

# GEF Country Portfolio Evaluation: Moldova (1994–2009)

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**Volume 2:  
Technical Documents**



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# Technical Document A

## Country Environmental Legal Framework

### 1 Introduction

Moldova is an Eastern Europe landlocked country, located between Romania to the west and Ukraine to the north, east, and south. The country is primarily a hilly plain interspersed with deep river valleys, with elevations up to 430 meters. Moldova is part of the Black Sea watershed and has two large rivers, the Dniester and the Prut. The Dniester flows to the Black Sea while the Prut is a major tributary of the Danube River. Three quarters of the country is covered by a fertile soil type called chernozem, which is ideal for agriculture. Rich soil and a favorable climate support diversified agricultural production ranging from wheat, corn, barley, tobacco, sugar beets, soybeans, and sunflowers to extensive fruit orchards, vineyards, and walnut groves. The country does not have any major mineral deposits but natural resources include deposits of lignite, phosphorite, and gypsum.<sup>1</sup>

By several measures, including UNDP's Human Development Index, Moldova is the poorest country in Europe.<sup>2</sup> The rural population which represents 58.6 percent of the total population (in 2009)<sup>3</sup> is particularly vulnerable. At the time it gained its independency in 1991, Moldova's economy was highly dependent on the support of the former Soviet Union. This is still partly true, especially in terms of energy, as 98 percent of the consumed energy resources is imported mostly from Russia. Moldova experienced unprecedented economic collapse after independence. The unstable internal political situation and territorial disintegration of the country was intensified by difficulties in implementing the reforms needed to cope with the political and economic transition.<sup>4</sup>

The 1991 conflict in Transdnistria, a separatist region, located between the Dniester River and the Ukrainian border, deepened the crisis by breaking economic ties within the country. Most of the industrial sector is located in Transdnistria including many food processing companies and the biggest power plant in Moldova. The gas pipelines which supply Moldova cross Transdnistria creating a threat to the security of the gas supply. The internal conflict also affects the banking, monetary, and payment systems and favored the emergence of black markets.

Although the Moldovan economy finally started to grow again in 2000, the country was severely hit by the 2009 global economic crisis. However, recent data suggests that the situation will improve in the coming years. In January 2010, EBRD revised its 2010 growth forecasts and is now expecting a 4 percent growth rate in Moldova for 2010 and 2011.<sup>5</sup>

The Soviet Union legacy of over-exploitation of national resources, along with the recent economic recession, has led to numerous environmental problems (increased water pollution, deforestation, soil erosion, and so on) although the decrease in economic activity also caused a corresponding decrease in pollution, particularly pollution from industry. The map below shows the location and nature of the main environmental and security issues in Moldova (see figure 3.1). These are mainly

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<sup>1</sup> UNECE, 2<sup>nd</sup> Environmental Performance Review, Republic of Moldova, 2005.

<sup>2</sup> Moldova ranks 117 in the human poverty index, according to the UNDP 2009 Human Development Report.

<sup>3</sup> Statistical Yearbook of the Republic of Moldova, National Bureau of Statistics of the Republic of Moldova, 1 January 2009.

<sup>4</sup> Government of Moldova, Economic Growth Poverty Reduction Strategy Paper (2004-2006), Chisinau 2004.

<sup>5</sup> EBRD 2010 Growth Forecast, 21 January 2010.

related to water pollution and scarcity, significant pollution is caused by large industrial centers, many of them in the Transdnistria region. The map also show protected areas but was drawn before the designation of three wetlands - Lower Prut Lakes, Lower Dniester, and Unguri-Holoșnița – as wetlands of international importance. Waste management is also a serious problem especially in the Transdnistria region with illegally imported hazardous waste storage. The map also indicates the largest organized storage of obsolete pesticides in Chismicio, in the South-West of the country.

## **2 Status of Environmental Resources in Key GEF Focal Areas**

### **Biodiversity**

The natural biological diversity of Moldova is determined by its geographical position. The territory of the republic is situated at the crossing point of three ecoregions: Central-European, Euroasiatic and Mediterranean, which favors a diverse and rich biodiversity. Moldova's territory borders on the Balkan region and constitutes a transition zone between the fauna of the Asian continental steppe and the European forest steppe.<sup>6</sup>

Agricultural land covers about 75.6 percent of the country, while natural and semi-natural ecosystems cover approximately 15 percent. Significant portions of these ecosystems are highly degraded and the number of endangered species has climbed dramatically from 55 to over 180 in the last 30 years.<sup>7</sup>

### **Flora and Fauna**

The flora of Moldova comprises 5,513 plant species, among which 1,989 are superior plant species and 3,524 are inferior plants species. Endemic plant species have not been identified in the country. According to floristic composition, the richest are the forest ecosystems, followed by steppe ecosystems.<sup>8</sup> During the last 50 years, 31 flora species have disappeared from Moldova. Ecological analysis of species has established that 77 percent of the plant species lost was dependent on wetland habitats.<sup>9</sup>

Forests account for about 11 percent of the total area of the country.<sup>10</sup> Natural formations represent only 4 percent of the total cover. The percentage of afforestation differs greatly from zone to zone and forest cover is quite limited and fragmented.

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<sup>6</sup> First National Report on Biological Diversity (2000).

<sup>7</sup> National Human Development Report (2009/2010). Climate Change in Moldova. Socio-Economic Impact and Policy Options for Adaptation (2009).

<sup>8</sup> Draft Fourth National Report on Biological Diversity (2009).

<sup>9</sup> Izverskaya Tatiana (2000). Climate changes influence on floral biodiversity (including rare, endangered and assailable species) of the Republic of Moldova. Climate change: Research, studies, solutions.

<sup>10</sup> Draft Fourth National Report on Biological Diversity (2009).

Figure 3.1

Environment and Security Issues in Moldova



**Source:** Environment and security issues in Moldova. (2007). In UNEP/GRID-Arendal Maps and Graphics Library. Map author: Viktor Novikov, UNEP/GRID-Arendal Retrieved 10:32, March 29, 2010 from <http://maps.grida.no/go/graphic/environment-and-security-issues-in-moldova>.

Similarly, Moldovan steppes are seriously threatened. In the past, steppe communities covered about two thirds of the Moldovan territory. Currently natural steppe communities have been preserved

only in small and isolated areas, occupying 1.9 percent of the total area of the country.<sup>11</sup> The status of flora diversity of steppe ecosystems is unsatisfactory throughout the country due to excessive and unorganized grazing and the decrease in steppe vegetation, as large surfaces with feather grass and other valuable steppe species have disappeared.<sup>12</sup>

The invasive flora includes about 460 species. There are about 114 species of invasive weeds, out of which, 11 are identified as being quarantine plants. These species affect mainly natural ecosystems of degraded meadows and agricultural ecosystems. The North American maple (*Acer negundo*) represents a significant danger for the forest ecosystems.

The share of endangered biota is rather high. Twenty six species of plants were introduced in the first edition of the "Red Book of the Republic of Moldova" (1978); the second edition (2000) includes 117 plant species and 9 species of fungi. Water Caltrop (*Trapa natans*) and Lady's Slipper orchid (*Cypripedium calceolus* L.) are included in the European Red Book.<sup>13</sup>

Moldova fauna includes 14,800 species of animals, including 461 species of vertebrates and about 14,339 invertebrates. One hundred and sixteen animal species are included in the "Red Book." The number of endangered or critically endangered species of animals increased from 29 to 101 during 1978-2001.<sup>14</sup> Several Moldovan fauna species are included in the "European Red Book."

### **Threats to Biodiversity**

Although the surface of protected areas and afforested zones has increased during the last twenty years, biodiversity remains threatened by a range of various factors. The lack of viable natural habitat is seen as the most significant threat to biodiversity, in comparison to other threats such as overharvesting, industrial pollution, invasive species, or other factors threatening biodiversity.<sup>15</sup>

During the 1960s and 70s, human activities, notably the conversion of forests, steppe areas, and wetland systems for agriculture have affected the country biodiversity through fragmentation of the natural areas and habitats, limiting their ecological function. It also threatens species diversity and ecosystem services (water retention and filtration, soil fertility, and stability) and results in ongoing loss of habitats and species. In particular, biodiversity of the steppe zones has been adversely affected by overgrazing, soil erosion and landslides, and soil salinization as a result of intensive irrigation of flood plains and pollution of surface waters.<sup>16</sup> In addition, intensive agriculture practices caused deforestation, soil erosion and pollution through extensive use of chemicals. This is due to the legacy of Soviet agricultural practices, which involved the use of a high quantity of pesticides and fertilizers. Today, the use of chemicals in agriculture has been reduced but this is mainly due to economic reasons not environmental concerns. However, there is always a risk that if the economic conditions of farmers improve, the use of chemicals will increase again. Illegal logging and hunting have also a negative impact on biodiversity. Moreover, the observed climate changes have affected various local

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<sup>11</sup> 2009/2010 National Human Development Report. Climate Change in Moldova. Socio-Economic Impact and Policy Options for Adaptation (2009).

<sup>12</sup> Draft Fourth National Report on Biological Diversity, 2009.

<sup>13</sup> First National Report on Biological Diversity, 2000.

<sup>14</sup> Red Book (1978), Red Book (2001).

<sup>15</sup> USAID, Moldova Biodiversity Analysis, prepared by DevTech Systems, February 2007.

<sup>16</sup> National Strategy and Action Plan on Biodiversity Conservation of the Republic of Moldova, 2001 and USAID, Moldova Biodiversity Analysis, prepared by DevTech Systems, February 2007.

species of flora and fauna that in turn had a significant impact on ecosystem composition and resulted in degradation of ecosystem services to the local population.<sup>17</sup>

The lack of free ecological niches and the competition between species favor the emergence of invasive species. These include: local invasive species such as the common vole (*Microtus arvalis*), rat (*Rattus norvegicus*), house mouse (*Mus musculus*), and several dozen species of insects which are major crop and forestry pest, and, foreign invasive species such as the Colorado potato beetle (*Leptinotarsa decemlineata*), and webworm (*Hyphantria cunea*). About 150 species of invasive animals have been identified, among which about 130 cause damage to crops, and 15 species damage forests. Annual losses in agriculture caused by these invasive species range from 5 to 10 percent of cereal crops.<sup>18</sup>

Finally, the poor enforcement of nature protection legislation is another threat to biodiversity conservation. The situation is particularly difficult in protected areas which are now managed by local authorities.

### **Protection Status**

Between 1998 and 2006 the surface of land under protected area regimes increased from 1.96 percent to 4.65 percent.<sup>19</sup> The number of protected areas grew from 309 to 312 (figure 3.3). Currently, the system of protected areas in Moldova covers 157,227 hectares. This coverage corresponds to the 2010 targets established by the country's Biological Diversity Conservation National Strategy and Action Plan (2002), the National Development Strategy (2008) and the Millennium Development Goals for Moldova (2007). However, the total protected area coverage in Moldova is still far below the average EU protected area coverage (about 15 percent).

The protected areas in Moldova that correspond to the IUCN classification system account for only 66,048ha (or 1.96 percent of the country). Of these, the categories 'Landscape Reserve' (52 percent by area) and 'Scientific Reserve' (29 percent by area) constitute the largest coverage. The Geological, Paleontological and Hydrological Natural Monuments (118ha) have limited biodiversity significance. At present, no National Park or Biosphere Reserve has been established in Moldova. Three wetlands - Lower Prut Lakes, Lower Dniester, and Unguri-Holoșnița – totaling 94,705 hectares have recently been included in the 'Ramsar List' and designated as Wetlands of International Importance, although a large proportion (more than 65 percent) of these designated sites are under agricultural production, with the remaining areas including existing protected areas and other semi-natural areas.<sup>20</sup>

Under current conditions, the protected area system of Moldova does not effectively address threats to biodiversity, as it is not ecologically representative. Large number of species, ecosystems and ecological processes are not adequately protected and the management regimes (management objectives, governance types or management effectiveness) of the existing protected areas do not provide full security for particular species or ecosystems. For example, the majority of protected areas are small (<100ha) and have a fragmented distribution, steppe and forest habitats are under-

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<sup>17</sup> 2009-2010 Human Development Report, Climate Change in Moldova, Socio-Economic Impacts and Policy Options for Adaptation, UNDP, 2009.

<sup>18</sup> First National Report on Biological Diversity, 2000.

<sup>19</sup> Environmental protection in the Republic of Moldova. Report of the Ministry of Environment and Natural Resources to the Belgrade Ministerial Conference. 2007.

<sup>20</sup> UNDP Project Document. Improving coverage and management effectiveness of the Protected Area System in Moldova., 2008



represented. Their boundaries are not clearly demarcated and the classification of a number of protected areas is not aligned with their biodiversity significance and/or management objectives.<sup>21</sup> Management plans at the level of individual protected areas are insufficient if not absent. Capacity for protected areas management is weak, in terms of technical and financial resources. Awareness raising and involvement of local population is extremely low.

**Figure 3.3**  
**Natural Areas Protected by State in Moldova**



Source: Biological Diversity Conservation National Strategy and Action Plan, 2002.

<sup>21</sup> UNDP Project Document. Improving coverage and management effectiveness of the Protected Area System in Moldova.

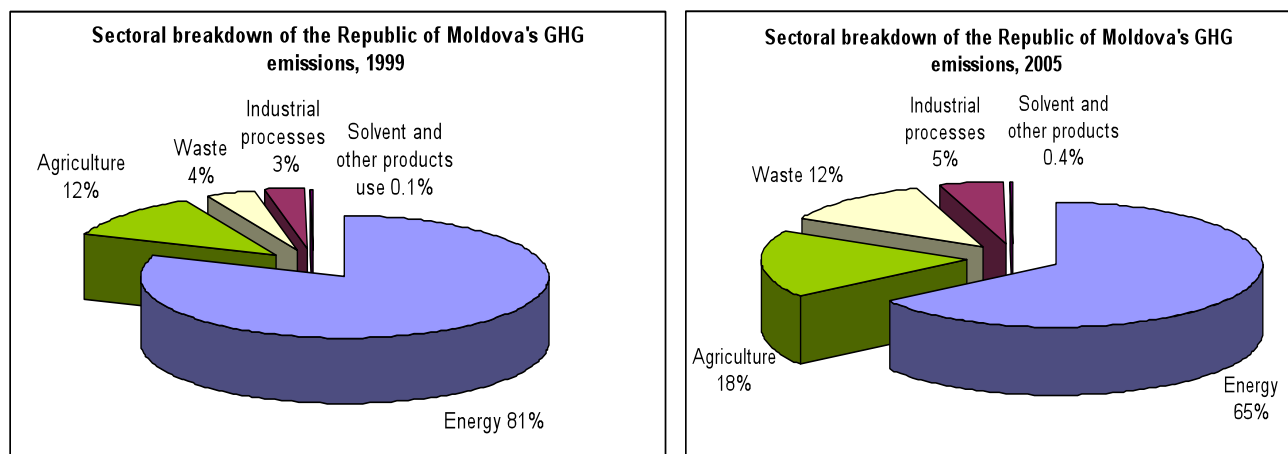
## Climate Change

### Status of Greenhouse Gas Emissions

Between 1990 and 2005, the evolution of total direct greenhouse gas emissions expressed in CO<sub>2</sub> equivalent, revealed a decreasing trend in Moldova, by about 72.3 percent from 42,886.0 Gg CO<sub>2</sub> equivalents in 1990 to 11,883.5 Gg CO<sub>2</sub> equivalents in 2005<sup>22</sup> due mainly to the transition period to a market economy after independence and the economic crisis. The energy sector is by and large the main contributor to GHG emissions in Moldova, followed by the agricultural sector, then the waste and industrial processes sectors, with a very limited share of emissions coming from solvents and other products category (figures 3.4 and 3.5). It should also be noted that, between 1999 and 2005, the share of GHG emissions from the waste sector tripled. While the other contributors have all seen an increase in their share of GHG emissions, the portion of the energy sector, although still the most important source of GHG emissions, has decreased from 81 to 65 percent.

Figures 3.4 and 3.5

#### Sectoral Breakdown of GHG Emissions, 1999 and 2005



**Data Source:** Second National Communication of the Republic of Moldova to the United Nations Framework Convention on Climate Change, Chisinau, 2009.

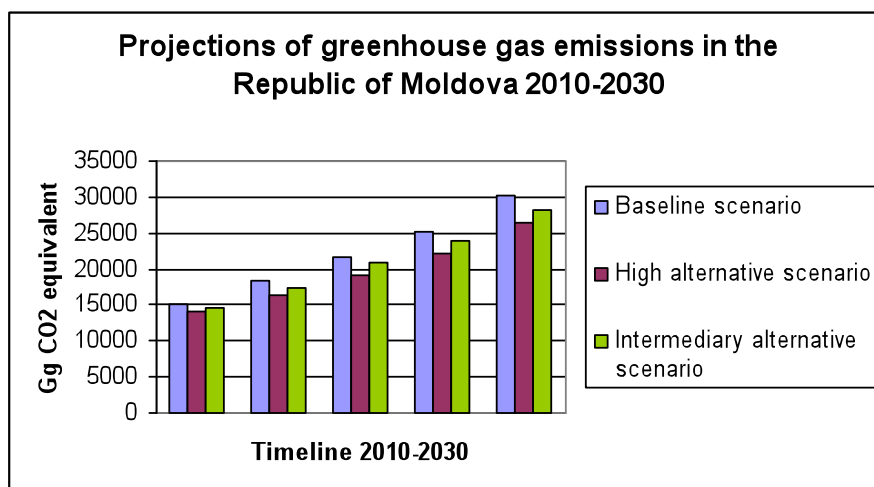
The second national communication to the UNFCCC developed three scenarios of future projections with a 2030 the horizon. A baseline scenario, which does not provide for abatement measures, and two alternative scenarios – the High Alternative Scenario and the Intermediary Alternative Scenario – which take into account the mitigation policies and measures included in the sectoral action plans on GHG emissions abatement were developed. All three scenarios foresee an increase in GHG emissions<sup>23</sup> ranging from 155.7 percent under the baseline scenario to 123 percent under the High Alternative Scenario, the most optimistic scenario (see figure 3.6 below).

<sup>22</sup> The National Inventory Report: 1990-2005. Greenhouse Gas Sources and Sinks in the Republic of Moldova, 2009.

<sup>23</sup> Without Land Use, Land-Use Change and Forest.

Figure 3.6

### Projections of Greenhouse Gas Emissions in Moldova 2010-2030



**Data Source:** Second National Communication of the Republic of Moldova to the United Nations Framework Convention on Climate Change, Chisinau, 2009.

### Mitigation Options

The Second National Communication to the UNFCCC<sup>24</sup> identifies the following main measures to reduce GHG emissions and increase carbon removals in the relevant sectors, as presented in table 3.1.

### Renewable Energy

The Republic of Moldova's Energy Strategy for the Period till 2020, sets a target of 6 percent for the share of renewable energy in the country's total energy balance by 2010 and 20 percent by 2020. According to the second National Communication to the UNFCCC, if these targets are achieved, it will contribute to the annual reduction rate of GHG emissions by about 167 to 210 Gg of CO<sub>2</sub> equivalent.

The Feasibility Study<sup>25</sup> on biomass, wind, and solar energy revealed that there is potential to use renewable energy on the territory of Moldova at reasonable costs. However, despite some experience in the use of renewable energy, the limited financial resources, insufficient political will and awareness constitute significant barriers for the implementation of renewable energy in Moldova.

<sup>24</sup> Second National Communication of the Republic of Moldova to the United Nations Framework Convention on Climate Change, Chisinau, 2009.

<sup>25</sup> Todos P., Renewable energy. Feasibility study, 2002.

**Table 3.1**

**Overview of Climate Change Mitigation Measures**

Sectors	Mitigation measures
Energy	<ul style="list-style-type: none"> <li>• Promotion of the policies and measures targeted at GHG emissions abatement throughout the whole energy chain</li> <li>• Enhancing energy efficiency in all sectors of the national economy</li> <li>• Introduction of local fuels, secondary energy resources, renewable energy sources (in particular, biomass, wind and solar energy) and energy-containing industrial or domestic waste in the energy balance</li> <li>• Use of low GHG emission fuels (comprehensive gasification of the Republic of Moldova)</li> <li>• Compliance with the European norms and standards to prevent environment pollution</li> <li>• Development of a National Program to liberalize the energy market and attract investment</li> </ul>
Transport	<ul style="list-style-type: none"> <li>• Strengthening the legal framework and implementation of relevant policies</li> <li>• Rehabilitation and development of the terrestrial transport infrastructure</li> <li>• Identification and implementation of organizational and technological measures to reduce emissions</li> <li>• Renewal of the rolling stock park</li> </ul>
Industry	<ul style="list-style-type: none"> <li>• Reducing the consumption of energy resources by promoting energy efficiency and energy conservation policies</li> <li>• Promoting clean production</li> <li>• Waste reduction and recycling incentive measures</li> <li>• Modernization and use of installations to collect and treat toxic substances</li> </ul>
Agriculture	<ul style="list-style-type: none"> <li>• Strengthening the legal framework</li> <li>• Revitalization of the animal breeding sector</li> <li>• Sustainable development of agri-business</li> </ul>
Forestry	<ul style="list-style-type: none"> <li>• Strengthening the legal framework</li> <li>• Strengthening of eco-protective and bio-productive potential of the existing forests</li> <li>• Rational use of forestry resources</li> <li>• Improving enforcement</li> <li>• Expansion of forest covered areas and creation of ecological interconnection corridors</li> </ul>
Waste	<ul style="list-style-type: none"> <li>• Strengthening the legal framework</li> <li>• Promotion of minimization, separate collection and recycling of municipal solid waste</li> <li>• Centralized disposal of waste at the solid waste disposal sites</li> <li>• Construction and putting into operation the Waste Incineration Plant in Chisinau</li> <li>• Reconstruction of the existing and construction of new waste water treatment plants, assuring aerobic treatment</li> </ul>

**Vulnerability to Climate Change**

The state of natural ecosystems, agriculture, and public health is dependent to a great extent on climate change impacts. The risk factors which determine the degree of vulnerability of ecosystems

and public health are soil humidity deficiency, uneven distribution of precipitations, frequent floods, and high temperatures, in particular in early summer and late spring.<sup>26</sup>

The main impacts of global climate change in Moldova have been identified in the 2009 UNDP Human Development Report, which focuses on climate change in Moldova. These impacts include: an increase in annual mean air temperature up to 4.1-5.4°C, with maximum warming in winter and in transition seasons, and a continuous annual fall in summer precipitations. The annual decrease in precipitation, against a temperature increase, stimulates a strong humidity deficit, resulting in a dryer climate. Finally, extreme weather events are likely to become more frequent in the future, as illustrated by two recent catastrophic events, the severe drought in 2007 and the heavy flooding in 2008.

These impacts represent a number of very serious threats, in particular:

- Water shortage, especially in the most populated and economically developed areas, coupled with increasing frequency of short-term water oversupply, particularly in the form of flash floods.
- Impacts on ecosystems such as biodiversity losses, linked inter alia to the predicted change of the climate of Moldova from semi-arid to arid, especially in the southern and eastern part of the country.
- Reduced agricultural harvests, seriously undermining the country's food security. Climate change impacts, in particular likely future drought events, could lead even to shortages of basic food.
- Likely negative impacts on transport infrastructure and energy distribution networks, demand and production capacity have been identified.
- Human health is directly influenced by the climate change and through indirect environmental factors. Two important transmission mechanisms are growing temperatures, leading to heat-waves and declining drinking water quality.

### **Adaptation to Climate Change**

The priorities in adaptation to new climate conditions, identified by assessing the vulnerability of ecosystems and risk factors, included measures related, inter alia, to water and biodiversity, as follows:

- For natural ecosystems - extension of natural areas; assessment of species and ecosystems stability under the new climate change conditions; development and implementation of forests and other green areas extension programs, efficient forest management; and restoration of wetlands.
- For water resources - water protection against pollution and depletion caused by anthropogenic activities; prevention of water destructive effects; identification of flood risk

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<sup>26</sup> Second National Communication of the Republic of Moldova under the United Nations Framework Convention on Climate Change Programme. Ministry of Environment and Natural Resources / United Nations Environment. Programme, 2009.

areas and implementation of flood prevention measures; and consolidation of hydro-technical constructions for flood protection.

## **International Waters**

### **Surface Water Resources**

All Moldovan rivers are part of the Black Sea basin and flow from the north-west to the south-east. The country's water network consists of the Dniester and Prut river systems, the rivers flowing into the Danube lakes, and the lakes in the vicinity of the Black Sea. The hydrographical network accounts for about 2.7 percent of the territory, with a total length of about 16,000 kilometers. The flow of small rivers decreases in summer, sometimes drying up completely. The most intense floods take place in summer during the torrential rain season.

The main sources of water supply in Moldova are the Dniester River with over 80 percent of total consumption and groundwater (15.2 percent).<sup>27</sup>

Water resources are unequally distributed over the territory of the country. The northern part of the country (and the central part to some extent) is currently more or less secure from this point of view, while the southern part suffers from a natural water deficit.

### **Groundwater Resources**

Groundwater resources are not uniformly distributed over the territory. The main water reserves are located in the Dniester River underlying aquifer. Moving further away from the river, the water supply of the water table decreases.<sup>28</sup>

In Moldova, the majority of groundwater does not meet the quality standards for potable water due to excessive concentrations of chemical substances (fluorine, iron, hydrogen sulfide, chlorides, sulfates, and excessive mineralization). The groundwater characteristics (degree of mineralization, chemical composition, and so on) are influenced by both natural factors (chemical and mineralogical composition of rocks, humidity, and water dynamics) and anthropogenic factors, in particular the lack of treatment of wastewater discharge and excessive use of pesticides and other chemicals in agriculture and forestry.

The groundwater is exploited through approximately 250 thousand springs and wells and the aquifers through about 6,600 boreholes. In recent years, the number of operational artesian wells significantly decreased by around 50 percent. Simultaneously, there is a pronounced increase in the number of wells fed by aquifers.

### **Main Threats to Water Resources**

Due to climate change, Moldova is expected to experience increasing frequency of short-term water oversupply, particularly in the form of flash floods as well as seasonal droughts.<sup>29</sup> In drought years, many Moldovan rural communities experience problems with water availability with consequences in terms of food security.

The main sources of water resources pollution are the point sources, namely discharge of insufficiently treated or untreated wastewater and diffuse sources, in particular rainwater drained

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<sup>27</sup> Ministry of Ecology and Natural Resources, State Environmental Inspectorate, 2008. State of environment and activity of the State Environmental Inspectorate in 2007.

<sup>28</sup> UNECE, Environmental Performance Reviews: Republic of Moldova, 1998.

<sup>29</sup> 2009-2010 Human Development Report, Climate Change in Moldova, Socio-Economic Impacts and Policy Options for Adaptation, UNDP, 2009.

from settlements and runoff from agricultural land and dumps.<sup>30</sup> Nutrient run-off to the rivers stems from: (1) environmentally unsustainable crop and soil management practices; (2) over-exploitation and illegal cutting of forests, leading to the destruction of forest belts and buffer strips; (3) inappropriate management, storage and disposal of animal manure and waste; (4) over-grazing; and, (5) mismanagement of wetlands.<sup>31</sup> Wastewater discharged from residential or industrial areas is a major contributor to surface water pollution, as wastewater treatment plants have stopped operating. The quantity of untreated or insufficiently treated wastewater has dramatically risen since 2000.

With regard to underground water resources, intense pollution by nitrates is mainly caused by improper management of manure and household waste, which is stored near groundwater sources.

In rural areas, where most of the population draws their drinking water from polluted groundwater sources and where only 17 percent of families use central supply sources, the low quality of water has a direct impact on the population's health, causing increased morbidity and generating additional health-related expenditures for the state budget and economy.

### **Persistent Organic Pollutants**

Moldova has used extremely high amounts of pesticides in the past. During the 1950s to 1990s an estimated total amount of 560,000 tons of pesticides were used in the country, including 22,000 tons of persistent organochlorinated compounds (OCPs). Pesticides use registered a peak during 1975 to 1985, but reduced dramatically over the last decades. The stockpiles of POPs obsolete pesticides pose a continuous threat to the environment and public health.

By the early 1990s, over 1,000 warehouses for pesticide storage had been built in former collective farms. During 1991 to 2003 about 60 percent of these were destroyed or dismantled, with only 20 percent of the remaining ones maintaining a satisfactory condition. Significant amounts of obsolete pesticides were stored in the open air. The deteriorated packaging increased the risk to human health and environment, as some warehouses were situated close to residential areas.<sup>32</sup>

According to the National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (NIP), adopted in 2004, the total amount of obsolete pesticides in Moldova amounted to approximately 5,650 tons at that time.

When obsolete pesticides were placed in storage they were generally indiscriminately mixed with each other in bags and drums. This resulted in a mixture of POPs pesticides with non-POPs pesticides and there is no economically viable way of determining the compositions of all the resultant mixtures in the repackaged plastic and steel drums. Representative sampling analysis indicates that the average amount of POP pesticides out of the total stock of obsolete pesticides is about 20 – 30percent.<sup>33</sup>

In 2005 Moldova had an unusually high amount of PCBs requiring disposal, as in former Soviet Union times, the country was the energy hub transmitting electricity to Bulgaria. Most of the PCBs in Moldova were concentrated in electrical power installations. The capacitors at power installations

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<sup>30</sup> Ministry of Ecology and Natural Resources, State Environmental Inspectorate, 2008. State of environment and activity of the State Environmental Inspectorate in 2007.

<sup>31</sup> Nutrient Balancer for Prut River Basin Project, 1994.

<sup>32</sup> National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants, 2004.

<sup>33</sup> World Bank, Project Document for a Persistent Organic Pollutants (POPs) Stockpiles Management and Destruction Project, October 28, 2005.



were situated outdoors and PCBs leaked from corroded capacitors to the soil below the capacitor batteries. Twenty thousand PCB-containing capacitors, unused and referred to as “discarded,” were located in 20 electrical substations throughout the country, mainly at the Vulcanesti Power station. The PCB-containing capacitors in the electrical substations were in a condition where leakages, due to corrosion, were occurring and expected to increase in the coming years.

The short term priority POPs issues<sup>34</sup> identified in order to be addressed in the NIP were:

- Management of stockpiles (pesticides and PCBs) and wastes (all chemicals under convention) in a safe, efficient and environmentally sound manner in order to reduce or eliminate releases.
- Development and implementation strategy for identification of POPs-containing stockpiles, wastes and products/articles.
- Development strategy for identifying and remediation of contaminated sites.
- Promotion and facilitation public information, awareness and education.
- Conducting research, development and monitoring.

## **Land Degradation**

Moldova has unique land resources characterized by predominant black earth with high productivity potential and a very high utilization rate (greater than 75 percent). Chernozem, a highly productive soil, represents 78 per cent of arable land.<sup>35</sup> As of January 2008, the country’s total available land amounted to 3,384.6 thousand hectares.<sup>36</sup> The share of the different types of land use in Moldova is provided in the figure 3.7 below.

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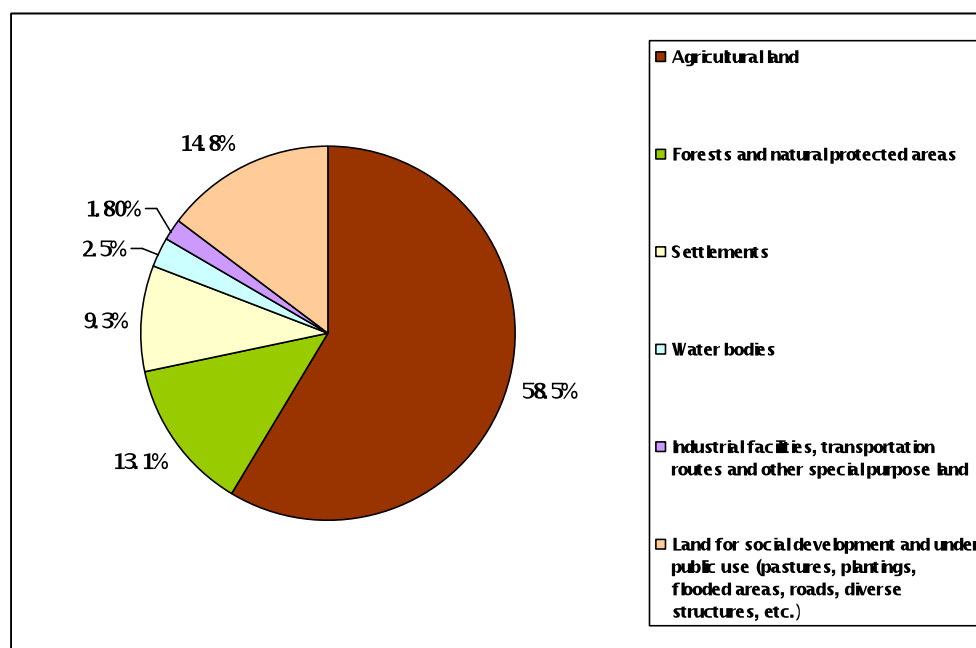
<sup>34</sup> World Bank. Persistent Organic Pollutants Final Completion Report, December 8, 2004.

<sup>35</sup> 2009-2010 Human Development Report, Climate Change in Moldova, Socio-Economic Impacts and Policy Options for Adaptation, UNDP, 2009.

<sup>36</sup> Statistical Yearbook of the Republic of Moldova, 2008.

Figure 3.7

### Land Use in Moldova



Source: Statistical Yearbook of the Republic of Moldova, 2008.

Soil fertility was seriously affected by the agricultural exploitation based on intensive technologies. Excessive grazing is one of several severe problems faced by Moldova, which also contributes to soil degradation. The animal husbandry exceeds by far the established standards of animal units per 1 hectare of pasture. In addition, the majority of pastures have a low productivity since they are located on eroded lands.<sup>37</sup>

Erosions, ravines, landslides, and floods have also a negative impact on soil, while soil dehumidification processes leads to a decrease in the humus content of agricultural lands.<sup>38</sup> According to the land cadastre, the landslide areas amount to 24,553 hectares (ha). The largest areas of landslides have been registered in districts of Calarasi - 2209 ha, Ungheni - 2065 ha, Hincesti - 1165 ha, Straseni - 697 ha, and Telenesti - 538 ha.<sup>39</sup>

### Ozone

Moldova has no chlorofluorocarbon (CFC) production and the consumption of the industrial, commercial and servicing sector has been covered entirely by imports. Since 1998 when the Country Program and the Refrigerant Management Plan (RMP) were approved, CFC consumption has rapidly decreased. In 2007, a consumption of 9.2 tons was reported. Since January 1, 2008, import of CFC and of equipment containing PCBs is banned. Servicing of old CFC-based equipment is done from existing stockpiles and/or from recovered and recycled CFCs.<sup>40</sup>

The refrigeration service sector is the only remaining sector where CFC is still being used. The most important CFC consumption is in industrial refrigeration (54 units, 5.3 tons consumption per year)

<sup>37</sup> Environmental protection in the Republic of Moldova. Report of the Ministry of Environment and Natural Resources to the Belgrade Ministerial Conference. 2007.

<sup>38</sup> Idem.

<sup>39</sup> Idem.

<sup>40</sup> Idem.

and the domestic sector (1.3 million units and 3.9 tons consumption per year). These figures may have significantly changed during the last years but the servicing sector is still facing the challenge of upgrading the skills of technicians in good practices and the knowledge of end-users in how to deal with retrofits and the conversion to non-CFC alternatives. This applies particularly to smaller and medium size locally owned businesses.<sup>41</sup>

At present the country is involved in the development of the Management Plan to phase-out the release of hydrochlorofluorocarbons (HCFCs) – HPMP with the support of the Multilateral Fund for the Implementation of the Montreal Protocol.

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<sup>41</sup> Idem.

# Technical Document B

## Renewable Energy from Agricultural Waste Project: Review of Outcomes to Impact

### 1. Introduction

At the request of the Global Environment Facility (GEF), the Evaluation Office conducts Country Portfolio Evaluation (CPE) every year. This year, Moldova was one of the two countries selected. CPEs aim to provide the GEF Council with an assessment of results and performance of GEF supported activities at country level, and of how GEF supported activities fit into the national strategies and priorities as well as within the global environmental mandate of the GEF. The CPE methodology involves carrying out two Review of Outcomes to Impact (ROtI) studies of projects that have been completed for at least two years to strengthen the information gathering and analysis on results.

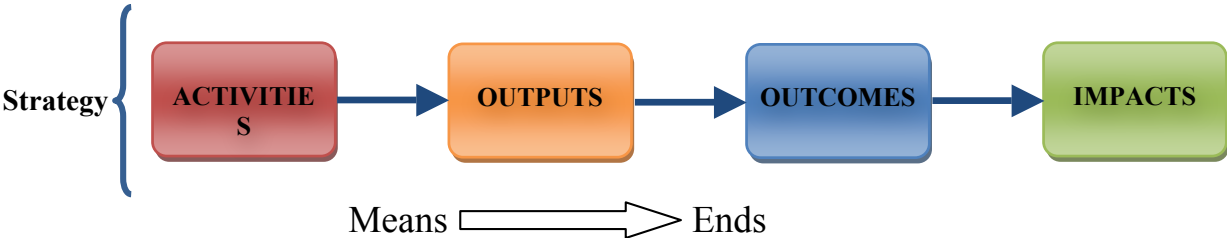
As part of the Moldova CPE, ROtI studies have been undertaken for the following projects:

- Renewable Energy from Agricultural Waste (REWA) project (medium-size project)
- UNEP Support to CBD Parties for Preparation of Third National Reports to the COP of CBD (enabling activity)

Terminal project evaluations rarely provide information about impact due to the lack of data available to make such an assessment, and the complexity of environmental processes and the long timeframe needed to generate impact, which may only be realized many years after project completion. The ROtI methodology seeks to overcome the challenges of measuring exploring the underlying logical sequence of conditions and factors (referred to as the **theory of change**) deemed necessary to convert project outcomes into the ultimate impact, and by assessing the extent to which the theory of change has been realized in practice. The methodology provides a quick and cost effective way of indirectly measuring project impact, or the potential to deliver impact in the future.

GEF projects are generally designed and structured according to the **logical framework**, which in essence is a simplified theory of change (TOC), with the following basic means-ends hierarchy:

Figure 1 Simplified Theory of Change



Most GEF projects and their terminal evaluations mainly focus on the first three steps in the above logframe hierarchy; that is the project **activities** that achieve a set of **outputs**, which in turn will

contribute to achieving **outcomes**. However, GEF terminal evaluations do score the likelihood that project results will be sustainable, thereby implicitly assessing the likelihood of impact. To more explicitly understand the process for delivering eventual impact, the ROTI methodology focuses on the last step in the means-end hierarchy; that is, developing a detailed theory of change from outcomes to **impacts**. The *GEF ROTI: Guidelines and Procedures Manual* provides a detailed explanation of the ROTI methodology; the main features include:

- The initial characterization of the project’s intended long-term environmental impacts, which in the GEF ROTI methodology are referred to as **global environmental benefits (GEBs)**. Understanding what the project is ultimately trying to achieve is a vital first step in developing the theory of change for achieving impact.
- The verification of the project’s logic and, when necessary, revised it retrospectively to ensure that there is a logical and incremental progression between the different levels of the project’s logical hierarchy in working towards the achievement of impacts.
- The analyze of the project’s major outcomes-impacts (TOC) pathways, including identifying intermediate states, assumptions, and impact drivers necessary to convert the project’s outcomes into eventual impacts.

This report presents the results of the ROTI for the REAW project, a medium-size project implemented through the World Bank between July 2005 and May 2008. It should be noted up-front that the time span between the end of the project and the assessment is rather short - less than two years. As a consequence, at the time of the assessment, the evidence of the realization of the impact drivers and assumptions may have been rather limited, at least for some of them. This remark is even more valid in relation with measurable evidence of the achievement of the intermediate states.

The REWA project falls under the removal of barriers to the adoption of renewable energy operational program of the climate change focal area. The national executing agency was the Consolidated Agricultural Project Management Unit. The total budget of the project was \$2.64 million, including GEF financing of \$0.97 million and \$1.65 million (\$0.84 million actual) in cofinancing. The differences in the actual budget against the original ones, as presented in table 1 below, are explained by a significant reduction in the expected contribution of the recipient.

**Table 1 Original and Actual Budget**

Cofinancier	Original	Actual
GEF	972,920	972,920
Financial Intermediaries	219,388	61,071 <sup>a</sup>
Recipient	1,434,950	783,230 <sup>b</sup>
<b>Total</b>	<b>2,627,258</b>	<b>1,817,221</b>

**Notes:**

<sup>a</sup> Investments in the baling machines through financial intermediaries.

<sup>b</sup> Includes tax exemptions by the central government; boiler room renovations and straw purchases over a period of 6 years by local authorities.

The ultimate goal of the Project was to overcome barriers in updating its primary agricultural wastes (biomass) technologies by providing examples of best practice (demonstration plants) in the use of biomass fuelled energy systems as a viable alternative to gas, oil and coal and as a sustainable means of addressing the energy supply problems facing rural communities and agro-enterprises.

The project had three main components:

- Biomass energy demonstration units (component costs \$826,801, of which GEF \$587,365, and government cofinancing of \$239,435)
- Biomass production and fuel cycle support (component costs \$646,232, of which GEF \$120,132, and government cofinancing of \$526,100)
- Public awareness, outreach and dissemination, and information barriers removal (component costs \$126,431, of which GEF \$118,529, and government cofinancing of \$7,902)
- Project management, monitoring and evaluation and audit (component costs \$156,687, of which GEF \$146,894, and government cofinancing of \$9,793)

The terminal evaluation is an Implementation Completion Memorandum (ICM) where the delivery of the project outcomes is considered as satisfactory, efficiency as satisfactory, overall outcome as satisfactory. Replicability is rated as high, and sustainability is rated as high for the private sector and low for the public sector.

The ROtI assessment involved desk research, interviews, one focus group session with the project team and other stakeholders, and field visit to Boghenii Noi village (Ungheni District), Chiscareni village (Singerei District) and Antonesti village (Stefan Voda District).

The report is structured according to the ROtI methodology, starting with the characterization of the intended project environmental impacts, or GEBs (section 2). The logical sequence of conditions (or theory of change) deemed necessary to convert outcomes to impacts was then modeled (sections 3), followed by an assessment of the extent to which the outcomes-impacts pathways have been realized, which in turn provides an indirect measure of impact that is likely to be achieved over time (section 4). Section 5 reviews the available information directly measuring the intended impact of the project (the status of the GEBs), and section 6 summarizes the overall conclusions of the ROtI assessment.

## **2. The Project's Global Environmental Benefits**

The starting point for the ROtI assessment is to identify the project's intended environmental impacts, which for GEF projects is the delivery of GEBs. They are defined in the ROtI manual as 'lasting improvements in the status of an aspect of the global environment that safeguards environmental functioning and integrity as well as benefiting human society'. The REAW project contributes to the overall objective of the United Nations Framework Convention on Climate Change (UNFCCC) to achieve [...] stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner" (UNFCCC, Art.2).

The aim of the project was to address global climate change and to reduce associated threats by achieving a reduction of greenhouse gas (GHG) emissions through promotion of renewable energy from biomass (annual emission reductions of 4258 tons of carbon dioxide (CO<sub>2</sub>) equivalent through greater efficiency and fuel switching from coal to straw biomass, and also by demonstrating social and economic benefits from use of renewable energy, including decreased operating costs). The main impacts of global climate change in Moldova have been identified in the *2009 UNDP Human*

*Development Report* (HDR), which focuses on climate change in Moldova.<sup>42</sup> These impacts include: an increase in annual mean air temperature over the course of this century could total up to 4.1-5.4°C, with maximum warming in winter and in transition seasons, and a continuous annual decrease in summer precipitations. The annual decrease in precipitation, against a temperature increase, stimulates a strong humidity deficit, resulting in a dryer climate. Finally, extreme weather events are likely to become more frequent in the future, as illustrated by two recent catastrophic events, the severe drought in 2007 and the heavy flooding in 2008. These impacts represent a number of very serious threats, in particular:

- Water shortage, especially in the most populated and economically developed areas, coupled with increasing frequency of short-term water oversupply, particularly in the form of flash floods.
- Impacts on eco-systems such as biodiversity losses, in particular due to the predicted change of the climate of Moldova from semi-arid to arid, especially in the southern and eastern part of the country.
- Reduced agricultural harvests, seriously undermining the country's food security. Climate change impacts, in particular likely future drought events, could lead even to shortage of basic food.
- In addition, likely negative impacts on transport infrastructure and energy distribution network, demand and production capacity have been identified.

Moldova is considering a number of measures to address these threats, notably through adaptation measures such as identification of flood risk areas and implementation of flood prevention measures, extension of natural areas, implementation of sustainable soil management measures, among others.<sup>43</sup> Moldova is also planning a range of measures aimed to mitigate GHG emissions and increase carbon removals. These relate to different sectors, including the energy sector, for which the Second National Communication to the UNFCCC<sup>44</sup> identifies the following main measures:

- Promotion of the policies and measures aimed at GHG emissions abatement throughout the whole energy chain
- Enhancing energy efficiency in all sectors of the national economy
- Introduction of local fuels, secondary energy resources, renewable energy sources (in particular, biomass, wind, and solar energy), and energy-containing industrial or domestic waste in the energy balance
- Use of low GHG emission fuels (comprehensive gasification of Moldova)
- Compliance with the European norms and standards to prevent environment pollution
- Development of a National Program to liberalize the energy market and attract investment

Moldova has already started developing the relevant policy framework. The main document setting up priorities in the field of energy policy is the National Energy Strategy (2007-2020), which has the

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<sup>42</sup> 2009-2010 Human Development Report, *Climate Change in Moldova, Socio-Economic Impacts and Policy Options for Adaptation*, UNDP, 2009.

<sup>43</sup> Second National Communication of the Republic of Moldova to the United Nations Framework Convention on Climate Change, Chisinau, 2009.

<sup>44</sup> Second National Communication of the Republic of Moldova to the United Nations Framework Convention on Climate Change, Chisinau, 2009.

objective to ensure the security of the energy supply; promote energy conservation and efficiency, and to increase the use of renewable energy to meet domestic energy demand.

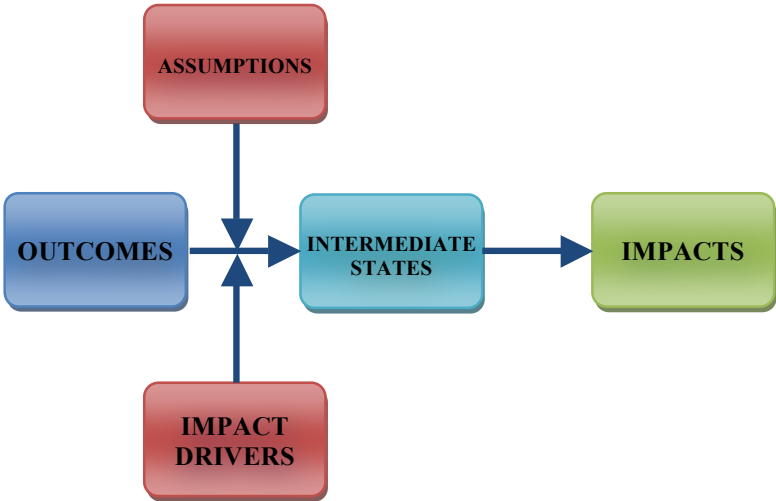
As underlined in the 2009 HDR, the development of renewable energy is an inherent part of the international efforts aimed at climate change mitigation and the promotion of the green economy. Energy potential from renewable sources (excluding geothermal) is estimated at 2,500 tons of oil equivalent (toe), including 2,700 toe from biomass.<sup>4</sup> Therefore, the REAW project clearly contributes to the development of renewable and is in line with the current policy priorities of Moldova.

The next section identifies the theory of change deemed necessary to deliver these global environmental benefits.

### 3. The REAW Outcomes-Impact Theory of Change

The theory of change for a project is the logical sequence of conditions and factors that are necessary to deliver the ultimate project impact. The basic project theory of change starts with activities and develops through a means-ends hierarchy until finally reaching impact. Most GEF project terminal evaluations assess the basic theory of change as far as outcomes, but do not usually go far in assessing the crucial last step to impact. However, in the case of the ROTI, assessment focuses on this last step and develops and assesses a detailed theory of change between outcomes and impacts, referred to as **outcomes-impacts pathways**. Figure 1 below illustrates the key elements and relationships for the detailed theory of change between outcomes and impacts.

**Figure 1 Generic theory of change for outcomes-impacts pathways**



The key ingredients in the outcomes-impacts pathways (or strategies) that are examined by this ROTI are intermediate states, impact drivers and assumptions, which are defined in table 2 below. If the project outcomes are assessed to be successfully delivered and the key ingredients of the theory of change between outcomes and impacts are in place, then it is reasonable to conclude that there is indirect evidence that the barriers and threats to impact have been overcome and that impact has or will be achieved with time.

<sup>4</sup> 2009-2010 Human Development Report, *Climate Change in Moldova, Socio-Economic Impacts and Policy Options for Adaptation*, UNDP, 2009.



**Table 2 Definitions of Theory of Change Elements in the Outcomes-Impacts Pathways**

TOC terms	Definition
Intermediate States (IS)	The transitional conditions between the project's outcomes and impacts that must be achieved in order to deliver the intended impacts
Impact Drivers (ID)	The significant factors that, if present, are expected to contribute to the ultimate realization of project impacts and that are within the ability of the project to influence
Assumptions (A)	The significant factors that, if present, are expected to contribute to the ultimate realization of project impacts, but that are largely beyond the power of the project to influence or address

It should be noted that, in the case of the REAW project, given the specific or narrow focus of the project, there is only one main strategy: the promotion of biomass use through demonstration sites. The following table shows the different elements of the outcomes-impacts theory of change for the REAW project.

**Table 3 The REAW Outcomes-Impacts Theory of Change**

	OUTCOMES	DRIVERS & ASSUMPTIONS	INTERMEDIATE STATES	IMPACTS
	<i>What is the situation at the end of the project?</i>	<i>What key factors are responsible for delivery (or non-delivery) of the intermediate states?</i>	<i>What has happened since the project ended, or still needs to happen to achieve impacts?</i>	<i>What was the project ultimately aiming to achieve?</i>
<b>STRATEGY: PROMOTION OF THE USE OF BIOMASS THROUGH DEMONSTRATION SITES</b>	Outcome 1: awareness raised on alternative energy systems (biomass boilers)	ID 1: continued awareness raising activities	IS: Replicated and up-scaled biomass energy systems (in rural areas, in replacement of gas, involves increased sales of biomass technology units)	<b>CARBON DIOXIDE REDUCTION</b>  &  <b>OVERALL ENERGY SECURITY</b>
	Outcome 2: demonstrated social and economic benefits of biomass boilers	ID 2: ensured sufficient supply biomass		
		ID 3: spot check systems		
		ID 4: reputation of biomass-fuelled systems established in Moldova		
	Outcome 3: encouraged biomass boiler manufacturing and development of straw bale market	ID 5: verified good performance of all systems in the public sector		
		A 1: Development of biomass use encouraged through policy, legislation and funding		
		A 2: Economic growth in particular in rural areas		

## 4. Assessment of Achievement of the Outcomes-impacts Pathways

The assessment of achievement of the outcomes to impact pathways was done through an initial desk-top study, interviews with key informants and fact-finding site visits. The rating system used for the assessment is given in table 4 as per the GEF ROTI Manual (August 2009).

**Table 4 Field ROTI Rating System**

Rating	Description
0	Not achieved: From a <i>theoretical perspective</i> , the Theory of Change (TOC) aspect is not explicitly or implicitly identified by the project, and/ or from a <i>delivery perspective</i> , very little progress has been made towards achieving the TOC, and the conditions are not in place for future progress
1	Poorly achieved: From a <i>theoretical perspective</i> , there are no appropriate mechanisms set out to achieve the TOC aspect after GEF funding ended, and/ or from a <i>delivery perspective</i> , little progress has been made towards achieving the TOC aspect, but the conditions are in place for future progress.
2	Partially achieved: From a <i>theoretical perspective</i> , the Theory of Change (TOC) aspect is explicitly recognized and the mechanisms set out to achieve it are appropriate but insufficient (e.g. there is no clear allocation of responsibilities for implementing the mechanisms after GEF funding ends). From a <i>delivery perspective</i> moderate and continuing progress is being made towards achieving the TOC aspect, although there is not yet a strong basis for the eventual delivery of the intended Global Environmental Benefits.
3	Fully achieved: From a <i>theoretical perspective</i> , the Theory of Change (TOC) aspect is explicitly recognized and appropriate and sufficient mechanisms to achieve it are apparent (e.g. specific allocation of responsibilities after GEF funding ended), and/ or from a <i>delivery perspective</i> substantial progress has been made towards achieving the TOC aspect and a strong basis is in place for eventual delivery of the intended Global Environment Benefits.

The REAW project has only one strategy, hence one intermediate state level, therefore the rating system is applied at the different levels of the theory of change; that is, at the individual TOC level (outcomes, impact drivers, assumptions, and intermediate states), and at the overall project level (which also corresponds to the strategy level). The reporting starts off by providing a justification for why the identified intermediate state for the strategy is considered important in delivering ultimate impact. The theory of change for the strategy is then examined through its logical steps, firstly validating the extent to which the outcomes were achieved at project closure, followed by an assessment of the extent to which the impact drivers and assumptions were realized. The section concludes with an assessment of achievement of the intermediate state itself.

### Theory of Change Overview

The project strategy – promoting biomass use through demonstration sites – focuses on delivering the intermediate state “Replicated and up-scaled biomass energy systems.” This intermediate state is seen as a necessary step in delivering the foreseen project impacts – a reduction in carbon dioxide emissions and contribution to overall energy security, and ultimately contribute to identified GEBs through lasting improvements (or at least maintenance) of earth climate and lasting improvements on the environment through better local air quality.

Three outcomes have been identified by the study team as the main elements needed to deliver the intermediate stage. These are primarily Outcome 2 - demonstrated social and economic benefits of

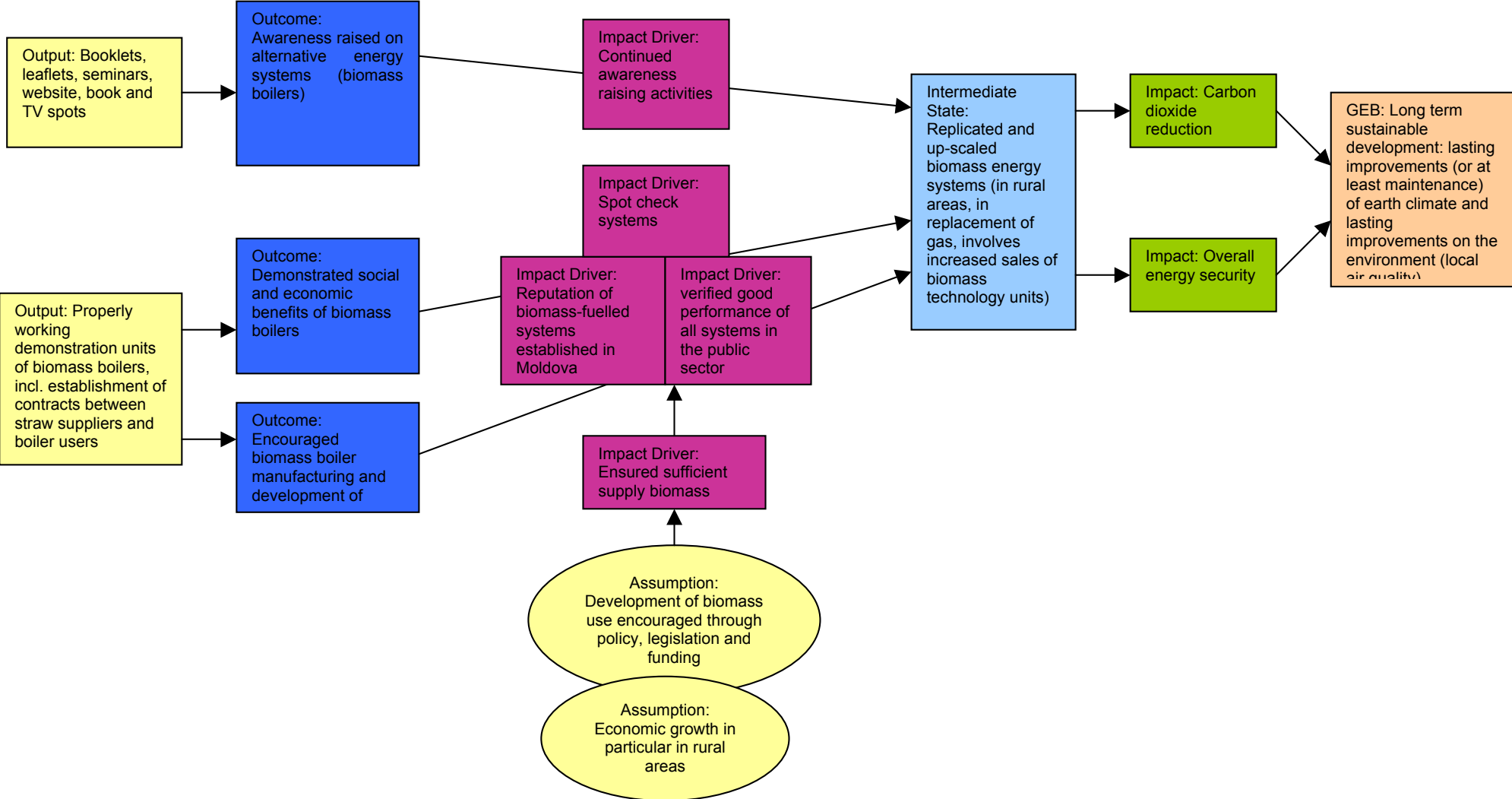
biomass boilers, and Outcome 3 - encouraged biomass boiler manufacturing and development of straw bale market, which should be supported by Outcome 1. Outcome 1 consists in general of awareness raised on alternative energy systems, in particular biomass boilers.

The study team identified five impact drivers and two assumptions that were considered as essential for bridging the gap between the project outcomes and the delivery of the intermediate state, as shown in the figure below. The impact drivers are significant factors that, if present, are expected to contribute to the ultimate realization of project impacts and that are within the ability of the project to influence, as per the definition provided by the ROTI Practitioners' Handbook. The first impact driver 'continued awareness raising activities' aims to sustain Outcome 1 and also to support the achievement of the fourth driver 'reputation of biomass-fuelled systems established in Moldova'. The second and third drivers 'ensured sufficient supply biomass' and 'spot check systems' are important to support the replication and scaling up of the technology, ensuring a catalytic effect of the project, through the provision of reliable and predictable fuel availability and the technical performance of the biomass boilers. These will also help to sustain Outcomes 2 and 3 while contributing to the realization of the fourth and fifth drivers 'reputation of biomass-fuelled systems established in Moldova' and 'verified good performance of all systems in the public sector', which, in turn, are key in ensuring the sustainability of Outcome 3.

As mentioned above, the replication and up-scaling of biomass energy systems also relies on the presence of two factors that, if present, are expected to contribute to the ultimate realization of project impacts, but that are largely beyond the power of the project to influence or address (see ROTI Handbook). The first assumption considered by the study team relates to the existence of policy, legislation, and funding which promote and encourage the development of biomass use. This should be seen in the overall context of the fundamental changes that the project is seeking to achieve in the long-term – namely a reduction in carbon dioxide emissions and overall energy security. If these are also considered as priority by the Moldovan authorities, it should trigger the development of a more enabling policy environment for the replication and up-scaling of biomass energy systems. The second assumption 'economic growth in particular in rural areas' has been singled out at several occasions by key informants as a condition to ensure that public authorities are able to make the necessary investments in this new technology.

The next section assesses the extent to which the theory of change has been realized in theory and practice by examining the achievement of the TOC components, starting with the outcomes and finishing with the intermediate state. Table 5 at the end of this section provides a summary of this analysis.

**Figure 3 Theory of Change for REAW project**



## **TOC Assessment**

### **Outcomes**

#### **Outcome 1: Awareness raised on alternative energy systems (biomass boilers)**

Prior to the project, there was very limited awareness about alternative energy systems and a general negative perception towards the use of biomass as a source of energy. During the project, awareness was raised through seminars for local authority representatives and directors of schools, kindergartens and other public offices with a total outreach of about 350 persons (ICM), audio and video adds, information leaflets and promotional materials, participation to thematic exhibitions, preparation and publication of a book 'Biomass and its use for energy purposes' in Romanian (550 copies), and the setting up of a website providing information on biomass use as a source of energy. Therefore, Outcome 1 has been successfully achieved within the frame of the project – in particular within its geographical scope in the demonstration sites surroundings.

#### **Outcome 2: Demonstrated social and economic benefits of biomass boilers**

The project aim to demonstrate that biomass is a sustainable, economical, and profitable fuel alternative to coal and gas. The primary tool to achieve this is the installation of properly working demonstration units of biomass boilers, including the establishment of contracts between straw suppliers and boiler users. The project installed 11 biomass boilers in 8 villages, in public buildings (school, church, kindergarten, and library) on a turn-key basis. Training has been provided to design experts, installation companies, and local boiler operators to secure an efficient operation of the equipment. The project beneficiaries reported savings on the cost of heating after switching to biomass systems (price of straw against coal, and so forth). The project implementation led to new economic activities (design, specification, procurement, supply, and maintenance of equipment). The evaluation team noted that the project supported rural development, working directly with small rural communities and helping them to secure and diversify their energy supply, a key step as energy is becoming more expensive especially through the costs of connecting to centralized networks, including the gas networks. It has also allowed creation of new economic opportunities for local farmers who could sell their production (straw) to the local market. The demonstration sites were selected, among others, on the absence of connection to the gas network.

Social benefits are mainly linked to the better temperature conditions in schools and other public buildings. Given unreliability of former heating systems and budget constraints (decrease in the quantity of coal bought), the installation of biomass boilers have allowed to increase the temperature from about 14°-16° to about 20°. In the case of schools, this improvement in the conditions in which children are studying, was an obvious social benefit. However, it should be noted that, in certain cases, notably during the 2009 winter which was unusually cold, problems experienced due to low quality of straw, lack of availability, technical problems for the boiler operation, have prevented reaching the necessary temperature (see below ID 2, 4 and 5).

The evaluation team concluded that Outcome 2 has been successfully achieved.

#### **Outcome 3: Encouraged biomass boiler manufacturing and development of straw bale market.**

This outcome has been achieved through the identification of two local producers of boiler heating systems. They now produce boilers under a Danish license and pay the corresponding royalties. The

project gave support in obtaining the certification necessary to produce and sell the boilers on the Moldovan market. Local production reduced the manufacturing costs by about 20 percent

With a view to ensure a full biomass chain supply, the project has identified ten agricultural companies for the production, storage, and supply of straw bales to demonstration sites through a staged selection process. The project supported the procurement of baling machines (25 percent grant for baling equipment for some of the companies). The project delivered a training program to the participating agro-companies on straw baling technologies: harvesting with minimal loss, storage and preservation, baling up and preparation for sale, and so forth. It also developed and finalized seven-year long supply contracts between these companies and local authorities. However, due to the fact that 2007 was a dry year the contract conditions could not be fulfilled by suppliers and some contracts have been terminated.

Outcome 3 is considered as being fully achieved and this assessment is further supported by evidence showing that the production of boilers continued after the project to respond to demand. With regard to boilers sold after the end of the project, straw supply did not pose any problem and, interestingly, the model contracts prepared by the project for straw supply have been used in these instances. However, since the end of the project the price of the straw increased by about 40 percent from \$30-35 to \$50-55.

### ***Impact Drivers and Assumptions***

#### **ID 1: Continued awareness raising activities**

The first impact driver is seen as an important condition to ensure promotion of and support to this new technology. Awareness raising activities have continued mainly through one of the manufacturer's activities to look for clients. There is also some evidence that further awareness raising initiatives have been pursued after the project ended, that is through visits of delegations from the districts and other districts, informal information exchange with other villages, and media coverage. It is also worth noting that biomass has become part of university curriculum, under the leadership of one of the former consultant to the project.

However, some of the outputs leading to increased awareness have not been sustained. This relates to the website as it was not available at the time of the evaluation due to the lack of financing. Current attempt to pass on the ownership of the website to an institution which could maintain it has not been finalized although the former project manager is pursuing efforts to find a solution.

Finally, the fact that boilers have been installed in other districts than the ones where the demonstration units are located is a clear sign that the effects of the project were not limited to the project locations. Therefore, the evaluation team considers that this impact has been achieved as awareness activities continue after the project and had effects even outside the villages and districts where the boilers have been installed.

#### **ID 2: Ensured sufficient supply of biomass**

Since the project ended, the price of straw has increased by about 40 percent and during the 2007 drought, some sites experienced shortages, leading in some cases to termination of supply contract (see above). In normal climatic conditions, the supply of straw is sufficient for the biomass boilers already installed.

In 2009, the straw was of lower quality (too short, wet mainly due to storage problems rather than the quality of the straw as supplied). Often, villages have supplemented straw with wood. However, it does not seem that people who bought boilers after the end of the project had major problems finding suppliers of straw. In some cases, they also use other biomass. Taking into consideration these last elements, this impact driver is assessed as partially achieved.

### **ID 3: Spot check systems**

The company provides instructions on boiler operation and maintenance when installing boilers. It also ensures maintenance services on an annual basis. Maintenance costs are covered by the beneficiaries. There is no fund available for ensuring spot check systems after the project ended.

Demonstration site visits have shown that technical problems have been experienced in the use of biomass boilers in a few cases. However, it seems that at least one of the two companies responded quickly to request for support in solving these problems. The impact driver is therefore rated as partially achieved.

### **ID 4: Reputation of biomass-fuelled systems established in Moldova**

The evaluation team has found no evidence that the reputation of biomass-fuelled systems has been established in Moldova on a national scale. Additional boilers have been installed in other districts than the ones where the demonstration sites were located: Telenesi, Anenii Noi, Hincesti, and Taraclia. There are plans to install a boiler in Donduseni district during this year.

However, this is still not sufficient to develop a significant market at the moment and, as noted by one of the manufacturer, the demand is still too low to bring in adequate profit. The progress made in establishing the reputation of biomass boiler is mainly driven by the enthusiasm shown by people using a biomass boiler and marketing activities of the manufacturer. Although this constitutes a positive outcome, it is not enough for considering this impact driver as achieved. Final assessment is therefore partially achieved.

### **ID 5: Verified good performance of all systems in the public sector**

This impact driver relates to the biomass boilers installed during the life-time of the project in the public sector. On one hand, the majority of biomass boilers installed have been working well demonstrating that this heating system if properly installed, tested, and operated can be effective and reliable. On the other hand, several of the visited demonstration sites have experienced problems, such as cleaning and removal of ashes, straw storage, and the size of the straw bales. Communities where a biomass boiler has been installed are actively looking for solutions and seem quite successful in solving these different problems. However, as long as such technical problems occur, there is not yet a sufficient basis to consider this impact driver as fully achieved. The evaluation team assessment is therefore partially achieved.

### **A 1: Development of biomass use encouraged through policy, legislation and funding**

At the time of the project, the project team interacted mainly with local authorities and stakeholders. The national authorities have not been actively involved despite attempts by the project team.

At the national level, the principal document setting up priorities in the field of energy policy is the National Energy Strategy (2007-2020), which sets as one of its objective to increase the use of renewables in order to satisfy the domestic energy demand, with an ambitious target that renewable

energy sources should achieve 10 and 20 percent shares in energy balance by 2010 and 2020, respectively. More recently, the Law on renewable energy, No. 160 of 12.07.2007, establishes the legal framework for the renewable energy sector. It established the National Agency for Energy Regulation, as well as an Energy Efficiency Fund. However, this law is poorly implemented. There is no incentive in place to encourage the use of renewable energy sources and the Fund has not been established.

The recent change in government may lead to a positive evolution. Key informants have noted that the new Minister for Agriculture, one of the promoters of the Law on renewable energy, has clearly taken a position in favor of the use of biomass. However, this remains to be seen and at the time of the evaluation, this assumption is still considered as poorly achieved.

## **A 2: Economic growth in particular in rural areas**

This first assumption has been recognized as very important in overcoming the lack of funds available to finance quite significant investment costs. This is mainly relevant for large-size boilers, but not for small boilers used by individuals principally to heat greenhouses. At the time of the evaluation, most biomass boilers which have been sold after the project, benefited from some form of help from IFAD, UNEP, the 2KR Japanese project (also known as the Grant Assistance for the Food Security Project for Underprivileged Farmers), and RISP. For the planned two boilers of 600KW in Criuleni District requested by a farmer for its large greenhouses, financial support was through from the EBRD credit line (MoSEFF) for energy efficiency projects.

By several measures, including UNDP's Human Development Index, Moldova is the poorest country in Europe.<sup>46</sup> The rural population which represents 58.6 percent of the total population (in 2009)<sup>47</sup> is particularly vulnerable. After a period of economic stagnation in the 1990s and some return to growth in the following decade. In 2009, Moldova was hit hard by the global economic crisis (-6.7 percent growth). However, recent data suggests that the situation should improve in the coming years. In January 2010, EBRD reviewed its 2010 growth forecasts and is now expecting a 4 percent growth rate in Moldova in 2010 and 2011.<sup>48</sup> It is expected that the rural areas will also benefit from these positive trends but there are still too many uncertainties to reach a definite conclusion.

In view of the above, the evaluation team considered that this assumption as poorly achieved to-date.

### ***Intermediate State - Replicated and up-scaled biomass energy systems***

This intermediary state involves that biomass energy systems are replicated and up-scaled in rural areas as an alternative to gas fuelled systems. It implies that a significant increase in the sale of biomass technology units is reached. Since the project ended, the first manufacturing company sold nine boilers (eight small boilers -80 to 90 KW - to farmers for heating greenhouses and one large capacity boiler – 150 KW - for a kindergarten) and the second company sold two small boilers. In visited areas, a growing interest from neighboring villages and district authorities were reported. In certain cases, the installation of biomass boilers for private houses has been considered. In such cases, one single boiler would be installed for several households. Finally, both manufacturers and the former project manager have received various inquiries, showing people's interest in biomass use. One of the manufacturers is currently dealing with three requests, for one 80 KW boiler in

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<sup>46</sup> Moldova ranks 117 in the human poverty index, according to the UNDP 2009 Human Development Report

<sup>47</sup> Statistical Yearbook of the Republic of Moldova, National Bureau of Statistics of the Republic of Moldova, 1 January 2009.

<sup>48</sup> EBRD 2010 Growth Forecast, 21 January 2010, <http://www.ebrd.com/new/pressrel/2010/100122.pdf>



Donduseni District and two large boilers of 600 KW in Criuleni District for a farmer who has 1.5 hectares of greenhouses.

It should also be noted that the sharp increase in the price of gas is a strong incentive for people to look for alternative energy supply. As noted in the UNDP 2009 HDR, "During the last couple of years, prices for imported gas and electricity have risen significantly, especially for gas, as Russia has started to apply a new price policy toward CIS countries. Furthermore, rising prices appear to undermine state efforts aimed at installing gas networks in rural Moldova, since exorbitantly high investment costs prohibit rural consumers from connecting to the networks, while increased prices make many people refrain from consuming gas even after being connected to the network."

However, there is a general recognition that continued awareness raising, governmental support and financial help are still needed for a significant up-scaling of biomass fuelled energy systems. The fact that most of the boilers bought after the end of the project have benefited from international funding, often combined with private financing, shows the need for additional support. The project team has made several attempts to find funding for replication of the project through JICA and SIDA, but, despite some extensive discussions, these have not been successful.

From a theoretical perspective, the intermediate state is considered as partially achieved. The mechanisms set out to achieve it are appropriate but insufficient. This is linked to the fact that most of the identified impact drivers are not fully achieved and no robust mechanism has been put in place to ensure continuity, in particular through complementary funding. From a delivery perspective, the evaluation team concluded to partial achievement. Replication and up-scaling are only starting to take on. This is mainly due to the fact that the assumptions foreseen as necessary are not in place yet. Besides, the project ended just two years ago (May 2008). More time would be needed to fully assess the extent of replication. On the whole, the final rating has been assessed as partially achieved.

**Table 5 Outcomes-impacts assessment findings for REAW project**

Theory of change component	Qualitative Assessment	Rating
<p>Outcome 1: Awareness raised on alternative energy systems (biomass boilers)</p> <p>Outcome 2: Demonstrated social and economic benefits of biomass boilers</p> <p>Outcome 3: Encouraged biomass boiler manufacturing and development of straw bale market</p>	<p>All three outcomes were fully achieved by the project. Awareness on biomass boilers was successfully raised through informative activities and the demonstration sites themselves, which also served to demonstrate the social and economic benefits of biomass boilers, namely lesser costs for heating, the creation of new economic activities, better attendance at schools during cold winters and general support to local development. The continuation of biomass boiler production after the end of the project is a clear sign of the successful achievement of outcome 3.</p>	<p>3</p>
<p>ID: Continued awareness raising activities</p>	<ul style="list-style-type: none"> <li>➤ Further activities have taken place, mainly through visits to and media coverage of demonstration sites and biomass boiler manufacturer's marketing activities</li> <li>➤ Extensive informative website has been developed and efforts are pursued to find a solution to maintain it.</li> </ul>	<p>2</p>
<p>ID: Ensured sufficient supply of biomass</p>	<ul style="list-style-type: none"> <li>➤ Extreme climatic conditions (in particular drought) have compromised the supply of straw.</li> <li>➤ In normal climatic conditions, no particular problem was experienced with the supply of straw.</li> <li>➤ Alternative biomass can be and have been used in the boilers.</li> </ul>	<p>2</p>
<p>ID: Spot check systems</p>	<ul style="list-style-type: none"> <li>➤ Instructions and maintenance services are provided by the manufacturer</li> <li>➤ Quick response in case of technical problems</li> <li>➤ No spot check system in place after the end of the project</li> </ul>	<p>2</p>
<p>ID: Reputation of biomass-fuelled systems established in Moldova</p>	<ul style="list-style-type: none"> <li>➤ Biomass boilers have been sold after the end of the project even outside the demonstration site districts.</li> <li>➤ However, the progress made in establishing reputation of biomass-fuelled system are still of local scale and the market is not fully developed yet.</li> </ul>	<p>2</p>
<p>ID: Verified good performance of all systems in the public sector</p>	<ul style="list-style-type: none"> <li>➤ Biomass boilers installed by the project in the public sector functions relatively well and, in such cases, bring in significant benefits (see Outcome 2)</li> <li>➤ Various practical and maintenance problems experienced by several demonstration sites.</li> </ul>	<p>2</p>
<p>A: Development of biomass use encouraged through policy, legislation and funding</p>	<ul style="list-style-type: none"> <li>➤ Strategies and legislation in place but there is no implementing mechanisms in place, in particular no economic incentives.</li> </ul>	<p>1</p>
<p>A: Economic growth in particular in rural areas</p>	<ul style="list-style-type: none"> <li>➤ The consequences of the 2009 economic crisis should be overcome this year with an expected 4 per cent growth.</li> </ul>	<p>1</p>

	<ul style="list-style-type: none"> <li>➤ However, Moldova is still one of the poorest countries in Europe. Poverty affects primarily rural population and it is unlikely that the situation will improve significantly in the near future.</li> </ul>	
Intermediate State: Replicated and up-scaled biomass energy systems	<ul style="list-style-type: none"> <li>➤ Eleven biomass boilers have been sold since the end of the project and three requests are being currently processed.</li> <li>➤ The sharp increase in the price of gas and cost of connection to the gas supply network will contribute to raising interest in alternative energy systems.</li> <li>➤ However, there is a general recognition that continued awareness raising, governmental support and financial help are still needed for a significant up-scaling of biomass fuelled energy systems. But, no additional funding and governmental support has been obtained to-date.</li> </ul>	2

## 5. Status of the GEBs

The ROtI review does not undertake a direct assessment of the status of the GEBs and very limited information is available on the status of the GEBs – climate change effects through a reduction in greenhouse gas emission and an improvement in overall environmental status through improved local air quality.

From the limited data included in the project completion report, an annual emission reduction of 4,258 tons of CO<sub>2</sub> was achieved through greater efficiency and fuel switching from coal to straw. However, these figures were collected only for the duration of the project and there is no further evidence of a significant improvement. In order to achieve substantial results, a larger scale of replication than the one achieved to-date is necessary.

However, it should be noted that the project ended less than two years ago (31 May 2008) and therefore, it is not possible to draw a definite conclusion at this stage, as very much depends on future replication.

## 6. Overall Conclusions

Overall, the project has partially succeeded in achieving the desired impacts, contributing to the reduction of GHG emissions and to overall energy security in the country, through promotion of renewable source of energy. Although the impacts of the project are limited by nature, by successfully delivering the planned outcomes, the project has been instrumental in ensuring the partial realization of the foreseen indirect impacts. The main area of concern remains the existence of the assumptions, which is only partially achieved.

A final consolidated rating of the project's progress towards impact is given in the table 6 below (using the scoring system given in table 4 above). In general, it should be noted that some of the ratings may change over-time. As noted above, the time-span since the end of the project is still limited (less than two years). A number of positive trends have been identified such as regular albeit limited sales of biomass boilers since the end of the project, which could lead to a better rating and indicate good chances that the ultimate impact will be achieved in the future.

Theory of change component	Rating
Outcomes 1, 2 & 3: Awareness raised on and demonstrated social and economic benefits of biomass boilers and encouraged biomass boiler manufacturing and development of straw bale market	3
ID: Continued awareness raising activities	2
ID: Ensured sufficient supply of biomass	2
ID: Spot check systems	2
ID: Reputation of biomass-fuelled systems established in Moldova	2
ID: Verified good performance of all systems in the public sector	2
A: Development of biomass use encouraged through policy, legislation and funding	1
A: Economic growth in particular in rural areas	1
Intermediate State: Replicated and up-scaled biomass energy systems	2
The project has resulted in increased social acceptability of biomass boiler and increased awareness of the benefits of using alternative sources of energy. Replication is taken place but at a limited scale to-date.	2

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UNECE (2009) National Case Study '*An Analysis of the Policy Reform Impact on Renewable Energy Projects Implementation in the Republic of Moldova*', November 2009.

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## Annex 1. People Met

Date	Name	Position	Organisation
05.11.2009	Liviu Gumovschi,	Executive Director	Consolidated Agricultural PMU
05.11.2009, 03.02.2010, 04.02.2010, 09.02.2010	Cornel Bordeianu	Former Project Manager	Renewable Energy Agricultural Wastes project
05.11.2009	Anatol Sirbu	Mayor	Antonesti Village (Stefan Voda District)
05.11.2009	Nicolae Nastase	Head	Ecological Inspectorate of the Stefan Voda District
27.01.2010	Sandra Borka	Task Team Leader	World Bank
03.02.2010, 05.03.2010	Sergiu Cicati	Director	Boiler manufacturer
03.02.2010	Prof Valentin Arion	Head, Thermo-energetics department	Technical University
03.02.2010	Anatol Gobjila		World Bank
03.02.2010	Raisa Rosca	Kindergarten director	Boghenii-Noi village (Ungheni District)
03.02.2010	Liuba Buga	Mayor	Boghenii-Noi village (Ungheni District)
09.02.2010	Vasile Cernavca	Deputy Mayor	Chiscareni village (Singerei District)
09.02.2010	Vasilie Nicic	Director of Russian Gymnasium	Chiscareni village (Singerei District)
09.02.2010	Marcela Bors	Director of the "Nicolae Casso" High School	Chiscareni village (Singerei District)
09.02.2010	Elena Grosu	School steward, inclusively boiler supervisor	Chiscareni village (Singerei District)
09.02.2010	Ludmila Stepanchevic	School Principle	Viisoara village (Glodeni District)
09.02.2010	Lurie Gorodenco	Mayor	Viisoara village (Glodeni District)

# Technical Document C

## National Component of the GEF/UNEP MSP Support to CBD Parties for Preparation of Third National Reports to the COP of CBD: Review of Outcomes to Impact

### 1 Introduction

At the request of the Global Environment Facility (GEF), the Evaluation Office conducts Country Portfolio Evaluation (CPE) every year. This year, Moldova was one of the two countries selected. CPEs aim to provide the GEF Council with an assessment of results and performance of GEF supported activities at country level, and of how GEF supported activities fit into the national strategies and priorities as well as within the global environmental mandate of the GEF. The CPE methodology involves carrying out two Reviews of Outcomes to Impact (ROtI) studies of projects completed at least two years before to strengthen the information gathering and analysis on results.

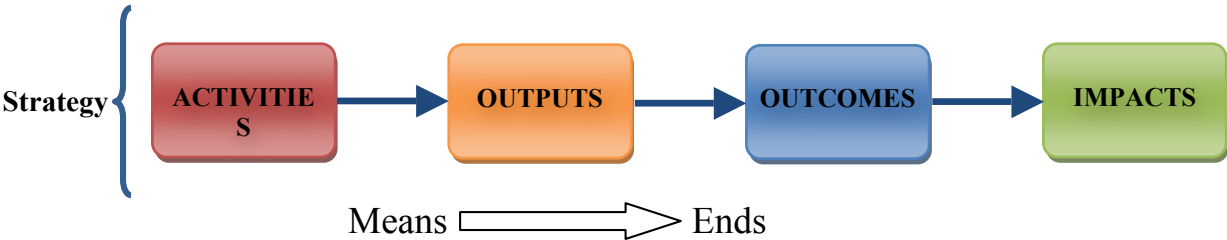
As part of the Moldova CPE, ROtI studies have been undertaken for the following projects:

- Project # 2490 Renewable Energy from Agricultural Waste
- An Enabling Activity from global projects # 2713 UNEP Support to CBD Parties for Preparation of Third National Reports to the CoP of CBD

Terminal project evaluations rarely provide information about impact due to the lack of data available to make such an assessment, and the complexity of environmental processes and the long timeframe needed to generate impact, which may only be realized many years after project completion. The ROtI methodology seeks to overcome these challenges by exploring the underlying logical sequence of conditions and factors (referred to as the **theory of change**) that will lead to impact, and by assessing the extent to which the theory of change has been realized in practice. The methodology provides a quick and cost effective way of indirectly measuring project impact, or the potential to deliver impact in the future.

GEF projects are generally designed and structured according to the **logical framework**, which in essence is a simplified theory of change, with the following basic means-ends hierarchy:

**Figure 1 Simplified Theory of Change**



Most GEF projects and their terminal evaluations mainly focus on the first three steps in the above logframe hierarchy; i.e. the project **activities** that achieve a set of **outputs**, which in turn will

contribute to achieving **outcomes**. However, GEF Terminal Evaluations (TEs) do score the likelihood that project results will be sustainable, thereby implicitly assessing the likelihood of impact. But to more explicitly understand the process for delivering eventual impact, the ROTI methodology focuses on the last step in the means-end hierarchy, i.e. developing a detailed theory of change from outcomes to impacts. The GEF ROTI: Guidelines and Procedures Manual provides a detailed explanation of the ROTI methodology; the main features include:

- The initial characterization of the project's intended long-term environmental impacts, which in the GEF ROTI methodology are referred to as **global environmental benefits (GEBs)**. Understanding what the project is ultimately trying to achieve is a vital first step in developing the theory of change for achieving impact.
- The verification of the project's outcomes, and their appropriateness to achieving the desired impacts.
- The identification and assessment of the logical steps, conditions and associated factors (i.e. theory of change) necessary to overcome the barriers to realizing impacts, which provide an indirect measure of impact.

This report presents the results of the ROTI for enabling activities carried out in Moldova under one global MSP # 2713 UNEP Support to CBD Parties for Preparation of Third National Reports to the CoP of CBD.

EA #2713 was implemented 1st April 2005 (date of disbursement) and 31 December 2005.

This EA fell under the Biodiversity focal area and was implemented by UNEP. The executing agency was the Ministry of Environment and Natural Resources (now Ministry of Environment).

The total budget of the national component was \$23,000 – including GEF financing of \$20,000 and \$3,000 co-financing – while the total budget for the global enabling activity was \$1 million. The project lasted 9 months.

The ultimate goal of the global project was to provide assistance to up to 50 eligible countries requesting support for the preparation of their 3rd National Reports to the Conference of the Parties (CoP) of the Convention on Biological Diversity (CBD) in response to CoP Decision VII/25 and SCBD Notification SCBD/I&O/NR/MC/43988.

As per the proposal submitted by Ministry of Environment, the national component in Moldova had the following objectives (also called priorities):

- Present a status analysis and analysis of trend dynamics of biodiversity and contribution of Moldova to the realization of scopes and working agenda of the Convention
- Analysis of activities undertaken by Moldova towards the realization of Convention's articles regarding biodiversity
- Implementation activities analysis of thematic programs of the Convention
- Analysis of coordination and regional cooperation activities of Moldova towards the realization of Convention's tasks regarding biodiversity.

The evaluation team intended in a first stage to look at two combined enabling activities, the one mentioned above along with GEF – UNED/UNEP Global Project *Support to GEF Eligible CBD*



*Parties for Carrying out 2010 Biodiversity Targets National Assessments – Phase II*, a project which also supported the preparation of the fourth national report to CBD. However, in the course of discussions with key informants, it appeared that the second enabling activity had not been completed at the time of the evaluation. Therefore, it was decided to focus only on the enabling activity related to the third report.

This enabling activity appeared not to be suitable for a full ROTI, as the only objective of the study is to develop one national report to the Convention. Given the limited budget – \$20,000 – and the short duration of the project – 6 months – there is no other activity foreseen for this enabling activity than the preparation of this report. Therefore, in agreement with the GEF Evaluation Office, it has been decided to draw only general conclusions and not a full ROTI study, with a focus on the significance of this activity in the overall picture of GEF support to biodiversity through enabling activities.

The ROTI assessment involved desk research (see list of documents consulted in Annex I), interviews, one focus group session with the project team and other stakeholders. No field visit was undertaken as this project was implemented by central authorities and no activities were carried out at the local level. As it is the case for most enabling activities, there is no completion report or terminal evaluation available.

The report is structured according to the ROTI methodology, starting with the characterization of the intended project environmental impacts, or GEBs (section 2). The logical sequence of conditions (i.e. theory of change) deemed necessary to convert outcomes to impacts was then modeled (sections 3), followed by an assessment of the extent to which the outcomes-impacts pathways have been realized, which in turn provides an indirect measure of impact that is likely to be achieved over time (section 4) and section 5 summarizes the overall conclusions of the ROTI assessment.

## **2. The Project's Global Environmental Benefits**

The starting point for the ROTI assessment is to identify the project's intended environmental impacts, which for GEF projects is the delivery of global environmental benefits (GEBs) which are defined in the ROTI manual as *'lasting improvements in the status of an aspect of the global environment that safeguards environmental functioning and integrity as well as benefiting human society.'* The Biodiversity EA contribute to supporting Moldova in meeting its obligations under the Convention on Biological Diversity of 5 June 1992 and generating global environmental benefits in the area of biodiversity.

However, in the framework of this particular ROTI, there is no direct environmental impact foreseen from a single activity, namely the preparation of one national report to the CBD. The report only constitutes a picture at one point in time of the state of fulfillment of the Convention requirements by Moldova. A first report to a Convention may have been more adequate for a ROTI as it involves a more thorough assessment and is usually linked to the development of the relevant strategy and action plan. With regard to Moldova, the preparation of the first national report to the CBD, together with the development of the Biodiversity Strategy and the Action Plan, was supported by a national enabling activity, with a GEF funding of \$125,000. However, this activity was implemented by the WB as was the project selected for the second ROTI.

Moldova ratified the CBD on 20 October 1995. The global Biodiversity EA aimed primarily at supporting CBD Parties in preparing respectively their third national reports to the Convention, pursuant to Article 26 of the CBD.

The location of Moldova at the crossing point between three eco-regions – Central European, Euroasiatic and Mediterranean, favors a diverse and rich biodiversity. Moldova also constitutes a transition zone between the fauna of the Asian continental steppe and the European forest steppe. Moldova counts about 5,513 plant species and 14,800 animal species. While 75 percent of the territory is occupied by agricultural ecosystems, natural ecosystems count for about 15 percent of the land surface. Significant portions are highly degraded and the number of endangered species has climbed dramatically from 55 to over 180 in the last 30 years.

Between 1998<sup>49</sup> and 2006<sup>50</sup>, the surface of land under protected area regimes increased from 1.96 percent to 4.65 percent. The largest part of the state protected areas is constituted by landscape reserves (52 percent) and scientific reserves (29 percent). The increase in the protected area surface has resulted mainly from the inclusion of 94,705 hectares of wetlands of international significance, including the lower Prut Lakes and Lower Dniester (Causeni, Stefan Voda districts) and Unguri-Holosnita (Ocnita, Donduseni, Soroca districts) in the Fund of natural protected areas.

The main threats to Moldova biodiversity are:

- Fragmentation of natural areas due to human activities and leading to losses of habitats and species
- Soil erosion
- Climate change had affected local species of flora and fauna leading to a significant impact on ecosystem composition
- Lack of public awareness
- Limited governance and conflict with Transdnistria

The next section discusses the application of the theory of change deemed necessary to deliver these global environmental benefits to the enabling activity subject to this study.

### 3. The Biodiversity EA Outcomes-Impact Theory of Change

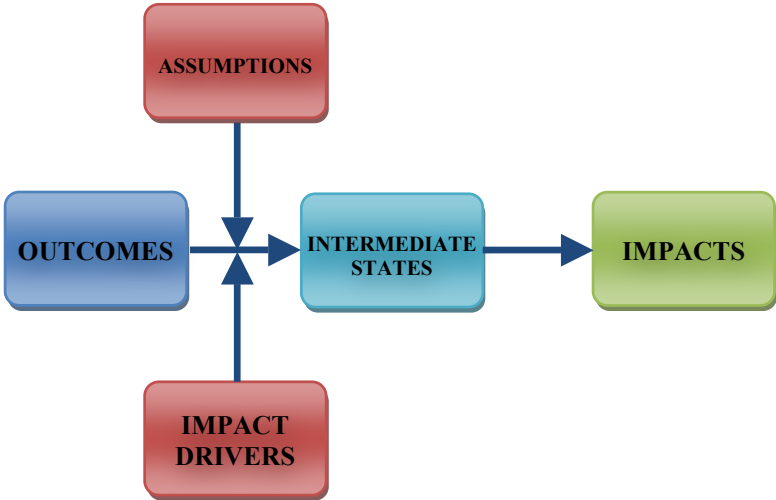
The theory of change for a project is the logical sequence of conditions and factors that are necessary to deliver the ultimate project impact. The basic project theory of change starts with activities and develops through a means-ends hierarchy until finally reaching impact. Most GEF project terminal evaluations assess the basic theory of change as far as outcomes, but do not usually go far in assessing the crucial last step to impact. However, in the case of the ROtI, assessment focuses on this last step and develops and assesses a detailed theory of change between outcomes and impacts, referred to as **outcomes-impacts pathways**. Figure 2 below illustrates the key elements and relationships for the detailed theory of change between outcomes and impacts.

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<sup>49</sup> Environmental Performance Review, 1998.

<sup>50</sup> Environmental protection in the Republic of Moldova. Report of the Ministry of Environment and Natural Resources to the Belgrade Ministerial Conference. 2007.

**Figure 2 Generic theory of change for outcomes-impacts pathways**



The key ingredients in the outcomes-impacts pathways (or strategies) that are examined by this ROTI are intermediate states, impact drivers and assumptions, which are defined in Table 1 below. If the project outcomes are assessed to be successfully delivered and the key ingredients of the theory of change between outcomes and impacts are in place, then it is reasonable to conclude that there is indirect evidence that the barriers and threats to impact have been overcome and that impact has or will be achieved with time.

**Table 1 Definitions of theory of change elements in the outcomes-impacts pathways**

TOC terms	Definition
Intermediate States (IS)	The transitional conditions between the project’s outcomes and impacts that must be achieved in order to deliver the intended impacts
Impact Drivers (ID)	The significant factors that, if present, are expected to contribute to the ultimate realization of project impacts and that are within the ability of the project to influence
Assumptions (A)	The significant factors that, if present, are expected to contribute to the ultimate realization of project impacts, but that are largely beyond the power of the project to influence or address

On this basis, the evaluation team has considered the application of the theory of change to the national component of the enabling activity *Support to CBD Parties for Preparation of Third National Reports to the Cop of CBD*. An outcomes-impacts pathway has been developed. It should be noted that there was very little consideration for outcomes and impacts at the national level in the project proposal and other project documents. Therefore, the theory of change was developed mainly through interviews and additional analysis by the evaluation team.

Further analysis have shown that there was little evidence that any of the proposed outcomes, impact drivers and intermediate states, as well as impacts have been achieved. It appeared that while such a scheme would be applicable to a series of enabling activities considered all together or one enabling

activity with more time and financial resources, it was too ambitious when considering one activity focused only on the preparation of a report, taken in isolation.

The Biodiversity EA outcomes-impacts theory of change as considered by the evaluation team is presented in the table next page.

**Table 2 The Biodiversity EA Outcomes-Impacts Theory of Change**

	<b>OUTCOMES</b>	<b>DRIVERS &amp; ASSUMPTIONS</b>	<b>INTERMEDIATE STATES</b>	<b>IMPACTS</b>
<b>STRATEGY 1: Broader awareness and mobilization in favor of biodiversity</b>	<i>What is the situation at the end of the project?</i>	<i>What key factors are responsible for delivery (or non-delivery) of the intermediate states?</i>	<i>What has happened since the project ended, or still needs to happen to achieve impacts?</i>	<i>What was the project ultimately aiming to achieve?</i>
	Outcome 1: raised awareness of biodiversity status and Moldova's international commitments	ID1: continued interaction between stakeholders  ID2: dissemination of report	IS: improvement of quality and awareness of biodiversity knowledge	<b>Broadened and mobilized constituency for biodiversity within Moldova</b>
<b>STRATEGY 2: sustained capacity to report to the CBD</b>	Outcome 1: trends, opportunities and threats to biodiversity in Moldova better understood	ID3: information data set maintained, used and updated	IS2: comprehensive fourth report timely submitted to CBD	<b>More active and effective involvement of the country in implementation of biodiversity-related international conventions and activities</b>
	Outcome 2: comprehensive national report to CBD submitted timely	ID4: improved capacity to report to the CBD		
		A1: commitment of relevant ministries at individual and cross-sectoral level		

#### **4. Assessment of achievement of the outcomes-impacts pathways**

The following section presents an overview of the realization of the different elements and factors considered in the outcomes-impacts pathway. It clearly shows that the enabling activity subject to the study is not extensive enough to produce direct meaningful impacts but should rather be seen in the context of a series of enabling activities, which main impact remains the establishment and maintaining of a solid team of qualified experts. Therefore, no rating has been applied in this instance.

##### **Outcomes**

##### **Outcome 1: Raised awareness on biodiversity status and Moldova's international commitments**

The first outcome is mainly achieved through the conducting of workshops and consultations with stakeholders for the preparation of the third report. From the national proposal, it is not clear if such workshops have taken place. People who participated in the preparation of the report are mostly biodiversity experts and specialists.

During the preparation of the Third Report, Mr. Alexandru Teleuta, Director of the Botanical Garden, participated in radio broadcasts on issues addressed in the report and in various meetings with local authorities from all districts of Moldova addressing the need to allocate degraded land for afforestation.

### **Outcome 2: Trends, opportunities and threats to biodiversity in Moldova better understood**

It has been noted that the low budget available was not sufficient to conduct a proper assessment of changes and trends in biodiversity status. Therefore, the main source of knowledge with regard to trends, opportunities and threats to biodiversity came from the work carried out for the preparation of the first report to CBD.

The work on the report helped in assessing the status and progress in implementing the Strategy and Action Plan on Biodiversity Conservation.

### **Outcome 3: Comprehensive national report to CBD submitted timely**

The third national report to the CoP of the CBD has been submitted on 17 February 2006. The deadline was 15 May 2005. However, compared to other countries, Moldova submitted its report reasonably on time (64th report out of 148 third national reports submitted to the CBD).

## ***Impact Drivers and Assumptions***

### **ID 1: Continued interaction between stakeholders**

There is continued interaction between biodiversity experts. The third report is one of various activities that support the existence of a team of dedicated experts, in particular within the Biodiversity Project Office. There was no evidence of continued interaction amongst a broader range of stakeholders that would be triggered by the preparation of the third national report.

### **ID 2: Dissemination of results of the report**

The dissemination of the report occurs primarily through its inclusion on the website of the CBD (<http://www.cbd.int/reports/search/>). It is also available on the website of the Moldovan site of the Clearing House Mechanism ([http://bsapm.moldnet.md/cg\\_h.html](http://bsapm.moldnet.md/cg_h.html)). It should be noted that the report is available only in English. The report has not been published as such. No dissemination has taken place apart from sending to some close stakeholders working in the field of biodiversity.

The only limited dissemination of the conclusions of the report occurred through some articles published in the journal 'Nature'. This journal is issued by the NGO Ecological Movement of Moldova, which was part of the working group.

### **ID 3: Information data set maintained, used and updated**

The database is maintained and updated by the Biodiversity Office and is available for the Ministry. Updating is as a rule carried out at the end of each year on the basis of the reports collected from the scientific institutes on the request of the Biodiversity Office. This exchange of information is based

on personal relations and not on a legal obligation. Article from scientific and other publications also serve as sources of information for updating the database. In other words, the information set is developed only on an ad-hoc basis and research is not policy-driven, nor specifically carried out for reporting activities. Besides, while the database has valuable information on the status of species and ecosystem and on biodiversity conservation legislation, there is little information on the implementation in practice and the main problem remains compliance with legal requirements.

#### **ID 4: Improved capacity to report to CBD**

It is difficult to assess if the capacity to report to CBD has improved through one single project. Considering the downfalls described above, the main issue is primarily the lack of resources, leading to limited information and supported research. In addition, stakeholders outside the specialized field of biodiversity are rarely involved.

The various projects and activities supporting biodiversity conservation in Moldova have triggered the setting up of a Biodiversity Office within the Ministry of Environment. The Biodiversity Office was established by Order No. 334 of July 14, 2000 of the Ministry of Environment, Construction and Territorial Development. It is a non-profit organization with financial and administrative autonomy. It has its own bank account and uses the seal and fiscal code of the Ministry of Environment. However, there is a certain level of control by the Government as the bank accounts are to be used in accordance with the annual budget approved by the Ministry of Environment and the Ministry of Finance, and coordinated with the World Bank.

The Office was set up with the overall goal to implement the GEF-WB Project Preparation of Biodiversity Phase II Enabling Activity and to deal with the implementation of the Biological Diversity Conservation National Strategy and Action Plan in the Republic of Moldova. It may also manage the implementation of other donor's projects dealing with biodiversity conservation. Interestingly, the Regulation as approved by the Ministerial Order No. 334 states that the Office acts in accordance with directives and standards of the World Bank, current legislation of the republic of Moldova and this Regulation. Obviously, the Regulation governing the Biodiversity Office is outdated as too much focused on the original project which triggered its establishment.

The Biodiversity Office played and still plays a key role in the preparation and implementation of projects with the active support of the GEF Agencies. In particular, it is a useful tool to maintain a core team of qualified experts able to prepare, manage and implement projects. It also acts as the CHM National Focal Point. However, its existence is very much dependent on available funding. At present, the Office faces difficult financial problems to the point it has no allocated room. Even if these are temporary problems, it does have an obvious influence on the performance of the Office. Finally, there is a high degree of ownership within the staff of the Office, who is directly involved in the projects, but less at the political level within the Ministry of Environment and at national level as shown below.

#### **A 1: Commitment of relevant ministries at individual and cross-sectoral level**

Overall, environment protection is low on the country agenda. For example, the Ministry of Environment has not been included in the Interministerial Committee on Strategic Planning established by the GD No. 838 of 09.07.2008 with the purpose to ensure an integrated process of strategic planning which replaced the former Sustainable Development and Poverty Reduction Interministerial Committee established by the GD No.688 of 25.12.2002 with the purpose to coordinate

the elaboration, promotion and implementation of the National Plan of Sustainable Development and Poverty Reduction, Strategy of Economic Development and Poverty Reduction, Millennium Development Goals and other strategic planning documents.

There was no evidence of commitment of other ministries. For example, conflicts with the State Forestry Agency 'Moldsilva' have been reported about protected areas management and representation. Similarly, cooperation with the Ministry of Agriculture and Food Processing is not always satisfactory. It has recently be noted that interaction among various institutions in charge of management of biological resources is poor and needs to be strengthened, in particular with regard to protected areas management.<sup>51</sup>

### **Intermediate States**

#### **Intermediate State 1 – Awareness of biodiversity importance expanded to larger public**

Although some publications and articles are being published following reporting to the CBD, this is not sufficient as such to broaden awareness of biodiversity importance to the larger public. This is done on an ad-hoc basis and, as a rule, limited to scientific publications. The contribution of biodiversity enabling activities is quite limited. National projects have been more effective in raising awareness of the population although mainly on a local scale.

#### **Intermediate State 2 – Comprehensive fourth report timely submitted to CBD**

The project proposal for the global project clearly states that the sustainability of this assistance will build capacity in national biodiversity institutions that will make it more likely that they will be able to maintain and update the biodiversity information and contacts that they will require in future reporting exercises. It also noted that, based on past experience, efficient and timely submission of future report (national and thematic) will continue to require small targeted inputs of both financial and technical assistance from external sources. This has been the case with the fourth report to the CBD, which preparation also benefited from GEF support through a global enabling activity. The fourth report was due by 30 March 2009. Moldova has submitted on 16 June 2009, actually quite early compared to other Parties.

### **Impacts**

#### **Impact 1 – Broadened and mobilized constituency for biodiversity**

In terms of broadened and mobilized constituency for biodiversity, enabling activities such as support to reporting to international conventions, help to develop and maintain a set of information on biodiversity conservation, although often incomplete as it is collected on an ad-hoc basis. As shown through the review of related indirect impacts, awareness raising outside the 'biodiversity community' is still very limited.

#### **Impact 2 – More active and effective involvement of the country in implementation of biodiversity related international conventions and activities**

Moldova has regularly reported to the CBD. The country is participating to the Clearing House Mechanism. It has also ratified a number of biodiversity related conventions, including:

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<sup>51</sup> David Rodríguez Rodríguez (2009), Protected Areas of the Republic of Moldova. An updated review, Centro de Ciencias Humanas y Sociales, Spanish National Research Council (CSIC), September 2009.

- CITES
- RAMSAR
- the Convention on the Conservation of Migratory Species of Wild Animals
- the Convention on the Conservation of European Wildlife and Natural Habitats
- the Convention on European Landscape

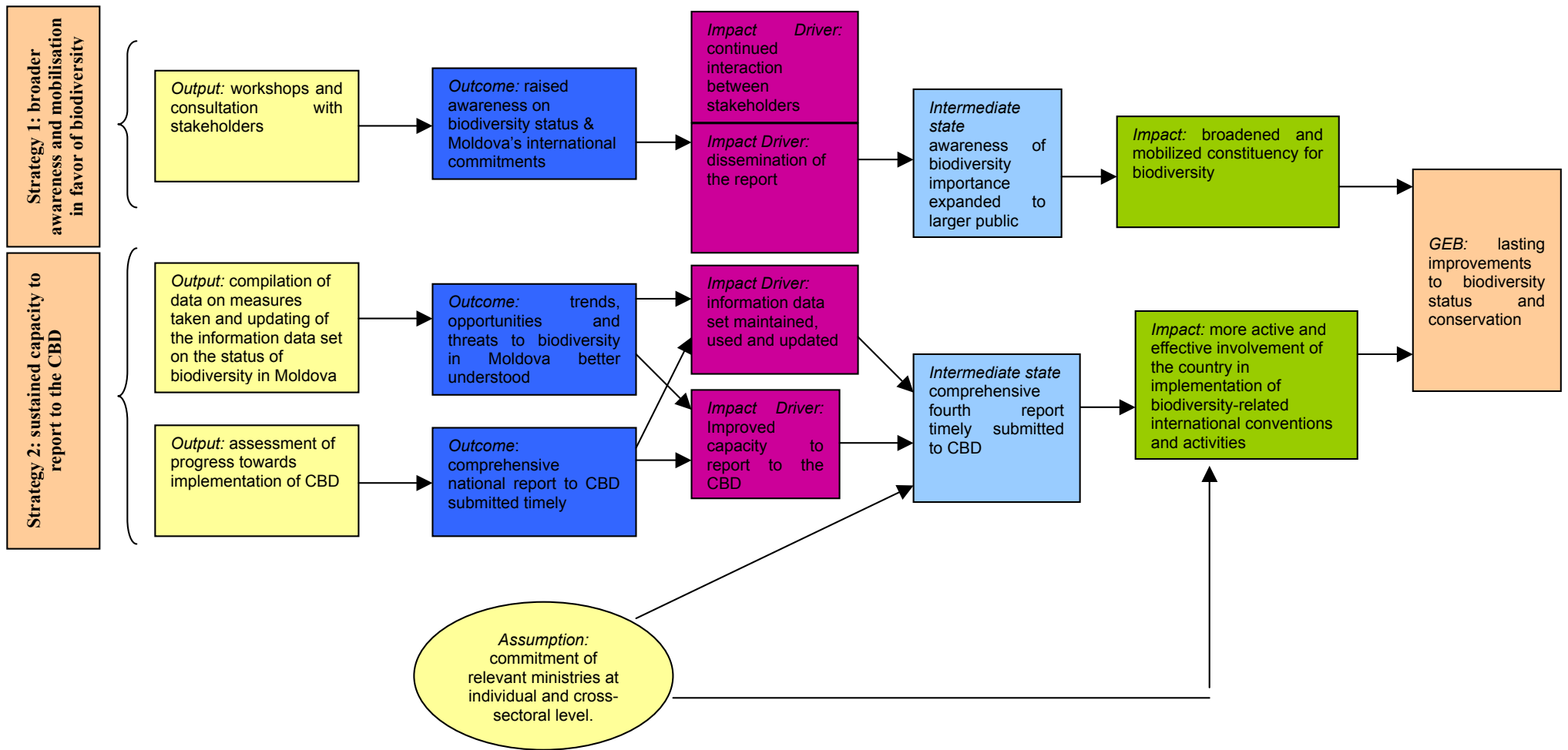
However, the ratification of these conventions took place in 2000 at the latest. The fact that Moldova has regularly reported to the Convention shows a certain degree of commitment. It has also reported to the Conference of the Parties to the Ramsar Convention in 2005 and 2008.

The quality of the reporting depends on the consistency and completeness of the information collected. As noted above, the data is gathered in a sporadic way and there is not enough funding available to generate new data.

No evidence of a direct link between the preparation of the third national report and a more active and effective involvement of the country in the implementation of biodiversity related international conventions and activities could be made. This impact should be considered looking at all different enabling activities and capacity-building projects. They have all contributed to setting up and maintaining a team of qualified experts, who are regularly involved in the implementation of these activities. Besides, the results of these enabling activities have also been used for developing two MSP, *Biodiversity Conservation in the Lower Dniester Delta Ecosystem (2002-2005)* and *Improving Coverage and Management Effectiveness of the Protected Area System in Moldova*, which started in September 2009.



## Theory of Change of the Biodiversity Enabling Activity



## 5. Overall Conclusions

The evaluation team has considered the application of the theory of change to the national component of the enabling activity *Support to CBD Parties for Preparation of Third National Reports to the Cop of CBD*. A tentative outcomes-impacts pathway has been developed but, throughout the analysis, it appeared that while such a scheme would be applicable to a series of enabling activities considered all together or one enabling activity with more time and financial resources, it was too ambitious when considering one activity focused only on the preparation of a report, the third report to the CoP of CBD, taken in isolation.

Taken these limitations into account, a number of conclusions can be drawn from the analysis of this enabling activity.

This enabling activity, in particular when considered together with other similar activities, has contributed to:

- Supporting regular reporting to the CBD, hence it helped fulfilling the country's obligations under the Convention
- Pulling together and maintaining a team of dedicated experts in biodiversity, favoring exchange of information.
- Assessing regularly but in a limited way the implementation of the CBD.
- Supporting the development and design of concrete projects with potential higher impact

This being said, the review of the different conditions and factors identified as necessary to achieve ultimate impacts shows that these are very partially achieved. The level of awareness of biodiversity status and conservation issues is still low. Central and local authorities' commitment remains very limited and the enforcement of biodiversity legislation is poor.

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## Annex 1. People Met

Date	Name	Position	Organization
03.11.2010, 10.11.2010	Iulian Gisca	Project Manager	Improving Coverage and Management Effectiveness of the Protected Area System Project
03.11.2010, 10.11.2010	Alexandru Rotaru	Project Assistant	Improving Coverage and Management Effectiveness of the Protected Area System Project
03.11.2010	Echim Gumeniuc	Dean	Forestry Faculty, Agricultural University of Moldova
04.11.2010	Alexei Andreev	Chairman	Ecological Society Biotica
04.11.2010, 05.02.2010, 10.03.2010, 22.03.2010, 23.03.2010	Alexandru Teleuta	Director	Botanical Garden, Academy of Science, Head of the Biodiversity Office
09.11.2010, 10.11.2010, 05.02.2010	Nadja Veters	Portfolio manager	UNDP Moldova
10.11.2010	Andrei Globa	Chairman	Orhei District
10.11.2010	Valeriu Scutelnic	Director	Orhei Forestry Enterprise
10.11.2010	Ion Sava	Head	Orhei Ecological Inspectorate

# GEF Evaluation Office Publications

Number	Title	Year
<b>Evaluation Reports</b>		
58	GEF Annual Country Portfolio Evaluation Report 2010	2010
57	GEF Annual Performance Report 2009	2010
56	GEF Impact Evaluation of the Phaseout of Ozone-Depleting Substances in Countries with Economies in Transition, Volumes 1 and 2	2010
55	GEF Annual Impact Report 2009	2010
54	OPS4: Progress Toward Impact—Fourth Overall Performance Study of the GEF, Full Report	2010
53	OPS4: Progress Toward Impact—Fourth Overall Performance Study of the GEF, Executive Version	2010
52	GEF Country Portfolio Evaluation: Syria (1994–2008)	2009
51	GEF Country Portfolio Evaluation: Egypt (1991–2008)	2009
50	GEF Annual Country Portfolio Evaluation Report 2009	2009
49	GEF Annual Performance Report 2008	2009
48	GEF Annual Impact Report 2008	2009
47	Midterm Review of the Resource Allocation Framework	2009
46	GEF Annual Report on Impact 2007	2009
45	GEF Country Portfolio Evaluation: Cameroon (1992–2007)	2009
44	GEF Annual Country Portfolio Evaluation Report 2008	2008
43	GEF Country Portfolio Evaluation: South Africa (1994–2007)	2008
42	GEF Country Portfolio Evaluation: Madagascar (1994–2007)	2008
41	GEF Country Portfolio Evaluation: Benin (1991–2007)	2008
40	GEF Annual Performance Report 2007	2008
39	Joint Evaluation of the GEF Small Grants Programme	2008
38	GEF Annual Performance Report 2006	2008
37	GEF Country Portfolio Evaluation: Samoa (1992–2007)	2008
36	GEF Country Portfolio Evaluation: The Philippines (1992–2007)	2008
35	Evaluation of the Experience of Executing Agencies under Expanded Opportunities in the GEF	2007
34	Evaluation of Incremental Cost Assessment	2007
33	Joint Evaluation of the GEF Activity Cycle and Modalities	2007
32	GEF Country Portfolio Evaluation: Costa Rica (1992–2005)	2007
31	GEF Annual Performance Report 2005	2006
30	The Role of Local Benefits in Global Environmental Programs	2006
29	GEF Annual Performance Report 2004	2005
28	Evaluation of GEF Support for Biosafety	2006
	Third Overall Performance Study	2005
	GEF Integrated Ecosystem Management Program Study	2005
	Biodiversity Program Study	2004
	Climate Change Program Study	2004
	International Waters Program Study	2004
<b>Evaluation Documents</b>		
ED-4	The GEF Monitoring and Evaluation Policy 2010	
ED-3	Guidelines for GEF Agencies in Conducting Terminal Evaluations	2008
ED-2	GEF Evaluation Office Ethical Guidelines	2008
ED-1	The GEF Evaluation and Monitoring Policy	2006



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