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Safe and Green Road Vehicles Europe

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1. Summary

The European project SAGE aims to strengthen regional capacity in research and innovation to support the transfer of road vehicle technology to the market. The project represents a network of regional research driven clusters with strong automotive industry, Västra Götaland (Sweden), Paris/Normandie (France), Regensburg (Germany), Piemonte (Italy) and Warsaw (Poland).

The aim of this report is to present the International Collaboration Strategy (ICS) within SAGE, namely the strategy for collaboration between the SAGE regions in Europe and research driven automotive clusters in Asia. The strategy is based on the analysis of Asian clusters done in SAGE D7.1[1] as well as on the regional analysis of the SAGE partner regions in Europe done in WP2 (SAGE D 2.2[2]) and the SWOT carried out in WP3 (SAGE D3.1 and D3.2[3]). The ICS is also linked to the thematic approach of the Joint Action Plan (SAGE D 4.3[4]).

In SAGE D 7.1, nine research driven automotive regions in Asia were described and analyzed with respect to their ability in the area of Green and Safe road vehicle development.

Out of those nine regions four were selected as most relevant considering the focus areas of SAGE; Safe, Green, Connected. Three parameters were particularly important in the selection process. The clusters need to display a strong R&D capability, have a triple-helix approach and preferably also have established links or contacts with partners in the SAGE regions.

Based on the criteria mentioned above, the regions of Beijing, Shanghai, Nagoya and Daejeon are of particular interest.

In order to strengthen the connections between the SAGE clusters in Europe and the selected regions in Asia, closer links will be established with the aim to develop a strategy and action plan for international collaborations.

The work was led by AB Volvo but in close collaboration with the WP7 core team consisting of representatives from Mov'eo in France, Continental in Germany, Warsaw University in Poland and Region West Sweden as coordinator for the project.

[1] http://www.sage-project.eu/reportsdocs.html
[2] http://www.sage-project.eu/reportsdocs.html
[3] http://www.sage-project.eu/reportsdocs.html
[4] http://www.sage-project.eu/reportsdocs.html

2. Introduction

The SAGE project (Safe and Green road vehicles) is a project under the European Regions of Knowledge framework program of FP7. The science and technology scope of SAGE are safety for drivers, passengers and other road users as well as greening of road transport. This is achieved partly by conducting thorough analysis of regional clusters of all SAGE partners. The goal of SAGE is to strengthen European competitiveness in the road vehicle sector by creating an integrated "meta-cluster", open to European contributors, taking the global lead in safe, green and sustainable road vehicle technology. The SAGE network consists of 5 regional European research driven clusters; Västra Götaland (Sweden), Paris/Normandie (France), Regensburg (Germany), Piedmont (Italy) and Warsaw (Poland). A strong and broad commitment in technology sectors related to Green and Safe technologies is present in all the regions and Western Sweden, Paris region and Piedmont host headquarters, plants, engineering and production centres of worldwide vehicle manufactures. The presence of leading automotive suppliers, public research centres and universities is also significant, whereas professional organizations and SMEs complete the global picture of the cluster's ecosystem.

To be able to learn from best practices from regions outside the partnership of SAGE, the project also maps automotive clusters/regions outside of Europe. Work package 7 focuses on international collaboration and the first deliverable (D7.1 Benchmark of international cluster best practice) presents the mapping of nine research driven automotive clusters in Asia. See Figure 1

Figure 1: Research driven automotive regions presented in D7.1.

This document presents the international collaboration strategy within SAGE, namely the strategy for collaboration between the SAGE regions in Europe and research driven automotive clusters in Asia. The strategy is based on the analysis of Asian clusters done in D7.1 as well as on the regional analysis of the SAGE partner regions in Europe done in WP2 (SAGE D 2.2) and the SWOT carried out in WP3 (SAGE D3.1 and D3.2). The ICS is also linked to the thematic approach of the Joint Action Plan (SAGE D 4.3).

The overall conclusion from the comparison of the regional clusters, with respect to the SAGE objectives of research and development intensive collaboration, is that the selection criteria to pursue further work on are:

- That the regions show important R&D capability
- That the regions have a triple-helix approach

- That SAGE partners or stakeholders within their regions need to have established links in order to develop collaboration.

3. Background

Global challenges are important drivers for research and innovation. Cutting edge research and innovation are being performed in countries outside of Europe and as research driven automotive clusters in Europe the SAGE regions need to get access to external sources of knowledge. A strategic approach to interesting research driven clusters in Asia is one way of strengthening our own research excellence and attractiveness.

It is of outmost importance to engage in win-win collaborations and to cooperate on the basis of mutual benefit. In the coming year's mobility and transport systems will need to fully integrate the vehicle, infrastructure and information and communication technologies in order to offer the mobility services that customers will progressively demand.

With this background, SAGE invites clusters from inside and outside Europe to join the network and collaborate within the areas of green, safe and connected transport and mobility solutions.

The existing research and innovation landscape in Beijing, Shanghai, Nagoya and Daejeon is described in the benchmarking study (SAGE D7.1). The description includes primary actors and organizations within the areas of green and safe as well as industrial and policy contexts. The four regions were selected because of their extended competence within the SAGE focus areas but also because of their existing cluster organization and supportive policies indicating growing interest for collaboration. In order to learn more about the four regions, representatives from the SAGE consortium will conduct study visits to important stakeholders and establish contacts with representatives from universities, industry and public authorities. The overall purpose is to better understand the ecosystem of automotive research and innovation and to validate the possibilities for cooperation between the SAGE regions in Europe and the identified clusters in Asia.

3.1.Strategic Research & Innovation Collaboration Areas

3.1.1. Safety

Every year about 1.3 million people are killed and 20-50 million are injured in road accidents worldwide. Vehicle and Traffic Safety is of vital importance for a sustainable future European transport system.

The SAGE consortium has long experience and strong competence within the safety area. New types of engines, drivelines, vehicle structures and materials however pose new challenges for safety. Co-operation on a SAGE consortium level allows the use of more resources in terms of e.g. competence and test arenas. Research and innovation within the safety field concerns both active (e.g. accidence avoidance and mitigation) and passive (protection of driver and passenger) safety.

3.1.2. Green

The European research agenda clearly stresses the importance of the topic Green for our society. Therefore new green technologies for the vehicle have to be developed (electrification, Internal Combustion Engine improvements and lightening). In addition, the vehicle must be able to respond to changes in environmental and traffic conditions, as provided by the transport management system. SAGE aims to contribute to this by identifying and prioritizing joint RDI projects. In this context, demonstration projects have an extremely important role to play in terms of comprehensively evaluating the impact of a technology and the innovative solutions developed, quantifying the benefits and costs to society in absolute terms.

3.1.3. Connectivity

Connectivity is a mega trend. For vehicles it means that either the vehicle is connected to another vehicle (V2V) or that the vehicle is connected to infrastructure (V2I). Infrastructure can be e.g. connection through a traffic operation centre, on line services (route maps, advertisements), workshops, the OEM, humans (via smart phone, PC) or the charging infrastructure and electricity grid for e-vehicles.

Connectivity increases traffic safety as vehicles can communicate with each other and pass warnings on dangerous situations. Connectivity can optimize traffic management and make a contribution to clean power. At the same time connectivity makes road traffic more comfortable for the driver. The Human Machine Interface (HMI) is an important topic of connectivity. HMI has to ensure usability and reduce distraction of the driver and is in this way also closely related to the Safety topic.

3.2. European research agenda – International strategy

On 14 September 2012, the Commission adopted a Communication entitled 'Enhancing and focusing EU international cooperation in research and innovation: a strategic approach' (COM (2012) 497)[5]. The Communication sets out a new strategy for international cooperation in research and innovation, in particular with the view to implement Horizon 2020. The new strategy includes that Horizon 2020 will be fully open to third country participants, allowing European researchers to cooperate with the best competences across the world.

Another important European research agenda with large impact on the European research funding programs for road transport has been developed by ERTRAC, the European Road Transport Research Advisory Council. Their most recent roadmaps can be downloaded from the website: www.ertrac.org

In a recent ERTRAC document, Multi-Annual Plan for implementation of Horizon 2020, (March 2013), that was prepared to identify the most important RDI topics for Horizon 2020 (the upcoming RDI funding program of the European Commission), overall efficiency targets for improvement of the European road transport system have been identified. They have been defined for three societal needs: decarbonisation, reliability and safety as illustrated in Figure 2:

	Indicator	Guiding objective
Decarbonization	Energy efficiency: urban passenger transport	+80% (pkm/kWh) *
	Energy efficiency: long-distance freight transport	+40% (tkm/kWh) *
	Renewables in the energy pool	Biofuels: 25% Electricity: 5%
Reliability	Reliability of transport schedules	+50% *
	Urban accessibility	Preserve Improve where possible
Safety	Fatalities and severe injuries	-60% *
	Cargo lost to theft and damage	-70% *

* Versus 2010 baseline

Figure 2: ERTRAC Multi-Annual Implementation Plan for Horizon 2020.

[5] http://ec.europa.eu/research/iscp/index.cfm?lg=en&pg=strategy

For **Safety** the target is to reduce the number of fatalities and severe injuries by 60% in 2030 compared to 2010 as a baseline, and for Green (decarbonisation) there should be an increase in 80% in energy efficiency of urban passenger transport in this period. Important RDI efforts needed to reach the targets are described in the roadmap mentioned above.

The SAGE focus area **Connected** is not classified by ERTRAC as a societal need, but it is seen as a very important technology to improve Safety and Reliability of the transport system as well as meeting the Decarbonisation targets. According to the Oliver Wyman Study "In-Car IT – Trends, Opportunities, and Challenges for Automotive Suppliers" from 2011 80% of all new vehicles will be connected in 2016. In addition, there is of course, the need to make all the "old" vehicles, which are already on the roads before 2016, connected as well. Connectivity is a cross-domain topic. Therefore, guidelines from EU referring to connectivity are not just ERTRAC but also documents such as e.g. the Smart-Grid Research Agenda 2035, the Digital Agenda for Europe 2020 and the Strategic Research Agenda for Robotics in EU 2009.

4. Methodology

Partners in the SAGE clusters have many cooperative activities with other partners in Europe and the United States particularly in the field of R&D. For the Asian market, however, much less cooperation exists and therefore in SAGE WP7 a benchmarking of a number of international Asian potential partners was carried out. In order to strengthen the connections between the SAGE clusters in Europe and important research driven automotive regions in Asia, closer links must be established with a few selected regions with the aim to develop a strategy and action plan for international collaborations. A mapping of current networks was conducted to illustrate where there are already close links between the European SAGE regions and the described Asian regions. It has been observed that there are substantial contacts between the mapped regions in Asia and the SAGE clusters, but at present there is limited coordination. The cooperation mainly comprises bilateral contacts.

To identify and follow up international competition in terms of clusters, but also in terms of technology and societal trends, is essential for the automotive clusters in Europe in order to anticipate the evolution in their relevant markets and be able to take appropriate measures.

A methodology for selection was developed, based on SAGE DoW, WP3 methodology (SWOT analysis in 5 dimensions) and other important criteria for cooperation.

4.1. Criteria for selection of clusters

Based on DoW:

- One cluster per region described in the benchmark
- Three regions in total visited

Based on WP3 methodology (SWOT analysis in 5 dimensions):

- Economy
- Innovation and Research and Development
- Education and Human resources
- Policy / cluster environment
- Cluster organization

Other important criteria:

- Possibilities for support and interest from the SAGE organizations
- Links already established – ongoing collaborations
- Focus areas within green, safe and connected according to WP4 definition
- Strong R&D ability

5. Results

5.1.SAGE International Collaboration Strategy – scope

The scope of SAGE is to promote joint research and innovation where triple helix representation is important. The strategy is built on needs for basic research within the areas of safe, green and connected but above all on the later stages of development where the need for demonstration activities and field testing is crucial. It is in these later stages that it is possible to see the greatest benefits of the SAGE consortium structure with representatives from academia, industry and policy makers making a common cause.

The SAGE consortium agrees that it is important to participate in joint research and innovation in Asia to learn more about the technology development, market drivers, societal challenges and cultural differences,. This is also recognized by the EU Commission in Horizon 2020. Below in figure 3 there is a matrix illustrating the focus areas of SAGE for the different regions:

Asian region / Focus area	Beijing -BIT	Shanghai -SIAC, MISTRA	Nagoya -GREMO	Daejeon -KAIST
Safe	X	X	XXX	X
Green	XXX	XXX	XX	XX
Connected	X	X	X	XXX
New Business Models	X	X	X	X

Figure 3: Matrix illustrating focus areas of SAGE in different Asian regions

5.1.1. Basic research

The strategy for SAGE is to participate in the international research front in strategic areas for the automotive industry and collaborate on academic research in the selected focus areas safe, green and connected.

The strategy is to (where possible) enhance the existing relationships between universities, industry and institutes/public authorities, but also to develop new contacts within the areas of interest.

- Beijing – BIT
- Shanghai – Tongji University
- Daejeon – KAIST
- Nagoya – Nagoya University and GREMO

5.1.2. Demos

The strategy for SAGE is to participate in demonstrations open to international contributions in strategic areas for the automotive industry.

Collaborate on demo activities in selected areas:

- Safety
- Connectivity
- Green

Connect to relevant regions e.g.:

- Shanghai – SIAC EV Zone and Jiading Automotive Science Park on NEV

- Daejeon – Daedeok Innopolis Science Park on Connectivity and KAIST on electric vehicle using electromagnetic induction
- Nagoya – Green Mobility Collaborative Research Center of Nagoya University

5.1.3. Field test

Participate in field operational tests open for international contributions in strategic areas for the automotive industry.

Collaborate on field operational test activities in selected areas:

- Safety
- Connectivity
- Green

Connect to relevant regions e.g.:

- Shanghai -SIAC EV Zone and Jiading Automotive Science Park on NEV
- Daedeok Innopolis Science Park on Connectivity

5.2. Beijing – SAGE International Collaboration Strategy

5.2.1. Purpose of collaboration

Beijing is one of the most populous cities in the world and its GDP growing fast. It is the political, cultural, and educational center of China and home to the headquarters for most of China's largest state-owned companies, national research institutions and professional organizations. Beijing has a great number of colleges and universities, including Peking University and Tsinghua University (two of the National Key Universities). The city has a very efficient official organization to enforce New Energy Vehicle (NEV) development and has more than 10 years of NEV demonstration experience. The city of Beijing has a strong supportive policy and rich project funds structured by functional roadmap development. No professional and clear automotive cluster organization if compared to Europe. Most interesting focus area is new energy vehicles with Beijing having an aggressive implementation and innovation strategy and more than 10 years NEV demonstration experience. There is currently a strong political momentum from the Chinese Government to promote low-emission vehicles as well as new-energy vehicles.

- Decision centre of the country
- Strong supportive policy for Safe and Green Vehicles
- Presence of Tsinghua University
- Key competences in NEV

5.2.2. Strategic topics of collaboration

After China's entry into the World Trade Organization (WTO) in 2001, the development of the automobile market has accelerated quickly. The automotive industry in China is the largest in the world measured by automobile unit production from 2008, where, e.g. in 2011 about 18.5 million vehicles were produced. Of the automobiles produced, almost half were local brands from OEMS such as Great Wall Motor, BYD Auto, FAW and SAIC, many of whom manufacture small, lightweight vehicles suitable for the Chinese consumers and businesses. Those national vendors have been joined in the market by foreign companies, such as VW, Hyundai, Toyota, Ford, GM and Volvo. The approach taken by the global brands has been to establish joint ventures with local vendors. The automobile industry in China has begun to develop also a reputable electrical vehicle sector, supported by both the private and public sector.

Beijing Automotive Group (BAIC) is a state-owned enterprise and holding company of several Chinese automobile and machine manufacturers, such as Beijing Automobile Works Co Ltd, etc. Located in Beijing, Beiqi makes Hyundai and Mercedes-branded autos for sale on the Chinese market. All the manufacturing units are featured in electric motor driven MIDI car, fully electric sanitation vehicle, and fully electric bus, forming a capacity of 51,000 units / year. A number of smaller and medium

sized companies work in electro mobility areas, such as electric drive train technology lithium ion battery manufacturing.

Research is conducted at e.g. the Department of Automotive Engineering in the area of automotive safety, energy conservation, and environmental protection, with a focus on automotive electronics and new power. The Beijing Institute of Technology and the Beijing Jiaotong University conduct research in major engineering disciplines, including several automotive or transportation research areas. Research in green vehicle technology is conducted at e.g. China Automotive Technology & Research Centre (CATARC), The National Engineering Laboratory for Electric Vehicles (NELEV), the State Key Laboratory of Automotive Safety and Energy at Tsinghua University, the Beijing International Collaboration Base on Sino-US Electric Automobile Technology at Tsinghua University, National Key Laboratory for Vehicle Transmission, BIT, Beijing Municipal Laboratory for Clean Vehicles, BIT.

5.2.3. Next step Beijing

In order to learn more about the region and understand the ecosystem of automotive research and innovation the SAGE partnership will arrange a workshop in Bejing in connection to the 5th International Symposium on Electric Vehicles August 26-28. Strategic partnership exists between Beijing Institute of Technology and Warsaw University which enables this arrangement.

The SAGE Consortium is invited to speak at the 5th International Symposium on Electric Vehicles (ISEV2013). After the symposium it will be possible to arrange a separate high level meeting with local and regional authorities. Lead for this activity is Warsaw University.

5.3. Shanghai– SAGE International Collaboration Strategy

5.3.1. Purpose of collaboration

Shanghai is a large industrial region and the economic center of China. The city has strong support from regional government concerning policies for research and innovation and a good investment climate. Shanghai is acknowledged as a region with strong financial power.

The city hosts a number of industries with great technical skills within e.g. electronics and information technology, automobile manufacturing, petrochemicals, steel and biopharmaceutical products. A number of important universities are present in the Shanghai area and the NEV engineering centre at the Tongji University is the base of NEV training and innovation in China.

Shanghai is through the Jiading Automotive Science park, the first international demo city for NEV with the ambition of building NEV industry network and cluster with focus on hybrid, electric vehicle, developing the technology of battery, motor and controlling system. The area is well known for its key competences in electric vehicle and hybrid electric vehicle technologies such as; batteries, motors, power electronics, charging systems.

Thanks to its strategic location Shanghai has become the country's premier sea and river port, the Shanghai harbour is one of the largest in the world. The large amount of goods passing through Shanghai affect the need for transportation, and Shanghai is well developed when it comes to both public transport and road networks. The fact that Shanghai is the largest city in China also affects the need for efficient transport. Due to its location and size Shanghai is identified as an attractive location for manufacturing.

- Strong automotive industry
- Important stakeholders like SAIC and Tongji University
- Demonstration city for NEV (New Energy Vehicle)
- Strong focus on R&D
- Mutual interest for international collaboration
- Interest to from all SAGE partner regions to improve/extend existing cooperation

5.3.2. Strategic topics of collaboration

As one of the mega cities of the world Shanghai has to face major transport challenges both regarding people and goods. Strategic topics high on the research agenda are therefore:

- Urban transport of passengers and goods
- Energy efficient vehicles
- Intelligent interaction between vehicles
- Safety of new vehicles

Vehicle industry in the Shanghai region is primarily represented by SAIC Motor Corporation, which is the largest automotive manufacturing company and it has its headquarters in Shanghai. SAIC products sell under a variety of brand names including those of its joint venture partners, Volkswagen, General Motors and Volvo. In 2010, SAIC produced 3.58 million units and has the largest output of all China-based automaker. Small OEM's are also present, e.g. Shanghai E-drive Co. Ltd. There are also a number of newly established SME in the area of electro mobility: Shanghai H&D EV Battery produce lithium-ion battery packs and battery management system; DLG Power Battery produce lithium-ion battery packs; Shanghai Leibo New Energy has power train of lithium-ion & super capacitor battery; Shanghai Pylon Technology offers series of power cells/packs and energy cells/packs as well as completed power systems; Shanghai Jieneng Automotive Technology offers power and controlling system for hybrid and Electrical vehicle; STK Shanghai Co. offers power and controlling system for hybrid and Electrical vehicle; And finally, the Shanghai Fuel Cell Vehicle Power System, company founded by SAIC & Tongji University, has a role in national fuel cell projects. About two to three percent of sales income of SAIC is from new energy vehicles.

Research capability is primarily centred to the universities of Tongji and Jiaotong, which are the largest universities in the area and that have collaboration with many OEMs, and with other universities and organizations in Europe. The University of Tongji has several centres dedicated to automotive engineering: The Automotive Lab, the National Fuel Cell Vehicle & Drive Line Technology & Research Centre.

There is a currently strong push from Chinese government to increase the domestic innovation capability within key technology areas. Shanghai has the ambition of building a NEV industry cluster working within the areas of hybrid techniques, electric vehicles, battery technology development, motor development and control systems development. The district of Jiading is identified as a city for national demonstration of new energy vehicles and it is claimed to be the first international demo city of this kind.

5.3.3. Next step Shanghai

In order to learn more about the region and understand the ecosystem of automotive research and innovation the SAGE consortium invites to a workshop May 19-21, in connection to the International Symposium on Traffic Safety at Tongji University. Separate workshops in the area of automotive research and innovation, international collaboration and regional development. Lead for this activity is AB Volvo.

Contacts for Shanghai:

- Shanghai Municipality Transport and Port Authority
- SIAC – EVZONE
- Tongji University
- Mistra Shanghai

5.4.Daejeon– SAGE International Collaboration Strategy

5.4.1. Purpose of collaboration

Daejeon is now considered to be the science and technology capital of South Korea and several important public institutions, research institutes, universities and high-tech companies are based in the region. It is a very dynamic area with a strong focus on R&D and Business. Daejeon is known as the Silicon Valley of Korea with excellent competences in Connectivity (Infotainment, HMI, Communication, ITS) and Energy Efficiency. The science park "Innopolis Daedeok" and the University KAIST (Korea Advanced Institute of Science and Technology) are located in Daejeon, offering an excellent science and technology infrastructure and research manpower. The Korean Advanced Institute of Technology (KAIST) and the connected Innopolis Daedeok research centre have direct relations with the main Korean industries and Innopolis Daedeok itself represents 15% of National R&D spending. Key competences are in Connectivity, Autonomous vehicles and Energy Efficiency.

Key technologies driving the economy are automobile, ship building, semiconductor, ICT, telecom and manufacturing. Korea has one of the highest rates of spending on R&D in the world, of which most is performed by private firms. It also has a highly educated labour force with a strong interest in science and technology. Korean RTD expenditures are above 4% of the national GDP, well above Europe and the OECD average. Korea is among the most technologically advanced and digitally connected countries in the world and a recognized market leader in electronics, mobile communication, shipbuilding and automotive with well-known multinational conglomerates (chaebols) like Samsung, LG and Hyundai. S. Korea has the ambition to develop new sources of growth in the sustainable development sectors: renewable energy, electric vehicles, and public transport.

- Very dynamic R&D area with KAIST and Innopolis (KAIST has direct relations with the main Korean industries & Innopolis Daedeok represents 15% of National R&D spending)
- Strong focus on R&D
- Excellent competence within connectivity
- Interest from all partner regions to try to develop cooperation with Korea

5.4.2. Strategic topics of collaboration

With production of 4.3 million vehicles in 2010, South Korea is the world's fifth largest automaker, after China, Japan, the US and Germany. Contributing to 10% of national production, the automotive sector remains a pillar of the Korean economy. While its initial operations were merely the assembling of parts imported from Japan and the United States, Korea is today among the most advanced automobile-producing countries in the world. The Korean automobile industry is characterized by the pre-eminence of Hyundai-Kia, the fourth largest car manufacturer in the world in 2010 (representing 74% of the Korean automotive production). The other producers are GM Korea and RSM (Renault Samsung Motors).

Research in the Daejeon region hosts a range of high-technology activities but not specifically aimed at automotive industry development. New vehicle and energy technology however demand such competence. KAIST was established as the nation's first research oriented science and engineering institution. KAIST is the foremost center of strategic research and development (R&D) projects. Researchers at KAIST have developed an electric transport system (called Online Electric Vehicle, OLEV) where the vehicles get their power needs from cables underneath the surface of the road via non-contact magnetic charging. KARI (Korea Aerospace Research Institute) is a research center performing basic and applied studies in aerospace technology as well as government-delegated tasks and support policy development. Various types of research are being held at KARI from aircraft, helicopter to aerospace and rockets. KATECH (Korea Automotive Technology Institute) is an institute with the aim to innovative technology development for the Korean automotive industry. The research and development categories at KATECH are: Green car powertrain, intelligent vehicle

technology, Materials and components and Corporation support and reliability. ETRI (Electronics and Telecommunications Research Institute) is the largest government funded research institute in Korea, which strives to advance science by means of formulating innovative ideas; developing new techniques; and training professional individuals in the area of information telecommunications to ultimately enhance social and economic aspects of the modern society.

Since 20 percent of the country's energy consumption accounts by the transportation sector, "Low Carbon-Green Growth" has been stated as the technology motto since October 2009. Development of Electric Vehicles has become one of the major national initiatives to align with the global environmental regulations as well as a measure against high fuel prices. With the national goal set to focus on the EVs, relevant ministries and government agencies were deeply involved in EV development plans. Industry and academia along with research institutes set the main goal for EVs. MKE (Ministry of Knowledge Economy) is responsible for the EV expansion and has launched the "Green Car Forum" with government specialist, university experts and different business sectors to establish meaningful strategies in developing and commercializing the environmentally-friendly vehicle.

5.4.3. Next step Daejeon

In order to learn more about the region and understand the ecosystem of automotive research and innovation a SAGE Consortium workshop is planned in connection to the IFEV conference October 21-22. A separate workshop for SAGE with invited speakers from KAIST, KOTI (Korea Transport Research Institute), ETRI and Daedeok Innopolis is planned. Lead for this activity is Mov'eo.

5.5. Nagoya– SAGE International Collaboration Strategy

5.5.1. Purpose of collaboration

Greater Nagoya is the main industrial area in Japan with strong international automotive players such as Toyota, Mitsubishi and DENSO. The region has a strong economic ability which accounts for approximately 1% of the global GDP and about 10% of the gross domestic product of Japan. The presence of strong automotive players is driving the innovation within the cluster for instance concerning new fuels and new energy vehicles. And the region has good research infrastructure both at university and industry level.

In Nagoya, there is an existing cluster organization with a triple helix structure within automotive research - Green Mobility Collaborative Research Center (GREMO). GREMO is supported by local and national authorities, university and industry.

Key competences are in materials, with testing facilities for; mechatronics, batteries and light weighting (National Composite Center expected to open in 2013). The government provides public funding for collaboration between industry, institutes and academia.

Automotive, aerospace and ceramic industries are the main industries in the Nagoya region. Many automotive players have their presence in the Nagoya region. Lexus has its headquarters in this region and Mitsubishi Motors have R&D headquarters in Okazaki located in the suburbs of Nagoya. It also hosts automotive suppliers like DENSO, Aisin Seiki, Toyota Industries, Toyota Boshoku. Aerospace-related firms operating in Nagoya include Boeing, Pratt & Whitney, Mitsubishi Heavy Industries, Bodycote, Kawasaki Heavy Industries and Fuji Heavy Industries. The large global companies provide strong in-house research facilities and dominate the research and innovation agenda in the region. Cross-cultural interaction and more of triple helix structures could possibly bring more flexibility into the system. Regional policy is linked to Greater Nagoya Initiative Centre, which was established as a joint organization of national government, local governments, industries and academia. It was created to promote foreign direct investment and alliance between overseas and Japanese companies. Public policy for cluster development origin from the national agency, METI (Ministry of Economy, Trade and Industry) that has adopted a new policy for cluster development to reinforce the dynamics of industrial networks involving universities, companies and governments in

clusters. Other national policy of relevance to the automotive industry in the region is e.g. JARI (Japan Automobile Research Institution), which is an independent and non-profit research organization that promotes pioneering research to understand the future, and diffuse of next-generation vehicles.

- Main industrial area in Japan including global automotive manufacturers with strong in-house research facilities, driving innovation concerning new fuels and new energy vehicles.
- Existing cluster organization, GREMO, with a triple helix structure.
- Established links with SAGE partner SAFER and good possibilities for cooperation.
- Excellent competence in battery technology, safety and materials.
- Interest from SAGE partners to develop collaborations with Nagoya through GREMO.

5.5.2. Strategic topics of collaboration

The automobile industry is a large part of the industrial presence in Nagoya. Greater Nagoya boasts one of the world's largest clusters of automotive companies. World-renowned and technically advanced automotive manufacturers such as Toyota, Honda, Suzuki, Mitsubishi, Volkswagen, and General Motors have headquarters and major manufacturing operations in the region. About 44% of all automobiles produced in Japan come from Greater Nagoya area. This means that also automobile supplier industry cluster in the region. There are many companies established firstly as textile industry that have now been converted into automotive component suppliers. Japanese manufacturers have been early in developing electric drive-line vehicles for the market and also have a track-record in developing light-weight vehicle concepts.

GREMO (Green Mobility Collaborative Research Centre) at Nagoya University is one example of cluster collaboration being applied. GREMO is supported by local and national authorities, university and industry and gathers inter-disciplinary researchers of Nagoya University within for example materials, ITS and Human Factors. Members of GREMO have a track record in research in the area of green mobility, automotive mechatronics, energy and environmental studies, next generation batteries and ITS. The Toyohashi University of Technology operate a Research Centre for Future Vehicle City with research in fuel cells, traffic safety and electric vehicles. The National Institute of Advanced Industrial Science and Technology (AIST) and Nagoya Institute of Technology cooperate with academia and business on research projects and development of resources for industry.

The automotive cluster has shown a proactive trend in the area of alternate fuels, especially in the area of hybrids and plug-in hybrids and the development of new energy vehicles.

5.5.3. Next step Nagoya

Through the existing MoU between SAGE partner SAFER and GREMO, a SAGE consortium workshop will be arranged at Nagoya University 19-20 September 2013. The overall purpose of this activity is to better understand the ecosystem of automotive research and innovation in Nagoya and to validate the possibilities for collaboration between the SAGE regions in Europe and Nagoya.

Specific workshops around selected topics will be arranged involving different stakeholders that have been identified. Some project proposals within the focus areas of safe, green and connected are already being discussed with the purpose to establish and improve academic exchange in order to develop innovative technologies and foster human resources for an environmentally-friendly, secure and safe transportation system. Lead for this activity is SAFER.

5.6. Funding possibilities

5.6.1. Sweden

VINNOVA – Sweden's Innovation Agency: http://www.vinnova.se/en/EU-and-international-co-operation/

VINNOVA in cooperation with the Swedish Energy Agency has launched a call for proposals for International Cooperation with Actors in China for Eco-Innovations 2013. The new call focuses on initiatives for implementation of international research and development projects and is open for consortia which have an active involvement of industry, universities, research institutes and public sector actors.

Region Västra Götaland: http://www.vgregion.se/en/Vastra-Gotalandsregionen/Home/EU--International/ An international plan of actions is available with the aim to strengthen global exchange through increased knowledge, stakeholder involvement and national affinity.

STINT – the Swedish Foundation for International Cooperation in Research and Higher Education: http://www.stint.se/en STINT was set up in 1994 by the Swedish Parliament with the mission to promote internationalization of Swedish higher education institutions and research. The foundation offers funding and scholarship programmes to support strategic internationalization and enhance the competitiveness of the higher education institutions. The aim of the programmes is to pick up on various current needs, from initiating international projects through four-year international partnerships at faculty level, to strategic internationalization at university level. STINT collaborates with foreign financiers on some programmes.

Sweden-Japan Foundation: http://www.swejap.a.se/templates/Page.aspx?id=396 Sweden-Japan Foundation was established in 1971 in order to promote relations between Sweden and Japan. The foundation reaches out to individuals, companies, media and politicians involved in the fostering of good international relations and promotes deeper and broader long-term exchanges by giving young people the opportunity to visit Japan for research. The scholarship program is one of the most important tools of the SJF to promote deepened and broadened relations between Sweden and Japan.

5.6.2. France

Oseo – French institution dedicated to SMEs: http:// www.oseo.fr/international

Oseo has bilateral partnerships with counterparts in countries including Brazil, Canada, China, Israel, Japan, Mexico and Russia. This favors international development of SMEs through cooperation, and can help SMEs respond to international calls for proposals. For these countries — and for R&D and innovative projects in particular — Oseo offers a full range of financing options and solutions to help businesses get their projects under way.

ANR – French National Research Agency: http://www.agence-nationale-recherche.fr/en/

Developing European and international collaborations is one of ANR's priorities. By funding transnational projects, the agency encourages the initiation and deepening of scientific collaborations between researchers, with the further aim of fostering the creation of transnational teams of excellence. ANR has transnational collaborations and organizes joint calls for projects with China (MOST, NFSC), South Korea (NRF) and Japan (JSPS).

UBIFRANCE– French Agency for International Business Development: http://www.ubifrance.fr

UBIFRANCE promotes technologies, products, services and know-how from France, and connects French-based professionals in contact with their international counterparts.

5.6.3. Germany

BMBF – (Bundesministerium für Bildung und Forschung) Federal Ministry of Education and Research in Germany www.bmbf.de. The main focus of the department of education and research (BMBF) lies in the long-term creation of growth, by creating new opportunities and improving the existing

research and education structure. It aims at maintaining the competitiveness of Germany and at creating new jobs through innovative technologies and services[6].

BMVBS – (Bundesministerium für Verkehr, Bau und Stadtentwicklung) Federal Ministry of Transport, Building, and Urban Affairs www.bmvbs.de. The areas of responsibility are closely related to housing and mobility. The BMVBS funds several projects concerning the improvement of infrastructure and in the transportation field[7].

BMWi – (Bundesministerium für Wirtschaft und Technologie) Federal Ministry of Economics and

Technology www.bmwi.de. The "BMWi" is the German department for economy and technology. It funds various projects conducted by medium sized companies. The main focus lies in supporting this economic branch[8].

BMU – (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit) Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety www.bmu.de. Its principal functions are fundamental environmental policy issues, climate protection, environment and energy as well as noise education. The BMU funds mainly projects regarding the reduction of GHG emissions and fuel efficiency[9].

Germany Trade & Invest www.gtai.de

Germany Trade & Invest's TRADE section, offers companies established in Germany up-to-date information on foreign markets, international tender opportunities, investment and development projects, legal information, customs regulations, as well as access to international business partners.

German Institute of Global and Area Studies (GIGA) Institute of Asian Studies (IAS) www.giga-hamburg.de The German Institute of Global and Area Studies (GIGA) is a German research institute. It emerged in Hamburg from the German Overseas Institute (founded in 1964) after a restructuring process in 2006. The GIGA defines itself as a think tank serving the academic, political and economic communities as well as the general public.

KfW Entwicklungsbank www.kfw-entwicklungsbank.de

Main client is the Federal Ministry for Economic Cooperation and Development (BMZ) but work also for other ministries, such as the Federal Foreign Office (AA), the Federal Ministry of the Environment, Nature Conservation and Reactor Safety (BMU) or the Federal Ministry of Education and Research (BMBF). The European Commission and the governments of other countries also commission us to implement their development cooperation programs and projects.

BDI - Bundesverband der Deutschen Industrie e.V. www.bdi.eu The BDI communicates the interests of German industry to those in positions of political responsibility. It primarily addresses policy-makers and the government in Germany and at EU level. In addition, the BDI is also active worldwide. It commands a wide network in all key markets and international organizations. The BDI provides political flanking for the opening up of international markets and provides information and economic policy advice on all topics relevant to industry.

[6] EAGAR – Publicly funded automotive research in Germany
[7] EAGAR – Publicly funded automotive research in Germany
[8] EAGAR – Publicly funded automotive research in Germany
[9] EAGAR – Publicly funded automotive research in Germany

6. Sustainable collaboration

6.1. SAGE consortium in the long run

The SAGE partnership today consists of five research driven automotive clusters in Europe joining forces in order to address common challenges. SAGE is a transnational collaboration platform that builds on the unique competences of the participating regions. A particular aspect of the SAGE platform is that it is built upon full triple helix representation. The platform allows access to a number of the most important stakeholders within the area of green and safe road vehicle technology.

In order to connect to and learn more about the four selected regions in Asia representatives from the SAGE consortium have conducted and will conduct study visits to important stakeholders and to establish contacts with representatives from universities, industry and public authorities. The overall purpose is to better understand the ecosystem of automotive research and innovation and to validate the possibilities for cooperation between the SAGE regions in Europe and identified clusters in Asia.

The SAGE partners are equally convinced that only clusters open to contributions from the surrounding world will be able to stay competitive. With this as background, SAGE invites clusters from inside and outside Europe to join the network, share best practice and collaborate within the areas of green, safe and connected transport and mobility solutions.

7. Appendix

EU International strategy

EUROPEAN COMMISSION

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COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Enhancing and focusing EU international cooperation in research and innovation: A strategic approach

(Text with EEA relevance)

{SWD(2012) 258 final}

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Enhancing and focusing EU international cooperation in research and innovation: A strategic approach

(Text with EEA relevance)

1. A CHANGING WORLD

The European Union is a world leader in research and innovation, responsible for 24% of world expenditure on research, 32% of high impact publications and 32% of patent applications, while representing only 7% of the population[1].

Over the past decade, however, the landscape has evolved rapidly. Global research and innovation were, until recently, dominated by the European Union, the USA and Japan. As the emerging economies continue to strengthen their research and innovation systems, a multipolar system is developing in which countries such as Brazil, China, India and South-Korea exert increasing influence. The share of the BRICS in global expenditure on R&D doubled between 2000 and 2009. The Union also has a clear interest in its neighbouring countries developing their research and innovation capacity.

Research and innovation are increasingly interlinked internationally, aided by rapidly developing information and communication technologies. The number of internationally co-authored scientific publications and the mobility of researchers are increasing. Research organisations are establishing offices abroad and companies are investing outside their home countries, in particular in the emerging economies.

Global challenges are important drivers for research and innovation. Our planet has finite resources which need to be cared for sustainably; climate change and infectious diseases do not stop at national borders, food security needs to be ensured across the globe. The Union needs to strengthen its dialogues with international partners to build critical mass for tackling these challenges.

As more research and innovation is performed in third countries[2], the Union will need to access this knowledge. To remain a major global player, the Union must promote itself as an attractive location for carrying out research and innovation and be successful in the global competition for talent, while at the same time preserving its economic interests, for instance as regards the protection of intellectual property.

With the entry into force of the Treaty on European Union (TEU) and the Treaty on the Functioning of the European Union (TFEU) the institutional setting for the Union's action on the international scene has changed. The Union's High Representative for Foreign Affairs and Security Policy, and Vice-President of the Commission, ensures the consistency of the Union's external action. The High Representative is assisted by the European External Action Service (EEAS). Research being a parallel competence, the Union and Member States shall ensure coordination of their respective activities, so as to ensure that national policies and Union policy are mutually consistent.

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1 Further information is provided in the accompanying Staff Working Document.

2 In this Communication 'third country' is a country that is neither a Member State nor a state associated to the research framework programmes, unless otherwise stated.

Based on this evolving context, the commitments under the Innovation Union,[3] the European Research Area (ERA) Framework[4] and the recommendations of the interim evaluation of the Seventh Framework Programme (FP7),[5] the Commission proposes a strategic approach to enhance and focus the Union's international cooperation activities in research and innovation, in particular with a view to preparing for the implementation of Horizon 2020[6].

2. TAKING STOCK

Europe has a long history in promoting research cooperation across borders. Established in 1954, the European Organisation for Nuclear Research (CERN) is a research centre of excellence and the world's largest particle physics laboratory, attracting top scientists.

Since 1986, the Treaties explicitly identify cooperation with third countries as a key activity of the Union's research policy. International cooperation activities have been developed under the TFEU and the Euratom Treaty. The Framework Programmes have gradually been opened up to participation by third countries, with support for international cooperation fully mainstreamed within FP7 (including Euratom FP7). The European Institute of Innovation and Technology (EIT) is also open to collaboration with third countries. As a result, 6% of FP7 participants come from third countries.

Progress has been made in optimising the scale and scope of international cooperation activities. For example:

- The *European and Developing Countries Clinical Trials Partnership* (EDCTP) is a partnership between 14 Member States, Switzerland, Norway and sub-Saharan African countries aimed at tackling HIV/AIDS, tuberculosis and malaria;
- Euratom, China, India, Japan, Russia, South-Korea and the USA have joined forces in the *ITER* project (supported by the Broader Approach Agreement between Euratom and Japan) to demonstrate that nuclear fusion is a viable energy source of the future;
- The *Marie Curie actions* have a strong international dimension. Participants in these actions come from 80 different countries;
- The Commission's *Joint Research Centre* cooperates with international partners on a wide range of issues;
- The world-wide interconnection of research and education networks provided by the *GEANT* network is largely funded by the Union (partially through its development cooperation instruments);
- The Union, together with 13 other countries, supports the *Human Frontier Science Programme* to finance international collaboration in basic research.

While this progress is welcome, critical mass is lacking in many cases and the strategy driving the development of the actions is not always clear. This was one of the conclusions of the FP7 interim evaluation, which stated that there needs to be an '*intensification of international cooperation*' activities focused on '*engaging with partners outside of Europe on equal terms and in programmes and activities of high mutual interest*'. The same report recommended the '*coherent strategic development*'of the Union's policy for international cooperation in research and innovation.

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3 COM(2010) 546
4 COM(2012) 392
5 http://ec.europa.eu/research/evaluations/index_en.cfm?pg=fp7
6 COM(2011) 809

3. OBJECTIVES OF INTERNATIONAL COOPERATION

International cooperation in research and innovation contributes to the broader policies of the Union, as reflected in the Europe 2020[7] strategy, in supporting the following objectives:

(a) **Strengthening the Union's excellence and attractiveness in research and innovation as well as its economic and industrial competitiveness** – by creating win-win situations and cooperating on the basis of mutual benefit; by accessing external sources of knowledge; by attracting talent and investment to the Union; by facilitating access to new and emerging markets; and by agreeing on common practices for conducting research and exploiting the results;

(b) **Tackling global societal challenges** – by developing and deploying effective solutions more rapidly and by optimising the use of research infrastructures; and,

(c) **Supporting the Union's external policies** – by coordinating closely with enlargement, neighbourhood, trade, Common Foreign and Security Policy (CFSP), humanitarian aid and development policies and making research and innovation an integral part of a comprehensive package of external action.

'Science diplomacy' will use international cooperation in research and innovation as an instrument of soft power and a mechanism for improving relations with key countries and regions. Good international relations may, in turn, facilitate effective cooperation in research and innovation.

This Communication proposes to enhance and focus the Union's international cooperation activities in research and innovation by using the dual approach of **openness** complemented by **targeted international cooperation activities**, developed on the basis of common interest and mutual benefit, optimal scale and scope, partnership, and synergy.

4. ENHANCING AND FOCUSING INTERNATIONAL COOPERATION ACTIVITIES

4.1. Openness in international cooperation

The Union will continue to engage with countries and regions across the globe. This will allow the Union's researchers and innovators to engage on a stakeholder-driven basis with their counterparts worldwide:

– Horizon 2020 will be fully open to participation from all over the world[8];

– The European Research Council and Marie Skłodowska-Curie actions will operate on a fully researcher-driven basis, open to researchers from third countries.

– The Research Infrastructures activity will have a specific focus on international cooperation. Its e-Infrastructures component has an inherent international dimension by supporting collaboration through digital means.

– However, not all third country participants will be automatically eligible for funding[9]. The list of countries eligible for automatic funding will be restricted, by complementing the current selection criterion, based solely on GNI per capita, with an additional criterion based on total GDP, excluding countries above a defined threshold. This will address the fact that some countries have established the critical mass needed to cooperate on a reciprocal basis with the Union. Similarly as for the

[7] COM(2010) 2020
[8] COM(2011) 810 Art 6(1)
[9] COM(2011) 810 Art 9

industrialised countries, funding for participants from these countries continues to be possible in exceptional cases;

– The more restrictive approach to automatic funding will be counterbalanced by increased efforts to facilitate the funding of participants through their national channels;

– The Union will continue to encourage reciprocal access to third countries' programmes. The Horizon 2020 proposals allow for limiting the geographical scope of calls, for instance when the conditions for the participation of legal entities from Member States in the third country's programmes are considered to be prejudicial to the Union's interest or satisfactory security guarantees can not be provided[10];

– Support for COST and EUREKA will encourage European networks of researchers to cooperate with their third country counterparts.

4.2. Targeted international cooperation activities

Maximising the impact of international research and innovation activities, while avoiding a costly fragmentation of efforts, requires the Union to complement the openness of Horizon 2020 with targeted actions in order to ensure optimal scale and scope.

4.2.1. Identifying areas for international cooperation

Horizon 2020 focuses the Union's research and innovation funding on a limited number of societal challenges and enabling and industrial technologies.

In preparing work programmes for implementing Horizon 2020 (the Euratom programme being a part of this), international cooperation will be a key consideration. Areas for engaging with third countries will be identified in a systematic and coherent manner on the basis of an analysis of the Union vis-à-vis the rest of the world in line with the following set of criteria:

– research and innovation capacity, including investment, output (publications, patents, citations, licensing), human resources and infrastructure;

– risks of and opportunities for access to existing, new or emerging markets, and their impact on the Union's competitiveness;

– contribution to the Union's international commitments, as reflected in the Millennium Development Goals, the post-2015 development framework, Rio+20, G20 and the international objectives of sectoral policies; and,

– the legal and administrative frameworks in place, among the international partners, and where appropriate the Member States, to engage in cooperation, also including lessons learnt from previous cooperation.

While sufficient objective information is available to support the analysis of the first criterion, the others will require qualitative assessment and judgment. A systematic gathering of information will be an essential element of the strategic approach, relying in particular on the new Research and Innovation Observatory being developed by the Commission. It will include in-depth stakeholder consultations, including with industry.

An enhanced innovation dimension will involve putting in place adequate framework conditions and a level playing field, including activities ranging from information gathering, policy learning, exchange of experience, identification of good practice, provision of information and assistance and networking between research and innovation actors to supporting the adaptation and uptake of existing technology in new markets, and – in limited

[10] COM(2011) 810 Art 6(2), 6(3) and 8(5)

cases –demonstration and pilot projects. There will be a stronger focus on close-to- market and other innovation related activities. This will require finding an appropriate balance between cooperating with third countries to jointly advance scientific knowledge and tackle global challenges while safeguarding the interests of the Union's companies. In this context, the fair and equitable treatment of IPR will be ensured to avoid uncontrolled loss of the Union's know-how.

More generally, sound innovation-related framework conditions are of the utmost importance for the Union to engage effectively in research and innovation at international level. For example, the removal of specific trade barriers remains a cornerstone of the Union's relationship with third countries.[11]

4.2.2. Developing multi-annual roadmaps for cooperation with key partner countries and regions

Based on the above criteria, the identification of areas for targeted international cooperation actions will be the starting point of the strategic approach. A flexible differentiation of partner countries and regions will allow additional focus – especially when considering funding options – while taking into account that a given country can fall into one or more groupings, depending on its research and innovation strengths. The following country groupings are included in the Horizon 2020 proposals:

- **The EFTA countries, EU enlargement countries and countries covered by the European Neighbourhood policy**, where the focus will be on fostering integration into – or alignment with – the European Research Area, including through their possible association to Horizon 2020. For the Neighbourhood, this will contribute to developing a 'Common Knowledge and Innovation Space', including improving the research and innovation competences of these countries. Cooperation will be in close coordination with the instruments of the enlargement and neighbourhood policies, as underlined at the recent conference on a renewed Euro-Mediterranean partnership in research and innovation. For the latter case, a specific follow-up action is in preparation.
- **Industrialised countries and emerging economies**, where the main objective will be to increase the Union's competitiveness, to jointly tackle global challenges through common innovative solutions, and to develop enabling technologies by accessing new sources of knowledge. This will provide the Union's private sector with business opportunities and access to new markets. There will also be a strengthened innovation dimension, as is the case for instance through the Transatlantic Innovation Action Partnership or the Indo-European Partnership for Research and Innovation.
- **Developing countries**, where the emphasis will be on complementing the Union's external policies and instruments by building partnerships – in particular bi-regional partnerships – to contribute to the sustainable development of these regions and address challenges such as the green economy, climate action, improved agriculture, food security and health. This includes supporting the Millennium Development Goals – and their possible successors – strengthening demand-led research and innovation for development, and delivery of the outcome of the Rio+20 conference, e.g. through the transfer of climate technologies.

[11] COM(2012) 70

Systematic identification of opportunities combined with differentiation by country groupings will support the development of **multi-annual roadmaps for cooperation with key partner countries and regions**.

5. A SET OF INSTRUMENTS THAT IS FIT FOR PURPOSE

5.1. Policy dialogue

The Union has Scientific and Technical Cooperation Agreements with 20 countries under the TFEU and with 15 countries under the Euratom Treaty. Science and technology are also often an important part of broader policy dialogues, such as in Partnership and Cooperation Agreements and other international framework agreements.

The S&T agreements will be important vehicles for defining and implementing the multi-annual roadmaps. Where appropriate, they will be developed into strategic long-term partnerships, including agreement on the priorities to be addressed. They should also promote the fair and equitable treatment of intellectual property and knowledge transfer. A similar approach will be followed on a regional basis, for instance for the partnerships with the Mediterranean countries, the Association of South East Asian Nations, Africa, and the Latin-American & Caribbean countries.

5.2. Information gathering

Objective information is needed to implement the strategic approach. Increased attention must, therefore, be paid to collecting qualitative and quantitative information, such as[12]:

– international cooperation activities funded through the Union, and their impact;

– international cooperation policies and programmes of the Member States and Associated Countries, as well as the strengths and weaknesses of their research and innovation systems, whereby Member States and Associated Countries will be encouraged to share with each other, through the Strategic Forum for International S&T Cooperation (SFIC), information obtained through national mapping exercises;

– research and innovation policies and programmes, including their international component, of third countries, as well as the strengths and weaknesses of their systems;

– foresight activities, to identify emerging challenges, future markets and trends.

Information gathering will make use of the Union's Delegations and science counsellors and the EEAS, as well as the new Research and Innovation Observatory.

5.3. Funding instruments

Horizon 2020 will be the main instrument for implementing the Union's international research and innovation cooperation actions, complemented where appropriate with national funding.

Targeted activities using the following instruments will implement the multi-annual roadmaps:

– research and innovation projects where the participation of third country entities is required and/or taken into account during evaluation;

– softer forms of cooperation such as networking between projects, clusters and/or programme managers;

[12] Further information is provided in the accompanying Staff Working Document.

– joint initiatives involving the Union and international partners:

- coordinated calls: launched and evaluated in parallel in the Union and the third country;
- joint calls: launched, evaluated, selected and funded jointly by the Union and the third country;
- contributions from the Union to funding programmes of third countries or international organisations to cover the participation of the Union's entities in those programmes; and,
- specific initiatives requiring joint funding from the Union, Member States, Associated Countries, and/or third countries to ensure optimal scale and scope, implemented through ERA-NETs, Article 185 or other instruments.

The Horizon 2020 proposals include provisions[13] to develop and present cross-cutting activities, such as international cooperation, in a coherent manner. The Commission intends to reflect these provisions in the work programme and comitology structure of Horizon 2020.

5.4. Coordinating with other policies and international fora

5.4.1. Policies and instruments of the Union

International cooperation activities in research and innovation will be developed in close coordination with the Union's external policies and instruments[14]. This will also include mainstreaming research and innovation across other policies with a strong international dimension, such as trade, CFSP, environment and energy, and exploiting synergies with international cooperation in higher education proposed under Erasmus for All[15]. The development of the multi-annual roadmaps for international cooperation in research and innovation should, therefore, be closely coordinated with the general external country strategies and the external dimension of the Union's internal policies.

The Union's external policies will aid in building-up research capacity in the enlargement, neighbourhood and developing countries. Research and innovation funding will focus on excellence, thereby contributing to finding innovative solutions for the challenges these countries face. In doing so it will contribute to the objectives of the Union's development policies, for instance through: forward-looking activities and socio-economic research to identify specific challenges; cutting-edge research and innovation to develop locally applicable solutions; or providing support for adapting and transferring existing technologies. This will be complemented by funding provided by the European Investment Bank and the European Bank for Reconstruction and Development.

5.4.2. International organisations and multilateral fora

International organisations and multilateral fora play a key role in addressing global challenges. The Organisation for Economic Cooperation and Development's (OECD) Committee on Science and Technology Policy and Global Science Forum focuses on improving the governance of global research and innovation activities. The United Nations and other organisations such as UNESCO, the Intergovernmental Panel on Climate Change, United Nations Framework Convention on Climate Change, the Intergovernmental Platform

[13] Article 13 of the Horizon 2020 Regulation and Article 5(6) of the Specific Programme.
[14] COM(2011) 865.
[15] COM(2011) 788.

on Biodiversity and Ecosystem services, Food and Agricultural Organisation and World Health Organisation, play a key role in shaping global research agendas.

The International Energy Agency and Nuclear Energy Agency (under the OECD framework), the International Atomic Energy Agency and the Generation IV International Forum and ITER International Organisation promote international cooperation in nuclear energy. Global and regional institutions such as the Consultative Group on International Agricultural Research, Global Forum for Agricultural Research and Forum for Agricultural Research in Africa are active in the field of agriculture. The Carnegie Group, set-up under the auspices of the G8/G20, provides a unique forum for high-level discussions on research and innovation issues.

The Commission intends to step-up its engagement with these organisations, both to enable the Union to exert greater influence on their activities, in particular where the Union is a major donor, and to give them a stronger voice in shaping the Union's agenda. In this context, the Union should attempt to ensure that its participation is commensurate with the responsibilities assigned to it by Treaties. Further developing the partnership with European intergovernmental initiatives, such as EUREKA and COST, and organisations, such as EIROForum[16], will contribute to a better coordination and more effective use of European resources.

6. PROMOTING COMMON PRINCIPLES FOR THE CONDUCT OF INTERNATIONAL COOPERATION

Guided by its principles for external action (Art 21 TEU), the Union is well placed to play a leading role in promoting common principles for the conduct of international research and innovation activities in order to create a level playing field in which researchers and innovators from across the globe feel confident to engage with each other. These principles will deal with issues such as responsible research and innovation, research integrity; peer review of proposals; promotion of the role of women in science and the gender dimension in research, research and innovation; research careers (building on the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers)[17]; fair and equitable treatment of IPR; and open access to publicly funded research publications.

A step has been taken with the establishment of the Global Research Council, a voluntary forum set up to share best practice and establish common principles in international cooperation. Other initiatives are on-going at Union and global level. The Carnegie Group has worked on establishing common principles for the construction of large-scale research infrastructures. As regards open access, the Commission adopted a Communication[18] in 2007 and, more recently, a follow-up Communication and Recommendation[19].

These issues have also been widely debated at international level, in both bilateral and multilateral fora. The move towards open access is a worldwide endeavour, demonstrated by UNESCO's contribution to its promotion[20] and the OECD declaration on access to research data from public funding[21]. Similarly, the Singapore Statement on research integrity

16 http://www.eiroforum.org
17 C(2005) 576 final.
18 COM(2007) 56.
19 COM(2012) 401 and C(2012) 4890
20 http://www.unesco.org/new/en/media-services/single-view/news/open_access_to_scientific_information_policy_guidelines_for_open_access_released/
21 http://www.oecd.org/dataoecd/9/61/38500813.pdf

represents the first international effort to encourage the development of global policies, guidelines and codes of conduct to foster greater integrity in research[22].

7. STRENGTHENING THE PARTNERSHIP WITH THE MEMBER STATES AND MAJOR STAKEHOLDERS

The Union's international cooperation activities and those of the Member States need to be consistent and complement each other. Deepening and strengthening the partnership between the Commission and the Member States will therefore be an important element of the strategic approach.

It will also be important to develop a stronger and more systematic interaction with the main research and innovation stakeholders. This will include better alignment with the international cooperation priorities of actors such as industry, universities and research organisations, but also the priorities of the Joint Programming initiatives, European Technology Platforms and European Innovation Partnerships.

SFIC has made progress in the alignment of international cooperation priorities of Member States and especially national and regional funding organisations, by developing a pilot initiative with India and exploring cooperation priorities with the USA and China.

These efforts need to be stepped up as Member States' international cooperation activities continue to be driven largely by national considerations rather than by developing priorities and strategies shared by the Union and its Member States. Accordingly:

– The Member States will be involved in the identification of areas for international cooperation and the development of the multi-annual roadmaps;

– The implementation of these roadmaps will involve preparing joint Union-Member States strategic research and innovation agendas, and involving Member States closely in their implementation;

– The Innovation Union commitment to develop common guidelines for engaging in agreements with third countries, on issues such as scientific visas, IPR, ethical principles in research, the import and export of scientific samples and equipment, reciprocity and taxation will be followed-up. This will include building upon the ERA guidelines on IP management in international collaboration agreements as adopted by the ERA Knowledge Transfer Group.

8. IMPLEMENTATION, GOVERNANCE, MONITORING AND EVALUATION

8.1. Implementation and governance

Implementation of the strategy will be closely aligned with the programming process of Horizon 2020, including by presenting the multi-annual roadmaps in a coherent manner in the work programmes.

While the development and implementation of the multi-annual roadmaps for each of the societal challenges and enabling and industrial technologies will continue to fall under the remit of the respective committee configurations, the Horizon 2020 horizontal programme committee configuration will be tasked with steering, monitoring and evaluating the overall approach to international cooperation. SFIC will continue to play its role in promoting more coherence between Member States' and Union policies.

[22] http://www.singaporestatement.org/

Communicating the value of international cooperation in research and innovation to a broader public will also be an on-going point of attention. Building on the positive experience with the EU-ASEAN Year of Science in 2012, the Commission proposes to organise a Year of Science every two years, alternating between a partner country and region.

8.2. Monitoring and evaluation

The Commission will report every two years on the implementation of the strategy. This report will present how the multi-annual roadmaps have been developed and implemented. It will assess progress and impact based on the list of indicators provided in the accompanying Staff Working Document. The first report will be presented at the beginning of 2014.

9. CONCLUSION

The new strategic approach to international cooperation in research and innovation will be characterised by:

- Horizon 2020 being fully open to third country participants, allowing European researchers to cooperate with the best brains across the world;
- Targeted international cooperation activities with the scale and scope necessary to maximise impact;
- The development of multi-annual roadmaps for cooperation with key partner countries and regions;
- Reinforcing the partnership between the Commission, the Member States and relevant stakeholders;
- Promoting common principles for the conduct of international cooperation in research and innovation;
- Enhancing the role of the Union in international organisations and multilateral fora;
- Strengthening implementation, governance, monitoring and evaluation.

Interested in knowing more or taking part in the project?
Please don't hesitate to contact us.

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