



Case Studies on Climate adaptation approaches and measures in Macedonia



<http://www.unfccc.org.mk/>

MOEPP and HMS

Legal framework

The law on Environment

Law on Nature Protection

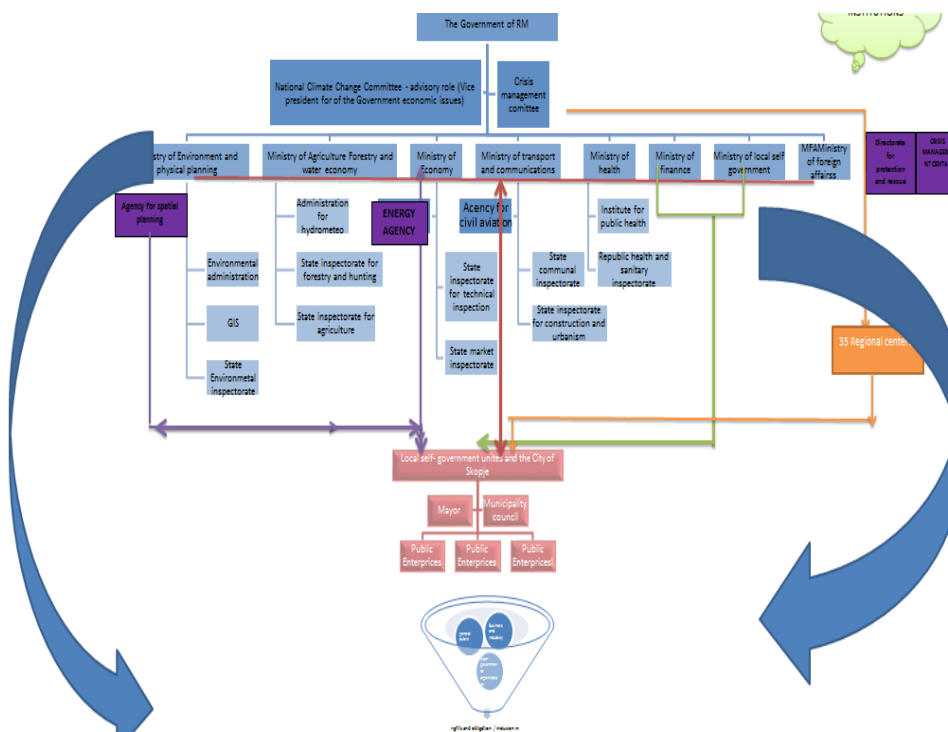
Law on ambient air quality

Law on Waste Management

Law on waters

- The UN Framework Convention on Climate Change (UNFCCC) was ratified on January 1998, and the Kyoto Protocol in July 2004.





Documents

First biannual update report on climate change (FBUR)

Third National Communication on Climate Change

Second National Communication on Climate Change

Macedonia's First National Communication under the United Nations Framework Convention on Climate Change

Third National Communication on Climate Change

National emissions of Greenhouse gases



Climate change mitigation



[Climate Change Mitigation - sector Transport](#)

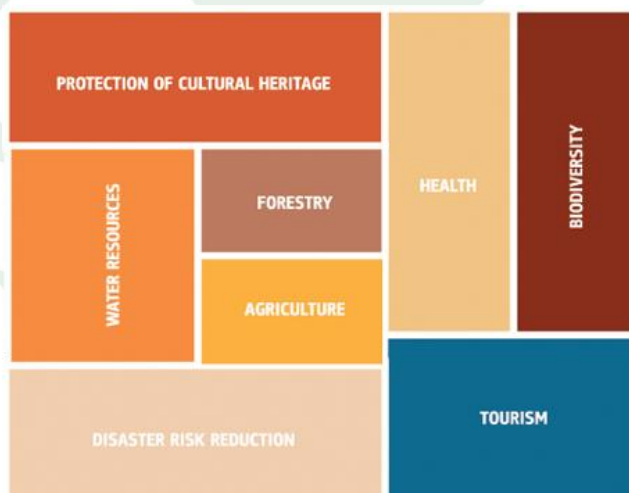
[Climate Change Mitigation - sector Agriculture](#)

[Climate Change Mitigation - sector Waste](#)

[Climate Change Mitigation – sector Energy](#)

Сите да бидеме
дел од ПРИРОДАТА

Adaptation potential in most vulnerable sectors



дел од ПРИРОДАТА

Vulnerability- sensitivity of different sectors to climate change



Sensitivity of different sectors to climate change and future estimated changes of temperature and precipitation

Extreme weather events

Climate change scenarios

Сите да бидеме
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Vulnerability assessment methodologies

Type	Criteria	Indicator
Flood	Sensitivity	Precipitation > 80 mm/day
		Maximum precipitation (mm)
		Maximum runoff (m ³ /s)
		Summer precipitation (mm)
	Exposure	Elevation (m)
Drought	Sensitivity	Population density (person/km ²)
		River improvement ratio (%)
	Exposure	Annual precipitation (mm)
	Adaptability	Precipitation > 1 mm/day
		Water requirement density (t)
Water management	Sensitivity	Area (km ²)
		Annual precipitation
		Annual temperature
		Conduit water consumption
	Exposure	Ground water consumption
		Elevation
	Adaptability	Population density
		Conduit water supply rate
		Sewage supply rate

дел од ПРИРОДАТА

CLIMATE CHANGE SCENARIOS FOR MACEDONIA

Climate change prediction in Macedonia is carried out with the help of the MAGICC/SCENGEN software package, version 5.3. in accordance with the IPCC's basic recommendations and the results contained in the last Fourth Assessment Report / AR4, as follows:

- No favoured ("best") scenario is adopted. Instead, preference is given to the application of several scenarios producing a spectrum of probable results rather than single values.
- The use of the three most probable values (optimal and limit values) for climate sensitivity: 2.0°C, 3.0°C and 4.5°C.
- The selection of scenarios valid for the region being observed.



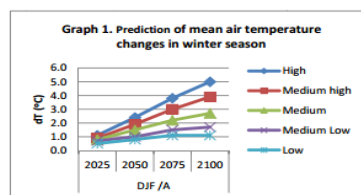
Air temp. prediction (2025-2100)

The results are as follows:

Winter season (December, January, February):

2025: a change of 0.8 [0.5 – 1.1] °C,
 2050: a change of 1.5 [0.8 – 2.4] °C,
 2075: a change of 2.2 [1.1 – 3.8] °C,
 2100: a change of 2.7 [1.1 – 5.0] °C.

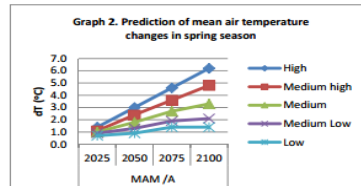
(These results are shown in Graph 1.)



Spring season (March, April, May):

2025: a change of 1.0 [0.7 – 1.4] °C,
 2050: a change of 1.8 [0.9 – 3.0] °C,
 2075: a change of 2.7 [1.4 – 4.6] °C,
 2100: a change of 3.3 [1.4 – 6.2] °C.

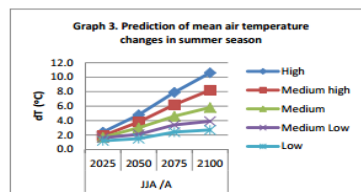
(These results are shown in Graph 2.)



Summer season (June, July, August):

2025: a change of 1.7 [1.2 – 2.4] °C,
 2050: a change of 3.0 [1.5 – 4.8] °C,
 2075: a change of 4.6 [2.4 – 7.9] °C,
 2100: a change of 5.8 [2.7 – 10.6] °C.

(These results are shown in Graph 3.)



Autumn season (September, October, November):

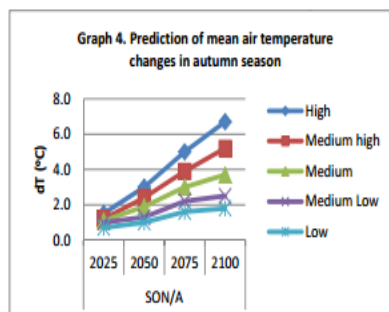
2025: a change of 1.1 [0.7 – 1.5] °C,

2050: a change of 1.9 [1.0 – 3.0] °C,

2075: a change of 3.0 [1.6 – 5.0] °C,

2100: a change of 3.7 [1.8 – 6.7] °C.

(These results are shown in Graph 4.)



At annual level:

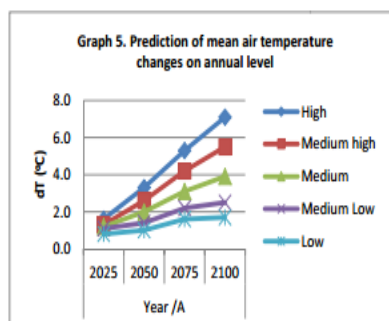
2025: a change of 1.2 [0.8 – 1.6] °C,

2050: a change of 2.0 [1.0 – 3.3] °C,

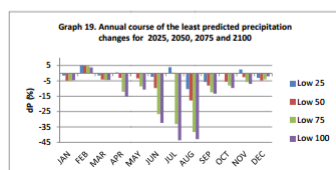
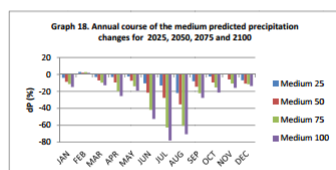
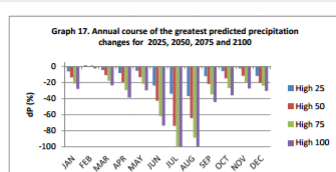
2075: a change of 3.1 [1.6 – 5.3] °C,

2100: a change of 3.9 [1.7 – 7.1] °C.

(These results are shown in Graph 5.)



Average monthly precipitation quantities (2025-2100)



дел од ПРИРОДАТА

Adaptation strategies and measures in water sector

Construction/modification of physical infrastructure

- Installation of canal linings to increase the efficiency of irrigation
- Use of closed conduits instead of open channels
- Integration of separate reservoirs into a single system
- Construction/rehabilitation of reservoirs/hydro-plants/delivery systems
- Raise the height of dams
- Removal of sediment from reservoirs for more storage
- Inter-basin transfer of water

Adaptive management of existing water supply systems

- Upgrade operating rules for reservoirs
- Use conjunctive surface/groundwater supply
- Physically integrate the reservoir operation system
- Coordinate supply and demand
- Indigenous/native options



Adaptation strategies and measures in water sector

Policy, conservation, efficiency, and technology

Domestic

- Municipal and in-home re-use of water • Leak repairs • Rainwater collection for non-potable uses • Low-flow appliances • Dual-supply systems (potable and non-potable)

Agriculture

- Irrigation timing and efficiency • Drainage re-use, use of wastewater effluent • High value/low water use crops • Drip, micro-spray, low-energy, precision application irrigation systems

Industry

- Water re-use and recycling • Closed cycle and/or air cooling • More efficient hydropower turbines • Cooling ponds, wet towers and dry towers

Hydropower

- Reservoir re-operation • Additional reservoirs and hydropower stations • Low head run of the river hydropower • Market/price-driven transfers to other activities • Using water price to shift water use between sectors



The Third National Communication proposes the measures for the prevention of flooding

- Restriction of urban development in flood-risk zones
- Measures aimed at maintaining dam safety
- Afforestation and other structural measures to avoid mudflows
- Construction of dikes
- Changing in operation of reservoirs and lakes
- Land use management
- Implementation of retention areas
- Improved drainage possibilities
- Structural measures such as temporary dams, building resilient housing and modifying transport infrastructure
- Migration of people away from high-risk areas



Adaptation actions for water conservation and management are presented in the table below:

Action	Type	Stakeholders	Timeframe	Financing	Constraints	Comments
Modification of existing water supply and irrigation systems to decrease water losses (drip, micro-spray, low-energy, measuring devices)	Capacity building Maintenance Planning	MAWFE Public water management enterprises	Long-term	High budget		Link: Agriculture
Implementation technology for re-use of water (municipal, drainage, waste water)	Policy	MAWFE Public water management enterprises	Medium-term	Medium budget	Finances, Technology aspect	Link: Agriculture Health
Inventory and GIS mapping the existing wells for groundwater use	Capacity building Policy	MAWFE Local municipalities Public water management enterprises	Short-term	Low budget	Low public awareness	Link: Agriculture
Construction system for inter-basin water transfer	Policy Planning	MAWFE MEPP Public water management enterprises	Long-term	High budget	Finances, Access to International funding programs	Link: Agriculture
River basin management plan development including conjunctive surface and groundwater supply	Policy Modelling	MAWFE MEPP Local municipality Public water management enterprises	Short-term	Medium budget		Link: Agriculture
GIS hazard events mapping and risk management (drought and flood)	Policy	MAWFE MEPP Public water management enterprises NGOs	Short-term	Medium budget	Lack of data	Link: Agriculture Forestry Biodiversity Health
Monitoring network improvement (surface water, groundwater, water use, water quality)	Capacity building Policy	MAWFE MEPP HMS Public water management enterprises	Short-term	Medium budget	Finances	Link: Agriculture Forestry Biodiversity Health

дел од ПРИРОДАТА

Name of project	End date	Sector	Subsector	Implementator	Beneficiary
Macedonia's First Biennial Update Report	28.02.2015	CLIMATE CHANGE	UNFCCC	UNDP	NATIONAL
Rehabilitation of health provider institutions in the Republic of Macedonia (Completion of the on-going works for the Institute for Children Lung Diseases – Kozle in Skopje)	31.12.2014	BASIC HEALTH INFRASTRUCTURE		MINISTRY OF HEALTH	MINISTRY OF HEALTH
Gevgelija Waste Water Treatment Plant	31.12.2014	WATER MANAGEMENT	WATER SUPPLY AND SANITATION - LARGE SYSTEMS	MINISTRY OF ENVIRONMENT AND PHYSICAL PLANNING	LOCAL PUBLIC CO. MUNICIPALITY
Consultancy Services for Gevgelija Waste Water Treatment Plant	31.12.2016	WATER MANAGEMENT	WATER SUPPLY AND SANITATION - LARGE SYSTEMS	COMPANY	LOCAL PUBLIC CO.
Nature Protection Programme in Macedonia	31.12.2016	GENERAL ENV. PROTECTION	NATURE PROTECTION	COMPANY	MINISTRY OF ENVIRONMENT AND PHYSICAL PLANNING
Restoration of Prespa Lake Ecosystem	31.12.2016	BIODIVERSITY PRESPA LAKE		UNDP	MUNICIPALITY
Bregalnica River Basin Management Plan	26.01.2016	WATER MANAGEMENT	RIVER BASINS DEVELOPMENT	CONSULTING	MINISTRY OF ENVIRONMENT AND PHYSICAL PLANNING
Education about nature conservation in the Bregalnica Region	31.12.2015	ENV. EDUCATION - TRAINING	RIVER BASINS DEVELOPMENT	NGO	MUNICIPALITY
Ending phase of Integration of Environmental Education in Macedonian Educational System	31.12.2015	ENV. EDUCATION - TRAINING	ENVIRO. SECURITY	NGO	
Improvement of the Gostivar water supply system project	31.05.2015	WATER MANAGEMENT	WATER SUPPLY - LARGE SYSTEMS	CONSULTING	LOCAL PUBLIC CO.
Improvement of the Gostivar water supply system project	31.05.2015	WATER MANAGEMENT	WATER SUPPLY AND SANITATION - LARGE SYSTEMS	CONSULTING	LOCAL PUBLIC CO.
Construction of new well in the well field Grodovski used for the drinking water supply system of the city of Kocani	31.12.2014	WATER MANAGEMENT	BASIC DRINKING WATER SUPPLY AND BASIC SANITATION	MUNICIPALITY	LOCAL PUBLIC CO.
Replacement of pumps and upgrade of the pumping stations at the well field Gradecka	31.12.2014	WATER MANAGEMENT	BASIC DRINKING WATER SUPPLY	MUNICIPALITY	LOCAL

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Replacement of asbestos pipes of the water supply network on Neretva Street and reconstruction of a pumping station in Rusinovo	31.12.2014	WATER MANAGEMENT	BASIC DRINKING WATER SUPPLY	CONSULTING	MUNICIPALITY LOCAL
River regulation and flood protection measures on Moroska River in the village Morodvis	31.12.2014	WATER MANAGEMENT	RIVER BASINS DEVELOPMENT	CONSULTING	MUNICIPALITY LOCAL
Reconstruction of a sewage system in the village Makedonka	31.12.2014	WATER MANAGEMENT	SANITATION - LARGE SYSTEMS	CONSULTING	MUNICIPALITY LOCAL
Rehabilitation of the water supply system in the village Dolni Lipovik by the reconstruction of two water catchments and the construction of a new transport pipeline	31.12.2014	WATER MANAGEMENT	BASIC DRINKING WATER SUPPLY	CONSULTING	MUNICIPALITY LOCAL
Modernization and upgrading the treatment plant for drinking water Sivritepe at Sveti Nikole	31.12.2014	WATER MANAGEMENT	BASIC DRINKING WATER SUPPLY	MUNICIPALITY	LOCAL PUBLIC CO.
Asset Management for Water and Sanitation Sector in South-East Europe	30.11.2015	WATER MANAGEMENT	WATER SECTOR POLICY AND ADMINISTRATIVE MANAGEMENT	MUNICIPALITY	REGIONAL
Skopje Urban Transport – Twinning Partnership for traffic management and urban road management	14.04.2015	TRANSPORT	SUSTAINABLE URBAN TRANSPORT	MUNICIPALITY	MUNICIPALITY LOCAL
Marine Microbial Biodiversity, Bioinformatics and Biotechnology	01.02.2016	GENERAL ENV. PROTECTION	BIODIVERSITY	COMPANY	REGIONAL
EURENPlus: Boost energy efficiency in manufacturing SMEs by extending European Energy Manager Training and Network	31.10.2015	ENERGY EDUCATION / TRAINING EE SMEs	STRENGTHENING NATURAL RESOURCES	COMPANY	NATIONAL
Reduce Energy use and Change Habits	01.03.2017	ENERGY EDUCATION / TRAINING EE	ENV. PROTECTION	NGO	NATIONAL
Triggering the market uptake of energy performance contracting through street lighting refurbishment projects	01.04.2017	ENERGY POLICY AND ADMINISTRATIVE MANAGEMENT STREET LIGHTS	ENV. PROTECTION	NGO, MUNICIPALITY	REGIONAL
Technical Assistance to Zletovica electricity production	31.12.2015	AGRICULTURAL WATER RESOURCES	IRRIGATION	LOCAL PUBLIC CO.	LOCAL

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Initiative to Enhance Public Dialogue on Sustainable Use of Energy	15.06.2015	ENERGY POLICY AND ADMINISTRATIVE MANAGEMENT	SUSTAINABLE ENERGY USE	NGO	NATIONAL
Development of the ENV.net in West Balkans and Turkey: giving citizens a voice to influence the environmental process reforms for closer EU integration	31.05.2015	ENV. POLICY AND ADMINISTRATIVE MANAGEMENT	MONITORING ENV. PROTECTION	NGO	REGIONAL
South East Europe Sustainable Energy Policy or SEE SEP	14.01.2015	ENERGY POLICY AND ADMINISTRATIVE MANAGEMENT	SUSTAINABLE ENERGY POLICY	NGO	REGIONAL
Support to the Republic of Macedonia for the revision of the National Biodiversity Strategy and Action Plan and development of the fifth national Report to the Convention on Biological Diversity	31.12.2014	BIODIVERSITY	NATIONAL STRATEGY	UNDP	NATIONAL
With saving energy – we invest in the future	31.12.2014	ENERGY EDUCATION / TRAINING	EE ENERGY	NGO	MUNICIPALITY LOCAL
With solar electric and heat energy to reduced CO2 from kindergarten	31.12.2014	ENERGY EDUCATION / TRAINING	SOLAR ENERGY	NGO	MUNICIPALITY LOCAL
Improving the Energy Efficiency in Municipality of Vrapchishte	31.12.2014	ENERGY POLICY AND ADMINISTRATIVE MANAGEMENT	STREET LIGHTS	NGO	MUNICIPALITY LOCAL
Reduction of CO2 emission throughout substitution of fossil fuel with biomass – wood waste in the Polog region	31.12.2014	EDUCATION / TRAINING	BIOMASS	NGO	MUNICIPALITY LOCAL
Energy efficient municipality – part 4	31.03.2015	ENERGY EDUCATION / TRAINING	EE ENERGY	NGO	MUNICIPALITY LOCAL
With energy efficient actions to reduced CO2 emissions and saving energy in Gocle Delcevo primary school in Gostivar	31.12.2014	ENERGY EDUCATION / TRAINING	EE ENERGY	NGO	MUNICIPALITY
From solar eco action to sports strategy	28.02.2015	ENERGY EDUCATION / TRAINING	SOLAR ENERGY	NGO	MUNICIPALITY
Ensuring High Quality and Sustainable DOTS Interventions in the Republic of Macedonia	30.09.2016	TUBERCULOSIS CONTROL	HEALTH	MINISTRY OF HEALTH	NATIONAL
Sustainable tourism and ecology promotion under partnership	30.04.2015	TOURISM POLICY AND ADMINISTRATIVE MANAGEMENT		MUNICIPALITY	REGIONAL
Rehabilitation and extension of	07.08.2016	WATER	WATER SUPPLY	CONSULTING,	PUBLIC CO.,

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Strengthening the administrative capacity of the energy department in the Ministry of Economy and the Energy Agency	13.08.2015	ENERGY POLICY AND ADMINISTRATIVE MANAGEMENT	EARM	CONSULTING	NATIONAL
Recycling of organic waste and green entrepreneurship in the urban web to secure public health	09.02.2015	WASTE MANAGEMENT - DISPOSAL	RECYCLING	MUNICIPALITY	MUNICIPALITY
Blue & Green vs Black & Grey	01.05.2015	GENERAL ENV. PROTECTION	OHRID LAKE	AGENCY	REGIONAL
Promotion of energy efficiency in buildings and protection of the environment	13.02.2015	ENV. POLICY AND ADMINISTRATIVE MANAGEMENT	EE HOUSING	NGO, MUNICIPALITY	REGIONAL
From trash to cash: Sustainable development and economic empowerment of informal waste collectors through waste recycling in the cross border region of Albania and Macedonia	30.04.2015	GENERAL ENV. PROTECTION	RECYCLING	NGO	REGIONAL
Works supervision for the investment project for wastewater collection and treatment in Prieip, Macedonia	02.07.2017	WATER MANAGEMENT	WATER SUPPLY AND SANITATION - LARGE SYSTEMS	CONSULTING	MINISTRY OF ENVIRONMENT AND PHYSICAL PLANNING, LOCAL
Towards the future - Study on the potential and utilization of renewable energy sources in the cross border region	18.06.2015	ENERGY POLICY AND ADMINISTRATIVE MANAGEMENT	RE ENERGY	AGENCY	AGENCY REGIONAL
Innovative practices in environmental protection	27.08.2015	ENV. POLICY AND ADMINISTRATIVE MANAGEMENT		NGO	PUBLIC CO, MUNICIPALITY REGIONAL
Green future for our kids	14.05.2016	ENVIRONMENTAL EDUCATION / TRAINING		MUNICIPALITY	REGIONAL
Public Institutions - Energy Efficiency	21.02.2015	ENERGY POLICY AND ADMINISTRATIVE MANAGEMENT	EE PUBLIC INSTITUTIONS	AGENCY	REGIONAL
Promotion of eco - products in the cross - border area	03.02.2016	ENV. POLICY AND ADMINISTRATIVE MANAGEMENT	ECO PRODUCTS	PUBLIC CO., MUNICIPALITY	REGIONAL
Establishment of Wind Database in the Republic of Macedonia	15.08.2015	POWER GENERATION / RENEWABLE SOURCES	WIND ENERGY	AGENCY	NATIONAL

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HCFC phase-out management plan	31.12.2020	ENV. POLICY AND ADMINISTRATIVE MANAGEMENT	HCFC	CONSULTING	NATIONAL
Improvement in the harmonized seismic hazard maps for the Western Balkans countries	30.06.2015	DISASTER PREVENTION AND PREPAREDNESS	SEISMIC	INSTITUTE	REGIONAL
Integrated pollution prevention and control in Macedonia	02.11.2015	ENV. POLICY AND ADMINISTRATIVE MANAGEMENT	IPPC	CONSULTING	NATIONAL
Municipal Water Programme I	31.12.2015	WATER MANAGEMENT	WATER SUPPLY AND SANITATION - LARGE SYSTEMS	MINISTRY OF TRANSPORT AND COMMUNICATIONS	PUBLIC CO. NATIONAL
Irrigation Programme Southern Vardar Region II	31.12.2016	AGRICULTURAL WATER RESOURCES	IRRIGATION	MINISTRY OF AGRICULTURE, FORESTRY AND WATER ECONOMY	PUBLIC CO. NATIONAL
Municipal Water Programme I	31.12.2015	WATER MANAGEMENT	WATER SUPPLY AND SANITATION - LARGE SYSTEMS	PUBLIC CO.	PUBLIC CO. NATIONAL
Irrigation Vardar Region II, Accompanying Measures	31.12.2016	AGRICULTURAL WATER RESOURCES	IRRIGATION	MINISTRY OF AGRICULTURE, FORESTRY AND WATER ECONOMY	PUBLIC CO. NATIONAL
Programme for Energy Efficiency and Renewable Energies Phase II	31.12.2014	POWER GENERATION / RENEWABLE SOURCES	HYDRO POWER / WIND ENERGY	ELEM	PUBLIC CO. NATIONAL
Reconstruction and rehabilitation of water treatment plant for drinking water in Municipality of Stip	31.12.2014	WATER MANAGEMENT	WATER SUPPLY - LARGE SYSTEMS	MUNICIPALITY	LOCAL
Disaster and climate risk reduction	31.12.2014	DISASTER PREVENTION AND PREPAREDNESS	CC	UNDP	PUBLIC CO. NATIONAL
National auto fuel economy assessment	31.01.2015	TRANSPORT	AUTO FUEL ECONOMY	International Non-profit Organization	NATIONAL
Conversion from HCFC – 141b in HFCs in the Manufacture of polyurethane foam for the commercial refrigeration units, sandwich panels and insulated doors	31.12.2016	BIOSPHERE PROTECTION	HCFC	UNIDO	NATIONAL



Catalyzing market transformation for industrial energy efficiency and accelerate investments in best available practices and technologies in the Former Yugoslav Republic of Macedonia	31.12.2014	ENERGY POLICY AND ADMINISTRATIVE MANAGEMENT	INDUSTRIAL ENERGY EFFICIENCY	International non-profit Organization	NATIONAL
USAID - Adaptation to climate change in agriculture	08.03.2015	AGRICULTURAL DEVELOPMENT	CC MANAGEMENT	NGO	NATIONAL
Clean Energy Investment Project	14.03.2016	ENV. POLICY AND ADMINISTRATIVE MANAGEMENT	EE ENERGY	COMPANY	NATIONAL
Refurbishment of the Public Building Stock	31.08.2016	ENERGY POLICY AND ADMINISTRATIVE MANAGEMENT		NGO	REGIONAL
Conservation and sustainable use of Biodiversity at Lakes Ohrid, Prespa and Skadar II	30.03.2017	BIODIVERSITY	WATER SECTOR, OHRID AND PRESAPA LAKE	GIZ	NATIONAL
Climate Change Adaptation in Western Balkans	31.12.2018	GENERAL ENV. PROTECTION	CLIMATE CHANGE	GIZ	NATIONAL



After the Rain - new documentary about women coping with climate change



So begins [After the Rain](#), the first ever documentary film made by a Macedonian director about **climate change**, will be screened in Skopje this November as part of the European Film Festival [Cinedays](#).

The documentary portrays four women, aged between forty and eighty, who work as farmers in the country. The women are from diverse backgrounds—Macedonian, Turkish and Albanian—and each has a very different attitude towards their work on the land.

<http://www.eurasia.undp.org/content/rbec/en/home/ourwork/environmentandenergy/successstories/after-the-rain---new-documentary-about-women-coping-with-climate/>

