

Climate Change Impacts, Risks and Vulnerabilities in the Republic of Moldova: Observed Trends and Future Projections

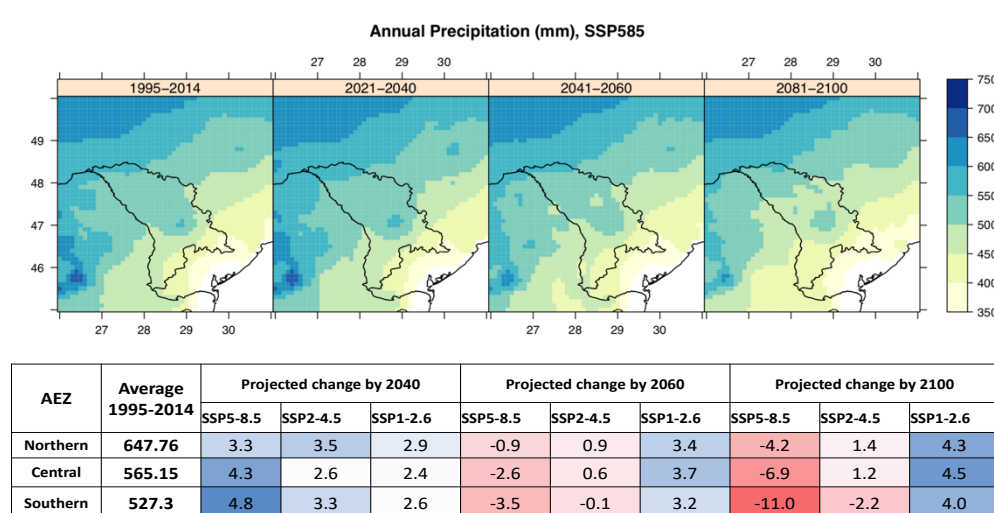
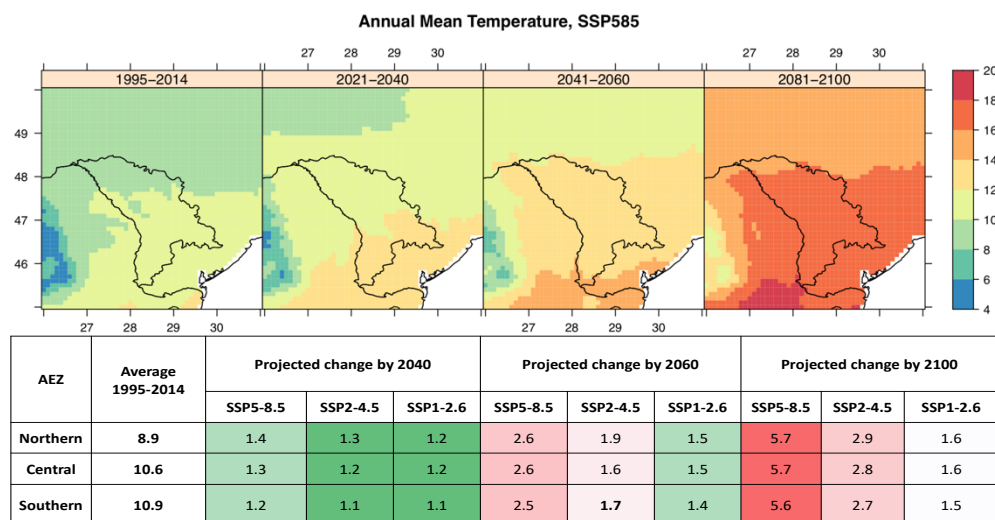
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Public Institution "Environmental Projects National Implementation Office", Ministry of Environmenta RM

MONOGRAPH

The novelty and scientific originality of the work:

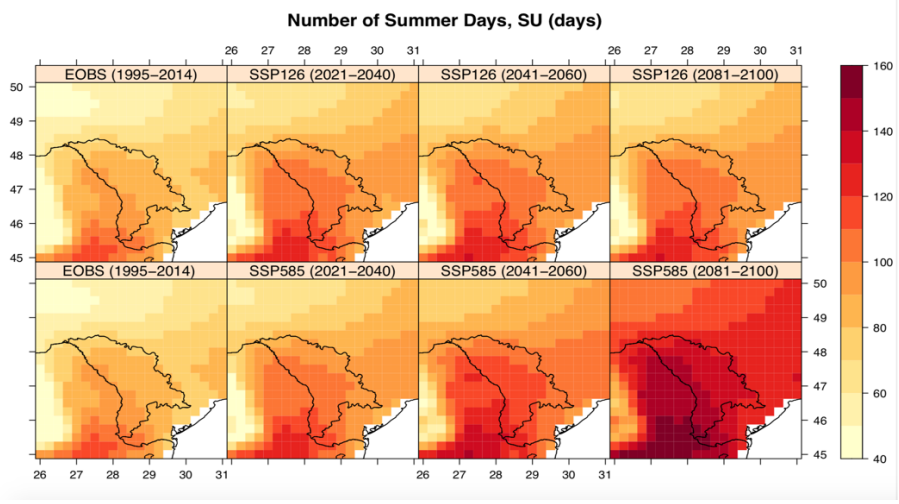
1. Elaboration of new regional climate change projections for the RoM's Northern, Central and Southern Agro-Ecological Zones (AEZs) in terms of the temporal and spatial distribution of annual and seasonal temperature, precipitation



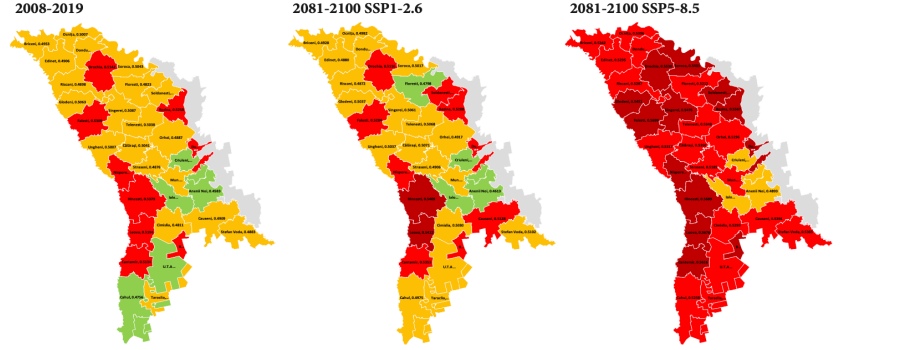
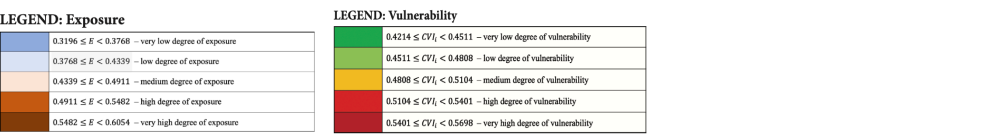
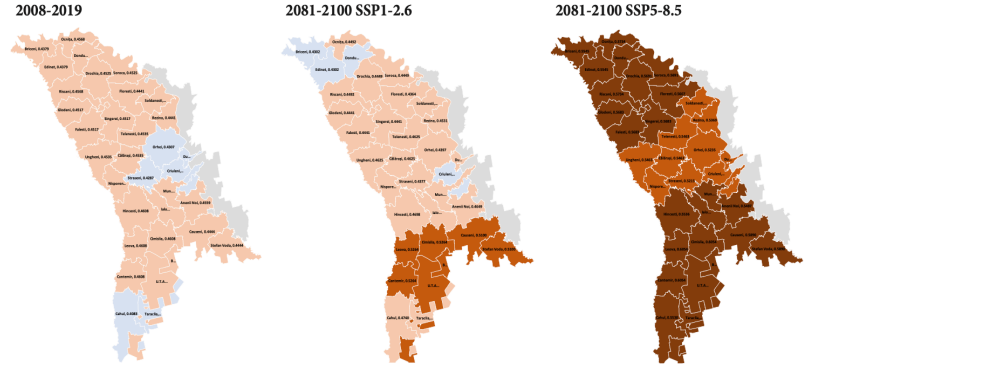
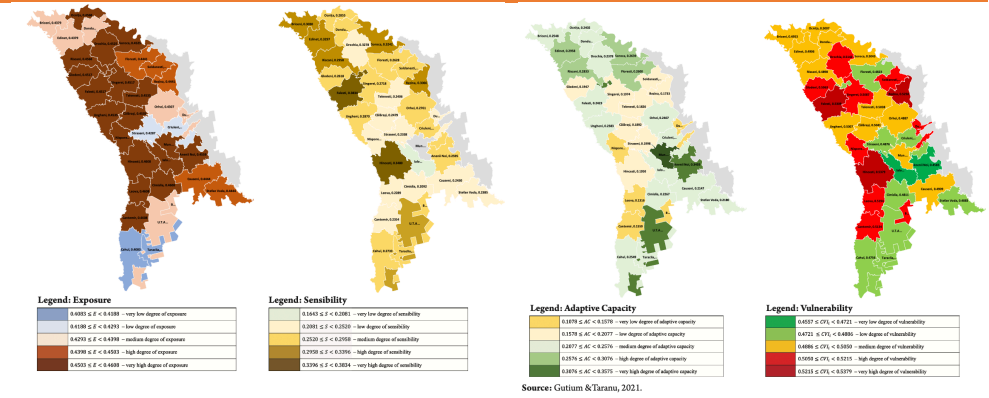
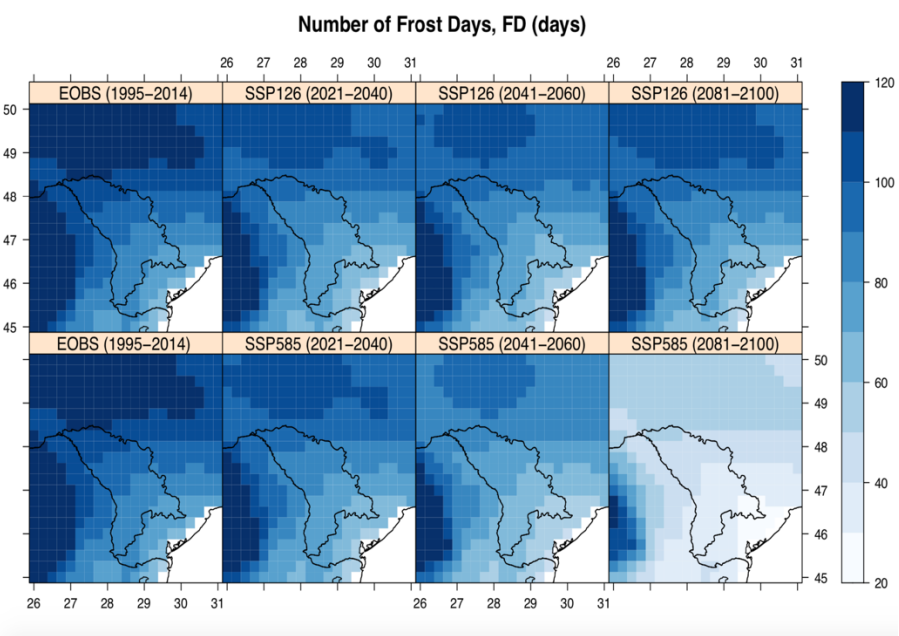
2. Elaboration of new climate change projections for 29 temperature and precipitation extreme indices

SU	Northern AEZ				Central AEZ				Southern AEZ			
	Mean	Trend	R ²	p	Mean	Trend	R ²	p	Mean	Trend	R ²	p
1961-1990	48	-5.0	8	0.1299	72	-9.2	21	0.0113	76	-6.4	15	0.0348
1991-2019	67	14.4	53	0.0000	87	13.3	49	0.0000	94	15.0	48	0.0000

3. Elaboration of Climate Change Vulnerability Index for the RoM's Administrative-Territorial Units: observations and projections



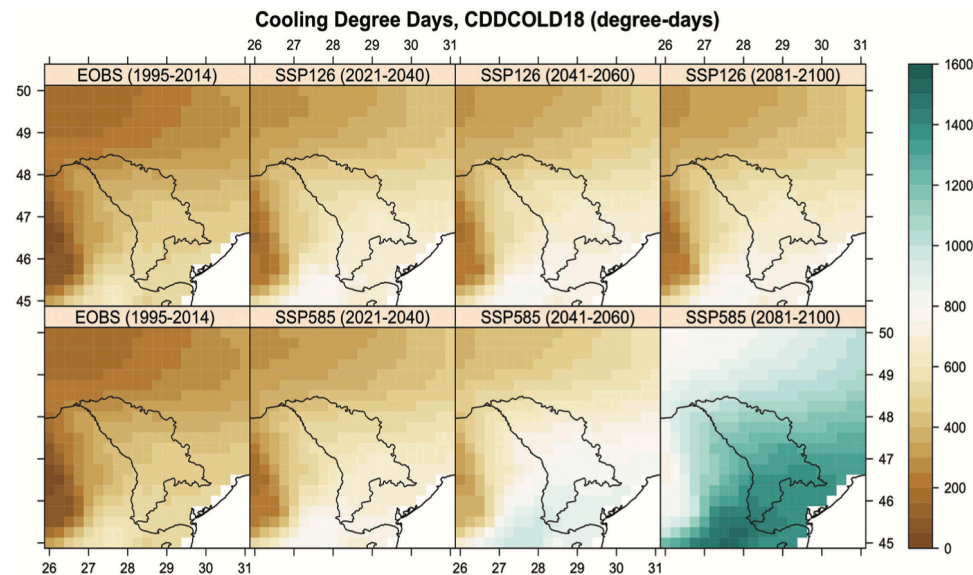
FD	Northern AEZ				Central AEZ				Southern AEZ			
	Mean	Trend	R ²	p	Mean	Trend	R ²	p	Mean	Trend	R ²	p
1961-1990	122	-2.5	2	0.4583	100	-0.4	0.1	0.8947	99	1.2	0.5	0.7035
1991-2019	106	-9.4	36	0.0006	89	-8.9	31	0.0018	87	-13.5	53	0.0000



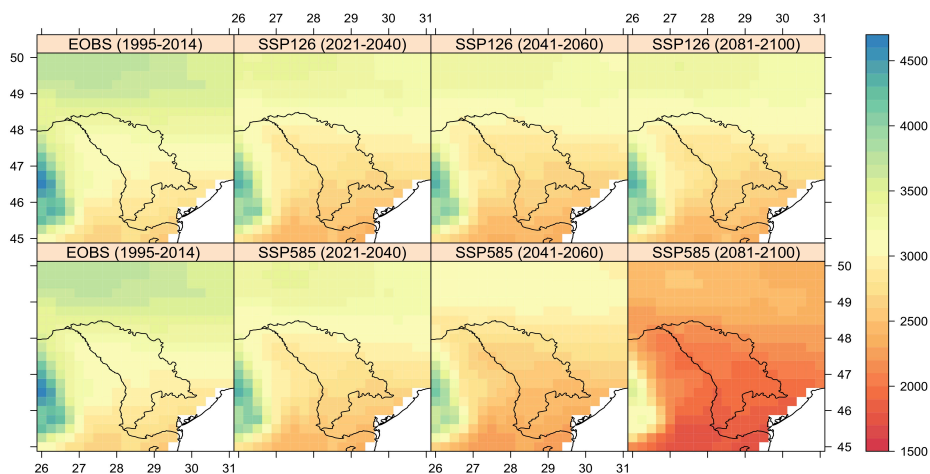
4. Development of broad set of climate change vulnerability indicators for different sectors of national economy: agriculture, energy, forestry, human health and society, based on a wide range of observations and different simulations of global climate models

CLIMATE CHANGE AND ENERGY SECTOR

AEZ	Time period	CDDcold18, degree-days			HDDheat18, degree-days		
		Trend	R ²	p-value	Trend	R ²	p-value
Northern	1961-1990	-13.4	4	0.2661	-52.1	2	0.4326
	1991-2019	63.5	42	0.0001	-203.9	45	0.0000
Central	1961-1990	-20.4	5	0.2150	22.7	0.4	0.7184
	1991-2019	81.9	37	0.0004	-158.7	36	0.0006
Southern	1961-1990	-25.4	8	0.1210	36.9	2	0.5178
	1991-2019	91.8	45	0.0000	-232.2	54	0.0000



Heating Degree Days, HDDHEAT18 (degree-days)



CLIMATE CHANGE AND HEALTH SECTOR

Time period	EHF HW indices			
	HWA, °C ²	HWN, events	HWF, days	HWD, days
Northern AEZ				
1961-1970	17.2	2.3	10.3	5.3
1971-1980	11	2.3	9.4	4.7
1981-1990	15.2	2.3	11.8	6.9
1991-2000	22.6	3.8	19	7.3
2001-2010	23.8	3.8	23	9.9
2010-2019	26.7	6.5	42.4	13.1
Central AEZ				
1961-1970	17.1	2.3	9.6	4.7
1971-1980	13.4	2.1	10.4	4.6
1981-1990	15.9	2.1	11.1	6.9
1991-2000	21.4	3.8	21.7	8.4
2001-2010	27	4.6	27.4	9.6
2010-2019	29.9	5.5	39	12.2
Southern AEZ				
1961-1970	16.3	2.7	11.1	5.6
1971-1980	10.8	2.2	9.4	4.6
1981-1990	13.9	2	9.8	5.9
1991-2000	20.5	3.3	16.7	6.8
2001-2010	26.4	4.3	26	8.9
2010-2019	24.5	5.6	38	12.6

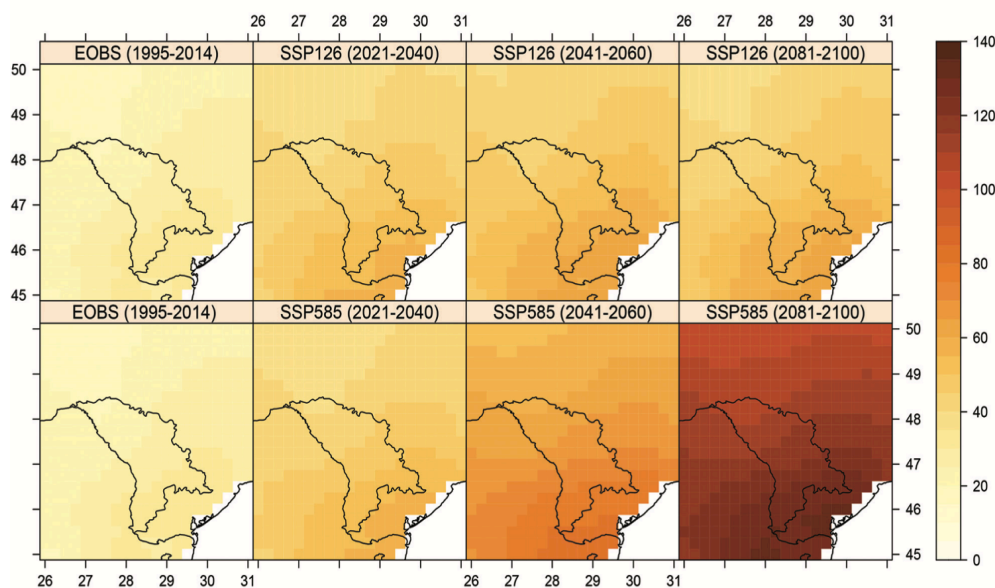
AEZ	Scenarios	Projected change by 2021-2040	Projected change by 2041-2060	Projected change by 2061-2080	Projected change by 2081-2100
Northern	SSP1-2.6	130.9	158.3	167.6	148.0
	SSP5-8.5	139.6	272.3	504.4	706.4
Central	SSP1-2.6	165.9	201.5	223.3	193.6
	SSP5-8.5	172.3	348.5	624.1	859.3
Southern	SSP1-2.6	178.2	213.8	238.3	260.2
	SSP5-8.5	184.9	370.7	595.5	908.1

CLIMATE CHANGE IMPACTS, RISKS AND VULNERABILITIES IN THE REPUBLIC OF MOLDOVA: OBSERVED TRENDS AND FUTURE PROJECTIONS

CHISINAU, 2023

Period	Scenario	EHF.HWM, (°C²)	EHF.HWA, (°C²)	EHF.HWN, (events)	EHF.HWD, (days)	EHF.HWE, (days)
Central AEZ						
2021-2040	SSP1-2.6	+0.3	+8.8	+1.7	+5.8	+20.2
	SSP5-8.5	+0.9	+10.9	+1.7	+5.8	+20.0
2041-2060	SSP1-2.6	+1.3	+14.6	+2.2	+6.7	+25.9
	SSP5-8.5	+2.0	+22.5	+3.0	+12.6	+43.0
2061-2080	SSP1-2.6	+1.1	+13.4	+2.0	+9.3	+28.0
	SSP5-8.5	+4.4	+40.7	+3.0	+30.4	+71.9
2081-2100	SSP1-2.6	+1.0	+12.2	+2.4	+5.8	+24.6
	SSP5-8.5	+6.4	+50.8	+2.3	+52.9	+92.9
Southern AEZ						
2021-2040	SSP1-2.6	+0.2	+7.3	+1.6	+7.0	+23.4
	SSP5-8.5	+0.7	+8.4	+1.7	+7.5	+23.2
2041-2060	SSP1-2.6	+0.8	+12.3	+2.3	+8.2	+29.0
	SSP5-8.5	+1.5	+19.4	+3.1	+16.3	+49.2
2061-2080	SSP1-2.6	+0.7	+12.8	+2.1	+10.7	+31.9
	SSP5-8.5	+4.0	+33.4	+2.3	+34.4	+70.2
2081-2100	SSP1-2.6	+1.0	+14.7	+2.7	+9.9	+35.4
	SSP5-8.5	+6.4	+47.6	+1.7	+58.5	+98.6

Heatwave frequency for EHF heatwaves, HWF_EHF (days)



https://www.researchgate.net/publication/372914680_Climate_Change_Impacts_Risks_and_Vulnerabilities_in_the_Republic_of_Moldova_Observed_Trends_and_Future_Projections

Theoretical significance and applied value of the research. This study presents a largely indicator-based assessment of observed and projected climate change, impacts, risks, and vulnerabilities to national economy, agriculture, energy, forestry, human health, and society, based on a wide range of observations and different GCMs simulations. It identifies the regions and Administrative-Territorial Units (ATUs) that are experiencing particularly severe climate change impacts, risks and vulnerabilities. The principal sources of uncertainty for the climate change indicators and modelling results are discussed and, where appropriate, reflected in the assessments. The climate change indicators included in this report cover observed and future time periods, and information is presented at different levels of aggregation: national, regional (Northern, Central and Southern AEZs), ATUs and districts.

Socio-economic importance. This study indicates that climate change could pose serious threats to the socio-economic development in the RoM. The government, regional and local authorities, business and civil society shall urgently involve in the development and implementation of climate change adaptation measures. The indicators of vulnerability and adaptation to climate change elaborated by research will contribute to the implementation of the RoM's international commitments assumed by signing the Paris Agreement, adopting the 2030 Global Agenda and its Sustainable Development Goals, as well as of the Sendai Framework for Disaster Risk Reduction, especially for climate objectives.

Acknowledgments. This research has been supported by the UNEP/GEF Project "Republic of Moldova: Preparation of the Fifth National Communication to the United Nations Framework Convention on Climate Change". We acknowledge the employees of the National Bureau of Statistics of the Republic of Moldova and State Hydrometeorological Service of the Republic of Moldova for national statistical and climate data used in the study. We acknowledge also the authors responsible for elaborating the E-OBS dataset from the EU-FP6 project UERRA (<https://www.uerra.eu>) and the Copernicus Climate Change Service, and the data providers in the ECA&D project (<https://www.ecad.eu>). We also thank the World Meteorological Organisation (WMO), the International Expert Team on Sector-specific Climate Indices (ET-SCI) that participated in elaborated the ClimPact2 tool: Lisa Alexander, Nicholas Herold, James Goldie, Enric Aguilar, Marc Prohom, and the Pacific Climate Impacts Consortium: David Bronaugh, James Hiebert, Hongang Yang, Yang Feng, et al.