



White Paper

on Opportunities and Challenges in View of Enhancing
the EU Cooperation with Eastern Europe,
Central Asia, and South Caucasus in Science,
Research, and Innovation



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Preface

Scientific research and the transfer of its results into innovative products, services and processes are the backbone of any knowledge-based economy. They are considered major drivers of economic growth, of societal development and of appropriate responses to global challenges. Against this background, policy stakeholders as well as science and innovation communities in the European Union (EU), countries associated to the EU RTD Framework Programme and the Eastern Europe and Central Asian countries, are most interested in exploiting the full potential of the cooperation in science, technology and innovation (STI) between the two regions, aiming at a shared borderless knowledge.

The present White Paper provides a knowledge-base on the state of *affairs of STI policies in the EU Member States and the European Neighbourhood, and in the Central Asian countries*, identifies a series of *challenges and recommendations on enhancing the EU-EECA STI cooperation* and proposes a *short-term implementation scenario* to a variety of stakeholders.

The findings of the White Paper are based on a broad methodological approach: analytical desk research concerning a variety of EU programmes and instruments was complemented by interviews with policy stakeholders and representatives of the science and innovation communities in the EECA region, as well as by mutual learning exercises, discussions at STI policy stakeholders' conferences in *Athens, Moscow, Astana, Warsaw*, and expert meetings on *ENPI and DCI* as well as meetings of *NCP*. The presentation of the draft of the present White Paper during the Warsaw Conference was followed by an open web-based consultation process of the wider public, which resulted in additional feed-back.

The White Paper presents a knowledge based approach to tackling major issues of relevance for enhancing STI cooperation between the EU and EECA countries. However, it should be perceived as experts' advice that neither reflects the official positions of individual countries nor of the European Commission. Stakeholders from the policy sector as well as from the science and innovation communities and civil societies in both regions are invited to reflect on the recommendations given in this White Paper and to draw their own conclusions for joint concrete actions to prioritize and implement in favour of advancing the bi-regional cooperation in science, technology and innovation.

The White Paper was compiled in the frame of the EU funded FP7-project 'IncoNet EECA' (S&T **I**nternational **C**ooperation **N**etwork for **E**astern **E**uropean and **C**entral **A**sian Countries). This project, which started in 2008 and ends in June 2012, addressed the bi-regional STI policy dialogue between the EU and EECA countries. Fourteen partners from EU and Associated Countries (Austria, Bulgaria, Finland, Germany, Greece, Norway, Poland, Sweden, and Turkey) and nine partners from EECA countries (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Moldova, Russia, Ukraine and Uzbekistan) participated in the project. Additional experience was provided by partners from Kyrgyzstan, Tajikistan and Turkmenistan, who take part in the sister project 'IncoNet CA/SC' (S&T **I**nternational **C**ooperation **N**etwork for **C**entral **A**sian and **S**outh **C**aucasus Countries), which will run until 2013.

The drafting of the White Paper was conducted and coordinated by the International Bureau of the German Federal Ministry of Education and Research at the Project Management Agency c/o German Aerospace Center (DLR). Other partners in the core drafting team were the International Centre for Black Sea Studies (ICBSS, Greece) and the Centre for Social Innovation (ZSI, Austria). Local correspondents from the EECA countries provided twelve country reports, which are annexed to this document.

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The contributions of all policy makers and experts participating at the policy stakeholder conferences and other conferences and workshops organised under the 'IncoNet EECA' and 'IncoNet CA/SC' projects are particularly acknowledged.

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List of Abbreviations

AC	Countries associated with FP7	CIS	Commonwealth of Independent States
AB	Asian Development Bank	CNRS	Centre National de la Recherche Scientifique, France
AGEPI	State Agency on Intellectual Property, Moldova	COST	European Cooperation in Science and Technology - one of the longest-running European instruments supporting cooperation among scientists and researchers across Europe
AITT	Agency on Innovation and Technology Transfer, Moldova	CRDF	Independent non-profit organization for the promotion of international scientific and technical collaboration through grants, technical resources, and training
AM	Armenia	DCI	Development Cooperation Instrument
ASM	Academy of Science, Moldova	EECA	Eastern European and Central Asian countries
AZ	Azerbaijan	EN	European Neighbourhood
BellSA	Belarusian Institute of System Analysis and Science & Technology Sphere Information Support	ENPI	European Neighbourhood and Partnership Instrument
BES	Business / Enterprise	EIP	European Innovation Partnership
BILAT RUS	EU project focused on enhancing the bilateral S&T partnership between the Russian Federation and the European Commission, the EU Member States, Candidate Countries and other countries associated with FP7 (AC)	ERA-NETs	Main EU instrument for the coordination of research funding carried out by Member States and associated countries at national and regional level
BILAT UKR	EU project focused on enhancing the bilateral S&T partnership between Ukraine and the European Commission, the EU Member States, Candidate Countries and other countries associated with FP7 (AC)	ERC	Economic Research Centre, Azerbaijan
BMBF	Federal Ministry for Education and Research, Germany	EU	European Union
BY	Belarus	EU MS	European Member States
CACAARI	Central Asia and Caucasus Association of Agricultural Research Institutions	EUREKA	European research initiative with the goal of motivating international cooperation in industrial oriented R&D
CACILM	Central Asian Countries' Initiative for Land Management	FP7	7th European Framework Programme for RTD
CASC	Central Asia and South Caucasus	GDP	Gross Domestic Product
CGIAR	Centres of the Consultative Group for International Agricultural Research	GE	Georgia
CIP	Competitiveness and Innovation Framework Programme	GEF	Global Environmental Facility
		GERD	Gross Domestic Expenditure on R&D

GIZ	Association for International Cooperation, Germany	OECD	Organisation for Economic Co-operation and Development
HEI	Higher Education Institute	OMC	Open Method of Coordination
HES	Higher Education Sector	PCA	Partnership and Cooperation Agreements
HSTC	High Scientific Technology Committee	PSC	Policy Stakeholder Conferences
ICT	Information and Communication Technology	R&D	Research and Development
IFAD	International Fund for Agricultural Development	RFBR	Russian Foundation for Basic Research
IFAS	International Fund for Saving the Aral Sea	RFH	Russian Foundation for Humanities
INCO-NETs	International Cooperation Networks – instrument for increasing the cooperation between the EU and third countries in the field of STI	RTD	Research and Technological Development
InExCB-Kz	Independent Expert Consulting Board-Kazakhstan	RUS / RF	Russia / Russian Federation
IPR	Intellectual Property Rights	S&T	Science and Technology
ISO	International Standards Organization	SME	Small and Medium-size Enterprises
ISTC	International Science and Technology Centre	SRNSF	Shota Rustaveli National Science Foundation, Georgia
JPI	Joint Programming Initiative	STI	Science, Technology and Innovation
KG	Kyrgyzstan	SWOT	Strengths, Weaknesses, Opportunities and Threats
KZ	Kazakhstan	TJ	Tajikistan
LLP	Lifelong Learning Programme	TM	Turkmenistan
MD	Moldova	UA	Ukraine
MSE/MES	Ministry of Science and Education / Ministry of Education and Science	UK	United Kingdom
NAS	National Academy of Sciences	UNDP	United Nations Development Programme
NCP	National Contact Points	UNECE	United Nations Economic Commission for Europe
NIP	National Information Points	UNESCO	United Nations Educational, Scientific, and Cultural Organization
NSI	National system of innovation	UZ	Uzbekistan
		WIPO	World Intellectual Property Organization

Executive Summary

The European Union (EU) and the Eastern European and Central Asian countries (EECA) share the common goal of achieving political, economic and social stability and prosperity. Knowledge-based economies are considered keys to success in both regions. Overarching policy objectives in the European Union are expressed in recently adopted strategies and most prominently in the EU's Europe 2020 strategy for smart, sustainable and inclusive growth with the European Innovation Union being one of its flagship initiatives. On the EECA side, prominent examples of knowledge- and innovation-based strategies are the Russian "Strategy for the Development of Science and Innovation in the Russian Federation for the Period until 2015," the upcoming "National Strategy on S&T until 2020" of the Republic of Moldova or the "Development Strategy until 2030" of the Kazakh Republic.

In order to achieve the aforementioned policy objectives under thriving international framework conditions, political, economic and cultural cooperation is considered critical by the EU and the countries in EECA. Cooperation between individual countries or institutions in both regions is supported by a number of strategic policy umbrellas which systematically strengthen the political and economic ties between the regions. Such policy umbrellas are the European Neighbourhood Policy, the Eastern Partnership, the Four Common Spaces with Russia and the recently adopted EU-Russian Partnership for Modernization, as well as the Central Asian Strategy of the EU.

Scientific research and technological development (RTD) is the backbone of any knowledge-based economy and an indispensable asset for responding to the global challenges which affect – directly or indirectly – all of us. Bilateral and multilateral cooperation in the field of RTD is also essential to make optimum use of each other's academic strengths, to share respective resources and to prepare the ground for a joint transfer of scientific results into innovative applications for national, regional and worldwide markets. Although the cooperation in Science, Technology and Innovation (STI) between the EU and the EECA partner countries is quite strong, there is still room for further development.

The EU-EECA policy dialogue among stakeholders is essential for the further development of S&T cooperation between the two regions. In that respect, three Policy Stakeholder Conferences were recently organized bringing together policy makers and representatives of the research communities in both regions (Athens 2009, Moscow 2010, Astana 2011).

The present White Paper on Opportunities and Challenges in View of Enhancing the EU Cooperation with Eastern Europe, Central Asia and South Caucasus in Science, Research and Innovation was jointly prepared by EU and EECA experts as a result of the three conferences and at the same time as an input to future dialogue activities between the two regions. It is based on a wider stakeholder consultation process involving political decision makers, representatives of the STI administration as well as science and innovation communities in the European Union, Countries associated with the EU RTD Framework Programme and Eastern Europe/Central Asian countries, which have been explicitly consulted through missions to EECA countries or through expert workshops on subjects of relevance for the EU-EECA STI cooperation. Furthermore, the White Paper integrates extensive desk research and was consolidated in a policy stakeholder conference in Warsaw (November 2011).¹

The White Paper is divided in three parts:

The first part (*State of Affairs of Science, Technology and Innovation Policies*) summarises the present trends in STI policy in the EU, in Central Asia, in the European Neighbourhood region and in the Russian Federation, focusing in particular on the status of international cooperation in STI and its institutional environment.

The second part (*Challenges and Recommendations on Enhancing EU-EECA STI Cooperation*) is organized into five main themes: 'Adjusting and Implementing Policy Strategies,' 'Strengthening Research Conducting Institutions,' 'Strengthening of Human Resources,' 'Strengthening the role of the Private Sector' and 'Strengthening the sub-Regional cooperation.' It identifies a series of challenges to be addressed and provides recommendations to stakeholders, i.e. policy

¹ Activities organized in the context of projects funded by the European Commission (FP7) and dedicated to the support of the EU – EECA policy dialogue: "S&T International Cooperation Network for Eastern European and Central Asia – INCO-NET EECA," "S&T International Cooperation Network for Central Asia and South Caucasus – INCO-NET CA/SC," "Enhancing the bilateral S&T Partnership with the Russian Federation (BILAT-RUS)," "Enhancing the bilateral S&T Partnership with Ukraine (BILAT-UKR)," "Linking Russia to the ERA: Coordination of MS/AC S&T Programmes towards and with Russia (ERA-NET RUS)," "Networking on Science and Technology in the Black Sea Region (BS-ERA-NET)".

makers, policy-delivery services, scientific personnel and the private sector from both regions, on how to better address the challenges, including options, for advanced EU-EECA STI cooperation.

The third part proposes a *Short-term implementation scenario* summarizing suggestions addressed to specific stakeholder groups which can be implemented by utilising existing cooperation instruments.

In addition, comprehensive individual country reports are included in the Annex, presenting the S&T landscape and trends in each EECA country focusing in particular on challenges in the field of international cooperation in STI.

The aforementioned **Challenges and Recommendations** constitute the core part of the White Paper, and are organized into five main themes which can be summarised as follows:

1. Adjusting and Implementing Policy Strategies

There are several challenges directly related to strategic policy-making and good governance, such as generating, accessing and using data and knowledge for evidence-based policy making; embedding STI policy and policy-delivery in a broader, mutually aligned strategic policy system; building appropriate and internationally compatible national legal and ethical frameworks; strengthening the institutional fabric of the STI policy-delivery systems with efficient tools and instruments; securing a sufficient financial allocation to the STI sector; identifying and addressing global and societal challenges; and making optimum use of international cooperation.

It is recommended to focus on supporting strategic STI policy making: implementing a series of mutual learning exercises; improving existing international STI cooperation frameworks at a national level; and contributing to exchange and coordination activities at an international level.

2. Strengthening Research Conducting Institutions

In order to make objectives related to international S&T cooperation attainable, research institutions have to be in the position to efficiently perform their duties, to adjust to changing demands in society and the economy and to possess the means for international S&T competition and cooperation.

It is recommended to: strengthen research institutions through their involvement in international benchmarking exercises and twinning programmes which contribute to the adoption of good practice; strengthen their strategic and operational capabilities through training and the application of SWOT, Balanced Score Card (BSC) or foresight exercises; and to establish and implement roadmaps, investment plans and management concepts for an improved development and exploitation of research infrastructures.

An essential element for any research institution is its human potential which is specifically addressed in the next theme.

3. Strengthening Human Resources

Building human resources is a particular challenge for all countries, especially when faced with societal and economic transformation which also requires an improved method of communicating science to the public. A particular challenge is the adjustment of frameworks for international mobility.

In that respect, it is recommended to set up joint training and twinning programmes, especially targeting young researchers; to further align scientific education schemes based on the Bologna principles; to open the way for a more balanced mobility for students and researchers e.g. through regional doctoral programmes; to further facilitate the issuing of scientific visas; to establish an EU-EECA Year of Science and to promote science communication.

4. Strengthening the Role of the Private Sector

The engagement of the private sector in R&D is a challenge not only in EECA but also for several EU Member States. This is closely connected to the setting-up of an appropriate framework, for instance in the field of international standardisation, with the ultimate goal of increasing the number of innovative companies.

It is recommended to initiate joint training courses on innovation management as well as mutual learning activities to stimulate the creation and support of innovative companies and to set the framework for a higher private engagement in STI, for instance, through an enhanced involvement of the private sector in policy dialogue processes; to provide linkages between industrial related R&D initiatives and similar structures in EECA and to establish joint competitive innovation funding programmes; to improve the con-

ditions for investments in innovation and to encourage EU-EECA cooperation.

5. Strengthening sub-Regional Cooperation

A particular challenge for the EECA region is to reduce its fragmentation and to increase critical mass through sub-regional cooperation.

Therefore, it is recommended to strengthen sub-regional policy coordination and to stimulate networking between the STI communities, as well as to investigate the possibility of establishing regional centres of excellence.

It goes without saying that many of these suggestions extend into the autonomous competences of state authorities and research organisations. The White Paper does not intend to interfere with independent decision-making processes but to contribute to the knowledge base of the international STI cooperation between EU and EECA countries with an informed input that takes into account the international perspectives of different regions and countries. Many of the suggested intervention areas require well planned and long-term efforts, since international STI cooperation needs a stable supportive framework to unfold its synergetic and self-energizing potential. Therefore, this White Paper further proposes to interested STI policy stakeholders in EU Member States and EECA countries to develop a medium-term **joint roadmap for enhanced STI cooperation** to be built with a common goal for mutual benefit and to be implemented in partnership through joint programmes. In this regard, the European Strategic Forum for International Cooperation (SFIC) might play a distinguished role by launching a new SFIC-Pilot Activity, thus inviting EECA partner countries to join the dialogue and monitor upcoming activities. The process of developing a joint roadmap needs to include wider stakeholder consultations in particular with the scientific community and the private sector in both regions. In addition, cross-sector policy coordination should be included to properly embed STI policy in comprehensive governmental strategies at a trans-national level tackling societal and global challenges.

Existing programmes such as the EU RTD Framework Programme, the European Neighbourhood Policy Instrument (ENPI) and the Development Cooperation Instrument (DCI) as well as ongoing and planned projects developed under the INCO-NET, BILAT and ERA-NET schemes should be promoted to further support trans-national EU-EECA STI cooperation. Particular emphasis should be given to exploring options for supplementing funds from the EU with funds from other international financial institutions such as the Asian Development Bank, the World Bank and the European Bank for Reconstruction and Development, as well as funds from countries in the EECA region.



1. Introduction: Rationale for a Closer EU-EECA Cooperation

The European Union (EU) and the Eastern European and Central Asian countries (EECA) share a common goal: achieving political, economic and social stability and prosperity. Democratic societies and knowledge-based economies are considered key to success. Overarching policy objectives at national and regional level in the European Union and the EECA region are expressed in recently adopted strategies, most prominently the EU's Europe 2020 strategy for smart, sustainable and inclusive growth with the European Innovation Union being one of its flagship initiatives. On the EECA side, prominent examples for corresponding strategies are the Russian "Strategy for the Development of Science and Innovation in the RF for the Period until 2015," the upcoming Republic of Moldova's "National Strategy on S&T until 2020" or the Republic of Kazakhstan's "Development Strategy until 2030."

In order to achieve those policy objectives, the utilization of benefits achieved through political and economic as well as cultural cooperation is considered critical by both the EU and the countries of EECA. Along that line, the international opening-up of national systems supported by respective policy measures are usually an integral part of any national or regional strategy. Apart from the traditional measures to deepen the relations between individual countries and institutions of both regions, a number of strategic policy umbrellas were launched – such as the European Neighbourhood Policy, the Eastern Partnership, the Four Common Spaces with Russia and the recently adopted EU-Russian Partnership for Modernization, the EU-Ukraine Association Agenda, as well as the Central Asian Strategy of the EU – to systematically strengthen the political and economic ties between the regions.

Scientific research and technological development (S&T) are considered the backbone of any knowledge-based economy and an asset for responding to the recent global challenges. Bilateral and multilateral cooperation in the field of S&T is moreover essential to make optimum use of each other's academic strengths, to share respective resources and to prepare the ground for a joint transfer of scientific results into innovative applications for national, regional and worldwide markets. Although the S&T cooperation between the EU and the EECA partner countries is quite strong, there is still room for further develop-

ment. Acknowledging the current global as well as societal challenges both regions are facing, new perspectives for the strategic S&T partnership between the EU, Countries associated with the European RTD Framework Programme and the EECA region should be developed, building on each other's strengths and on common policy objectives such as:

- the creation of synergies by linking the scientific potential of leading researchers and innovators in partnership;
- ensuring mutual access to unique S&T infrastructure and pooling resources for establishing a new S&T infrastructure;
- removing existing barriers for S&T cooperation and for joint innovation activities;
- pooling resources to jointly address global challenges such as climate change, sustainable use of global resources, food security, ageing societies, global health threats;
- reinforcing industry driven partnerships and exploitation of markets, to stimulate knowledge driven innovation.

Furthermore, the EU-EECA partnership should encourage the close alignment of public and private sector initiatives in order to increase and accelerate the dissemination and exploitation of research results, and thus build the framework for creating an advanced EU-EECA innovation partnership. Evidently, many obstacles need to be removed to progress towards these objectives.

EU-EECA policy dialogues in the sphere of STI are considered a key to jointly address the aforementioned objectives and to achieve the goals of creating knowledge-based sustainable and inclusive growth in both regions through raising the full potential of real partnership. Much dialogue is already going on – both among individual EU member states and individual EECA countries and among the European Commission and individual EECA countries. Usually there are policy umbrellas created, most prominently in terms of bilateral governmental agreements on S&T cooperation among individual countries, as well as Partnership and Cooperation Agreements and dedicated agreements on S&T cooperation between the European Union and EECA countries. However, there is room for increasing the impact of such dialogues and for exploiting the available interests, among oth-

ers through the identification of options for a closer coordination of various activities.

To support the dialogue process among policy stakeholders as well as science and innovation communities and to foster practical cooperation among interested institutions, two bi-regional S&T projects between the EU and EECA (INCO-NET EECA and INCO-NET CASC) are funded by the European Commission within the 7th European RTD Framework Programme. They are implemented in bi-regional ownership by larger project consortia consisting of a range of interested institutions from EU member states, countries associated with the present EU RTD Framework Programme and EECA countries. Both INCO-NETs strongly inform and support the bi-regional policy dialogue aiming among others to identify opportunities and priorities for joint action. To prepare a better foundation for such policy dialogues, analytical results have been delivered, such as those pertaining to EU-EECA S&T cooperation patterns and to strategic research areas of mutual interest with potential for future cooperation and enhanced coordination between the EU Member States and EECA countries.

The EU-EECA policy dialogue among stakeholders is essential for the further development of S&T cooperation between the two regions. In that respect, three Policy Stakeholder Conferences bringing together policy makers and representatives of the research communities of both regions were recently been organized (Athens 2009, Moscow 2010, Astana 2011).

As a result of the aforementioned policy stakeholder conferences and at the same time as an input to future dialogue activities between the two regions, the present **White Paper on Opportunities and Challenges in View of Enhancing the EU Cooperation with Eastern Europe, Central Asia and South Caucasus in Science, Research and Innovation** was jointly prepared by EU and EECA experts. It is based on a wider stakeholder consultation process involving political decision makers, representatives of the STI administration as well as of the science and innovation communities in the European Union, Countries associated with the EU RTD Framework Pro-

gramme and Eastern Europe/Central Asian countries, which have been explicitly consulted through missions to EECA countries or through expert workshops on subjects of relevance for the EU-EECA STI cooperation. Furthermore, the White Paper integrates extensive desk research and was consolidated in a dedicated policy stakeholder conference in Warsaw (November 2011)².

The White Paper particularly aims to:

- i. present the current state of STI and STI policies in the relevant regions (strengths, weaknesses, opportunities, threats) as well as aspects of trans-sector policy coordination and its contributions to national/regional development;
- ii. reflect on the state of regional cooperation and its institutional environment;
- iii. present the benefits of enhanced international STI cooperation;
- iv. recommend knowledge-based policy approaches to better address national/regional challenges including options for advanced EU-EECA STI cooperation.

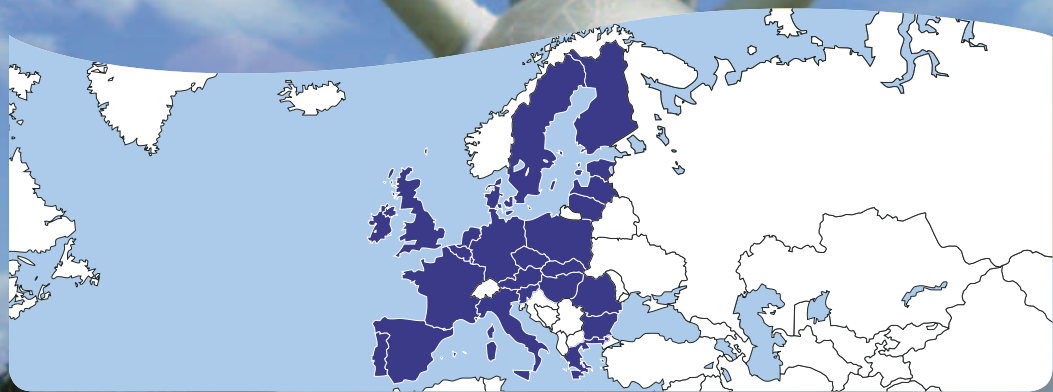
The **White Paper** is divided into three main chapters. The first chapter – State of Affairs – outlines the current state of STI in the EU, Central Asia, the European Neighbourhood Region and the Russian Federation, including an outline of the role of international cooperation. Within the second chapter “Challenges and Recommendations on Enhancing EU-EECA STI Cooperation” common policy strategies, instruments for its implementation and the respective framework conditions are described in detail. Building on these findings, major policy challenges are highlighted and recommendations are formulated for developing a joint EU-EECA STI Cooperation Strategy. Along the lines of the recommendations, the last chapter “Short-term Implementation Scenario,” suggests an ad-hoc Joint Action Plan for different groups of stakeholders.

² Activities organized in the context of projects funded by the European Commission (FP7) and dedicated to the support of the EU-EECA policy dialogue: “S&T International Cooperation Network for Eastern European and Central Asia – INCO-NET EECA”, “S&T International Cooperation Network for Central Asia and South Caucasus – INCO-NET CASC”, “Enhancing the bilateral S&T Partnership with the Russian Federation (BILAT-RUS)”, “Enhancing the bilateral S&T Partnership with Ukraine (BILAT-UKR)”, “Linking Russia to the ERA: Coordination of MS/AC S&T Programmes towards and with Russia (ERA-NET RUS)”, “Networking on Science and Technology in the Black Sea Region (BS-ERA.NET)”.



2. State of Affairs of Science, Technology and Innovation Policies

2.1 European Union



2.1.1 Current State of S&T in the European Union

2.1.1.1 S&T Indicators

This section focuses on the European Union at **Community level** and concentrates on data, initiatives, strategies, and programmes often triggered by the European Commission. It goes without saying that the EU is more than just the sum of its twenty-seven Member States and that in the field of R&D, like in other policy areas, large discrepancies can be found among the EU's Member States. While some of the Member States are world leaders in R&D, the EU in total is still under-investing, spending every year 0.8% of GDP less than the US and 1.5% less than Japan on R&D, with major gaps in business R&D, venture capital investments, knowledge-intensive service sector etc.³ R&D as a percentage of GDP in the EU was 2.01% in 2009, which is considerably higher than in the EECA countries, but lower than that of some of the EU's global market competitors (e.g. Japan: 3.44% in 2007; USA: 2.76% in 2008). In the EU-27, 55.0% of R&D expenditure was financed by the business enterprise sector (BES) and 33.5% by public sources (GOV). Only three EU Member States have two thirds of R&D expenditure financed by the BES. In terms of R&D performance, the BES accounted for 64% of EU's R&D expenditure, followed by the Higher Education Sector (HES) (22%) and the governmental research sector (13%) in 2008.

In 2008, around 2,250,000 researchers (head count) were engaged in the EU. The number of researchers steadily increased in recent years (+ 38% compared to 2000)⁴. Although this is an impressive figure, the number of researchers in Europe as a percentage of the population and labour force is well below that

of the US, Japan and other countries. In the EU-27, 45.9% of researchers (in FTE) were employed in the business / enterprise sector in 2008, 40.4% in the HES and 12.5% in the government sector⁵. Female researchers are still under-represented (32% of all researchers in the EU in 2008), especially in the BES (19% in 2008). Moreover, many researchers will retire over the next decade. If the EU wants to reach the R&D target quota of 3% by 2020, many more research jobs need to be created. Young people must be recruited and trained to become researchers, and internationally competitive research careers must be secured to keep them in Europe and to attract the best from abroad. There are however positive signs as well: the EU-27 produced twice as many doctoral graduates as the US and over the period 2000-2005, the number of doctoral graduates grew more in the EU than in the US and Japan⁶.

International mobility especially between EU Member States is high. Intra-European mobility barriers are being reduced. There is still a relative “*brain drain*” of European researchers to the US. The Marie Curie fellowships under the European Research Framework Programme are playing an important role to strengthen skills development, mobility and the careers of researchers across borders. To facilitate researcher's mobility the EC published a ‘*European Charter for Researchers*’ and a ‘*Code of Conduct for the Recruitment of Researchers*’, however with limited direct impact.

2.1.1.2 Research Structure and Policy

At European level, science and technology policies needed a couple of decades to develop. In 1971, the **first milestone in European R&D**, the **COST** programme was implemented. In 1985, **EUREKA**

TABLE 1: S&T INDICATORS FOR THE EUROPEAN UNION⁷

Country	R&D expenditure as % of GDP (GERD)	Number of research organisations	Number of R&D personnel (head count)
EU	2.01	n/a	3,047,825

³ Data taken from “Europe 2020 Flagship Initiative Innovation Union,” published by EC (SEC(2010) 1161).

⁴ Eurostat, <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=ts00003&plugin=1> accessed on 8 September, 2011.

⁵ Eurostat (2011): Science, technology and innovation in Europe. Eurostat pocket books.

⁶ EC (2008): A more research-intensive and integrated European Research Area. Science, Technology and Competitiveness key figures report 2008/2009.

⁷ Data from EUROSTAT, accessed on 8 September, 2011

was established by a Conference of Ministers from seventeen countries and the European Commission. At Community level, S&T was not legally institutionalised as a preferential policy area of the EU until Title VI of the **Single European Act** came into force in 1987. However, in 1985 the European Commission suggested the aggregation of the budgets of some of the EU's already existing R&D initiatives (e.g. ESPRIT) into one 'envelope', which was the start of the **European Framework Programme for RTD**. Today it is the largest competitive R&D funding programme globally. Within the ongoing 7th European Framework Programme for RTD (with a budget of €54b) a broad portfolio of several different instruments has been made available to support the competitiveness of European industries and the well-being of EU citizens.

In 2000, the European Council launched the '**Lisbon Strategy**' aimed at transforming the EU by 2010 into *'the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion'*. In 2002, a further target was added in Barcelona, namely, to spend by 2010 at least 3% of GDP on research, of which two thirds should be financed by the BES. All these ambitious goals could not be reached. The new EU's growth strategy for this decade is the **"Europe 2020" strategy**, which has set five ambitious objectives on employment, innovation, education, social inclusion and climate/energy to be reached by 2020. The 'old' Barcelona target, namely, to invest 3% of the EU's GDP in R&D, is the most pressing "Europe 2020" R&D goal. To facilitate the attainment of the set objectives seven flagship initiatives were created, among them the **"Innovation Union"** being the most relevant for R&D and innovation. With over thirty action points, the *Innovation Union* aims to improve conditions and access to finance for research and innovation in Europe, and to ensure that innovative ideas can be turned into products and services that create growth and jobs.

It was agreed to **tackle unfavourable framework conditions**; to facilitate private investment in R&D and innovation; to avoid the fragmentation of efforts by creating a true European Research Area; to focus on innovations that address the major societal challenges identified in *Europe 2020*; to pursue a broad concept of innovation and to involve all parties and all regions in the innovation cycle (including '*social innovation*' and '*smart regional specialisation*'). The whole chain of R&D and innovation should be strengthened

and made more coherent, from blue sky research to market uptake. This should also be reflected in EU funding programmes. Therefore, as of 1 January, 2014 **"Horizon 2020"** will bring together research and innovation funding currently provided through the European Framework Programme for Research and Technical Development, the Competitiveness and Innovation Framework Programme (CIP) and the European Institute of Innovation and Technology (EIT). Under **"Horizon 2020"** priority will be given to enabling technologies ('eco', 'nano', 'bio' and 'info') and to addressing societal and mostly global challenges (e.g. 'green' energy, transportation, effects of climate change and ageing).

By delivering the **European Research Area** by the end of 2014, costly overlaps and unnecessary duplication in R&D at different regional levels should be avoided. Starting points have been identified in the fields of human resources, research programmes and research infrastructures, knowledge sharing and international S&T cooperation.

It was recognised from the beginning that the Community research policy should be based on two pillars: the **coordination of national policies and the joint implementation of projects of interest to the Community**. This principle is integrated into Article 181 of the Treaty on the Functioning of the European Union, where it is stated that the Community and the Member States shall coordinate their research and technological development activities so as to ensure that national policies and Community policy are mutually consistent and that the EC may take any useful initiative to promote the coordination in close cooperation with the Member States.

Practically, the main **driver for R&D** and innovation at Community level is the European Commission (EC), in particular DG Research and Innovation, which is responsible for developing and implementing the European research and innovation policy with a view to achieving the goals of *Europe 2020* and the *Innovation Union*. Among the other directorates, DG Enterprise and Industry, DG Information Society and Media and DG Education and Culture are mostly involved in R&D and innovation. To contribute to the realisation and better governance of the European Research Area, the so-called '**Ljubljana Process**' was launched in May 2008 to develop a common vision and effective governance of the European Research Area. In 2010, ERAC (European Research Area Committee, formerly

CREST) was endorsed as the most strategic policy advisory body whose function is to assist the EC and the Council of the European Union in performing the tasks incumbent on these institutions in the sphere of R&D.

The EC has its own **joint research centre (JRC)** providing scientific advice and technical know-how to support a wide range of EU policies. Its status as a Commission service guarantees independence from private or national interests. The JRC has seven large scientific institutes with a wide range of laboratories. It employs around 2,750 staff coming from all over the EU and its budget comprises of €330 million annually, coming from the EU's research budget. Further income is generated through the JRC's participation in indirect activities, plus additional work for Commission services and contract work for third parties. The bulk of research organisations engaged at the European level, however, originates from the individual EU Member States. Until May 2011, more than 71,000 participations⁸ in more than 12,500 FP7 projects were funded. In absolute numbers, most active in FP7 are research organisations from Germany, the UK, France, Italy, Spain, the Netherlands, Belgium, Sweden, Greece and Austria.

With respect to **scientific excellence**, expressed as the number of scientific publications, the EU is the largest producer of scientific publications in the world (37.6% of the world peer-reviewed scientific articles). However, the EU contributes much less than the US to high-impact publications and is not specialised in the faster-growing scientific disciplines.

In terms of **patent** applications, there has been some increase in the EU-27 inventiveness in the last decade. PCT⁹ patent applications of EU-27 inventors have increased in number somewhat more rapidly than those of US inventors, but less rapidly than those of Asian countries. Japanese and U.S. inventions are focused to a higher degree than the EU inventions on enabling technologies (biotechnology, ICT and nanotechnology). Regarding IPR, the burdensome process of establishing a single EU Patent has become a symbol for Europe's failure on innovation.

Although in the EU (excluding Greece) 51.6% of enterprises in industry and services reported innovation activity between 2006 and 2008, the **innovation performance** of the EU lags behind some of its major global competitors. The annual high-tech trade balance is usually negative and the share of EU high-tech exports in percentage of total exports is shrinking compared to ten years ago¹⁰. In terms of world-market shares of high-technology exports, the EU has 16.7% (2008), which is clearly behind China (21.5%) but ahead of the US (14.1%), Hong Kong and Japan. Within the EU-27, Germany is the leading exporter of high-tech products. In terms of global export shares, the EU was in the lead in numerous product groups such as '*Aerospace*', '*Chemistry*', '*Non-electrical machinery*', '*Pharmacy*' and '*Scientific instruments*,' whereas the United States ranked first only in '*Armament*'. China was the world's foremost exporter in '*Computers / office machines*' and '*Electronics and telecommunication*' product groups, while other Asian countries were leading exporters of '*Electrical machinery*'.

To battle the European paradox, i.e. the conjecture that EU countries play a leading global role in terms of top-level scientific output, but lag behind in the ability to convert this strength into wealth-generating innovations¹¹, European policies recently started to promote **demand-side measures to complement supply-side R&D measures**. In addition, there is agenda setting on regulations and standardisation to forward R&D and innovation. Smart and ambitious regulation, for example, stricter environmental targets and standards, are considered particularly important for eco-innovation. The EU wants to maintain and further reinforce its impact on setting standards at a global level, where other countries are increasingly seeking to set the rules. Pre-commercial procurement to support innovations is another aspect which emerged recently, but as yet little public procurement in the EU is aimed at innovation, despite its high theoretical potential.

⁸ These participations are not necessarily from different organisations. The number of single discrete R&D organisations is significantly lower than the number of participations.

⁹ An international patent application under the Patent Cooperation Treaty (PCT).

¹⁰ Source: <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=0&language=en&pcode=tgite210&tableSelection=1>, accessed on 8 September, 2011

¹¹ Definition from Dosi, G., Llerena, P. and Labini, M. S. (2005). Science-Technology-Industry Links and the "European Paradox": Some Notes on the Dynamics of Scientific and Technological Research in Europe. Working Papers of BETA 2005-11, Bureau d' Economie Théorique et Appliquée, UDS, Strasbourg.

2.1.2 State of International Cooperation

2.1.2.1 Community Policies and Community Programmes

At the Community level, international S&T cooperation with countries outside the EU has become an integral part of any European Framework Programme for RTD since FP3. Moreover, COST and EUREKA were created to facilitate international S&T cooperation. In 2008, the EC published *"A Strategic European Framework for International Science and Technology Cooperation."* The principles of this strategy are to widen the ERA and to make it more open to the world; to ensure coherence of policies and complementarity of programmes; to foster strategic S&T cooperation with key third countries; to develop the attractiveness of Europe as a research partner and to launch result-oriented partnerships on information society regulations. All these principles should be approached as a combined effort of the EC and the EU Member States. To better align and coordinate S&T internationalization efforts between the Community and the Member States level, a dedicated working group under CREST was established in 2007, whose recommendation to organize a formal Strategic Forum for International S&T Cooperation (SFIC) was adopted, starting its operations in 2009.

At the operational level, a comprehensive portfolio of instruments has been developed under FP7 to enhance international R&D cooperation. Most importantly, FP7 is open to participation from third country partners. Community funding is normally limited to participants from International Cooperation Partner Countries (ICPC: 139 countries from all over the world, except some post-industrialised high-income countries, like Japan or Singapore). R&D organisations from ICPC can now participate in almost all calls for proposals launched under FP7 and receive funding for their efforts. Moreover, in the 'Capacities' section of FP7 a few more dedicated instruments have been developed to support international R&D cooperation. Today, the instrumental portfolio encompasses international ERA-NETs, INCO-NETs, INCO-Labs, ERA-Wide, BILAT projects etc.

Despite all these efforts and the existence of a full-fledged instrumental international S&T cooperation portfolio, the share of participation from third countries did not significantly increase compared to the previous FPs.

2.1.2.2 Bilateral Agreements and Programmes

The EC has a number of bilateral S&T agreements with key partner countries in place. These agreements are based on the principles of equitable partnership, common ownership, mutual advantage, shared objectives and reciprocity. In addition, bilateral measures are tested and implemented within FP7 such as *'coordinated calls', 'joint calls'* or the *'twinning'* instrument. Within the EECA, bilateral S&T agreements have been concluded with the Russian Federation and Ukraine.

2.1.2.3 (Sub-)Regional Cooperation

S&T cooperation with the EU's neighbours is explicitly featured in the EC's strategic document *"A Strategic European Framework for International Science and Technology Cooperation."* A certain emphasis was placed on FP7 association, which materialised for most Western Balkan Countries, while the EU position towards the Russian and Ukrainian request for FP7 association was significantly more reluctant – a fact also caused by non-S&T policy issues. The opportunity for European Neighbourhood Partner Countries to participate in certain EC policies and programmes, including FP7, is an important aspect of the European Neighbourhood Policy (ENP).

2.1.2.4 European Agreements (PCA, S&T) and Programmes (FP, ENPI, DCI, CIP-EEN)

Agreements and implemented programmes between the EU and the EECA as well as the Russian Federation are described in the respective Central Asia, European Neighbourhood Countries and Russia sections.

Summarising the most important developments, the EU in the 1990s launched Partnership and Cooperation Agreements (PCA) with the Central Asian countries that also provide an umbrella for cooperation in the scientific field. Furthermore, the EU has strengthened its relationship with the whole region since the adoption of **"The EU and Central Asia: Strategy for a New Partnership"** by the European Council in June 2007.

The **Development Co-operation Instrument (DCI)** (2007-2013) is a programme for poverty reduction, sustainable economic and social development and the integration of Central Asia into the world economy supported by the EU with €719 million. In general, DCI projects do not target special research topics, but some of the DCI priority activities benefit from the generation of scientific knowledge or recognise the development of scientific research and research infrastructures.

The thematic interest of CA institutions participating in **FP7** is very wide, but in fact only thirty-four Central Asian organisations took part in different S&T projects within the FP7 (until May 2011). With the aim of enhancing the participation of Central Asia in the FP7, **National Contact Points (NCP)** were created in Kazakhstan, Kyrgyzstan and Uzbekistan.

With respect to the **European Neighbourhood countries**, all except Belarus have **Partnership and Cooperation Agreements (PCAs)** with the EU. These form the legal basis for EU relations with each country. The PCAs establish the institutional framework for bilateral relations, set the principal common objectives and call for activities and dialogue in a number of policy areas including S&T.

All EN countries participate in the **7th EU RTD Framework Programme** as International Cooperation Partner Countries (ICPC). The association of Moldova went into force on 1 January, 2012. Up until the end of 2010 the majority of countries had a limited number of successful proposals in FP7.

The **European Neighbourhood Policy (ENP)** covers all European Neighbourhood countries. For each country, tailor-made ENP Action Plans have been drafted taking on board differing national needs. With regards to STI, a common goal for all countries is closer integration to the ERA through more active participation of domestic research organizations in the EU Framework Programmes for RTD.

All EN countries are also involved in the **Lifelong Learning programmes (LLL)** and in particular in TEMPUS, in which these countries achieve a high success rate. Very strong relations have been established with Russia. **Russia**, which concluded an S&T agreement with the European Commission for the first time in 1999, implements several “coordinated calls” with the EU, which are jointly defined and funded. Since 2001, S&T agreements between the EU and Russia are also in place for **EURATOM**, covering fission and fusion oriented research.

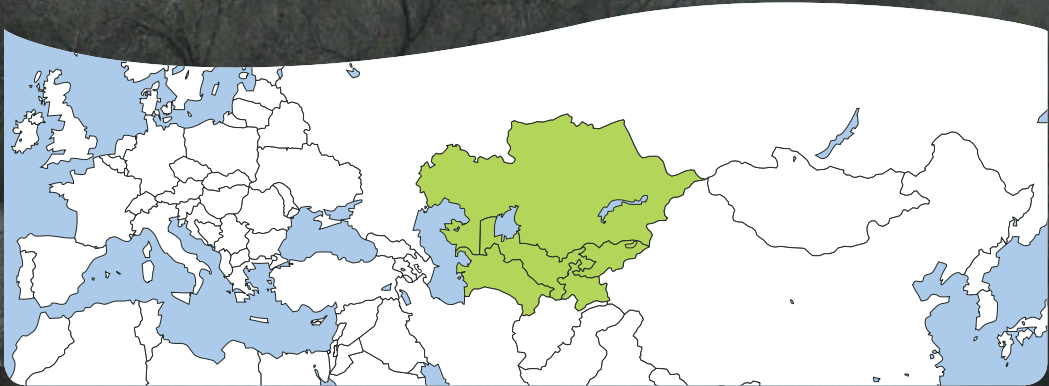
Another framework for strengthening cooperation was agreed in 2003 with the **Four Common Spaces**, which comprise a common space for research and education, including cultural aspects. A series of measures to facilitate Russia’s integration into the European Research Area have been implemented. Russian scientists also participate in projects of the

European initiatives **COST** and **EUREKA**.

Through the **International Science and Technology Centre (ISTC)**, founded in 1992 as an international organisation by USA, Japan, Russia and the EU, substantial support to the former Soviet Union R&D sector is provided with the aim to redirect their talents to peaceful scientific activities.

Russia is also one of the target countries in the **EU Eastern Partnership and the Northern Dimension initiatives**. The more recent joint EU-Russia initiative is a **“Partnership for Modernization”**, agreed in the spring of 2010. It includes cooperation in R&D and innovation.

2.2 Central Asia



2.2.1 Current State of S&T in Central Asia

2.2.1.1 S&T Indicators

Funding for R&D in the five countries of Central Asia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan, is generally low and ranges from 0.06% of GDP (TJ) to 0.21% (KG) in 2011 (see Table 2). In all five countries, science is largely funded by the state budget. In terms of research organizations, in absolute figures, Kazakhstan and Uzbekistan have the highest number of active scientists and research organizations and rank among the highest in the CIS countries (on a similar level to Belarus). Turkmenistan, with its forty-six research organizations, is in the process of re-opening some institutions after its previous president had closed the Academy of Science and its research institutions.

2.2.1.2 Research Policy and Structure of National Science, Technology and Innovation Systems

Science and technology policies are in a phase of transition in all countries of Central Asia, especially after their independence from the Soviet Union. In the years following independence, all Governments have taken up concrete measures for the progress and development of S&T in their countries.

Since June 2007, **Kazakhstan** has been implementing the *State Programme on Science Development for*

*2007-2012*¹⁸. The main goals of the programme are the modernization of the RTD management system, its infrastructure, and its legal background, as well as increasing governmental financial support for RTD. In 2010, the *State Programme for Accelerated Industrial-Innovative Development for 2010-2014*¹⁹ was adopted as part of the *Strategic Plan of Development of Kazakhstan till 2020*, which is the second stage of the overall *Kazakhstan Development Strategy till 2030*. This programme aims at ensuring sustainable and balanced economic growth through diversification and increased competitiveness. In 2011, Kazakhstan adopted the Law “On Science”²⁰. The law regulates the relationship between science and scientific and technological activities, and foresees a fundamental restructuring of the higher education system and the science system. It furthermore identifies new research funding tools, such as grants for basic research and industry targeted activity.

The legal basis for national S&T policy in **Kyrgyzstan** formed the following regulations: Law “On the National Academy of Sciences” from 2002; Law “On Science and Basic State Scientific and Technical Policy” from 2008; Law “On System of Scientific and Technical Policy” from 2005 and the Law “On Innovative Activity” from 1999. The Law “On Science and Innovation Activities” from 2009 describes the management of practical results in the direction of national economic priorities,

TABLE 2: S&T INDICATORS FOR THE FIVE CENTRAL ASIAN COUNTRIES

Country	R&D Expenditure as % of GDP (GERD)	Number of Research Organisations	Number of Research Personnel
Kazakhstan ¹²	0.16	424	17,021
Kyrgyzstan ¹³	0.21	84	5,125
Tajikistan ¹⁴	0.06	67	5,617
Turkmenistan	n/a	46 ¹⁵	3,689 ¹⁶
Uzbekistan ¹⁷	0.20	202	34,587

¹² According to the Kazakhstan Agency for Statistics, www.stat.kz

¹³ National Statistic Committee of the Kyrgyz Republic, 2010

¹⁴ UNESCO Science Report 2010

¹⁵ Calculated

¹⁶ Statistical Yearbook of Turkmenistan, Ashgabat 2010, p.160

¹⁷ Committee for Coordination of Science and Technology Development of Uzbekistan 2010

¹⁸ Presidential Decree of 20.06.2007 N 348 “On State Programme of Science of the Republic of Kazakhstan for 2007 – 2012”

¹⁹ Presidential Decree, Republic of Kazakhstan March 19, 2010 No 958

²⁰ Presidential Decree, Republic of Kazakhstan, February 18, 2011 No 407-IV

and the need for development of innovations. Furthermore, in the *Country Development Strategy for 2009-2011* particular attention is paid to the development of science and innovation, and this Strategy sets the research priorities in the fields of S&T for the country.

The government of **Tajikistan** has recently adopted a number of science-related laws, e.g., the Law “*On Science and National S&T Policy*” in 1998, the Law “*On the National Academy of Sciences*” in 2002, and a Decree *on the Activities of the National Academy of Sciences in 2004*. The current *National Development Strategy for 2007- 2015*²¹, which includes the Science Development Strategy, allows for the updating of the legislative basis of S&T and finding measures to ensure its proper execution. The Strategy also aims to further strengthen the collaboration between Tajik research organisations and the different Ministries, and outlines a comprehensive programme for developing international scientific cooperation via intergovernmental agreements and partnerships to be concluded by the Academy of Sciences, research institutes and universities²².

In **Turkmenistan**, the Law “*On the Status of Scientists*” adopted in 2009 defines the rights, duties and responsibilities of researchers, the criteria for evaluation of their qualifications as well as the responsibility of state government bodies to ensure the freedom of academic work, provide social protection for researchers, and raise the prestige of scientific activities.

The S&T and innovation activity in **Uzbekistan** is regulated by the Presidential Decree No. 436 from 2006 “*On measures for further development of coordination and management of science and technology development*”. In the frame of this Decree, the Committee for Coordination of Science and Technological Development was established, and the responsibilities of the different Ministries, the Academy and the research organizations were re-organized. Together with Decree No. 31 from 1998 “*On state support of international scientific programmes, projects in the framework of international and foreign grants,*” it forms the basis of S&T policy in the country. A Law “*On invention*” is currently under preparation. Also, 2011 was declared as the national year of SMEs at the government level.

The **research structures** responsible for implementing scientific programmes, however, vary between the five countries.

In **Kazakhstan**, the main research stakeholder is the High Scientific Technology Committee (HSTC) headed by the Prime Minister. The Committee coordinates all Ministries of Kazakhstan which are responsible for research development. Any decision of the Committee has to be approved by the Parliament of the Republic. The S&T policy in Kazakhstan is divided between two ministries: the Ministry of Industry and New Technologies is responsible for innovation, while the Ministry of Education and Science overlooks the scientific programmes and activities.

To accelerate S&T development in **Kyrgyzstan** a Coordination Committee was set up by the President. The main task of this Committee is to monitor different scientific activities, research and innovations. There are three main stakeholders involved in science: the Ministry of Science and Education (MSE), and the National Academy of Science (NAS KR), which acts as a Ministry and advises the government on S&T policy. The NAS KR also defines and coordinates the research activities of the universities and most of the academic institutes, and manages basic research funded by the state. The Agrarian Academy, as the third minor player, is a management entity similar to the NAS KR and reports directly to the Ministerial Cabinet.

In **Tajikistan**, the National Academy of Sciences (NAS TJ) is the country's main scientific body that has important decision making power in the national S&T policy. In the absence of a Ministry of Research, this function is carried out by the NAS TJ with its president holding a position similar to a Minister. The majority of research organisations are administered by the NAS TJ, as well as by the National Academy of Agricultural Sciences, and the National Academy of Educational Sciences. In addition, there are a few research institutes and universities which are not part of the structure of the Academies. All universities except the National University are under specific Ministries; the National University is independent.

²¹ Национальная стратегия развития Таджикистана до 2015 года и стратегия снижения бедности на 2006-2015 года: Стратегия развития науки. (National Development Strategy of Tajikistan until 2015)

²² UNESCO Science Report 2010

In **Turkmenistan**, in 2009 the Academy of Sciences (NAS TM) was re-opened, and in 2010 the position of the Vice Prime Minister for Science, New Technologies and Innovation was first established. The Vice Prime Minister is also the President of the Academy of Sciences. A large number of research institutes fall under the supervision of the NAS TM. Yet, specific thematic research institutes are administered directly by the respective ministry, for instance the Desert Institute under the Ministry of Environment. Also, a new Centre for Science and Innovation is being created, which will coordinate applied sciences and will be supervised by the NAS TM. Relevant scientific decisions have to be approved by the Committee for Science, Education and Culture in the Parliament of Turkmenistan.

In **Uzbekistan**, the Committee for the Coordination of Science and Technological Development under the Cabinet of Ministers is the main governmental body responsible for implementing the state S&T policy and developing priority fields of S&T and international S&T cooperation. It is responsible for the coordination of all research programmes of the Academy of Sciences (NAS UZ) as well as the Ministries, including the Ministry of Education, and their related research institutes and universities via its Executive Committee. Furthermore, the Committee monitors the implementation of research and innovation projects, and the transfer of their results to industry. It is also assigned to assist and support Uzbek scientists and engineers to participate in international S&T programmes.

What unites all of these countries is their research priorities. Overall, the countries indicated the following national priority fields that should contribute to their socio-economic development:

- Information and Communication Technologies (KZ; KG; TJ; TM;UZ);
- Agriculture, Biotechnology, Food Security, Land and Water Management (KZ; KG; TJ; TM; UZ);
- Energy and Water Technologies, Renewable Energy Resources (KZ; KG; TJ; TM; UZ);
- Metallurgy and Extraction (KZ; KG; TJ; TM; UZ)
- Environmental Protection, Safety (KZ; KG; TJ; TM; UZ);
- Health, Medicine (KZ; KG; TJ; TM; UZ)
- Oil and Gas sector, i.e. extraction and processing (KZ; TM; UZ)
- Socio-economic Policy and Economic Production, Labour (TJ; TM; UZ)

2.2.2 State of International Cooperation

2.2.2.1 National Policies and National Programmes Addressing International S&T Cooperation

The expansion of international cooperation plays an important role in the implementation of the national S&T strategies in all Central Asian countries. The importance of international relations is usually regulated by **Presidential Decrees** (UZ, TJ) or in the current Laws on Science (KG, KZ, TJ) and "On the Status of Scientists" (TM) (see above). The main national objectives of the Central Asian countries regarding international collaboration include the following aspects: a) exchange of S&T knowledge; b) financial and technical support; c) creation of joint research centres and organizations. The Kazakh State Programme "The Path to Europe" 2009-2011 is the sole international strategy established at the national level. The aim of the Programme is to bring the Republic of Kazakhstan to a new level of strategic partnership with leading European countries, especially in technological fields like energy, transport, quality of life, cooperation with SME as well as in social sciences and humanities.

Moreover, the cooperative actions regarding national laws and strategies are connected to the economic development and promotion of **innovation** in some countries. Currently, the National programme "Kazakhstan-2020" aims to develop an innovative economy by identifying positive trends in the Kazakhstan economy (energy efficiency; growth of non-raw material sector; agro-industrial complex; support to SMEs and growth in labour productivity) and by using international support for its implementation.

The current discussion about the protection and utilisation of **intellectual property rights** has begun in the Central Asian countries. Furthermore, an important step in this area is the setting up of a legal basis for the respective training of CA experts. The law "On the status of the scientist in Turkmenistan," adopted in 2009, for example, sets a legal basis and has a significant influence on expanding the cooperation between local scientists and foreign partners. In Kazakhstan and Kyrgyzstan there are several IPR and Patent Laws (e.g. "On Copyright and Related Rights," "On Employee's Inventions, Utility Models and Industrial Designs," "About trade marks, service marks and designations of places" etc.), which define the legal basis in these countries. The Uzbek government is currently preparing some additional regulations concerning these topics.

The number of **national programmes** in Central Asia open to foreign researchers is significantly low. In Kazakhstan the new Law on Science strengthens the participation of foreign researchers in national calls for proposals. Turkmenistan allows foreign participation in national programmes in the form of technical assistance. In general, at this current stage the scientific activities include mainly scientists from EECA, but not from other European countries.

2.2.2.2 Bilateral Agreements and Programmes

Each Central Asian country has signed several bilateral S&T agreements with different EU MS/AC, for example, the Agreement between the Government of Kazakhstan and the Government of Italy on Cultural and Scientific Cooperation (May 11, 2000), or the Agreements between the Government of Kazakhstan and the Governments of Latvia and Estonia on Economic and Scientific-technical Cooperation (March 2006).

Apart from the EU, the countries have built up formal scientific relations with China (KG), South Korea (UZ), the USA (UZ, TJ) and Afghanistan, Iran, Pakistan and India (TJ). They traditionally cooperate very closely with the other countries of the Former Soviet Union, like Armenia, Belarus, Russia etc. Besides government level agreements, bilateral collaboration is also established at the level of research organizations such as NAS, state research centres and universities.

2.2.2.3 (Sub-)Regional Cooperation

A considerable number of S&T **cooperation agreements** were signed with the neighbouring countries in the years immediately after independence. Russia still remains the main partner of the countries in the region. However, among other factors, the political situation in the region (e.g. conflicts in Tajikistan, Kyrgyzstan) strongly affects scientific cooperation. Currently, the political relations between TJ and UZ, as well as between KG and UZ are strained. On the other hand, the Turkmen interest in regional scientific cooperation has increased and agreements with KZ and UZ exist.

Overall, the **regional cooperation** is still driven by older (meaning Soviet) personal or institutional links, although new initiatives have also been created in the last few years. A good example of an existing regional approach is the **University of Central Asia** which operates in three countries in the region, i.e., Kazakhstan, Kyrgyzstan and Tajikistan.

The common thematic interests and joint priorities of the Central Asian countries offer the opportunity for a collaborative approach. Renewable energy, agriculture and water research are very relevant to the entire region (see above). The Eco-Regional Programme for Sustainable Agricultural Development in Central Asia and the Caucasus²³, which is a consortium of eight National Agricultural Research Centres, eight Centres of the Consultative Group for International Agricultural Research (**CGIAR** consortium members) and three additional advanced research institutions (non-CGIAR consortium members), is an excellent example that the cooperation between the Central Asian countries can work successfully. Under this Programme, for example, a centre of excellence involving the countries of Tajikistan, Kyrgyzstan, Turkmenistan and Kazakhstan has been established in recent years to support the transfer of information and experience exchange in the field of biodiversity.

Furthermore, the International Fund for Saving the Aral Sea (**IFAS**) with the five Central Asian countries as member states coordinates cooperation at national and international levels in order to use existing water resources more efficiently and to improve the environmental and socioeconomic situation in the Aral Sea Basin. The Executive Committee of IFAS serves as a platform for a dialogue among the countries of Central Asia, as well as the international community. The Committee has also achieved a dynamic partnership with the institutions of the European Union (e.g. European Parliament, Council of the European Union, European Commission).

Another good practice example is **CACAARI**, the Central Asia and Caucasus Association of Agricultural Research Institutions²⁴, which aims at facilitating regional cooperation in agricultural research for development by providing a dialogue platform to the various stakeholders of the agricultural field, and supporting information flow from global organizations to local partners and back.

2.2.2.4 Agreements and Implementing Programmes between the EU and Central Asian Countries

In the 1990s the European Union launched Partnership and Cooperation Agreements (PCA) with the Central Asian countries that also provide an umbrella for cooperation in the scientific field. Moreover, the EU

²³ <http://www.icarda.org/cac/>

²⁴ <http://www.cacaari.org/>

has strengthened its relationship with the whole region since the adoption of **“The EU and Central Asia: Strategy for a New Partnership”** by the European Council in June 2007. The objective of the strategy is to reinforce the EU-Central Asia political dialogue with regular meetings of EU and Central Asian Foreign Ministers. The document includes the following main topics: human rights, cooperation in the areas of education, rule of law, energy and transport, environment and water, common threats and challenges (including border management and combating drug trafficking), trade and economic relations. The strategy is supported by a significant increase of EU assistance in the region. The EU Delegation in Astana (KZ) for instance coordinates the activities in the region. Recently an EU Delegation in Bishkek (KG) was established. The existing Houses of Europe in Ashgabat (TM) and Tashkent (UZ) are an intermediate step in establishing an EU delegation in these countries.

An agreement between the EU and the Government of Uzbekistan on the Establishment of Privileges and Immunities of the EU Delegation in Uzbekistan was signed on January 24, 2011 in Brussels. Following this agreement the Delegation of the European Union to the Republic of Uzbekistan started its activity in May 2011. An EU Ambassador in Uzbekistan was appointed in January 2012.

Under the first initiative within the EU-Central Asia Strategy, the EU supports Higher education cooperation, academic and student exchanges, for instance under the new **Erasmus Mundus** facility (five master's courses students from CA 2011, partnership between fifty-one institutions from the CA countries) and **TEMPUS** (e.g. seven current projects in KG) as well as on a bilateral level. The European Commission is for example currently implementing projects in the field of private sector development (Central Asia Invest Regional Programme).

The **Development Cooperation Instrument (DCI)** (2007-2013) is a programme for poverty reduction, sustainable economic and social development and the integration of Central Asia into the world economy supported by the EU with €719 million. In general, DCI projects do not target special research topics, but some of them benefit from the generation of scientific knowledge and are therefore, at least to some extent, related to scientific research. However, there seems to be room for advancing the link between scientific research and problem solving approaches for poverty reduction and

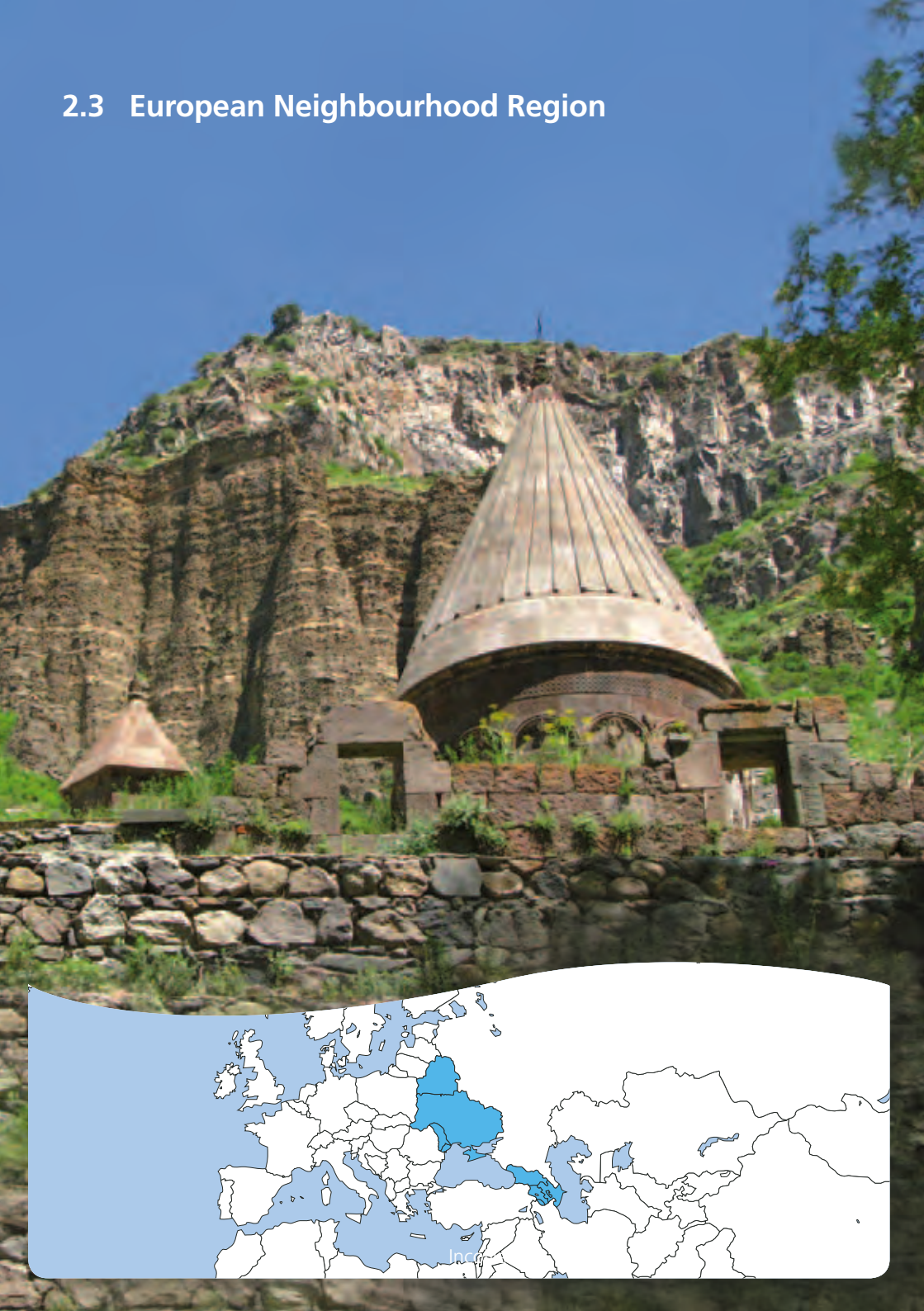
social and economic development. Forty-three regional projects (e.g. “East European Co-operation Network in Food, Agriculture and Biotechnology for EU-Kazakhstan-Russia-Ukraine-Armenia-Belarus Countries”) and 133 national projects (e.g. Food security and social protection in Kyrgyzstan) were developed under DCI (as of May 2011). Regarding the allocation of the budget between the 133 national projects Tajikistan receives 30% (€67.2 million) which is the largest share of funding for its activities. Out of the total amount of 176 projects, twenty-nine involve educational and scientific issues (e.g. environmental problems and supporting in development of higher education).

The thematic interest of CA institutions participating in **FP7** is very wide. They are to some extent linked to addressing global challenges through building strategic partnerships, to ensure stability and prosperity in the region. However, only thirty-four Central Asian organisations took part in S&T projects within FP7 (until May 2011). The collaborative activities were supported by the EC with €1.7 million (€38.25 million for all EECA). Kazakhstan, with seventeen participations, is the strongest partner in the region.

With the aim of enhancing the participation of Central Asia in the FP7, **National Contact Points (NCP)** were created in Kazakhstan, Kyrgyzstan and Uzbekistan. With fourteen thematic NCPs and a National Coordination Office, Kazakhstan has the most developed NCP system. A similarly advanced structure can be found in Uzbekistan (thirteen NCPs). In Kyrgyzstan only one organisation is operating as NCP, generally coordinating the FP activities; however, it is planned to appoint further institutes to act as NCPs in certain fields of research. In Tajikistan a National Information Point (NIP) is linked to other NCPs in the region and disseminates information about the application procedures within FP7. Currently, there is no acting NCP or NIP in Turkmenistan. Overall, the NCP and NIP network in the region is not supported financially by national governments.

At the EU level besides the FP7 there is another key funding instrument which supports research and innovation: the **Competitiveness and Innovation Framework Programme (CIP)**. On the basis of Article 21.5 of the CIP regulation a third country may join CIP and the Enterprise Europe Network (a network of regional consortia providing integrated business and innovation support services for SMEs within EIP). However, the Central Asian countries are not yet involved.

2.3 European Neighbourhood Region



2.3.1 Current State of S&T in the ENPI Region

2.3.1.1 S&T Indicators

Statistical data to evaluate the research performance of the systems are often missing or differ largely depending on the source.

In most EN countries R&D Gross expenditure is very low. Yet, three groups can be differentiated: the highest values are observed in Belarus and Ukraine, with an R&D expenditure of 0.65% and 0.82% respectively (Table 3). The second group, i.e. Georgia and Moldova spend around 0.4% of their GDP on R&D. Lowest R&D expenditure was reported for Armenia and Azerbaijan with less than 0.3%, which is similar to R&D spending in the Central Asian countries Kazakhstan or Uzbekistan (see Chapter 2.2.1). However, positive trends

are observed. In some cases the change might seem undetectable, e.g. in Belarus the expenditure share remained almost unchanged from 2001-2009, but since the country's GDP rose very rapidly, the amount of funding in nominal terms has also increased. In some cases the goals are ambitious; such is the case in Azerbaijan where a recently announced strategy for S&T foresees a tremendous increase from 0.2% to 2% by 2015. However, it is also true that in some cases the spending dropped drastically as a result of the recent financial crisis.

All the countries have faced a significant decrease in the number of researchers, especially in the years immediately after the collapse of the Soviet Union. However, a positive trend has already been recorded in Belarus, where R&D employment increased by 5% from 2003-2008.

TABLE 3: S&T INDICATORS FOR THE EN COUNTRIES

Country	R&D expenditure as % of GDP (GERD)	R&D expenditure as USD per capita	Number of research organisations	R&D personnel: Number of employees
Armenia	0.27	12 ²⁵	83	6,926 ²⁶
Azerbaijan	0.2		146	22,500
Belarus	0.65 ²⁷	53.4 ²⁸	446	20,571
Georgia ²⁹	0.4		31	3,200
Moldova	0.42	n/a	38	4,764 ³⁰
Ukraine	0.82 ³¹	ca. 24.5 ³²	1,303 ³³	141,1 ³⁴

²⁵ <http://www.unescap.org/stat/data/syb2009/15-Research-and-development.pdf> (data for 2007)

²⁶ National Statistical Service of RA, <http://armstat.am/> (data for 2009)

²⁷ Science, Innovation and Technology in the Republic of Belarus – 2008. Statistical book, State Committee on Science and Technology, Ministry of Statistics and Analysis of Belarus, 2009

²⁸ In 2010: 38.13 Euro

²⁹ Source: SRNSFlang=1

³⁰ The Court of Accounts of Moldova Report <http://lex.justice.md/viewdoc.php?action=view&view=doc&id=338497&lang=1>

³¹ State Statistics Service of Ukraine: Science and Technology Activities in Ukraine - Statistical Data Collection (Державна Служба Статистики України: Наукова та інноваційна діяльність в Україні - Статистичний збірник, ДП "Інформаційно-видавничий центр Держстату України") Kiev, 2011, p. 178 (data for 2010)

³² ca. 8996 mln UAH R&D expenditure (2010) (State Statistics Service of Ukraine: Science and technology activities in Ukraine - Statistical Data Collection (Державна Служба Статистики України: Наукова та інноваційна діяльність в Україні - Статистичний збірник, ДП "Інформаційно-видавничий центр Держстату України") Kiev, 2011, p. 81) and ca. 45.8 mln inhabitants (1 January, 2011) (State Committee of Statistics of Ukraine: Population of Ukraine as of 1 January 2011 (Державний Комітет Статистики України: Чисельність наявного населення України на 1 січня 2011 року), Kiev, 2011, p. 8)

³³ State Statistics Service of Ukraine: Science and Technology Activities in Ukraine - Statistical Data Collection (Державна Служба Статистики України: Наукова та інноваційна діяльність в Україні - Статистичний збірник, ДП "Інформаційно-видавничий центр Держстату України") Kiev, 2011, p. 10 (data for 2010)

³⁴ State Statistics Service of Ukraine: Science and Technology Activities in Ukraine - Statistical Data Collection (Державна Служба Статистики України: Наукова та інноваційна діяльність в Україні - Статистичний збірник, ДП "Інформаційно-видавничий центр Держстату України") Kiev, 2011, p. 31 (data for 2010); number of researchers is 89,600.

A common characteristic of the EN countries is that research is largely funded from the state budget with limited contributions from the private sector. Research is state financed either through core funding and/or through competitive mechanisms such as programme type schemes and competitive grants. In certain countries (e.g. in Belarus) the predominant method for financing research has the characteristics of public procurement, with the project proposals selected on a competitive basis, either for basic or applied research, and the results owned by the state or state owned organisations.

Weak career prospects and motivation for young researchers is a common issue, due to wage disparity and fewer opportunities in comparison to EU MS, resulting in a continuous brain drain problem. However, attempts are made to attract young scientists usually through involvement in international programmes (such as the joint CRDF projects for young researchers in Armenia, Azerbaijan and Moldova), and/or Diaspora funding (in Armenia and Moldova, and recently initiated in Georgia too).

2.3.1.2 Research Policy and Structure of National Science, Technology and Innovation Systems

The common “historical” background which was marked in most of the countries by the dramatic **downsize of the R&D intensity since the early 90s** (i.e. the collapse of the Soviet Union), led to the shutting down or to the reorientation of research branches previously answerable to Moscow. Most of the countries are still undergoing reforms of the S&T system and some have just implemented them.

Research policy: All the EN countries have legislation for S&T in place. There are numerous laws and amendments to the national strategies for the development of science, but very few have concrete quantitative targets or follow a comprehensive systematic approach.

Innovation was named a priority in most of the EN countries (where there is a law or a strategy). Generally, there is a positive trend manifested through new laws on creating favourable conditions for innovation activities and designation of state bodies to be in charge of innovation policy development and implementation. S&T policies for innovation can be found in most of the National Strategies. Examples are given below:

In May 2010, the **Armenian** Government adopted the Strategy on Development of Science, which describes the state policy towards the development of science for 2011-2020. The *Law on the National Academy of Sciences of Armenia* was adopted in 2011 which stipulates wider possibilities for the Academy to carry out business activity and commercialise R&D outcomes.

Azerbaijan's attempts to increase the role of innovation are expressed in rather specific strategies, e.g. *National Information and Communication Technologies Strategy for the Development of the Republic of Azerbaijan (2003-2012)*, the programme *Creation of Regional Innovation Zone in Azerbaijan*, or the *State Programme on Development of Fuel and Energy Complex of the Azerbaijan Republic (2005-2015)*. However, the country has no medium or long-term vision of development, nor of R&D, while the short-term policy of RTD is inconsistent, which makes any meaningful planning difficult. A draft Law on the state R&D policy was given the first reading in the Parliament of the Republic in 1998. After that two additional readings took place but the law has not been accepted yet.

The legal basis in S&T and innovation policy in **Belarus** is currently formed by 443 operating legal acts³⁵. The *Programme of Social and Economic Development for 2011-2015* provides for innovations and increase of investments. The *Strategy of Science, Technology and Innovation Activities* formulated in this document includes the development of effective national innovation systems, increasing innovative activities of companies and support to entrepreneurship and inventions. The *State Programme of Innovative Development of the Republic of Belarus for 2011-2015* contains a list of priority measures and projects, funding sources, executors and stakeholders with the overall goal to develop new and to modernize existing manufactures. Also, the Belarusian Innovation Fund has been established, a venture capital facility has been initiated and SMEs are encouraged to participate in national S&T programmes.

The S&T activities in **Georgia** are regulated by two main legal acts: “*Law on Science and Technologies and their Development*,” and the “*Law of Georgia on Higher Education*.” Besides these two, the “*Law on National Academy of Sciences*” regulates the Academy's activities.

³⁵ All these documents are available in Russian at the Belarus Legal Internet-Portal, <http://www.pravo.by/webnpa/webnpa.asp>

The main legal acts which regulate S&T in the Republic of **Moldova** are the *Code on Science and Innovation*, adopted in July 2004, and the Partnership Agreement between the Government and the Academy of Sciences of Moldova (ASM), for the period of 2009-2012, which gives the ASM governmental competence in the field of scientific research. Furthermore, Moldovian companies are encouraged to use the innovation infrastructure facilities (e.g. Technological Parks, Incubators, etc.) with 50% from public support, while a draft law concerning venture funding is under public consultation following the *Law on Science and Technology Parks and Innovation Incubators from 2007*.

The legal basis of the S&T policy in **Ukraine** is composed of a number of Laws such as “*On Scientific and Scientific and Technological Activities*” (last amendments 2010); “*On Priorities of Science and Technology Development*” (last amendments 2010); “*On Legal Specifics of Functioning of the National Academy of Sciences of Ukraine, Field Academies of Sciences and Their Property Complex*” (last amendments 2010); “*On Innovation*” (last amendments 2010); “*On Scientific Parks*” (last amendments 2010). The S&T priorities are defined according to the National Target S&T and Innovation Development Forecast Programme.

Taxation is usually high in all EN countries and is considered an issue throughout the region, although good practice examples exist in Belarus, for example, where all research projects (national and international) are tax exempt. There is also a trend to reduce or waive customs duty on import of equipment (e.g. Georgia).

Legislation and specific agencies on **Intellectual Property Rights** are in place in most countries. In some cases rules and regulations, as well as relevant bodies have been established from the early 90s. Georgia, for example, is a party to all the main international agreements concerning IPR and thus a legislative base of intellectual property protection comprises most of the elements necessary for its functioning. In the Republic of Moldova, the State Agency on Intellectual Property (AGEPI) is responsible for the protection of intellectual property, issuing patents at national level. Nevertheless, there is significant room for improvement especially for the countries that are not WTO members (e.g. AZ and BY), which implies compliance with the WTO TRIPS agreements.

Research structure: The **Ministries of Education and/or Science** are usually responsible for S&T policy making while the Ministry of Economic Development implements innovation policy. However, in other cases, **the Academy** remains the main contributor to policy making and implementation; such is the case in Azerbaijan and Moldova. In some cases, new agencies for S&T policy programmes were also established with a relatively independent status.

In **Armenia**, the Ministry of Education and Science (MES) is the body authorized by the state to develop and coordinate S&T policy-making. To improve the coordination, in October 2007 the State Committee of Science was created to carry out an integrated S&T policy in the country. Although the Committee is answerable to the MES, it is more independent. The National Academy of Sciences of Armenia, however, remains the main R&D performing organization. Its status as the highest self-governing state organization was further strengthened following the law on the National Academy of Sciences of Armenia in April 2011. Since 2006, the Ministry of Economy is the authorised body for development and implementation of innovation policy, in cooperation and coordination with other concerned ministries and organizations.

In the absence of a Ministry for Science in **Azerbaijan**, the Ministry of Finance allocates funds for material expenditure, research projects, junior researcher employment and approval of vacancies for new appointments. On the basis of the President's decree from January 2003, the Azerbaijan National Academy of Science is considered the main organization which provides and organizes science in the country. The Ministry of Economic Development participates in formulating state innovation and scientific technological policy although at present there is no concrete body which decides the priorities of scientific, technological and innovation policy in the country.

In **Belarus**, policy-making and coordination in the field of STI are mainly carried out by the State Committee on Science and Technology (ranked as a ministry for S&T), and the National Academy of Sciences. The Committee is responsible for S&T and innovation policy and its coordination. The Academy organises, conducts and coordinates basic and applied research activities as the country's leading research organization.

S&T policy in **Georgia** is developed by the Ministry of Education and Science. In accordance with the Presidential Decree No. 428 of June 2010, the Shota Rustaveli National Science Foundation (SRNSF) was established by merging two main funding entities, i.e. the Georgia National Science Foundation and the Rustaveli Foundation for Georgian Studies, Humanities and Social Sciences. The SRNSF develops S&T strategies and identifies thematic priorities for cooperation with foreign partner organisations. The Georgian Academy of Sciences is the advisory body and plays a leading role in setting national R&D priorities.

The Academy of Sciences of **Moldova** (ASM) is the sole public institution of national importance in the field of S&T and therefore the main coordinator of S&T activities. The Agency on Innovation and Technology Transfer (AITT), an auxiliary institution to the ASM, is authorized to implement innovation and technology transfer strategies and policies, and promotes the development of innovation infrastructure in the country.

In **Ukraine**, the structure for S&T is rather complex³⁶. The Parliament of Ukraine (Verkhovna Rada) is responsible for regulating public administration in S&T. A special Committee of Parliament is responsible for education, science and innovation. The Ministry of Education and Science, Youth and Sports administers public funds allocated to innovation development based on a list of innovation priorities and S&T programmes approved by Parliament. The Department of S&T Strategy and Programmes is responsible for the formulation and supervision of programmes and also for the progress of the Forecasting Programme of S&T Development. The Ministry of Economy is also responsible for the supervision of some S&T programmes. The Ministry of Industrial Policy is one of the biggest players in the area of S&T and innovation policy. The National Academy of Sciences of Ukraine is the highest state-supported research organization with the right of self-governance in decision-making about its activities.

Research activities are mainly conducted in institutes and centres under the coordination of **national academies**, with few exceptions, such as in Georgia where research institutes have been integrated into the university system following a recently completed reform. In Ukraine there is also an attempt to strengthen the integration of research in universities with the aim to

train experts to carry out competitive research (Programme for Science in Universities 2008-2012).

Research organisations across the EECA region face various problems. State funding for the modernization of research infrastructure and facilities remains low. Scientists often work with obsolete equipment but despite the difficult working conditions significant research results are achieved.

Besides the **considerable reduction in personnel**, the **ageing of the remaining scientists** is another issue common to the countries in focus. Since a considerable number of the most active middle-aged and young scientists have moved abroad or left the research sector, currently the research teams are composed, to a large extent, by researchers close to retirement age.

Reform of the **higher education system** along the lines of the Bologna process is a priority, especially in Ukraine, Belarus, Georgia and Armenia. Both private and public universities exist. The introduction of the accreditation system in Georgia helped to reduce the number of private higher education institutions and increase the quality of those remaining. The significant number of successful TEMPUS projects in Ukraine is also proof of advancement of the Bologna process.

Priority setting in S&T: There is usually a **general set of priorities** (or “strategies”), for example to build a knowledge-based economy (BY), or to strengthen the State of Law (MD), and a set of thematic/scientific field oriented priorities, which, however, are in most of the cases either numerous or too broad. It is not always evident how these priorities are set. State funding is not always distributed along set lines and sometimes there is a discrepancy in the priorities of the National Academies and those set by policy making bodies, for instance (AM). Priority areas do not necessarily receive more funding.

In some cases, following assessments of the results of previous budget cycles, thematic priorities are (re-) defined and this is reflected in new cycles of national S&T programmes (BY). In other countries priorities are defined in accordance with national forecast programmes (UA). Some of the priorities the countries have in common are stated below; for Azerbaijan no priorities were defined.

³⁶ IncoNET EECA D5.1 – Assessment report on the current status of S&T statistics in EECA (2009)

- Advanced technologies, Information and Communication technologies (AM³⁷, BY³⁸, GE³⁹, MD⁴⁰, UA⁴¹)
- Renewable Energy and Energy Efficiency (AM, BY, MD, UA)
- Life Sciences, Biomedicine, Medical Equipment and Technologies, Pharmaceuticals and Human Health (AM, BY, MD, UA)
- Agricultural Biotechnology, Production, Soil fertility and Food Security (BY, MD);
- Natural Resource Management, Protection (AM, BY, UA)
- Nanotechnology, Industrial Engineering, New Materials and Products, Chemical Technologies (BY, MD, GE, UA);
- Space Technologies, Earth Sciences (AM, BY)

³⁷ State Committee of Science, <http://www.scs.am/>

³⁸ Approved by the Decree of the President of Belarus No. 378 of 22 July, 2010, <http://www.pravo.by/webnpa/text.asp?RN=P31000378>.

³⁹ Thematic priorities were identified by the Ministry of Education and Science of Georgia

⁴⁰ Partnership Agreement between the Government and the Academy of Sciences of Moldova for the period 2009-2012

⁴¹ The Ukrainian priorities up to 2020 were defined in the Law "On Priorities of Science and Technology Development" from 2010

2.3.2 State of International Cooperation

2.3.2.1 National Policies and National Programmes Addressing International S&T Cooperation

In all EN countries national STI policy acknowledges the **importance of strengthening International Cooperation**. Provisions (articles, paragraphs etc.) are included in the respective national legislation (AM: *Law on Scientific and Technological Activity, the Strategy on Development of Science and Action Plan 2011-2015*; GE: *Law on Science and Technologies and their Development*; MD: Code “On Science and Innovation”; “Moldova Knowledge Excellence Initiative” Action Plan 2008; UA: *National Indicative Programme 2011-2013*). For example, international S&T cooperation has got special priority in the Belarusian state budget and receives 3-4% of budget spending for R&D annually. However, there is no distinct policy document referring to the issue of International Cooperation in any country.

EN countries have a number of **national programmes** that are in operation. In some countries the programmes are open to foreign researchers (BY), in other countries programmes are open but funds are provided only to domestic researchers (GE and MD: *The State Grants for Fundamental and Applied Studies*), while there are also cases where programmes are more restricted (AM).

2.3.2.2 Bilateral Agreements and Programmes

EN countries have a number of **bilateral agreements** mainly with other CIS countries and countries of the EU. Some countries have also signed agreements with other non-EU countries such as the USA (AM), Argentina (AM), China (AM, BY, MD), India (AM, BY) and Venezuela (BY). Bilateral agreements have also been signed by research institutions (mainly the National Academies of Sciences) with counterparts abroad (e.g. AM, MD, UA).

In addition to the national programmes, there are also a number of **bilateral programmes** in force involving national authorities in EU Member States as well research organisations and centres. Examples are:

- *Collaborative Programme* between CNRS, France and the State Committee of Science of the Republic of Armenia,
- the *Science and Technology Entrepreneurship Programme* between CRDF, the USA and Georgian

organisations,

- the collaborative calls between the Academy of Sciences of Moldova (ASM) and the Russian Foundation for Humanities (RFH) as well as between the ASM and the German Federal Ministry of Education and Research (BMBF)
- Programmes of Belarus and Russia, e.g. the family of programmes for developing supercomputers – “SKIF” (2000-2004), “TRIADA” (2005-2008) and “SKIF-GRID” (2007-2010) – with its follow-up, “ORBISS” (2012-2015).

2.3.2.3 (Sub-)Regional Cooperation

Regional cooperation is based on the numerous **bilateral agreements** that exist between the countries as well as between specific research institutions (academies, universities, research centres) in the EECA region. Historically, collaboration with Russia is characterized by the highest indices (e.g. in Belarus 55% of the NAS’s international projects are carried out with Russia). Furthermore, some bilateral programmes between the EN countries serve to enhance the cooperation in the sub region (e.g. Call for joint bilateral basic research projects 2011 between BRFFR (Belarus) and State Committee of Science of Armenia). Overall, regional cooperation is mainly driven by past personal or institutional links often inherited from Soviet times and current political initiatives and programmes (BSEC, GUAM, CIS, ENP/ENPI, etc.).

Regional cooperation also benefits from **cross border programmes** under ENPI (especially the Black Sea Cross Border Cooperation programme 2007-2013, the Black Sea Basin Joint Operational Programme 2007-2013). Other international programmes/projects with EU countries mainly under FP7 provide opportunities for STI regional cooperation. Also important for fostering regional cooperation in STI is the participation of almost all ENP countries in regional organizations such as BSEC and/or GUAM which provide fora for political dialogue in various sectors including STI (see above).

2.3.2.4 Agreements and Implementing Programmes between the EU and the ENPI Region

All EN countries - except Belarus - have **Partnership and Cooperation Agreements (PCAs)** with the EU. These form the legal basis for EU relations with each country. The PCAs establish the institutional framework for bilateral relations, set the principal common objectives and call for activities and dialogue in a num-

ber of policy areas including S&T. In specific cases (e.g. in AM, MD, UA) the PCA has led to the approval of concrete Action Plans listing precise commitments of the targeted country in order to meet EU standards.

All EN countries participate in the 7th **EU Framework Programme for RTD (7FP)** as International Cooperation Partner Countries (ICPC). On 11 October, 2011, the Republic of Moldova signed the Memorandum of Understanding for the association of Moldova to the EU's Seventh Research Framework Programme and it became officially associated with FP7 from the 1 January, 2012.

Up until the end of 2010 the majority of countries had a limited number of successful proposals and the EC funding for EN participants under FP7 ranged between €1-3million per country. The only exception is Ukraine which had 103 successful proposals with the EC contribution reaching approximately €12 million.

All EN countries have a developed **NCP structure** to support local researchers along the lines of the NCP structures in EU countries (i.e. NCP coordinator and thematic NCPs). In some countries the NCPs are financially supported by the national authorities (MD) or by the corresponding institutions (UA). In others, NCPs are not funded (AM, BY, GE).

All EN countries are covered by the **European Neighbourhood Policy Instrument (ENPI)**. For each country tailor-made ENP Action Plans have been drafted taking on board differing national needs. With regards to STI, a common goal for all countries is closer integration to the ERA through more active participation of local research organizations in the EU Framework Programmes.

Funding through the ENPI focuses on strengthening democratic structures and good governance, supporting regulatory reform and administrative capacity building and on poverty reduction. The European Commission offered more than €900m for financing the activities in the EN countries for the period 2007-2010. Indeed STI is not seen as a priority area for

funding as such but can benefit through, for example, regulatory reform and capacity building (as is the case with the operation of the Joint Support Office of the EC Nuclear Safety Programme for Ukraine). Few activities within ENPI are related to different scientific topics directly, for example, the Capacity Enhancement for Implementing Bologna Action Lines in Georgia (Twinning); the Workshop "Traffic Regulations in EU in AZ" (TAIEX) or the TAIEX⁴² Workshop on FP7-Opportunities for SMEs (MD); the Feasibility Study for the Improvement of Water and Sanitation Systems in MD (proposal); or Preparatory studies for the modernization of Ukraine's gas transit corridors and underground gas storage facilities (proposal).

According to **Competitiveness and Innovation Framework Programme (CIP)** regulations, the programme is open to third countries. From the EN countries, Armenia, Moldova and Ukraine⁴³ participate in the Enterprise Europe Network of CIP (a network of regional consortia providing integrated business and innovation support services for SMEs) without however receiving financial support from the programme. In addition, Moldova and Ukraine participate in the Intelligent Energy Agencies initiative of CIP again without financial support from the programme. All other EN countries have not been involved yet with CIP.

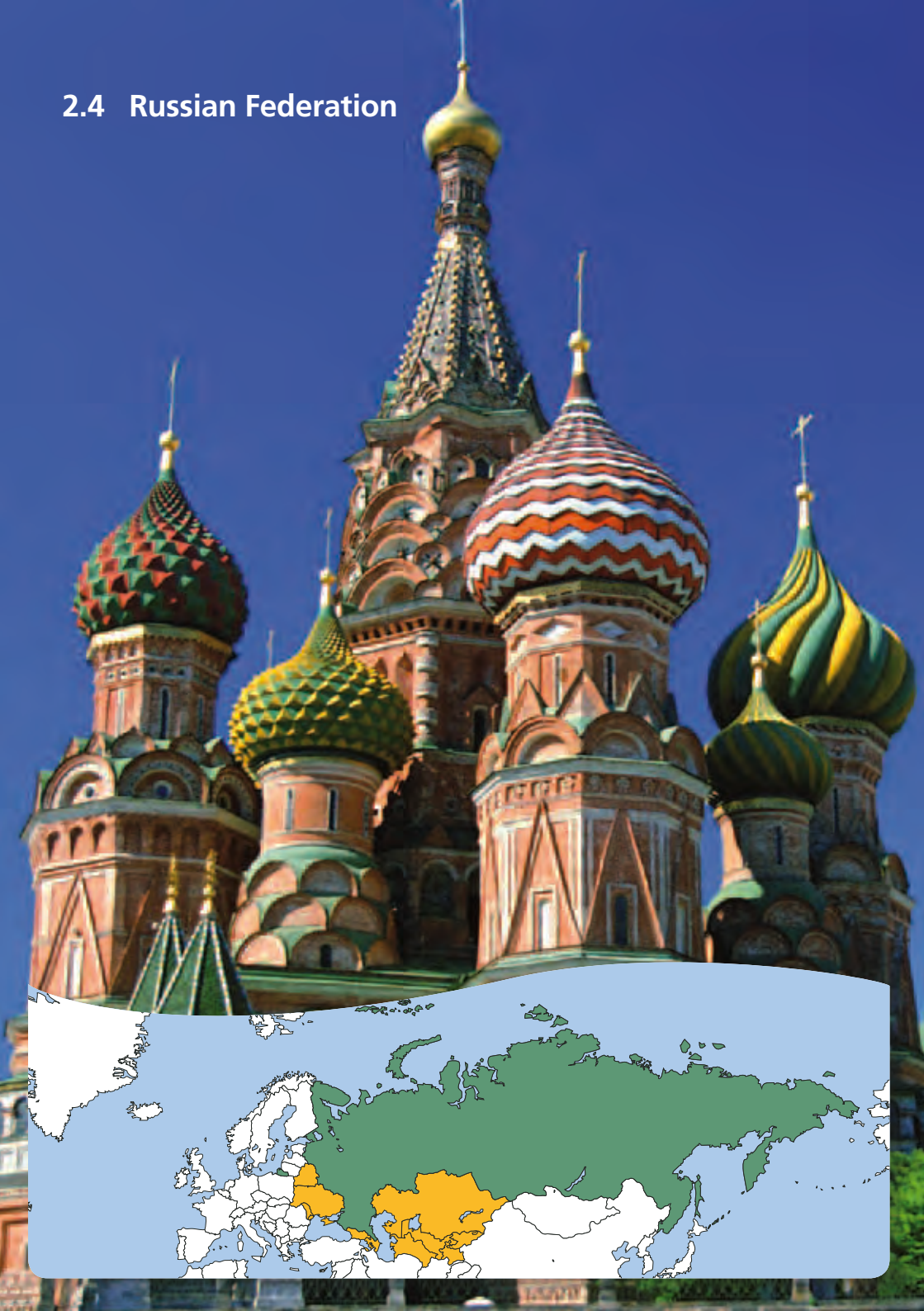
All EN countries are involved in the **Lifelong Learning Programmes (LLL)** and in particular in TEMPUS which is the oldest and in which the EN countries have a higher success rate, and in ERASMUS MUNDUS which is becoming more popular but is still relatively new and with limited participation (e.g. forty-eight master's courses students and twenty-three projects for institutional cooperation and staff exchange in the six EN countries in 2011).

In general, international mobility especially for young researchers remains low, with the exception of programmes within the ICT area where a positive trend is recorded (BY). Visas remain an issue for scientists in many countries, but in others (GE) recently implemented visa procedures will make it easier and cheaper for scientists to travel to the EU.

⁴² Other TAIEX actions in Moldova are: an expert mission on developing a Guide on innovative clusters; a TAIEX study visit on the adjustment of the statistical data on innovation indicators as required by the EU; a TAIEX Workshop on venture funds, or the TAIEX expert mission on assisting Moldova in the preparation process for the association to the FP7

⁴³ EEN Members: <http://www.enterprise-europe-network.ec.europa.eu/about/branches> the statistical data on innovation indicators as required by the EU; a TAIEX Workshop on venture funds, or the TAIEX expert mission on assisting Moldova in the preparation process for the association to the FP7

2.4 Russian Federation



2.4.1 Current State of S&T in the Russian Federation

2.4.1.1 S&T Indicators

R&D as a percentage of GDP in Russia was 1.24% in 2009, which is the highest value among all EECA. Although it grew even further in 2010, it was still considerably lower than most global market competitors. Russian R&D allocation in 2008 expressed in PPP⁴⁴ corresponded roughly to the R&D allocations of Canada, India or Italy. Almost 65% of the total R&D budgets come from public sources. Only 29% stem from the business-enterprise sector and almost 6% from abroad. In terms of R&D performance the business-enterprise (BES) sector consumes 63%, the government sector 30% and the higher education sector around 7%. However, these data are biased, because several publicly owned research institutes are organised as companies and counted to the BES. The strong overall dependence from public R&D sources is a major weakness and underpins the still underdeveloped innovation orientation of Russia's corporate sector.

Like other Eastern European Countries Russia also faced a significant decrease in the number of researchers. R&D personnel in the RF count 742,433 heads, which is two-thirds of the 1991 figure. In full-time equivalents Russia has five times more R&D personnel employed than Brazil, Canada or Italy but less than Japan. R&D personnel per 10,000 employees brings Russia equal to Germany and above the respective values of Korea and the UK. However, only half of the R&D personnel in Russia are researchers. If only researchers per 10,000 employees are considered, then Russia clearly falls behind Korea and the UK. Since 1991, the high-

est drop in total numbers of researchers occurred in the BES, which is the largest employer for researchers in the country. Ageing of R&D personnel remains a problem in Russia. More than 50% of researchers are above 50 years of age.

International mobility, especially for young researchers, remains low. Visa issues continue to be a serious barrier. New governmental incentives resulted in a reduction of brain drain, but income mobility of researchers is still limited. To improve this skewed position, Russia launched the "Measures to Attract Leading Scientists to Russian Educational Institutions" in 2010.

2.4.1.2 Research Structure and Policy

Since the early 1990s the transformation of Russian S&T and innovation policies went through different reform processes, which caused some painful restructuring and do downsizing effects, especially in terms of R&D personnel and resource allocation to the sector⁴⁷. The S&T system in the first half of the 1990s was undoubtedly not in the position to respond successfully to new economic and social requirements, which caused the government to introduce previously non-existent mechanisms and connections determining an S&T model corresponding to a market economy (e.g. introduction of competitive funding schemes; enhancing linkages with universities and teaching). Since the early 2000s, the then existing, fragmented institutional S&T fabric was put together by several top-down measures to construct a modern-shaped national system of innovation (NSI) with a strong focus on supporting high-technology sectors of the economy. Since the system still has weaknesses in interlinking with economic and societal demands

TABLE 4: S&T INDICATORS FOR THE RUSSIAN FEDERATION⁴⁵

Country	R&D expenditure as % of GDP (GERD)	Number of research organisations	Number of R&D personnel (head count)
Russia	1.24	3,536	742,433 ⁴⁶

⁴⁴ PPP: purchasing power parity. Data taken from "Science and Technology. Innovation. Information Society," Pocket Data Book issued by the Ministry of Education and Science of the Russian Federation, the Federal Service for State Statistics and the National Research University – Higher School of Economics, Moscow 2010.

⁴⁵ Taken from "Science and Technology Indicators: 2011," Data Book issued by the Ministry of Education and Science of the Russian Federation, the Federal Service for State Statistics and the National Research University "Higher School of Economics," Moscow 2011.

⁴⁶ Number of researchers is 369, 237 (2009)

⁴⁷ The four stages concept and description are taken from the ERA.NET RUS deliverable D1.1. "The Russian S&T system," 2010.

and between different fields of policy, the transition towards a full-fledged functional NSI, well embedded in the social and economic realities of today's Russia is an ongoing process.

Recently introduced measures support the creation of a structured national science and innovation policy framework including the identification of national priorities, the introduction of performance-based budgeting, the ongoing restructuring of the governmental R&D sector, human resources and infrastructure development, etc. These attempts are advocated in main strategy documents, such as the *"R&D and Innovation Development Strategy in the Russian Federation until 2015"* (published in 2006) or the Ministry of Education and Science's basic report *"The Development of Innovation System of the Russian Federation"* (published in 2008). These and many other documents were consolidated and widened in the *"Concept of a Long-Term Socio-Economic Development of the Russian Federation until 2020"*⁴⁸.

Russia has a complex **S&T governance system**⁴⁹ with several interdepartmental Councils and Committees, e.g. Council by the President on Science, Technology and Education and the Committee of the State Duma of the RF on Science and R&D. The executive level involves the Government of the RF, federal ministries and agencies, as well as the Russian Academy of Science. The Ministry of Education and Science (Minobrnauki or MES Russia) has an important coordinating role in the area of S&T and innovation policy-making. Other important ministries are the Ministry for Economic Development and the Ministry for Industry and Trade. MES Russia also takes care of policy implementation and manages several major R&D funding programmes. It ensures coordination and control of the Federal Service for Supervision of Education and Science (Rosobrnadzor), and manages state property, including the activity of federal science and high-tech centres, state science centres, leading scientific schools, national research computer network and information support to S&T and Innovation activity.

At the executive authority level, an important role in S&T management belongs to the Federal Space

Agency (Roscosmos). It is not answerable to any ministry, but directly to the Government of the RF.

Historically, Russia, like other states of the former Soviet Union, has been characterised by a well-developed system of **public R&D institutes**. The Russian Academy of Sciences is the largest and most prominent research organisation in the country consisting of 468 research institutes (data for 2008). In addition, the sectoral Russian Academy of Medical Sciences and the Russian Academy of Agriculture are engaged in R&D. The mandate of the academies is to conduct fundamental research, but they also carry out applied research.

Universities have until recently occupied a rather modest place in the Russian R&D system. Only around 40% of the 1,114 HEI in Russia (data for 2009) are actually involved in R&D, and only around 20% of all professors and teachers conduct research⁵⁰. Nonetheless, the situation is changing. Funding from the Academies is redirected to universities through a number of new initiatives, foremost the awarding of a special status of a "Federal University" or "National Research University". These statuses are accompanied by generous federal budget funding.

Although the political elite puts innovation oriented R&D high on its agenda to support the diversification of the Russian economy beyond primary goods production, R&D performed in the business/enterprise sector is mostly carried out by often state-owned industrial research institutes and not by companies themselves. Also some large private and public companies and financial industrial groups including a few large foreign companies, conduct intramural R&D in Russia. The number of small innovative enterprises is remarkably limited and estimated at 25,000. It should be noted, however, that some statistical appropriation problems hinder an exact assessment. In general, it can be concluded that SMEs are still not in a position to act as engines of innovation and that large enterprises account for the majority of innovation activities. More than two-thirds of innovation expenditures are concentrated in two sectors: chemicals and chemical products, and machinery and equipment. Both sectors are dominated by large companies in Russia⁵¹.

⁴⁸ Approved by the decree of the government on 17 November, 2008.

⁴⁹ Summary of the ERA.NEet RUS deliverable D1.1. "The Russian S&T system," 2010.

⁵⁰ Dezhina, I. and Spiesberger, M., "Trends in stimulating internationalization of the Russian R&D system: an inside and outside view". To be published.

⁵¹ Information taken from ERA.NEet RUS deliverable D1.1. "The Russian S&T system," 2010.

In 2010, a list of eight national priority S&T areas were identified in the course of a national Foresight exercise, which were approved by the President in July 2011⁵²:

- security and counterterrorism;
- industry of nanosystems;
- information and telecommunication systems;
- advanced weapons, military and special equipment.
- life sciences;
- rational use of natural resources;
- transport and space systems and
- energy efficiency, energy saving and nuclear energy.

A detailed list of twenty-seven critical technologies, which refines the broad thematic fields, reflects the most advanced Russian technological areas. Government support is directed towards these critical technologies and should lead to more innovative production and accelerated economic growth.

Over the last years, the Russian government continued to improve the legal framework for IPR in general and the regulation of IPR in Russia's publicly funded research sector in particular. The "*Federal Law of Rights on Single Technologies*", adopted in December 2008, facilitates the transfer of IP to private investors and the conclusion of licence agreements.

Despite the manifold efforts taken mostly by the public sector, Russia's innovation performance is still weak. Only 10% of enterprises are engaged in technological innovation activities. Only 5% of total sales are due to innovative products. The balance of payments is continuously negative. Furthermore, in terms of research results measured by the number and quality of publications, Russia is slowly losing its position in the world rankings.

2.4.2 State of International Cooperation

2.4.2.1 National Policies and National Programmes

Enhancing internationalization of the R&D sector has been identified as one important aspect for improv-

ing the quality and results of Russian R&D in the last years. Internationalization, however, starts from a low level. Many R&D organisations are still isolated from each other and from the outside world. Data on co-publications show that the USA and the EU countries Germany, France, the UK and Italy are the **top collaborating partners**. Cooperation with China and South Korea is quickly increasing.

To counteract **brain drain**, Russia implemented within the frame of its "*Scientific and Scientific-Pedagogical Personnel of Innovative Russia for 2009-2013*" an initiative to attract emigrants back to Russia or to develop various kinds of links. Moreover, in June 2010 another targeted programme⁵³ aimed at attracting foreign scientists was launched. A few Russian R&D programmes are also open for participation by EU researchers⁵⁴. A lack of information about Russian research programmes, linguistic barriers and financial and legal issues are factors that obstruct access.

2.4.2.2 Bilateral Agreements and Programmes

Russia has bilateral agreements and programmes in place with many states all over the world. Since 1991 the USA has always been an important partner and among the first and largest investors in Russian science.

The EU is another important partner for Russia's R&D internationalization attempts. Russia has concluded bilateral S&T agreements with a broad range of EU MS and countries associated with the FP. Agreements have also been established regarding research funds. When it comes to research organisations, the Russian Academy of Sciences has a dense network of cooperation agreements in place.

Findings of a survey conducted under the ERA.NET RUS project proved that bilateral cooperation is focused on basic research. The most frequently used instrument is mobility support. Thus, not surprisingly, the budgets of bilateral agreements are mostly small scale and annual investment is usually below €1 million. Most recent trends show a shift from mobility towards more substantial R&D projects, a higher propensity for supporting applied research and innovation and an evolution from bilateral towards multilateral schemes.

⁵² "Decree of the President of the RF No. 899, 7 July, 2011 "On approval of the Priority Areas of S&T Development for the Russian Federation and the list of critical technologies of the Russian Federation," <http://graph.document.kremlin.ru/page.aspx?1;1563800>

⁵³ The name of the programme in English is "Attracting leading scientists to Russian universities."

⁵⁴ See <http://www.access4.eu/index.php> for more information

2.4.2.3 (Sub-)Regional Cooperation

Russia is still strongly connected to its neighbouring countries in EECA at different cooperation levels. At the multinational level most important is the recently adopted Intergovernmental Programme for Innovation Cooperation of CIS member-states⁵⁵. Bilateral S&T agreements have been concluded with all EECA except Turkmenistan⁵⁶. In 2011 an intergovernmental programme for cooperation in the sphere of innovation within the Commonwealth of Independent States (CIS) was adopted. R&D cooperation within CIS is facilitated by the fact that Russian is considered as *lingua franca* among the scientific communities. In addition to the strong traditions and ties within the CIS, R&D cooperation with other Asian countries rapidly increases. RFBR for instance regularly runs joint calls with the Japanese Society for the Promotion of Science, the State Fund for Natural Sciences of China and with the Indian Department of Science⁵⁷.

2.4.2.4 Agreements and Implementing Programmes between the EU and the Russian Federation

Like the USA, the EU and its MS quickly reacted to the crisis of the R&D sector in post-Soviet Russia and established a specific funding programme in 1992 with INTAS, which terminated its operation just a few years ago. Currently the **EU's Framework Programme for Research and Technological Development** is the most important R&D instrument at the Community level. Until the beginning of FP7, Russia had consistently the highest project participation among the group of "third countries". Now its leading status is contested by the USA. Under the framework of FP7, Russia, which concluded an S&T agreement with the European Commission for the first time in 1999, implements several "co-ordinated calls" with the EU which are jointly defined and funded. Since 2001 S&T agreements between the EU and Russia are also in place for EURATOM covering fission and fusion oriented research.

Another framework for strengthening cooperation was agreed in 2003 with the "*four common spaces*," which comprise of a common space for research and education, including cultural aspects. A series of measures, outlined in roadmaps for the year 2009-

2011 and 2010-2012, to facilitate Russia's integration into the European Research Area have been implemented.

Russian scientists also participate in projects of the **European initiatives COST and EUREKA**. Among all non-COST member countries, Russia has the highest participation in COST actions. Russian participation in EUREKA, however, is comparatively low, which confirms the limited innovation capacities of the country.

Through the **International Science and Technology Centre (ISTC)**, founded in 1992 as an international organisation by the USA, Japan, Russia and the EU, substantial support to the Russian R&D sector is provided with the aim of converting military research to civilian.

Russia is also one of the target countries in the **EU Eastern Partnership and the Northern Dimension initiatives**. ENPI is the financial tool used to support Russia's participation in these initiatives.

The latest joint **EU-Russia** initiative is a "*modernization partnership*," agreed in the spring of 2010. It includes cooperation in R&D and innovation. Regarding the latter, certain emphasis is on aligning technical regulations and standards and on enforcing IPR.

⁵⁵ <http://rs.gov.ru/topic/185>

⁵⁶ Taken from <http://mon.gov.ru/work/mez/dok/1075/>

⁵⁷ Information taken from Spiesberger, M. (2008): Country Report Russia: An Analysis of EU-Russian Cooperation in S&T. Prepared on behalf of the CREST OMC Working Group

2.5 Lessons learnt for a joint way forward



To enhance the STI cooperation between the European Union and EECA it needs to be acknowledged that the countries in Eastern Europe and Central Asia are transition economies on the way towards knowledge-based societies. Historically, they have been characterised by a strong S&T base at public level. The dramatic downsizing of the public R&D spending since the early 90s (i.e. the collapse of the Soviet Union), led to the shutting down or the reorientation of research branches. Although most of the countries are still undergoing reforms of the STI system or have just implemented them, there is a strong need for capacity and institution building at national (or sub-regional) level to stabilize/advance the STI systems. Furthermore, there is also a need to improve the innovation capacities particularly in the private sector. Generally, there is a positive trend manifested through new laws on creating favourable conditions for innovation activities and through the designation of state bodies to be in charge of innovation policy development and implementation.

Societal and global challenges (such as ageing populations, urban development, global health, climate change and sustainable management of natural resources, energy and food security) are common for both the EU and the EECA region. As a consequence, new STI policies addressing common societal and global challenges need to be further advanced building on common policy priorities and needs.

Traditionally strong links within the EECA S&T community are the basis for existing (and partially growing) academic networks and even joint programmes (i.e. the CIS innovation programme). The STI cooperation of the EU with the countries in EECA is supported by several policy initiatives and respective agreements at various levels that also provide an umbrella for cooperation in the scientific field, such as Partnership and Cooperation Agreements (PCAs) of the EU with a variety of EECA countries, the EU-Russia Four Common Spaces and the related Partnership for Modernization, the Eastern Partnership of the EU and the European Neighbourhood Policy as well as the Agreements on Cooperation in Science and Technology – EU-Russia and EU-Ukraine and last but not least the Development and Cooperation (DC) of the EU with Central Asia linked to the EU-Central Asia Strategy.

Although the countries in Eastern Europe and Central Asia share common traditional and historical links, there are social, political and economic differences between the regions and among the countries. After the collapse of the former Soviet Union and the following economic decline of the 1990s, Russia experienced the strongest economic and societal push. Not only its dimension and size of population but also its economic and geopolitical weight (Russia is member of the G8 and UN Security Council) far surpass the other countries. Also, in terms of S&T potential and absolute output Russia is greatly ahead followed by Ukraine. The intensity in STI cooperation with the EU (e.g. participation in the 7th EU Framework Programme for RTD) is strongest for both Russia and Ukraine. Similarly, the policy framework for STI cooperation is most advanced in Russia and Ukraine with S&T agreement with the EU and a number of Member States.

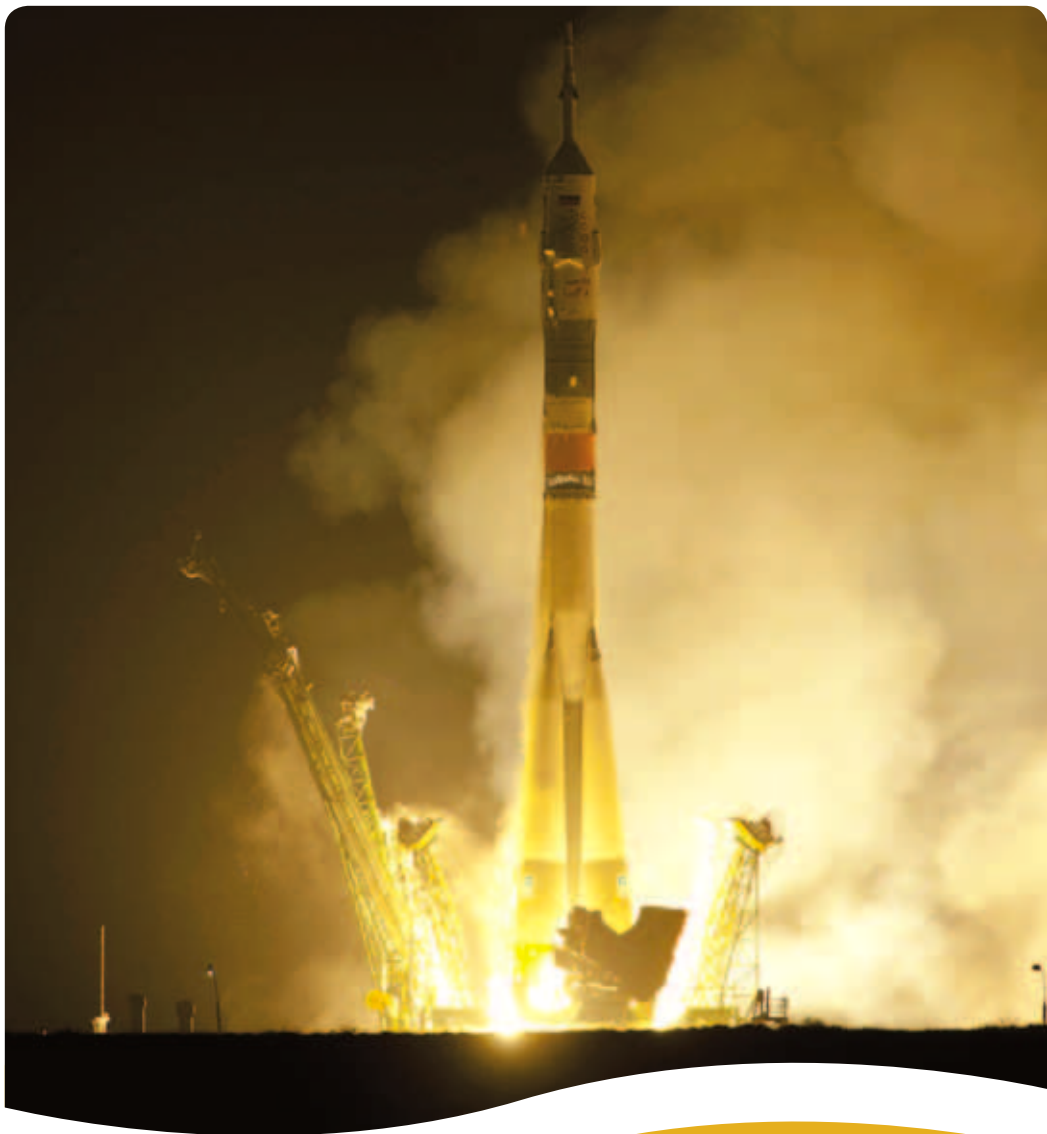
Although the S&T cooperation between the EU and the EECA partner countries is quite strong there is still much room for further development. Acknowledging the current global as well as societal challenges both regions are facing, new perspectives should be developed for the strategic S&T partnership between the EU, Countries associated with the present European RTD Framework Programme and the EECA region, building on each others' strengths and on common policy objectives such as:

- (i) creating synergies by linking the scientific potential of leading researchers and innovators in partnership;
- (ii) ensuring mutual access to unique S&T infrastructure and pooling resources for establishing new S&T infrastructure;
- (iii) removing existing barriers for S&T cooperation and for joint innovation activities;
- (iv) pooling resources to jointly address grand challenges such as climate change, sustainable use of global resources, food security, ageing societies, global health threats; and
- (v) reinforcing industry driven partnerships and exploitation of markets to push knowledge driven innovation.

Despite national specificities, the countries in each of the two regions share a lot of common elements which, in turn, provide the rationale for an EU-EECA cooperation at policy level, among others:

- the geographic proximity: they are neighbours (in particular EE) and therefore share traditional societal and cultural links, economic proximity and strong trade as well as common regional challenges ahead (see European Innovation Union);
- the need for common policy frameworks allowing optimum use of opportunities (scientific, economic, political) through joint policy approaches;
- the need for strong public and private institutions on both sides to create a win-win situation; therefore institution building and institutional networking between the two regions needs to be improved;
- to ensure optimum circulation of knowledge throughout the two regions in order to develop human capacities;
- to offer compatible, coordinated or joint instruments for policy implementation ensuring equal footing/balanced partnership and reciprocity.

Against this background, the following chapter outlines the challenges and recommendations for joint policy responses to address common challenges and build on an enhanced EU-EECA STI Cooperation.



3. Challenges and Recommendations on Enhancing EU-EECA STI Cooperation

3.1 Preamble



Building on the analysis of the state-of-the-art science, technology and innovation policies in the EU and the EECA, this section describes present challenges for both regions, which could be best addressed through fostering EU-EECA cooperation. Respective recommendations will be given, which are derived from good practice examples.

It needs to be highlighted that despite national specificities, the countries in each of the two regions share a lot of common elements. Along that line, we will present the challenges in a generic way acknowledging that there are some issues which should be considered country specific or which are not relevant anymore for some countries.

As far as the recommendations are concerned, they are addressed to a variety of stakeholders in the countries of the EU and EECA as well as to the European institutions building on common policy objectives and respective drivers for bi-regional cooperation.

The dedicated role of policy dialogue schemes and mutual policy learning is highlighted as well as the need for efficient and effective instruments and framework conditions for STI cooperation. As a conclusion, the benefits from developing a joint EU-EECA STI cooperation strategy are emphasized including a joint action plan to be developed and agreed upon addressing relevant stakeholders at the EU and EECA representing in particular the STI policy sector and the STI community including the private sector.

3.2 Adjusting and Implementing Policy Strategies



3.2.1 Challenge: Creating and Using Knowledge for Evidence-based Policy Making

Investment in research, technological development and innovation is a major driver for sustainable long-term economic performance. In order to raise the full potential of such investments, policy-makers benefit from an evidence-based knowledge which evaluates the impact of present policies and implementing programmes and suggests options for their enhancement including the setting of policy priorities, structural aspects of the national STI system and the advancement of implementation instruments as well as the regulatory framework. Among others, these also address the governance of the science and innovation system, the definition and implementation of STI funding programmes, mechanisms for knowledge transfer between the public and private sector and priorities and tools for international cooperation.

Recommendation 1:

Advancing national STI statistics - strengthening national statistics offices and raising capacities of staff

It is recommended to national policy stakeholders to fully introduce and further advance reliable and internationally comparable STI statistics at national level, and to further strengthen the capacities of national statistics offices. Targeted training activities for both decision makers and for personnel of national statistics offices are recommended as well as mutual learning exercises by EU and EECA experts to further advance indicators and tools for its measurements.

Indicators complying with international standards are increasingly applied to monitor the performance and dynamics of national S&T systems and to estimate their development trends. To a growing extent they contribute to evidence-based policy making. Mainly driven by the OECD, the EU and the UNESCO, such indicators have been advanced and successfully applied for more than forty years. On the EU side, those standards are widely applied still leaving room for further advancement with an emphasis on the innovation domain. On the EECA side, Russia fully transferred its system to OECD and Eurostat standards in 1994. However, in the majority of the EECA countries some of the most important international STI standard indicators have not been fully introduced into national STI statistics.

As a first step, the process towards applying international statistical standards (e.g. OECD-Frascati 'Family' Manuals, Eurostat methodological recommendations,

UNESCO science statistics) could be accelerated in interested EECA countries building on a project proposal developed by the IncoNets EECA and CASC. In this context, the aim is to create awareness of the need for common standards, to increase knowledge about it including measurement tools and to learn lessons from the present implementation in some countries of the region.

Good practice examples:

- Under IncoNet EECA a core set of methodological guidelines, definitions and model templates for S&T statistical surveys available in the national languages and tested in field trials was jointly developed by experts from the EU and EECA. The proposal "Modernising S&T Statistics in Eastern European and Central Asian Countries" was presented for funding to national authorities, UNESCO and the CIS Committee of Statistics.
- INCO-Net EECA and CASC International Training Workshops were conducted in Austria, Russia, Moldova and Kazakhstan to train statisticians and relevant stakeholders from EECA countries to transfer international statistical standards to national statistical practice.

Recommendation 2:

Increasing capacities of national think tanks to inform and advise policy

It is recommended to national policy stakeholders, to the EU Commission as well as to decision makers in the community of social, economic and political sciences to strengthen the capacities of think tanks at national and regional level in the EU and EECA and to increase their role in policy definition and its advancement as well as their role in the public discourse.

Think tanks are critical for policy stakeholders in addressing the complex societal and economic challenges through analytical and knowledge-based approaches. Among others they provide new ideas for creative political solutions through policy recommendations to various political representatives (parliament as well as individual political parties, governmental institutions, public administration).

More specifically, international cooperation and targeted training activities are recommended in order to enhance the capacities and the knowledge base of national think tanks. Joint workshops, seminars and conferences could help to identify important topics, trends and ideas for research, discussions and public debate.

Furthermore, it is proposed to policy makers to take appropriate action to widen and deepen the system of think tanks through setting financial incentives for a “science for science policy”. Here, either national or regional programmes might be applied including dedicated action within the present EU RTD Framework Programme or its successor. In addition, twinning arrangements among think tanks in the EU and EECA might support mutual learning and capacity building.

Finally, it is suggested that good practices be shared between EU and EECA countries, among others through dialogue processes such as Policy Stakeholders Conferences (PSC), on how to implement and govern formal policy advisory structures (expert committees as well as scientific or innovation councils etc.).

Good practice examples in EECA countries:

- (i) the Economic Research Centre (ERC) in Azerbaijan,
- (ii) the Belarusian Institute of System Analysis and Science & Technology Sphere Information Support (BellSA)
- (iii) the Committee for Science, Technologies and Education of the President of the Russian Federation,
- (iv) the Centre for Economic Development in Uzbekistan.

Recommendation 3:

Implementing strategic policy mix reviews of national policies

It is suggested that national policy stakeholders jointly plan and implement international STI Policy Mix Reviews for interested EECA countries as a mutual learning exercise between EU and EECA countries allowing at the same time to have better informed political decisions and to increase the legitimacy of ongoing reforms.

Reviews and assessments of policies/strategies, programmes, projects and institutions – ex-ante, ex-post or during their implementation – as well as regular benchmarking exercises to compare performance with other activities/institutions attract a growing interest by policy makers and by decision makers in S&T organisations and research performing institutions. Building on the experience of EU Member States, a number of international STI Policy Mix Reviews should be highlighted which have been conducted under the

umbrella of the Open Method of Coordination (OMC) on a voluntary basis in order to advance the STI policies of interested EU Member States. Those reviews were implemented by experts including policy makers from different Member States. They rely on mutual trust among the institutions involved, as well as on their shared confidence in the process.

Most of the countries of the EECA region are undergoing a period of transition/reform of their research systems. New strategies for RTD are launched and new laws implemented but, in most of the cases, with limited scientific evidence to support them.

Interested EECA countries are invited to express interest in such an STI Policy Mix Peer Review and experts from EU Member States, Countries associated with the EU RTD Framework Programme and other EECA countries are invited to join review panels.

First pilot cases are offered to be planned and implemented within the ongoing INCO-NETs EECA and CASC. Internal and external expertise and logistic support is offered by the projects through a network of local partners with good knowledge of the STI policy landscape and with close contacts with the local authorities.

Good practice examples:

- The completed Policy Mix Reviews with the European Open Method of Coordination conducted for Austria (2008), Belgium (2007), Bulgaria (2008), Cyprus (2009/2010), Estonia (2007), France (2007), Latvia (2009/2010), Lithuania (2007), The Netherlands (2006/2007), Romania (2005/2006), Slovenia (2010), Spain (2005/2006), Sweden (2005/2006) and the United Kingdom (2007).
- The completed OECD country review of innovation policies for the Russian Federation (OECD Reviews of Innovation Policy: Russian Federation 2011⁵⁸).
- The UNECE review of the innovation performance in Belarus⁵⁹ and the one recently launched in Kazakhstan.

3.2.2 Challenge: Embedding STI Policies in Overarching National Strategies Through a Holistic Policy Approach

In dynamic knowledge-based economies, S&T and innovation are among the drivers of social and econom-

⁵⁸ http://www.oecd-ilibrary.org/science-and-technology/oecd-reviews-of-innovation-policy-russian-federation-2011_9789264113138-en

⁵⁹ <http://live.unecce.org/fileadmin/DAM/ceci/publications/icp4.pdf>

ic development. In addition, S&T has a large potential to address today's complex societal and global challenges and propose respective scenarios for future sustainable development. In such multifaceted environments there is a strong need for embedding research policy in overarching governmental strategies on economic growth and social development to ensure a consistent and comprehensive policy approach and to raise the full potential of a scientific knowledge base for social and economic development and global problem solving.

This requires that firstly, the value of S&T will be acknowledged by society as a whole and more specifically by other policy sectors and secondly, that appropriate mechanisms will be in place to link S&T policy making and its implementation with other policy sectors in a synergetic manner. In this regard, there seems to be room for improvement both in the EU and EECA. However, there are a number of valuable policy approaches to be analysed both in the EU, in countries associated with the EU RTD Framework Programme and in EECA.

The ongoing discussion on European Innovation Partnerships and their international dimension addressing societal challenges through knowledge-based approaches as a core element of the flagship initiative "Innovation Union" is of particular relevance.

Recommendation 4:
Strengthening comprehensive knowledge-based cross-sectoral policy approaches at governmental level

It is suggested that political decision makers in the EU and EECA perform joint training seminars for policy stakeholders and key players from various sectors to increase knowledge of the role of S&T in social and economic development and in facing societal and global challenges. In addition, information should be given about implementation mechanisms and how S&T policy could be successfully built in into sector policies.

*It is also proposed to national policy stakeholders and to the European Commission to implement mutual learning exercises on good practices of comprehensive **knowledge-based** national and regional governmental strategies in the EU and EECA region and respective implementation instruments.*

A core prerequisite for embedding S&T in comprehensive governmental strategies is the awareness of the potential of S&T to drive social and economic development and societal and global problem solving. Success stories need to be communicated and analyzed and lessons need to be learned to advance national strategies and implement tools accordingly.

International stakeholder conferences are considered an appropriate tool as they are implemented for the time being with support from the INCO-NETs EECA and CASC involving experts from various policy sectors from the science and innovation communities and from civil society. In addition, national and international think tanks are to be invited to run accompanying analytical studies identifying good practice in policy making.

Finally, it is recommended to national political decision makers to introduce cross-cutting instruments applied by governments to better coordinate scientific approaches in support of different policy sectors.

This could include advanced dialogue processes at national level between the knowledge producers and the knowledge users to foster target driven research including accompanying socio-economic studies to be systematically utilized for sector policy planning and implementation.

Good practice examples:

- Integrated Programme of Scientific and Technological Development and Engineering Modernization of the Economy of the Russian Federation until 2015.⁶⁰
- The OECD Green Growth Strategy/Declaration⁶¹ (signed by all thirty OECD countries plus Chile, Estonia, Israel and Slovenia) is a practical policy framework on how countries can achieve economic growth and development while at the same time preventing costly environmental degradation, climate change and inefficient use of natural resources. It brings together economic, environmental, technological, financial and development aspects into a comprehensive and overarching framework. Different policy tools will be combined.
- The Pilot European Innovation Partnership (EIP) on Active and Healthy Ageing: it engages stakeholders across policy sectors to contribute to its planning and implementation.

⁶⁰ <http://www.st-gaterus.eu/en/542.php>

⁶¹ <http://www.oecd.org/dataoecd/58/34/44077822.pdf>

3.2.3 Challenge: Building Appropriate and Internationally Compatible National Legal and Ethical Frameworks Covering amongst others IPR, Taxation and Customs Regulations, Access to Labour Markets

New knowledge and innovative technologies are being developed increasingly within international networks. Cross-border exchange is constantly gaining importance. Nowadays, it is impossible for a country to progress in science and technology on its own. International cooperation on a European and global scale is vital for a country's scientific performance and influences economic and social development.

To be open to the "world," barriers hindering cooperation need to be removed (e.g. for international mobility, protection and utilization of intellectual property, transfer of funds as well as scientific equipment, shipping of scientific material and samples etc.) and appropriate legal frames should be designed according to international standards. In addition, to ensure real partnership common ethical standards for conducting research (among others for clinical trials, the use of stem cells, the treatment of genetically modified organisms etc.) should be agreed upon and followed. At present, and with respect to issues mentioned above, there are still considerable obstacles for the EU-EECA STI collaboration which concern legal regulations for mobility of researchers (visa issues); joint utilization and protection of intellectual property; taxation and customs' fees for the transfer of funds; equipment and legal restriction for shipping of biological and geological material and samples, among other things.

Recommendation 5:

Raising awareness and communicating good practice of regulatory frameworks encouraging international STI cooperation and fostering ethical standards for conducting research at a national level

It is advised that national policy stakeholders responsible for setting legal and regulatory frameworks within the EU and EECA as well as the European Commission raise the awareness of the political decision makers of the need to stimulate regulatory frameworks for STI cooperation as well as of existing barriers and threats which require urgent action.

It is further advised that national policy stakeholders in the EU and EECA, academic communities and their scientific associations, establish ethical standards and align them to international standards.

Along that line it is proposed to organise training seminars for legal experts from different governmental institutions and other relevant public administrations on international good practice of regulatory frameworks for STI cooperation, on international ethical standards for conducting research and on successful reforms of national rules and regulations.

Both in the EU and EECA considerable efforts have been undertaken by the governments and public administrations to allow international openness of the respective STI systems. Accordingly, there are a number of good practice examples to be shared. Setting the internal and external regulatory frames for STI policies is usually a shared responsibility within a government including different policy fields (justice, internal and foreign affairs, finance etc.).

International S&T cooperation requires a high level of ethical responsibility and inter-cultural issues need to be taken into account. Cultural and moral diversity should however not lead to a laissez-faire driven erosion of ethical S&T standards or the conscious exploitation and capitalisation of legal gaps and unethical action (e.g. plagiarism). Thus, adequate fora to exchange and discuss existing ethical standards at regional and global level should be further promoted and the participation of EECA countries in these networks should be enhanced. Standards, e.g. peer review standards or authorship standards, should be aligned and promoted throughout the scientific communities.

To optimize present frameworks one can build on respective analytical outcomes, dialogue and training activities offered by the coordination and support activities funded at present by the European Commission within the 7th EU RTD Framework Programme, namely, the INCO-NETs EECA and CASC as well as BILAT RUS and BILAT UKR. Those projects and the new generation of IncoNets and BILAT projects could put a particular emphasis on sharing good practice among (legal) experts from the EU / EECA and on fostering a dialogue with the science and innovation communities on existing barriers and threats.

Good practice examples:

- The EU Visa Facilitation Agreements with Moldova, the Russian Federation, Ukraine and Georgia.
- Visa-free travel of OECD nationals to Kazakhstan from 2012.
- The European Charter for Researchers and the

Code of Conduct for the Recruitment of Researchers (<http://ec.europa.eu/euraxess/index.cfm/rights/europeanCharter>).

- Visa-free visits of EU, Switzerland, Liechtenstein citizens to Ukraine since 2005 (the same is valid for several non-EU countries).

Recommendation 6:

Assessing and – if appropriate – advancing the national regulatory framework for the protection and utilization of intellectual property according to international standards

It is recommended to political decision makers in the EU and EECA as well as to the European Commission to ensure the application of international standards for the protection and utilization of intellectual property. These standards should be formally agreed upon.

A core issue of any cooperation among different institutions is the fair treatment of intellectual background or foreground knowledge, which ensures the protection of the rights of its producers. The issue becomes particularly relevant in the innovation sphere if a commercial utilization of knowledge is foreseen. Here, governments are asked to create national regulations which follow international standards.

Emphasis should be put on both the protection of each other's knowledge and on the trans-national access to it allowing international exchange of scientific data and results while guaranteeing the rights of individual partners. Apart from national regulations, respective clauses should be systematically negotiated in international agreements on S&T cooperation and respective guidelines should be jointly developed. The definition of a common legal framework either within Partnership and Cooperation Agreements (PCA) or within dedicated S&T agreements between the EU and selected EECA countries (e.g. RUS and UA) seems to be of particular benefit for an EU-EECA STI cooperation. It is recommended that these European agreements are expanded to umbrella agreements to provide a common legal frame for all EU Member States and third countries.

Good practice examples:

- Recommendation of the European Commission on the management of intellectual property in knowledge transfer activities and code of practice for universities and other public research organiza-

tions from 10 April, 2008 and respective resolution of the European Competitiveness Council of 29 May, 2008.

- Coalition for Intellectual Property Rights (CIPR⁶²) as a private-public partnership dedicated solely to the advancement of intellectual property protection and reform in the Baltic States, Russia, Ukraine, and other countries of the former Soviet Union. CIPR is an official observer at the World Intellectual Property Organization (WIPO) of the United Nations and the CIS Interstate Council on the Protection of Industrial Property.
- The agreement of the Customs Union on common principles of the IPR protection between Russia, Kazakhstan and Belarus.

3.2.4 Challenge: Strengthening Institutions and Developing Efficient Tools and Instruments for Policy Implementation at International Standards

The implementation of political strategies oriented towards the strengthening of national STI systems requires efficient and effective instruments as well as an appropriate administration fostering knowledge creation, circulation and exploitation in partnership with the international science and innovation community in order to tackle common societal challenges and to contribute to knowledge-based economies. In this respect, both the EU at national and community level and EECA countries have long lasting experience in developing and implementing STI policy strategies. Regarding tools and instruments, national as well as trans-national targeted STI (funding) programmes should be highlighted, which are open to international partners or which are coordinated at trans-national level. Here, room is seen for enhancing the EU-EECA STI cooperation through advanced national programmes and a better coordination among programme owners in both regions.

Recommendation 7:

Strengthening the implementation of national STI strategies through mutual learning of policy makers and STI administrations

It is recommended to STI policy makers in the EU and EECA as well as to national administrations and the EU Commission to identify and share good practice of implementing national STI strategies through mutual learning. It is further recommended to conduct targeted training seminars on programme planning and implementation for national administrations

⁶² <http://www.cipr.org/>

(e.g. programme managers from public authorities and agencies as well as research councils,) as well as to enable trans-national twinning among national administrations and implementing agencies and service providers in the EU and EECA.

Policy Stakeholders Conferences as they are implemented through the EU funded INCO-NETs EECA and CASC within the 7th EU RTD Framework Programme should be conducted with particular emphasis on the exchange of information and good practices on existing national and regional programmes as well as on appropriate mechanisms and technical tools for their implementation. Such mutual learning activities should also address the different approaches to the institutional setting of programme implementation by operating structures of ministries, public agencies or private service providers.

Trans-national twinning of governmental management institutions of EU Member States and EECA countries should deepen mutual learning and should – once appropriate – pave the way for the trans-national coordination of STI strategies and implementing instruments across the EU and EECA. Bilateral as well as multilateral instruments offered by ENPI should be exploited to provide support for such activities.

Recommendation 8:
Improving the quality of programme implementation through systematic evaluation and benchmarking according to international standards.

It is proposed to political decision makers in the EU and EECA as well as to the European Commission to further advance approaches towards a systematic assessment of effectiveness and efficiency of national programmes using performance indicators to international standards. In addition, it is advised to conduct international benchmarking exercises of programme implementation to support mutual learning of programme owners.

Building on the experience of programme implementation both in the EU and EECA, there seems to be room for optimizing national programmes as well as processes and tools for their implementation. As key to gaining evidence, systematic approaches to programme evaluation and international benchmarking of STI programmes should be fostered.

Training workshops by experts representing policy makers and programme owners are suggested in order to raise awareness, gain information, learn joint lessons and develop concepts for advanced evaluation and benchmarking exercises. As a follow-up, pilot exercises could be implemented by joint EU-EECA teams to test and validate the methodology and also to deepen the mutual learning of programme owners. Coordination and support activities like the new generation of IncoNets and BILAT projects to be supported within the 7th EU RTD Framework Programme seem to be appropriate mechanisms to facilitate both training workshops as well as pilot exercises based on a request by policy stakeholders in both regions.

3.2.5 Challenge: Increasing Gross Domestic Expenditure on R&D (GERD)

GERD in percentage of GDP in the EU is around 2% on average (ranging from 0.5% for Cyprus to 3.8% for Sweden and Finland). In EECA countries, GERD is below 1% with the exception of Russia (1.16%⁶³). According to those figures, both the EU's and EECA's R&D investments are lacking behind the main competitors: Japan (3.5%), the USA (2.6%) and South Korea (3.1%). Against this background, in both regions there is considerable awareness of the need to increase R&D expenditure. Particular attention is paid to the contributions from the private sector, which in most of the countries is crucial.

Recommendation 9:
Analyzing the barriers for increasing public and private S&T expenditure

It is recommended to national governments in the EU and EECA to analyse the obstacles hindering the increase in public and private expenditure for S&T in order to strengthen the knowledge base for socio-economic development and to address the present societal and global challenges. Priority should also be given to developing a consistent policy mix to stimulate R&D expenditure in the private sector.

Despite the present challenging financial frameworks for most countries around the world strategic decisions by governments are suggested in favour of a further increase of investments in the knowledge base of the economy and society targeting a figure of 3% out of which around two-thirds should be spent by the private sector. This requires increased public spending. It seems to be even more challenging to strengthen

⁶³ Data for 2010, produced by the Institute for Statistical Studies and Economics of Knowledge, National Research University – Higher School of Economics, Moscow 2010.

the private sector and to raise its investments in R&D.

To facilitate mutual learning among policy makers it is recommended to conduct international policy stakeholder conferences in order to analyze good practice of comprehensive policy mix frameworks with the view to raise R&D investments in their country. Here, a link to recommendation 4 is given.

Good practice examples:

- EU-2020 strategy⁶⁴: 3% target for GERD.
- Azerbaijan recently announced a strategy for S&T to increase the GERD from 0.2% to 2% by 2015.
- Kazakhstan wants to increase its expenditure on S&T to 2%.

3.2.6 Challenge: Identifying and Addressing Global and Societal Challenges

Societal and global challenges (such as ageing populations, cities of tomorrow, global health, climate change and sustainable management of natural resources, energy and food security) are common for both the EU and the EECA region. To increase efficiency and effectiveness of policy measures and make best use of shared knowledge and resources these challenges can be best addressed through joint policy approaches and corresponding joint implementation scenarios. As a consequence, national strategies should be coordinated wherever possible following the concept of the present Joint Programming Initiatives of the EU.

Recommendation 10:

Fostering mutual learning and training of policy stakeholders in the EU and EECA on how to address global and societal challenges

It is recommended to STI policy makers in the EU and EECA to learn lessons from the various policy approaches of EU and EECA countries addressing societal and global challenges in order to enhance national strategies. It is further recommended to increase the knowledge of public administrations about good practice for implementation instruments to reach the respective policy objectives.

Dedicated conferences and training seminars for different policy stakeholders as well as for experts from implementing institutions should be held in order to identify relevant societal and global challenges and to discuss strategies and implementation measures to

address them most effectively and efficiently. Analytical work is suggested beforehand to provide a valuable knowledge base for policy discussions. Such studies could analyze potential effects of present or upcoming challenges on countries or regions as well as good implementation practices of different governments or international organisations.

Support for analytical activities as well as mutual learning and training events could be already given by ongoing coordination and support activities funded within the 7th EU RTD Framework Programme, most prominently by the INCO-NETs EECA and CASC. Dedicated tasks are implemented and could be further adapted to the needs of policy stakeholders in the EU and EECA.

Recommendation 11:

Contributing to international dialogue processes as well as to the international knowledge base on societal and global challenges

It is recommended to national governments and the EU Commission to proactively contribute to international dialogues on global and societal challenges among others within the UN family (Intergovernmental Panel on Climate Change, Food and Agriculture Organisation, International Oceanographic Commission etc.) and within OECD fora and activities (Global Science Forum etc.).

There is a huge variety of discussion and consensus building activities on joint approaches to addressing present global and societal challenges which are often driven by international organisations like the UN institutions (UNESCO, UNDP, etc.), the OECD and to a growing extent by G20. Accepting the responsibility for meeting such challenges and developing appropriate responses, national governments and the European Commission are in many cases aligned to such processes, both at policy level and by sending national experts to respective committees or dedicated workshops and conferences. However, for many countries there seems to be room for more involvement.

It is further recommended to national S&T policy makers to foster knowledge generation on the impact of global and societal challenges through the funding of data gathering based on international scientific standards for data production, collection and dissemination.

⁶⁴ http://ec.europa.eu/europe2020/targets/eu-targets/index_en.htm

Building on an international science driven consensus on how to monitor and to respond to global challenges there are a number of observatories and databases in place (such as weather and climate observatories, data on biodiversity patterns, global health observatories etc.), aiming at gathering scientific evidence according to agreed standard methodologies. It is crucial to widen the database through scientific projects, which in many cases depend on national funding by governments. Relevant activities should be jointly identified by EU and EECA policy stakeholders through mutual learning as proposed in recommendation 10.

Recommendation 12:

Fostering the international coordination of programmes addressing societal and global challenges beyond the EU and EECA

It is proposed to policy makers and programme owners in the EU and EECA as well as to the European Commission to take action towards the coordination of national and European programmes with other global partners. In addition, it is recommended to jointly contribute to the implementation of recommendations by international dialogue processes at UN, OECD and G8/20 level.

Going beyond the coordination of policy measures as proposed by recommendation 8, the nature of global and societal challenges suggests further increasing action towards joint activities at a global level. This could be built on the experience of coordination and support activities funded within the EU RTD Framework Programme highlighting a number of ERA-NETs which have been implemented with the participation of programme owners and managers outside the EU. The two international ERA-NETs targeting EECA should be highlighted: ERA.NET RUS and Black Sea ERA.NET.

New momentum is expected from European driven Joint Programming Initiatives addressing joint transnational approaches towards global challenges. In this respect it is recommended to European stakeholders involved to put a stronger emphasis on raising the full potential of international cooperation through dialogue processes with interested partners from EECA and other regions of the world, as well as with international public and private programme owners and financial institutions.

As a consequence of recommendation 11 and acknowledging the results from international dialogue processes, which were implemented with participation of EU and EECA policy stakeholders and national experts, it is suggested that political decision makers in both regions exploit options for financial contributions on a case-by-case basis allowing the implementation of international scientific initiatives towards global and societal problem solving with participation of the national S&T communities.

Good practice examples:

- Europe 2020 Strategy⁶⁵ aims to address core societal challenges Europe is faced with among others through Innovation Partnerships open to international partners.
- Water Initiative between the EU and Eastern Europe, Caucasus and Central Asia (EECA).
- Interstate Commission for Water Coordination (ICWC) of the Central Asian countries as part of the Interstate Council for the Aral Sea to support technical needs.
- Global CGIAR Research Programme 1.1 'Integrated agricultural production systems for the poor and vulnerable in dry areas' covering crop improvement, natural resources management, livestock, aquaculture and fisheries, policy and institutions with implementation measures in Uzbekistan, Kazakhstan, Turkmenistan and Azerbaijan.
- Central Asian Countries' Initiative for Land Management (CACILM) which maintains a database with economic, social and environmental data. The initiative is supported by the Asian Development Bank (ADB), the Global Environmental Facility (GEF), UNDP, World Bank, IFAD, the German Association for International Cooperation (GIZ), and others.

3.2.7 Challenge: Making Optimum Use of International Cooperation

There is a wide consensus that excellence in research stems from competition between researchers and from getting the best to compete and cooperate with each other. A way to achieve this is to work across borders⁶⁶. Besides achieving this excellence, other rationales exist for the justification for international cooperation, such as the support for market penetration, for knowledge and technology transfer; acquisition of material and immaterial resources from

⁶⁵ http://ec.europa.eu/europe2020/index_en.htm

⁶⁶ EC (2008): A Strategic European Framework for International Science and Technology Cooperation. Communication from the Commission to the Council and the European Parliament. Brussels: European Commission

abroad; sharing costs and risk through international division of labour (e.g. in the field of infrastructure) and supporting joint global or regional development objectives.

Although the potential for international cooperation is manifold in theory, the level of exploitation in practice is far from optimum. International cooperation is not always adequately represented in national S&T strategies: supporting instruments and programmes are often lacking or sub-critical, regular targeted meeting places to exchange S&T policy views and to establish joint initiatives are not yet a matter of course, and available resources in general are often too limited, especially given the fact that international cooperation causes higher transaction costs than national or local S&T cooperation. In addition, smaller countries in particular have to set regional or thematic priorities, because they are hardly in the position to cooperate always on a uni- or bilateral basis.

To overcome the relative isolation of some partner countries from global cutting-edge S&T developments and to engage in meaningful S&T cooperation for the mutual benefit of the EU and EECA, a more optimum use of international cooperation should be achieved.

Recommendation 13:

Further advancing functional STI policy dialogue fora between the EU and EECA countries

It is recommended to policy stakeholders from EU MS, the European Commission and EECA countries to assess present formats of STI policy dialogue among both regions in order to identify options for the dialogue to become more efficient and effective as well as to increase the active participation of the countries in both regions in such policy dialogue fora. In addition, it is recommended to support the generation of a much needed knowledge base in order to ensure the best information. It is proposed to the European Commission to further support Coordination and Support Actions facilitating functional bi-regional fora for S&T policy dialogue, most prominently the INCO-NET and BILAT scheme.

At the moment, STI policy dialogue among the two regions is systematically taking place either between individual EU Member States and EECA countries or between the European Commission and selected EECA countries. In order to better address the joint challenges for both regions, there seems to be room for introducing advanced mechanisms for such a func-

tional STI policy dialogue. This would provide a floor for regular information exchange on national strategies as well as internationalization strategies and a respective clearing house for joint ideas and activities. Also, it would provide a coordination forum for needs, suggestions and proposals targeting various aspects which are addressed in this White Paper. Primary addressees of such a dialogue would be interested policy stakeholders to whom discussion fora in 'variable geometries' are provided. To ensure an efficient dialogue it is important to evidence the knowledge base of the participants through relevant data collection and analytical studies. One might build on the example of present Coordination and Support Actions within the EU RTD Framework Programme namely, the INCO-NET and BILAT scheme, which provide a targeted knowledge base for policy stakeholders to analyse and advance the STI cooperation.

As an additional element of such dialogues, the value of discussion fora allowing a direct interaction of policy makers with representatives of the science and innovation community and the civil society of both regions needs to be highlighted in order to provide policy stakeholders with an optimum framework for international STI cooperation.

Good practice example:

- Steering Platform on Research with the West Balkan Countries (<http://www.wbc-inco.net/about/mission.html>).

Recommendation 14:

Optimizing existing international STI cooperation frameworks at national level through mutual learning of policy stakeholders

It is advised that national policy stakeholders in the EU and EECA in cooperation with the European Commission analyse good practice of existing national frameworks for international cooperation in terms of STI strategies, implementation programmes and stimulating regulatory frames.

As a first step, good practices on how other countries in the EU and EECA optimize the degrees of freedom for international STI cooperation within existing policy frameworks should be collected and exchanged. A dialogue among interested policy stakeholders from both regions can be supported by INCO-NET or BILAT-schemes funded within the EU RTD Framework Programme.

Complementing this approach, national policy-makers in EECA countries in partnership with the EU Commission are advised to make optimum use of the European Neighbourhood Policy Instruments or the Development Cooperation Instruments to advance national capacities and existing institutions for STI policy making and policy implementation with particular emphasis on international cooperation. Among others, options are provided through the “twinning” arrangements made between EU Member States’ institutions and national authorities in EECA.

Good practice example:

- ENPI support for the association of Moldova to the EU RTD Framework Programme.

Recommendation 15:

Increasing capacities of National Information Points and National Contact Points for the EU RTD Framework Programme and for international cooperation in general terms

It is proposed to national policy stakeholders in the EU and EECA to assess and advance the support structures for European and international STI cooperation, building on existing good practice. It is suggested that the European Commission and individual EU member States support respective capacity building in EECA.

In order to allow the STI community to make the best use of European and international STI cooperation, a sound knowledge of the respective framework is a prerequisite and a major success factor. Against this background, efforts need to be undertaken at a national level to provide professional and easily accessible services in terms of information dissemination and consultancy.

As far as the EU RTD Framework Programme is concerned, the system of National Contact Points (NCPs), which is well established in the EU Member States, has proven to be an efficient tool to be analysed by the national authorities in the EECA countries. Here, both the INCO-NET scheme and the BILAT scheme, and also the invitation to NCPs/NIPs in EECA to join European NCP networks facilitated via dedicated Coordination and Support Activities funded within the EU RTD Framework Programme are appropriate tools to foster mutual learning and capacity building in EECA. In addition, institution and capacity building with emphasis on NCPs/NIPs in EECA might also be supported through the European Neighbourhood Policy and Development Cooperation Instruments

(ENPI/DCI). Such measures could be complemented by dedicated bilateral initiatives of EU Member States in partnership with interested EECA countries.

Good practice examples:

- IncoNet EECA: Analytical report for strengthening EECA NCPs/NIPs – Russia, 2009 (<http://www.inco-eeca.net/en/119.php>).
- Services of the International Bureau of the German Federal Ministry of Education and Research (<http://www.internationales-buero.de/en/index.php>).
- Services of the National Information Centre for Ukraine-EU S&T Cooperation (<http://www.fp7-ncp.kiev.ua>).

Recommendation 16:

Increasing the efficiency of national programmes through opening-up to foreign organisations and through trans-national coordination

It is recommended to national (and international) programme owners in the EU and EECA to advance the framework for international STI cooperation through targeted opening of national STI programmes in EU and EECA countries to foreign organisations as well as through targeted trans-national coordination of funding programmes.

In order to increase the knowledge base of national research organizations and to benefit from international STI resources and infrastructures, the participation of foreign research organizations in national STI programmes should be allowed, usually without the provision of funds.

Furthermore, fragmentation should be overcome and the efficiency of research funding in both the EU and EECA should be increased through joining resources of programme owners on the basis of a common interest and joint priority setting. To implement such schemes, lessons should be jointly learned from trans-national pilot activities of funding organisations (programme owners/managers) from EU Member States, countries associated with the EU RTD Framework Programme and EECA countries as they are conducted at present through the Black Sea ERA.NET and the ERA.NET Russia. These projects are dedicated coordination and support activities within the 7th EU RTD Framework Programme. ERA-NETs have a proven track record of catalyzing joint calls and programmes in areas of specific interest to participating programme owners. For such trans-national schemes, particular emphasis should be given on exploiting options for

complementing national financial contributions by funds from the EU and other international financial institutions including the Asian Development Bank, the World Bank and the European Bank for Reconstruction and Development.

Good practice examples:

- Joint calls for collaborative S&T and innovation projects within ERA.NET Russia (www.eranet-rus.eu) and Black Sea ERA.NET (<http://bs-era.net>).
- Joint Operational Programme Romania-Ukraine-Republic of Moldova 2007-2013, to allow neighbouring areas to jointly address development challenges. Partners from other countries can participate based on own funds.

3.3 Strengthening Research Conducting Institutions



3.3.1 Challenge: Improving the Performance of STI Institutions

Almost all the countries in EECA experienced a series of reforms to their research systems during the last decades, aiming at the adaptation of their systems to the tremendous societal changes that occurred after the collapse of the Soviet Union. At the same time, research institutions faced a series of problems mainly in terms of finance and human resources, with varying levels of success in addressing them. In that context, improving the performance of STI institutions in EECA should constitute a key priority in the EU-EECA S&T cooperation.

Recommendation 17:

Preparing and implementing joint benchmarking exercises as well as systematic assessment procedures of research conducting institutions

It is advised that national policy stakeholders in EECA and the EU set up and implement a systematic assessment procedure of their national STI institutions as a mutual learning exercise and as a way to share the good practices already in place in several EU Member States.

It is proposed to interested research institutions in EECA and the EU to jointly plan and implement benchmarking exercises of similar volunteering research institutions in several EECA countries, based on internationally accepted standards and procedures, as a mutual learning exercise between EU and EECA countries that will highlight the best practices, contributing at the same time to the improvement of the performance of the participating institutions.

Prior to the implementation of any new measure or broader reform, the assessment of the performance of the national research institutions is a major challenge and a prerequisite, since it increases the pertinence and legitimacy of the reform, as well as the acceptability of the measures deriving from it. Such assessment is equally important as the need to increase the funding level of the institutions since spending more in an underachieving institution could constitute a waste of funds and effort. Along that line, a national systematic procedure for the assessment of the performance of STI institutions well adapted to the local conditions, but based on international standards, is a key element for a highly productive STI system.

In most of the EU Member States assessing the performance of the research institutions is a well estab-

lished procedure. Moreover, several EU institutions are among the world pioneers in developing adequate approaches and methodologies for such assessments adapted to various types of research institutions. The countries in EECA ready to integrate such systematic assessment procedures in their respective national research systems could benefit from the world class know-how accumulated in some EU Member States on the development and implementation of such procedures. In that respect, joint EU-EECA evaluation and benchmarking exercises could be mutually beneficial by adapting existing knowledge to local conditions. The EU Commission could possibly provide support to such activities through specific instruments (ENPI and DCI in particular), following a formal request from the relevant national authorities in EECA.

Such joint EU-EECA effort could take on the one hand the form of a mutual learning exercise among STI policy stakeholders accompanied by pilot assessments in interested EECA countries to be planned and implemented building on the expertise of EU member states. On the other hand, interested and similar research institutions in EECA and EU countries could jointly plan and implement an international benchmarking exercise, based on internationally accepted standards and procedures available in EU member states. As a result, the best practices across the participating STI institutions will be highlighted providing room for a self-assessment as well as evidence for improving institutional strategies, structures and processes of under-performing institutions.

Good practice example:

- The EC funded STRATA project "RECORD": Under this project a method for benchmarking RTDI performing institutions has been established and tested in a couple of New Member States (the 'RECORD manual').

Recommendation 18:

Twinning activities between research centres or institutes

It is suggested that national policy stakeholders in EECA and the EU encourage and provide the necessary framework conditions and possibly incentives for twinning arrangements between research centres or institutes in EECA and the EU.

Twinning activities between similar or complementary research centres or institutes in EECA and the EU constitute a valuable tool for exchanging knowledge and

good practices that goes beyond simple networking activities. Such twinning could take the form of memoranda or agreements between the respective research entities and could include a large variety of activities such as: exchange of staff and young researchers; setting-up joint research projects; joint participation in international projects; sharing experience on equipment procurement and use; sharing infrastructure, etc. The twinning constitutes a long-lasting activity mutually beneficial for both institutions.

The national authorities should encourage twinning activities, providing the appropriate framework conditions and incentives or seed money for launching them.

Good practice example:

- The ERA-WIDE scheme launched by the EU Commission under FP7, which has already supported research entities in Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine. (http://cordis.europa.eu/fp7/capacities/international-cooperation_en.html).

Recommendation 19:

Training in institutional management tools

It is suggested that national policy stakeholders in EECA and the EU and the EU Commission organize training in management tools for STI institutions also emphasizing knowledge management, and that they encourage the managerial staff of the research conducting institutions to attend them.

During the last few decades, the management model of the most renowned research institutions worldwide has changed drastically: from institutional funding to more or less rigid internal structures (divisions, laboratories, etc.). The model evolved to project oriented multidisciplinary research and funding, across laboratories and teams, with an increased involvement of the private sector and a growing concern for the protection and exploitation of the research results, etc. Such transition is currently in place in most EU Member States with several countries and institutions pioneering changes and others still striving to adapt to it. In the EECA countries this transition coincided with the crisis (under-financing, brain drain, etc.) faced by most of the research institutions. It is therefore understandable that an important effort still needs to be made to adapt the functioning of the institutions to the new trends and requirements.

In that respect, *training in state-of-the-art S&T management tools* for research managers should constitute a high priority for the research institutions and a field for joint EU – EECA activities. Such training could address competitive research, project writing and implementation, budget issues, contacts and cooperation with the private sector, protection and exploitation of Intellectual Property Rights (IPR). *Training in knowledge management and IPR* is of paramount importance especially for an enhanced international cooperation and participation of the private sector. It should be implemented in parallel to the improvement of the IPR legislation and system that needs to take place in several EECA countries.

In the context of the EU-EECA S&T cooperation, the aforementioned training could take the form of *specialized seminars* to be organized in the EECA countries and/or the form of *mutual learning exercises through exchanges* of research managers that will stimulate the spreading of good practices.

3.3.2 Challenge: Balancing Investments in Blue-sky Research and Target Problem Solving Through Institutional Roadmapping

Despite several attempts to reform the S&T system and institutions in the EECA countries, most of the existing research institutions already served the S&T system of the Soviet Union and inherited a legacy from that system in terms of governance, organisation, promotion structures and fields of activities. In that respect, the difference between the research orientation of the institutions and the current national conditions and needs is an issue that needs to be taken into account in order to strengthen the role of the institutions and the impact of its research output vis-à-vis present societal and global challenges. To address the issue of the role and orientation of a research institution, tools such as SWOT⁶⁷ analyses, Balanced Score Card approaches, and foresight exercises are already in use by a number of well performing institutions in the EU Member States and beyond.

Recommendation 20:

Implementing SWOT analyses, BSC approaches and foresight exercises in the research conducting institutions

It is recommended to the national policy stakeholders to provide incentives and to the heads of STI institutions to implement institutional SWOT analyses, Bal-

⁶⁷ SWOT = Strength, Weaknesses, Opportunities and Threats

anced Score Card approaches, and foresight exercises enabling the development of strategies and institutional roadmaps that will strengthen the role of the institutions in the national research system.

A SWOT analysis of the institution can identify the current Strengths and Weaknesses (scientific output, human resources, role in education, exploitation of research results, infrastructure, finance, etc.), but also the Opportunities and Threats that may exist in the short term (national or local priorities and needs, evolution of the private sector, existing competition, etc.). Balanced Score Card (BSC) approaches help to align resources to objectives and facilitate strategic management decisions.

The institutional foresight exercise can outline scenarios for the potential role of the institution in the medium to long term (c.a. 20 years) by taking into account the broader conditions in the country and in the region (scientific and societal challenges, economic conditions, education, etc.).

The aforementioned tools can significantly assist the institution in defining its internal strategy and roadmap in terms of: optimum balance between basic and applied research; setting up multidisciplinary research programmes; planning vacancies for new staff; re-organizing the research teams; defining equipment needs, etc.

SWOT analyses, BSC approaches and foresight exercises could constitute a priority for the EU-EECA S&T cooperation through joint implementation projects or mutual learning exercises (e.g. through visits to EU institutions that are currently applying such approaches).

3.3.3 Challenge: Improving the Quality and Quantity of STI Infrastructure.

As mentioned earlier, after the collapse of the Soviet Union, research institutions in EECA suffered from a tremendous under-financing that reached a very low level with only weak signs of improvement appearing recently in some countries. A direct consequence of this situation was the huge lack of investment in research infrastructure in terms of state-of-the-art scientific equipment but also in terms of buildings and labs, which are currently for a majority of EECA countries outdated or even missing. As far as the innovation infrastructure is concerned, substantial efforts were undertaken by governments to estab-

lish institutions in support of the commercialization of S&T outcomes. However, there is still a long way to go due to the lack of innovation activities in the private sector.

In the EU, several Member States experienced the same challenge within the last few decades. This is particularly true for the Central European MS which underwent a tremendous reform process towards democracy and knowledge-based market economies starting in the early 1990s. However, due to the higher spending for S&T both by public authorities and the private sector in the EU Member States major and systematic investments were made in the STI infrastructure, which became particularly relevant after launching the European Lisbon agenda. To meet these ambitious goals, which had been reconfirmed through the Europe 2020 strategy, the updating of STI infrastructures remains a continuous challenge and requires an upgrade.

In addition, all the EU Member States realized that for infrastructures above a certain size a better coordinated approach was necessary to avoid unnecessary duplication of facilities, as well as a more efficient model of managing them based on an open access to users from the country and from abroad. This is true for medium and large scale S&T infrastructures following the roadmap of the European Strategy Forum on Research Infrastructures (ESFRI). This is also true for the innovation sector highlighting the example of the European Institute of Technology (EIT).

In that context, the necessary improvement of STI infrastructure including coordinated trans-national approaches could constitute a key priority in the EU-EECA cooperation.

Recommendation 21: Establishing a joint roadmap on improving existing S&T infrastructures and jointly building new ones in EECA, as well as the mutual opening of infrastructures in both the EU and EECA

It is recommended to the national policy stakeholders in cooperation with the national scientific communities in EECA and the EU and possibly with support by the EU Commission, to initiate the establishment of a roadmap for the improvement of the S&T infrastructure in EECA and for the mutual opening of key infrastructures, building among others on the experience from the ESFRI roadmap.

As a first step for the preparation of such a roadmap an inventory of existing major EECA infrastructure at national and regional level will be necessary, as well as a realistic prioritisation of the needs for updating or upgrading S&T infrastructure. Building on that inventory of infrastructures and needs, benefits from coordinated EU-EECA approaches should be analyzed for identifying space for increased efficiency of S&T infrastructure development both in the EECA and the EU. The experience and approach implemented in the EU through the European Strategy Forum on Research Infrastructure (ESFRI) can be very valuable for the implementation of such activity.

In parallel, the modalities, necessary steps and possible barriers for the mutual opening of research infrastructures in both EU and EECA countries should be studied and precise recommendations should be addressed to the relevant national authorities.

Good practice example:

- The ESFRI roadmap (http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri-roadmap)

Recommendation 22:

Exploiting options for utilizing ENPI/DCI funds for investing in STI infrastructure

It is advised that the national policy stakeholders in EECA as well as the responsible authorities in the EU explore the modalities for investments in STI infrastructure using ENPI/DCI funds.

The two EU instruments (ENPI/DCI) are valuable sources of funds for the support of capacity building activities and the construction or improvement of infrastructures in the target countries. As a general rule, the priorities and actions supported by the instruments are jointly agreed between the EU Commission and each relevant country, although a regional component also exists. Support of STI has not been a key priority of these instruments so far, mainly due to more pressing needs in other fields that have been forwarded by the beneficiary countries.

However, since on one hand the role of STI in the generation of growth is widely recognised and, on the other hand, pressing needs for evidence-based decision-making in public affairs (e.g. in the sectors of health, climate protection, transportation, social affairs etc.) are evolving, investment in STI infrastructure could be upgraded to a national priority to be supported by ENPI/DCI. To achieve this goal, a realistic

assessment of the needs in infrastructure as well as their expected impact, are a prerequisite before initiating any investigation among the national authorities in charge of the negotiation with the EU and implementation of ENPI/DCI projects.

The EU-EECA STI cooperation could be instrumental in achieving the aforementioned goal through the development of roadmaps for improving the STI infrastructure (see previous recommendation), as well as through assistance in the preparation of precise proposals to be addressed to the ENPI/DCI stakeholders, based on the accumulated knowledge of using similar procedures in EU Member States for support from the EU Structural Funds.

Specific attention should be given to the possibility of supporting the development of regional facilities in Eastern Europe, South Caucasus or Central Asia, using the regional/multilateral components of ENPI and DCI.

Good practice example:

- The Operational Programme 'Research and Development for Innovation' of the Czech Republic (<http://www.strukturalni-fondy.cz>).

Recommendation 23:

Joint training in managing S&T infrastructures

It is suggested that national policy stakeholders set-up joint EU-EECA training activities in management of S&T infrastructures as a mutual learning exercise and as a way to share the good practices already in place in several EU Member States.

Managing S&T infrastructures, in particular medium and large size national and supra-national research facilities, requires specific scientific and managerial skills: optimization of the governance of the facility, modalities for opening-up the facility to users from other institutions and from abroad including business models for sharing costs (fees, sponsors, etc.), providing services to the private sector where relevant, etc.

The EU Member States possess significant experience in managing larger S&T infrastructures (e.g. synchrotron facilities but also medium size installations in physics, chemistry, biology, etc.) to be shared with the EECA countries in the frame of joint training activities.

3.4 Strengthening of Human Resources



3.4.1 Challenge: Building Human Capacities.

Building human capacities is of paramount importance for the strengthening of the research conducting institutions. This is particularly true for the institutions in EECA countries that are facing an often dramatic decrease in their human resources due to brain drain and 'brain-loss,' as well as a simultaneous drastic change in the level and way of funding and functioning.

The EU-EECA cooperation could be extremely beneficial in that field, not only due to the longstanding experience of several EU Member States in the development of human capacities in the research field, but also due to the similarities of the situation that several newer EU Member States faced during their transition to the market economy. In that respect, several mutual learning activities can be implemented addressing science managers or research staff.

Recommendation 24:

Setting up joint training activities in science management

It is suggested that national policy stakeholders set up joint EU-EECA training activities in science management as a mutual learning exercise and as a way to share the good practices already in place in several EU Member States.

The joint training activities in science management should tackle issues like the development of project oriented research, the development of a framework and incentives for the engagement of the young generation in research carriers, the development of entrepreneurial skills, etc.

Such training should not only target the established hierarchies but also younger promising researchers for whom issues like project oriented research and entrepreneurship are of paramount importance.

Recommendation 25:

Setting up twinning arrangements for training young researchers

It is recommended to the national policy stakeholders to set up incentives for twinning arrangements such as joint graduation programmes (master's, PhD) like international sandwich fellowship programmes⁶⁸, co-supervising PhD theses ('these en co-tutelle')⁶⁹, etc., between Higher Education or Research Centres in EU and EECA countries.

The twinning arrangements constitute a very valuable decentralized mutual learning activity that can benefit an important number of young researchers in various scientific fields. At the same time, such arrangements pave the way for long-lasting cooperation between the involved institutions and the beneficiaries of the schemes.

Good practice examples:

- The Erasmus Mundus Action 1 schemes: joint programmes (master's and doctoral) with third countries.
- The Erasmus Mundus External Cooperation Window (action 2) with the Eastern European region including Russia and with the Central Asian region (cooperation in the field of higher education between the European Union and Third-countries through a mobility scheme addressing student and academic exchanges).

3.4.2 Challenge: Improving the Framework for International Mobility

The international mobility of students and researchers between countries with different economic development levels is often perceived as a Janus-shaped activity: on one hand it is regarded necessary to advance competences and careers, but on the other hand brain drain causes constant concern. It goes without saying that brain drain can best be reduced if the domestic working conditions for researchers are at an international competitive level. A way forward is to develop schemes which support 'brain circulation'.

⁶⁸ Also known as Partial Doctoral Fellowship or 'Sandwich Doctorate,' it is a PhD Programme offered by some research institutions in collaboration with a (generally foreign) research institution. In such a programme, the PhD student initiates his/her PhD in his own country, usually taking classes and defining a problem. The second phase, varying from a few months to one or more years, asks the student to carry out research in the foreign institution. The third phase finds the student back in his/her home country to finish his/her studies and defend his/her thesis.

⁶⁹ The model for a joint supervision of a thesis ("co-tutelle de thèse") was introduced as a result of an initiative of the French Government to create a procedure for the joint supervision of doctoral candidates between French universities and universities in a number of other countries. Nowadays, arrangements using this co-tutelle model can be established between various universities in countries other than France. Co-tutelle arrangements are personalized conventions between a primary university and a partner university (the primary university being the institution where the doctoral candidate will defend his/her dissertation).

Furthermore, legal and procedural aspects have to be taken into account and implemented to guarantee internationally recognised degrees⁷⁰, to promote international scientific education schemes and to improve a more balanced flow of students and researchers (including visa issues). With respect to these issues, the Bologna process, which has been taken up by many EECA countries, provides a framework for cooperation and improvement of several aspects like mobility and quality assurance. Some nations outside the European Higher Education Area are very interested in the Bologna Process and are remodelling their own national systems taking into account the Bologna Process reforms.

The barriers to the mobility of scientists are to a large extent similar to those involved in the general movement of people: language, school for children, job for spouse, transfer of social security and pension packages, reintegration into the country of origin, etc. Therefore, improving the social conditions and childcare facilities for internationally mobile researchers, as well as upgrading the scientific attractiveness of the host countries, harmonizing national legislations, simplifying regulations and practices for obtaining scientific visas and other administrative requirements, would contribute significantly to the facilitation of 'brain circulation'.

Recommendation 26:

Enhancing alignment with the Bologna process through practical activities which support international scientific education schemes and a balanced student and researcher mobility

It is recommended to national policy stakeholders in the EECA to create the legal basis and support for the higher education sector for facilitating the establishment of joint degree programmes (joint master's and doctorates), to enable co-tutelles de thèse with European partners (including the writing of dissertations in English) and to create more attractive conditions for incoming students and researchers.

The first steps could be to foster a higher awareness of common degrees on a broad level, while recognising that a more comprehensive introduction of the ECTS is a major factor for common degrees. At the same time capacity building measures to improve the information and knowledge base on common degrees of the relevant central university service functions have to be

increased. To create more attractive conditions, more courses in foreign languages should also be provided and eLearning exploited to enhance the concept of common degrees in practice.

In general, most of these issues have to be addressed at national level, but coordination with partners from abroad can enable better results. The TEMPUS and Erasmus-Mundus programmes of the EU support the modernization of higher education in EU neighbouring regions (including EECA) and promote mobility. Erasmus Mundus Partnership is a complementary programme that funds student and staff exchanges and visits between European universities and universities from other countries. The EURAXESS network and portal is the 'visit card' of the EU for information about jobs and funding opportunities, as well as assistance to mobile researchers and their families. National mobility centres could be created in EECA countries and actively linked to the EURAXESS network to further promote a two way 'brain circulation'.

Good practice examples:

- Good practices of Erasmus Mundus master's courses (<http://www.emqa.eu/?AspxAutoDetectCookieSupport=1>).
- EURAXESS mobility portal, which provides information on jobs, services, rights and links, to promote researcher mobility (<http://ec.europa.eu/euraxess/index.cfm>).

Recommendation 27:

Establishing a regional exchange instrument for joint doctoral programmes

It is recommended to national policy stakeholders in the Eastern European countries and especially the neighbouring EU Member States and countries associated with the EU RTD Framework Programme, to establish a joint mobility programme for researchers (including pre-docs) based on university networks operating joint programmes, especially Joint Doctoral Programmes, ideally leading to Joint PhDs.

A first step towards such a regional exchange instrument to support joint doctoral programmes would be the stock-taking of existing initiatives and agreements. In order to promote the neighbourhood aspect, it is recommended to identify the interest of potential partner countries from Eastern Europe but also from the neighbouring EU member states and

⁷⁰ Convention on the Recognition of Qualifications concerning Higher Education in the European Region (so-called Lisbon Convention), which was signed by most East European countries.

countries associated with the EU RTD Framework Programme. Ideally, such an instrument does not create duplication with TEMPUS and Erasmus Mundus, but complements and forwards already existing initiatives supported by them.

Good practice example:

- CEEPUS - Central European Exchange Program for University Studies (including Western Balkan Countries and the Russian Federation) (<http://www.ceepus.info/>).

Recommendation 28:

Further facilitating the issuing of scientific visas and optimizing the administrative and living conditions for mobile researchers

As a major cross-cutting aspect for the enhancement of scientific mobility it is suggested that national policy stakeholders in cooperation with relevant authorities further simplify the issuing of visas for scientists, both in legal and practical terms, in all concerned partner countries in the EU and EECA.

Many scientific opportunities can be planned in time, but sometimes opportunities arise at short notice. Unclear and lengthy visa application regimes can hinder or even make short-notice mobility impossible.

The EU has substantially rectified this issue by introducing the scientific visa package, which facilitates the procedure of admitting researchers coming from non-European countries (third-country nationals) to Europe for the purpose of scientific research.

Wherever necessary, inter-governmental dialogue in the EU and EECA or at bi-regional level should focus on the analysis and removal of obstacles in the national legislations that will further facilitate the 'brain circulation' such as visa provision and work permits, etc.

Furthermore, it is recommended to national policy stakeholders in cooperation with relevant authorities to undertake the necessary measures that would improve the living conditions of the mobile researchers (compatibility of the social and medical security systems, hosting conditions for spouses, child-care facilities, etc.).

The EU Communication: "Better Careers and more mobility: a European Partnership for Researchers" (May, 2008) encourages the Member States to include

provisions facilitating the international mobility of researchers, when concluding bilateral and multilateral social security agreements with third countries. Such provisions should be further expanded to also include assistance in finding appropriate accommodation for the researcher taking into account his/her family status; assistance in employment for spouse; assistance in finding a kindergarten or school if the researcher brings their family, etc. Such assistance would facilitate significantly researcher mobility between the EU and EECA.

3.4.3 Challenge: Improving the Quality of Communicating Science to Society

Science affects every part of life in today's global society. It is increasingly important that developments in science relevant to society are effectively communicated to allow the public to have an informed opinion on controversial issues. Moreover, only if science is appreciated as a helpful tool for economic and societal development, will it receive the attention, regulation and resources needed. The government and society might also benefit from more scientific literacy – since an informed electorate promotes a more effective democratic society. Moreover, facts uncovered by science are often relevant to ethical decision making.

In times of global challenges, international S&T cooperation must not only be enhanced but also communicated and advocated to the public. The universal attitude of science facilitates understanding across borders and science diplomacy should support scientific cooperation for the progress of science and the progress of a peaceful co-existence.

Recommendation 29:

Promoting science communication to increase public understanding and support including aspects of international S&T cooperation to tackle regional and global challenges

It is recommended to national policy stakeholders in the EECA and to the academic communities to put significantly more effort on communicating science to the public and in particular the challenges and virtues of international scientific cooperation to tackle regional and global challenges.

A first step would be to establish a repository of good practices on how journalists, politicians, governmental authorities and other S&T programme owners as well as the science community enter into dialogue

on the role of science with the general public, which itself is heterogeneous in terms of social and cultural diversity. The international exchange of success stories and of lessons learned from science communication practices as well as targeted training seminars could be facilitated by international Coordination and Support Activities funded within the EU RTD Framework Programme like the INCO-NETs or through other targeted Support Activities. In addition, within such activities dedicated outreach measures to the general public could be planned and implemented to advance capacities for science communication in the EU and EECA. Last but not least, joint study programmes on the communication of science between European and EECA universities could be explored and initiated.

Recommendation 30:

Implementing an EU-EECA Year of Science and Scientific Cooperation to communicate science to society and the benefits of bi-regional cooperation

It is recommended to national policy stakeholders in the EU and EECA supported by the European Commission and in close partnership with the institutions of the academic communities in the EU and EECA, to plan and implement a bi-regional information and communication campaign on science for society and the benefits of EU-EECA S&T cooperation therein building on respective good practice in both regions.

Such a bi-regional Year of Science requires a shared vision and a coordinated effort by policy stakeholders, the science communities as well as the private sector. With this in mind, it is highly recommended to build on Coordination and Support Activities, namely, the INCO-NETs EECA and CA/CS or their successors for consensus building and concept development.

A final decision should be taken at bi-regional policy level.

Good practice example:

- German-Russian Year of Education, Science and Innovation
(<http://www.deutsch-russisches-wissenschaftsjahr.de/de/wissenschaftsjahr.php>).

3.5 Strengthening the Role of the Private Sector



3.5.1 Challenge: Increasing the Engagement of the Private Sector in STI and Advancing the Academia-Industry Relationship

The engagement of the private sector in S&T is an issue not only in EECA but also in several EU Member States. It is well known that in addition to the target of 3% of GDP to be dedicated to research in the EU MS, a target of two-thirds participation by the private sector in that objective has also been set and proves to be equally or even more difficult to achieve in several EU MS. However, the fact that the aforementioned targets have been set and still constitute a key objective in the EU, obliged the EU MS to develop strategies for achieving them, as well as tools for monitoring their implementation and identifying the problems that occur.

In EECA the private investment and, generally, the participation of the business sector in the research effort is extremely low in almost all the countries of the region: almost all funds for research are public funds and to a very large extent the recipients of these funds are public institutions. As a general trend, the private sector funds RTD insufficiently, does not benefit from public RTD funding substantially and does not perform RTD systematically.

In addition, or as a consequence, the private sector in EECA participates only partially in the setting of national research priorities, it hardly benefits from the research results and does not exploit them to produce new products, services and growth.

In that context, the issue of increasing the engagement and participation of the private sector in S&T could constitute a key priority in the EU-EECA cooperation.

Recommendation 31:

Initiating mutual learning activities on setting the framework for private engagement in STI

It is suggested that national policy stakeholders initiate mutual learning activities on a framework setting that will encourage the engagement of the private sector in STI and will advance the academia - industry relationship.

Such mutual learning activities on a framework setting should review in particular the legal frameworks, incentives and their impact, the ways to jointly involve the private and academic sector in research projects, the ways to develop in-house research in the business

sector, the employment of researchers in the private sector, etc.

It is obvious that such reviewing encompasses several national policies and involves national administrations well beyond the research sector. The involvement of these administrations in the mutual learning activities from the very beginning is a key element for their success but constitutes a challenge that necessitates a high level of coordination and commitment.

Recommendation 32:

Involving the private sector in a national and international STI policy dialogue

It is advised that national policy stakeholders increase the involvement of the private sector in the national STI dialogue processes and fora, in order to better identify its needs and expectations and to advance the academia - industry relationship.

Involving the representatives of the most active players in the private sector in the national S&T dialogue processes and fora constitutes an important step for an increased engagement of this sector in the research activities of a country for an advanced academia - industry cooperation and for informing decision making on the ways to stimulate such engagement and cooperation.

Through their involvement in such fora, the private sector representatives will not only express their needs and possible expectations of the academic sector but will also receive information on the capabilities of the academic sector of that country and on the benefits the private sector could gain from a closer cooperation with it. In addition, such involvement in the dialogue can stimulate the development of in-house research in the private sector.

Furthermore, it is advised that national policy stakeholders and the EU Commission increase the involvement of the private sector in the international STI dialogue processes and fora. Among these processes, of particular importance is the multilateral EU-EECA dialogue organized at community level supported by the EU Commission, as well as the bilateral dialogue among individual EU and EECA countries.

Such involvement in an international STI dialogue can further stimulate the interest of the private sector in research activities by providing to its representatives a broader view of the international landscape and

trends in STI. It can also initiate mutually beneficial cross-border industry-academia or industry-industry cooperation.

A valuable opportunity to involve the private sector in such activities is a series of EU-EECA Policy Stakeholder Conferences (PSC) bringing together policy makers and representatives of the STI community, organized with the support of the EU Commission fostering an advanced EU-EECA STI policy dialogue. Coordination and Support Activities funded within the EU RTD Framework Programme, such as the INCO-NET and BILAT scheme provide an appropriate framework to facilitate such dialogue formats.

Recommendation 33:

Promoting the link of state-of-the-art EU initiatives, such as research intensive clusters and technology platforms with similar structures in EECA, and enhancing the participation of private companies from EECA in these structures

It is recommended to the stakeholders of research intensive clusters and technology platforms in the EU and EECA (private and academic sector, local and national authorities, EU Commission, etc.) to promote the link between such structures and the stronger involvement of private companies from EECA.

In the EU, the Research Intensive Clusters, the European Technology Platforms (ETPs) and the Joint Technology Initiatives (JTIs) constitute state-of-the-art activities and structures bringing together the private and academic sectors as well as national or regional authorities. Similar structures are emerging in EECA (e.g. the Technology Platforms in the Russian Federation). Promoting the links among such structures in the EU and EECA will be mutually beneficial allowing mutual learning, sharing experience and possibly joining forces. Despite the rather autonomous character of the aforementioned activities especially in the EU, the national authorities can intervene through incentives for joint activities, support for path finding missions, and actions aiming at an increased visibility of innovation related structures in EECA towards structures in the EU, etc.

At the same time, a specific effort should be devoted towards an increased participation of the private sector in EECA (e.g. innovative companies) in clusters, ETPs, JTIs, etc. Such increased participation could further stimulate the engagement of the private sector in EECA in research and, in return, can provide additional

strength to the clusters and technology platforms. The modalities and conditions for such participation should be carefully prepared (IPR and other issues) and should be accompanied by a well planned information and dissemination effort in EECA (e.g. dedicated Brokerage Events) in order to attract players in the private sector not familiar with such initiatives. Here again the Coordination and Support Activities funded within the EU RTD Framework Programme such as the INCO-NET and BILAT scheme should be utilized.

3.5.2 Challenge: Increasing the Number of Innovative Companies

Increasing the number of innovative companies is still an issue and a target in several EU Member States. In that respect, incentives and skill development measures have been set up in order to develop entrepreneurship and innovation management abilities especially in the younger generation.

In EECA, the drastic changes towards the market economy in the last decades have resulted in a strong increase in the number of private companies, mainly SMEs and especially in the service sector. Unfortunately, the same increase has not been observed for knowledge intensive sectors that could benefit from the strong academic tradition in the region. Therefore, in the context of the EU-EECA STI cooperation, increasing the number of innovative companies in EECA should constitute a priority.

Recommendation 34:

Initiating mutual learning activities focusing on best practice examples in the EU, in particular in the transition economies in the newer EU Member States

It is recommended to national policy stakeholders in the EU and EECA to initiate mutual learning activities focusing on the best practice examples for the stimulation of the creation and support of innovative companies. Particular emphasis should be given to examples from the transitional periods of the newer EU Member States.

In several EU Member States a wide range of incentives has been offered to stimulate the creation of innovative companies. Among these we can mention seed funding, guarantees or loans, tax exemptions, setting up technology parks and incubators, incentives to hire young researchers, etc. The impact of all these measures was often below the expected level and even failures have been observed due to unexpected

barriers or weak planning. However, the undeniable success stories that exist, along with the documented failures, constitute valuable knowledge to be shared among policy makers and innovation managers from both the EU and EECA.

Particular emphasis should be given to mutual learning activities on success stories and failures in the transition economies in the newer EU Member States since in these countries the overall context and development path presents some similarities with those in the EECA.

Recommendation 35:

Setting up joint training courses on innovation management and entrepreneurship

It is suggested that national policy stakeholders, the academic communities and the managers of innovation related infrastructures set-up joint EU-EECA training courses on innovation management and entrepreneurship.

Several national authorities and institutions in EU MS possess considerable experience and worldwide recognition in innovation management activities and in entrepreneurship development, which could be beneficial for the increase of innovative companies in the transition economies of the EECA countries. Therefore, joint training courses on innovation management and entrepreneurship should be set up within academic or innovation related institutions in EECA, involving experts from both EU MS and EECA countries, with financial or indirect support (e.g. incentives) from the national or local authorities.

Recommendation 36:

Setting up collaborative competitive innovation funding programmes

It is recommended to the national policy stakeholders and to the EC Commission to set up collaborative EU-EECA competitive innovation funding programmes as an indirect or explicit means to stimulate the development of innovative companies.

Such collaborative competitive innovation funding programmes should financially support joint EU-EECA R&D projects designed to lead in the mid-term to innovative products, services or processes of significant economic and/or societal value. Such programmes constitute a valuable incentive that could either explicitly require or indirectly stimulate the creation of innovative companies.

EU-funded FP7 Coordination and Support Activities such as ERA-NETs stimulating the coordination of programme owners, or INCO-NETs and BILATs fostering stakeholder dialogues for the benefit of bilateral/-regional STI-cooperation could be utilized to design and test joint activities for national EU and EECA owners/managers of innovation programmes.

Good practice examples:

- The competitive innovation funding scheme already under implementation in the context of the ERANET project for Russia (www.eranet-rus.eu).
- The intergovernmental programme for cooperation in innovation of the CIS countries, which was recently launched involving eight EECA countries (AM, BY, KZ, KG, MD, RU, TJ, UA).

3.5.3 Challenge: Providing an Appropriate Framework for Investments in the Growing EECA Innovation Sector

The ability to attract investments in the innovation sector is a critical issue in several EU Member States and in the EECA countries. Such investments (in the form of venture capitals, business angels, etc.) are of paramount importance for the transformation of the research results into commercially viable products and services. To succeed in that critical step, it is necessary to create and maintain an appropriate framework in terms of legislation, taxation, movement of funds, Intellectual Property Rights, etc. It is obvious that the creation of such a framework goes far beyond the competences of the authorities responsible for STI in every country and therefore necessitates a holistic approach.

In the context of the EU-EECA STI cooperation, several activities could support the creation of appropriate frameworks for investment in the innovation sector in EECA countries.

Recommendation 37:

Implementing mutual learning activities on setting the framework for investments in innovation

It is proposed to the national policy stakeholders to initiate demand driven mutual learning activities on a framework setting for investments in innovation through a dialogue with representatives of the science community as well as the business and financial sectors in both the EU and EECA.

Such mutual learning activities should focus on legislative, tax and IPR issues, as well as on the coherence and coordination of the whole framework, in order to identify good practices, success stories but also barriers and failures in both EU Member States and EECA countries. The way the newer EU Member States established such frameworks in their transition economies should require specific attention.

To implement such international exercises, joint workshops or even smaller conferences are proposed, which could be organised in the scope of INCO-NET and BILAT activities funded within the 7th EU RTD Framework Programme or at a bilateral level, based on the partnership of individual EU Member States and EECA countries.

Recommendation 38:
Promoting and encouraging investments from the EU in the innovation sector in EECA

It is advised that national policy stakeholders in both the EU and EECA organize activities that will promote and encourage private sector investments from the EU in the innovation sector in EECA.

Such activities could include workshops, brokerage events or site visits involving, on one hand potential investors and, on the other hand, target innovative companies or individual inventors. A key step for such activities is the pre-selection of innovative institutions and for concrete investment projects to be presented demonstrating sufficient evidence of their commercial viability.

In addition, policy support is proposed for such investment campaigns in order to raise the confidence of potential investors in the respective national legal framework.

3.5.4 Challenge: Contributing to International Standards

Compliance with international standards or contribution to their development is of the utmost importance for the private sector and others (regulatory authorities, hospitals, etc.). At the same time, it is a field where business and research are meeting.

The EU Member States have longstanding experience regarding standards (CEN, CENELEC, contribution to ISO, etc.) whereas, in contrast, several EECA countries still have considerable efforts to make in that field. This will strengthen the position of the private sector

in the international arena and will also contribute to the development of in-house research and/or to enhanced business-academia cooperation.

Recommendation 39:
Initiating mutual learning activities in the field of international standards

It is proposed to national policy stakeholders and to regulatory authorities in EECA and the EU to initiate mutual EU-EECA learning activities in the field of international standards. In addition, targeted training activities addressing managers in the private and academic sectors are proposed.

These mutual learning activities between the EU and EECA should focus on contributing to and setting international standards or the approaches to comply with them, also addressing the role of research in that field. Such activities can contribute to the transfer of knowledge and identification of good practices. Twinning arrangements between national offices in charge of standardisation are proposed as they may be funded among others within the European Neighbourhood Policy Instruments and the Development Cooperation Instruments of the EU.

In addition, dedicated awareness raising and training seminars for the management of STI institutions should be provided in order to inform about the respective processes and support structures.

3.6 Strengthening the Sub-regional Cooperation



3.6.1 Challenge: Increasing Critical Mass and Avoiding Fragmentation through Sub-regional Cooperation

The STI policy dialogue activities between the EU and EECA countries, also the analysis of EU-EECA cooperation patterns among research institutions and teams, revealed a relatively weak intra- and sub-regional cooperation (such as Central Asia, South Caucasus), especially when addressing the EU Commission, the EU Member States or the scientific community in the EU. Strengthening such cooperation would be beneficial for a more effective identification and promotion of STI priorities since it would reduce the fragmentation of activities and would increase the critical mass of beneficiaries and therefore the impact of the EU-EECA cooperation.

Recommendation 40:

Fostering networking of STI policy makers and researchers in EECA sub-regions to increase critical mass and efficiency when addressing the European STI community

It is recommended to national policy stakeholders in the EECA sub-regions on the one hand to take appropriate action at national level to stimulate networking between the STI communities and on the other hand to strengthen policy coordination at sub-regional level, especially when addressing the EU.

Against the background of under-financing of STI at national level, national policy stakeholders are advised to foster trans-national networking of national STI communities within a given sub-region in order to increase the effectiveness and efficiency of their activities. This could first of all be implemented through national strategies for sub-regional STI cooperation, following the example of the EU or the Nordic countries.

A valuable outcome is expected from a stronger coordination among national policies in the EECA sub-regions when proposing research priorities or specific implementation instruments, like coordinated national STI programmes or joint STI programmes at regional level, as well as the coordinated utilization of the EU assistance programmes ENPI or DCI. Such approaches are expected to considerably increase the 'weight' of the sub-regional STI policy since it will provide evidence for less fragmentation and a larger impact.

The EU-EECA policy dialogue activities such as the series of Policy Stakeholder Conferences or the IncoNet type projects supported by the EU Commission could be

further exploited for an increased coordination among policy makers at sub-regional level, since they provide the frame and means for such coordination as well as for mutual learning with STI policy makers in the EU.

Good practice example:

- The Nordic Council of Ministers for Education and Research consisting of Norway, Sweden, Finland, Denmark, Iceland, Greenland, Faroe Island (<http://www.norden.org/en/nordic-council-of-ministers/councils-of-ministers/nordic-council-of-ministers-for-education-and-research-mr-u/>).

In addition, it is advised that the scientific communities in EECA foster networking at sub-regional level in order to address more efficiently the EU STI community.

A stronger networking of the scientific communities in similar fields of science in the EECA sub-regions will increase the capacities and the visibility of such communities as well as the weight of their requests in terms of priorities and tools to be included in the cooperation with the EU. It will also contribute to the exchange of good practices among scientists acting in similar environments and to a better utilization of resources (facilities, bibliography, etc.).

The EU Member States encouraged the networking of their scientific communities through e.g. the COST Programme⁷¹. Similar schemes and Programmes could possibly be developed at regional or sub-regional level in EECA countries.

Recommendation 41:

Building regional centres of excellence through ENPI/DCI

It is recommended to the national policy stakeholders, to the academic communities and to the relevant authorities in the EU to investigate the possibility of building regional centres of excellence using ENPI/DCI funds.

Building regional or sub-regional centres of excellence (of research facilities) presents several advantages: reduction of fragmentation in terms of human resources, funds and effort, better visibility of the centre, contribution to networking and to spreading knowledge, etc. In addition to very large well known centres (such as CERN, Dubna, ITER, etc.), many others of medium to large size exist (synchrotron facilities, metrological institutes, etc.).

⁷¹ COST Programme: European Cooperation in the field of Science and Technology (www.cost.esf.org)

Despite the obvious difficulties when planning such regional centres, the numerous benefits from the establishment of such a centre make the exploration of this possibility a challenging goal for the EECA region or sub-regions. The regional/multilateral part of ENPI and DCI constitute a privileged source of funds to use.

The EU-EECA policy dialogue activities such as the series of Policy Stakeholder Conferences or the IncoNet type projects supported by the EU Commission can provide the frame for examining the possibility to create a regional centre of excellence and can also contribute to the transfer of knowledge that exists in the EU Member States for the establishment of such centres.

Good practice examples:

- The Nordic Institute for Theoretical Physics – NORDITA (<http://www.nordita.org/institute/index.php>).
- The Nordic Vulcanological Centre – NORDVULK (<http://www.norden.org/en/nordic-council-of-ministers/councils-of-ministers/nordic-council-of-ministers-for-education-and-research-mr-u/institutions-co-operative-bodies-and-working-groups/co-operative-bodies/nordic-volcanological-center-nordvulk>).



4. Short-term Implementation Scenario

Building on the variety of recommendations given in Chapter 3 and on available mechanisms which could be utilized for their implementation, a first approach to a short-term implementation scenario is proposed for further consideration by different stakeholders in the EU and EECA. Here, particular emphasis is given to existing programmes like the EU RTD Framework Programme, the European Neighbourhood Policy Instrument (ENPI) and the Development Cooperation Instrument (DCI) as well as to ongoing and planned projects such as the INCO-NET, BILAT and ERA-NET schemes.

The following stakeholders are specifically addressed:

- national STI policy stakeholders as well as their implementing agencies
- science and innovation communities (funding agencies, research performing organisations, corporate sector) under their own responsibilities
- the European Commission with emphasis on Directorate General for Research and Innovation and Directorate General for External Relations
- the European External Relation Service
- the European Strategic Forum for International Cooperation (in Science and Technological Development).

As an overarching element of this implementation scenario it is proposed to interested STI policy stakeholders in EU Member States and EECA countries to develop a medium-term joint roadmap for enhanced STI cooperation to be built with the common goal of mutual benefit and to be implemented in partnership through joint instruments. In this regard, the European Strategic Forum for International Cooperation (SFIC) might play a distinguished role by launching a new SFIC-Pilot Activity thus inviting EECA partner countries to join the dialogue and monitor upcoming activities. The process of developing a joint roadmap needs to allow for wider stakeholder consultations in particular with the science community and the private sector in both regions. In addition, cross-sector policy coordination should be built in to properly embed STI policy in comprehensive governmental strategies at transnational level tackling societal and global challenges.

In the short-term it is proposed to

National STI policy stakeholders in the EU and EECA

- to proceed with the policy stakeholder conferences as a tool for mutual learning, joint agenda setting as well as wider stakeholder dialogues with the

science community, the private sector and the civil society as they are facilitated through the IncoNets EECA and CA/SC, while shaping the format and the topics to be addressed according to the respective needs and interests of both regions (see recommendations 7, 10 etc.);

- to fully introduce and further advance reliable and internationally comparable STI statistics at a national level as well as further strengthen the capacities of national statistical offices building on respective analysis, training workshops and recommendations undertaken within the IncoNets EECA and CA/SC (see recommendation 1);
- to jointly plan and implement international STI Policy Mix Reviews for interested EECA countries as mutual learning exercise between the EU and EECA countries building on respective pilot cases which might be supported by the IncoNet EECA and CA/SC (see recommendation 3);
- to advance the framework for international STI cooperation assuring at the same time reciprocity through the targeted opening of national STI programmes for foreign institutions from either the EECA or the EU without or with funding (see recommendation 8);
- to learn lessons from the various policy approaches of EU and EECA countries addressing societal and global challenges in order to enhance national strategies building on analytical activities as well as on mutual learning events implemented by the INCO-NETs EECA and CASC (see recommendation 10);
- to set up systematic assessment procedures of national STI institutions as a mutual EU-EECA learning exercise by sharing good practices already in place in several EU Member States (see recommendation 17);
- to systematically involve the private sector in the national as well as bilateral/regional EU-EECA STI policy dialogue, in order to explore the needs and expectations of this sector and to create awareness of the benefits of its cooperation with the academic community (see recommendation 32);
- to assess and advance the national support structures for European and international STI cooperation building on existing good practice in the EU Member States and utilizing mutual learning and partnership arrangements (see recommendation 15);
- to take advantage of the coordination of national programmes in the EU and the EECA for setting up targeted bilateral or multilateral innovation programmes utilizing among others the ERA-NET

scheme as well as future INCO-NETs and BILATs funded via the EU RTD Framework Programme while building on lessons learnt from the 2011 innovation call facilitated through ERA.Net RUS (see recommendation 8 and 36);

- to further simplify the issuing of visas for scientists, both in legal and practical terms (see recommendation 28).

Decision makers representing the science community in the EU and the EECA

- to prepare and implement joint evaluation and benchmarking exercises of similar volunteering research institutions in several EECA countries, based on internationally accepted standards and procedures, which can be prepared and implemented in the frame of ongoing future FP7 INCO-NET type projects such as IncoNet EECA and CA/SC (see recommendation 17).

Decision makers representing the private sector in the EU and EECA

- to take appropriate action to involve the private sector of EECA in EU initiatives such as Knowledge and Innovation Communities and Joint Technology Initiatives (see recommendation 33).

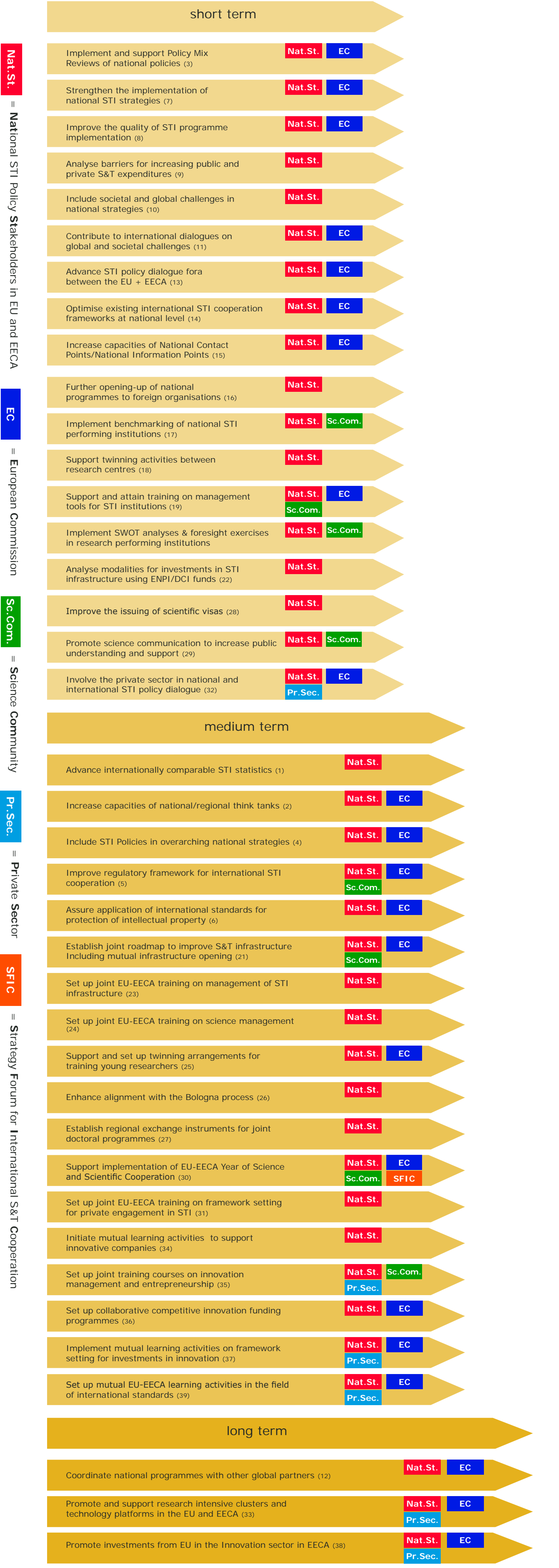
The European Commission

- to continue supporting policy stakeholder conferences as a tool for mutual learning, joint agenda setting as well as wider stakeholder dialogues with the science community, the private sector and the civil society as they are facilitated through the IncoNet scheme;
- to support through the IncoNet scheme the planning and implementation of international STI Policy Mix Reviews for interested EECA countries as a mutual learning exercise between the EU and EECA countries by funding respective pilot cases (see recommendation 3);
- to allow for Coordination and Support Activities within the EU RTD Framework Programme in order to provide
 - › room for mutual learning on good practice of national strategies and implementation instruments for international cooperation (see recommendation 14);
 - › a methodological and organisational framework for joint evaluation and benchmarking exercises for volunteering research institutions (see recommendation 17);
 - › assistance for assessing and advancing the national support structures for European STI cooperation building on existing good practice in the EU Member States (see recommendation 15);
 - › tools for the coordination of national programme owners in the EU and EECA for setting-up joint innovation programmes utilizing in particular the ERA-NET scheme as well as future INCO-NETs and BILATs while building on lessons learnt from the 2011 innovation call facilitated through ERA.Net RUS (see recommendation 36);
 - › to allow for dedicated activities within the European Neighbourhood Policy Instrument and the Development Cooperation Instruments in partnership with policy stakeholders in EECA in order to provide
 - › room for twinning arrangements of EU and EECA institutions supporting systematic assessment procedures of national STI institutions as a mutual learning exercise and as a way to share the good practices already in place in several EU Member States (see recommendation 17);
 - › room for twinning arrangements of relevant ministries and national STI administrations in the EU and EECA allowing the sharing of good practice of developing and implementing national STI strategies (see recommendation 7);
 - › assistance for assessing and advancing the national support structures for European STI cooperation building on existing good practice in the EU Member States (see recommendation 15);
- to systematically involve the private sector in the bi-regional EU-EECA STI policy dialogue, in order to explore the needs and expectations of this sector and to create awareness of the benefits of its cooperation with the academic community (see recommendation 32);
- to open up EU initiatives such as Knowledge and Innovation Communities, Joint Technology Initiatives and Technology Platforms to the private sector from EECA utilizing among others the potential of Coordination and Support Activities (such as present and future INCO-NETs and BILATs) (see recommendation 33).

Graph 1 “Joint Implementation Roadmap” illustrates the tentative joint implementation plan on a short-, medium- and long-term basis;

Graph 2 “White Paper Impact Assessment” depicts the qualitative impact analysis of every recommendation of the White Paper.

Graph 1: Joint Implementation Roadmap



Graph 2: White Paper Impact Assessment

<div>Impact on: Impact expected to be</div> <div>HighMediumLow</div>	National Research Performance	Human Resources for Research	Innovation Potential	Strengthening Participation in FP 7 / Horizon 2020	Addressing Global Challenges	Employment (general)	Growth
Recommendation							
Adjusting and Implementing Policy Strategies							
1. Advancing national STI statistics - strengthening national statistics offices and raising capacities of staff	High	Medium	Medium	Low	Low	Low	Low
2. Increase capacities of national think tanks to inform and advise policy	High	Medium	High	High	Medium	Low	Low
3. Implement strategic policy mix reviews of national policies	High	High	High	Medium	Medium	Low	Low
4. Strengthening comprehensive knowledge-based cross-sectoral policy approaches at governmental level	High	Low	High	Low	High	Medium	Medium
5. Raising awareness and communicating good practice of regulatory frameworks stimulating international STI cooperation and fostering ethical standards for conducting research at national level.	High	Medium	Medium	High	Low	Low	Low
6. Assess and – if appropriate – advance the national regulatory framework for the protection and utilisation of intellectual property according to international standards.	High	Medium	High	Medium	Low	Low	Low
7. Strengthening the implementation of national STI strategies through mutual learning of policy makers and STI administrations	High	Medium	Medium	Medium	Medium	Low	Low
8. Improve the quality of programme implementation through systematic evaluation and benchmarking according to international standards.	High	High	Medium	Medium	Low	Low	Medium
9. Analyse the barriers for increasing public and private S&T expenditures	High	Medium	Medium	Low	Low	Medium	Low
10. Foster mutual learning and training of policy stakeholders in EU and EECA on how to address global and societal challenges.	High	Medium	Low	Low	High	Low	Medium
11. Contribute to international dialogue processes as well as to the international knowledge base on societal and global challenges.	Medium	Medium	Low	Low	High	Low	Low
12. Foster the international coordination of programmes addressing societal and global challenges beyond EU and EECA.	Medium	Medium	Low	Low	High	Low	Low
13. Advance functional STI policy dialogue fora between the EU and EECA countries	High	Medium	Medium	Medium	Medium	Low	Medium
14. Optimising existing international STI cooperation frameworks at national level through mutual learning of policy stakeholders	High	Medium	Low	High	Medium	Low	Low
15. Increase capacities of National Information Points and National Contact Points for the EU RTD Framework Programme and for international cooperation in general terms	High	High	Medium	High	Medium	Low	Low
16. Increasing efficiency of national programmes through opening-up to foreign organisations and through trans-national coordination	High	High	Medium	Low	Low	Low	Low
Strengthening Research Conducting Institutions							
17. Prepare and implement joint benchmarking exercises as well as systematic assessment procedures of research conducting institutions	High	High	Medium	Medium	Low	Low	Low
18. Twinning activities between research centres or institutes	High	High	Medium	Medium	Low	Low	Low
19. Training on institutional management tools	High	High	Medium	Medium	Low	Low	Low
20. Implement SWOT analyses, BSC approaches and foresight exercises in the research performing institutions	High	Medium	Medium	Medium	Low	Low	Low
21. Establishing a joint roadmap on improving existing S&T infrastructures and jointly building new ones in EECA, as well as on the mutual opening of infrastructures in both EU and EECA	High	Medium	Low	Medium	Low	Low	Low
22. Exploiting options for utilising ENPI/DCI funds for investing in STI infrastructure	High	Medium	High	Low	Medium	Low	Medium
23. Joint training in managing S&T infrastructures	High	Medium	Low	Medium	Low	Low	Low
Strengthening Human Resources							
24. Setting up joint training activities on science management	High	High	Medium	Medium	Low	Low	Low
25. Setting up twinning arrangements for training young researchers	High	High	Medium	Medium	Low	Low	Low
26. Enhanced alignment with the Bologna process through practical activities which support international scientific education schemes and a balanced student and researcher mobility	High	High	Low	Medium	Low	Low	Low
27. Establishment of a regional exchange instrument for joint doctoral programmes	High	High	Low	Low	Low	Low	Low
28. Further facilitate the issuing of scientific visas	High	High	Low	Low	Low	Low	Low
29. Promotion of science communication to increase public understanding and support including aspects of international S&T cooperation to tackle regional and global challenges	Medium	Medium	Low	Low	Low	Low	Low
30. Implementing an EU-EECA Year of Science and Scientific Cooperation to communicate science to society and the benefits of bi-regional cooperation	Medium	Low	Low	Low	Low	Low	Low
Strengthening the Role of the Private Sector							
31. Initiate mutual learning activities on framework setting for private engagement in STI	High	Medium	High	Low	Low	Medium	Medium
32. Involving the private sector in a national and international STI policy dialogue	Medium	Medium	Medium	Medium	Low	Medium	Medium
33. Promoting the link between state-of-the art EU initiatives such as research intensive clusters and technology platforms with similar structures in EECA and enhancing the participation of private companies from EECA in these structures	High	Low	High	Medium	Low	Medium	Medium
34. Initiate mutual learning activities focusing on best practice examples, in particular in the transition economies in the newer EU Member States	Medium	Medium	High	Low	Low	Medium	Medium
35. Setting up joint training courses on innovation management and entrepreneurship	High	Medium	High	Low	Low	Medium	Medium
36. Setting up collaborative competitive innovation funding programmes	High	Medium	High	Medium	Low	Low	Low
37. Implementing mutual learning activities on framework setting for investments in innovation	Medium	Low	High	Low	Low	Medium	Medium
38. Promoting and encouraging investments from EU in the innovation sector in EECA	Medium	Low	High	Low	Low	Medium	Medium
39. Initiate mutual learning activities in the field of international standards	Low	Low	High	Low	Low	Low	Medium
Strengthening sub-regional Cooperation							
40. Foster networking of STI policy makers and researchers in EECA sub-regions to increase critical mass and efficiency when addressing the European STI community	Medium	Medium	Low	Medium	Low	Low	Low
41. Building regional centres of excellence through ENPI/DCI	High	High	Medium	Medium	Low	Medium	Medium