



## Government of the Republic of Moldova

# Republic of Moldova's Intended National Determined Contribution

## 1. Introduction

The Republic of Moldova is fully committed to the UNFCCC negotiation process towards adopting at COP21 a protocol, another legal instrument or an agreed outcome with legal force under the Convention, applicable to all Parties, in line with keeping global warming below 2°C.

The Republic of Moldova hereby communicates its Intended Nationally Determined Contribution (INDC) and the accompanying information to facilitate clarity, transparency, and understanding, with reference to decisions 1/CP.19 and 1/CP.20.

Regarding the invitation to consider undertakings in adaptation planning, the Republic of Moldova has included in Annex 1 to INDC the information on adaptation contained in its draft Fourth National Communication currently under preparation, as well as in the Republic of Moldova's Climate Change Adaptation Strategy covering the period up to 2020 and the Action Plan on its implementation, approved recently by Governmental Decision No. 1009 as of 10.12.2014.

## 2. Republic of Moldova's Intended National Determined Contribution

The Republic of Moldova intends to achieve an economy-wide unconditional target of reducing its greenhouse gas emissions by 64-67 per cent below its 1990 level in 2030 and to make best efforts to reduce its emissions by 67 per cent.

The reduction commitment expressed above could be increased up to 78 per cent below 1990 level conditional to, a global agreement addressing important topics including low-cost financial resources, technology transfer, and technical cooperation, accessible to all at a scale commensurate to the challenge of global climate change.

In line with Lima Call for Climate Action, in particular its paragraph 14, the following quantifiable information is hereby submitted:

## A) UP-FRONT INFORMATION ON MITIGATION

Intended National Determined Contribution	
<b>Quantifiable information on the reference period</b>	<b>Base Year:</b> 1990. <b>Total Emissions in Base Year:</b> 43.4 Mt CO <sub>2</sub> eq (without LULUCF) and 37.5 Mt CO <sub>2</sub> eq (with LULUCF). These data are provisional and will be defined on biennial basis through inventory submissions.
<b>Timeframes and periods of implementation</b>	Time frame of the commitment is from 1 <sup>st</sup> January 2021 to 31 <sup>st</sup> December 2030. Its achievement will be tracked periodically through the Republic of Moldova's Inventory of Greenhouse Gas Emissions and Sinks.
<b>Type of contribution</b>	Absolute reduction from base year emissions.
<b>Coverage of contribution</b>	<b>Economy-wide</b> absolute reduction from the base year emissions. The geographic coverage is the same as the country's geopolitical boundary (including the administrative territorial units on the left bank of Dniester river). Republic of Moldova intends to account for 100 percent of national greenhouse gas emissions and removals for the base year as published in the Republic of Moldova's Greenhouse Gas Emissions and Sinks, on a net-net basis.
<b>Scope: inclusion of gases and sectors</b>	<b>Gases Covered:</b> all greenhouse gases not controlled by the Montreal Protocol – Carbon Dioxide (CO <sub>2</sub> ), Methane (CH <sub>4</sub> ), Nitrous oxide (N <sub>2</sub> O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur hexafluoride (SF <sub>6</sub> ), Nitrogen trifluoride (NF <sub>3</sub> ). <b>Sectors covered:</b> energy; industrial processes and product use; agriculture; land use, land-use change and forestry; and waste.
<b>Reduction level</b>	The Republic of Moldova is committed to an unconditional target of a 64-67 per cent reduction of its greenhouse gas emissions by 2030 compared to 1990 levels. The 64 per cent reduction corresponds to a self-sufficiency power system development scenario, while the 67 per cent reduction allows for a 30 per cent import of electricity. The reduction commitment could increase up to 78 per cent reduction below 1990 level conditional to a global agreement addressing important topics, including access to low-cost financial resources, technology transfer and technical cooperation commensurate to the challenge of global climate change.
<b>Planning processes</b>	Relevant legislative acts for the INDC implementation are required and will be considered being approved on Parliamentary level. By mid-2016, a draft Low Emission Development Strategy (LEDS) of the Republic of Moldova for the period up to 2030 will be developed. After consultations at the national level, the Low Emission Development Strategy of the Republic of Moldova until 2030 will be subject to approval by the Government by end of 2016. The LEDS is expected to be fully in line with the provisions of the European Union and the Republic of Moldova Association Agreement signed on 27 <sup>th</sup> of June 2014 and any other relevant national legislation.

## Intended National Determined Contribution

### Fair and ambitious

The Republic of Moldova's approach to considering fairness and ambition is to assess how its INDC contributes to meeting the ultimate objective of the Convention, of achieving stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

National commitments are well in line with the emissions pathways towards 2050 that correspond to keeping global warming below 2°C compared to pre-industrial levels.

It is worthwhile to note that fairness considerations in the national perspectives include various aspects and no single indicator on its own can accurately reflect fairness or a globally equitable distribution of countries' efforts.

It is further important to note that the evolving nature of a country's circumstances is to be reflected in the fairness consideration:

- Responsibility is reflected in a country's past, current and future greenhouse gas emissions. Total emissions, as well as per capita emissions, are to be considered.

The Republic of Moldova's responsibility in terms of greenhouse gas emissions is low. In 2013, the Republic of Moldova emitted 12.8 Mt CO<sub>2</sub> eq (without LULUCF) and 12.7 Mt CO<sub>2</sub> eq (with LULUCF), which is less than 0.03 per cent of current world's emissions.

Total and net per capita emissions were less than half of the world's average (3.2 tCO<sub>2</sub> eq/capita vs 6.4 tCO<sub>2</sub> eq/capita (reference), respectively 3.1 tCO<sub>2</sub> eq/capita vs 6.8 tCO<sub>2</sub> eq/capita respectively)<sup>1</sup>.

Also, the Republic of Moldova has a low level of historic emissions, of about 0.05 per cent (without LULUCF) and/or of about 0.04 per cent (with LULUCF), since 1990.

- The capacity to contribute to solving the climate change problem is closely related to the ability to invest in appropriate mitigation measures. Hence, one aspect of capacity is to take into account the GDP growth level and GDP per capita in fairness considerations.

In this context, it is worth mentioning that within 1990-2014 period, the Real GDP decreased in the Republic of Moldova by 29 per cent, from 9.8935 to 6.9881 billion 2010 US\$, while the real GDP per capita decreased by 14 per cent, from 2,261.9 to 1,950.2 2010 US\$<sup>2</sup>.

- The mitigation potential and abatement costs are other core aspects in considering a fair contribution of a country.

The greenhouse gas intensity ("CO<sub>2</sub> emissions per GDP") indices decreased considerably within 1990-2013 period in the Republic of Moldova, from 4.4 to 1.9 kg CO<sub>2</sub> per real GDP 2010 US\$ (without LULUCF), or by 56.4 per cent; and, from 3.8 to 1.9 kg CO<sub>2</sub> per real GDP 2010 US\$ (with LULUCF), or by 56.8 per cent respectively.

These values are still among the highest within the transition economies

<sup>1</sup> CAIT 2.0 WIR's Climate Data Explorer: <<http://cait.wri.org/profile/Moldova>>

<sup>2</sup> United States Department of Agriculture Economic Research Center International Macroeconomic Data Set: <<http://www.ers.usda.gov/data-products/international-macroeconomic-data-set.aspx>>.

Intended National Determined Contribution	
	<p>from the Central and Eastern Europe and reveal a high mitigation potential to achieve the Republic of Moldova's reduction targets. But, in order to reach the conditional target of up to 78 per cent reduction of its greenhouse gas emissions by 2030 compared to 1990 levels, appropriate international financial support approximately equal to US\$ 4.9-5.1 billion, i.e. about US\$ 327-340 million per year until 2030, is needed; the support needed will be in addition to the domestic allocations to cover the required abatement costs.</p> <p>This support will allow adjusting the development pathway of the Republic of Moldova towards a low-carbon economy, thus moving towards progressive decoupling of carbon emissions from economic growth and ensuring a decent level of Real GDP per capita, equal to 4,483 US\$/capita in 2030, which will still be approximately one-tenth of EU 28 average, forecasted to be US\$ 43,516/capita<sup>3</sup> in 2030.</p> <p>As stated above, along with the international financial support for covering the abatement costs, the country will also need assistance in form of technology transfer and capacity building.</p>
Key assumptions and methodological approaches	<p><b>Metrics applied:</b> The Republic of Moldova intends to use 100-year Global Warming Potential (GWP) values to calculate CO<sub>2</sub> equivalent totals. The Republic of Moldova intends to report emission totals using the Fourth Assessment Report values, and will consider future updates to GWP values from IPCC.</p> <p><b>Methodologies for estimating emissions:</b> IPCC Guidelines 2006.</p> <p><b>Approach to accounting for agriculture, forestry and other land use:</b> the Republic of Moldova intends to include all categories of emissions by sources and removals by sinks, and all pools and gases, as reported in the National Inventory of Greenhouse Gas Emissions and Sinks; to account for the land sector using a net-net approach; and to use a "production approach" to account for harvested wood products which is consistent with IPCC guidance. The Republic of Moldova may also exclude emissions from natural disturbances, as consistent with available IPCC guidance.</p> <p>There are material data collection and methodological challenges to estimate emissions and removals in the land sector. In compliance with IPCC Good Practice, the Republic of Moldova will continue to improve its land sector greenhouse gas reporting, which will involve the update of its methodologies.</p> <p><b>Contribution of international mechanisms:</b> The Republic of Moldova may use bilateral, regional and international market mechanisms to achieve its conditional 2030 target, subject to robust systems that deliver real and verified emissions reductions. The unconditional INDC commitment will be met through domestic actions, although these would assist cost-effective implementation.</p> <p>In order to avoid GHG emissions' double counting, an appropriate robust national MRV system will be put in place in the period of 2016-2017. It will cover the GHG emissions accounting from international bunkers and CDM projects as well, delivering real and verified emission reductions.</p>

<sup>3</sup> United States Department of Agriculture Economic Research Center International Macroeconomic Data Set: <<http://www.ers.usda.gov/data-products/international-macroeconomic-data-set.aspx>>.

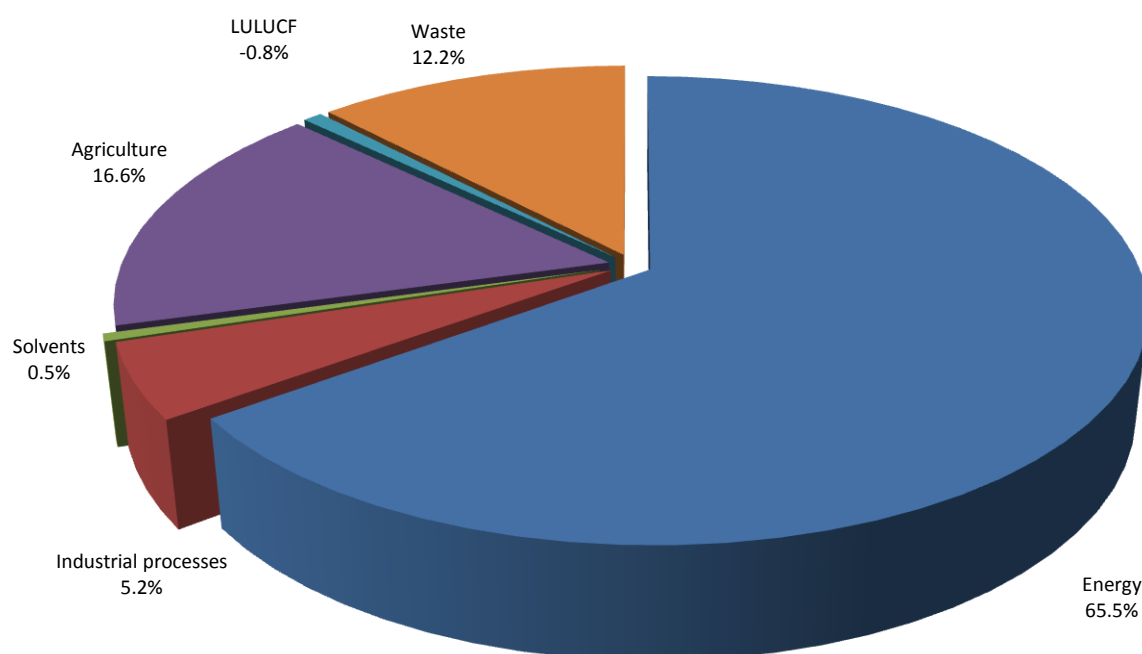
## B) CLARIFYING INFORMATION ON MITIGATION ASPECTS IN THE REPUBLIC OF MOLDOVA

The Republic of Moldova's share in global greenhouse gas emissions is less than 0.03 per cent. In 2013, total and net greenhouse gas emissions of the Republic of Moldova equalled 12.8 Mt CO<sub>2</sub> eq (with LULUCF) and 12.7 Mt CO<sub>2</sub> eq (without LULUCF) (see table 1) and total and net per capita emissions were less than half of the world average (3.2 tCO<sub>2</sub> eq/capita vs 6.4 tCO<sub>2</sub> eq/capita, and 3.1 tCO<sub>2</sub> eq/capita vs 6.8 tCO<sub>2</sub> eq/capita respectively).

**Table 1:** Greenhouse Gas Emissions and Sinks Trends in the Republic of Moldova within 1990-2013 period, Mt CO<sub>2</sub> equivalent

	1990	1995	2000	2005	2010	2011	2012	2013
1. Energy sector	34.5213	11.7222	6.6728	8.4684	9.6473	9.8255	9.4690	8.4046
2. Industrial processes	1.8420	0.4784	0.2702	0.5605	0.5594	0.6011	0.6227	0.6726
3. Solvents	0.1261	0.0346	0.0288	0.0675	0.0612	0.0689	0.0759	0.0666
4. Agriculture	5.0639	3.2844	2.2899	2.3588	2.1007	2.0865	1.6400	2.1267
5. LULUCF	-5.8866	-1.0294	-1.3922	-0.3754	-0.6571	-0.4296	-2.4704	-0.0976
6. Waste	1.8655	1.9044	1.4690	1.2978	1.5707	1.5597	1.5567	1.5658
<b>Total (without LULUCF)</b>	<b>43.4188</b>	<b>17.4240</b>	<b>10.7307</b>	<b>12.7530</b>	<b>13.9394</b>	<b>14.1417</b>	<b>13.3642</b>	<b>12.8363</b>
<b>Net (with LULUCF)</b>	<b>37.5322</b>	<b>16.3946</b>	<b>9.3385</b>	<b>12.3776</b>	<b>13.2823</b>	<b>13.7120</b>	<b>10.8939</b>	<b>12.7387</b>

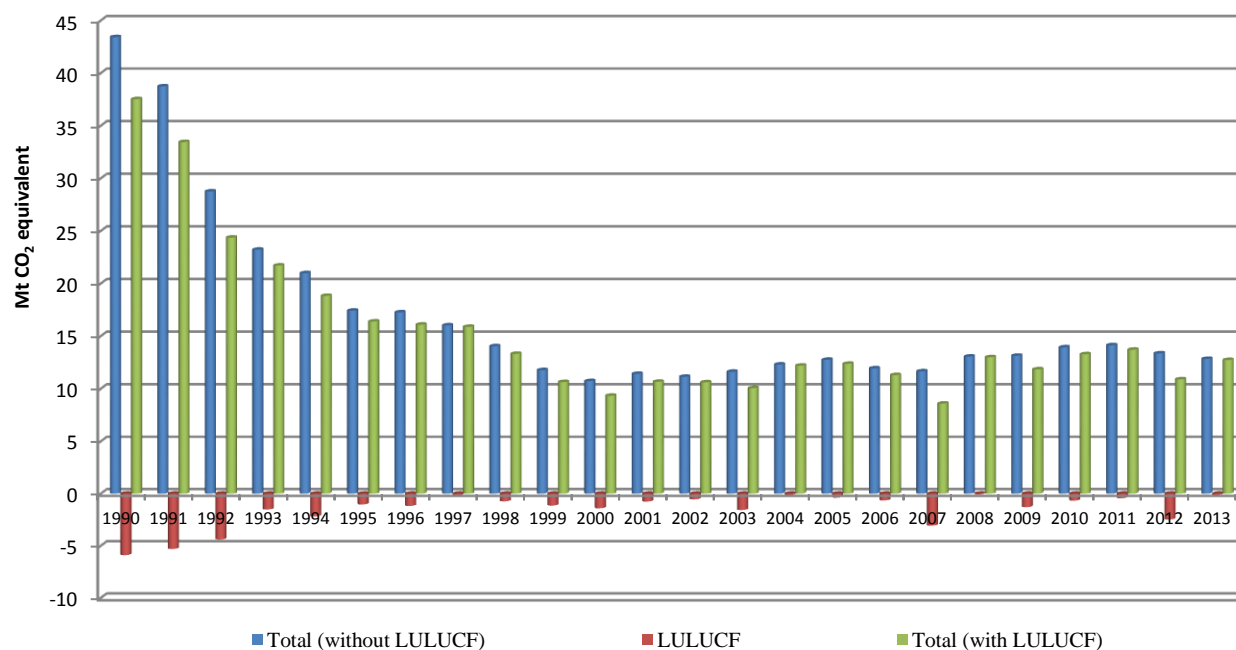
In 2013, about 65.5 per cent of the total national direct GHG emissions originated from Energy Sector. Other relevant direct GHG sources were represented by Agriculture Sector (16.6 per cent of the total), Waste Sector (12.2 per cent of the total) and Industrial Processes Sector (5.2 per cent of the total). The share of two other sectors (Solvents and Other Product Use and Land Use, Land-Use Change and Forestry Sector) was insignificant, less than 1.0 per cent (see figure 1).



**Figure 1:** Breakdown of the Republic of Moldova's Total GHG Emissions by Sectors in 2013

In comparison with the 1990 year level, by 2013 the Republic of Moldova's GHG emissions were 70.4 per cent below 1990 levels (see figure 2).

From table 2, it is obvious that this reduction in GHG emissions over the last 24 years is in full consistency with a decrease in some important socio-economic indicators: population number decreased by 6.8 per cent, the GDP – by 32.2 per cent, the GHG intensity (CO<sub>2</sub>eq/GDP) – by 56.4 per cent, the electricity consumption – by 52.3 per cent, the heat consumption – by 82.4 per cent, while the consumption of primary energy resources decreased by 78.3 per cent.



**Figure 2:** Greenhouse Gas Emissions and Sinks Trends in the Republic of Moldova within 1990-2013 period, Mt CO<sub>2</sub> equivalent

**Table 2:** Republic of Moldova's total GHG Emissions and Associated Variables, 1990-2013

	1990	1995	2000	2005	2010	2011	2012	2013
<b>Population, million inhabitants</b>	<b>4.3616</b>	<b>4.3479</b>	<b>4.2815</b>	<b>4.1479</b>	<b>4.0817</b>	<b>4.0738</b>	<b>4.0690</b>	<b>4.0647</b>
Change compared to 1990, %		-0.3	-1.8	-4.9	-6.4	-6.6	-6.7	-6.8
Inter-annual change, %		-0.1	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1
<b>Total emissions, Mt CO<sub>2</sub> eq</b>	<b>43.4188</b>	<b>17.4240</b>	<b>10.7307</b>	<b>12.7530</b>	<b>13.9394</b>	<b>14.1417</b>	<b>13.3642</b>	<b>12.8363</b>
Change compared to 1990, %		-59.9	-75.3	-70.6	-67.9	-67.4	-69.2	-70.4
Inter-annual change, %		-17.0	-8.8	3.6	6.1	1.5	-5.5	-4.0
<b>GHG per capita, tons per person</b>	<b>10.0</b>	<b>4.0</b>	<b>2.5</b>	<b>3.1</b>	<b>3.4</b>	<b>3.5</b>	<b>3.3</b>	<b>3.2</b>
Change compared to 1990, %		-59.7	-74.8	-69.1	-65.7	-65.1	-67.0	-68.3
Inter-annual change, %		-16.9	-8.6	4.0	6.3	1.6	-5.4	-3.8
<b>GDP, billion 2010 \$US</b>	<b>9.8935</b>	<b>3.9663</b>	<b>3.5229</b>	<b>4.9597</b>	<b>5.8116</b>	<b>6.2068</b>	<b>6.1633</b>	<b>6.7119</b>
Change compared to 1990, %		-59.9	-64.4	-49.9	-41.3	-37.3	-37.7	-32.2
Inter-annual change, %		-1.4	2.1	7.5	7.1	6.8	-0.7	8.9
<b>GHG intensity, kg CO<sub>2</sub> eq/2010 \$US</b>	<b>4.4</b>	<b>4.4</b>	<b>3.0</b>	<b>2.6</b>	<b>2.4</b>	<b>2.3</b>	<b>2.2</b>	<b>1.9</b>
Change compared to 1990, %		0.1	-30.6	-41.4	-45.3	-48.1	-50.6	-56.4
Inter-annual change, %		-15.8	-10.7	-3.6	-0.9	-5.0	-4.8	-11.8
<b>Energy imported, million tce</b>	<b>16.703</b>	<b>5.109</b>	<b>2.535</b>	<b>3.123</b>	<b>2.960</b>	<b>3.075</b>	<b>2.918</b>	<b>2.977</b>
Change compared to 1990, %		-69.4	-84.8	-81.3	-82.3	-81.6	-82.5	-82.2
Inter-annual change, %		11.0	-18.0	4.2	5.0	3.9	-5.1	2.0
<b>Energy consumed, million tce</b>	<b>14.269</b>	<b>5.085</b>	<b>2.647</b>	<b>3.257</b>	<b>3.157</b>	<b>3.201</b>	<b>3.068</b>	<b>3.091</b>
Change compared to 1990, %		-64.4	-81.4	-77.2	-77.9	-77.6	-78.5	-78.3
Inter-annual change, %		9.7	-20.2	6.3	6.7	1.4	-4.2	0.7
<b>Electricity produced, billion kWh</b>	<b>15.690</b>	<b>6.168</b>	<b>3.624</b>	<b>4.225</b>	<b>6.115</b>	<b>5.785</b>	<b>5.802</b>	<b>4.491</b>
Change compared to 1990, %		-60.7	-76.9	-73.1	-61.0	-63.1	-63.0	-71.4
Inter-annual change, %		-25.8	-11.8	1.1	-1.3	-5.4	0.3	-22.6
<b>Electricity consumed, billion kWh</b>	<b>11.426</b>	<b>7.022</b>	<b>4.510</b>	<b>5.838</b>	<b>5.257</b>	<b>5.416</b>	<b>5.604</b>	<b>5.449</b>
Change compared to 1990, %		-38.5	-60.5	-48.9	-54.0	-52.6	-51.0	-52.3
Inter-annual change, %		-3.9	-4.4	-3.1	-0.9	3.0	3.5	-2.8
<b>Heat produced, million Gcal</b>	<b>22.212</b>	<b>7.278</b>	<b>3.846</b>	<b>4.830</b>	<b>4.487</b>	<b>4.376</b>	<b>4.239</b>	<b>4.307</b>
Change compared to 1990, %		-65.3	-81.7	-77.0	-78.6	-79.1	-79.8	-79.5
Inter-annual change, %		-3.1	-31.9	11.1	10.1	-2.5	-3.1	1.6
<b>Heat consumed, million Gcal</b>	<b>20.983</b>	<b>6.283</b>	<b>3.358</b>	<b>4.160</b>	<b>3.798</b>	<b>3.764</b>	<b>3.600</b>	<b>3.694</b>
Change compared to 1990, %		-70.1	-84.0	-80.2	-81.9	-82.1	-82.8	-82.4
Inter-annual change, %		-5.6	-29.6	11.6	9.4	-0.9	-4.4	2.6

The significant reduction in the level of socio-economic indicators over the 1990-2013 periods is a consequence of the deep transformation processes common during transition from a centralized economy to a market economy, specifically after the breakup of the Soviet Union and the declaration of the Republic of Moldova's independence on 27<sup>th</sup> of August 1991.

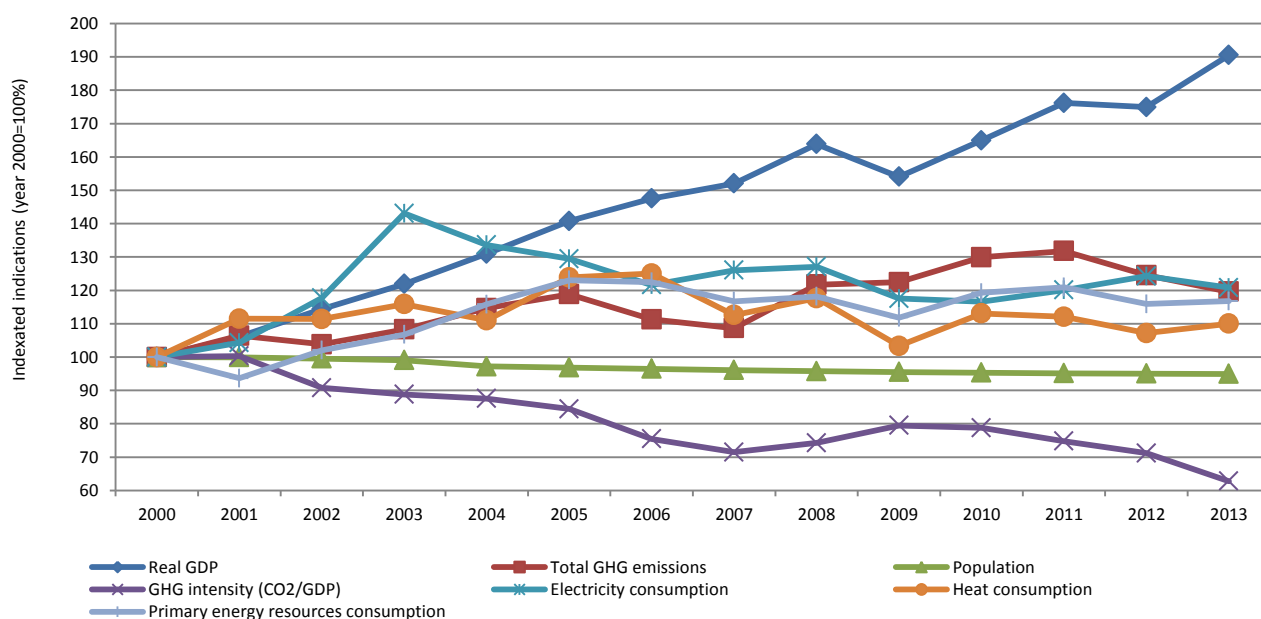


The country rated among the low-medium income countries in 1990, and it is at present one of the lowest income nations in Europe. Certain economic decline patterns had been registered prior to 1991, but the separation from the USSR has considerably accelerated the process.

The GDP level was decreasing continuously during the period from 1990 to 1999 inclusively, when it fell down to as little as 34 per cent of the 1990 level. The reasons for the economic collapse were numerous. First, the country had been fully integrated in the USSR economic system, and the independence resulted, among other things, in the cessation of any subsidies or cash transfers from the centralized government. Second, the end of the Soviet Era with its well established commercial links has resulted in the emergence of numerous obstacles for free movement of goods, and in access restrictions introduced by the emerging markets. Third, the lack of domestic energy resources and raw materials in the country has contributed considerably to the nation's strong dependence on other former Soviet Republics.

This dependence has affected consumers' capacity to pay for the energy used due to the increased prices of energy resources (ex., from 1997 to 2014 the natural gas tariff increased 13.0 times; electricity tariff increased 6.6 times; gasoline, diesel and liquefied gases prices increased 1.9 times), in the condition when about 95% of energy resources were imported. On the other hand, without applying cross subsidizations policies, the current energy prices have incentivized the population to take strong energy efficiency measures in the Republic of Moldova, which led to a significant decrease of the energy intensity, declining since 2006 with an average annual negative growth of 11.3 per cent.

At the same time, within 2000-2013 period, the real GDP increased by 90.5 per cent, from 3.5229 to 6.7119 billion 2010 US\$, while the real GDP per capita increased by 120.0 per cent, from 842.8 to 1,854.1 2010 US\$. The considerable real GDP growth achieved since 2000 seems to indicate that the economy is finally developing in the correct direction, although it should be remembered that in 2013 the real GDP reached only 68 per cent of the 1990 year level. It is worth mentioning that from 2000 to 2013, the electricity consumption increased in the Republic of Moldova by 20.8 per cent; the heat consumption – by 10.0 per cent, the consumption of primary energy resources – by 16.8 per cent; while the GHG intensity (CO<sub>2</sub>eq/GDP) decreased during the same period by 37.2 per cent, showing the first signs of the decoupling of economic growth from the growth in greenhouse gas emissions, by 19.6 per cent within 2000-2013 periods (see figure 3).



**Figure 3:** Trends in total GHG emissions and associated variables in the Republic of Moldova within 2000-2013 period

### *Pre-2020 Mitigation Policy Framework*

In 2010, the Republic of Moldova joined the Copenhagen Accord and submitted an emission reduction target to the UNFCCC Secretariat, which is specified in Annex II to this Agreement “Nationally Appropriate Mitigation Actions of the Developing Countries”. The target of the appropriate mitigation actions of the Republic of Moldova envisaged in this Agreement represents:

*“A reduction of no less than 25% of the 1990 level total national GHG emissions has to be achieved by 2020 through implementation of global economic mechanisms focused on the climate change mitigation, in accordance with the Convention’s principles and provisions.”*

This target was provided without specific nationally appropriate mitigation actions, identified and quantified, or further clarification on the support needed. However, it was recognized that, to achieve this target, significant financial, technological and capacity building support will be needed, which can be provided by UNFCCC mechanisms.

The Environmental Protection Strategy for the years 2014-2023 and the Action Plan for its implementation was recently approved through the Governmental Decision No. 301 as of 24.04.2014<sup>4</sup>. According to this policy document, a 20 per cent GHG emissions reduction compared to the BAU scenario has to be reached in the Republic of Moldova by 2020.

Along with the overall national target, the policy document sets up GHG emissions reduction targets for seven economic sectors:

- power production sector – 25 per cent GHG emissions reduction compared to BAU scenario has to be achieved by 2020;
- buildings, industry and agriculture sectors – 20 per cent GHG emissions reduction compared to BAU scenario has to be reached by 2020;
- transport and waste sectors – 15 per cent GHG emissions reduction compared to BAU scenario has to be achieved by 2020; and
- LULUCF sector – an increase by 25 per cent of the net removals has to be reached by 2020.

The desired reduction of GHG emissions by 2020 of 20 per cent below the BAU scenario level requires decisive actions at the national and sector levels. For instance, considerable abatement contributions are expected to be achieved within the energy sector (533 ktep savings are envisaged from energy efficiency measures and 430 ktep savings from RES implementation covering the energy demand – the policy instruments in place envisage increasing the share of RES in the country’s energy balance up to 20 percent by 2020, and covering up to 10 percent of the electricity demand with locally produced renewable energy by 2020).

### *Post-2020 Mitigation Policies Framework*

Relevant legislative acts for the INDC’s commitments implementation within 2021-2030 periods are required and will be considered being approved on Parliamentary level.

By mid-2016, a draft Low Emission Development Strategy (LEDS) of the Republic of Moldova for the period up to 2030 will be developed. After consultations at the national level, the Low Emission Development Strategy of the Republic of Moldova until 2030 will be subject to approval by the Government by end of 2016.

Thus, the Republic of Moldova stays committed to and striving for an ambitious international agreement on climate change in line with recommendations by science to maintain average global temperature increase below two degrees Celsius.

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<sup>4</sup> <<http://lex.justice.md/index.php?action=view&view=doc&lang=1&id=352740>>.



### **3. FOLLOW UP**

The Republic of Moldova urges all other Parties, in particular major economies, to communicate their INDCs in a manner that facilitates their clarity, transparency and understanding.

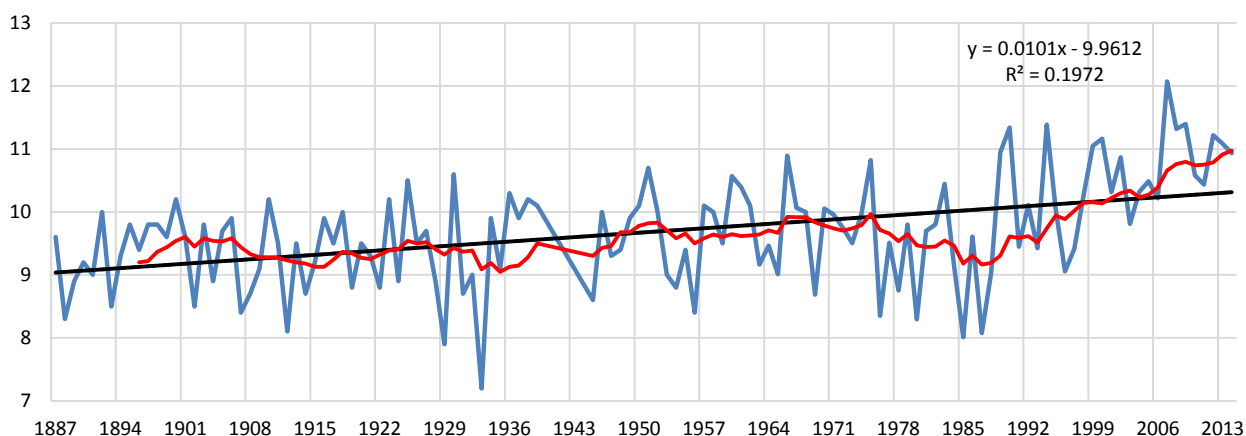
The Republic of Moldova requests the UNFCCC Secretariat to publish its INDC on its website and to take it into account when preparing the synthesis report on the aggregate effect of the INDCs communicated by Parties.

The Republic of Moldova looks forward to discussing with other Parties the fairness and ambition of the INDCs in the context of the below 2°C objective, their aggregate contribution to that objective and ways to collectively further increase this ambition.

## A) UP-FRONT INFORMATION ON ADAPTATION PLANNING

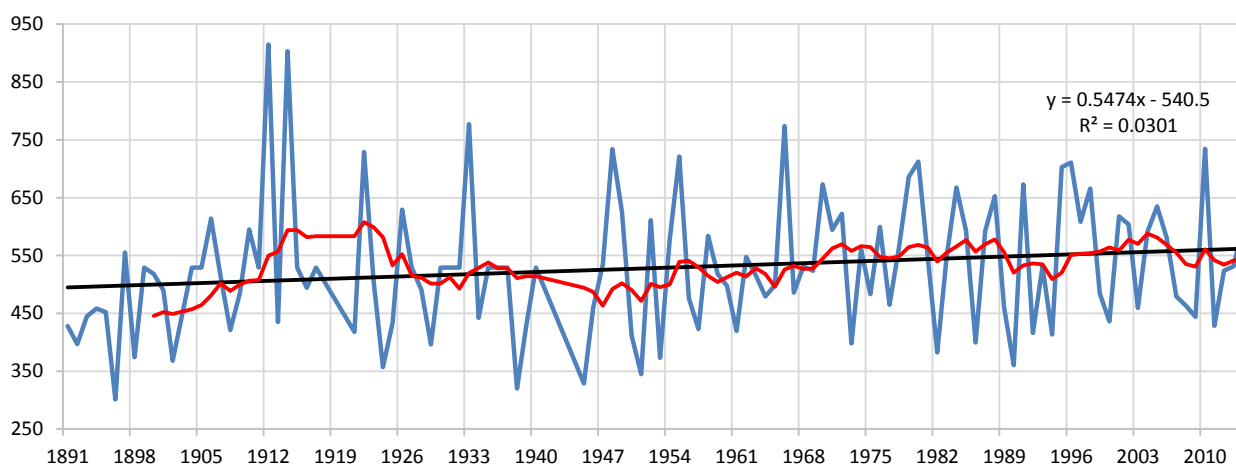
### A.I. Climate change trends, impacts and vulnerabilities

The Republic of Moldova is a highly vulnerable country to the adverse impacts of climate change. Over the last 127 years, the Republic of Moldova has experienced changes in temperature and mean precipitation. The country has become warmer, with the average temperature increase greater than 1.0°C.



**Figure 4:** Trends of annual average air temperature change (°C) for 1887-2014: blue (actual course trend), black solid line (linear trend secular course) and red line (10 year moving average trend) at the meteorological station Chisinau, central part of the country

At the same time, the Republic of Moldova has experienced an increased number of extreme weather events, such as droughts and floods. An analysis of national climate data revealed that the frequency of droughts in the Republic of Moldova in a 10-year time span is 1-2 droughts in the Northern part of the country; 2-3 droughts in the Central part and 5-6 droughts in the South. Their frequency is increasing, especially over the last decades. During the 1990-2014 timespan, 10 years were marked by droughts, which reduced significantly the crop yields. In 1990, 1992 and 2003, droughts continued during the entire vegetation period (April-September). The disastrous droughts of 2007 and 2012 affected over 70 per cent of the territory of the country, being the most severe droughts in the entire instrumental record period.



**Figure 5:** Trends of annual average precipitation (mm) for 1891-2014: blue (actual course trend), black solid line (linear trend secular course) and red line (10 year moving average trend) at the meteorological station Chisinau, central part of the country.

Floods also affect the Republic of Moldova on a recurring basis. In the past 70 years, 10 major floods on the great rivers of the Republic of Moldova (Dniester and Prut) were reported, and three of those occurred already in XXI century (2006, 2008 and 2010). Large floods on the smaller rivers of the country are also quite common.

The socio-economic costs of climate change related to natural disasters such as droughts and floods are significant. Both their intensity and frequency are expected to further increase as a result of climate change. During 1984-2006, the Republic of Moldova's average annual economic losses due to natural disasters were about US\$61 million.

The 2007 and 2012 droughts alone caused losses estimated at about US\$ 1.0 and 0.4 billion, respectively. The 2008 floods cost the country about US\$120 million, and the total damage and losses produced by 2010 floods were estimated at approximately US\$42 million.

The patterns of future temperature and precipitation conditions were computed for the Republic of Moldova from the global climate model output gathered as part of the Coupled Model Intercomparison Project Phase 5 (CMIP5).

Twenty one global coupled atmosphere ocean general circulation models (GCMs) were implied in this exercise under the Fourth National Communication Project, the projections being made under the Representative Concentration Pathway (RCP) scenarios RCP 2.6, RCP 4.5, and RCP 8.5 available in the IPCC AR5.

The future climatic changes were assessed over the three Agro-Ecological Zones (AEZs) (North, Centre and South) of the Republic of Moldova for the near term (2016–2035), midterm (2046–2065) and long term (2081–2100) given relative to the reference period (1986–2005).

It was revealed that for temperature, the ensemble average changes consistently have the same sign across scenarios and their magnitude increase from the low RCP 2.6 radiative forcing pathway to the high RCP 4.5 and RCP 8.5, as moving into the later decades of the 21st century. The CMIP5 projections reveal warming in all seasons for the three AEZs, while precipitation projections are more variable across scenarios, sub-regions and seasons.

Annual changes for temperatures are very homogeneous over the three AEZs. The rate of warming is higher under RCP 8.5 scenario +4.6°C; medium +2.4°C under RCP 4.5; and smaller +1.3°C under the RCP 2.6 scenario by 2100. The ensemble, driven by RCP 8.5 emission scenario, estimates that the three AEZs will experience the most significant warming during summer from +5.9°C in North up to +6.1°C in South by 2100. The pattern of change derived from the ensemble RCP 2.6 models is quite similar, but the magnitude of change is lower from +1.3 to +1.5°C. The warming would be higher during winter up to +4.6°C in North, in the Centre and South temperature rise will be lower up to +4.2°C according to the RCP 8.5 scenario. The RCP 2.6 scenario reveals less intense warming over the three AEZs, from +1.2 to +1.4°C.

The ensemble projections from the RCP 8.5 forcing scenario show that the three AEZs would exhibit a general annual decrease in precipitation varying from 9.9% in North to 13.4% in South. Controversially, according to RCP 2.6 scenario moderate increase in precipitation from 3.1% in North to 5.1% in South by 2100 is projected. Winters were been estimated to be wetter in the Republic of Moldova by the end of the 21st century. The ensemble projections show the largest increase in precipitation from 4.0% (RCP 2.6) to 11.8% (RCP 8.5) in winter over Northern and the lowest one from 3.0% (RCP 2.6) to 7.4% (RCP 8.5) in Central parts of the country by 2100. The precipitation decrease will be more extended in the three AEZs during summer; the greatest rainfall reduction from 13.2% (RCP 4.5) to 25.1% (RCP 8.5) is projected in Centre and the lowest one from 7.4% (RCP 4.5) to 18.1% (RCP 8.5) in the North of the Republic of Moldova.

## A.II. Mid-term **adaptation** vision, goal and targets

The Republic of Moldova's Climate Change Adaptation Strategy until 2020 and the Action Plan on its implementation have been recently approved through the Governmental Decision No. 1009 as of 10.12.2014<sup>5</sup>.

The **vision** of the Strategy is to develop and apply *"a mechanism for adaptation to actual and potential climate change impacts, integrated and implemented across all sectors of the national economy so as to reduce vulnerability and increase resilience to the effects of these changes"*.

The **goal** of the Strategy is *'to assure that the Republic of Moldova's social and economic development is less vulnerable to climate change impacts by becoming more resilient'*.

The **general objective** of the Strategy is oriented towards *'increasing the capacity of the Republic of Moldova to adapt and respond to actual or potential climate change effects'*.

The **three specific objectives** of the Strategy are to:

- 1) Create by 2018 the institutional framework in the field of climate change that would assure the efficient implementation of adaptation measures at the national, sector and local levels.
- 2) Create by 2020 a mechanism to monitor the climate change impacts, the related social and economic vulnerability and for the management/dissemination of the information on risks and climate disasters.
- 3) Assure the development of climate resilience by reducing at least by 50% the climate change vulnerability and facilitate climate change adaptation in six priority sectors (agriculture, water resources, forestry, human health, energy and transport) by 2020.

The Action Plan on implementation of the Republic of Moldova's Climate Change Adaptation Strategy until 2020 is treated as 1<sup>st</sup> National Adaptation Plan (NAP). It is envisaged that the progress made in the area of adaptation to climate change will be determined on a periodic basis and in post-2020 period 4-year based NAPs and Sector Adaptation Plans (SAPs) will be developed and implemented. More detailed information on this issue is provided in section 'A.VI. *Monitoring and reporting progress*'.

## A.III. Current and planned **adaptation** undertakings

The Republic of Moldova's Climate Change Adaptation Strategy until 2020 and the Action Plan on its implementation is intended to serve as an umbrella strategy that creates the enabling environment for specific sectors and ministries to "mainstream" climate change adaptation and risk management in their existing and future strategies through a series of NAPs and SAPs, supported by a long-term financial strategy that includes national resources and international support to prevent the adverse effects of climate change and maximize the opportunities provided by them.

**Specific Objective 1:** *Create by 2018 the institutional framework in the field of climate change that would assure the efficient implementation of adaptation measures at the national, sector and local levels*

The specific objective 1 is envisaged be achieved through the following courses of action:

**Action 1.1:** *Develop the institutional framework in the field of climate change adaptation*

The Government has to create a strong institutional structure and the environment that would enable advocating for climate change adaptation across all sectors and at all levels of implementation with strengthening technical capacities and leadership for implementation of climate change adaptation measures. Institutional framework for climate risk management is

<sup>5</sup> <<http://lex.justice.md/index.php?action=view&view=doc&lang=1&id=355945>>.

needed to sustain the capacity to implement specific measures at sector level, based on a reasonable understanding of the risks. In the initial capacity development stage this is reflected in training and awareness rising among decision-makers and technical staff to develop foundational capacity.

Given the fact that the Ministry of Environment does not have a special structure that would develop and promote an effective climate change policy, the capacity building becomes indispensable to this ministry by creating a division specialized in climate policies. Considering the need to integrate climate change aspects in sectorial development policies, climate change units will also have to be created in the line ministries and these institutions shall be provided adequate financial resources.

Building the capacities of governmental institutions to manage and integrate climate change adaptation in sectoral development policies and sustainable practices to be implemented at national and local levels will be initiated at the beginning of the implementation of the Strategy. A training program will be developed and implemented on building the capacity to integrate climate risks and disasters in sectoral policies and sustainable practices related to climate change adaptation methods, adapted to the needs of local and national levels, and sector-specific issues, accordingly.

***Action 1.2: Mainstream climate change adaptation in the sectoral policies of national economy***

Responding to the risk posed by climate change will require coordinated and focused efforts of the Government in view of promoting policies and measures at national and sector levels to prevent adverse climate change effects. Central Public Authorities will need to amend the existing and/or develop new sectoral strategies and action plans on climate change adaptation to address climate risks as part of the policies and activities planned at sector level.

Mainstreaming climate change risks and adaptation into the national framework requires several steps to assure that information about climate-related risks, vulnerability, and options for adaptation is incorporated into planning and decision-making in key sectors as well as into existing national assessments and action plans.

Broadly speaking, these steps include: understand climate risks and existing knowledge on climate change adaptation; assess institutional and policy implications of key threats posed by climate change; amend the existing and/or develop new sectoral strategies and action plans that are climate-resilient.

To assure the implementation of these policies, actions on identifying funds for adaptation, creating mechanisms for performance coordination and monitoring will be needed. As this process is not linear, it requires that new information on climate risks and adaptation approaches be continuously integration to minimize the impacts.

The implementation of climate change adaptation measures while assuring the sustainable development and economic growth also requires the improvement of the existing legal framework, the development of efficient financial instruments to implement these measures and a change in the behaviour and attitude to consumption mode and generation method.

Thus, the relevant legislative acts will be reviewed to identify fields that do not enable the existing or potential adaptation activities, the legislation will be amended or new legislative and regulatory acts will be developed to assure that legislative and regulatory frameworks facilitate climate change adaptation at all levels, including autonomous adaptation of individuals, communities and private sector.

***Action 1.3: Develop the communication and the institutional cooperation in view of implementing adaptation policies***

In the spirit of joint action stemming from the general objective, public authorities will establish clear objectives and jointly achieve them, to protect the Republic of Moldova against the negative effects of climate change. They will propose measures and solutions and will implement actions under the leadership, guidance and coordination of the Ministry of Environment, in accordance with the national priorities and the European Climate Change Adaptation Policy and the obligations of the country under the Republic of Moldova-EU Association Agreement (AA) to implement these policies. Following the courses of action set out, decision makers and those who assure its implementation in all priority sectors should cooperate effectively to assure a secure future.

Since governmental institutions cannot assume themselves the responsibility to implement of climate change adaptation measures, the whole society should be ready to respond to requests by going through a transition process of changing attitudes and actions, from a reactive to a proactive approach to a climate change mitigation policy, fully accepted, adopted, implemented, and continuously updated by the Government. Public authorities need to focus on the cooperation with the business community, NGOs and academic/scientific community and combine the expertise and resources to raise the willingness to act. Public authorities need to assure the creation, sharing and dissemination of knowledge, as well as the exchange of best practices in all priority sectors. The development of public-private partnership will encourage for increasing the effectiveness of the approach specific to a field. Regional and international cooperation will be also developed, and as long as the provision of financial resources is limited, collaborative relationships with donor financial institutions will be developed.

The main instrument for strengthening the cross-sector coordination will be Communication Strategy on Climate Change Adaptation, which will establish an effective mechanism to disseminate, among relevant ministries, the information on implementation of climate change adaptation strategies, and as a feedback link inclusive, to have a two-way information flow.

**Specific Objective 2:** *Create by 2020 a mechanism for monitoring the climate change impact, related social and economic vulnerability, and managing/disseminating the information on climate risks and disasters*

The specific objective 2 will be implemented in three courses of action:

**Action 2.1:** *Continuous monitoring and research of climate change impacts, related social and economic vulnerability, and periodic updating of climate scenarios*

Continuous monitoring of climate change impacts at the national level allows for identifying the most likely evolution in this field, and providing opportunities for immediate action and decisions at the administrative level. As accurate as possible knowledge on potential climate change effects on economic and social sectors is needed to adopt effective climate change adaptation measures. Research activities need to be implemented on the following priorities:

- a) determine the vulnerability of sectors, regions and natural/anthropogenic systems when extreme weather events take place;
- b) identify the climate change evolution, as close as possible to the regional and local levels, and develop climate maps to identify at-risk areas in the country to undertake priority actions.
- c) develop climate scenarios (average conditions and various extreme weather events) that are based on regional climate models, and assess the uncertainties related to such scenarios;
- d) carry out research on climate change impact on sectors, regions and natural/anthropogenic systems.

**Action 2.2:** *Create a climate change database*

The Ministry of Environment will coordinate the creation of a national climate change database, acting in this regard jointly with the research institutions, academia, universities and NGOs. This database will contain full information on the evolution of climatic factors such as temperature, rainfall regimen, etc., including their variability, and the occurrence of extreme hydro-meteorological events. To create such a database, all available information will be collected and areas where knowledge and data are missing will be identified. The database will be completed and organized in a systematic manner so as to be easily accessible to stakeholders. The database will be expanded at the local level, as authorities at this level are the ones who often implement measures, which are not part of the central governmental structures' duties. A model of creating this database is the *Clearinghouse Mechanism*, developed at European level, which will be a tool for collecting and disseminating climate change information, data and case studies, and will also help to increase the coordination between the relevant sectoral policies.

Capacity building and strengthening of the national system of statistics collection/monitoring, reporting, to assure adequate management of electronic databases for periodic hydro-meteorological and climate information and other data needed to assess climate risks and impacts, will be considered some of the important elements for assuring the implementation of the national climate change adaptation policy.

**Action 2.3:** *Raise the awareness of all stakeholders on climate change risks and adaptation measures*

To implement climate change adaptation policies, the whole society together with public authorities, companies and NGOs, will assure an appropriate level of knowledge about climate change and its expected effects. The awareness on the need to promote climate change adaptation measures will facilitate the needed shift in attitudes and behaviour, and will improve the overall capacity to mitigate climate change effects. Awareness raising actions will be developed based on the need to change the attitudes and behaviour towards the use of natural resources, environmental protection and especially to climate change and the urgency of climate change adaptation actions.

At the same time, inclusion of climate change adaptation issues in the curricula at all levels and in the professional training process plays a very important role in the development of appropriate attitudes, so that young people and children have access to information on disaster and climate risk, appropriate emergency response and long-term adaptation options.

To achieve this goal, an effective awareness campaign will be conducted on climate change adaptation issue, on the potential and the current risks and threats associated with climate change and on the needed preventive actions. Raising the awareness level, disseminating information and proper training are essential elements in the decentralization of the efforts of identifying and implementing specific adaptation measures. The promotion and implementation of the Strategy on communicating climate change impacts and possible responses to them will be of particular importance in this regard, including a public information and awareness campaign through appropriate mass-media.

An early warning system on natural disasters of climatic origin will be created, by providing access for public to data and information needed to assess the climate risks and impacts, as well as the publication of regular monitoring reports as part of the strategy for communication of climate change impacts. By assuring the appropriate level of awareness and sensitivity, obvious behavioural changes are expected in society and at the community level.

**Specific Objective 3:** *Assure the development of climate resilience by reducing at least by 50% the climate change vulnerability and facilitate climate change adaptation in six priority sectors (agriculture, water resources, forestry, human health, energy and transport) by 2020.*



Climate change adaptation process will take place in different sectors and at different levels (national, regional, local) with a customized approach for each sector/location. As climate change has a different impact across the sectors and at different levels, measures on adaptation to climate change effects will also be different but will respect the same parameters. To provide viable sectoral solutions, adaptation will be mainstreamed in planning the development of the given sector and will be achieved by close cooperation between stakeholders. In this regard, adaptation measures will be mainstreamed in the current sectoral policies, or new Strategies and/or Action Plans for risk mitigation and climate change adaptation will be developed.

Thus, for each relevant sector specific measures will be identified and implemented taking into account:

- a) assessment of the current stage (actions undertaken, their results, etc.) and experience gained;
- b) general objectives, intermediate objectives and measures to be taken to achieve them;
- c) indicators to monitor the progress of their implementation;
- d) present and future research needs;
- e) available and needed resources;
- f) the institutional framework for implementation, and allocation of responsibilities;
- g) risk management tools;
- h) best practices for the integration of climate change adaptation measures in the development of national policies.

If necessary, the legal framework, regulations and financial instruments will be amended to implement climate change adaptation. Development and implementation of all climate change adaptation measures will be coordinated by the Ministry of Environment and achieved by line ministries.

### ***Action 3.1: Risk Management and Climate Change Adaptation in the **Agriculture Sector*****

1) At the national level it will be necessary to:

- a) identify vulnerable areas and subsectors, assess the needs and opportunities of alternative crops, and change varieties as a response to climate change;
- b) support agricultural research and experimental production for the selection of crops and development of the best varieties that are better suited to the new climate conditions;
- c) improve the capacities for the adaptation to climate change effects through raising the awareness of stakeholders with agricultural advice and essential information on farm management;
- d) assure increased investments in efficiency of irrigation infrastructure, aqua-technologies and improvement of water resources management;
- e) develop irrigation plans based on a careful assessment of their impact, future water availability and water needs, taking into account the supply-demand balance;
- f) create tools for risk and crisis management to cope with the economic consequences of climate related events.

2) At the local/farm level, the following measures are important:

- a) adapting of periods during which agricultural activities are carried out;
- b) develop technical solutions to cope with extreme weather events, to protect the crops and livestock;
- c) improve ventilation and air conditioning systems of livestock farms;
- d) choose crops and varieties better adapted to changes in the growing season and to water availability, as well as greater resilience to new climate conditions;

- e) crops adaptation by using the existing genetic diversity and new opportunities provided by biotechnology;
- f) increase the efficiency of pest and disease control;
- g) efficient use of water by reducing water losses, improving irrigation techniques, water recycling and storage;
- h) improved soil management by increasing water retention to maintain the soil moisture;
- i) landscape management by maintaining landscape elements that provide shelter to livestock;
- j) introduce livestock species resilient to extreme temperatures and adapt the nutritional regime of livestock to demands caused by climate change;
- k) popularization of new technologies addressing soil structure stability and soil treatment for enlarging the active layer of the root zone for enlarging water uptake;
- l) runoff reduction by agronomic practices (no-tillage can reduce water runoff);
- m) develop new complex agricultural water management programmes (combining irrigation, fishery and excess inland water management);

3) Other relevant measures will consist in:

- a) developing good practice guides for agriculture sector, especially for non-irrigated agriculture;
- b) developing and implementing local adaptation action plans (at community level);
- c) developing and implementing plans for land improvement that would increase the precipitation likelihood (including afforestation, water surfaces, etc.);
- d) use research to combat current vulnerabilities and change crops structure promoting an agriculture less exposed to climate change;
- e) encourage crop/farm insurance;
- f) improve the availability and applicability of modelling and adaptation options to be used by farmers (provide data and results on the reaction of water resource to possible climate change scenarios, promote the use of GIS technology, etc.);
- g) develop infrastructure and technologies needed for local interventions to combat extreme weather events to protect crops and local communities.

**Action 3.2: Risk Management and Climate Change Adaptation in the *Water Resources Sector***

1) To protect water resources of the country against climate change, there is a need to conduct studies that will serve as a basis for climate change adaptation:

- a) re-evaluate available water resources for each river basin;
- b) determine the projected climate change influence on the maximum, medium and minimum flow of water courses;
- c) determine the vulnerability of water resources to climate change;
- d) assess water requirements of the major crops in the context of climate change (cross-sectoral studies with agriculture);
- e) assess water needs for the main categories of consumption (drinking water, industrial water, domestic water, etc.) in the context of climate change;
- f) assess the danger of floods, droughts and water scarcity in the river basins under different climate scenarios;
- g) assess potential climate-change-related damages in case of flooding/drought.

2) To assure the availability of water at source in the country taking into account the current and future climate change, the following measures need to be undertaken:

- a) build new infrastructure for transforming water resources into socio-economic ones (new accumulation lakes, new inter-basin derivatives, etc.);
- b) modify the existing infrastructure to regulate the water flows whose distribution changes over time as a result of climate change (over-increased dam height);

- c) design and implement solutions for rain water collection and usage;
- d) extend solutions for recharging the ground layers with water;
- e) build reservoirs without dams (with water level below the ground level);
- f) protect wetlands, allowing thus groundwater recharge and reduce peak discharges downstream;

3) Other potential adaptation actions in water use will be directed to:

- a) more efficient water use and conservation through the rehabilitation of water transport and supply/distribution facilities and through technological changes (promote technologies with reduced water consumption);
- b) changes in the people's lifestyle (reduce water demand, use recycled water etc.);
- c) increase the level of water recycling for industrial needs;
- d) change the types of agricultural crops using those adapted to low water demand;
- e) develop and implement a system of water prices and tariffs based on the season and available resource;
- f) use lower quality water for certain purposes/uses.

4) Measures to be taken at river basin level to assure climate change adaptation:

- a) update the directory landscaping and management schemes, so as to take into account climate change effects (decrease in the available water at the source, increase in water demand);
- b) apply integrated water management principles for water quantity and quality;
- c) introduce, at the stage of designing the accumulation lakes to be built, backup volumes to be used only in exceptional circumstances or creation of accumulation lakes with special operation regimen to supplement the available water resources in critical situations;
- d) inter-basin transfers of water to compensate for water shortages in certain reservoirs;
- e) set water quality targets and apply water quality criteria to prevent, control and reduce the transboundary impact, coordinate the regulations and issue clearances;
- f) improve treatment of wastewater and domestic water;
- g) harmonize the regulations on limiting the emissions of hazardous substances in water;
- h) identify potentially risky areas.

5) Measures to be taken for flood risk management:

- a) select certain local protection works (for some communities and socio-economic structures) instead of large-size protection works;
- b) choose regularization of flood path (slowing and reducing floods as they occur) instead of increasing the height of existing dams or building new dams;
- c) use the latest methods and technologies for the rehabilitation/construction of dams and carry out protective works in line with local spatial plans;
- d) increase the awareness on flood risk among the exposed population (the appropriate response before and after the event, insurance contracts, etc.);
- e) measures to protect irrigation infrastructure against flooding;
- f) improved flood forecasting and installation of systems to provide dam break alerts;
- g) effective collaboration between the Republic of Moldova, Ukraine, and Romania to monitor water discharges, improve weather/flood forecasting and early warning for all downstream countries.

6) Measures to be taken to combat drought/water scarcity:

- a) services on monitoring and warning on the decreasing flow/drought at the national level;
- b) reduce leakage in water distribution networks;

- c) conservation measures and efficient water use (for irrigation, in industry);
- d) cooperation with other countries aimed at sharing experiences in combating droughts;
- e) plans for priority water supply/setting the hierarchy of water supply restrictions;
- f) establish methodologies for drought thresholds and drought mapping;
- g) increase water storage capacity;
- h) re-assure water quality during drought.

**Action 3.3: Risk Management and Climate Change Adaptation in the *Health Sector***

Actions for improving climate change adaptation in the Health Sector could include:

- a) develop integrated assessments of environmental, economic and health impacts of climate change;
- b) discuss and design adaptation strategies to be used by the Health Sector;
- c) appoint a lead body to coordinate the public health preparedness for and response to climate change; define roles and responsibilities;
- d) review and strengthen the existing disease surveillance systems with a view of including further climate-related health outcomes, such as heat-related morbidity and mortality;
- e) increase awareness of medical professionals, public and the most vulnerable groups;
- f) improved medical access for remote communities and vulnerable groups (e.g., elderly, obese, and disabled);
- g) identify, monitor and target risk groups and vulnerable populations;
- h) develop treatment protocols for climate-related health problems;
- i) provide training and guidance for medical professionals and advice for the public on measures to be taken during extreme weather events, such as heat-waves, flooding and drought;
- j) upgrade current education and communication programmes for medical professionals with relevant information on climate change adaptation in health sector;
- k) a monitoring system and evaluation mechanism to assess the effectiveness of preparedness and response measures;
- l) apply new technology for scientific measurement (e.g. vector borne disease, water quality, climate change, etc.);
- m) assessing the risk for the emergence of new, unfamiliar diseases and health impacts;
- n) consider the cost and amount of energy and CO<sub>2</sub> emissions used by air-conditioning and advocate alternative cooling methods to the public;
- o) increase the international and regional cooperation.

**Action 3.4: Risk Management and Climate Change Adaptation in the *Forestry Sector***

The following climate change adaptation measures could be implemented in the Forestry Sector:

- a) revision and development of new important components of the forestry regulatory basis, as integral parts of the forestry regime, focusing on: maintenance and conservation of forestry stations; conservation of forestry genetic resources; ecological reconstruction of forests; certification of forests, forest products and forest management systems;
- b) revision of the regulatory framework pertaining to development of an appropriate financial mechanism in conservation and development of forestry resources, needed for expansion of lands covered with forestry vegetation etc.;
- c) development and approval of the regulation on implementation and assuring functionality of the principles of participatory management of public forest resources;
- d) increasing the forest cover, including in the climate change context mitigation and biodiversity conservation;

- e) development and implementation of projects aimed at planting protection forestry strips (buffer zones) for agricultural lands protection, anti-erosional purpose, and for waters protection;
- f) establishment of plantation forests to meet the needs of population in fuel wood for heating, cooking etc.;
- g) develop methodologies/technologies to assure forest ecosystems adaptability to climate change.

### **Action 3.5: Risk Management and Climate Change Adaptation in the *Energy Sector***

Climate change adaptation measures to reduce losses/risks in the Energy Sector are as follows:

#### **1) Energy supply:**

- a) *Mined resources* (oil and natural gas): replace water cooling systems with air cooling, dry cooling, or recirculating systems; improve design of gas turbines (inlet guide vanes, inlet air fogging, inlet air filters, compressor blade washing techniques, etc.); (re)locate in areas with lower risk of flooding/drought; build dikes to contain flooding, reinforce walls and roofs; adapt regulations so that a higher discharge temperature is allowed; consider water re-use and integration technologies at refineries.
- b) *Hydropower*: build de-silting gates; increase dam height; construct small dams in the upper basins; adapt capacity to flow regime (if increased); adapt plant operations to changes in river flow patterns; operational complementarities with other sources;
- c) *Wind*: (re)locate based on expected changes in wind-speeds.
- d) *Solar*: (re)locate based on expected changes in cloud cover; and
- e) *Biomass*: introduce new crops with higher heat and water stress tolerance; substitute fuel sources; early warning systems (temperature and rainfall); support for emergency harvesting of biomass; adjust crop management and rotation schemes; adjust planting and harvesting dates; introduce soil moisture conservation practices.

2) *Energy demand*: invest in high-efficiency infrastructure and equipment; invest in decentralized power generation such as rooftop photovoltaic generators; efficient use of energy through good operating practices.

3) *Energy transmission and distribution*: improve robustness of pipelines and other transmission and distribution infrastructure; burying or cable re-rating of the power grid; emergency planning; and regular inspection of vulnerable infrastructure such as wooden utility poles.

### **Action 3.6: Risk Management and Climate Change Adaptation in the *Transport Sector***

The adaptation measures to reduce losses/risks in Transport Sector are outlined as following:

#### **1) In case of *significant variations of temperatures, including heat waves*:**

- a) develop new, heat-resilient paving materials;
- b) greater use of heat-tolerant streets and highways landscape protection;
- c) proper design/construction, milling out ruts;
- d) shifting construction schedules to cooler parts of day;
- e) designing for higher maximum temperatures in replacement or new construction;
- f) adaptation of cooling systems.

#### **2) In case of *increases in extreme precipitation events*:**

- a) develop new, adverse climate conditions-resilient paving materials;
- b) overlay with more rut-resilient asphalt;
- c) using the most efficient technologies to assure sealing and renewal of asphalt concrete (for example, those that combine impregnation and surface treatment of asphalt concrete and

which, respectively, assures the revitalisation and renewal of bituminous binder quality, reducing the fragility of the upper asphalt layer, increasing its elasticity and flexibility, and its resilience to water and chemicals);

- d) wider use of efficient road maintenance methods (*preventive maintenance*: include coatings, repairs, sealing by spraying cationic emulsions, crushed stone seals, sealing cracks with suspensions, etc.; *corrective maintenance*: include patching, repair of surface and surface treatments with sealants);
- e) conduct risk assessments for all new roads;
- f) improve flood protection;
- g) greater use of sensors for monitoring water flows;
- h) upgrading of road drainage systems;
- i) pavement grooving and sloping;
- j) increases in the standard for drainage capacity for new transportation infrastructure and major rehabilitation projects; and
- k) engineering solutions, increase warnings and updates to dispatch centres, crews and stations.

#### **A.IV. Gaps and barriers**

##### *a) Policy framework*

- Lack of effective enforcement presents the key challenge facing implementation of the adaptation action plans; enforcement is specifically critical at the local level;
- Insufficient inter-institutional coordination of the implementation of national policies and strategies;
- Limited awareness on cross-sector-based policies and strategies;
- Systemic level impediments on enhancing the political commitment to address climate adaptation;
- Limited capacities (time, personnel and funding resources) to review and amend and/or develop new national policies and strategies focused on integrating climate change and disaster risk reduction considerations.

##### *b) Coordination mechanisms*

- Systemic level impediments to effective use of multi-level and multi-sector climate change coordination mechanisms to address climate change impacts and strengthen adaptive responses;
- Lack of an integrated, comprehensive and efficient monitoring of climate change adaptation implementation;
- Limited number of climate change policies and limited references to them make coordination mechanisms difficult, mainly ad-hoc and project driven;
- Limited use of criteria and indicators to guide and monitor the coordination work;
- Limited capacity of lead agencies to coordinate and promote a higher degree of local level involvement combined with a limited understanding and awareness by local authorities on climate change impacts and adaptation approaches to climate change;
- A link between climate change coordinating mechanisms and other relevant national coordinating mechanisms has yet to be established.

##### *c) Institutional capacities and planning process*

- The country still lacks a programmatic approach to addresses multiple sectors and levels of governance; it is envisaged that the next (4 year based) NAP, will address this aspect;
- The lack of an integrated planning process between the central public authority institutions and uncoordinated allocation of financial resources through various national funds;

- Concerns from high-level officials on the implications of following a programmatic approach;
- Limited institutional capacities to design, develop, implement and coordinate a programmatic approach;
- Lack of national policies and strategies that can guide a programmatic approach;
- Lack of a coherent presentation of statistical data between central public authorities;
- Limited technical and staffing capacity in addressing climate change issues;
- Non-coherent system of access to information for central and local public authorities.

*d) Mainstreaming climate change adaptation into policies, plans and budgetary processes*

- Limited understanding at national and sectoral levels of the concept of mainstreaming and how it can be undertaken;
- Climate change and climate change adaptation are not mainstreamed into national legislation on human health and related social services;
- Limited understanding by policymakers of the looming threat of climate change as a development issue and its links with, and implications for, resource allocation, economic growth and ecosystem services.

*e) Technology transfer*

- Low skills and knowledge on climate adaptive solutions; lack of advisory services in the context of identifying adaptation measures for different sectors;
- Low level of public-private partnerships in implementing climate change adaptation measures;
- Undeveloped market and mechanism to promote technology innovations and adaptive technology transfer;
- Lack of comprehensive climate change and disaster management risks databases;
- Lack of documents of major importance for the territorial planning, such as the National and Regional Spatial Plans, General Urban Plans of the cities; these documents would contribute to the identification of adaptation actions at the local and regional level, and to improving the situation in the context of urban planning;
- Slow reforms and adoption of new technical and normative standards in transport and building sectors (adoption of Eurocodes); and reduced financial allocations for this task;
- Lack of medium to long-term investment planning, with little efforts on prevention adverse impacts of climate change, relying more on post factum removing of adverse effects;
- Inappropriate financial incentives and disincentives for adaptive technology transfer;
- Inadequate rural infrastructure and tenurial arrangements for climate change adaptation.

*f) Financing climate change adaptation interventions*

- There is no integration of climate change adaptation measures into the national budget;
- No dedicated budget to specific climate change adaptation activities;
- No financial strategy developed for adaptation to climate change;
- No climate indicators incorporated into planning and budgeting framework;
- No contingency budget in specific sectors for adaptation interventions.

## **A.V. Summary of needs**

*a) Research and development needs to meet adaptation targets*

National research on climate change has to be linked to international research efforts and has to apply the knowledge gained at this level. Experienced research institutes will be encouraged to participate in supporting the development of the national climate change policy. Since most



research institutes conduct studies only on a contractual basis, adequate financial resources are crucial for conducting climate change research, and collaborative relationships will be developed with international financial institutions as long as financial resources remain limited for a long time. A major emphasis will be placed on building the capacities of Working Group members for climate modelling to develop climate models and perform impact assessment studies, for example, by facilitating the exchange of experience and research visits to international climate modelling centres.

It is equally important to monitor the climate change impact and conduct research in *priority sectors* such as: Agriculture, Health, Forestry, Energy, Transport, Water Resources etc.

#### *Agriculture Sector*

- Research needs to address not only change in temperature and precipitation and its impacts on agriculture, but also the interaction with hazards, directly or indirectly arising from atmospheric conditions, such as rainfall, flood, frost, drought, hail, heat waves, seasonal shifts (length of growing season, bud break, quality aspects), and changes in pest and disease patterns.
- Crop specific evaluations should be conducted to determine changes in seasonal development, characteristics of production, cultivation methods, etc., under climate change.
- Crop models are required to assess the impacts of climate change and increased atmospheric concentration of CO<sub>2</sub> on various crops, pastureland and livestock.
- Further, crop simulation models need to be interfaced with Geographic Information Systems (GIS) in order that these models can be applied for regional planning and policy analysis.
- In addition, a variety of approaches, such as economic regression models, microeconomic and macroeconomic models, and farm models should be used.

#### *Health Sector*

- Quantitative research is required to identify the regions of the Republic of Moldova most vulnerable to the adverse health effects of climate change.
- These areas will require focused adaptation measures, including better health clinics and tools, education of the public in these areas about how they can cope with new health concerns.
- Improved disease burden estimates need to be established, based on latest climate models to estimate:
  - heat-related mortality statistics based on existing mortality and population data at the national level and in key cities of the Republic of Moldova;
  - the impacts of projected changes in climate, taking into account various forms of acclimatization/adaptation; and
  - climate-water and foodborne diseases relationships using panel data on income and health to project cause-specific deaths and disability-adjusted life year (DALY) rates by demographic group.
- Further in depth studies on the socio-economic assessment of climate change in the health sector would be beneficial, including:
  - the health 'damage' costs of climate change under different mitigation scenarios;
  - the costs of preventing death, illness and injury under different mitigation scenarios (i.e. adaptation measures).

### *Water Resources Sector*

- Defining critical thresholds in water resource;
- Improving the capacity to calibrate state-of-the art rainfall runoff models;
- Understanding of the economic and social impacts of climate change on water quantity, supply, and demand including irrigation, drinking-water supplies, recreation/tourism, hydropower and industry, and system losses;
- The capacities of developing and implementing systems of hydro-economic assessment of river basin will be enhanced to assess the further development of water resources and the related sustainable development, such as hydro-electric development, waste treatment and irrigated agriculture;
- Pre-feasibility or feasibility studies for irrigation and land use projects are needed (including from groundwater sources), and should be required to include an assessment of the physical and economic impacts of climate change;
- Assessments and analyses on social, economic and environmental costs and benefits of future adaptations will be performed.

### *Forestry Sector*

- Establishing the climatic thresholds that correspond to the distribution limits of a forest type or species and develop a bioclimatic model to predict future steady-state forest distributions under a range of plausible climate change scenarios;
- Collecting historical analogues and life-history information to estimate how long it might take for the forest boundary to migrate a given distance;
- Calibrating a biogeochemistry model to predict changes in productivity and carbon stocks in each forest type, with and without the effects of elevated CO<sub>2</sub> concentrations;
- Evaluation of adaptive capacity including the inherent adaptive capacity of trees and forest ecosystems and the socioeconomic factors determining the ability to implement planned adaptation measures.

### *Energy Sector*

- Assessing the possible effects (both positive and negative) of climate change on energy consumption:
  - effects of climate warming on energy use for space heating;
  - effects of climate warming on energy use for space cooling;
  - market penetration of air conditioning and heat pumps (all-electric heating and cooling), and changes in humidity;
- Conducting studies possible effects on energy generation and supply:
  - assessment of impact of increase temperatures and droughts on hydro energy potential;
  - impacts of climate change on energy generation from biomass;
  - wind resources changes (intensity and duration); and
  - electricity transmission and distribution;
- Research on efficiency of energy use in the context of global warming, with an emphasis on technologies and practices that save cooling energy and reduce electrical peak load.

### *Transport Sector*

- Examining the long-term impacts of climate change on the Transport Sector in light of climate change projections to determine whether, when, and where the impacts could be consequential, particularly in light of the long planning horizons for transport infrastructure;

- Analysing options for adapting to these impacts, including the possible need to alter assumptions about infrastructure design and operations, the ability to incorporate uncertainty into long-range decision making, and the capability of institutions to plan and act on mitigation and adaptation strategies at the state and regional levels.

The promoted studies on climate change and on the vulnerability to its effects enable better knowledge about sectors, ecosystems and regions that are particularly exposed to climate change, facilitating the identification and promotion of vigorous and effective actions for mitigating the adverse effects of climate change in the country. The findings of these studies will substantiate the adoption of planned adaptation measures and will help to increase the domestic adaptation capacity in line with the achievement of objectives and national sustainable development and environmental protection priorities.

#### *b) Needs for support required to execute current and mid-term adaptation undertakings*

The implementation of climate change adaptation objectives needs to be supported by appropriate financial mechanisms. The implementation cost of the Republic of Moldova's Climate Change Adaptation Strategy until 2020 and the Action Plan on its implementation is estimated at about US\$ 200 million.

The cost of inaction could be devastating, given the fact that natural disasters alone cause the country an average loss of about US\$ 61 million each year. The estimates of future costs and benefits suggest that every euro spent on flood protection would avoid six euros of cost generated by damage.

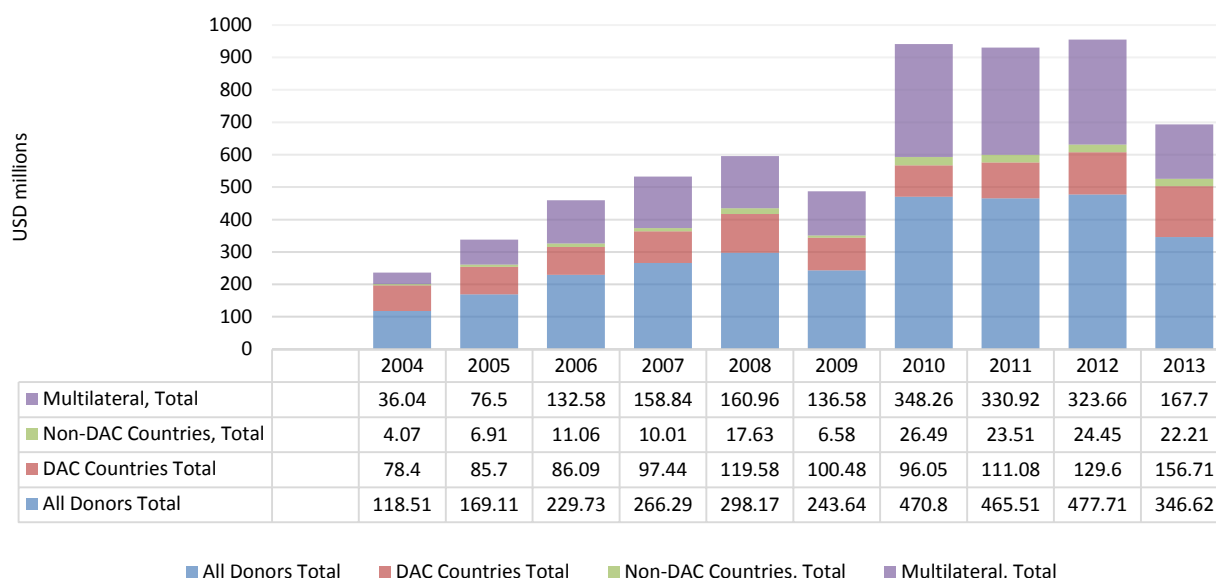
The provision and allocation of adequate financial resources are prerequisites for achieving a successful outcome of the climate change adaptation process. To support climate change adaptation initiatives, both domestic financial resources as well as international ones are required. Domestic financing can be secured both from the state budget and from other financial mechanisms (special funds: National Ecological Fund, National Fund for Regional Development, etc.). They will be important tools for directing the domestic monetary flows in environmental investments, and a means of strengthening the external and domestic financing). Foreign assistance and investments is envisaged to play the most important role in promoting climate change actions in all economic sectors and in catalysing the specific investments that will be needed to assure climate change adaptation in the Republic of Moldova. These investments are linked to a wide range of technologies intended to improve the energy efficiency, use of renewable energy, develop the related road and building infrastructure, and finally adapt to climate change. In this context, the international financial support is needed to implement in full extent the appropriate national and sectorial policies and strategies, or to resolve specific issues in the fields where the climate change impact is significant. Implementation of small and medium-scale pilot and demonstration projects will involve sustainability of external assistance to be received, including through financial mechanisms available under the UNFCCC.

It is anticipated, that the Strategy's objectives will be achieved to a greater extent under the conditions in which the Republic of Moldova gains access to the financial mechanisms of the UNFCCC, specifically to the Green Climate Fund, Special Climate Change Fund, Adaptation Fund and others, in view of implementing adaptation projects in the most vulnerable sectors of the national economy.

#### *c) Summary of recent external support*

According to the Organization for Economic Co-operation and Development (OECD) on-line database (see figure 6), Moldova ranks among the top ten countries of Europe that benefit from

external assistance. Also, it was the sixth country in Europe by development cooperation received, with a 5 per cent average of all the assistance provided to the region for 2011-2013.<sup>6</sup>

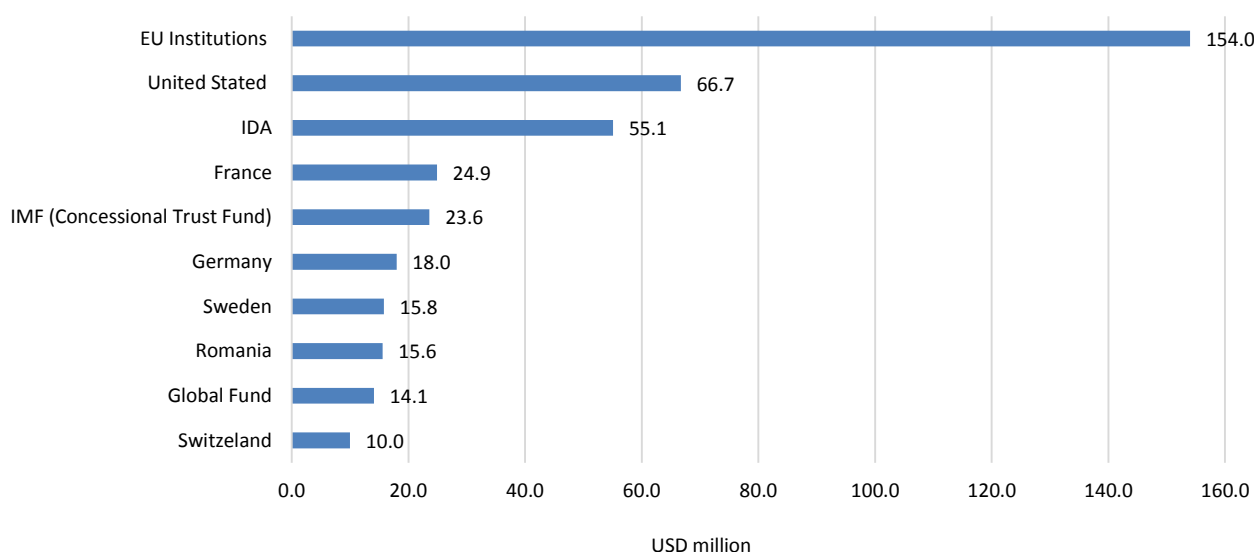


Source: <<http://stats.oecd.org/qwids/>>. Abbreviation used: DAC countries – OECD Development Assistance Committee countries (29 in total).

**Figure 6:** Bilateral, Multilateral and Private Donors’ aid and other resource flows to the Republic of Moldova according to the International Development Statistics (IDS) online databases

Republic of Moldova’s biggest donor since 2007 is the European Union, which started to provide aid to the Republic of Moldova through the European Neighborhood and Partnership Instrument (ENPI), created especially for the countries covered by the European Neighborhood Policies (ENP).

In terms of bilateral aid, the Republic of Moldova’s “big league” partners are: USA, Sweden, Austria, Switzerland and Germany, which add to the plethora of smaller (in terms of granted ODA – Official Development Assistance) Eastern European donors – Romania, Poland, Czech Republic, Hungary, Slovakia, Bulgaria, Estonia, Hungary, Latvia, Lithuania, Slovenia, and Turkey. Top Ten Donors of Gross ODA for the Republic of Moldova is presented in figure 7.



Source: <[https://public.tableau.com/views/AidAtAGlance\\_Recipients/Recipients?:embed=n&:showTabs=y&:display\\_count=no&:showVizHome=no#1](https://public.tableau.com/views/AidAtAGlance_Recipients/Recipients?:embed=n&:showTabs=y&:display_count=no&:showVizHome=no#1)>.

**Figure 7:** Top Ten Donors of Gross ODA for Moldova, 2012-2013 average, USD million

<sup>6</sup> <<http://www.oecd.org/dac/stats/documentupload/5%20Europe%20-%20Development%20Aid%20at%20a%20Glance%202015.pdf>>.

In September 2009, the Government of the Republic of Moldova addressed to the donor community with the request for support in implementing the priority reforms for the country's economic growth, specified in the "We are relaunching Moldova" paper. As a result, during the reunion of the Advisory Group "Partnership for Moldova Forum," held in Brussels on 24 March 2010, the donors community committed to allocate to Moldova 1.84 billion euros (0.96 billion in the form of grant, 52% of the total; respectively, 0.88 billion in the form of credits, 48% of the total) for the 2011-2013 period. As a whole, the USA (through the Compact Program of the Millennium Challenge Corporation of the USAID, signed in 2010 in the amount of USD 262 million) has become one of Moldova's main bilateral development partners. The EU commitment and of the EU member states on future allocations have accounted for 40% of the resources promised during the reunion.

Towards the end of 2012, over 70% of the resources provided in the 2010 Brussels reunion had been contracted, through specific projects started in various national economy sectors. In addition, external funds of about 800 million euros have been attracted. Thus, a total amount of 2.6 billion euros were provided to the Republic of Moldova by the donor community in the 2010-2012 periods (by 40% more as compared to the financial commitments made during the Brussels reunion).

In 2012 the donor funds were estimated at about 474 million euros. According to the data of the State Chancery of the Republic of Moldova, the budget of the projects contracted in the reporting period account for about 206 million euros and the disbursements reported by the donors – about 465 million euros (about 98% of the estimated amount). For comparison, in 2007 the disbursements amounted to 266 million euros; in 2008 – 298 million euros; in 2009 – 244 million euros; in 2010 – 470 million euros; in 2011 – 451 million euros. For 2013 and 2014 there are provided 322 million and 213 million euros, respectively.

The manner of cooperation between the Republic of Moldova and the development partners has taken various forms: technical assistance, support for implementing various investment or social projects, the support provided to the budget for implementing sector policies or the support provided for supporting the state's payment balance. The objectives of the cooperation between the Government and its partners are agreed upon and stipulated in the medium-term framework cooperation agreements.

According to the data available for external development assistance, the highest share is held by the assistance with project implementation (75%), followed by sector budget assistance (about 17%), technical assistance, and assistance with maintaining the state payment balance. Given the budgetary constraints and of state debt servicing, the manner of attraction of external resources that is preferred by the Government are grants and/or concessional credits.

The amount of on-going external assistance in 2012, according to the information from the database of the State Chancery, the Republic of Moldova accounted for about 1.1 billion euros in the form of grants and 682.8 million euros in the form of loans. Accordingly, in 2012, the contracted resources were distributed as follows: about 109.4 million euros in the form of grants and 97.1 million euros in loans (EBRD, EIB, WB). The share of active grants in the total amount of external assistance has represented about 62%. For 2012, the grant-credit parity represented 53%, accordingly, 47% of the total amount of external assistance contracted during the year.

By the end of 2012, the Republic of Moldova was implementing 384 projects in various sectors, including 116 projects in governance and civil society, 58 projects in infrastructure and social services, 49 projects in education, 31 projects in agriculture, 29 multi-sectorial projects, 24 projects for private sector development, 19 projects in the environment and 16 projects related to energy generation and supply.

As a total, in 2012, there were launched 98 new projects, with new commitments in the amount of 206.6 million euros in various sectors. For 2013, the estimated amount of external assistance was 314 million euros.

It was quite difficult to estimate the external support allocated to date, specifically for adaptation-related work, as part of these projects and support received is cross-cutting and/or inter-sectorial, covering both mitigation and adaptation aspects.

On November 6, 2014 EU Commissioner for European Neighborhood Policy and Enlargement Negotiations and Prime-minister of the Republic of Moldova signed the Memorandum of Understanding on the Single Support Framework for EU support to the Republic of Moldova for the period of 2014-2017 together with a financing agreement to support the implementation of the Association Agreement (AA) and the Deep and Comprehensive Free Trade Area (DCFTA) – which the Republic of Moldova signed with the EU on 27 June 2014.

The three priority sectors are:

- public administration reform;
- agriculture and rural development;
- policy reform and border management.

The financial assistance for the period 2014-2017 amounts to EUR 410 million and EUR 30 million for DCFTA.

#### **A.VI. Monitoring and reporting progress**

The Republic of Moldova's Climate Change Adaptation Strategy until 2020 will be implemented through an Action Plan. To assure the financial support for the activities planned in the Action Plan, such activities will be included in the sectoral strategies for mid-term expenditures and in the annual work plans of institutions involved in this Strategy implementation.

The responsibility for implementing the Strategy rests with all competent institutions identified in the Action Plan.

The National Commission for implementation of mechanisms and provisions of the UNFCCC and of the Kyoto Protocol will coordinate the implementation and will conduct regular assessment of the level of indicators and progress achievement.

The monitoring of the Strategy implementation will be carried out by the Ministry of Environment of the Republic of Moldova, where a subdivision will be designated for that purpose.

Based on the collected and systematized information, it will prepare annual monitoring reports on implementation of the Strategy and will submit them for consideration and approval to the Government.

The monitoring reports to be developed will include information on the implementation of the indicators set in the Action Plan for each action, and every 3 years or as needed progress evaluation reports will be developed as well to assess the impact of activities carried out during the given time and the level of objectives implementation.

As the Strategy was not designed as a linear, but as an iterative process, therefore it will be updated and reviewed periodically, based on the monitoring and evaluation findings, as well as on the updated climate models, and in accordance with the most recent scientific researches.

Towards the end of the Strategy implementation, a final assessment report, containing information on the level of achievement of objectives and of the expected impact, will be prepared. Based on this report, the next stage of strategic planning of climate change adaptation has to be decided.

Further, the Republic of Moldova will put in place a four year based NAPs and SAPs. The proposed framework for NAPs and SAPs will allow for monitoring and planning along a 3-tier M&E approach. First tier, *macro-level monitoring* would allow for tracking the evolution of the national adaptation planning process as a whole.

This would entail the development of a number of process-oriented indicators that would be followed across sectors. Examples of such indicators could include: number of SAPs; overall level of Government funding channelled towards adaptation needs; index of resilience/vulnerability of the Moldovan economy, etc. These indicators would provide an image of the overall dynamism of the adaptation planning process as a whole. As such, they may depend on the aggregation of data from lower-level indicators (e.g., data on adaptation funding by sector). The final indicator on level of resilience would allow for tracking of the impact of the adaptation process as a whole. It would have to be computed from recognized vulnerability indices and legitimate sources of data. The next NAP will be used to develop the 'Index', 'Methodology' and to gather 'Baseline Data'.

Second tier, *meso-level monitoring* would allow for tracking of progress and results at a disaggregated level, either sectoral or geographic (e.g., regional), depending on the choices made during planning phases.

These indicators would depend on the provision of data from regional or sectoral authorities. Such indicators would be the following: the number and type of adaptation measures included in sectoral/regional plans, proportion of sectoral budget dedicated to adaptation measures, number/type of sectoral stakeholders implementing adaptation or resilient measures, degree to which the sector/region's vulnerability has been reduced.

Similarly to the first tier, the final indicator would be an 'Index' for which the 'Methodology' would be determined in the early phases of NAP planning. Also, while these indicators remain somewhat process-oriented, it could be possible to adopt more concrete indicators within each sector (e.g., if water availability was a constraint to resilience, the water sector M&E framework could adopt an indicator on "overall water availability").

Sector-specific indicators would have to be agreed upon during the early phases of NAPs or SAPs planning, and could be renewed, depending on their relevance, at the end of each planning period. However, it would be important to keep a number of indicators similar from one sector to the next, to enable comparisons. The prioritization of adaptation measures will be done by the sectors or stakeholders participating in the development and implementation of NAPs and SAPs.

Each time a SAP or a NAP is proposed, it should contain prioritized measures for that planning period. The process of determining the prioritization and selection of certain adaptation options over others should be transparent, and based on rationalized criteria. Ideally, it would be carried out by a stakeholder group, which can consider different economic, environmental, social, cultural or political spheres and concerns. The M&E system will verify if the planned measures have been implemented accordingly. The Cost Benefit Analysis (CBA), Cost Effectiveness Analysis (CEA), Multi Criteria Decision Analysis (MCDA) and other relevant to case econometric assessment methods and tools will be used.

Third tier, a *micro-level structure of reporting* would also be defined. This would concern indicators related to specific adaptation actions that are adopted within individual sectoral or national plan. For each action or group of actions, a target and an indicator have to be developed (e.g., number of people trained; hectares of forest protected; kilometres of road upgraded; degree of water use (drop-per-crop) efficiency in the wine sector, etc.). Each of these indicators should be attached to the actions contained in the specific sectoral or regional action plan. As such, they would serve as the basis level of results tracking by stakeholders, and would be reported upon annually at least. They could be modified at each round of successive planning, and be aggregated to feed into the



meso- and macro-level reporting frameworks. Responsibility for providing information on these indicators would rest upon those who will also be tasked with the implementation of the adaptation actions.

The milestones for reporting under the national adaptation planning process would be as follows:

- micro-level indicators: annually;
- meso- and macro-level indicators: every two year.

As each NAP will be set for four years, this would mean that results could be tracked and aggregated twice per period, allowing for an informed planning process for the next phases. Naturally, the first planning period would also entail a baseline assessment of key indicators, and some time to develop the methodologies and indices.

At the end of a planning cycle, the data would be aggregated into a “NAP Impact Study”, which would synthesize all results achieved during the period and make recommendations for the next period. This study will be submitted for consideration to the Government.

The main responsibility for reporting will be of the sectoral administrations, which would need to undertake annual and biennial reporting for micro- and meso-level indicators. All data would be provided to the coordination mechanism, whose secretariat could synthesize information to develop reports. The Secretariat would also provide sectoral administrations with templates and formats in order to allow for standardized tracking. Also, a database would be created to be administered by the coordination mechanism, being accessible however to all participating administrations, in order to facilitate the flow of information. In addition, micro-level reporting could be undertaken with the participation of local NGOs and associations which would participate in the implementation of targeted adaptation measures. Participation of NGOs at all levels of the M&E framework would allow for increased transparency and for broader ownership and dissemination of results.

As adaptation planning is an iterative process, gradually growing in scope and learning from the monitoring and review of on-going adaptation actions, a description of how adaptation progress will be nationally monitored, reviewed, updated, and reported can be an important element.