership this publication hopefully will trigger activities and initiatives to foster a long-term programme of innovation partnership between Korea and Europe.

Gerold Heinrichs
KORANET Coordinator

Hans Westphal
KORANET Managing Coordinator

Greetings

Dear Readers,

The Korean government and the European Commission signed an agreement on S&T cooperation in 2006, and since that time, both sides have seen tangible results which have positively affected both their economies and societies in general. As a core tool for accelerating cooperation, KORANET has contributed to the consolidation of a sustainable partnership and the exploration of potential areas of cooperation both at the researcher and national level. Based on the experiences of the KORANET project, we will be able to set the stage for the next round of EU-Korean cooperation.

The channels of communication established under KORANET have enhanced our mutual understanding, and as a result, substantial cooperative projects have been initiated – this includes the Pilot Joint Call on Research for Life-long Health in 2010 and the Joint Call on Green Technologies in 2012.

This publication presents a distillation, in part, of important research that has gone into making the KORANET project successful. Thus, I firmly believe that it will allow researchers in Korea and the EU to better understand the positive impact S&T cooperation with Korea will have on the quality of S&T research. Going forward, this will contribute to the strengthening of researcher networks between Korea and the EU, and to the further development of our respective S&T systems and policies.

We sincerely hope this KORANET publication will be considered a useful resource for researchers, and we expect that it will bring about increased levels of knowledge and collaboration in the future.

Soon-Ro Cho
Director of the Center for International Affairs
National Research Foundation of Korea

1. Introduction

1. Introduction

Interest in joint research activities between Korea and the EU member states has been growing steadily over the last couple of years. In fact, there are many positive preconditions for cooperation activities. The EU-Korea Free Trade Agreement which entered into force in July 2011 and a high match of top priorities on the policy agendas of both the EU and Korea such as the creation of smart growth or the promotion of green technologies are only some of the examples for shared interests. However, interest in cooperation in science and technology (S&T) is only partly mirrored by the actual number of joint projects involving research partners from both Europe and Korea. The reasons for this lie in cultural and linguistic differences and challenges presented by the mismatch of the time zones, but also exist due to a dearth of established networks among researchers or institutions from Korea and Europe. To bridge differences and to connect researchers from both regions, the European Commission has invested in the KORANET project since the beginning of 2009.

KORANET's aim is twofold. Firstly, it set out to analyse the current status of research cooperation and to promote an understanding of the S&T landscape of Korea in Europe, and vice versa. Secondly, it aimed to bring together and forge close, sustainable research partnerships between researchers, funding and research institutions, and political stakeholders.

In order to find the relevant research and cooperation partners, it is first necessary to make information available about research activities, areas of excellence, and the existence of networks in specific fields of research. However, until now there has been poor availability of data about current research activities, technical expertise and cooperation interests in Europe and Korea. To fill these knowledge gaps, this second edition of "Korea and Europe –

KORANET Consortium Members

Meeting through science" will set out information relevant to European and Korean research stakeholders, and provide a helpful overview of the variation in S&T strategies used in Korea and in European countries. This publication is prepared for major S&T stakeholders in Europe and Korea, including researchers, research institutions and funding agencies, policy makers at national and international level, cluster managers, in particular those involved or interested in S&T cooperation, and all those responsible for international collaboration.

The publication is divided into eight main chapters:

- The **second chapter** addresses outstanding features of the Korean and European S&T systems and offers background information about the political, economic and social context into which science, technology development and innovation activities are embedded in both the EU and Korea;
- The **third chapter** adds facts and figures in a brief overview of relevant S&T statistics of both regions;
- To complete the picture, the **fourth chapter** offers an overview of the main policy instruments for S&T cooperation at bilateral and EU level. The main S&T agreements which set the framework conditions for cooperation activities as well as single projects for the enhancement of cooperation activities are being presented;
- In order to find out more about the drivers and barriers of cooperation, a SWOT analysis was carried out under the KORANET project and in a review of the EU-Korea S&T Agreement. The results of this analysis task are being presented in **chapter five**;
- **Chapter six** has a stronger innovation related focus on S&T clusters. The initial presentation of the structure and organisation in both regions is followed by an accentuation of the similarities, differences and opportunities they offer for cooperation;
- Since the two joint calls which have been successfully implemented under the KORANET project constitute the core activities of the KORANET project, **chapter seven** is devoted to a brief description of their thematic areas and the outcomes;
- At a more general level **chapter eight** highlights other activities of the KORANET project such as the organisation of numerous conferences, study tours, partnering events or a summer school;
- As the final outcome of the strategy and foresight tasks of the KORANET project, a Policy Paper and Joint Action Plan have been developed. The recommendations which are included in this document are being presented in **chapter nine**.

It is hoped that joint exploration of research topics will strengthen the flow of global knowledge between the two regions; and that the detailed knowledge about ongoing S&T policy and research activities in Europe and Korea shared in this publication will create a competitive advantage – by facilitating the exchange of experts, improving methodology and results, and by spurring competition.

Throughout the KORANET project, a wide array of methodological instruments was used to gather the relevant information. These include desk research, questionnaires and online surveys, targeted interviews and round table discussions, dedicated workshops and larger conferences, including brokerage events and scientific visits to research institutions in Europe and Korea.

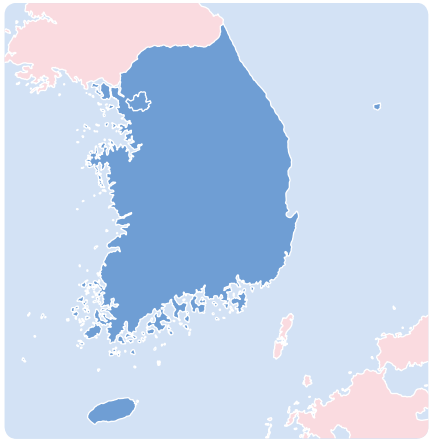
The information contained in this publication is mainly based on comprehensive reports authored by the KORANET partners during the course of the project. The full reports are accessible at http://www.koranet.eu/en/115.php.

2. Korea and Europe – good reasons for working together

2. Korea and Europe – good reasons for working together

Working knowledge of a partner country's S&T landscape, its main stakeholders, and its underlying S&T policies is part and parcel for creating successful international S&T cooperation. This chapter provides a brief overview of the major features of the research systems in both Korea and Europe.

2.1. Why Korea?



Korea

Political drive

Korea has benefited from increasing investment in education and indigenous talent in S&T. Historically, investing in these areas has been an engine for rapid growth and global integration of high-tech industrialised economies. Based on the traditional investments in S&T from the private sector (Korea's economy has for the most part been dominated by conglomerates such as Samsung or LG), public policy also prioritized expenditure in science and research.

It should be mentioned that currently the new Korean government under President Geun-Hye Park is implementing a reorganization of its ministries. In particular the responsibilities in the field of STI are subject to significant changes. Since March 2013 the new Ministry of Science, ICT and Future Planning (MSIP) has become the key ministry for STI. According to first statements by the new government, one of the main tasks of the MSIP is to provide support to creative small firms and start-ups for the creation of new jobs. However, there are only first statements and no tangible strategy which could be presented is available so far. Hence, in the following we would like to present the Korean S&T landscape at its current stage and the political, economic and societal framework conditions that have shaped it.

In August 2008, the Lee administration's S&T programme enacted the '577 Initiative'. Its aim was to change the embedded S&T environment and to turn Korea into one of the world's leading S&T powers. The inherent goals were to raise R&D investment to five per cent of GDP (5), to focus on seven major technological areas (7), and to achieve a global top seven status in terms of scientific citations and international patent applications (7).

Increasing the government R&D budget

At nearly 4 % of GDP, Korea's Gross Domestic Expenditure on R&D (GERD) stands among the highest in the world. Almost three quarters of Korean R&D is performed by industry. The Korean government has also been driving its R&D support initiatives by steadily increasing its R&D budget in recent years.

Ministries	R&D investment priorities	Budget for 2010 (in € million)	Budget for 2011 (in € million)
Ministry of Education, Science and Technology*	Basic sciences & Education	2,816	3,040
Ministry of Knowledge Economy**	New growth engine	2,815	2,885
Ministry of Sports, Culture and Tourism	Culture technologies	54	58
Ministry for Health, Welfare and Family Affairs	Public health	198	215
Ministry of Land, Transport and Maritime Affairs	Construction, transportation, sea	369	391
Small and Medium Business Administration	SMEs	359	403
Others		2,173	2,544
Total		8,784	9,536

Table 1: R&D investment priorities of ministries and budget. Note: € 1 = KRW 1,472 as of February 2013
* Since March 2013 the Ministry of Education, Science and Technology (MEST) has been divided into two Ministries: the Ministry of Science, ICT and Future Planning (MSIP) & Ministry of Education (MOE)
** The Ministry of Knowledge Economy (MKE) has been changed to the Ministry of Trade, Industry and Energy (MOTIE)
Source: Government S&T basic plan (577 strategies) for 2011

In 2011, this figure stood at € 9.54 billion which was an increase from € 8.78 billion in the previous year.

The government was also leading strategic investment, following important R&D policies of each government department (Ministries), and R&D investment priorities to enhance the efficiency of R&D investment.

Setting priorities on major technology areas

Following its **577** R&D initiative, the Korean government prioritized **seven major technology areas**.
These are:

- Key Industry Technologies (cash cows) – consumer electronics and automobile industries;
- Emerging Industrial Technologies (green ocean) – IT-based convergent technologies and emerging technologies in the areas of drug, health and medical care;
- Knowledge-based S&T – software technologies and advanced logistics;
- State-led Technologies (big science) – space programmes, nuclear energy development, and military technologies;
- Global Issue-related Technologies (mega trend science) – energy, climate change, and environment technologies;
- National Issue-related Technologies (risk science) – public health and food safety;
- Basic & Convergent Technologies (national platform technology) – nanotechnology and robotics.

These technology areas include 50 critical technologies and 40 candidate critical technologies.

Improving R&D infrastructures

In addition to the seven major technological areas, the '577 Initiative' includes details for the advancement of **seven major S&T systems**. The government invested € 3.43 billion in 2011, an increase of 11.4 % compared to the previous year in the enhancement of the following major system areas: cultivation and utilisation of world-class human resources in S&T, promotion of basic and fundamental research, support for SMEs' innovation, S&T globalisation, enhancement of regional innovation capacity, advancement of S&T infrastructure, and spread of S&T culture (education, museum, and public understanding). To raise the number of human resources in low-carbon green technologies, the former Ministry of Education, Science and Technology planned to invest € 1.62 million on five graduate schools in three universities. It also continued to invite renowned scholars from abroad to work in universities and expanded mobility opportunities for researchers. The government planned to expand investment in basic and fundamental research to 50 % of the government R&D budget by 2012, although that mark has not been met. Funding for small and medium-sized enterprises (SMEs) has shown a 20.3 % increase in 2011 compared to the previous year, reaching € 829 million. This money was mainly used to fund SMEs with potential for innovation, globalisation and commercialisation of R&D results through the former Ministry of Knowledge Economy and the Small and Medium Business Administration. Investment in S&T globalisation was relatively lower than other areas (€ 94 million), but it had also been increased by 7.3 % compared to 2010. Regional innovation took up € 558 million, including regional research and manufacturing enhancement, as well as cluster or industrial complex development. One of the key initiatives is the **International Science and Business Belt (ISBB)** which was created under a new law by the Korean government in May 2011 to improve Korea's R&D infrastructure. The ISBB is a national growth system combining basic science and business, and is designed to build a creative research environment to attract outstanding human resources and to establish a 'Korean Silicon Valley'. Advancement of S&T infrastructure includes efforts to standardise technologies and protect intellectual property rights. One of the main initiatives of the ISBB is the newly opened (2012) Institute for Basic Science (IBS). IBS hopes to attract scientists from all around the world and become a guiding force for developing new technologies.

Nurturing S&T human resources and establishing a job-creating innovation system

Korea's global competitiveness in education is relatively strong, ranked first and third grade in the categories of mathematics and science at Trends in International Mathematics and Science Study in 2011. In an effort to improve creativity that is a key basis for science and research, to be balanced with mathematics, the **World Class University programme** of the former Ministry of Education, Science and Technology invites leading scientists to stay for three years teaching or researching at universities, or establishing new departments in their specialist fields. The government had also planned to set up basic plans for nurturing human resources in science and engineering by linking education and sciences to improve creative thinking methodologies.

Korea has also tried to establish a national innovation framework within which technology innovation leads to job creation. In 2011, the materials and components industry was targeted for job creation and regional development. The plan was to generate new jobs via technology trade SMEs and through new research-industry cooperation.

In addition, the government had begun to encourage investments that could lead to new value chains in R&D projects, beyond its traditional emphasis on the manufacturing industry.

A particular emphasis had been put on those patent policies that play an important role in technology innovation. Efforts were being made to eliminate threats from patent trolls and to actively conduct market research and patent analysis at the R&D planning stage.

Enhancing basic and fundamental research

The government set a target to invest half of its R&D funds to basic and fundamental research. The investments increased from 43.5 % in 2010 to 46.7 % in 2011. It had also increased funds for individual/project based basic research, which includes funding for young scientists and female researchers.

The **Global Frontier R&D Programme**, which supports key fundamental technologies of national importance (green technologies, nanotechnologies and other new growth engines), received € 32 million in 2011, greatly increasing from 2010's € 9.7 million. Research for public health has also been prioritised.

Another S&T policy priority is the development of the aforementioned International Science and Business Belt (ISBB), designed to enhance Korea's S&T capabilities, secure high value-added key technologies and create a virtuous cycle in R&D. There are three aims to the programme: to develop fundamental technologies, to become a hub for future-oriented industries, and to achieve regional development.

Securing and diffusing green technologies and future growth engines

Korea is the tenth largest energy consumer in the world with imports accounting for 97 %; and the ninth largest emitter of carbon dioxide. The country's CO2 emissions have increased 113 percent to 488.7 million tons in 2007 from 1990. The pecentage growth of greenhouse gases measured between 1990 and 2007 is the highest among the OECD member countries. To prevent further crisis as well as to boost national growth, in 2009 the Korean government announced the **Low Carbon, Green Growth Strategy** including a green growth national strategy and a Five-Year Green Growth Plan (2009–2013). Additionally, a Framework Act on Low Carbon Green Growth was enacted.

The government R&D investment in green technologies was set at around € 1.62 billion in 2011, slightly increased from 2010. The intention was to advance nuclear energy technology and develop new, renewable and sustainable energy supplies as well as conservation of environment. These programmes run in parallel with the expansion of government support for next-generation batteries and technologies for climate change mitigation (smart-grid, LED, green software, solar energy).

The Korean government had also planned to invest heavily in areas which are closely related to public health, and that have potential for growth. These include intelligent robotics, new materials and nanotechnologies, and biotechnology and medical sciences. Mainly, the government budget was directed towards three key areas – bio and medical sciences, energy and environment, and information and communication technologies. These areas are based on the **National Converging Technology Map in NBIC** (nanotechnology, biotechnology, information technology, and cognitive sciences) areas drawn up by the former Korean Ministry for Education, Science and Technology in September 2010, which is a flagship of future convergence technology in Korea by 2020.

Building a foundation for national competitiveness

'Big sciences' – space, satellite development and nuclear reactor technologies – continued to receive investment in order to drive national competitiveness. There were also efforts to secure marine and polar resources through the research programmes of both the former Ministry of Education, Science and Technology, and the Ministry of Land, Transport and Maritime Affairs.

With technology becoming more and more advanced, research ethics and public safety through S&T are receiving more and more attention and are also being evolved.

The demand for cooperation with developing countries is steadily increasing, as is international interest in a young workforce, natural resources and energy. Securing abundant natural resources and a relatively well-educated workforce from developing countries are regarded to be important factors to safeguard Korea's position in the field of S&T as Korea is faced with a lack of natural resources and a low birth rate. The former Ministry of Education, Science and Technology allocated € 13 million to related activities (2011).

Finally, participation of Korean researchers in international research programmes and exchange programmes is largely encouraged in the form of joint research, including the establishment of foreign research institutes in Korea, and the contribution of funds to foreign institutions to create more workplaces for Korean researchers.

Running international R&D programmes

Korea has global joint research programmes such as the **Global Research Laboratory (GRL) Programme** or the **Global Research Network (GRN) Programme**. There are also MoU-based cooperation activities such as international joint seminars, international collaborative research projects and researcher exchange. In addition, there are cooperation programmes by region including Korea-EU cooperation programmes, and cooperation programmes with single countries in North America, Europe, Asia and Africa. The total budget for international cooperation in S&T is around € 70.32 million for 2013.

In particular, the government runs a **matching-fund programme** for researchers who joined projects within the Seventh Framework Programme for Research and Technological Development (FP7). Each project receives maximum € 100,000 annually. As of October 2012, 53 Korean research institutions have participated in 47 FP7 projects amounting to a total of € 2.43 million EC financial contributions.

High-level cooperation between Korea and the EU

In order to ensure effective S&T cooperation between Korea and the EU, a governmental platform known as the Joint S&T Cooperation Committee was established in 2007 in accordance with the Agreement on the Scientific and Technology Cooperation between the EU and Korea in 2006. This Agreement stipulated a comprehensive cooperative relationship between the two sides. The role of the Joint Committee has been to exchange views and information on S&T policy issues, review and discuss cooperative activities and accomplishments, and mutually make decisions on the enhancement of further cooperation. Through these high-level dialogues, both parties make recommendations to each other, which include identifying and proposing cooperative activities between their respective research communities.

For supporting a sustainable partnership with the EU, Korea has been participating in an array of initiatives implemented through FP7 projects. So far, the three main projects which have acted as support instruments between the EU and Korea are:

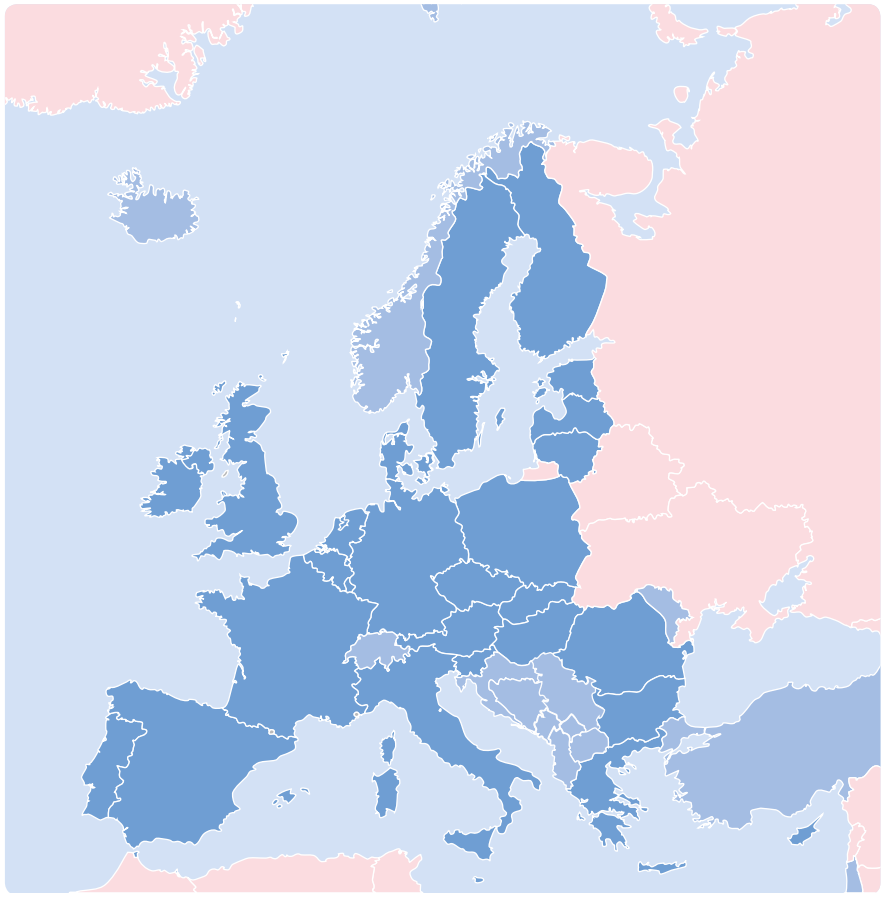
- KESTCAP (Korea-EU Science and Technology Cooperation Advancement Programme, 2008–2012)
- KORRIDOR (Stimulating and facilitating the participation of European researchers in Korean R&D programmes, 2009–2012)
- KORANET (An Initiative to Intensify and Strengthen S&T-Cooperation between Korea and the European Research Area, 2009–2013)

2.2. Why Europe?

Political commitment to research and innovation

R&D is often considered to be one of the key elements in the EU's bid to become the most dynamic and competitive economy in the world. The EU implements several activities to achieve this aim.

One of the three priorities of the **Europe 2020 strategy** is smart growth. This means developing an economy based on knowledge and innovation. To underpin this priority, the European Commission published the **Europe 2020 Flagship Initiative – Innovation Union** in October 2010. The 'Innovation Union' described in this report is one which tries to refocus R&D and innovation policy on major challenges for society, like climate change, energy and resource efficiency, health and demographic change. It will also strengthen every link in the innovation chain, from 'blue sky' research to commercialisation. Its aim is to improve framework conditions and access to finance for research and innovation, in order to ensure that innovative ideas can be turned into products and services that create growth and jobs. One of the EU targets in this respect is for combined public and private investment levels to reach 3 % of the EU's GDP, a target formulated in the Lisbon Strategy in 2000.



The EU member states and countries associated to the 7th Framework Programme

Investing in R&D

In 2010, R&D intensity stood at 1.91 % of GDP in the EU-27, which is far below Korea, (3.74 % in 2010). However, GERD as percentage of GDP is quite diverse in the EU, ranging from Finland (3.78 % in 2011) to Romania (0.5 % in 2011). In absolute numbers, the EU-27 dedicated € 235.75 billion to R&D (GERD at current prices and PPPs) in 2011, with three member states accounting for more than half of all R&D expenditure. Germany alone, with € 67.93 billion, made up more than one quarter of the total. This was followed by France, and the United Kingdom with € 38.43 billion and € 29.37 billion respectively.

As well as the 27 individual EU member states, the EU also funds research directly. Since its start in 1984, the **Framework Programme for Research and Technological Development** (FP) has been the EU's main instrument for funding research in Europe. The current 7th Framework Programme (FP7) runs from 2007–2013, after which its successor, the Horizon 2020 programme, will continue until 2020. Within FP7, € 50.5 billion are being invested in R&D and innovation. This represents a significant increase from the € 17.5 billion allocated in FP6 (2002–2006).

Most of the FP7 budget is spent on grants to research actors all over Europe and beyond, to co-finance research, technological development and demonstration projects. Grants are determined on the basis of highly competitive calls for proposals and a peer review process. In order to complement national research programmes, FP7-funded activities must have 'European added value'.

The broad objectives of FP7 are grouped into **four Specific Programmes**:

- **'Cooperation'** with 10 thematic key areas (health; food, agriculture, fisheries and biotechnology; information and communication technologies; nanosciences, nanotechnologies, materials and new production technologies; energy; environment including climate change; transport including aeronautics; socio-economic sciences and the humanities; space and security),
- **'Ideas'** implemented by the European Research Council (ERC) to finance frontier research on the basis of scientific excellence,
- **'People'** to support human resource development, researcher mobility and career development, both for researchers inside the EU and internationally, and
- **'Capacities'** to strengthen Europe's research capacities.

The EU is currently in a transition phase from FP7 to Horizon 2020 which will start in 2014. Horizon 2020 is the financial instrument for implementing the Innovation Union Flagship Initiative which integrates the **Framework Programme for Research and Technical De-**

velopment, the innovation related activities of the Competitiveness and Innovation Framework Programme (**CIP**) and the European Institute of Innovation and Technology (**EIT**). The budget that is currently under discussion for Horizon 2020 amounts to around € 70 billion.

The proposed support for research and innovation under Horizon 2020 will:

- Strengthen the EU's position in excellent science with a dedicated budget of € 24,598 million. This will provide a boost to top-level research in Europe, including an increase in funding of 77 % for the very successful European Research Council (**ERC**).
- Strengthen industrial leadership in innovation by € 17,938 million. This includes major investment in key technologies, greater access to capital and support for SMEs.
- Provide € 31,748 million to help address major concerns shared by all Europeans such as climate change, developing sustainable transport and mobility, making renewable energy more affordable, ensuring food safety and security, or coping with the challenge of an ageing population.

Investing in human resources

In 2010, the EU member states had a total of almost 1.6 million researchers in terms of full-time equivalents, a number that increased by almost 220,000 in five years. The highest numbers of researchers can be found in Germany (327,953), the United Kingdom (256,584) and France (239,612). The majority of EU researchers were employed in the business enterprise sector, followed by higher education.

The EU acknowledges that one of the main competitive edges in R&D is the quantity and quality of its human resources. The **'People' Specific Programme of FP7** is entirely dedicated to fostering human resources in research (for example, through initial training of researchers, life-long training, industry-academia pathways and partnerships). This Programme has a significant overall budget of more than € 4.7 billion, which represented a 50 % average annual increase over FP6.

Investing in research infrastructures

There are **eight major intergovernmental European research organisations** operating large-scale infrastructures already in existence in Europe.

Intergovernmental research in Europe
European Organisation for Nuclear Research (CERN)
European Fusion Development Agreement (EFDA), International Thermonuclear Experimental Reactor (ITER)
European Molecular Biology Laboratory (EMBL)
European Space Agency (ESA)
European Southern Observatory (ESO)
European Synchrotron Radiation Facility (ESRF)
Institute Laue-Langevin (ILL)
European X-Ray Free-Electron Laser (XFEL)

Table 2: Intergovernmental European research organisations

Research infrastructures are also supported as part of the **FP7 'Capacities' Specific Programme** (€ 1.8 billion over the duration of FP7).

Additionally, in 2002, the **European Strategy Forum on Research Infrastructures** (ESFRI) was set up to ensure a coherent and strategy-led approach to policy-making in research infrastructure in Europe. Its aim is to facilitate multilateral initiatives leading to better use and development of research infrastructure. The ESFRI is a strategic instrument to develop the scientific integration of Europe and to strengthen its international outreach. The latest ESFRI roadmap from 2008 lists 44 priority projects to improve research infrastructure in Europe. A further update of the ESFRI Roadmap, focusing on energy, food and biology, was published at the end of 2010. The main task of ESFRI is now to help the projects on the roadmap move towards implementation.

Fostering innovation

As mentioned before, the upcoming Horizon 2020 will merge the Framework Programme for Research and Technological Development (FP), the Competitiveness and Innovation Framework Programme (CIP) and the European Institute of Innovation and Technology (EIT) to facilitate the achievement of the goals of the Innovation Union Flagship Initiative. Through these strategic measures, synergies will be better harnessed and redundant structures avoided. Hence, the quantitative increase of financial means will also be accompanied by qualitative improvements which will ultimately lead to better and more marketable innovations.

The Innovation Union Scoreboard 2013 places EU member states into the following four country groups:

- Innovation leaders: Sweden, Germany, Denmark and Finland, all show a performance well above that of the EU average.
- Innovation followers: Netherlands, Luxembourg, Belgium, the UK, Austria, Ireland, France, Slovenia, Cyprus and Estonia all perform above the EU average.
- Moderate innovators: Italy, Spain, Portugal, Czech Republic, Greece, Slovakia, Hungary, Malta and Lithuania perform below the EU average.
- Modest innovators: The performance of Poland, Latvia, Romania and Bulgaria is well below that of the EU average.

In 2008, the EU set up the **European Institute of Innovation and Technology** (EIT) in Budapest to address Europe's innovation gap. The EIT will be a key driver of sustainable European growth and competitiveness through the stimulation of world-leading innovations which could have a positive impact on the economy and society. The mission of the EIT is to grow and capitalise on the innovation capacity and capability of actors from higher education, research, business and entrepreneurship from the EU and beyond, through the creation of highly integrated **Knowledge and Innovation Communities** (KICs). Since 2009, three KICs were designated.

Knowledge and Innovation Communities
Climate Change Mitigation and Adaptation (Climate-KIC)
Sustainable energy (KIC InnoEnergy)
Future Information and Communication Society (EIT ICT Labs)

Table 3: Knowledge and Innovation Communities

A dedicated EU funding programme, the **Competitiveness and Innovation Framework Programme (CIP)** targets small and medium-sized enterprises (SMEs), supports innovation activities (including eco-innovation), provides better access to finance and delivers business support services. The CIP runs in parallel with FP7 from 2007 to 2013 with an overall budget of € 3.6 billion.

EUREKA is an intergovernmental network launched in 1985, to support market-oriented R&D and innovation projects by industry, research centres and universities across all technological sectors. It is composed of 41 members, i.e. 40 member countries and the EU. EUREKA's EUROSTARS Programme is the first European funding and support programme to be specifically dedicated to research-performing SMEs. Korea became an associated member of EUREKA in 2009. Since then, 19 projects

have been started under EUREKA involving Korean partners, two of which are EUROSTARS projects.

Creating a borderless European Research Area

The **European Research Area** (ERA) encompasses 40 countries regardless of their membership in the EU. Currently, it includes not only the EU-27 countries but also Switzerland, Israel, Norway, Iceland, Liechtenstein, the Faroe Islands as well as EU candidate and potential candidate countries in South Eastern Europe (such as Albania, Bosnia and Herzegovina, Croatia, FYR of Macedonia, Montenegro, Serbia and Turkey). All these countries are countries associated to FP7. Set up in 2000, the idea of the ERA was to overcome the fragmentation of research in Europe along national and institutional barriers. It was given new impetus in 2007 with the European Commission's Green Paper on the ERA. In 2008, the Council set in motion the Ljubljana Process to improve political governance of ERA and adopted a shared ERA 2020 vision. According to the opening statement of this vision, by 2020, all players should benefit from: the free circulation of researchers, knowledge and technology (the 'fifth freedom') across the ERA; attractive conditions for carrying out research; investing in R&D intensive sectors in Europe; and healthy Europe-wide scientific competition, together with the appropriate level of cooperation and coordination.

COST is an intergovernmental framework for European cooperation in S&T, allowing the coordination of nationally-funded research on a European level. COST does not fund research itself but provides a platform for European scientists to cooperate on a particular project and exchange expertise. These projects are called COST Actions, centred around research projects in fields that are of interest to at least five COST countries.

Defining common priorities

With the **Flagship Initiative 'Innovation Union'**, the EU will complete the ERA through the development of a strategic research agenda focused on challenges such as energy security, transport, climate change, resource efficiency, health and ageing, environmentally-friendly production methods and land management. More than thirty action points are contained in the 'Innovation Union'. These include groundbreaking proposals like the **European Innovation Partnerships**, which bring together public and private actors at EU, national and regional level to tackle the aforementioned common challenges.

In line with the above mentioned challenges, Horizon 2020 will presumably focus on the following societal challenges:

- Health, demographic change and well-being;
- Food security, sustainable agriculture, marine and maritime research, and the bio-economy;
- Secure, clean and efficient energy;
- Smart, green and integrated transport;
- Inclusive, innovative and secure societies;
- Climate action, resource efficiency and raw materials.

Strengthening the knowledge triangle

In a globalised world, the EU has to support the translation of scientific knowledge into patented processes and products for use in high-tech industries. One of the aims of the Flagship Initiative 'Innovation Union' is therefore to promote knowledge partnerships, to strengthen links between education, business/innovation and research and to promote entrepreneurship by supporting young innovative companies.

European Technology Platforms	
Energy	Production and processes
European Biofuels Technology Platform (EBTP)	European Construction Technology Platform (ECTP)
European Technology Platform for Electricity Networks of the Future (SmartGrids)	European Steel Technology Platform (ESTEP)
European Wind Energy Technology Platform (TPWind)	European Platform on Sustainable Mineral Resources (ETP SMR)
European Photovoltaic Technology Platform	Future Manufacturing Technologies (Manufuture)
Zero Emission Fossil Fuel Power Plants (ZEP)	Future Textiles and Clothing (FTC)
Sustainable Nuclear Energy Technology Platform (SNE-TP)	Water Supply and Sanitation European Technology Platform (WSSTP)
Renewable Heating & Cooling (RHC)	European Technology Platform for Sustainable Chemistry (SusChem)
ICT	Advanced Engineering Materials and Technologies (EuMat)
Advanced Research and Technology for Embedded Intelligence and Systems (ARTEMIS)	European Technology Platform on Industrial Safety (ETPIS)
European Nanoelectronics Initiative Advisory Council (ENIAC)	Transport
Integral Satcom Initiative Technology Platform (ISI)	Advisory Council for Aeronautics Research in Europe (ACARE)
Mobile and Wireless Communications Technology Platform (eMobility)	European Rail Research Advisory Council (ERRAC)
Networked and Electronic Media (NEM)	European Road Transport Research Advisory Council (ERTRAC)
Networked European Software and Services Initiative (NESSI)	European Technology Platform Waterborne
European Technology Platform on Robotics (EUROP)	European Space Technology Platform (ESTP)
European Platform on Smart Systems Integration (EPoSS)	
European Technology Platform for Photonics (Photonics21)	
Bio-based economy	
Farm Animal Breeding and Reproduction Technology Platform (FABRE)	
Food for Life (Food)	
European Technology Platform for Global Animal Health (GAH)	
Nanotechnologies for Medical Applications (Nanomedicine)	
Plants for the Future (PLANTS)	
Forest-based Sector Technology Platform (FTP)	

Table 4: European Technology Platforms

To strengthen the links with the industry, **European Technology Platforms** (ETPs) were set up in research areas such as energy, ICT, bio-based economy, production and processes and transport. ETPs are bottom-up industry-led stakeholder forums charged with defining research priorities and action plans on a number of technological areas where achieving EU growth, competitiveness and sustainability requires major research and technological advances in the medium to long term. The European Commission has supported the development of ETPs and has carried out a facilitation role.

Joint Technology Initiatives (JTIs) are a means to implement the strategic research agendas of a limited number of ETPs. In these few ETPs, the scale and scope of the objectives is such that loose coordination through ETPs and support through the regular FP7 instruments are not sufficient. Instead, effective implementation requires a dedicated mechanism that enables the necessary leadership and coordination to achieve the research objectives. JTIs are a new way of realising public-private partnerships at the European level in the field of industrial research.

Joint Technology Initiatives
Innovative Medicines Initiative (IMI)
Embedded Computing Systems (ARTEMIS)
Aeronautics and Air Transport (Clean Sky)
Nanoelectronics Technologies 2020 (ENIAC)
Hydrogen and Fuel Cells Initiative (FCH)

Table 5: Joint Technology Initiatives

Improving framework conditions for research and innovation

Through the Flagship Initiative 'Innovation Union', the framework conditions for businesses to innovate will be improved. This will include the creation of the single EU Patent and a specialised Patent Court, the modernisation of the framework of copyright and trademarks, an improved access of SMEs to intellectual property protection, the speeding up of setting interoperable standards, and the improved access to capital. The Agreement on the Unified Patent Court was signed by 24 EU Member States on 19 February 2013. It will need to be ratified by at least 13 states, including France, Germany and the United Kingdom to enter into force. The Agreement creates a specialised patent court with exclusive jurisdiction for litigation relating to European patents and European patents with unitary effect (unitary patents).

Opening up the ERA to the world

The international dimension is considered an important additional component of the ERA. The EU encourages international cooperation through the 'International cooperation' subprogramme of the **'Capacities' Specific Programme of FP7** (a total of € 180 million was earmarked over the duration of FP7), as well as through bilateral S&T agreements with non-European partner countries.

Whereas the 'International cooperation' subprogramme specifically targets countries that are neither EU member states, nor countries associated to FP7, it should be stressed that FP7 is in general open for the participation of **International Cooperation Partner Countries** (ICPCs) and industrialised countries. Project partners from Korea have to attract own funding since it is part of the latter category. In some well-argued cases the EU even provides co-funding for the Korean partner (e.g. if the research project could not be carried out without the Korean partner). For the about 140 countries which are currently designated as ICPCs funding is provided via the EU. Detailed eligibility criteria for their participation are laid down in the individual FP7 calls for proposals.

As a key component to broaden the ERA, in September 2008 the European Commission adopted a **Strategic European Framework for International Cooperation in Science and Technology** based on a long-term partnership between the member states and the European Community. A **Strategic Forum for International Scientific and Technological Cooperation** (SFIC) was also installed in 2008 to facilitate the further development, implementation and monitoring of the international dimension of the ERA.

As a next step, the Commission adopted a **Communication 'Enhancing and focusing EU international cooperation in research and innovation: a strategic approach'** in September 2012. The Communication sets out a new strategy for international cooperation in research and innovation, hereby addressing the further development of the external dimension of the ERA. The core principle of the strategic approach is that international cooperation in research and innovation is not an end in itself but a means for the EU to achieve its higher level objectives, in particular by:

- strengthening the Union's excellence and attractiveness in research and innovation and its economic and industrial competitiveness;
- tackling global societal challenges, such as food and energy security and climate change;
- supporting the Union's external policies.

To achieve these objectives, the strategy will follow a dual approach:

- Horizon 2020 will be open to participation from entities from across the world, although the approach to providing funding from the EU budget to these entities will be revised. Through this general opening, European researchers will be free to cooperate with their third country counterparts on topics of their own choice;
- To complement the general opening, targeted activities will be developed where cooperation will be sought on particular topics and with well identified countries and/or regions.

A number of cross-cutting issues will also be an integral part of the strategy:

- The partnership with the EU member states will be strengthened, building on the work of the aforementioned SFIC to facilitate the further development, implementation and monitoring of the international dimension of ERA;
- Common principles for the conduct of international research and innovation activities will be developed and promoted together with key international partners, in order to create a global level playing field;
- Research and innovation will make a stronger contribution to the Union's external policies.

3. What the statistics say

3. What the statistics say

This chapter describes the current situation of R&D performance based on data available in spring 2013 as well as the pattern of international S&T cooperation between Korea and Europe. The key figures presented here measure R&D activity in Korea and the European countries, including levels and sources of investment in R&D, performance indicators in the form of figures on patents and scientific publications/citations, human resources and researcher mobility, as well as levels of participation in European Framework Programme (FP) projects.

3.1. Financial investment in research and development

The main aggregate used for international comparisons of R&D expenditure is **gross domestic expenditure on R&D (GERD)**, which represents a nation's domestic R&D-related expenditure for a given year. Increased levels of R&D expenditure are an important tool in achieving the goals of the Europe 2020 Strategy, which set a target of 3 % of GDP investment in R&D by 2020. Korea's GERD was € 40.46 billion (2010), with **R&D intensity (GERD as a % of GDP)** recorded at 3.74 % (2010). Compared with the different EU member states, this puts Korea only after Finland as the EU country with the highest R&D intensity.

The R&D intensity performance of Korea and Finland is strongly related to a specialisation in ICT (an R&D intensive sector), rather than to a particularly high propensity to invest in R&D from the public sector. In the EU-27, GERD was € 241.97 billion (2011), with an R&D intensity of 1.94 %.

R&D has various **sources of financing**. Of these, the four that are generally taken into account in statistics are government, industry, other national sources and funds from abroad (see figure 2). In 2010 in Korea, the highest share of funding came from industry (71.8 %) followed by government (26.7 %). The situa-

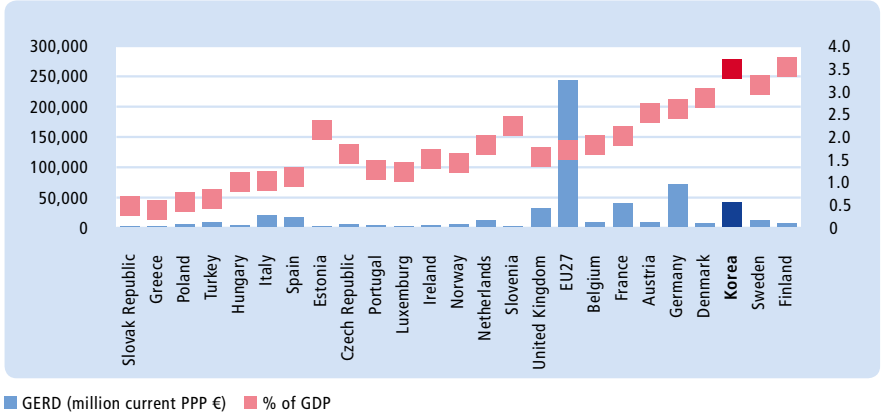


Figure 1: GERD at current PPPs and GERD as a percentage of GDP (2011 or latest year available)
Source: OECD Main Science and Technology Indicators 2012/2

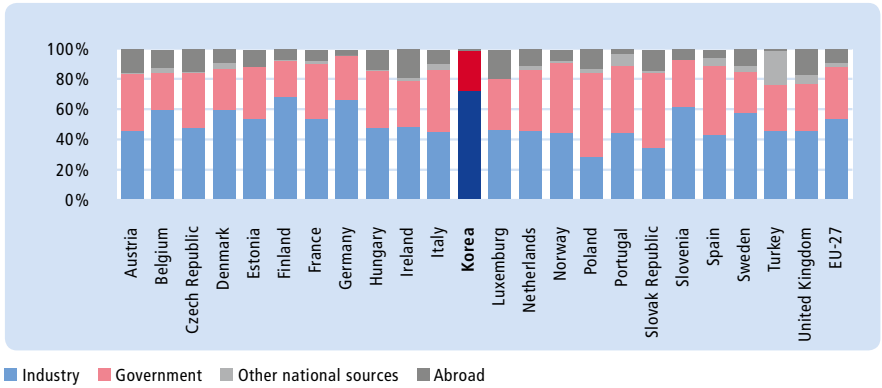


Figure 2: GERD by source of financing (2011 or latest year available)
Source: OECD Main Science and Technology Indicators 2012/2

tion is similar in Finland and Germany. At the other end of the extreme lie countries such as Poland and the Slovak Republic, where only about 1/3 of financing comes from industry sources and more than half from government. On average, industry accounted for only 54.3 % of the financing in the EU-27 (government 35.3 %) in 2010.

R&D is performed by different sectors. The four **R&D performers** that are generally taken into account are business enterprises, government, higher education and the private non-profit sector. Korea has the highest share of R&D expenditure performed by business enterprises, which stood at 74.8 % in 2010. In the EU-27, the number stood at 61.7 % (2011), followed by 24.1 % (2011) performed by the higher education sector (as compared to 10.8 % in Korea (2010)).

3.2. Human resources and researcher mobility

Investment in human capital is one means for a country to develop a competitive and knowledge-based economy. S&T development has been placed at the core of both Korean and EU policies, with an ever increasing interest in the role and measurement of skills of labour forces.

One objective for both Korean and European research systems is to attract and retain highly qualified staff and students to support their research capabilities. The **number of researchers** across Europe and in Korea has increased between 1995 and 2010, an increase which has been particularly considerable in Korea in recent years. In 2010 there were 264,118 full-time equivalent researchers in Korea, which marked an increase of 64,128 full-time equivalent researchers compared with 2006. In the EU-27 countries, the number of full-time equivalent researchers was nearly 1.6 million in 2010, with 1/5 of them working in Germany and 1/6 in the United Kingdom.

In Korea, a breakdown of the **number of researchers by institutional sector** in 2010 showed that with 76.5 % most researchers were concentrated in the business enterprise sector, while 14.9 % worked in the higher education sector and only 7.5 % in the government sector. In the EU-27 (2010), 44.9 % worked in business enterprises, 41.5 % in higher education and 12.3 % in the government sector. In Poland, Portugal, the Slovak Republic and the United Kingdom, by contrast, the majority of researchers (over 60 %) is employed in the higher education sector, as shown in figure 3.

In particular, researchers qualified in science and engineering (S&E) can be key resources for research performing organisations.

Overall, the average of the 20 European countries for which information is available for the **percentage of S&E doctoral degrees of all new degrees awarded at doctorate level** is around 42.2 % (see figure 4), Korea's ratio is reported at 33.7 %. However, there are differences among countries in the balance of the S&E doctoral degrees obtained. For instance, in France, the United Kingdom, Germany, Spain and Ireland almost 2/3 of the total S&E doctoral degrees were obtained in science. The situation is opposite in Finland, Denmark, the Netherlands, Sweden and the Slovak Republic where the majority of new S&E doctoral degrees was obtained in engineering. This difference suggests that the mix of skills learned in universities differs across countries, possibly owing to differences in labour market demand, salaries and perceived career opportunities.

The vast majority of Korean researchers is male. In 2010, only 16.7 % of all researchers (based on headcount) in Korea were female, compared to more than 40 % in Portugal, the Slovak Republic and Estonia and 33 % in the EU-27 (in 2009).

3.3. Patents

Patents are indicators of invention and there is a positive relationship between patent counts and other indicators of inventive performance such as productivity and market share. A country's statistics on patents can also indicate its level of cooperation in S&T – looking at the number of patents involving inventors who live in different countries gives a basic picture of the extent of international collaboration. The number of patents whose inventors and owners live in different countries (an invention

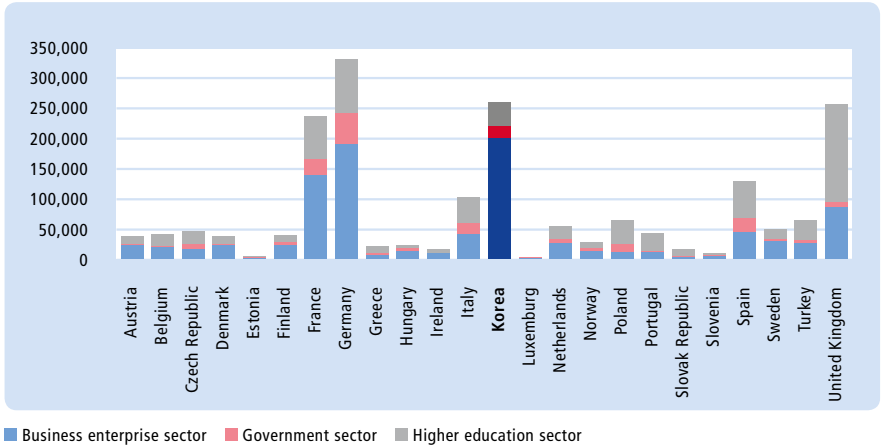
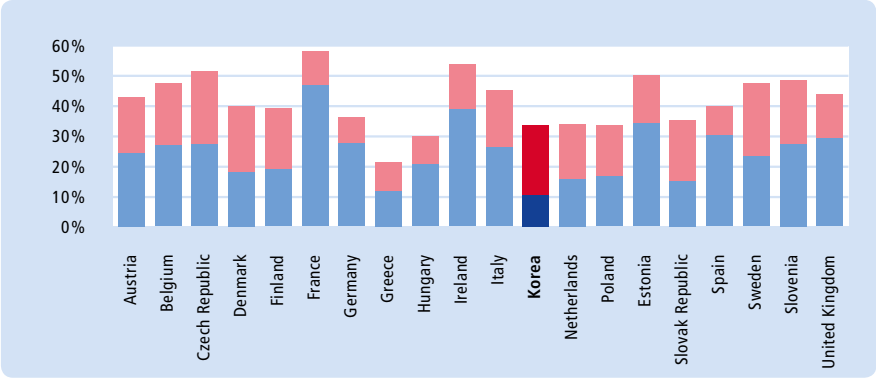


Figure 3: Number of full-time equivalent researchers by institutional sector (2011 or latest year available)
Source: OECD Main Science and Technology Indicators 2012/2



Science / Engineering doctorate degrees in % of all new degrees awarded at doctorate level

Figure 4: Science and engineering graduates at doctorate level, 2009
Note: The category "Science" includes life sciences, physical sciences, mathematics, statistics and computing; engineering comprises engineering and engineering trades, manufacturing, processing, architecture and building.
Source: OECD Science, Technology and Industry Scoreboard 2011

made in country A is owned by a firm based in country B) also reflects cross-border ownership of technology. The number contains information about the extent to which foreign firms control domestic inventions; and the extent to which domestic firms control inventions made by residents of other countries.

Korea's strengths in ICT are reflected in the number of **patents filed in the ICT sector** under the Patent Cooperation Treaty. In 2011, Korea filed 3,692 patents in this research field (a huge increase compared to the 43 patents filed in 1995). In the EU, about 11,942 ICT patents were filed in 2011.

When comparing country data for patents, **triadic patent families** (for example, patents for inventions filed at the European Patent Office and the Japan Patent Office as well as granted at the United States Patent and Trademark Office) are a useful focus for higher value patents, and they remove the influence of home advantage. The triadic patent data (2010) show that at world level Japan accounted for 31 % of all filed triadic patents, followed by the EU-27 countries with 28 % (of which 11 % from Germany) and both succeeded by the United States (28 %). In comparison, Korea accounts for 4.4 % of all triadic patent families.

The extent of **international co-patenting** differed significantly between the various European countries, with figures ranging between 18 % and 63 % of all patent applications filed in 2010. During this time, the percentage of patent applications with co-inventors located abroad was particularly high in Luxembourg (63 %), Latvia (55 %), Romania (46 %), Cyprus (43 %) and Belgium (43 %). Compared to the EU-27 average of 10 %, Korea's share of international co-patenting is the lowest, at 3 %. When Korea did co-patent internationally, it did so with the United States rather than Europe.

3.4. Publications

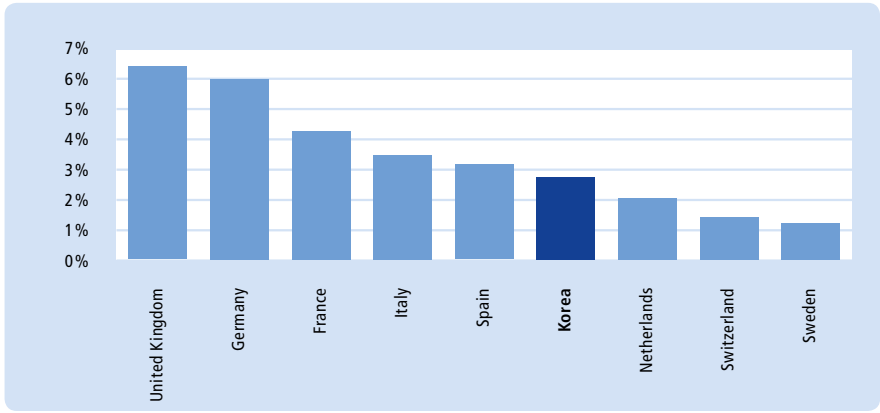
The **number of scientific publications** published gives an indication of the level of knowledge production. In recent years Korea has increased its share of the world's scientific literature – recording fast growth in Scopus-listed papers. In output of published papers, Korea recorded 63,283 papers in 2011. By comparison, the United Kingdom published 150,778, Germany 141,082, France 101,222 and Italy 80,443. The number of Scopus-listed papers per hundred researchers (full-time equivalent) was the lowest in Korea, at 24 in the same year.

Korea's overall share of scientific publications in the Scopus database was 2.7 % in 2011 compared to 6.3 % for the United Kingdom and 5.9 % for Germany, and its world rank based on the number of Scopus-listed publications was 12th in 2011. The EU-27 accounted for about 29.5 % of the world's publications in 2011.

Korea's strongest performance – in absolute numbers – was in the fields of materials sciences, engineering, computer sciences, medicine, physics and astronomy, biochemistry, genetics as well as molecular biology and chemistry. When compared internationally, Korea is best ranked in materials science (rank 5 worldwide), engineering (rank 6 worldwide), chemistry, chemical engineering and nursing (all three rank 8 worldwide) in 2011. Figure 6 shows Korea's share of publications worldwide in these fields in comparison with the strongest EU countries in scientific publishing.

3.5. Participation in European projects

Korea's **involvement in the Framework Programmes** has been steadily increasing since it started its participation in 1985. Under FP5 Korea participated in only eight projects. This figure increased to 19 under FP6; and to 47 under FP7 (as of October 2012). The research fields in which Korean partners are most active are ICT, health and research infrastructures. Institutions from Germany with 109 project partners, France with 93, the United Kingdom with 91, Italy with 68 and the Netherlands with 49 project partners in total are most frequently involved in these 47 FP7 projects with Korea.



% of share worldwide 2011

Figure 5: World share of Scopus-listed papers 2011 (Korea and selected European countries)
Note: European countries are those countries with highest numbers of publication output 1996–2011 in Europe (ScimagoJr)
Source: Scopus (query: 21. 3. 2013)

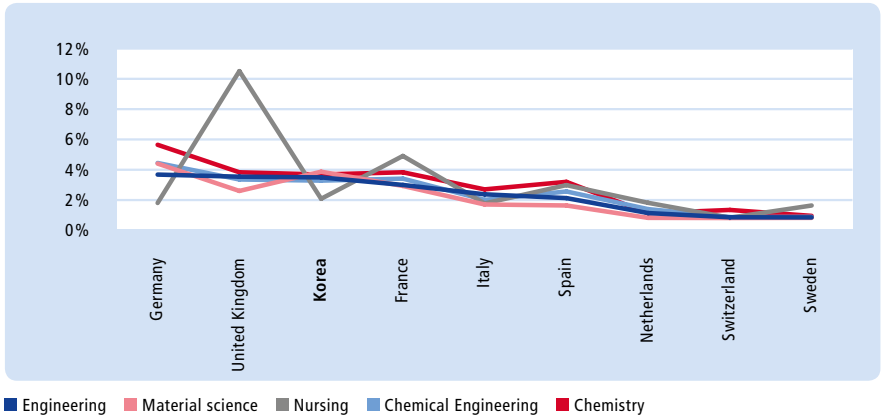


Figure 6: World share of Scopus-listed papers in Koreas top 5 ranked subject areas (2011)
Note: European countries are those countries with highest numbers of publication output 1996–2011 in Europe (ScimagoJr)
Source: ScimagoJr (query: 1. 3. 2013)

Korea ranks 25th in the number of FP7 applications of third countries (countries other than EU member states and FP7 associated countries). However, the Korean FP7 applicant success rate of about 26.8 % is considerably higher than the average third country success rate of 23.4 %. Most of the higher ranked countries are eligible to get funding from the EC compared to Korea which, as a high income country is normally not eligible to receive an EC financial contribution to cover costs related to the participation in the projects. Therefore, the Korean government is running a matching-fund programme for researchers who join projects within the FP7 (see also chapter 2). To encourage the participation of Korean researchers in FP7, the Korean government has allocated special funds to FP7 promotion and has established a Korean network of FP7 National Contact Points (NCPs). Korea also has a scientific attaché in residence in Belgium, and was involved in specific FP7 international cooperation projects such as KORANET, KESTCAP and KORRIDOR that aimed at enhancing S&T cooperation between Europe and Korea in all fields of research (further details on these three projects are given in chapter 4). Through government dialogue platforms such as the EU-Korea Joint S&T Cooperation Committee and Korea's synergy of its national programmes with themes specific to the ERA, opportunities for collaboration have increased between Korean researchers and their counterparts in Europe.

4. Policy instruments for cooperation

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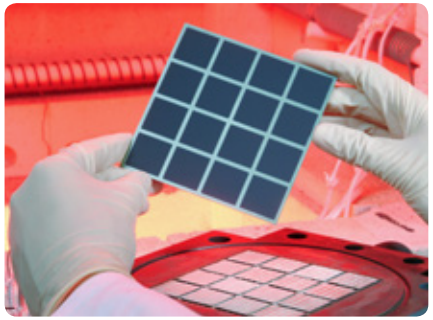
This chapter presents the main policy instruments used at bilateral and EU levels to promote collaborative R&D between Korea and Europe.



4.1. S&T cooperation agreements and joint committees

Bilateral S&T agreements between governments have been a long-standing feature of policies to promote the internationalisation of S&T. Korea has bilateral S&T agreements with a number of EU member states, for example with Denmark, France, Germany, Italy, Sweden and the United Kingdom. These agreements usually are formal national-level initiatives (formal contracts, treaties or MoU between national or sometimes regional administrations) to promote S&T cooperation between two countries. In practice however, the majority of bilateral agreements in the EU remain expressions of a general willingness to collaborate over a broad scientific area. Taking into account the quantity of the agreements in existence may, therefore, be a reflection of bureaucratic measures rather than actual scientific activity. In addition to governmental bilateral S&T agreements, individual research institutions, funding agencies or higher education institutions also sign S&T agreements with their counterparts to enhance cooperation in selected scientific areas or through cooperation programmes.

Korea, by contrast, has taken a different approach to bilateral agreements. Unlike many European countries, it has instead been building up more concrete and specific (but not strategic) programmes based on formal agreements. These basic or high level formal documents then act as a broader 'umbrella communication' system, and within the frameworks of these, subsequent policies or specific funding programmes of support and activities are moulded and developed. These formal agreements facilitate the funding of international cooperation between the countries involved, and can also serve as a means to persuade partner countries to set aside dedicated budgets for collaboration.

The implementation of bilateral S&T cooperation agreements is usually supported by the work of **joint committees** at ministerial or governmental level. These committees which meet regularly (usually every 2 years) decide on bilateral activities and measures such as the organisation of workshops or the setting up of programmes and exchange mechanisms to enhance the cooperation of researchers.

The overall bilateral relations between the EU and Korea are governed by a **Framework Agreement** which was recently updated along with the bilateral **Free Trade Agreement**. Both agreements entered into force on 1 July 2011. The Framework Agreement enables both parties to engage in rapidly evolving political

and economic relations. In addition, Korea's involvement in the EU Framework Programme dates back over a decade and it is supplemented by an EU-Korea EURATOM Agreement, as well as an Agreement under the ITER-fusion energy project.

The European Community also has a formalised bilateral S&T agreement with Korea, which entered into force in March 2007. This agreement includes a framework and a privileged forum to identify common interests, priorities, and the necessary tools for S&T collaboration. In addition, an **EU-Korea Cooperation Roadmap in Science, Technology and Innovation** has been formulated. The second roadmap covers the years 2011 to 2013. To keep the information exchange alive, a Joint S&T Cooperation Committee has been set up via the EU-Korea cooperation agreement. It provides for the parties to meet regularly at Senior Official level alternately in Korea and in the EU. The third meeting of the Joint Committee took place in Seoul on 7–8 July 2011. At this meeting the EU and Korea agreed to reinforce cooperation, in particular in the areas of energy, nano and industrial technologies, ICT and mobility of researchers. Both sides agreed to organise the 4th Joint Committee Meeting in June 2013 in Brussels to review progress.

4.2. Science counsellors at embassies

Several EU member states (e.g. France, Germany, Italy, United Kingdom) have established dedicated science counsellors in their embassies in Seoul. Other embassies require their counsellors for economy or culture to additionally cover S&T issues. Science counsellors monitor the science, technology and innovation landscape in Korea and inform their governments on latest developments, network with researchers and relevant industry located in Korea and build a bridge between their science communities and the host country.

Korea also has science counsellors posted in several EU member states and one in Brussels to deal with EU S&T relations.

4.3. Funding for exploratory visits and workshops

The most popular strategy across many European countries and in Korea has been the creation of small scale funding for workshops, exploratory visits or brokerage missions. This provides seed funds to initiate international cooperative projects and to stimulate networking and matchmaking activities between domestic and foreign researchers. Small scale funding can be used to cover costs of international conferences, seminars and exhibitions.

Most countries have also set aside additional or preferential funding for international R&D projects to foster international collaboration. Korea has also put in place this kind of direct funding for research.

4.4. Measures to enhance researcher mobility and exchange

The basic linkages and networks that are vital for successful collaboration are to a large extent developed via mobility programmes. Countries such as Denmark, France, Germany, Italy and the UK have run mobility programmes with Korea for many years.

In most countries, policies designed to encourage researcher mobility share a common nature and rationale, rooted in an attempt to cope with situations that could cause skill shortages and economic losses in a country. Nevertheless, there are noticeable differences between these policies in different countries, and various measures have been developed to attract researchers. These range from **incoming fellowship programmes** to the removal of barriers, and providing information to make mobility easier. In some countries, barriers to mobility are being removed through policies designed to simplify the inflow of foreign talent. These policies are accompanied by **changes in immigration, legislation or taxation** – as immigration law can be instrumental in attracting, retaining, and developing foreign talent in a country; and strict immigration and work permits regimes can deter highly skilled emigrants from undertaking overseas work and study. Countries such as Austria, Germany, Italy and the United Kingdom have simplified their immigration procedures for highly skilled people; some countries have also introduced measures to reduce income tax or social security contributions.

Many European countries as well as Korea have **outgoing fellowship programmes** in place for local talent. However, the existence of **return programmes** – for example, a requirement for delegated scientists to return with the experience gained at foreign institutions – varies from country to country. Measures like this can be vital in transforming the problem of brain-drain into an asset for the S&T system. Returning researchers can strengthen scientific capacity in their home country. Even when they do not return, maintaining linkages with them can play an important catalytic role in the development of domestic innovative capabilities through the cross-fertilisation of skills and techniques and exchange of knowledge. In particular, Austria, Finland, Germany and Hungary have follow-up measures to maintain relationships with fellows from their countries staying abroad or even foreign fellows that have returned to their home countries. Germany, for example, has been running the ADeKo network (Alumni network Germany-Korea) since 2007. This network unites Koreans who have undertaken studies, research or business in Germany through offering thematic events, workshops and other exchange possibilities. In addition, many European countries have accreditation programmes for foreign qualifications.

Mobility of researchers within Europe is also supported by **EURAXESS – Researchers in Motion**, a unique web portal providing access to a complete range of information and support services for European and non-European researchers wishing to pursue research careers in Europe. It includes a job database, information about rights and duties of researchers and employers and has established a network of more than 200 service centres which assist researchers and their families in organising their stay in a foreign country. In addition, a special networking tool for European researchers working in selected non-European countries (ASEAN, China, India, Japan and United States) was also set up.

4.5. Creation of joint institutes and research centres and funding of large-scale research

Joint international activities can also be performed under joint institutes or research centres. Joint institutes are usually established at institutional level and are much more focused on strategic areas with prioritised partners. This kind of collaborative model has been developed in several countries.

The France-Korea Particle Physics Laboratory (FK-PPL) is an example for a virtual International Associated Laboratory (ILA) implemented by CNRS and the Korean Institute of Science & Technology Information (KISTI) in cooperation with several French Research Universities. Another ILA is the Centre for Photonics and Nanostructures, a collaboration involving CNRS, the Joseph Fourier University and the École Centrale de Lyon, as well as the Korea Institute of Science and Technology (KIST) and the Korea Advanced Institute of Science and Technology (KAIST). Institut Pasteur Korea (IP Korea) is an institute located near Seoul. Its mission is to improve the speed and reliability of drug discovery through cellular models, high content screening, and medicinal chemistry. IP Korea was established in 2003 as a collaboration between the Institut Pasteur in Paris and KIST. A joint research centre in nanophotonics & spintronics involving the University of Strasbourg (IPCMS) and the Ewha Womans University, Seoul was established in October 2010.

Similar collaborative models have been developed by German research organisations such as Max Planck Society and Fraunhofer Gesellschaft. They actively established joint ventures, joint institutes or joint centres in some selected countries in Europe and non-European countries linked with local universities or university-related institutes. For example, two Max Planck Centres were recently established in Korea devoted to Attosecond Science (MPC-AS) and Complex Phase Materials. The former includes partners from Australia, China, Japan, Korea and the Max Planck Society of Germany. In 2010, two virtual joint institutes were established with the help of funding from the German Federal Ministry of Education and Research (BMBF): an institute on algae biotechnology (Berlin University of Technology and Dongseo University in Busan) and on Nanobiotechnology (JINBiT, University of Münster and Gwangju Institute of Science and Technology).

Korea also participates in international large-scale infrastructures and research projects such as the International Thermonuclear Experimental Reactor (ITER) and the European Organization for Nuclear Research (CERN). ITER is a large-scale scientific experiment that aims to demonstrate the possibility of producing commercial energy from fusion. Korea has a cooperation agreement with CERN, the world's largest laboratory, since 2006.

4.6. Incentives for multinational firms

Fiscal, administrative and other incentives are an important tool for fostering R&D and for attracting international R&D companies. Several European countries and Korea have already introduced policy measures around changes to the R&D strategies of large multinational corporations (MNCs). International activities of MNCs used to be largely focused on production and marketing. However, with recent shifts towards a focus on the creation of new technology, and tapping into local fields of expertise and home-made innovations, there is increasing scope for less developed countries to be successful locations for MNCs. Policy measures promoting activities to attract investments of multinational firms therefore focus on the creation of technological capacity in a country; facilitating the creation of a favourable environment for foreign direct investment (FDI).

Diverse support policies to encourage foreign R&D investments are being developed in many countries. These include direct incentives such as grants, loans, and tax incentives and indirect incentives, such as providing administrative support or subsidised locations for R&D facilities of MNCs; creating clusters as key vehicles for attracting inward foreign R&D investments; and promoting national systems (by using marketing to attract FDI in R&D, generally done through embassies or foreign branches of local S&T institutions). France and Hungary are particularly active in using such diverse policy instruments to attract foreign technological activity. Currently, Korea provides grants as a direct financial incentive, but also uses the range of indirect incentives described above, as well as promoting its national R&D systems abroad.

Many studies have shown a correlation between R&D tax incentives and increases in private research spending within individual countries. Although it is difficult to relate heightened R&D intensity directly to fiscal measures, on average, tax incentives appear to increase private research spending by an amount equal to the loss in tax revenue. Tax cuts for foreign firms are one such measure, but there are also other R&D tax provisions which are used to various extents to incentivise. The design of R&D tax relief depends on the general configuration of a country's tax system and the particular policy goals being pursued.

In addition to the above policy measures, governments in many countries are actively providing partner search services and consulting services for legal, technical and managerial issues, as well as support for finding international partners to encourage links between domestic research and foreign sources of excellence. Some countries have formulated more proactive strategies – such as the establishment of off-shore units, liaison offices or agencies to facilitate information exchange.

4.7. EU projects to support collaboration

Since the start of the Korean-EU S&T agreement in 2007, the European Commission has been supporting the promotion of closer cooperation between Korean and European scientists through several dedicated projects financed in the 'Capacities' Specific Programme (International Cooperation) of FP7.

- **KORANET** (2009–2013), an ERA-NET with the general aim of strengthening the research partnership between Korean and European researchers. This includes the preparation and implementation of joint calls to fund networking projects with the support of European and Korean funding agencies and ministries.

- **KESTCAP** (Korea-EU Science and Technology Cooperation Advancement Programme, 2008–2011) was a BILAT project with a focus on promoting FP7 in the Korean research community. It aimed to develop S&T cooperation strategies between the European Research Area (ERA) and Korea; disseminate S&T information, and enable joint events between EU and Korea. The KESTCAP partners were the National Research Foundation of Korea (also coordinator), the

Korean Ministry of Education, Science and Technology and the Korea Institute of Science and Technology Europe Forschungsgesellschaft mbH.

- **KORRIDOR** (Stimulating and Facilitating the Participation of European Researchers in Korean R&D, 2009–2011) was an ACCESS4EU project that aimed to identify Korean funding programmes open for the participation of European researchers, and to increase European researchers' awareness of these programmes. The partners involved in KORRIDOR were the Korea Institute of Science and Technology Europe Forschungsgesellschaft mbH (also serving as coordinator), the International Bureau of the BMBF at the German Aerospace Centre, Germany, the French Centre National de Recherche Scientifique, the Korea Institute for the Advancement of Technology, and the National Research Foundation of Korea.

The **follow-up project KONNECT** which will be coordinated by the Korean National Research Foundation (NRF) that will combine the strengths and results of the aforementioned three projects will be launched during autumn 2013. This new generation of BILAT project aims to support the institutional dialogue under the bilateral S&T agreement between the EU and the targeted country and to contribute to the implementation of the roadmap defined by the Joint S&T Cooperation Committee. In addition, it will strengthen and coordinate the bilateral S&T policy dialogue and programmes of EU member states vis-à-vis Korea. The new BILAT project will focus on several specific societal challenges and industrial technologies from those defined in the Commission proposal for Horizon 2020, the EU Framework Programme for funding of research and innovation from 2014–2020)

4.8. National Contact Points for FP7 and Horizon 2020

In addition to the European Commission's efforts to increase the low participation of Korean researchers in FP7, the Korean government has set up a network of **National Contact Points** (NCPs) that advise Korean researchers on cooperation opportunities within FP7. Altogether there are 23 Korean NCPs covering 12 main research areas. They are mainly located at the Korean Ministry for Education and Research and the National Research Foundation, as well as at selected universities and other research institutes and research promotion agencies.

The Korean NCP network is the counterpart of the NCPs located in all EU member states and countries associated with FP7. The NCPs serve as the main provider of advice and individual assistance to the research community. In general, they offer the following basic services including guidance on choosing thematic priorities and instruments, providing advice on administrative procedures and contractual issues, training on and assistance with proposal writing, distribution of documentation (forms, guidelines, manuals etc.), and assistance with identifying partners.

The list of the current NCPs in EU member states, associated countries and non-European partner countries is accessible at the CORDIS website, the European Commission's gateway to research and development.

5. Strengths and weaknesses of cooperation

5. Strengths and weaknesses of cooperation

The Strengths, Weaknesses, Opportunities and Threats (SWOT) of and for S&T cooperation between Korea and the EU have been analysed by the KORANET project and in an analysis done for "A Review of the S&T Agreement between the European Union and the Republic of Korea" by Bobe and Crehan (European Commission, 2013). The following overview of the SWOT analysis is based on expert interviews with selected representatives from European and Korean STI planning agencies, scientists experienced in European-Korean R&D cooperation, online surveys of Korean and European policy makers, programme executive agencies, companies and researchers, as well as recording the experiences of the KORANET team.

5.1. Perceived strengths

of both sides

There have been many positive experiences of S&T cooperation both in Europe and Korea. Based on the empirical evidence gathered in the analyses, researchers involved in the cooperation have come across only very few barriers and confirmed that there was a good fit in cooperation. Even though intercultural understanding needs to be addressed, differences also open up new opportunities. The openness of both research systems for cooperation is of utmost importance. European partners appreciate the fact that both basic and applied research in Korea is funded in a way that facilitates cooperation, while the EU FPs also fund projects open for international cooperation and provide, in some well-argued cases, even direct co-funding for the Korean partner through the programme (e.g. if research could not be carried out without the participation of the partner). Researchers are also attracted by the access to very well equipped and technologically advanced research systems in the respective other region. S&T cooperation instruments (e.g. FP7/Horizon 2020) offer many opportunities to improve cooperation in research and innovation, in particular with respect to those addressing common global challenges.

of the European side

World-class excellence exists in practically all areas and disciplines in Europe, which is highly regarded by Korean S&T stakeholders. The "Nobel Prize", for example, has a very high reputation in Korea, and Europe also has extensive networks of excellence which are easy to identify. Europe is a leader in many scientific and industrial areas and leads many global S&T initiatives (e.g. CERN and ITER).

The European Union is the world's biggest trading block, accounting for 20 % of global imports and exports. It is the world's largest exporter of manufactured goods and services, and many key suppliers for Korean companies, from large multi-nationals to small high-quality 'hidden champions', have their headquarters in Europe which is also the biggest export market for more than one hundred countries. The Korean government and the country's researchers have taken note of the growing importance of the European market and developed a great interest in partnering with institutions from the EU.

The European Union and the member states already provide many tools for international S&T cooperation, for example, the European Framework Programmes, the European Institute of Innovation and Technology, the European Research Council, bilateral programmes,

and multilateral instruments of variable geometry, such as KORANET.

In some priority fields of research, the Korean government urges its researchers to become part of international and multilateral scientific networks. Korean researchers view FP7/Horizon 2020 as an opportunity to tap into scientific networks on a global level. The FP also provides an opportunity to develop nationally underfunded scientific niche fields which are not listed as a priority for the Korean government (e.g. social sciences), and it allows for stable long-term planning of research cooperation.

The Korean government highly values the prestige of the Framework Programmes as multilateral research-funding instruments. Therefore, it becomes much easier for Korean researchers to access national funding in case they are already participating in joint research projects in the context of the FP.

Koreans appreciate the strong existing networks between European research partners, and the division of European research centres and universities into specialisations which facilitates access to knowledge and competences from different countries.

European S&T partners enjoy a high level of trust in Korea, as they are generally considered very reliable and highly qualified, providing stability for long-term planning of joint research ventures.

of the Korean side

Korea's cultural power is certainly stronger in Asia and the US but Korea's strengths are also communicated in Europe and its scientific community.

The issue of intellectual property is well addressed in Korea and also in the S&T agreement with the EU. Korea has an up-to-date system for IPR protection. In general, IPR is respected and enforceable through the courts.

Since 1962 the Korea Trade Investment Promotion Agency (KOTRA) has facilitated Korea's rapid export-led economic development through various trade promotion activities such as overseas market surveys and business matchmaking. It promotes cross-border investment and supports technological and industrial cooperation projects. KOTRA has opened an extensive worldwide network of overseas Korea Trade Centers (KTC) and maintains more than 113 Korean Business Centers in 78 countries in the world of which 21 offices are located in Europe and nearly 13 in Korea, and the network certainly adds strength to Korea in relation to its cooperation potential and possibilities.

There is a strong political focus on developed roadmaps in relation to research and innovation. Many European companies with subsidiaries in Korea appreciate its high-quality, capable human resources, respect for contract law and strong protection for Intellectual Property Rights. Korea has unique capabilities which include R-learning (application of robotics in teaching environments), social robotics and machine ethics. It also has the ambition to become a world leader in S&T and some markets such as the green-tech market. In addition to further strengthening applied research which has a very dominant position in comparison to other countries, more emphasis than before will be put on basic research and fundamental sciences. Among other activities these efforts include also the establishment of the Institute for Basic Science (IBS) in 2012 which has plans to become one of the world's leading basic-research institutions and should make Korea a guiding force in developing new technologies.

5.2. Perceived weaknesses

of both sides

Overseas S&T cooperation is generally considered to be very time consuming and expensive to maintain since the administration costs often outweigh the expected benefits. Time is a very important factor for building the trust and confidence necessary for partnerships and for generating stable relationships.

Hitherto, most Korean international S&T collaboration has been with the US and Japan. Cooperation between Korea and European countries and the EU has increased only in recent years.

of the European side

It seems that Europe has to some extent been unaware of Korea's rapid economic growth and its industrial and social evolution during the last 50 years. There is also a lack of awareness for the S&T areas where Korea is excellent. These fields include engineering, material science, nursing, chemical engineering and chemistry. In the year 2011 Korea ranked among top 10 scientific publishing countries world-wide in these fields. A broadly discussed weakness of the European system is also its comparatively low success rate in transferring S&T advances to innovation, to create products and companies and increase its market share in science driven fields.

The time and effort needed to engage in multilateral research proposals (e.g. FP) is considered to be disproportionate by Korean researchers: competition for funds is extremely high, and the application, negotiation and reporting processes are rather bureaucratic. In comparison, Korean funding is easier to apply for.

of the Korean side

The Korean government exercises a substantial amount of control over research structures and decision-making. Korean researchers seem to be very dependent on the government's legislative periods, as programmatic focuses and budget decisions may change based on these periods. Particularly in scientific fields that are outside the Korean government's focus, long-time planning for non-listed subjects is considered very difficult.

Negotiations about funding programmes set up between Korean programme agencies and the government take a long time, as does the actual implementation of the programmes. In the research community there is a lack of awareness of the availability of bilateral and multilateral funding opportunities as well as a lack of knowledge about suitable cooperation partners abroad. For a Korean researcher knowledge about the existence and functioning of EU programmes – their funding structures, the application process and participation status – is very limited. In addition, project planning and project management methods are often not sufficient to apply for multilateral funding.

The Korean funding programmes currently offered are not encouraging long-term international cooperation. Frequent changes of Korean contact persons who provide information about research programmes weaken cooperative ties or make it hard to establish them.

Many stakeholders are involved in the funding of research, innovation, demonstration and deployment activities and overall it is hard for European actors to access the people they should contact in the Korean administra-

tion because of a lack of transparency and the cross-cutting nature of the challenges they often work on.

5.3. Perceived opportunities

of both sides

An opportunity is provided by the roadmap proposed by the EU-Korea S&T Agreement dealing with the areas of common interest in which to deepen cooperation, namely ICT, nanotechnology, renewable energies and the mobility of researchers. In the area of ageing societies cooperation e.g. with Japan and China is an additional opportunity. The focus on triangular cooperation in development cooperation can also be seen as an opportunity. Triangular cooperation includes a beneficiary from a developing country (e.g. in Asia or Africa) in addition to one or more European and Korean partners to implement development cooperation programmes/projects in beneficiary countries. Also an opportunity for both regions is the increased access to world-class infrastructures and facilities, which can provide an important motivation for researchers to join multilateral projects.

of the European side

An opportunity for the European side is the further support of its research-based companies, the deeper integration of European suppliers in Korean supply chains, and the opening up of market opportunities.

Moreover, the conditions for good market penetration are quite favourable in Korea where S&T cooperation projects are widely seen as an avenue to testing research results on a very advanced market.

of the Korean side

Participation in multilateral programmes makes adaptations to international standards a necessary requirement. This is an important factor for Korea in becoming a strong partner in international cooperation with the EU. Enhanced incoming and outgoing mobility of researchers is an important opportunity to further internationalise Korea. In particular, possibilities for joint publications and enhanced researcher mobility are considered to be an important opportunity and a driver for researchers to join multilateral funding schemes.

Due to historically developed strong ties, Korea's cooperation efforts often focuse on the United States and Japan. Hence, there is a lot of unused potential and a clear opportunity to balance and further broaden the internationalisation of S&T towards the European Union and its member states.

Korea is already an important part of the lives of many Europeans as it is a top global provider of a wide range of consumer electronic goods such as mobile phones, tablets, cameras, video recorders and TV sets. It is also a major exporter of construction services and has a huge shipbuilding industry. The large industrial groups of Korea (chaebols) are global players and have extensive international networks. Their subsidiaries in Europe provide employment for many European citizens. Korea is taking part in the competition to emerge as the logistic hub in the Northeast Asian economic bloc. Busan, for example, Korea's largest port city and world's fifth largest container port, has a steady growth rate that could lead to the top position.

Korea has a large and diverse economy and an adventurous consumer society which unites both traditional and contemporary elements. Consumers in Korea nowadays are very sensitive to the power of brand names, the health aspects of a product, and the perfection of after sales services. Purchasing decisions are decreasingly guided by nationalistic arguments.

5.4. Perceived threats

of both sides

Both Korea and Europe have to be aware of the increasing power of emerging economies such as Brazil, Russia, India, China, South Africa (BRICS countries) and others in S&T and beyond. The global challenges make it necessary to pool know-how to find solutions, to adjust and compare different approaches and also to implement the findings world-wide on a broad scale. Both sides could fail to address e.g. climate change or ageing societies. There is a possible threat that trough a lack of preparedness opportunities to strengthen STI cooperation could be missed. To be successful, efforts for a stronger cooperation should be based on a clear strategy and an implementation process followed up by all relevant stakeholders.

of the European side

There is a risk of not adequately matching Korea's ambition and drive. Europe could also risk to fail matching Korea's excellence in turning S&T into business as well as their advanced IPR management. In general, the EU could fail to use S&T to support the competitiveness of its industry or other EU policies in the creation of jobs and stimulating growth.

of the Korean side

Due to the top-down priority setting by the Korean government, scientific fields of research or scientific niche fields that are outside government-defined priority areas have a slim chance of receiving support for engaging in multilateral research schemes. The lack of strategic policy guidelines for maximising the benefits from multilateral S&T cooperation is reflected in the lack of coordination between internationalisation programmes and policies between the ministries responsible. International cooperation is very often a direct consequence of political decision-making and regional trends. These 'cooperation trends' do not favour continuous funding for supporting the long-term relationships required for fruitful S&T collaborations. Another factor which is also perceived as a threat is the low priority often given to Korea-Europe cooperation from governments and policy makers, compared to Korea-United States cooperation. As a result, budgets dedicated to Korea-Europe S&T cooperation are rather low. There is a risk that the FP may not be used to its full extent for mutual cooperation if Horizon 2020 does not maintain a general openness for Korean partners and multilateral funding mechanisms such as KORANET are discontinued.

The business sector provides the main part of the GDP with more than 70 % of the money spent in both R&D funding sources and in performing sectors. The high investment from the business sector leads to a focus on short-term investments and on research with the potential for commercialisation. The attention of the Korean government has shifted towards the creation of jobs in Korea. These job growth is planned to be based on the success of new companies, instead of the Chaebols since they have gone global, and create fewer new jobs in Korea than they did in the past. Their growth is mainly due to expansion outside of Korea.

SWOT of S&T cooperation between Korea and the EU			
		Positive Factors	Negative Factors
		Strengths	Weaknesses
Internal Factors	Europe and Korea	• Positive experience of previous cooperation and good cultural fit • Differences between research systems in Korea and Europe offer new opportunities • Existing S&T cooperation instruments to support cooperation	• Time consuming nature of overseas cooperation • Few existing linkages in S&T
	Europe	• Many centres of S&T excellence • Extensive, easily identifiable networks of excellence • Scientific and industrial leadership in many areas • Leader in many global S&T initiatives and large-scale research infrastructures • Biggest and most powerful trade block • Raising interest in and importance of the European market in Korea • Location of headquarters of many key suppliers • Many different cooperation tools in place • Stability for long-term planning of S&T cooperation • FP is an opportunity to tap into scientific networks on a global level • Participation in the FP has a high reputation in Korea • European partners enjoy high levels of trust as cooperation partners in Korea	• Lack of awareness of rapid Korean growth and evolution • Low awareness of areas of Korean excellence • Lack of implementation capacity to create products and new companies from S&T advances • High competition and complex application procedures in the EU programmes, while access to Korean funding sources is easier
	Korea	• Good protection of Intellectual Property Rights (IPR) • Korea has areas with unique capabilities • Strong R&D orientation of the KOTRA programs • Singular policy focus on growth engines and clear roadmaps • High level of satisfaction of European companies operating in the Korean environment • Ambition to become a world leader in S&T and selected priority markets • Exploitation of the momentum created by launch of the Institute for Basic Science (IBS)	• Dependency on top-down decision-making • Little experience of Korean researchers in multilateral cooperation • Frequent changes of contact people in Korea who provide information about cooperation possibilities • Double or multiple points of entry for information on funding programmes • Chaebols are creating jobs abroad

		Opportunities	Threats
External Factors	Europe and Korea	• EU-Korea S&T Agreement including nano safety, food and drug safety etc. • Common challenges such as ageing societies, climate change etc. • Triangular cooperation with developing economies • Increased mutual access to facilities	• General loss of competitiveness against emerging economies • Failure to meet the global challenges • Missing a window of opportunity through lack of preparation, a clear strategy and a continuous implementation process
	Europe	• Deeper integration of EU suppliers in Korean supply chains • Favourable conditions for market penetration	• Failure to match Korean ambition, drive and advanced management skills • Failure to use S&T to support competitiveness and EU policies
	Korea	• Global industrial power already deeply embedded in Europe • Asian logistic hub of growing importance • Highly diversified economy, adventurous consumer society • Adaptation to international standards • Opening up an increasing mobility • Balancing efforts in the internationalisation focus	• High government control over priority fields of funding • Lack of coherent strategic policy and guidelines for multilateral cooperation • Korean-European cooperation not always prioritised by governments and policy makers • Focussing too much on short-term results and commercialisation

Table 6: SWOT of S&T cooperation between Korea and the EU
Note: The strengths and weaknesses of S&T cooperation systems, including the way they are organised (existing programmes and cooperation schemes) are internal factors determining the RTDI cooperation. External factors are the opportunities and threats presented to STI cooperation by the environment.

6. Clusters and their potentials for cooperative activities

6. Clusters and their potentials for cooperative activities

6.1. Clusters as drivers for innovation

Small and medium sized enterprises, large companies, R&D institutions, universities, spin-offs and other ventures are the basis of economic progress. Due to the growing complexity of innovation, individual companies are less and less capable of providing competencies and resources in order to cover the entire innovation management process. Thus, cooperating with other organisations that complete the value chain is reasonable. In this respect, it is assumed that the transfer of knowledge and know-how among cooperating organisations leads to more successful and faster innovation cycles.

The term "cluster" was coined by Michael E. Porter, the leading authority on competitive strategy and the competitiveness and economic development of nations, states, and regions. Porter has pointed out that clusters inspire new ways of thinking in terms of the organisation of companies, the integration of research institutes and universities in the process of innovation, as well as with respect to how government can support these efforts (Porter, 1998).

Since Porter's description, many different forms of networks have been defined as clusters and understanding their differences is particularly important in international cooperation. When talking about a cluster the term might be understood differently in Europe, Korea or other countries. Torre stated, "the cluster concept continues to grow in popularity and seldom has an economic concept caused such passions, particularly one from the framework of territorial policies" (Torre, 2008, p. 30). He notes that the cluster concept seems to be successful because it is so vague: "This permits the term to correspond to various types of localization as well as adapt easily to a great number of policy circumstances and situational constraints" (Torre, 2008, p. 31). Torre calls it a soft concept, and this might be the reason for its popularity in policy making in the United States, Europe, and also in Korea.

Additionally, Torre explains why clusters are so popular from a scientific point of view. The concept of clusters derives from other innovation related concepts, such as the knowledge economy and the network as knowledge hub, the concept of positive external effects, the concept of vertical integration (meaning that firms have a market advantage due to their pooling together), and the concept of globalisation, since clusters present the potential to interact with other clusters in a globalised economy (cf. Torre, 2008, p. 32).

Furthermore, when analysing their innovation potential, clusters cannot be approached as individual entities. Iammarino and McCann have pointed out that "[…] the particular form of innovation system that emerges in a particular locality will also depend on the nature of knowledge embodied and exchanged in both the industry and the firms. As such, a careful assessment of industry transactions, relations, and knowledge outflows is essential for understanding cluster-innovation dynamics." (Iammarino, McCann, 2008, p. 25). Therefore, the differences between Korean and European dynamics need to be analysed carefully.

6.2. Differences in the development of clusters and subsequent policy making

The formation of clusters can happen in different ways, within which two major types can be distinguished. On the one hand there are clusters that have developed by themselves through diverse cooperation of companies and organisations within a specific region (bottom-up developed networks). On the other hand networks and clusters can be developed through political will, i.e. when policy makers discover the economic advantages such kind of cooperation can bring to companies and thus to the region and country (top-down organised networks). Depending on the country, the proportion of bottom-up and top-down organised clusters differs.

This difference becomes especially obvious when comparing e.g. Germany's cluster landscape with Korea's. Whereas in Germany both types of networks exist, Korea's cluster landscape exclusively consists of top-down organised clusters (German Ministry of Education and Research, 2009). Many of Korea's clusters show more characteristics of a technology park than of a cluster. This fact must not be ignored when talking about European and Korean clusters. In planning cooperation, special recognition should be given to the fact that in some cases the evolution of the clusters/technology parks that wish to cooperate greatly differs, and that their entire organisational management structures and cultures may also differ from each other. This can lead to difficulties in working with each other as equals. However, by addressing this challenge beforehand and by not letting it turn into a problem during negotiations, this issue can be solved, provided that the cluster managers seek to find a joint process of cooperating with each other.

The setting up of clusters in Korea can be considered as a political act. On the one side the Korean cluster landscape has developed from industrial parks/industrial complexes to innovative clusters with the aim to compete at international level (Korea's Best Products in Industrial Clusters, 2011). These agglomerations can be called business-driven clusters. One example is the cluster Gumi. On the other hand there are also research-driven agglomerations, e.g. as science towns, such as Daedeok.

KORANET Korea-EU Cluster Expert Workshop, November 2010, Seoul

INNOPOLIS Daedeok comprises more than 1,000 researchers. The aim is to foster the regional development of the 80 technoparks in the region of Daejeon and to promote knowledge, science and industry through cooperation. INNOPOLIS Daedeok provides comprehensive support for R&D activities, coordinates innovation networks and technology transfer with the aim to become the world's most innovative cluster by 2015. INNOPOLIS Daedeok offers its expertise in five areas: industry, academia, R&D institutes, community and government. Its technological foci are biotechnology, space technology, sustainable eco-friendly energy technology and nanotechnology. The assumption is that all these technology fields can be managed best by a cluster that is aligned to national policies. With the support of the central and local government INNOPOLIS Daedeok can become an Asian hub for technology commercialisation and for connecting industrial complexes nation-wide. It is Korea's only R&D driven innovation cluster. Thus, it is of special interest for INNOPOLIS Daedeok to find R&D partners abroad.

Daedeok is not sponsored by the local government, but by the central/national government since it is focused on supporting the national innovation system. The research institute[1] of INNOPOLIS Daedeok attempts to overcome the barriers between national, regional and global innovation systems in order to achieve national industrial competitiveness.

INNOPOLIS Daedeok has a dedicated internationalisation strategy in which it builds a system with leading innovative clusters, for example with Sophia Antipolis in France (Memorandum of Understanding). Furthermore, it pursues a special programme where other countries are being informed about the success factors of the science park.

Bringing together business-driven and research-driven clusters in Korea allows public researchers to operate venture businesses, enables public institutions and universities to build holding companies and can lead to spin-off companies. These activities are among the aims of the current cluster policy in Korea.

Korea has labelled 12 innovation clusters. Their main focus is: support of technology transfer between research and industry, increase innovation potential of SMEs, provision of research landscape, consultancy for meeting international standards, support of export activities, market analyses (Meier zu Köcker, Garnatz, 2010). Each of these innovation clusters comprises three to five mini-clusters with a specific technology focus. These mini-clusters consist of stakeholders at industry, research and policy level. An overview on the innovation clusters and mini-clusters is shown in table 7.

In Korea, the Korea Industrial Complex Corporation (KICOX) plays a crucial role in implementing cluster policy. It has taken on the role of setting up the above-mentioned innovation clusters. Furthermore, KICOX is the first contact point for interested parties from abroad that want to approach Korean clusters.

The mini-clusters are someway similarly organised to many European clusters, as they are managed by cluster development agencies that aim at the promotion of their clusters mostly funded by KICOX. However, the over-

1 Within Korea there are 26 research institutes with similar aims.

Industrial Complexes/ Innovation Clusters	Technology Field	Names of the Mini-Clusters
Banwol/Sihwa	Parts/Materials	Mold & Materials, Mechatronics, Textile, Automobile Parts, Electric/Electronics, Precision Chemicals, Clean Gilding
Changwon	Machinery	Engineering Machine, Metal, Mold, Mechatronics, Transportation Equipment
Daebul	Ship-Building	Leisure Vessel, Ship-Building, Ship Parts
Gumi	Electronics	E&H, IT Fusion Textile, IT Equipment, Mobile, Parts/Material/Mold, Power Display
Gunsan	Automotive/Machinery	Machinery & Steel, Plasticity (car parts), Information Sharing, Plastic (car parts)
Gwangju	Light	LED, Light Application, Optical Communication, Mold, Car Parts, Electronic Parts
Namdong	Machine Parts	Industrial machine parts, Information industry parts, Production base parts, Automobile parts
Noksan	Machinery/Ship-Building	Parts (ship-building), Ship-Building Equipment, New Technology Fusion Plating, Transportation Equipment
Ochang	Electric/Electronics	Semi-Conductor, Electric/Electronics, Battery/Materials
Seongseo	Mechatronics	Machine/Metal/Material, Business Convergence, Intelligent Automobile, IT/Electric/Electronics
Ulsan	Automobile	Body/Chassis, Power Train, Design Module, Production Base
Wonju	Medical Devices	Measuring Device, Image Device, Rehabilitation Device, Health-Care Device

Table 7: Korean Mini-Clusters (KICOX, 2009)

all controlling of these mini-clusters follows again a top-down approach (Meier zu Köcker, Garnatz, 2010).

Korea's cluster policy, which relies on a top-down approach, has recently added some bottom-up activities. This transition is characterised by more interactions between government institutes and local governments, incubators and companies. Before 1998 each local government had its own research institutes, but this has changed in recent years. Many of them have developed from government institutes into private firms. These companies assign their expertise through open practice, where a group of people share a problem, conduct creative activities through which they can exchange detailed and tacit knowledge. This transformative process contributes to moving towards a bottom-up approach in Korea's cluster policy, through which members within a cluster can better interact with each other.

In Europe, many cluster programmes have been initiated. These cluster support initiatives can include grant funding or any other kind of financial assistance to clusters or cluster management organisations, or alternatively, the programmes can support the clusters and cluster management organisations predominantly through technical assistance measures, e.g. working groups consisting of cluster managers, workshops, conferences, benchmarking and support the clusters in their activities focussing on internationalisation. The internationalisation of clusters is an important aspect of cluster programmes in Europe. The international competitiveness of clusters can be seen as a key element of the country's international relations. Exemplary initiatives have been set up in Denmark, France, Sweden and Poland (Müller et al., 2012). Table 8 shows those European cluster programmes that have put internationalisation activities high on their agendas.

An example of a European initiative to support clusters is the "Leading-Edge Cluster Competition" of the German Federal Ministry of Education and Research. Since 2007, 15 Leading Edge Clusters were selected in three rounds. They each receive up to € 40 million of fund-

Country	Programme	Focus	Website
Czech Republic	Cooperation Clusters	funding, matchmaking and study trips, support through export promotion agencies or other offices abroad, cooperation with other funding initiatives	www.czechinvest.org
Denmark	Innovation Networks	training, funding, matchmaking and study trips, support through export promotion agencies or other offices abroad	www.innovationsnetvaerk.dk
Estonia	Cluster Development Programme	training, funding, matchmaking and study trips	www.eas.ee
Germany	Go-Cluster	training, matchmaking and study trips, cooperation with other funding initiatives	www.go-cluster.de
Germany	Leading-Edge Cluster Competition	training, funding, matchmaking, cooperation with other funding initiatives	www.bmbf.de
Hungary	Cluster Development Program of the New Széchenyi Plan	training, funding, matchmaking and study trips, support through export promotion agencies or other offices abroad, cooperation with other funding initiatives	www.magzrt.hu
Italy	Innovation Clusters Piedmont	funding, matchmaking and study trips, cooperation with other funding initiatives	www.regione.piemonte.it
Latvia	Cluster Programme	training, funding, matchmaking and study trips	www.liaa.lv
Luxembourg	Cluster Initiative	matchmaking and study trips, support through export promotion agencies or other offices abroad, cooperation with other funding initiatives	www.clusters.lu
Norway	Centres of Expertise	training, matchmaking and study trips, support through export promotion agencies or other offices abroad	www.nce.no
Poland	Cluster Support	training, funding, matchmaking and study trips	www.parp.gov.pl

Table 8: Selected European cluster programmes and their focus on internationalisation (adapted from Müller et al., 2012)

ing for a maximum of 5 years. The implementation envisages a matching level of financial participation on the part of businesses and private investors. These clusters formed by business and science that enter into strategic partnerships are set to boost Germany's innovative strengths and economic success.

Cluster policy is addressed by the European Commission, DG Enterprise and Industry and in particular by the European Cluster Alliance. Because of the crucial impact clusters can have on the development of regional and national economies, many European calls include cluster activities. Clusters have thus become an integral part of economic policies in Europe.

6.3. The role of cluster managers

Independent of whether clusters have been developed top-down or bottom-up, cluster managers fulfil special tasks and must have specific competences.

Due to their flexibility clusters can offer new possibilities for innovation by leaving the regular paths of innovation management. Clusters and specifically cluster managers can enable their members to try out "open innovation" more creatively than they could do in their companies. Open innovation is easier in a cluster than in a company (esp. large enterprises) because in a cluster the social structures and patterns of a classical organisation are only weakly developed or not established at all. This characteristic appears to be an obstacle at first sight. However, on deeper consideration it often becomes obvious that by not being bound to rigid organisational systems that are often hard to change within a company, it can be much easier to become more creative as company. A conscientious cluster manager should therefore mobilise his/her "absorptive capacity" by "sucking in" external know-how in order to enable network partners to benefit from it (Federal Ministry of Education and Research Germany, 2011). Furthermore, cluster managers should act as contact points for international collaboration. Especially against the background of the increasing international responsibility for small and medium sized companies and the dearth of experience in this field, cluster managers can support entrepreneurs in their international business activities by making sure that they receive training in intercultural competence and other matters related to international relations.

6.4. Policy instruments that support cluster management organisations

Among various policy instruments in Europe there are many programmes that specifically support clusters and cluster management organisations. The reports "Clusters are Individuals, Vol. I + II" summarise policy instruments of several EU member countries (Lämmer-Gamp et al., 2011; Müller et al., 2012).

By the late 1990s several European cluster policy initiatives were already being analysed by Boekholt & Thuriaux (1999) on the basis of the indicators of systemic market failures and their policy responses. These failures are: "inefficient functioning markets, informational failures, limited interaction between actors in innovation systems, institutional mismatches between (public) knowledge infrastructure and market needs, missing demanding customer and government failure" (Boekholt,Thuriaux, 1999). Boekholt & Thuriaux mirrored them against current policy activities in selected countries. Among these policies are "competition policy and regulatory reform, technology foresight, cluster studies, platform for constructive dialogues, public procurement policies, cluster development schemes, reduction of government interference" (Boekholt, Thuriaux, 1999). The table developed by Boekholt & Thuriaux (see table 9) provides a detailed overview on possible policy measures, which can be used to analyse the status of cluster policies worldwide.

Policy rationales	Cluster-oriented policy action	Tools
• Lack of cluster identity and awareness	• Identification and public marketing of clusters	• Mapping exercises • External promotion of regional clusters • External/internal promotion of cluster member's competencies
• Government regulations hamper innovation or competitiveness	• Organise cluster specific fora to identify regulative bottlenecks and take actions to improve them	• Cluster platforms and focus groups • Tax reform • Regulation reform (environment, labour markets, financial markets)
• Firms do not take up opportunities for collaboration with other firms	• Encourage and facilitate inter-firm networking • Purchase innovative products through collaborative tender procedures	• Networking programmes • Brokerage training • Public procurement for consortia
• Firms, particularly SMEs, cannot access strategic knowledge	• Support cluster based retrieval and spread of information • Organise dialogue on strategic cluster issues	• Set up cluster specific information and technology centres • Platforms to explore market opportunities • Foresight exercises
• Firms do not utilise the expertise of knowledge suppliers	• Collaborative R&D actions and cluster specific R&D facilities	• Set up cluster specific technology and research centres/initiatives • Subsidise collaborative R&D and technology transfer
• Lack of crucial elements in a cluster	• Attract or promote growth of firms in cluster • Attract major R&D facilities	• Targeted inward investment • Support start-up firms in particular clusters

Table 9: Cluster policy relations, initiatives and tools (copied from Boekholt, Thuriaux, 1999)

The first item in table 9 – "lack of cluster identity and awareness" – has been recognised as a major barrier towards international cluster cooperation between clusters in Europe and Korea. On the one hand the European countries and Korea are aware of their different cluster structures; on the other hand they hesitate to use these structures for knowledge transfer. It can therefore be assumed that the promotion and marketing of the benefits of clusters has not yet been successfully established. However, trust among partners coming from Korea or Europe increases if the institutions that want to cooperate are supported by internationally known initiatives like the Framework Programme. More and more, clusters become part of such funding programmes (e.g. ERDF) and are thus better visible in other countries. Hence, the aim for future measures of support should be that (as mentioned in table 9) "mapping exercises, external promotion of regional clusters, external/internal promotion of cluster member's competencies"

become core activities in projects to be supported by specific programmes.

6.5. Information platforms: a method to learn from other countries' cluster policies

Mutual learning among the EU countries with regard to their cluster initiatives is one of the aims of the European Cluster Collaboration Platform. With the help of such platforms, clusters worldwide can get in contact with each other. With regard to cross border policy exchange there is still room for improvement when it comes to mutual learning. In order to eliminate this knowledge gap, one proposition could be to set up an overview presenting the challenges, the relevant policy answer to these challenges and the measures that are taken by the government and the cluster management organisations from each member country of the European Cluster Collaboration Platform. As such countries could learn from each other about their policy approaches towards more innovation capacity through enhanced cluster management. This becomes especially relevant when several countries (EU and/or non-EU) become affected by economic uncertainties, since the process of learning is made much easier and more rapid by sharing experiences and adopting similar measures rather than struggling with concepts that have not yet been approved. As such, being part of such an information platform for clusters should also become relevant for Korea.

Europe has also created a so-called "Cluster Observatory" as an online platform that provides a single access point to information and analysis of clusters and cluster policy in Europe.

The Cluster Mapping tool gives access to an advanced data set on clusters and regions in Europe. It provides statistical information from a wide range of sources, both on the geographic concentration of various industries and indicators of economic performance. In addition, the Observatory offers data on the framework conditions that shape regional competitiveness. Users can access data for standard sectors and regions, or use special definitions that will be gradually added to the mapping tool. They also can apply their own customised regional definitions.

7. KORANET Joint Calls on Research for Life-Long Health and Green Technologies

7. KORANET Joint Calls on Research for Life-Long Health and Green Technologies

KORANET has successfully conceptualized and implemented two joint calls in the areas of "Life-Long Health" in 2010 and in "Green Technologies" in 2012. They have brought together Korean and European researchers to collaborate on topics of political, societal and scientific challenges facing modern societies.

7.1. KORANET funded projects

The KORANET Pilot Joint Call was launched in October 2010. Its topic was chosen due to the ever-increasing ageing population and the drastic changes in the demographic profiles of both Europe and Korea. The ageing of our populations represents one of the most significant political, social and scientific challenges of modern societies. To allow for an interdisciplinary approach, proposals were welcomed from the areas of health/medicine, technology and social sciences.

The 14 funded projects addressed a wide variety of themes related to ageing societies, from projects enhancing the quality of older peoples' everyday lives in their home through computerized assistance to health projects dealing with Alzheimer's, osteoporosis and neurodegeneration as well as scientific approaches for analyzing age management in different countries. The overall total budget was € 925,000, in a virtual common pot, provided by Austria, France, Germany, Korea and Turkey.

The second call funded 11 projects, which started in October 2012 for a duration of two years, dealing with reduction of carbon footprints, technologies for sustainable development, renewable energies and energy efficiency. The projects covered aspects such as zero emission buildings, promotion of advanced bio-fuels, designing of ZnO based nanomaterials for solar cell application, technologies for wastewater reuse to cope with global water scarcity, thermal management of Li-polymer batteries for efficiency improvement to be used in green transportation and development of new composites for concentrating solar thermal power applications. The overall total budget was € 2,008,000, provided by Austria, Germany, Korea, Poland, Slovakia, Sweden, Switzerland and Turkey.

Each consortium was comprised of a minimum of two partners from two different European countries participating in the KORANET Joint Call and one Korean partner. Participation of partners from other ccountries was possible in case they could ensure funding from other sources. The first joint call targeted researchers from public research institutions and higher education institutions, whereas the second one was also opened to private research institutions, SMEs and industry. A maximum of € 20,000 was made available per partner and per year for the first call, and was raised to € 25,000 for the second joint call. Both of the calls funded mobility and networking (travel costs, living expenses, costs for small scale material and event organization). In figure 7 the cooperation network established through the two KORANET joint calls is shown.

The following projects were funded in 2010/11:

- **ICAA** – International Collaboration for Advanced AMOLED (Active-Matrix Organic Light-Emitting Diode)
- **CAMCAD** – A computational approach to Analyzing Morphology and Connectivity

relationship in human brains with Alzheimer's Disease
- **Aged Liver** – Genomic changes in the liver in ageing population: impact on metabolism and hepatocellular carcinoma
- **Nano4Stent** – Micro/Nanostructured Surfaces for Cardiovascular Stents
- **MN-MRI** – Multi-nuclear in vivo MRS and RFcoil development at 7T to detect metabolic alterations in tissue
- **Fat By MRI** – Joint development of non-invasive assessment of fat metabolism: Biomarkers for health care management of an ageing population
- **EPIMOD** – Epigenetics in ageing and neurodegeneration: Modulation of the epigenome and environmental factors to reduce chronic inflammation, neurodegeneration and to increase cognitive performance
- **PleasureHome** – Bringing safety and pleasure to the home of the elderly
- **CoCoBeT** – Computerized Cognitive Behavior Therapy for Elderly
- **StemReg** – Organ Regeneration and Stem Cell Senescence
- **AGEGASK** – Age Management in a changing economic environment as a Korean, Austrian and German comparison
- **IC-LOC** – Integrated Circuit based Lab-on-Chip Platform for Cancer Detection
- **CAROFEX** – Control of Assistive Robot with Facial Expressions
- **DNotOP** – Development of Non-Pharmacological Therapies for Treatment of Osteoporosis

The following projects were funded in 2012 to 2014:
- **ACME** – Anion Conducting Membranes for Energy Applications
- **CMC4CSP** – The development of sic-based sandwich-structured ceramic matrix composites for concentrating solar thermal power applications

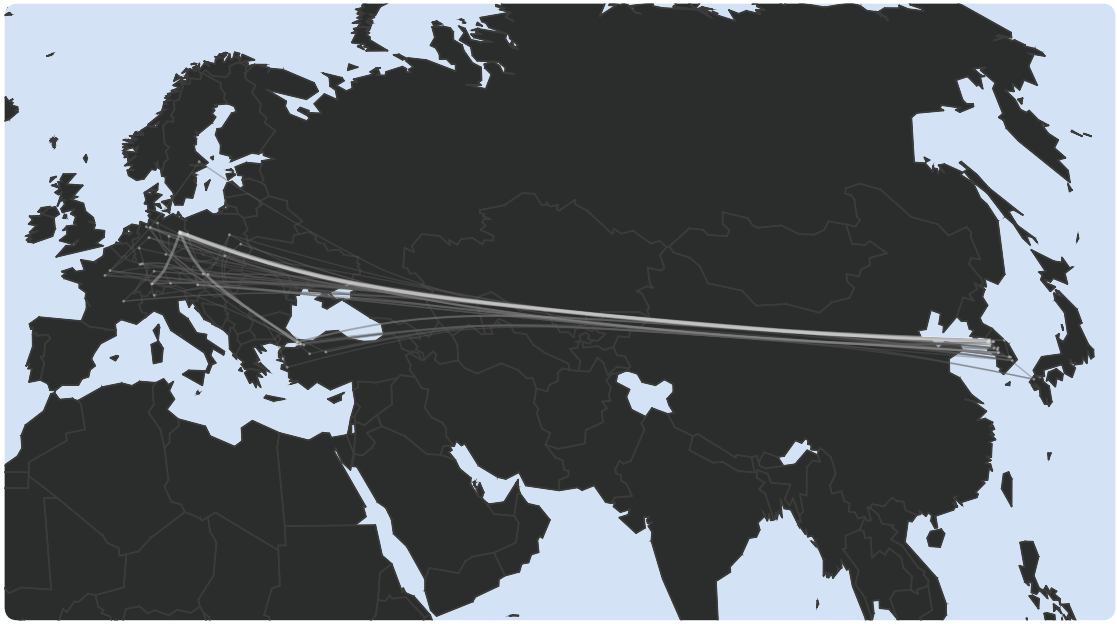


Figure 7: Scientific network established through the KORANET joint calls

Source: KORANET Pilot Joint Call and Joint Call data; created with jflowmap

- **ENV-BIO-GA** – Environmental and Biomedical Applications of Microplasmas Produced by Gliding Arc Discharges
- **EURRO-KPS** – Estimation of Uncertainty in Rainfall RunOff modelling, Korea, Poland and Slovakia
- **FOREBIOM** – Potentials for realizing negative carbon emissions using forest biomass and subsequent biochar recycling
- **PROMOFUEL** – Promotion of Advanced Biofuels: Preparation, Fuel Properties and Engine Emissions
- **QQEST-MBR** – Quorum Quenching Energy Saving Technology in Membrane Bioreactor for Wastewater Reuse to cope with global water scarcity
- **SolarNZnO** – Designing of ZnO based Nanomaterials for Solar Cell
- **TOLPE** – Thermal Management of Li-Polymer Battery Pack Modules for Efficiency Improvement to be Used in Green Transportation
- **ZEB-ISTIS** – Zero Emission Building - Integrating Sustainable Technologies and Infrastructure Systems

7.2. Pilot Joint Call success stories

The funding awarded by the KORANET Pilot Joint Call on Research for Life-long Health was intended to act as a launch pad for future cooperation between project partners.

Another target was to strengthen the cooperation between research institutes or universities as a basis for scientific cooperation. For example, collaboration within one of the funded projects (EPIMOD) triggered a new partnership between two universities in Korea and Germany. On 25 September 2010 Chungnam National University and Eberhard-Karls-University Tübingen signed two MoUs to enhance their cooperation. These MoUs (one on academic cooperation, one student exchange programme) will contribute to the cultural enrichment, scientific progress, and strengthening of the partnership between the two countries.

More details of some of the projects funded by the KORANET Pilot Joint Call on Research for Lifelong Health are presented below:

PleasureHome – Bringing safety and pleasure to the home of the elderly

Project partners:
- Eberhard-Karls-University Tübingen, HELP-Platform, Germany
- Ecole des Mines de St. Etienne, Centre SPIN/LPMG, France
- Kyungpook National University, Department of Materials Science and Metallurgy, Korea
- Kangwon National University, School of Electronics, Information & Communication, Korea

PleasureHome was a project in the field of Ambient Assisted Living (AAL), which first and foremost supports the elderly in being able to live a happy and safe life in their own homes for as long as possible. For AAL to be successful, a diversified understanding of human expectations, social systems, healthcare infrastructure, privacy and the role of families, communities and carers is crucial, i.e. sociological, psychological, economic and market issues need to be considered alongside technological ones.

The objective of PleasureHome was to facilitate the exchange of knowledge, expertise and best practice in AAL between Korea and Eu-

rope in order to create an AAL roadmap document containing input from the experts involved in the consortium as well as high-level stakeholders from the EU and Korea.

The first experiences of the cooperation within the project have been very positive. Despite some cultural differences (which also exist amongst EU member states) there are nonetheless many overlaps and common interests in terms of business opportunities resulting from research into strategies for improving life in an ageing society. The benefits to each of the partners are clear, since the participating countries are the leaders in the respective markets and fields (e.g. Korea on the home entertainment market). Cooperation between the EU and Korea promises to be key to expanding and strengthening the impact of the already effective developments, products and services with respect to AAL.

MN-MRI – Multi-nuclear in vivo MRS and RFcoil development at 7T to detect metabolic alterations in tissue

Project partners:

- Otto-von-Guericke University Magdeburg, Germany
- Medical University of Vienna, Austria
- Gachon University of Medicine and Science, Korea

Multi-nuclear magnetic resonance spectroscopy (MRS) is a non-invasive tool for investigating metabolism in vivo, which allows the study of metabolic changes under the influence of ageing or medication, as well as the diagnosis of a wide range of diseases, including metabolic and neurological disorders.

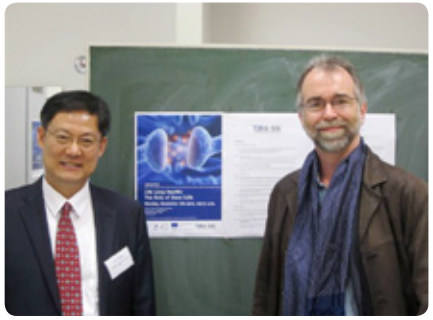
Three scientific disciplines came together as medical science, physics and electrical engineering joined forces to achieve the aims of this project. The electrical engineering groups simulated and optimised the multi-nuclei RF-coils for use in MRS. The contribution of physics and medicine was to evaluate the RF-coil by organizing a study with subjects at the Medical University of Vienna. Cooperation between all three groups was very dynamic and has a broad bandwidth of knowledge in RF-Coil manufacture for ultra-high field MRI-Systems and application of muscle metabolism studies.

Throughout this project, Korea and Europe have benefitted immensely by joining their knowledge and technical options to reach a higher level in ultra-high field MRS studies.

StemReg – Organ Regeneration and Stem Cell Senescence

Project partners:

- Charité University for Medicine Berlin, Germany
- Austrian Academy of Sciences, Institute for Biomedical Aging Research, Austria
- Chongbuk National University, Department of Biochemistry, Global Research Laboratory, Korea
- Seoul National University, Dept. of Veterinary Public Health, Adult Stem Cell Research Center, Korea



Partners of the StemReg consortium

Cellular senescence is a determining factor in ageing of tissues and subsequent loss of organ function. The aim of this project was to form a network of expertise to investigate the processes of stem cell senescence. The goal was to detect early ageing signals and to provide technologies to attenuate the cellular ageing process for the rescue of failing organs. Data obtained were analysed in a specialised databank to model the process of stem cell senescence and correlate this with organ ageing. The most important initial task of the project partners was to define the research and to exchange schedules, and to form a network which will attract further funding. These tasks were tackled with enthusiasm from all sides. In fact, the consortium was expanded by associated partners interested in collaboration at the first workshop and a symposium held in Berlin. There is a strong technology orientation of Korean science and research, which benefits from a close interaction with technology companies. Hence the cooperation benefit for European research with Korea lies in the translational strength and relevant networks. For Korean research, the access to top basic research and how this is connected to applications may be an important incentive. For all partners social and cultural exposure is certainly a strong benefit.

Starting a cooperative endeavour with Korea requires a careful selection of matching partners with strong commitment for transparent and long-term cooperation, sufficient resources and language abilities. It is of the utmost importance that communication is established, including a real, project-oriented exchange of researchers. For this project, the establishment of a sustainable cooperation platform was a key goal, which required the involvement of researchers in their early career on both sides.

AGEGASK – Age Management in a changing economic environment – a Korean, Austrian and German comparison

Project partners:

- Ewha Womans University Seoul, Department of Business Administration, Korea
- Vienna University of Economics and Business, Department of Management, Austria
- Helmut Schmidt University, Institute for Human Resources and International Management Hamburg, Germany

Partners of the AGEGASK consortium, study visit to a Korean semiconductor producer

A changing economic environment, ageing society and the change in organisational management especially influences older peoples' careers in large companies. Therefore, this project analysed the established Age Management systems in large German, Austrian and Korean companies, putting special emphasis on the health and human resource management for older employees. Expert interviews have revealed potential chances or risks for older employees and their life-long health in large German, Austrian and Korean companies.

The lively cooperation between project partners has led to a theoretical report on Age Management in the respective countries and interview guidelines for the expert interviews. Apart from this, methodological questions

were discussed and common solutions were found by the project consortium. Face-to-face meetings between partners before conducting interviews in Korea particularly clarified the aim of the interview guidelines and questions. The presence of the German researcher during the interviews in Korea enabled a full picture of the research process for the project coordinator. The methods workshop in Austria paved the way for a common understanding of the interpretation of collected data.

The different cultural environments in Europe and Korea revealed a very different approach to qualitative social research. In general, such experiences and intercultural research can only be conducted if researchers of both cultural backgrounds work together on a project. Access to the research field as well as interpretation of empirical material can only be carried out if the researchers are culturally highly sensitive. The common work of researchers from both cultural backgrounds therefore enabled solid qualitative research.

For future Korean-European research teams, cultural pre-conceptions should not be underestimated. Only joint work on the agenda of the research process, the collection of empirical material, the interpretation of results and face-to-face discussions enable smooth progress throughout a multinational research project. Due to the KORANET funds available for regular team meetings, this project consortium was able to discuss all of these aspects in person, to overcome misunderstandings and to bring together different approaches. Interpretation of the empirical material was making rapid progress, and the results were presented by all the researches at the final conference on Age Management in Hamburg in July 2011.

7.3. Evaluation results show the success of the Pilot Joint Call

An evaluation of the concept and implementation of the Pilot Joint Call showed that there is a huge potential and interest in Europe-Korea collaboration. Many researchers welcomed the funding of mobility and networking as a first step to more sustainable financing from other sources – such as thematic calls in the EU Framework Programmes or national, other European, or Korean funding programmes.

The usefulness of the Pilot Joint Call, especially in terms of starting or supporting a sustainable cooperation was assessed after the funded projects were finalised. The main outcomes gained from online-surveys sent to the researchers that were funded (response rate 39 %: 41 out of 104) can be summarised as follows:

- The Pilot Joint Call was a very successful instrument to start off cooperation. Only 34 % of the European researchers had experience in cooperation with Korean counterparts before. Compared to the European researchers the Koreans at 17 % had even less cooperation experience.
- The success rate of 50 % (14 out of 28 proposals funded) was considered very satisfactory.
- When looking at the subtopics chosen, the greatest interest was in the areas of technologies and health/medicine, whereas social sciences were less well addressed. An explanation might be that the Korean S&T system, which is very strong in technologies and medicine, offered greater attraction for European scientists wanting to collaborate in these fields.
- The strongest motive from both Korean and European researchers for the application to the Pilot Joint Call was to build new cooperation (67 % of Koreans and 76 % of the Europeans surveyed). The fact that relevant research partners are located in Europe/Korea has also been an important motivation for the Korean (50 %) and the European (66 %) scientists.
- The overwhelming majority of the researchers had no problems with the implementation of the projects. Differences in management approaches/cultures were seen by 11 % as very challenging. The time difference between Europe and Korea (around 8 hours) was considered by 30 % as a minor problem.
- Both Korean and European researchers highlighted the high added value of multilateral cooperation: 61 % of Korean researchers stated that a project with only Korean participation would never have produced the same quality of results, and 41 % of the European researchers thought the same had their work been confined to collaboration with only European partners. 33 % of Korean researchers and 45 % of their European colleagues stated that without European or Korean collaboration respectively, their projects would even not have been possible.
- The researchers stated that the greatest impacts of the joint projects were the establishment of new cooperation partnerships, the production of new knowledge (which cannot be achieved within the national framework only) and the better insight into another scientific culture.
- The Pilot Joint Call is also very successful in terms of ensuring sustainability: all scientists involved in the call are planning follow-up activities: e. g. 62 % plan publications with a project partner and 60 % plan to cooperate in the future through a project funded within a formalised programme (e.g. the FP/Horizon 2020).

Following this very positive experience from the Pilot Joint Call, KORANET launched its second Joint Call on Green Technologies. The funded projects will be finalised in autumn 2014.

If you would like to find out more about the 25 projects funded by the KORANET Joint Calls, please consult the fact sheets that were prepared for each project. They can be downloaded at http://www.koranet.eu/en/211.php for the Pilot Joint Call on Life-Long Health (2010) and at http://www.koranet.eu/en/229.php for the Joint Call on Green Technologies (2012).

8. More KORANET achievements

8. More KORANET achievements

Analyses, events, networking, joint funding, people – these are the main building blocks that have so far made KORANET a success. In the past four years of its existence, KORANET has conceptualised, implemented and evaluated a wide range of activities in various European countries and in Korea. This chapter gives an overview of the KORANET project, and describes in more detail individual project activities contained within it.

8.1. KORANET – An EU project promoting research cooperation with Korea

KORANET stands for "Korean scientific cooperation network with the European Research Area". It is a network of European ministries, funding organisations, S&T promotion centres, think-tanks and Korea, represented by the National Research Foundation of Korea (NRF).

KORANET is an ERA-NET project supported financially by the European Commission, under FP7. ERA-NETs are one of the instruments of the European Commission, set up to stimulate cooperation between research funding institutions. The ERA-NET instrument has existed since FP6 (2002–2006), which supported around 70 ERA-NETs. Only a few ERA-NETs are non-thematic, international and target the cooperation with a selected non-European country.

KORANET's activities aim to enhance existing research partnerships between European countries and Korea. To achieve this, several analytical exercises (mappings, foresight studies, inventories of research institutions and funding programmes and other reports) were performed; as well as the conceptualisation and implementation of two Joint Calls for joint European-Korean networking projects. In addition, several events were held to bring together Korean and European S&T stakeholders. These included annual conferences, workshops, and information and brokerage events in Europe and Korea. In addition, a project website was set up and a regular newsletter is published.

The overarching goal of the KORANET project has been to bring together European and Korean S&T stakeholders, with a view to strengthening the international dimension of the European Research Area. The detailed project objectives are:

- Improving information exchange and cooperation between Korean and European research communities
- Exchanging best practices in terms of planning and implementation of S&T policies and international S&T cooperation
- Coordinating bilateral approaches of EU member states/associated countries with Korea
- Specifying priority thematic areas for cooperation
- Establishing an appropriate framework for strategic cooperation
- Developing a one-stop agency for Korean S&T interests
- Learning from completed and ongoing ERANETs
- Developing and implementing a full concept for a Joint Funding Programme area based on a Pilot Joint Call

The KORANET project included five work packages:

- **WP 1: Analysis, monitoring, review**
  Mapping of regional approaches including the preparation of reports and studies on S&T cooperation, as well as an analysis of cooperation instruments and approaches
- **WP 2: Strategy and foresight**
  Leading strategic discussions, identifying areas of common interest, setting framework objectives for future cooperation
- **WP 3: Joint funding**
  Development and implementation of a Pilot Joint Call and based on its evaluation, a Joint Funding Programme of programme owners
- **WP 4: Joint activities**
  Implementing a continuous scientific policy dialogue (annual conferences dedicated to different topics, workshops, brokerage and information events, networking activities for researchers)
- **WP 5: Organisation and management**
  General coordination of the project, including the dissemination of information

More details of KORANET, the project's deliverables and news on EU-Korean S&T cooperation can be found on the official KORANET project website: www.koranet.eu.

8.2. KORANET analytical work

Work packages 1 and 2 of KORANET are dedicated to collecting information on the Korean S&T system and on EU-Korean S&T cooperation. They also contain analyses and inventories of the gathered information and statistics. In addition to general publications on EU-Korean S&T cooperation, this publication, "Korea and Europe – Meeting through science, 2nd Edition" has been compiled by building on the following analytical reports drafted by the KORANET partners. All of the reports in full can be read on the KORANET website at http://www.koranet.eu/en/115.php.

- Overview on existing publications on S&T and cluster/networks statistics (D 1.1.1)
- Recommendation on the production of S&T and competency network statistics (D 1.1.2)
- Report on S&T and competency network cooperation policies and initiatives and public funding organisations (D 1.2.1)
- SWOT analysis of patterns of cooperation (D 1.2.3)
- Report on key institutions (D 1.3.1)
- Report on internationalisation patterns (D 1.4.1)
- Report on scientific collaboration between Europe and Korea (D 1.4.2)
- Questionnaire on driving forces for Korean involvement into European initiatives (D 1.4.3)
- Report on experiences from participation in ERA-NETs and perspectives for ongoing ERANETs (D 1.4.4)
- Concluding report on opportunities and needs for excellent cooperation on S&T and competency network programme owner in EU and Korea (D 1.5.2)
- Foresight synthesis report and consultation paper (D 2.3.1+D 2.2.1)
- KORANET Policy Paper and Joint Action Plan (D 2.1.1+D 2.4.1)

8.3. KORANET public events

During the four and a half years of its runtime, KORANET organised several events dedicated to either particular stakeholders or the general public with an interest in S&T. In addition to four bigger annual conferences, four annual workshops were held on topics that were of interest for Korean and European research communities. In addition, several additional smaller events – such as face-to-face networking sessions, information and brokerage events targeting the European Commission, national research ministries and funding institutions were arranged.

The main events held since the start of KORANET in 2009 are as follows:

The **KORANET conference on green technologies** was held on 14 October 2009 in Seoul, Korea. Its aim was to identify common research topics for Korea and the EU in the area of sustainable energy solutions. The conference identified different issues in green technologies, specifically focusing on renewable energy, next-generation batteries, and energy storage and conversion.

The first **KORANET workshop** was held in Istanbul, Turkey on 20 October 2009 and dealt with green ICT solutions. The purpose of the workshop was to review best practices in Korean-European international cooperation activities in the green ICT field and to examine the current novel approaches to environmentally friendly ICT solutions.

KORANET's Pilot Joint Call Partnering Conference was held on 1–2 February 2010 in Seoul, Korea. The conference officially launched the KORANET Pilot Joint Call in the field of Research for Lifelong Health (Ageing Society).

15 European researchers from France, Germany, Turkey and Austria and 15 Korean researchers presented their expertise and areas of interest in the fields of health/medicine, technology and social sciences. About one hundred researchers and experts took part in the event. A networking session for researchers to have face-to-face time and plan future cooperations took place as part of the conference.

Networking Session at the KORANET Pilot Joint Call Partnering Conference, February 2010, Seoul

The second **KORANET annual conference** was held on 9 September 2010 in Budapest, Hungary. The main aim of the conference was to present the 14 projects that were selected to be financed within the frame of the KORANET Pilot Joint Call on Research for Lifelong Health. The presentations covered medical, technological and social sciences targeting the elderly in an ageing society. Another conference objective was to promote discussion and collaboration between project partners and to present other projects and initiatives in the area of life-long health.

A series of **cluster workshops and trips to clusters in Korea** was organised by KORANET in November 2010. Altogether, five workshops were held over a three day period in Seoul, Gyeonggi, Daejeon and Gumi. The aim of the workshops was to get an understanding of the cluster landscape in Korea and in Europe, to formulate strategies, policies and management practices, to strengthen international cooperation between clusters and to provide a unique platform for policy makers and innovation/cluster experts to exchange experiences and practices. Another **cluster workshop in Europe** was held in March 2011, with guided visits to Italian clusters in the Venice area.

KORANET European Cluster Workshop, March 2011, Venice

In addition, some smaller, more focussed workshops were held in Berlin in June 2009 (Mapping workshop on S&T cooperation policies) and in Vienna in June 2010 (Foresight expert meeting). Visits to selected research institutions and labs in Korea and Europe added to the fact-finding on Korean-European S&T cooperation.

Scientific Visit, October 2009, Seoul

The third annual KORANET conference focussed on nanotechnology and was held on 19 October 2011 in Budapest. At the **KORANET Conference on Nanotechnology**, key scientists from Korea and Europea presented current achievements from their fields of expertise, and provided a platform for the discussion of future visions for the development of the technology as well as the main potential application areas. The conference was organised in cooperation with the KESTCAP project (http://www.kestcap.org), a platform to disseminate information on the European Research Area and the 7th EU Framework Programme in Korea. Experts from the fields of nano- and biotechnology jointly participated in the plenary session of the conference. After this, participants split in two groups to follow more focussed presentations in nanotechnology (organised by KORANET) and biotechnology (organised by KESTCAP). The lunch, coffee breaks and the joint dinner offered ample opportunities to the participants of both events for networking and exchange.

The **KORANET Entrepreneurship Seminar for Early Career Researchers** took place in Daejeon/Seoul on 20 and 21 October 2011. Its aim was to provide opportunities for early career researchers from the EU and Korea to meet face-to-face for the exchange of ideas, knowledge and information on entrepreneurship skills for nanotechnology and other disciplines, and to explore future areas of research and collaboration.

To officially launch the second KORANET Joint Call, a **Partnering Event** was organised on 6 and 7 February 2012 in Seoul/Korea. The topic of the second Call was Green Technologies and was and still is of vital interest for both Korea and Europe, as it fosters green growth, including environmental sustainability as well as industrial growth. The partnering event targeted researchers from universities, research institutions, SMEs or industries from Europe and Korea who were interested in sharing new project ideas and finding collaboration partners within the field of green technologies to participate in the KORANET Joint Call. The main European target countries were those that participate in the KORANET Joint Call: Austria, Germany, Poland, Slovakia, Sweden, Switzerland and Turkey. Around 30 speakers from Korea and several European countries presented their project ideas to the audience. Overall, more than 80 researchers took part in the event, most of them from Korea.

From 2 July to 6 July 2012 the **KORANET Summer School on European-Korean Cooperation in Environmental and Social Sciences** took place in Vienna, Austria. Young researchers and project managers from Korea and Europe were invited to learn more about all steps of project management processes in international scientific projects. The interest of the target group in taking part in the summer school shown ahead of the event was very high. 74 early stage researchers and research project managers from Europe and Korea applied for the summer school. Finally, after evaluation of the applications, 25 participants from Austria, Czech Republic, Germany, Korea, Kosovo, Lithuania, Poland, Slovakia, Spain and Switzerland were invited for participation. They were given an overview of all steps of project management procedures in international scientific projects. They also got a deeper insight into the process; from the first project concept to the successful implementation of projects in intercultural and multidisciplinary teams as well as how to deal with related challenges. Many contacts for future cooperation were established. All participants were highly motivated and contributed with their enthusiasm to a very successful week. They affirmed the applicability of the inputs and group work from the summer school to their scientific careers and international research cooperation plans.

KORANET Summer School, July 2012, Vienna

KORANET was represented at the **Euroscience Open Forum 2012 (ESOF)**. ESOF is Europe's largest, general science meeting which is held in a leading European city every two years. The event is unique in the diversity of delegates who attend: it attracts top researchers from the natural sciences and the social sciences; business leaders; senior EU and government officials; and international scientific media. They come to discuss the best of European science and to address all of the current major global scientific challenges, including energy, climate change, food and health. The KORANET consortium did not want to miss out on this unique opportunity to be part of a get-together of various stakeholders from the world of science, in particular , because the two joint calls which have been implemented within the framework of the program offered two successful examples about how researchers can be supported in teaming up at global level to tackle the major societal challenges of the 21st century. The open-minded and stimulating atmosphere made it quite easy to attract the interest of various people along the entire spectrum of the ESOF's visitors. Profession and disciplinary boarders were only of mi-

nor importance, thus, many different and original views on the KORANET project were given as valuable new input. At the same time the KORANET project was able to raise interest among stakeholders who were not previously aware of KORANET.

Back-to-back to its Annual Conference, the KORANET consortium organised a conference in Espoo, Finland, which picked up the thematic focus of the Second Joint Call on Green Technologies: The **2nd EU-Korea Conference on Green Technology – Solutions for a Green Future in Science and in Industry**. The conference served as a kick-off meeting for the projects which were selected for funding but it was also open for interested stakeholders and the public in general. From 7 to 8 November 2012, the themes of the conference (three main areas of Green Technologies: Reduction of carbon footprint, Technologies for sustainable development and Renewable energies and energy efficiency) were discussed and the way for new cooperative research between Korea and the EU was paved.

On 15 March KORANET held the workshop "International Collaboration in Green Innovation" at the British Council in London. The most striking achievement of the workshop was its ability to bring together experts from different fields for a truly interdisciplinary exchange. According to many of the participants, they gained manifold new insights into the relatively broad field of green innovation through the presentations and comments made by others. While some participants were more focused on EU-Korea STI cooperation, others were more knowledgeable in fields such as technology transfer and innovation management, or the practical application of innovations for sustainable development. The many discussions that took place between the participants during the breaks and after the workshop, give good reason to assume that the workshop might have established new links that will lead to follow up activities. Hence, the workshop can be considered as a success since it was able to establish new links across both physical and disciplinary borders.

Agendas, presentations and reports of many of the events described here can be downloaded from: http://www.koranet.eu/en/117.php.

9. Policy Paper and Joint Action Plan

9. Policy Paper and Joint Action Plan

The following chapter aims to provide policy recommendations for the continued strengthening of R&D cooperation between the European Union and Korea and to suggest related joint actions to National STI Policy Stakeholders in Korea and European countries, the European Commission, the scientific community and the private sector. These recommendations have been developed by experts and stakeholders active in European-Korean R&D cooperation (ministries and agencies from more than 15 countries) within an interactive foresight process involving "back-casting" as one of the methodologies used. It started with the vision of a very optimistic European-Korean R&D cooperation scenario in the year 2020: a so called "Summer Scenario" and then focused on the actions needed to reach this desired cooperation status. Each policy recommendation includes several joint actions, which were prioritised by the stakeholders. They are presented in the roadmap according to their possible time horizon of implementation, feasibility and importance. Further information is available in the full KORANET deliverable available from the website.

Summer Scenario for the future of R&D cooperation between Korea and the European Union in the year 2020

R&D cooperation between Korea and the European Union and its member states emerged from a rather low cooperation level in 2010 to an internationally recognised good practice showcase until 2020. While in 2010 Korean participation in the European Framework Programme for RTD was lagging behind its theoretical potential, in 2020 Korea has significantly improved its position and sustainably belongs to the top 5 cooperation partner countries of the EU in Horizon 2020, the European Framework Programme for RTD. The bilateral R&D relations between Korea and most EU Member States have developed too. Furthermore, European researchers actively participate in Korean national funding programmes which have been opened up further. R&D cooperation between European and Korean researchers became as normal as R&D cooperation between European and U.S. American researchers or Korean and U.S. American ones.

Several efforts have contributed to this satisfying situation.

Firstly, a stable policy dialogue between the European Commission, EU member states and Korea could be maintained with a high solution-orientation to overcome previously existing barriers of R&D cooperation. The policy dialogue was backed by operational convening support, analytical intelligence and S&T policy reflection, and personal, institutional and financial commitment from the side of all involved partners. Moreover, a regularly updated action plan with milestones as well as a regular monitoring of its implementation was the basis for the structuring of the policy dialogue.

Secondly, the policy dialogue was accompanied by several promotion actions, which increased awareness of Korean S&T in Europe and vice versa. These activities

also created meeting places between research managers and researchers from Korea and the EU. They were supported by an operational network of national contact points, who provided information about participation opportunities in research programmes from both Korea and the EU. In addition, other innovation and business consultancy capacities were actively engaged to facilitate the trans-continental cooperation and to reduce transaction efforts.

Thirdly, Korea and the EU and its member states developed joint R&D programmes to enhance joint knowledge generation as well as knowledge and technology transfer. Step-by-step advanced co-financing schemes to support substantial research projects were introduced which replaced unilateral initiatives and decentralised bilateral mechanisms. Joint evaluation procedures were additionally introduced. To overcome fragmentation and/or under-critical mass, several EU member states joined also forces to develop joint programmes and initiatives with Korea in the field of S&T.

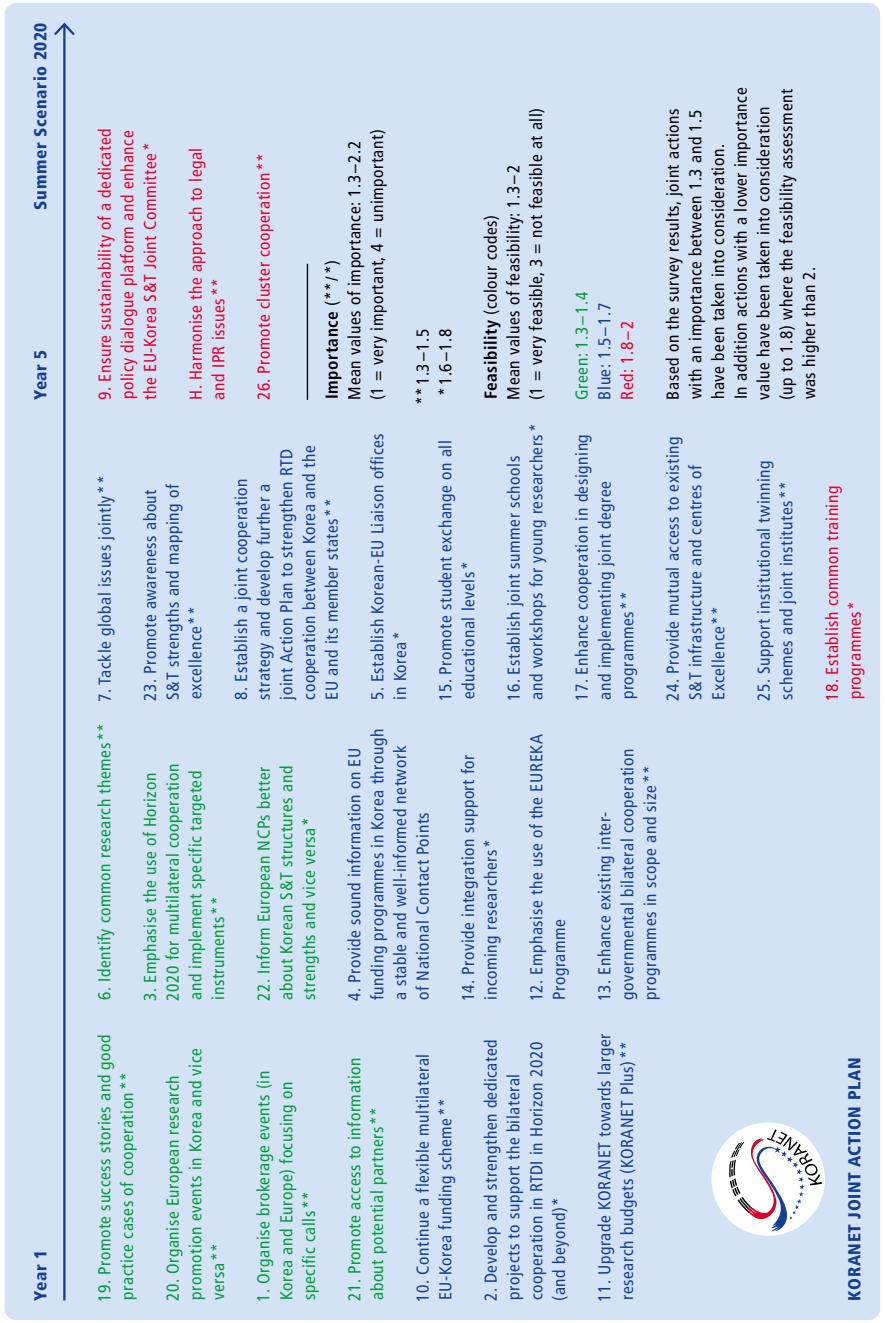
Fourthly, the stimulation and support actions led to an enhanced mobility of researchers and to strategic cooperation agendas of research institutions from Korea and the EU. Bit by bit, joint training and university courses as well as joint degree programmes began complementing purely research-based mobility. Mutual access to existing research infrastructures was also facilitated and research funders agreed to support new joint research infrastructures at several orders of magnitude.

Last but not least, the increase in R&D cooperation between the EU, its member states and Korea was moved forward substantially by innovative companies, which enhanced collaborative project-based R&D cooperation. Moreover, foreign direct investments in R&D both in the EU and Korea were increased and strategic R&D alliances with other companies or research organisations and universities formed. SMEs were also able to be integrated through joint cluster operations and collaborative applied R&D projects.

It goes without saying that certain favourable framework conditions also supported this positive development. Communication technologies and virtual meeting places could increasingly replace lengthy and costly business trips. Initially different regulatory frameworks between Korea and the EU could be harmonised on basis of bilateral agreements as well as on WTO and OECD efforts. Finally, the general efforts of the EU to become a key partner for East and Southeast Asia in economic and cultural terms and the impetus of the EU to tackle global issues pro-actively also supported the bi-regional cooperation between Europe and Korea in general.

9.1. Policy Recommendations and Joint Actions

Based on the stakeholder consultation and questionnaires, the most relevant and most feasible actions have been included in the Joint Action Plan which would be necessary to reach the summer scenario – prioritised as well as planned in time. There is a high correlation between the time horizon and the as-



sessed feasibility of implementation. Most actions can be implemented during the coming five years.

A. Strengthen Koreas participation in the EU Framework Programmes

It is of key importance to strengthen Korea's participation in the EU Framework Programmes as one of the main instruments to improve S&T cooperation between Europe and Korea in the near future. It is certainly good practice that the Korean government has allocated special funds to FP7 promotion and has established a Korean network of FP7 National Contact Points (NCPs) to encourage the participation of Korean researchers in FP7, an approach that should be maintained under Horizon 2020 on the basis of common interest and mutual benefit.

European networks will also be encouraged to cooperate with international non-European counterparts in Horizon 2020, who will be funded by the respective national channels. In this context, close cooperation between the EU and Korean stakeholders to strengthen cooperation and to develop multi-annual roadmaps is envisaged; increased efforts from both sides to facilitate joint projects are needed.

1. Organise brokerage events (in Korea and Europe) focusing on specific calls

The development of trusted cooperation relationships needs to be supported by people-to-people contacts. Brokerage events are recommended to initiate first contacts between researchers and innovators from Korea and Europe, to create contacts for common research projects and to develop potential synergies. Such events are usually also suitable for increasing attendees awareness of specific funding possibilities. One option is the organisation of dedicated brokerage events for EU-Korean cooperation in specific priority topics. On the other hand, calls for participation could be launched for Korean researchers to participate in brokerage events which are organised e.g. in the frame of Info Days in Brussels or elsewhere in Europe as side-events to conferences, etc.

Partnering conferences have also been organised by KORANET for the two joint calls in Korea, both of which had a high impact on consortium building for the submission of joint project proposals and would be a good practice to build upon.

2. Develop and strengthen dedicated projects to support the bilateral cooperation in RTDI in Horizon 2020 (and beyond)

The EC already unilaterally funds so-called 'BILAT' projects, e.g. KESTCAP (Korea-EU Science and Technology Cooperation Advancement Programme) with a focus on promoting FP7 in the Korean research community during 2008–11. A successor project called KONNECT is envisaged. These projects aim to develop S&T cooperation strategies between the ERA and Korea, disseminate S&T information, and enable joint events.

Jointly funding the long-term continuation of such endeavours would ensure the sustainability of the established cooperation to raise even more interest for cooperation under Horizon 2020 and beyond, and to support the policy dialogue under the bilateral S&T agreement between Korea and the EU.

The joint S&T committees need to maintain close links to the stakeholders and consortia working in this area in order to jointly develop credible activities involving all relevant stakeholders, in particular in the common priority areas. Joint ownership, good coordination, sound management and broad participation are keys to the success of such initiatives. The success of the 'BILAT'-type projects should be measured based on the increase of cooperation in the Framework Programmes.

3. Emphasise the use of Horizon 2020 for multilateral cooperation and implement specific targeted instruments

Korea's involvement in the EU Framework Programme has been steadily increasing but compared to other non-European countries it is still very low. Therefore, it is recommended to place further emphasis on the use of Horizon 2020 to address specific problems, which are of global interest and therefore require cooperation by engaging the best scientists to work in and with Europe.

Horizon 2020 is open to the participation of researchers from Korea as an industrialised country, which does not mean that they will be automatically granted funding, but that they are invited to participate in projects.

Furthermore, it is recommended to implement more specific instruments focussing on Korea's strengths – in particular in relation to Europe's weaknesses. Based on the strategic approach to international cooperation of the European Union, specific instruments supported by Horizon 2020 should be utilised for cooperation beneficial to both sides.

4. Provide sound information on EU funding programmes in Korea through a stable and well-informed network of National Contact Points

The Korean government has set up a network of National Contact Points (NCPs) that advise Korean researchers on cooperation opportunities within FP7. The established Korean network of FP7 NCPs needs a further upgrade of its activities and additional support to provide and spread information about Horizon 2020 – but also of other EU programmes open for international participation such as EUREKA and COST. It is recommended that framework conditions are set which ensure the sustainability of the system and the development and upgrade of appropriate information channels to the actors both in the research institutes as well as the business sector (see also action 22. Inform European NCPs better about Korean S&T structures and strengths and vice versa). The staff needs to be well trained and informed about the EU's and EU member states' funding systems, the relevant stakeholders and networks but also able to provide assistance for matchmaking and partnering. Projects such as the above mentioned 'BILAT's as well as specific projects addressing NCPs outside of Europe (e.g. INCONTACT and its continuations) should be fully exploited.

5. Establish Korean-EU liaison offices in Korea

Liaison offices are very good instruments used to gather and exchange information and to encourage linkages between domestic research and foreign sources of excellence. A Korean-EU liaison office in Korea representing European research activities should provide information about European S&T systems, actors and contact points for collaborative research with Europe, identify research funding sources, promote Horizon 2020 and help to develop joint research proposals. Supporting the current collaboration with European institutions and representatives, it should be a reliable information point tracking and reporting on research-related data, help to assess technologies and markets in Korea and Europe, support dealing with issues of intellectual property rights, commercialisation and support cooperation which includes industry-led innovation. Although liaison offices have already been successfully implemented by several EU member

states in some regions (e.g. the French CNRS has already established liaison offices in several cities in the world such as Beijing, Hanoi, Tokyo, Moscow and Washington; Austria operates an Office for Science and Technology in Washington, etc.), currently no European country has such an office in Korea.

As a first step, a feasibility study should determine the possible focus of such an office, which activities it could launch and which impacts it could have. The feasibility study should also explore the interest of European stakeholders to actively contribute to and participate in the establishment of the liaison office. Based on the results, the establishment of a Korean-EU liaison office representing European research organisations is recommended.

B. Strengthen the policy dialogue between Korea and the EU

Since 2007 the European Community has a formalised a bilateral S&T agreement with Korea. This agreement includes a framework and a privileged high-level forum to identify common interests, priorities, policy dialogue, and the necessary tools for S&T collaboration. To keep the information exchange alive, a Joint S&T Cooperation Committee (JSTCC) has been set up by the agreement.

Starting from the current achievements in S&T cooperation between the EU and Korea, it is recommended that the JSTCC should in the future take a pivotal role in further advancing this cooperation. The dialogue on high political levels needs to be thoroughly followed up through concrete implementation steps and in this respect, concrete and jointly funded activities should be implemented in a flexible manner, adaptable to the deliberations and conclusions of the dialogue, see action 2. Develop and strengthen dedicated projects to support the bilateral cooperation in RTDI in Horizon 2020 (and beyond).

6. Identify common research themes

At the third JSTCC meeting which took place in 2011 in Seoul, the EU and Korea agreed to reinforce cooperation, in particular through a 'scale & scope approach' focusing on key sectors of shared interested and mutual benefit. It has been agreed that cooperation in the key areas of energy, nano- and industrial technologies, ICT and mobility of researchers should be increased. The next JSTCC meeting, mid-2013 in Brussels, shall review the progress. To maintain a focused and structured policy dialogue, it is recommended to continue to concentrate on these key priority areas. The further identification and updating of these areas should be backed by scientific analyses on the strengths and weaknesses, current cooperation in publications and patents, etc. which could be complemented by a participatory process figuring out common research interests.

7. Tackle global issues jointly

Global challenges make it necessary to pool know-how to find solutions, to adjust and compare different approaches and also to implement the findings worldwide on a broad scale. Sharing knowledge, exchanging experiences and pooling resources based on common policy strategies are of outmost importance in tackling problems efficiently and effectively. It is important to focus on mutual learning processes involving scientists and researchers but also STI policy makers in the EU and Korea, as well as on the exchange of effective policy approaches and good practices to tackle global issues. Special events and trainings should be organised to increase the knowledge about good practices and strategies on both sides. Analytical background could be provided by projects supported by existing cooperation programmes, eventually also involving other world regions in the joint endeavours.

8. Establish a joint cooperation strategy and develop further a joint Action Plan to strengthen RTD cooperation between Korea and the EU and its member states

A 'Joint Cooperation Strategy' shall provide a common platform complemented by a 'Joint Action Plan' to address different stakeholders in STI cooperation through specific measures and instruments.

Based on the experience of previous projects and publications, the document at hand serves as a baseline which is recommended to be updated on a regular basis in the frame of the strengthened policy dialogue, with the involvement of a broader group of stakeholders, and taking into account current developments.

9. Ensure sustainability of a dedicated policy dialogue platform and enhance the EU-Korea S&T Joint Committee

In order to implement the overall recommendation B. Strengthen the policy dialogue between Korea and the EU, a dedicated and sustainable policy dialogue platform is necessary. With the EU-Korea Joint Science and Technology Cooperation Committee (JSTCC) such a platform already exists.

Currently the JSTCC involves officials from Korea and the European Commission's Directorate General for Research and Innovation, while representatives of the EU member states are currently not involved in the dialogue. Therefore, it is recommended to invite alternating representatives of different countries, and to establish sustainable communication channels with representatives of other relevant DGs as well as the EU member states. The involvement of SFIC also needs to be considered in this respect.

C. Improve the use of existing RTDI programmes for research cooperation

Beside the Framework Programme of the European Commission already highlighted above, there are a lot of other programmes offering possibilities for RTDI cooperation: bilateral programmes co-funded by Korea and single European countries, unilateral programmes targeting one or more European country/countries run by Korea, unilateral programmes targeting Korea run by a European country, multilateral programmes such as KORANET as well as the pan-European programmes EUREKA and COST.

Unilateral Korean RTDI programmes offered by the funding organisations KIAT, NRF and KETEP which are open for European participation and have also been promoted through the European funded project KORRIDOR are still not used for mutual cooperation to their full potential. KORANET as a flexible multilateral funding scheme is under danger of discontinuation. And although Korea is the first non-European country in the EUREKA scheme, the awareness of this opportunity is not yet very high.

10. Continue a flexible multilateral EU-Korea funding scheme

KORANET implemented two joint calls with commitments by several European countries and Korea. The call monitoring showed that the activity was very successful to initiate research cooperation. Based on these calls, a flexible and sustainable European-Korean funding programme could be set up within the framework of one of the following possibilities:

- A funding-scheme driven by national contributions, in which the two Korean funding institutions (NRF and KIAT) and the funding organisations of European member states go ahead without EC funding;

- A new BILAT project with Korea including a flexible component continuing the joint funding scheme;
- An upgraded KORANET project, including a top-up funding by the European Commission with larger research budgets (KORANET Plus) based on the ERA-NET scheme; or
- A coordinated call between Korea and the EC.

The instrument used has to be adaptable to the needs of the stakeholders for the different calls. This means that it should be possible to adjust the joint funding programme to the number of countries participating in a call, the research themes in which the call is realised, the research activities to be funded, the target beneficiaries, etc.

The multilateral funding scheme needs to have simple rules and procedures, with clear application processes and a short time-to-grant. It is recommended that the EC instruments (ERA-NET, BILAT) are used as far as possible, as they provide additional incentives for the participating agencies, and ensure coherent and high quality processes for applications, evaluation and monitoring, etc.

11. Upgrade KORANET towards larger research budgets (KORANET Plus)

Based on the action 10. Continue a flexible multilateral EU-Korea funding scheme, it is particularly recommended that the European Commission is lobbied for the co-funding of an "ERA-NET Plus" project to support EU-Korea cooperation.

ERA-NET Plus is one of the further developments of the ERA-NET funding instrument which was used to implement KORANET. Selected pre-existing ERA-NET projects receive top-up funding from the European Commission to increase the funding for the transnational call for proposals with common research priorities. While the ERA-NET scheme supports the coordination of the launch of joint calls for proposals, ERA-NET Plus focuses on funding of the actual R&D-activities. The ERA-NET Plus actions shall relate to areas in which research will have sufficient European added value as the European Commission tops-up the joint call with additional funding of 33 % of the total sum of national contributions. To make use of the positive experiences gained and networks built up with KORANET so far, it is recommended to offer an ERA-NET Plus in the first calls of Horizon 2020.

12. Emphasise the use of the EUREKA Programme

EUREKA is an intergovernmental network launched in 1985, to support market-oriented R&D and innovation projects by industry, research centres and universities across all technological sectors. It is composed of 41 members, i.e. 40 member countries and the EU.

EUREKA's Eurostars Programme is the first European funding and support programme to be specifically dedicated to research-performing SMEs. Korea became an associated member of EUREKA in 2009 and was the first (and still only) country from Asia. It is proposed to further emphasise the use of EUREKA by actively promoting the programme. This would be e.g. possible by an information campaign designed for the Enterprise Europe Network (EEN). The EEN is a network with has approx. 600 member organisations across the EU and beyond, including chambers of commerce and industry, technology centres, universities and development agencies which support SMEs in their internalisation efforts.

13. Enhance existing inter-governmental bilateral cooperation programmes in scope and size

Bilateral agreements are often only expressions of a general willingness to collaborate and an expression of bureaucratic measures, but the approach already taken by Korea to build up concrete and specific programmes based on formal agreements needs to be further capitalised upon. Korea does provide concrete funding instruments for international cooperation activities between Korea and the respective other country. It is important to allocate a dedicated budget for the cooperation, providing financial support to concrete projects, rather than only supporting mobility.

Although for the European side and in particular for smaller countries, the multilateralisation of some bilateral agreements, as demonstrated in KORANET, is very useful – see action 10. Continue a flexible multilateral EU-Korea funding scheme, bilateral cooperation programmes still also have their place in a strategic approach to cooperation with Korea, in particular if enhanced in scope and size.

D. Increase researchers' mobility and cooperation

There are several possibilities used by both Korea and the EU and its member states to implement policies encouraging researcher mobility: they range from incoming fellowship programmes to the removal of barriers, the provision of information to make mobility easier, to policies designed to simplify the inflow of foreign talent. To increase mobility, exchange of information on existing measures to facilitate researchers' mobility and the promotion of available funding schemes as well as of the conditions and requirements is necessary.

14. Provide integration support for incoming researchers

Up-to-date and easy to find information is one of the aspects important for mobile researchers. As already mentioned, EURAXESS – Researchers in Motion is a web portal providing access to information and support services for European and non-European researchers who wish to pursue research careers in Europe. EURAXESS includes a job database, informs about rights and duties of researchers and their employers and has established a network of more than 200 Service Centres, which assist researchers and their families in EURAXESS, which also includes a section on funding for international research searchable by discipline is certainly a good practice in this respect and should be further enhanced e.g. by providing specific information for Korean researchers in Europe. ACCESS4EU is another platform which informed Europeans about possibilities to access funding provided by Korea until the end of 2012 and which is recommended to further be updated.

To establish new connections between the researchers and funding agencies in Europe and Korea, networking events that support short-term mobility should be organised, for example researcher workshops, summer or winter schools for selected scientific fields and priority areas or pooled scholarship resources. Also web-based networking should be facilitated.

Following action 1. Organise brokerage events (in Korea and Europe) focusing on specific calls, the "Excellent Science" pillar of Horizon 2020 as well as the "Marie Skłodowska-Curie Actions" (MCA) which aim to increase the transnational mobility of researchers should be highlighted and promoted intensively with dedicated material in Korea.

organising their stay in a foreign country. In addition, a special networking tool for European researchers working in selected non-European countries (such as United States, Japan, China, Singapore and India) was also set up and an information officer is working in the respective countries. This approach needs to be extended towards Korea. And a similar approach should be taken from the Korean side. Taking into account different cultures and languages, more specific support for long-term incoming researchers on both sides is needed. Such support should also extend towards the spouses (double careers) and families of the mobile researchers. It should include integration support to culture and language, networking and support to understanding the systems of health care, housing, etc.

15. Promote student exchange on all educational levels

Korean students and researchers are highly mobile. However, they prefer to go to the United States and Japan than to European countries. In turn, the current share of international students going to Korea is relatively low. To reinforce students' and (young) researchers' mobility between the EU and Korea several actions are recommended, for example, it is vital to offer a critical amount of the curriculum in English language, especially in countries whose languages are rarely spoken by foreigners, e.g. Korean, Hungarian, Polish, Finnish, Lithuanian or many others. It is recommended to promote internationally oriented university courses and to present them at international education or research fairs, e.g. an annual EU-Korean education fair taking place in both Europe and Korea. Furthermore, the visibility of already existing exchange programmes needs to be enhanced, e.g. through an information portal linked to EURAXESS, listing exchange and fellowship programmes, upcoming calls for student exchanges and information on dedicated summer schools (see action 16. Establish joint summer schools and workshops for young researchers) or research-oriented workshops.

16. Establish joint summer schools and workshops for young researchers

Summer (or winter) schools and dedicated workshops are very important for stimulating cooperation and mutual cultural understanding, especially with a focus on young researchers. The participants shall gain knowledge about subject areas but also on Korean and European research policies, funding possibilities, preparation and evaluation of a project proposal and intercultural aspects of the project work.

17. Enhance cooperation in designing and implementing joint degree programmes

Building cooperation between Korean and European higher education institutions is an important step towards mutual collaboration. At present, cooperation and exchange between Korean and European universities still remain rather inactive, compared to those with U.S. institutions.

Korean universities have the possibility to operate joint curricular programmes with foreign universities on the basis of bilateral arrangements, in the frame of which they may offer joint degrees. Joint curricular programmes currently in operation include for example a joint M.A. programme in mechanical engineering by Sogang University of Korea and Germany's Technische Universität München or a joint M.A./Ph.D. programme in biological chemistry engineering with Friedrich-Alexander-Universität Erlangen-Nürnberg. Korea's KyungHee University operates a dual degree programme with the French Ecole Polytechnique, while the Seoul National University of Technology offers a dual degree programme with the U.K. University of Northumbria.

To offer more joint degrees between the EU and Korea in the future it is recommended to identify and disseminate showcases of EU-Korean higher education cooperation and to make more use of programmes offering support to establish these kind of programmes, e.g. the 'EU-ICI-ECP Education Cooperation Programme' which supports joint mobility projects with industrialised countries and joint degree projects. Scholarships for students studying abroad are offered e.g. by the 'Erasmus Mundus Programme' which aims to enhance quality in higher education through scholarships and academic cooperation between Europe and the rest of the world.

18. Establish common training programmes

In order to enhance successful cooperation, it is suggested that training programmes and activities in science management are implemented. These activities could be workshops or summer schools in the fields of science, innovation management and related technical skills organised by European or Korean funding agencies for project managers from both sides to share best practices.

E. Promote European research actors in Korea and vice versa

A core prerequisite for stimulating and enhancing cooperation is the respective promotion of research stakeholders such as research organisations, universities, private enterprises and public authorities in the two geographical areas respectively. Different stakeholders and projects have already taken important steps in this direction, but coordinated efforts are needed to step up the impacts.

19. Promote success stories and good practice cases of cooperation

The promotion of success stories should serve as an example, encouraging researchers and stakeholders to cooperate with each other. Lessons learned can be used to advance cooperation strategies. Hence, it is recommended that success stories are promoted through a diverse set of channels (e.g. social media, project newsletters, presence at scientific and political events) to ensure good coverage of the target groups.

20. Organise European research promotion events in Korea and vice versa

To provide opportunities facilitating the public dissemination of research outputs, foster exchanges of learning and allow awareness-raising in terms of research excellence available in Korea and Europe, it is recommended that dedicated research promotion events are organised, or a travelling exhibition which provides information about excellence projects. A presentation of Korean research excellence could be linked to the Researchers' Night which is a yearly Europe-wide event.

21. Promote access to information about potential partners

The European Commission runs CORDIS, the Community Research and Development Information Service, which is an interactive information platform that publishes the latest news on initiatives and progress in European research and development. CORDIS is free of charge and offers access to European Union research and development funding programmes, as well as information on potential partners and previous and on-going projects. KORANET set up a research institute inventory for the two joint calls, which enables partner searches in Korea and in the European countries participating in KORANET.

To facilitate partner searches for new cooperation, promotion of CORDIS by the NCPs is recommended, especially in Korea where there is still only minimal knowledge about this platform.

Additionally, it is recommended that incentives are provided for Korean research institutes to promote their activities on their webpages in English as well as in Korean, in order to facilitate access to information for potential partners.

22. Inform European NCPs better about Korean S&T structures and strengths and vice versa

One of the core activities of the NCPs of FP7/ Horizon 2020 and other EU programmes is informing and raising awareness through circulating general and specific documentation (programmes, requirements for participation, open calls etc.), and via the organisation of promotional activities (info days, seminars, conferences, newsletter, web sites, fairs etc.). They are information hubs for European researchers and therefore it is recommended to inform the European NCPs better about the S&T structures and strengths in Korea so that they can provide tailored input to their clients.

A sustainable NCP system in Korea is equally important – see action 4. Provide sound information on EU funding programmes in Korea through a stable and well-informed network of National Contact Points. This includes inter alia efficient trainings of NCPs and the avoidance of frequent staff changes.

F. Strengthen research cooperation on institutional level

One of the main pillars of international cooperation is the institutional level. A variety of institutional agreements by European and Korean S&T institutions (universities, research agencies, business and non-government organisations) has been signed over the last years. These agreements are preparatory actions, to initiate and facilitate research cooperation and to provide the basis for long-term cooperation. Taking into consideration the high importance of cooperation on institutional level, it is recommended that the identification of the best partners and the creation of initial contacts is facilitated, to promote more institutional long-term cooperation and research programmes which provide the financial background to implement agreements and for an enhanced and sustainable cooperation.

23. Promote awareness about S&T strengths and mapping of excellence

Maps of excellence to identify the best research performing institutions in selected science and technology fields are useful instruments to shed light on the research strengths of countries and to facilitate first steps in international cooperation. Mapping results should be widely disseminated to policy makers, the scientific community, industry and investors to increase the visibility of European research in Korea and vice versa. The mapping should therefore lead to a greater recognition of excellence of Korean and European research and provide a sound basis for 'get-in-touch' activities.

24. Provide mutual access to existing S&T infrastructure and centres of Excellence

Research infrastructures are a key instrument in attracting and bringing together researchers from the public sector and industry to act together and also to jointly tackle global challenges. Research infrastructures and centres of Excellence offer stimulating research environments that attract researchers from different countries, regions and disciplines.

To figure out which S&T infrastructures in Europe and Korea are internationally accessible, the development of an inventory is recommended. In addition, the analysis of good practices, barriers, obstacles and threats on trans-national access to scientific infrastructure should be conducted to ensure that it will be possible for researchers in both Europe and Korea to mutually profit from existing S&T infrastructures. Based on these results, it is recommended that a Korean-European roadmap is developed, which includes links and synergies between the strategic discussions within the European Strategy Forum on Research Infrastructure (ESFRI), Horizon 2020 and respective Korean strategies and programmes.

25. Support institutional twinning schemes and joint institutes

To strengthen research cooperation between Korean and European research institutions, support for institutional twinning schemes is recommended. Institutional twinning activities facilitate long-term cooperation between research institutions and can foster capacity building. Examples of possible activities are staff exchange, joint research projects and the shared use of infrastructure. Such long-lasting and mutually beneficial twinning activities could be organised within Memoranda of Unterstanding between similar or complementary research institutions. Support from the Marie Curie schemes could be exploited to that end or the UNITWIN programme run by UNESCO which involves 131 countries, including Korea.

A next step could be the creation of joint institutes, joint ventures or joint centres which serve as a platform for further cooperation – linking existing institutes or universities. Policy stakeholders at national and EU-levels should provide the necessary financial means and framework conditions for supporting institutional twinning schemes or executive programmes for the establishment of sustainable institutional cooperation.

G. Focus on technology and industry related cooperation

In Korea, investments from industry play a major role in R&D. Figures for GERD in 2010 show that 72 % are funded by industry while in Europe and in particular in some EU member states this share is rather weak. Korean companies invest heavily in research and development. To further strengthen the technology and industry related cooperation with the EU it is recommended that a focus is placed upon already existing organisations and instruments, e.g. initiatives and services provided by KOTRA (Korea Trade-Investment Promotion Agency) which is a non-profit, governmental agency of Korea committed to promoting international trade and investment with a worldwide network of over 100 offices in 70 countries.

Political stakeholders and technology and industrial organisations should also place a stronger focus on the use of the EUREKA programme (see action 12. Emphasise the use of the EUREKA Programme) as well as other schemes that provide opportunities for companies and public research organisations to create networks and partnerships for joint R&D projects and to increase skills exchange between the commercial and non-commercial sectors (such as one of the FP7 Marie Curie Actions, the Industry-Academia Partnerships and Pathways/IAPP).

26. Promote cluster cooperation

Clusters are networks that enable the unification of fragmented value chains especially in interdisciplinary fields, such as green technologies or intelligent housing. They help to implement internationalisation activities of companies and research institutions by connecting

the relevant stakeholders and can link regions in Europe and Korea from a technology perspective to enable technology and knowledge transfer.

To strengthen cluster cooperation, a benchmarking exercise of European and Korean clusters with regard to objectives, methods and impact of cluster activities would provide insights and best practice examples that can influence the quality of national cluster and network programmes as well as policy initiatives and innovation support programmes. The European Cluster Observatory provides a basis for mutual learning, knowledge transfer, comparing to others and a dialogue at meta-level could be ensured.

In addition, concerted internationalisation strategies of the members of a cluster can facilitate its cross border cooperation activities. Based on a state-of-the-art-analysis of the cooperation patterns and a needs assessment, the strategy should include an action plan and regular monitoring and controlling. Clusters should also be supported with training on intercultural management, international leadership, and negotiation skills across borders etc.

H. Harmonise the approach to legal and IPR issues

Currently, reports on the evaluation of Korea-Europe S&T cooperation show that IPR issues are not a major hindrance, but expertise from lawyers is certainly needed. The recommendations to further harmonise the regulatory framework on IPR and to strengthen the IP regulations are considered already well tackled as the standards set by the TRIPS Agreement (trade-related aspects of intellectual property rights), which is a cornerstone of the WTO, are signed by Korea and Europe and represent the most important attempt to establish a global harmonisation of Intellectual Property protection. Additionally, the EU and Korea plan a regular dialogue on intellectual property, during which the implementation of the Agreement will be monitored and any other relevant issue may be addressed. Furthermore, the EU-Korean S&T Agreement lays down principles concerning the allocation of intellectual property rights for direct cooperation activities.

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Acronyms

AAL Ambient Assisted Living
ADeKo network Alumni network Germany-Korea
ASEAN Association of Southeast Asian Nations
BILAT Projects of FP7 to enhance the bilateral S&T partnerships between the EU and third countries
BMBF German Federal Ministry of Education and Research
BRICS Brazil, Russia, India, China, South Africa
CERN European Organization for Nuclear Research
CIP Competitiveness and Innovation Framework Programme
CNRS Centre national de la recherche scientifique (France)
CORDIS Community Research and Development Information Service
EC European Commission
EEN Enterprise Europe Network
EIT European Institute of Innovation and Technology
ERA European Research Area
ERC European Research Council
ERDF European Regional Development Fund
ESFRI European Strategy Forum on Research Infrastructures
ESOF Euroscience Open Forum
ETP European Technology Platform
EU European Union
EU-27 EU's 27 Member countries (as of 2007)
EURATOM European Atomic Energy Community
FDI Foreign Direct Investment
FK-PPL France-Korea Particle Physics Laboratory
FP Framework Programme for Research and Technological Development
FTA Free Trade Agreement
FYR Former Yugoslav Republic
GDP Gross Domestic Product
GERD Gross Domestic Expenditure on R&D
GRL Global Research Laboratory Programme
GRN Global Research Network Programme
IBS Institute for Basic Science
ICPC International Cooperation Partner Country
ICT Information and Communication Technologies
ILA International Associated Laboratory
IPCMS Institut de Physique et Chimie des Matériaux de Strasbourg
IP Korea Institut Pasteur Korea
IPR Intellectual Property Rights
ISBB International Science and Business Belt
IT Information Technology
ITER International Thermonuclear Experimental Reactor
JINBiT Joint Institute für NanoBio-Technology University of Münster and Gwangju
JSTCC Joint S&T Committee on Scientific and Technological Cooperation
JTI Joint Technology Initiatives
KAIST Korea Advanced Institute of Science and Technology
KIC Knowledge and Innovation Communities
KICOX Korea Industrial Complex Corp.
KIST Korea Institute of Science and Technology
KISTEP Korea Institute for S&T Evaluation and Planning
KISTI Korean Institute of Science & Technology Information
KOTRA Korea Trade-Investment Promotion Agency
KTC Korea Trade Centers
LED Light Emitting Diode
MCA Marie Skłodowska-Curie Actions
MEST Korean Ministry of Education, Science and Technology
MKE Korean Ministry of Knowledge Economy
MNC Multinational Companies
MOTIE Korean Ministry of Trade, Industry and Energy
MoU Memorandum of Understanding
MPC-AS Max Planck Centre on Attosecond Science
MSIP Korean Ministry of Science, ICT and Future Planning
MRS Magnetic Resonance Spectroscopy
NIBC Nanotechnology, biotechnology, information technology, and cognitive sciences
NRF National Research Foundation of Korea
OECD Organisation for Economic Co-operation and Development
PPP Purchasing power parity
R&D Research and Development
RTD Research and Technological Development
RTDI Research Technological Development and Innovation
SCI Science Citation Index
S&E Science and Engineering
S&T Science and Technology
SFIC Strategic Forum for International S&T Cooperation
SMEs Small and medium-sized enterprises
STI Science, Technology and Innovation
SWOT-Analysis Strengths, Weaknesses, Opportunities, Threats-Analysis
UNESCO United Nations Educational, Scientific and Cultural Organization
WTO World Trade Organisation

KORANET partner organisations

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- Centre for Social Innovation (ZSI), Austria
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The book presented by the consortium of the KORANET project (supported by the 7th EU Framework Programme) reviews the current cooperation practices and possibilities of science, technology and innovation (STI) cooperation between the European Union / the EU member states and Korea.

It presents the main features of the Korean and European S&T systems and updated statistics in order to promote understanding of the differences and similarities of the research landscape. The 2nd edition of "Korea and Europe – Meeting through science" sets out information relevant to European and Korean research stakeholders by providing an overview of the variation in S&T strategies and policy instruments used in Korea and in European countries, an analysis of the existing networks and clusters as well as the results of the SWOT analysis of the current cooperation practices.

KORANET has met the growing interest of the research community by supporting excellent research projects in two joint calls focusing on the areas of life-long health and green technologies, which are also briefly described in the book as well as other selected activities and achievements. Proposals for further joint actions which have been widely discussed in a participatory foresight exercise are presented in the final chapter.

This publication is prepared for major S&T stakeholders in Europe and Korea, including researchers, research institutions and funding agencies, policy makers at national and international level, cluster managers, in particular those involved or interested in S&T cooperation, and all those responsible for international collaboration.

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