



Ministry of Environment and
Physical Planning

Chapter

Research and Innovation, Innovation and Transfer of Technology within the Third National Communication on Climate Change

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It is anticipated that this report, covering the findings, conclusions and recommendations of the national consultant will be considered by respective stakeholders during discussions with regard to the preparation Third National Communication on Climate Change progress.

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List of Abbreviations

CC	- Climate Change
UNFCCC	- United Nation Climate Change
MOEPP	- Ministry of Environment and Physical Planning
UNDP	- United Nations Development Program
GEF	- Global Environmental Facilities
FP	- Framework Program
COST	- European Cooperation in Science and Technology
ESSEM	- Earth System Science and Environmental Management
ERA	- European Research Area
FP	- Full Size Project
MSP	- Medium Size Project
EA	- Enabling Activities

Objectives, methodology and preparation process

In the framework of this report, a comprehensive assessment of the research, development, innovation and technology transfer related to climate change in Republic of Macedonia has been presented. The review and the assessment of the current national state of the R&D, Innovation and TT, as well as the review of the implemented and on-going projects has provided specific recommendations for policy development, institutional setup, as well as financing possibilities to ensure the effectiveness of the Climate Change related activities in country. The overall objective of the report is to conduct a comprehensive assessment of the research, development, innovation and technology transfer related to climate change in Republic of Macedonia. Based on the survey and the assessment, main facts will be given the chapter related to Research, Development and Innovation (RDI) and Transfer of Technology (TT) within the Third National Communication on climate change and also some recommendations will be provide how to catalyse the development of the country by using these facilitative tools (RDI and TT) for action on mitigation and adaptation related to climate change

In this chapter, the consultant has provided quantitative and qualitative information's wherever possible based on the status of the outputs in the Project at the time of the reporting. The report is as evidence – based as possible within the time available in order to substantiate the findings and, moreover, to enable practical recommendations to be proposed on the basis of these findings.

The report was based on the documents available at the time which had been developed as much as possible.

Methodology of the work includes:

- Analysis and summary of the possibilities and requirements under the UNFCCC Technology Mechanism.
- Overview of possibilities to be financed through UNFCCC Technology Mechanism eligible for our country
- Analysis of the possibilities for using other applicable mechanisms related to climate change research, development, innovation and technology transfer (i.e. EU Mechanisms, Joint Research Center) and related funds (i.e. Joint technology initiative, FP7)
- Assessment of the baseline (state of the art) in the country related to climate change research, development, innovation and technology transfer in terms of existing:
 - institutional set-up (Government and University level)
 - strategies
 - legal framework
- Recommendations for possible measures in order to enhance the enabling environment for research, development, innovation and transfer of technologies in the country to pursue their objectives for sustainable development in a climate-friendly manner
- Information on governmental budget allocations for climate change research, development, innovation and technology transfer.
- Identification best practices in the country related to climate change research, development, innovation and technology transfer (experience, benefit and lessons learned)

1. UNFCCC and the Technology Transfer Initiative

In 1992, countries joined an international treaty, the United Nations Framework Convention on Climate Change, to cooperatively consider what they could do to limit average global temperature increases and the resulting climate change, and to cope with whatever impacts were, by then, inevitable. After the negotiations to strengthen the global response to climate change in 1997 the Kyoto Protocol was adopted. The Kyoto Protocol legally binds developed countries to emission reduction targets. The Protocol's first commitment period started in 2008 and ended in 2012. The second commitment period began on 1 January 2013 and will end in 2020.

Republic of Macedonia ratified the Kyoto Protocol in 2004. As a developing country Republic of Macedonia doesn't have binding targets under the Kyoto Protocol, but it still has a commitment under the treaty to reduce their emissions. Under the Protocol, emissions of developing countries are allowed to grow in accordance with their development needs.

The general actions taken by developed and developing countries to reduce emissions include support for renewable energy, improving energy efficiency, and reducing deforestation. All these actions necessary to reduce the human impact of the environment and climate change come from all disciplines and fields connected to research, development and technology..

The United Nations Framework Convention on Climate Change stipulates that all Parties are to promote and cooperate in developing, applying and diffusing, including transferring technologies, practices and processes that control, reduce or prevent certain anthropogenic emissions of GHGs in all relevant sectors. At each session of the Conference of the Parties, Parties have taken decisions on the development and transfer of environmentally sound technologies (ESTs). These decisions have laid down specific actions to be undertaken by Parties, the subsidiary bodies, the Expert Group on Technology Transfer, the Technology Executive Committee and the secretariat to promote the development and transfer of ESTs. The Article 4.5 of the Convention urges developed country Parties and Annex II Parties to take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly to developing countries, to enable them to implement the provisions of the Convention. The extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology (Article 4.7).

Republic of Macedonia as non-Annex 1 country is eligible for usage of the Technology Transfer Framework themes and financing mechanisms for technology transfer. The TT framework gives many financing options for introduction of the world's state of the art research, development and technology transfer in the country.

1.1. Technology Transfer under the UNFCCC

The Technology Mechanism, as an instrument for transfer of technology and technological and institutional development between the member states of the UNFCCC convention was established in 2010. The technology transfer mechanism missions is to facilitate the implementation of enhanced action on technology development and transfer to support action on mitigation and adaptation in order to achieve the full implementation of the Convention. The Technology Mechanism is under the guidance of and accountable to the COP, and consists of the following two provisional bodies:

- A Technology Executive Committee; and
- A Climate Technology Centre and Network.

The Conference of the Parties invited Parties to nominate their national designated entities (NDEs) for the development and transfer of technologies, pursuant to in order to facilitate the operationalization of the Climate Technology Centre and Network (CTCN).

The NDEs serve as national bodies in charged for the development and transfer of technologies and as focal points for interacting with the Climate Technology Centre regarding requests from developing country Parties about their technology needs.

The assessment of the national circumstances of Republic of Macedonia showed that the country hasn't nominated NDE responsible for Transfer of Technologies, and consequently there is no Macedonian representative in the CTCN committee. Without a designated NDE for TT the country is not introduced with the activities and decisions from the CTCN committee and the Technology Mechanism, as well as is not eligible for seeking support for implementation of projects connected to TT, R&D and Innovation. Since the Ministry of Environment and Physical Planning is a key national institution that is dealing with the Climate Change issues, it is recommended that this Ministry is also nominated as NDE responsible for Transfer of Technologies in the country.

1.2. Technology Transfer Framework

The Technology Transfer Framework aims to develop actions to implement Article 4.5 of the Convention by increasing and improving the transfer of environmentally sound technologies and know-how.

The framework is consisted of five key themes that provide uniformed, systematic and efficient structure for technology transfer

- Capacity Building

The purpose of capacity building under the framework is to strengthen the capacities of Parties other than developed country Parties, to promote the widespread dissemination, application and development of environmentally sound technologies and know-how and to enable the developing countries to implement the provisions of the Convention. The capacity building process seeks to build, develop, strengthen, enhance and improve existing scientific and technical skills, capabilities and institutions in developing countries, in order to enable them to assess, adapt, manage and develop technologies.

- Enabling Environments

The enabling environments component of the framework focuses on government actions, such as fair trade policies, removal of technical, legal and administrative barriers to technology transfer, sound economic policy, regulatory frameworks and transparency, all of which create an environment conducive to private and public sector technology transfer. The ultimate focus on this component is to improve the effectiveness of the transfer of environmentally sound technologies by identifying and analyzing ways of

facilitating the transfer of environmentally sound technologies, including the identification and removal of barriers at each stage of the process.

- Mechanisms for Technology Transfer

Mechanisms for Technology Transfer theme is consisted of four sub-themes:

- Innovative Financing
- International Cooperation
- Endogenous Development of Technologies
- Collaborative Research and Development

Mechanisms for technology transfer are to facilitate the support of financial, institutional and methodological activities in order to enhance the coordination of the full range of stakeholders in different countries and regions, to engage cooperative efforts to accelerate the development and diffusion, including transfer, of technologies, know-how and practices to and between countries through technology cooperation and partnerships and to facilitate the development of projects and programs.

- Technology Information

The technology information component serves to establish an efficient information system in support of technology transfer and to improve the generation and flow of, access to, and quality of technical, economic, environmental and regulatory information relating to the development and transfer of ESTs under the Convention. This component of the framework defines the means, including hardware, software and networking, to facilitate the flow of information between the different stakeholders to enhance the development and transfer of technologies.

- Technology needs assessments (TNAs)

Technology needs assessments (TNAs) are a set of country-driven activities that identify and determine the mitigation and adaptation technology priorities of developing country. The determination of the priorities is considered to be done through involvement of different stakeholders in a consultative process of identification of barriers to technology transfer, in order to address soft and hard technologies, such as mitigation and adaptation technologies, identify regulatory options and develop fiscal and financial incentives and capacity-building.

The Expert Group on Technology Transfer has collaborated with the Global Environment Facility (GEF), the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP) and Climate Technology Initiative (CTI) on providing technical assistance to non-Annex I Parties to conduct technology needs assessments (TNAs). The secretariat has published two synthesis reports on technology needs identified by non-Annex I Parties, which highlight priority technology needs identified in various sectors to reduce greenhouse gas emissions and facilitate adaptation to the adverse impacts of climate change. They also draw attention to specific barriers to technology transfer and suggest measures to address them.

In April 2004 Republic of Macedonia submitted its TNA report with the title “Evaluation of Technology Needs for GHG Abatement in the Energy Sector”. This assessment was prepared by the Ministry of Environment and Physical Planning of R. Macedonia (MoEPP) and was supported by UNDP-GEF’s within the project “Expedited Financing of Climate Change Enabling Activities”.

Updated Handbook for Conducting Technology Needs Assessments

The updated Handbook for Conducting Technology Needs Assessments was developed in 2010, as a response to the request from the UNFCCC COP Decision. The handbook was jointly prepared by the UNDP and the UNFCCC Secretariat, with the support of the Expert Group on Technology Transfer and in cooperation with the Climate Technology Initiative.

The UNFCCC latest handbook on conducting technology needs assessment for climate change is designed to assist countries in making informed decisions on their technology choices. Building on lessons learned from earlier TNA efforts over the past decade, it offers a systematic approach for conducting technology needs assessments in order to identify, evaluate and prioritize technological means for both mitigation and adaptation. It also provides processes and methodologies for uncovering gaps in enabling frameworks and capacities and for formulating a national action plan to overcome them, as part of overall climate change strategies and plans such as NAMAs and NAPAs. The key steps of the process of conducting TNAs, envisioned by this handbook, are depicted in the following graphic.

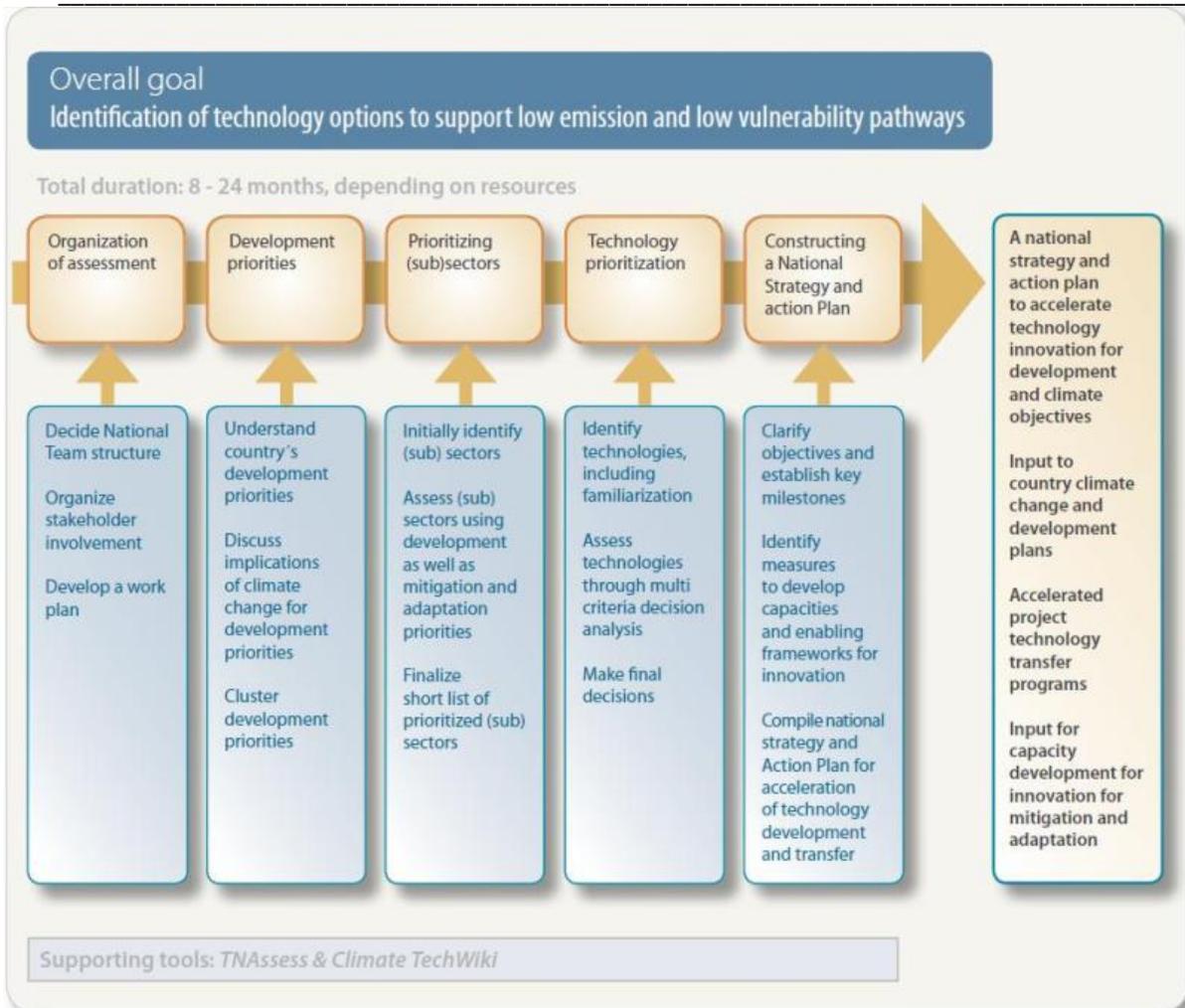


Figure 1.1 Pattern for preparation of National Technology Transfer strategy and action plan (source: UNDP TNA Handbook, 2010)

2. Financial Support for Implementation

Support for technology transfer activities under the Convention takes place at the bilateral and multilateral levels.

2.1. Multilateral support through the financial mechanism

The financial mechanism of the Convention was established to provide financial resources on a grant or concessional basis to assist developing country Parties implement the Convention, including for the transfer of technology.

Recently the UNFCCC on its official webpage www.unfccc.org has established the technology portal of TT:CLEAR. The portal is designated to serve as a technology brief or technology roadmap on a climate change related technology implemented by the UNFCCC TT framework worldwide. There are two operating entities of the financial mechanism:

- Global Environment Facility (GEF)
- Green Climate Fund

2.1.1. Global Environment Facility (GEF)

The Global Environment Facility (GEF) was established in 1991 as the financial mechanism of the main multilateral environmental agreements. Currently, the GEF is the largest public funder worldwide of projects aiming to generate global environmental benefits, while supporting national sustainable development initiatives. The GEF has allocated US\$10.5 billion, supplemented by more than US\$51 billion in co-financing for over 2,700 projects.

Additionally, through its Small Grants Programme (SGP), the GEF has also made available more than 14,000 small grants directly to civil society organizations totaling US\$634 million. The GEF unites 182 member governments - in partnership with international institutions, civil society organizations, and the private sector- and its resources go directly to developing countries for projects related to biodiversity, climate change, international waters, land degradation, persistent organic pollutants, and the ozone layer (the last concerning only countries with economies in transition).

The Global Environment Facility (GEF) supports technology transfer activities through:

- **The climate change mitigation programme of the GEF Trust Fund**

The GEF-5 Climate Change Mitigation Strategy Document promotes a broad portfolio of environmentally sound, climate-friendly technologies that will achieve large GHG reductions in GEF-recipient countries in accordance with national circumstances. GEF support involves a combination of technology push and market pull interventions; as well as the various stages of technology development in the innovation chain, from demonstration of innovative, emerging, low-carbon technologies to diffusion of commercially-proven, ESTs and practices. The GEF-5 Strategy on Technology Transfer endeavors to exert a transformative impact in helping GEF-recipient countries to move along a low-carbon development path through investment in, and market transformation of, ESTs.

- **The technology transfer window (SCCF-B) of the Special Climate Change Fund**

The Special Climate Change Fund (SCCF) was established to support adaptation and technology transfer in all developing country parties to the UNFCCC.

- **The Poznan strategic programme on technology transfer**

Through the Poznan Strategic Programme, the GEF provides funding for:

- Technology needs assessments (TNAs);
- Implementing technology transfer pilot projects;
- Disseminating GEF experience and successfully demonstrated ESTs.

Progress achieved under the Poznan Strategic Program on Technology Transfer, particularly in the development of pilot projects and TNAs, has highlighted the need to go beyond current practices to

catalyze investments in technology transfer. At the 16th session of the Conference of the Parties to the UNFCCC, the parties requested the GEF to consider the long-term implementation of the strategic program. The GEF Secretariat has established the following elements to increase the investment in ESTs in developing countries and to enhance technology transfer activities under the Convention.

- Support for Climate Technology Centers and a Climate Technology Network

GEF is well positioned and ready to support technology centers and networks at the global, regional, and national levels. In December 2011, a regional pilot project titled Pilot Asia-Pacific Climate Technology Network and Finance Center was submitted by Asian Development Bank (ADB) and UNEP for CEO endorsement and is undergoing revision.

-Piloting Priority Technology Projects to Foster Innovation and Investments

The GEF will step up its efforts in promoting the demonstration, deployment and transfer of technologies for both mitigation and adaptation. For mitigation, the GEF will target piloting of low-carbon, innovative options as well as projects for wider deployment and diffusion of commercially viable technologies. In order to further enhance adaptation-relevant technology transfer, the GEF plans to launch the Adaptation Technology Transfer Program under its Long-Term Program, subject to donor contributions to Window B of the SCCF.

Global, regional and country specific projects are approved to promote the demonstration, deployment, and transfer of innovative low-carbon technologies. In addition, a number of projects that address market transformation in energy efficiency, investments in renewable energy, low-carbon transport urban systems, and conservation and enhancement of carbon stocks through sustainable management of land use, land-use change, and forestry have been approved.

-Public-Private Partnership (PPP) for Technology Transfer

PPP Programs aims to support businesses that seek to commercialize or scale-up ESTs in developing countries. The GEF Council approved the private sector strategy in November 2011. The GEF Secretariat has developed operational modalities for the private sector engagement.

Technology Needs Assessment (TNAs)

The GEF is funding the preparations and updating of TNAs, especially for countries that have not been supported for TNAs from GEF-4, in accordance with the Convention guidance. GEF is ready to support additional TNAs focusing on small and medium income countries, taking into consideration the lessons learned from the ongoing Poznan-supported TNA projects.

GEF as a Catalytic Supporting Institution for Technology Transfer

GEF participated in key international discussions to support the development of technology transfer initiatives.

2.1.2. Green Climate Fund - upcoming

The Green Climate Fund is still not operative in terms of financing opportunities and mechanisms, but it is foreseen that it will be fully constituted and operative in 2014. The main objective of the constitution of the Green Climate Fund is to make a significant and ambitious contribution to the global efforts towards attaining the goals set by the international community to combat climate change.

The Green Climate Fund was designated as an operating entity of the financial mechanism of the UNFCCC, in accordance with Article 11 of the Convention. Arrangements will be concluded between the Conference of the Parties (COP) and the Fund to ensure that it is accountable to and functions under the guidance of the COP. The Green Climate Fund will support projects, programmes, policies and other activities in developing country Parties using thematic funding windows. It is intended to be the centerpiece of efforts to raise Climate Finance of \$100 billion a year by 2020. This is not an official figure for the size of the Fund itself, however. Disputes also remain as to whether the funding target will be based on public sources, or whether "leveraged" private finance will be counted towards the total. Only a fraction of this sum had been pledged as of July 2013, mostly to cover start-up costs.

The Green Climate Fund has flexibility in relation to the sources and forms in which it can receive financial inputs. As the Fund evolves, this flexibility should allow for innovation and ambition in the Fund's resource mobilization strategy, financial inputs and financial instruments.

The Fund will contribute to the achievement of the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC). In the context of sustainable development, the Fund will promote the paradigm shift towards low-emission and climate-resilient development pathways by providing support to developing countries to limit or reduce their greenhouse gas emissions and to adapt to the impacts of climate change, taking into account the needs of those developing countries particularly vulnerable to the adverse effects of climate change.

Recognizing the need to facilitate the immediate functioning of the Green Climate Fund and ensure its independence, the COP requested the UNFCCC Secretariat jointly with the Global Environment Facility (GEF) Secretariat to take the necessary administrative steps to set up the Interim Secretariat of the Green Climate Fund as an autonomous unit within the UNFCCC secretariat premises after the seventeenth session of the COP so that the Interim Secretariat can provide technical, administrative and logistical support to the Board until the independent Secretariat of the Green Climate Fund is established. The Interim Secretariat is fully accountable to the Board and functions under its guidance and authority.

2.2. Bilateral Support

Article 4.5 of the Convention urges developed country Parties and Annex II Parties to take all practical steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly to developing countries, to enable them to implement the Convention.

Annex II Parties provide information in their National Communications on practicable steps taken with respect to technology transfer activities. In reporting their technology transfer activities in their fifth National Communications, many Annex II Parties differentiated between activities undertaken at the bilateral level and activities undertaken at the multilateral level.

The majority of the activities relating to technology transfer targeted mitigation and involved technology transfer in the energy sector, in particular related to the deployment and diffusion of renewable energy and energy efficiency technologies. Most of the programmes and projects reported by Annex II Parties were implemented in Africa and Asia and the Pacific.

2.3. EU Mechanisms

Starting from 1st of January 2014, all the EU mechanism, programmes and opportunities for financial support of the research, innovation and technology transfers as well as for the other social and cultural

fields will be under the umbrella of HORIZON 2020. At the moment, the FP7 Office at the Ministry of Education and Science is working on the preparation of Republic of Macedonia for the HORIZON 2020.

- **Horizon 2020 – upcoming**

The Horizon 2020 is the financial instrument implementing the Innovation Union. Running from 2014 to 2020 with an €80 billion budget, the EU's new programme for research and innovation is part of the drive to create new growth and jobs in Europe.

Currently, the European Union has two key funding opportunities to support research, innovation and technology transfer projects for the countries in the pre-accession phase as R. Macedonia:

- **Research Framework Programme (FP7)**

The Seventh Framework Programme for Research and Technological Development is the EU's main instrument for funding research activities and programmes.

- **Competitiveness and Innovation Framework Programme (CIP)**

The Competitiveness and Innovation Framework Programme (CIP) supports innovation activities (including eco-innovation), provides better access to finance and delivers business support services in the regions. The CIP runs from 2007 to 2013 with an overall budget of € 3621 million. The CIP is divided into three operational programmes: Each programme has its specific objectives, aimed at contributing to the competitiveness of enterprises and their innovative capacity in their own areas, such as ICT or sustainable energy:

- The Entrepreneurship and Innovation Programme (EIP)
- The Information Communication Technologies Policy Support Programme (ICT-PSP)
- The Intelligent Energy Europe Programme (IEE)

In the frame of CIP-IEE, there is an on-going action STEER which provides funding for the projects promoting renewable energy in transports.

The main office for the CIP programme for Republic of Macedonia is located at the Economic Chamber of Macedonia.

Starting from 01.01.2014, CIP programme will be replaced with COSME - Programme for the Competitiveness of enterprises and SMEs (COSME) 2014-2020

The new Programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises (COSME) will run from 2014 to 2020, with a planned budget of €2.3 billion (current prices).

The main objectives of the COSME programme will be:

facilitating access to finance for Small and Medium-sized Enterprises (SMEs)

- ❖ creating an environment favorable to business creation and growth
- ❖ encouraging an entrepreneurial culture in Europe
- ❖ increasing the sustainable competitiveness of EU companies
- ❖ helping small businesses operate outside their home countries and improving their access to markets

COSME will:

- ❖ ensure continuity with initiatives and actions already undertaken under the Entrepreneurship and Innovation Programme (EIP), such as the Enterprise Europe Network, building on results and lessons learnt.
- ❖ continue the many successful features of the EIP, while simplifying management of the programme to make it easier for entrepreneurs and small businesses to benefit.

- ❖ support, complement and help coordinate actions by EU member countries. COSME will specifically tackle transnational issues that – thanks to economies of scale and the demonstration effect – can be more effectively addressed at European level.

Main beneficiaries

- Existing entrepreneurs (small businesses in particular) – easier access to funding for development, consolidation and growth of their business.
- Future entrepreneurs (including young people) – assistance in setting up their own business.
- National, regional and local authorities – tools for effectively reforming policy: reliable, EU wide data and statistics, best practice and financial support to test and scale up sustainable solutions for improving global competitiveness.

Access to finance will be easier for entrepreneurs, in particular those willing to launch cross-border activities, resulting in an expected annual increase of €3.5billion in additional lending and/or investment for EU companies.

The Macedonian Office of The Enterprise Europe Network is located at the University Ss Cyril and Methodius in Skopje.

Additionally the EU Commission has established few more side mechanisms for scientific, technical and financial support for development to the EU member states and the countries in pre assessing phase:

- **IPA** - Beneficiary countries have very different funding needs. IPA is designed to meet these different needs flexibly, and provide a tailor-made funding solution through the following channels (known as "components"): Transition Assistance and Institution Building – for institution building measures and associated investments. Supports the transition to a democratic society and market economy. Helps strengthen democratic institutions, administrative & judicial capacity, and civil society.

- Cross-Border Cooperation (CBC) – for cross-border cooperation between the enlargement countries; or between them and EU countries. Essential for promoting good neighborly relations and regional cooperation and working towards a sustainable economic, social and territorial development of border regions. Prepares the countries for managing the Structural Funds, once they become EU members.
- Regional Development – for investment in transport, environment and economic cohesion, and associated technical assistance. Participating in such programmes should help beneficiary countries to use EU regional funding more effectively once it becomes available (after they become EU member states).
- Human Resources Development – supports the development of human capital and helps reduce social exclusion. IPA assistance in this area contributes to improving work skills, creating more and better jobs, and increasing social inclusion and equality.
- Rural Development – contributes to sustainable rural development. Assistance for restructuring agriculture and adapting it to EU standards.

- The **Joint Research Centre (JRC)** provides customer-driven scientific and technical support to the conception, development, implementation and monitoring of EU policies. As the research ‘arm’ of the

European Commission, the JRC is a reference center for science and technology issues that serves the interests of the Member States while at the same time remaining independent of special interests. Under its Enlargement and Integration Action (E&IA), the JRC provides scientific and technical support to Candidate countries for EU accession. It supports the transfer of the *acquis communautaire* to national legislation, and facilitates scientific and technical exchanges. The JRC promotes close cooperation through a wide range of expert exchange possibilities, such as job opportunities, workshops, training courses and research projects. They currently work together on three Framework Programme projects on the regional coordination of scientific and technical cooperation policies, seismic engineering research and wireless communication technologies in addition to contributing to chemical accident prevention research within the EU.

The Ministry of Education and Science is the national designated entity responsible for collaboration with the JRC.

- **Directorate-General for Climate Action (DG CLIMA)** leads international negotiations on climate, helps the EU to deal with the consequences of climate change and to meet its targets for 2020, as well as develops and implements the EU Emissions Trading System. Its policies also aim at protecting the ozone layer and at ensuring that the climate dimension is appropriately present in all Community policies and that adaptation measures will reduce the European Union's vulnerability to the impacts of climate change. DG CLIMA together with DG Research, follows also the FP7-and other Climate-related research programmes.

Each year DG Climate Action publishes an annual work programme, including information on grants that are going to be awarded during the year: the objectives, the schedule of the call for proposal(s) with the indicative amount and the expected results, the essential selection and award criteria to be used to select the proposals. The financing is provided by two mechanisms:

- **NER300** is a financing instrument managed jointly by the European Commission, European Investment Bank and Member States and is foreseen to subsidize the installations with support for integration of innovative renewable energy technology and carbon capture and storage (CCS).
- **LIFE+** is intended to finance and co-finance projects that contribute to EU's efforts to address the climate challenge. Accordingly financing can be made available for best practice pilot projects in areas such as climate adaptation techniques, climate smart urban environment and local construction, as well as energy efficiency initiatives.

- **European Cooperation in science and Technology (COST)** is an intergovernmental framework for European Cooperation in Science and Technology, allowing the coordination of nationally-funded research on a European level. COST has a very specific mission and goal. It contributes to reducing the fragmentation in European research investments and opening the European Research Area to cooperation worldwide. As a precursor of advanced multidisciplinary research, COST plays a very important role in building a European Research Area (ERA). It anticipates and complements the activities of the EU Framework Programmes, constituting a "bridge" towards the scientific communities of emerging countries. COST plays a very important role in building a European Research Area (ERA). It also increases the mobility of researchers across Europe and fosters the establishment of scientific excellence in the nine key domains, as well as Trans-Domain Proposals:

- Biomedicine and Molecular Biosciences

-
- Food and Agriculture
 - Forests, their Products and Services
 - Materials, Physics and Nano sciences
 - Chemistry and Molecular Sciences and Technologies
 - Earth System Science and Environmental Management
 - Information and Communication Technologies
 - Transport and Urban Development
 - Individuals, Societies, Cultures and Health

The Ministry of Education and Science is the National Designated Entity responsible for cooperation with the COST programme. The future possibilities for the on-going COST actions are given at the Annex of this Chapter.

- **TEMPUS** is the European Union's programme which supports the modernization of higher education in the EU's surrounding area. Tempus promotes institutional cooperation that involves the European Union and Partner Countries and focuses on the reform and modernization of higher education systems in the Partner Countries of Eastern Europe, Central Asia, the Western Balkans and the Mediterranean region. It also aims to promote voluntary convergence of the higher education systems in the Partner Countries with EU developments in the field of higher education. With regards to the Western Balkans, Tempus contributes to preparing the candidate and potential candidate countries for a participation in the integrated Life Long Learning Programme.

The responsible institution for the implementation of the TEMPUS programme is also the Ministry of Education and Science.

3. Republic of Macedonia and the Research, Innovation and Technology Transfer projects

3.1. GEF Financing

Since Republic of Macedonia has joined GEF it has received grants US\$ 11.587.900, 00; leveraging 42.474.100, 00 US\$ in co-financing resources for 11 national projects. These includes 3 projects in biodiversity, 5 in climate change, 2 in persistent organic pollutants and 1 in multi-focal areas.

Similarly, Republic of Macedonia has participated in 9 regional and global projects financed by the GEF totaling 26.055.000, 00 US\$ leveraging 204.460.009 US\$ in co-financing resources. These include 2 projects in Climate Change, 4 in international waters, 1 in persistent organic pollutants (POPs) and 2 in multi-focal areas.

During the current replenishment period (GEF-5), from July 2010 to June 2014, the country has received an indicative allocation of 5.980.000 US\$ to formulate and execute projects, distributed on focal areas: 1.500.000, 00 US\$ in biodiversity, 2.000.000, 00 US\$ in climate change and 2.480.000, 00 US\$ in land degradation (according the Report March 2012).

Table 3.1. GEF financial support for Republic of Macedonia

Type of projects	Number of projects	Total GEF financing	Total * Co-financing
National projects	11	11.587.900	42.474.100
Regional and Global projects	9	26.055.000	204.460.009
Small Grants Projects	65	1.384.682	1.680.352

*Funds from other sources different from GEF

Table 3.2 - Allocation and Utilization of resources for Republic of Macedonia during GEF 5/ July 2010-June2014 (in USD) (as of February 2012)

Focal area	STAR GEF-5 indicative allocation	Allocation utilized	Allocation remaining to be programmed
Biodiversity	1.500.000	0	1.500.000
Climate Change	2.000.000	0	2.000.000
Land Degradation	2.480.000	0	2.480.000
TOTAL	5.980.000	0	5.980.000

The full list of the national projects supported by GEF is given in the Table 3.3. listed below. From the listed national projects supported by GEF it can be seen that few of them are closely connected to innovation, technology transfer and R&D. Those projects are mainly within the focal area of climate change, because of the climate change mitigation concept supported by the innovative technologies and sustainable development.

From the assessment of the implementing agencies of the national projects financed by GEF it can be stated that the IBRD is supporting implementation of the technical and infrastructural projects mainly connected to renewable energy and climate change. UNDP is mainly focused on climate change capacity building projects, international obligations in terms of reporting requirements and biodiversity projects, which again have a R&D and TTs components. The UNEP national activities are mainly focused on implementation on projects connected with the biodiversity and land degradation. UNIDO regional office is implementing the activities in Republic of Macedonia through the partnership with other national offices, and their activities are mainly focused on the technical aspects and capacity building for implementation of the Stockholm Convention dedicated to Persistent Organic Pollutants (POPs), and lately with the Industrial Energy Efficiency.

Table 3.3 - List of Approved National Projects supported by the GEF

N u m b e r	Project Name	Focal Area	Implementing Agency	Project Type	GEF Grant	Cofinancing	Status
1	Mini-Hydropower Project	Climate Change	IBRD	MSP	750,000	2,541,000	Project Closure

2	Development of Mini-Hydropower Plants	Climate Change	IBRD	FP	1,500,000	4,900,000	Project Closure
3	National Strategy and Action Plan of Biological and Landscape Diversity, National Report, Clearing House Mechanism, and Assessment of Capacity Building Needs	Biodiversity	IBRD	EA	336,500	35,000	Project Closure
4	Sustainable Energy Program	Climate Change	IBRD	FP	5,500,000	28,800,000	Under Implementation
5	Enabling FYR of Macedonia to Prepare its First National Communication in Response to its Commitments to UNFCCC	Climate Change	UNDP	EA	345,000	0	IA Approved
6	National Capacity Needs Self-Assessment for Global Environmental Management (NCSA)	Multi Focal Area	UNDP	EA	195,400	15,700	IA Approved
7	Strengthening the Ecological, Institutional and Financial Sustainability of Macedonia's National Protected Areas System	Biodiversity	UNDP	MSP	1,000,000	4,161,400	Under Implementation
8	Macedonia's First Biennial Update Report	Climate Change	UNDP	EA	321,461	106,000	CEO Approved
9	Climate Change Enabling Activities (Phase II)	Climate Change	UNDP	EA	100,000	0	CEO Approved
10	Support for the Revision of the NBSAPs and Development of Fifth National Report to the CBD	Biodiversity	UNEP	EA	220,000	212,000	IA Approved
11	BS: Support the Implementation of the National Biosafety Framework	Biodiversity	UNEP	MSP	407,000	236,000	CEO Approved
12	Support for the Development of National Action Program Aligned to the UNCCD 10 Year Strategy and Reporting Process under UNCCD	Land Degradation	UNEP	EA	136,986	170,000	CEO Approved
13	Enabling Activities to Facilitate Early Action on the Implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) in the Republic of Macedonia	POPs	UNIDO	EA	497,000	0	Project Closure

14	Demonstration project for Phasing-out and Elimination of PCBs and PCB-Containing Equipment	POPs	UNIDO	MSP	957,000	1,785,000	Under Implementation
15	Enabling Activities to Review and Update the National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPs)	POPs	UNIDO	EA	155,000	423,000	IA Approved
16	Catalyzing Market Transformation for Industrial Energy Efficiency and Accelerate Investments in Best Available Practices and Technologies in the Former Yugoslav Republic of Macedonia	Climate Change	UNIDO	FP	1,400,000	5,620,000	Council Approved
17	Removal of Technical and Economic Barriers to Initiating the Clean-up Activities for Alpha-HCH, Beta-HCH and Lindane Contaminated Sites at OHIS	POPs	UNIDO	FP	3,100,000	12,450,000	Council Approved
					16,921,347	61,455,100	

The full list of global and regional projects supported by the GEF is given in the Table 3.4. As it can be seen from the Table, one of the main focus on the regional and global projects financed by the GEF are the International Waters and Climate Change, The most active implementing agencies are IBRD with multifocal projects, UNDP with projects mainly connected to International Waters and UNEP with a main focus of climate change projects.

Table 3.4 - List of Approved Regional and Global Projects by the GEF

Number	Project Name	Focal Area	Implementing Agency	Project Type	GEF Grant	Cofinancing	Status
1	Capacity Building on Obsolete Pesticides in EECCA Countries	POPs	FAO	MSP	1,000,000	1,396,550	Under Implementation
2	Lake Ohrid Management	International Waters	IBRD	FP	3,970,000	21,300,000	Project Closure
3	MED: Sustainable Governance and Knowledge Generation	International Waters	IBRD	FP	3,000,000	6,600,000	IA Approved
4	MED Mediterranean Environmental Sustainable Development Program "Sustainable MED"	International Waters	IBRD	FP	0	0	Council Endorsed

5	World Bank-GEF Investment Fund for the Mediterranean Sea Large Marine Ecosystem Partnership, Tranche 1, 1st Allocation	Multi Focal Area	IBRD	FP	0	0	Council Approved
6	Southeastern Europe and Caucasus Catastrophe Risk Insurance Facility (SEEC CRIF)	Climate Change	IBRD	FP	5,500,000	21,500,000	CEO Endorsed
7	World Bank-GEF Investment Fund for the Mediterranean Sea Large Marine Ecosystem Partnership, Tranche 1, 2nd Installment	International Waters	IBRD	FP	905,000	0	Council Approved
8	Integrated Ecosystem Management in the Prespa Lakes Basin of Albania, FYR-Macedonia and Greece	Multi Focal Area	UNDP	FP	4,135,000	9,403,460	IA Approved
9	Enabling Transboundary Cooperation and Integrated Water Resources Management in the Extended Drin River Basin	International Waters	UNDP	FP	4,500,000	22500000	Council Approved
10	GEF SGP Fifth Operational Phase - Implementing the Program Using STAR Resources II	Multi Focal Area	UNDP	FP	71,246,300	74,100,000	CEO Endorsed
11	Financing Energy Efficiency and Renewable Energy Investments for Climate Change Mitigation	Climate Change	UNEP	FP	3,000,000	9,260,000	Under Implementation
12	Stabilizing GHG Emissions from Road Transport Through Doubling of Global Vehicle Fuel Economy: Regional Implementation of the Global Fuel Efficiency Initiative (GFEI)	Climate Change	UNEP	FP	1,713,640	13,460,600	Council Approved
					98,969,940	179,520,610	

3.2. Bilateral Financing

The assessment of the Transfer of Technology Bilateral support projects in Republic of Macedonia showed that only one formal technology transfer project was financed thought this

mechanism. The project title is Geothermal System Kocani and the project was dedicated to transfer of Know-how concerning combined heat and power and long-distance community heating. The donor country of this project is Austria and the project was implemented in 1998. The project was focused on the use of geothermal energy in order to supply the population with renewable heating energy.

3.3. Participation in the Framework Programme of European Community

The following table presents the R&D and Transfer of Technology projects supported by the EU framework programme directly/or indirectly related to the Climate Change and the Environment for the period 2007-2012. Actually, the full list of FP7 projects for Republic of Macedonia, for the period 2007-2012 is longer, and contains 83 projects with total budget of **10.283.000, 00** EUR. According to the EU statistics, the total budget is approximately 5 EUR per capita, which is the second highest financial allocation for the Balkan region after Serbia with 7 EUR per capita.

The Ministry of Education and Sciences (MES) is also NDE responsible for implementation of the EU Framework Programme as well as the programme HORIZON 2020. MES has established FP7-office with overall responsibility for administration of the national contact points and provision of administrative support in the processes of the preparation of the projects.

The description and the full list of the CC related FP projects are given in the Table 3.1.

Table 3.5 - Climate Change related FP6 and FP7 Projects

	Title	Program & Call	Start date /Budget (€) for RM	Macedonian Partner
1	Eco-houses based on Eco-friendly Polymer Composite Construction Materials	FP6	01.10.2004/ 250.000,00	FTM-UKIM, MOEPP, EUROINVEST, Studio R, ZIMRANT Skopje,
2	RISE - Renewables for Isolated Systems-Energy supply and Waste Water Treatment	FP6	3 years/ 434.900,00	Faculty of Electrical Engineering and Information Technologies, Macedonian Academy of Sciences and Arts, Bioengineering DOO - BIG (SME), MEPSO (Transmission system operator)
3	LPAMS - Production Process for Industrial Fabrication of Low Price Amorphous-microcrystalline Silicon Solar Cells,	FP6	3 years / 84.000,00	Macedonian Academy of Sciences and Arts
4	RES INTEGRATION - Rural Sustainable Development through Integration of Renewable Energy Technologies in Poor European Regions;	FP6	3 years / 150.000,00	Macedonian Geothermal Association;
5	EU Geo Capacity, Assessing European Capacity for Geological Storage of Carbon Dioxide	FP6	3 years / 18.000,00	Macedonian Geothermal Association

6	RECOVER - Renewable Energy Coordinated Development in the WBC;	FP6	2 years / 18.120,00	Macedonian Geothermal Association
7	ACCENT - Acceleration of the Cost Competitive Biomass Use for Energy purposes in the WBC;	FP6	2years; 23.120,00	Macedonian Geothermal Association
9	Biomass Energy Europe	FP7-ENERGY-2007-3.7-01	01.10.2008/ 37.985,00	Macedonian Geothermal Association
10	CLASSIFICATION OF EUROPEAN BIOMASS POTENTIAL FOR BIOENERGY USING TERRESTRIAL AND EARTH OBSERVATIONS	FP7-ENERGY-2007-3.7-01	01.10.2008/ 40.018,00	Balkan Foundation for Sustainable Development
11	Testing Innovative Strategies for Clean Urban Transport for historic European cities	FP7-ENERGY-2007-	01.10.2008/ 234.400,00	Faculty for Technical Sciences, University "St. Clement Ohridski", Bitola; Municipality of Skopje; Public Transport Company
12	South-East European TSO Challenges	FP7-ENERGY-2008-	01.01.2010/ 156.000,00	Ss. Cyril and Methodius University, Faculty of electrical engineering and information technologies; Operator of Power Transmission System of Macedonia-MEPSO
13	Development and demonstration of a dynamic, web-based, renewable energy rating platform	FP7-research for SME-2011	01.10.2011/ 10.000,00	Macedonian association for solar energy-SOLAR „Macedonia
14	Fiber Reinforced Composite Reflectors for Concentrated Solar Power Plants	FP7-research for SME-2011	01.01.2012 220.000,00	Center for Plasma Technologies - PLASMA ltd.
15	Development of a modular, all-polymer solar thermal collector for domestic hot water preparation and space heating	FP7-SME-2010	01.01.2011/ 250.000,00	Center for Plasma Technologies - PLASMA ltd.
16	Balkan GEO Network Towards Inclusion of Balkan Countries into Global Earth Observation Initiatives	FP7-ENV-2010.4.1.4-1	01.10.2010/ 30.000,00	Balkan Foundation for sustainable development
17	Strengthening and development of Earth Observation activities for the environment in the Balkan area	FP7-ENV-2010.4.1.4-1	01.10.2010/ 36.885	Ss. Cyril and Methodius University, Skopje
18	Promotion and coordination of environmental research in Central and Eastern Europe for a sustainable Development with the support of the Enterprise Europe Network	FP7-ENV.2010.5.1.0-2	01.10.2011/ 46.729	Foundation for Management and Industrial Research
19	Complex Research of Earthquake's Prediction Possibilities, Seismicity and Climate Change Correlations	FP7-PEOPLE-2011	01.10.2011/ 68.000	Ss. Cyril and Methodius University, Skopje

20	Marine Microbial Biodiversity, Bioinformatics and Biotechnology	FP7-OCEAN-2011	01.10.2011/ 290.000	InterWorks, Bitola
21	Development and demonstration of compact, multi-source heat exchanger technologies for renewable energy applications	FP7-SME Association-2011	01.01.2012/ 25.000,00	Macedonian Association of Solar Energy, SOLAR Macedonia
22	Fiber Reinforced Composite Reflectors for Concentrated Solar Power Plants	FP7-ENV-2011	01.01.2012/ 220.000,00	Center for Plasma Technologies - PLASMA ltd.
23	Cost-effective sensors, interoperable with international existing ocean observing systems, to meet EU policies requirements	FP7-OCEAN-2012	01.10.2013/ 100.000,00	FTM-UCIM

3.4. IPA projects on research, development, innovation and transfer of technologies related to climate changes in the period 2007-2013

The official office of the IPA programme in Republic of Macedonia is located in the Sector for European Integration of the Government of Republic of Macedonia. . The IPA programme has additional sectorial offices in few Ministries, such as Ministry of Agriculture and Ministry of Economy.

According the last report for Republic of Macedonia, the revised Multiannual Indicative Financial Framework for 2012-2013 allocates a total EU contribution of € 215 million to the country. The last national programme under the current IPA Component I was submitted to the Commission in July 2012 with a total EU allocation of € 56 million for the years 2012 and 2013. Implementation of all IPA programmes on the ground is slowly taken off.

The total budget of the IPA Programme related to allocations for CC projects for the period 2007-2013 is estimated on 31.549.722,00€. For the period 2007-2013, the following CC-related projects in Macedonia have been supported:

Table 3.6 - Climate Change related IPA Projects

Title	Institution	Short Description	Duration
Monitoring of the environment of the town of Kavadarci and the Tikvesh area.	Faculty of Natural and Technical Sciences	Environmental protection of the Tikvesh area and the town Kavadarci	2011-2012
Environmental Highway Observatory (e-Highway)	Agency for State Roads	Measure 2.1 Promote and protect the environmental resources of the area	
Local Communities in Environmental Action (ENVI)	Municipality of Kavadarci	Environmental protection of Natural resources, sensitization and Volunteer participation of local	

		communities in order to Improve river water quality and quality of life in cross border area	
Integrated Selection, Protection and Promotion of Balkan Forest Genetic Resources with Aesthetic Value (ISPROP FORGEN)	Goce Delcev University – Stip (Faculty of Agriculture)	The ultimate objective of this project is to protect the forest genetic resources of the cross-border area	2012
Local Communities in Environment Developing cross-border joint fire-protection plan “FIRESHIELD” tal Action	Municipality of Bitola Municipality of Prilep	Fire protection plan to mitigate the unwanted effects of fires	

3.5. TEMPUS Projects related to Climate Changes and Environment

The TEMPUS cooperation started in the first phase of the Programme, known as Tempus I, which covered the period 1990-1994. Macedonian higher education institutions were partners in three TEMPUS projects. Because of the political issues the programme was closed in 1994 and reopened again in 1996. However, it should be pointed that from 2013, Republic of Macedonia is not eligible to participate in TEMPUS without financial contribution, and this financial contribution is still not allocated from the national budget. Up to know, general TEMPUS office for Republic of Macedonia was located in the Ministry of Education and Science.

The table 3.4.presents the list of the environmental and climate change related project financed by the EU-educational program TEMPUS.

Table 3.7 - Climate Change and Environment related TEMPUS projects

No	TITLE	Faculty	Project Number	Duration
1	Creation of University-enterprise cooperation network for education on sustainable technologies	Faculty of Technology and Metallurgy, Ss. Cyril and Methodius University - Skopje	158989-TEMPUS-1-2009-BE-TEMPUS-JPHES	2010-2013
2	Development of Environment and Resources Engineering Learning	Faculty of Mechanical Engineering, Ss. Cyril and Methodius University - Skopje	511001-TEMPUS-1-2010-1-IT-TEMPUS-JPCR	2010-2013
3	Regional Joint Doctoral Programme in Entrepreneurship and SME Management for Western Balkan Countries	Ss. Cyril and Methodius University - Skopje	510993-TEMPUS-1-2010-1-IT-TEMPUS-JPCR	2010-2013

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3.6. Projects financed by the research fund of the Domestic Universities

The University Ss. Cyril and Methodius, Skopje has allocated financial resources for R&D, Innovation and TT in the framework of the following activities:

- Study of distribution of radionuclide and heavy metals in the soils and atmosphere of some regions in Macedonia, implemented by Faculty of Natural Sciences in 2012
- Implementation of multi- functional system for education, research and promotion of renewable energy resources, implemented by the Faculty of Electrical Engineering and Informatics during the period 2011 - 2013

The University Goce Delcev Stip finances the following R&D projects connected to Climate Change and the Environment:

- The possibility for application of zeolite in the treatment of water contaminated with heavy metals, implemented by the Faculty of Natural and Technical Sciences in the period 2008 – 2009
- Monitoring of the environment of the town of Kavadarci and the Tikvesh area, implemented by the Faculty of Natural and Technical Sciences, in the period 2011 – 2012
- Impact of agricultural land use on biodiversity and regional distribution of broomrapes (Orobanchaceae) in the Balkans, Faculty of Natural and Technical Sciences, 2012

4. Legal, strategic and Institutional framework for Innovation, TT and R&D activities in Republic of Macedonia

Since innovation is also considered a key driver of the economy, especially when it leads to a competitive advantage or increasing productivity, innovation policy is being shaped at the national level. Research institutions are considered as main carriers of innovation activity while private sector takes over the implementation and commercialization of the innovative ideas in the form of products.

These are the main actors that form the innovation system of the country. In line with this, framework conditions regulating the complex relations between these actors are essential to build an innovation-friendly environment and foster innovation infrastructure in the country.

The main objective of this chapter is to add to common understanding of the national innovation system in Republic of Macedonia and to map the innovation infrastructure and stakeholders in the county. Thus, the report aims to facilitate the identification of potential partner organizations for technology transfer and co-operations from the country.

To this end, the report identifies innovation-related government institutions, programmes as well as innovation infrastructures such as Technology and Innovation Centers, Clusters, Technology and Science Parks, Business Start-up centers, Technology Incubators and other related organizations.

4.1. Legal framework

The main directions of the current research policy were introduced with **the Programme of the Government of R. Macedonia for the period 2011-2015**. The following priorities in the context of the country R&D activities are:

- to increase investments in scientific-research infrastructure in order to create a foundation for the use of modern research methods;
- to encourage and support science through fiscal policy;
- to promote cooperation with scientific-research institutions from abroad for the purpose of enabling better knowledge transfer;
- to create possibilities for joint degrees with foreign universities;
- to establish strict and fair selection criteria regarding staff employment in scientific research institutions;
- to support cooperation between scientific research institutions and economic institutions; and
- To support technological development through the development of new technologies, technology transfer, innovation, continuous upgrade and transfer of knowledge, information and ICT technologies.

More focused research policy goals are specified in the following legal acts:

- **Law on Scientific and Research Activities (LSRA)** adopted in 2008 along with the changes of the law adopted in 2012 and with the **Law on Encouragement and Support of Technological Development (LESTD)** adopted in 2011. According to these laws, the research policy goals and directions are the following:
 - development of market conditions through industrial improvement;
 - development of new technologies, products and services;
 - environmental protection and improvement;
 - improving the institutional and organizational effectiveness of entities involved in technological development;
 - promotion of new forms of management and marketing;
 - support for entrepreneurship;
 - promotion of European standards in communication and information;
 - improving the institutional, educational, scientific and technological infrastructure;
 - increasing the take-up of knowledge and creativity;
 - modernizing communication and cooperation between entities involved in technological development;
 - communication and cooperation between ministries and other institutions in charge of technological development;
 - cooperation with entities in scientific research; and
 - participation in international programmes for the improvement of technological development.
- **Law on Higher Education regarding R&D activities performed by the higher education sector**, adopted by the Ministry of Education and Science in January 2013. The changes define the criteria necessary to fulfill the requirements of the Bologna process and Bucharest Communiqué 2012. These criteria should strengthen R&D and ensure monitoring of the quality of the R&D activities performed by the higher educational institutions. One of the mandatory requirements for universities is the establishment of new Faculty boards which consist of all important stakeholders

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- involved in educational and R&D activities. The boards should ensure that universities' curricula are in line with the needs of the industry and enable know-how and technology transfer to the business community. Furthermore, the public universities are obligated to allocate 40% from tuition fees to R&D activities, international cooperation, capital investments and exchange of professors and students with Top 500 world universities from the Shanghai Jao Tong University ranking.
- **National Programme for Scientific R&D Activities 2012-2016** and the **National Strategy for Scientific R&D Activities 2020**, prepared by the Ministry of Education and Science through broad public discussions organized in the country. They are more citizen-centric and propose new thematic priorities and new R&D targets for the country.
 - **The Innovation Strategy of the R. Macedonia for 2012-2020** adopted by the government in October 2012. The strategy was prepared by the Ministry of Economy with support from the Organization for Economic Co-operation and Development (OECD). One of the main strengths of the policy is the involvement of all relevant stakeholders from the country in its preparation. This strategy takes into account the country's current state of development to ensure that policies to promote innovation are both focused and relevant for the country. The strategic objectives of the policy concerning the business sector's propensity to innovate, quality of the human resources and knowledge flows are in line with the structural challenges of the national system.
 - **Law on Innovation Activity**, adopted by the Government of the FYR of Macedonia in May 2013, which determines the innovation activity, as well as principles for commercialization of the results of the innovation activity, the scientific research activity, the technical and technological knowledge and of the inventions. The law envisions establishment of a body entitled as **Fund for innovation and technological development**, which will finance and logistically support the innovative projects in order to improve the competitiveness of Macedonian companies through development of new knowledge and innovation. The Fund will provide technical assistance and consulting services for start-up and existing enterprises in order to increase the investment in innovation, as well as financing and co-financing of research and innovative projects. The Fund shall be developed in two phases, the first shall be funded solely by the Government, and the second phase shall be additionally financed by the World Bank and IPA funding scheme. In the period within which the state finances the development of the Fund, it shall also support the establishment of start-up companies and innovations with grants up to €10,000, the commercialization of innovations developed by domestic companies by an assistance up to €30,000 and equity and mezzanine investment funds with up to €80,000 financial support. The Law on Innovation Activity also envisions establishment of a new governmental Department of Competitiveness, Entrepreneurship and Innovation, which along with the Committee on Entrepreneurship and Innovation shall monitor the development and commercial exploitation of the innovations.
 - **The Industrial Policy of the Republic of Macedonia 2009-2020**, prepared by the Ministry of Economy, the Government of R. Macedonia and the World Bank, is national strategic document for enhancing the competitiveness of Macedonian industry and the economy in general, through coordination of the competitiveness policies in the republic of Macedonia. In the Industrial Policy of RM 2009-2020, **the five strategic objectives** (areas of intervention) as drivers of the competitiveness are:
 - International Cooperation and Foreign Direct Investments enhancement;
 - Research, Development and Innovations;
 - Eco-friendly Technologies, Products and Services;
 - SME development and entrepreneurship;

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- Collaboration in Clusters and Networks.

Effects of this policy are on the long run, through strengthening the competitiveness of Macedonian industry based on knowledge and innovation, better informed companies, increased internalization, and initially better utilization of the EU Funds for projects for enhancing and development of competitiveness.

- The **Stop Brain Drain Strategy 2013-2020** is in the process of being developed on behalf of the Ministry of Education and Science. The development of the strategy will be supported by the USAID project “Youth Network for Gaining Skills for Employment – YES (Youth Employability Skills) Network”. With this strategy the government will try to prevent brain-drain and repatriate researchers who leave the country.

4.2. The institutional set-up

4.2.1. National level

The following ministries are actively involved in the formulation and promotion of the National innovation policy:

- **Ministry of Economy (MoE), Department for Entrepreneurship and Competitiveness of SMEs and Department for Industrial Policy**

The Ministry of Economy of R. Macedonia is the responsible institution for creating and implementing documents and programs regarding: Economic policy, Industrial policy, SME competitiveness and innovation enhancement. There are few departments within the MoE that are dealing with innovation indifferent segments. The department for Industrial Policy is responsible for the creation and follow-up of the implementation of the Industrial Policy of the R. Macedonia. The Industry policy department worked with the department for Entrepreneurship and Competitiveness of SMEs jointly to create the Innovation Score Board and define the further detailed implementation schedule related to all areas of intervention within the Industrial Policy including Innovation enhancement.

- **Ministry of Education and Science (MoES), Department for the Advancement of Science and Technological-Technical Development.**

The Ministry of Education and Science has responsibility for strategy formulation and planning in the field of science and technology, it manages project development, and it takes responsibility for the legislative aspect of science and technology, technological development and technical culture and organizes international scientific cooperation and bilateral, multilateral and European activities. It supports and encourages the development of scientific research infrastructure in the R. Macedonia (institutes, universities and independent research groups), aiding the development of young researchers and the overall technological development of the country.

In the framework of this responsibility, the Ministry has defined the following priorities in the development of science, research and technology in the country: Energy, Transport and Ecology, Chemistry, Materials, Agriculture, Veterinary Medicine, Biotechnology and Food Production, Informative technology, Water resource management and Earthquake Engineering.

- **Ministry of Information Society and Administration (MoISA)**

The Ministry of Information Society and Administration is the basic authorized institution for coordinating activities for the development of the information society and measures which derived from

the National strategy for developing the information society and action plan and the National strategy for developing electronic communications with information

Other ministries also have important impact on Innovation, R&D, and TT in line with their responsibilities. **The Ministry of Environment and Physical Planning** as the designated entity for climate change and environmental concerns is closely associated with the international R&D activities, technological development and innovations. As a national designated body responsible for climate change policy, measures and issues, it is of great importance this Ministry to be nominated as a National Designated Entity for Technology Transfer under the UNFCCC.

There are several additional national entities that are assisting the climate change Innovation, R&D and TT. The majority of them are constituted to provide Innovative and R&D support to the national ministries, agencies and universities. The identified supportive national infrastructure is listed below.

- **Agency for Financial Support in Agriculture and Rural Development (IPARD)**

This Agency is responsible for the implementation of Council Regulation (EC) No 1085/2006 of 17 July 2006 for establishing an Instrument for Pre-Accession Assistance (IPA) for the period 2007-2013. It is a National body accountable for the utilization and monitoring of the Instrument for Pre-accession Assistance for Agriculture and Rural Development (IPARD). The IPARD programme is supporting the agricultural sector in terms of knowledge transfer, support for innovative agricultural techniques and practices, direct financial support for modernization of the agricultural equipment, as well as implementation of agricultural techniques for renewable energy production.

- **Agency for Foreign Investments and Export Promotion of R. Macedonia**

Invest Macedonia is the primary government institution supporting foreign investment in Republic of Macedonia. The agency's main goal is to win new investment project in the country and to support the expansion of the existing base of overseas companies in the country. Foreign investments in the country are supposed to bring new technologies, knowledge and exchange of know-how, and consequently support the R&D and Innovational Environment in the country.

- **Agency for Promotion of Entrepreneurship of the Republic of Macedonia (APERM)**

The state institution "Agency for Promotion of Entrepreneurship of the Republic of Macedonia" (APERM) was established in 2003 in order to support entrepreneurship and competitiveness of small businesses in the county. To this end, APERM implements and coordinates state and international support for micro, small and middle businesses and promotes entrepreneurship through various forms of financial and non-financial support.

- **Energy Agency of the Republic of Macedonia**

Energy Agency of the Republic of Macedonia –EARM was establish to support the implementation of the energy policy of the Government, through the preparation of the energy strategies, development plans and programs, with particular emphasis on energy efficiency (EE) and usage of renewable energy sources (RES). EARM has a mandate to lead, give initiatives, and coordinate the preparation of studies and projects on energy efficiency and usage of renewable energy sources, in terms of successful implementation of the Action Plan for realization of the Strategy for Energy Efficiency of the Republic of Macedonia.

- **Research Center for Energy, Informatics and Materials of the Macedonian Academy of Sciences and Arts, ICEIM-MANU.**

The role of ICEIM is to initiate and coordinate national research programs and to conduct researches on high level in certain fields. The majority of research projects implemented by the ICEIM is closely

connected with the TT, Climate Change issues, and developed usage of modeling tools and energy sector policies and assessments.

- **Centre for Applied Research and Permanent Education in Agriculture (CIPOZ), Faculty of Agriculture and Food Sciences, Skopje**

The Independent Applied Research and Continued Education Center (CIPOZ), established within the Faculty of Agricultural Sciences and Food – Skopje in 2002 have contributed for the informal education of various participants in agriculture. ACE has realized many projects and trainings in various agriculture, rural development, environmental protection and similar areas. CIPOZ, as part of its activities, has realized significant activities and results in the area of research, knowledge transfer as well as application of modern technology (training programs and seminars).

- **Centre for Research, Development and Continuing Education: Mechanical Engineering Systems – Centre of Excellence (CIRKO-MES CE)**

In order to remedy deficiencies of the Macedonian manufacturing companies to integrate advanced engineering technology into the production process, CIRKO-MES was founded at the Faculty of Mechanical Engineering (FME), Skopje in 2005 with support of USAID. To achieve this objective, CIRKO-MES provides access to new technology (3D modeling, 3D printing) and training (CAD, CAM, Solid Works, etc.) to partner companies in order to enhance their capabilities, increase the quality of their products and improve their production process. Furthermore, CIRKO-MES gives its members the opportunity to join a network of Macedonian manufactures enabling cooperation, coordination and exchange.

- **Centre of Technology Transfer at the Faculty of Electrical Engineering and Information Technology (FEEIT), Ss. Cyril and Methodius University, Skopje**

The Faculty of Electrical Engineering and Information Technology (FEEIT) developed a model for offices for international technology transfer 2002-2004 and established a Centre of Technology Transfer. The Centre's main scope of activities is in research activities and technology transfer to interested companies within Republic of Macedonia, but the Centre is also open for wider (international) collaboration. The center is consisted of three constitutive bodies: distance learning center, project management center and engineering mathematics center.

- **Centre of Technology Transfer at the Faculty of Technology and Metallurgy (TMF), Ss. Cyril and Methodius University, Skopje**

A Technology Transfer Centre in chemical and textile engineering was established at the Faculty of Technology and Metallurgy, providing opportunities for benefit from different forms of life-long learning courses.

4.2.2. National good practices

The national and international NGOs structure has significant influence in the process of the establishment of the national Innovation, TT and R&D infrastructure. This important stakeholder also presented extraordinary outcomes of the implementation of the Innovation, TT and R&D activities in the country and presented the national best practice in many thematic areas including climate change and sustainable development.

Several good practices connected with the Innovation, TT and R&D activity in the country are outlined below:

- **The first Regional Hub for Social Innovation**

In June 2013, the Faculty of Computer Science and Engineering at the University of Ss. Cyril and Methodius together with UNDP launched the first Regional Hub for Social Innovation in the country. The Hub is established as pilot Center for technology transfer, that will aim to make the most of technology to tackle social challenges and advance human development by encouraging development of innovative [information technology (IT)] solutions to social and economic problems. It will further facilitate and foster new partnerships between the private sector, policy-makers, academics and other players interested in promoting social innovation. Projects aiming at environmental protection and mitigation of the climate change will be among the priorities.

In doing so, the Hub will seek to draw skills from a diverse range of sectors – from undergraduates, from the private and the public sector, from civil society – and not just people already involved in IT but also from people with know-how in other relevant fields such as climate change and environmental protection. It will act as a kind of catalyst for the incubation of innovative solutions to address the most pressing challenges of the people. The products developed will be aimed at the local, national and regional level. Some solutions may even be applicable on a global scale.

- **Foundation Business Startup Centre Bitola.**

The foundation is financed by the USAID and its mission is to contribute towards the economic development of the country through promoting the entrepreneurship of small and medium enterprises (SMEs). In order to accomplish its mission the foundation supports the potential and existent entrepreneurs for establishing or further development of their businesses. Technology-Transfer Toolbox component of the Foundation is consisted of trainings, exchange of information and investments in innovative projects.

- **Foundation for Management and Industrial Research (MIR) and the European Information and Innovation Centre of R. Macedonia (EIICM)**

The Foundation MIR is the Macedonian representative in the Network's expert group – Intelligent Energy, consisted of 38 countries and dealing with exchange of experiences in the field of energy, developing rolling-plans for energy and energy efficiency, building partnerships for business, technology and research in the field as well as joint preparation of projects. The Foundation MIR is responsible for the services of transfer of innovative technologies between all kinds of innovation players. The core activity includes identifying the technology needs and offers in Macedonia and finding potential partners through the Network for establishing different types of business cooperation with providing support to the companies in the process of negotiation.

The Foundation for Management and Industrial Research (MIR) is a part of a consortium that has been awarded the first project from the European Commission's Competitiveness and Innovation Framework Programme CIP, for establishing the European Information and Innovation Centre in Macedonia (EIICM). The EIICM, as a part of a large European Network (Enterprise Europe Network), provides services to the defined target groups (mainly SMEs, but also larger companies, universities and research centers) through dissemination of information on EU legislation, enabling business contacts with potential European partners, facilitating the technology and knowledge transfer as well as promoting the possibilities for participation in EU research programmes.

- **Macedonia Innovation Centre – Innovation to Business**

The Innovation Centre was established by the USAID Competitiveness Project in April 2010. Its main goals are, on the one hand, to assist innovators and innovative companies in adopting innovations,

developing new products and services, and commercializing existing innovations and, on the other hand, to create an innovation “ecosystem” supporting innovative ventures. To this end, the innovation center will build up a network of partners and serve as the platform for innovators and partners to facilitate access to knowledge, technology and resources which are essential for the implementation of an innovation.

- **National Centre for Development of Innovation and Entrepreneurial Learning (NCDIEL)**

The National Centre for the Development of Innovation and Entrepreneurial Learning (NCDIEL) was established in November 2009 with financial support from Austrian Development Cooperation. Located at the Faculty of Mechanical Engineering, NCDIEL supports the realization of innovative, technology-based and profit orientated ideas through the provision of capital for start-ups, counseling and coaching of established enterprises in order to strengthen the survivability, capacity and growth of newly established enterprises. NCDIEL’s activities encompass providing start-up training, coaching and financial support to highly innovative business ideas; analyzing the current state of and developing strategies for innovation, entrepreneurship and competitiveness of the Macedonian economy; stimulating the evolution of a new innovative entrepreneurial culture and promoting entrepreneurial learning; and conducting feasibility studies for incubators, business support centers, technology parks, etc.

- **Gauss Institute – Bitola**

Gauss Institute is a Foundation for New Technologies, Innovations and Knowledge Transfer, established in 2006 in Bitola. This foundation continues activities of previously active foundation Euro-regional Technology Center – Bitola, and is considered to be one of most active organizations in the region related to innovations, technology and knowledge transfer. The role of the establishment of the foundation is through development and application of new technologies, innovations and knowledge transfer to contribute toward establishment of knowledge based society in the region. All activities Gauss Institute undertakes are solely directed to accomplishing the mission of creation of knowledge-based society, by using science and technology, that is eco-friendly and sustainable in the long-term.

- **National activities supported by the JRC (EU Joint Research Center)**

Building upon the Memorandum of understanding signed in September 2012 between Joint Research Center and Ministry of Education, covering climate change as one of the focal areas, fruitful collaboration was established between the project Third National Communication and the JRC Institute in Ispra. This enabled using BioMA (Biophysical Models Applications) developed by JRC for assessing climate change vulnerability in agriculture in Republic of Macedonia, that is leap forward not only in the country but also in the region. Modeling in BioMA, related to the anticipated reduced access to water, gave a lot of parameters that both the government and the farmers can benefit from. Possibilities for using results obtained with BioMA are an added value in terms of raising capacities of national stakeholders and creating sustainability of the process for preparation on national communications.

4.3. Educational curricula related to Climate Change Research, Development, Innovation and Technology Transfer

The education for climate change and sustainable development is quite new concept in Republic of Macedonia. Nevertheless the sustainable development is slightly incorporated in the educational system at a different levels to a different extend, but the assessment of the educational curricula about the wider and

more complex climate change issues showed that this topic is still not adequately incorporated in the national educational system.

Concerning the state university curricula there is only three state faculties that have graduate, post-graduate level and PhD programs connected to climate change and sustainable development. Furthermore the climate change accent of these programs is not strictly emphasized in the programme naming as an educational focal point.

The tables below briefly present the programs that are closely connected to climate change and sustainable development, as well as the hosting faculties and the principal coverage of the programmes.

1. The Faculty of Technology and Metallurgy, University Ss Cyril and Methodius in Skopje

Graduated Level:

1. Climate changes – topic in “Environmental Protection” – common subject for all curricula
2. “Impact of climate changes on the water and soil characteristics” – in curriculum: Inorganic Engineering and Environment
3. “Pollutants” – in curriculum: Inorganic Engineering and Environment
4. “Chemistry of atmosphere” – in curriculum: Inorganic Engineering and Environment

Post-graduated Level:

1. Curriculum: Environmental Engineering”

PhD Studies:

1. Curriculum: Technology
2. Curriculum: Metallurgy

2. Faculty of Electrical Engineering and Informatics, University Ss Cyril and Methodius in Skopje

Graduated Level:

1. Energy and Sustainable development
2. Photovoltaic systems
3. Renewable energy sources

Post-graduated Level:

1. Curriculum: Renewable energy sources (*several related subjects*)
2. Curriculum: Energy Efficiency, environment and sustainable development (*several related subjects*)

PhD Studies:

1. Curriculum: Electrical Engineering and Informatics

3. Faculty of Natural and Mathematical Sciences, University Ss Cyril and Methodius in Skopje

Graduated Level:

1. Curriculum: Ecology
2. Climate changes – topic in “Environmental Protection” – common subject for all curricula
3. Climatology and Climate Changes in curriculum: Geography
4. Plant ecology – in curriculum: Biology

Post-graduated Level:

1. Curriculum: Biology
2. Curriculum: Geography

Concerning the climate change educational curricula on the private universities there is a graduate program dedicated to sustainable development on the private MIT University. The details about this educational program are given below.

1. Faculty of Management of Ecological resources

Graduated Level:

1. Metrology with Climatology and Global Climate Changes
2. Chemistry and application of chemical compounds in the environment
3. Environmental Impact Assessment
4. Environmental Law
5. Environmental management
6. Management of Physical Planning
7. Eco-business
8. Environmental monitoring
9. Waste management
10. Biodiversity
11. Alternative energy resources

It line with the above conclusions based on the finding it is recommended that effective mechanisms and strategies are needed in order to incorporate the climate change and sustainable development concepts in the educational curricula, which is lately considered as an elementary concept of the natural and technical sciences. Additionally it is recommended to emphasize the attention on climate change in the existing and the forthcoming educational programs, due to the increased national and international attention on the climate change topic and possibility for increased interest for this educational curricula.

5. Recommendations

This report was prepared in close collaboration with the national scientific institutes, policy makers and the project implementing agencies that are mainly dealing with the Innovation, R&D and TT issues. The assessment of the national condition showed that in the recent years Republic of Macedonia has made a significant move to enable environment for development of Innovative and R&D Infrastructure, and those initial steps are a good basis for continuous improvement of the national condition, which is essential for the country international aspirations and commitments.

The assessed gaps in the legal, educational and institutional setup provided a focus for development of recommendations for improvement of the Innovation, R&D and TT issues, with a special consideration to the climate change component which is a main target of this report.

In order to improve the national organization and coordination of the research, innovation and technology transfer activities in the field of Climate Change, in the Republic of Macedonia it is necessary to consider the following recommendations:

- To establish National Climate Technology Centre and Network (NCTCN) which will serve as national and regional climate change center of excellence, with ultimate scope to provide continuous transfer of technology, sustainable financing for R&D and Innovation activities in the country.

The detailed objectives and goals of the National Climate Technology Centre and Network shall be as follows:

- to provide leadership for green economic growth in the country and the region through promoting international cooperation and the facilitation of technology transfer, knowledge exchange and financial support.
- to act as a knowledge hub, to facilitate education, disseminate information and communicate learning.

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- to act as a national, regional facilitator and international contributor to the development and adoption of clean technologies.
 - to promote innovative investment solutions for tangible and bankable projects in a range of key sectors to facilitate sustainable growth of the green economy.
- Nomination of responsible institution for Technology transfer at national level, serving as a point of reference for TT with the UNFCCC. From the assessment done in the framework of this assignment, the Ministry of Environment and Physical Planning as the national institution responsible for climate change issues is the most appropriate institution for nomination for NDE for TT under UNFCCC.
 - Enhancing partnerships and information exchange between research institutions, academia and administrations at national and regional level
 - Creation of better partnerships between R&D, and policy making especially from the assessment of applicability of CC –related EU policies into the national policies
 - To explore possibilities for public –private partnerships
 - During the reporting period, it was noted that there is no one organized central database for the projects and all other activities related to the Climate Change. So, the creation and continuous update of national CC- database which will serve as a referent point for information gathering and their dissemination is of utmost importance.
 - Concerning the assessment of the educational system and climate change curricula it is concluded that effective mechanisms and strategies are needed in order to incorporate the climate change and sustainable development concepts in the educational curricula. Additionally it is recommended to emphasize the attention on climate change in the existing and the forthcoming educational programs connected to this subject, due to the increased national and international issues on the climate change and sustainable development concepts.

In order to be more efficient in the process of utilization of the International Financial Support funds for the Climate Change related projects, actions and platforms, it is very important to work on the following recommendations

- To join COST Action 11011 Climate Change and Migration: knowledge, law and policy, and Theory
- To apply and be active member in COST ESSEM-actions because the main benefit of this networking will be to contribute to the development of an EU-funded project of the Seventh Framework Programme
- To establish cooperation, partnership and membership of the EU-LAC (European-Latin America) Joint Initiative of Research and Innovation related to the Biodiversity and Climate Change, led by France and Colombia. The EU-LAC JIRI provides financial support for research mobility as well as organization of workshops in the field of Biodiversity and Climate change.

In order to improve the capacities and to create wider network of partnership, as well as to increase to availability and eligibility of the researchers involved in the research projects, innovations and technology transfer activities regarding the Climate changes, the following recommendations are provided::

- Continuation of the dissemination of the project achievements on seminars and conferences at national, regional and international level
- Pro-active participation on all the calls for Climate change related Workshops all over the world.
- To establish a Regional Capacity Building Network related to the Climate Change research, development, innovations and transfer of technologies which will disseminate project outcomes (for example from the project no.10-BALKANGEONET) realized in the previous period.

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