GREEN economy

Scoping Study

Republic of Moldova

UNEP

ISBN: 978-92-807-3464-5

Citation:
UNEP, 2014, Green Economy Scoping Study: Republic of Moldova

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Green Economy Scoping Study: Republic of Moldova

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Acknowledgements

This study has been developed within the "Greening Economies in the Eastern Neighbourhood" (EaP GREEN) programme, under the coordination of the United Nations Environment Programme (UNEP). This sectoral study is assessing the impact of green economy investments in the Republic of Moldova, focusing on energy and organic agriculture.

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UNEP would like to thank Maria Nagorni, Head of the Analysis, Monitoring and Policy Evaluation Department of the Ministry of Environment of the Republic of Moldova, and Lilia Palii, State Secretary of the Ministry of Economy of the Republic of Moldova, for their guidance.

UNEP would further like to thank Andrei Isac, consultant, and Alexander Stratan, Director of the National Institute for Economic Research, for the fruitful collaboration and contributions.

UNEP is also grateful to IISD for the review and editing and to GRID Arendal for the layout of the report.

Acronyms and abbreviations

BAU	Business as usual
EU	European Union
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GE scenario	Green economy scenario (specific to the modelling in Sections 5 & 6)
GHG	Greenhouse gas
GoM	Government of Moldova
GVA	Gross Value Added
GWh	Gigawatt hour
HDI	Human Development Index
IEA	International Energy Agency
ILO	International Labour Organization
ITUC	International Trade Union Confederation
kWh	Kilowatt hour
LULUCF	Land Use, Land-Use Change and Forestry
Mt	Megatonnes
MW	Megawatts
NAMA	Nationally Appropriate Mitigation Actions
MDL	Moldovan Leu
OECD	Organisation for Economic Co-Operation and Development
SDGs	Sustainable Development Goals
SOPU	Solvent and Other Product Use
TJ	Terajoules
UN	United Nations
UNEP	United Nations Environment Programme
USSR	The Union of Soviet Socialist Republics
WDI	World Development Indicators

Executive summary

Moldova has been undergoing economic reform since its independence in 1991, when it began its transition towards a market economy. Despite a significant economic recession in 2009, Moldova has, in the last decade, experienced an encouraging upward trend in economic performance, having implemented a number of comprehensive social, economic and political reforms. However, a variety of challenges remain, including: low GDP per capita (among the lowest in Europe); high emigration and dependence on remittances from workers abroad; inequality in income; a high poverty rate (especially in rural areas); and a significant decline in population due to high emigration and declining birth rates.

In light of the above, the Government of Moldova requested the United Nations Environment Programme's (UNEP's) assistance to demonstrate the economic, environmental and social impacts of implementing "green economy" measures and to evaluate the findings in the context of sustainable development and climate change adaptation and mitigation.

This study offers an overview and sectoral analysis for Moldova's transition to a green economy. It contains a general introduction and rationale for a green economy; a presentation of Moldova's socio-economic and environmental profile; a review of sustainability challenges and green economy opportunities in the agriculture and energy sectors; a modelling analysis of the potential impacts of green policies in these sectors; and a set of consequent policy considerations and recommendations.

In consultation with stakeholders, the following three specific sectoral focus areas were selected for their importance to the Moldovan economy, and they shape the focus of this assessment:

- Agriculture: Expansion of sustainable (e.g., certified organic) agriculture land
- Energy demand: energy efficiency
- Energy supply: renewable energy

The modelling analysis – conducted using customized sectoral simulation models, based on existing physical and economic data from a variety of national and international sources – assesses the impact of green economy interventions, including an estimation of the investment required to reach the specified goals, an assessment of the avoided costs and a valuation of the expected benefits (e.g., jobs and income). The results of a business-as-usual case are compared with a green economy scenario. The analysis also highlights potential synergies across policy options, indicating the extent to which policies are mutually supportive. The results are based on assumptions inherent to the simulation models, and thus offer the possibility of examining alternative and updated scenarios over time.

The modelling results indicate that implementing green economy policies will likely bring economic returns while reducing costs and improving national resilience to external shocks (e.g., energy price volatility). The overall expected impacts of these policies include economic growth, additional direct and indirect employment, lower poverty rates and improved contributions to social well-being, as well as environmental benefits, such as reduced greenhouse gas emissions and retention of natural capital.

Specific results for the three selected sectors include:

- **Agriculture: In addition to long-term benefits of organic farming techniques on soil fertility, the expansion of sustainable (or organic) agriculture is estimated to increase employment and generate revenues in excess of the investment required.** Model results showed average value added per tonne of organic crops to be about 55 per cent higher than conventionally cultivated crops (MDL6,853 [or €375] per tonne, compared to MDL4,429 [€242] per tonne, respectively). Thus, positive net returns are foreseen for Moldovan organic producers, even if the yield of sustainable production was 30 per cent lower than that for conventional production. According to the modelling results, close to 4,000 new jobs would be created through the expansion of sustainable agriculture.

- **Energy demand and energy supply: Though significant upfront investments are required, their overall payback time is projected to be within 10 years for renewable energy and energy efficiency measures.** Benefits are anticipated to include reduced energy demand and related costs, a diversified energy supply and lower emissions. Estimates considered renewable energy and energy efficiency investments and operation; avoided fossil fuel capacity and expansion costs; avoided electricity importation costs; savings on electricity consumption; and stimulus to employment. Rapid payback times for upfront investments are anticipated, provided that incentives are structured to share costs between the public and the private sectors.

Generally, green economy policies were found to have positive synergies with the two other overarching policy frameworks that were reviewed: the proposed draft of the Sustainable Development Goals and efforts to better align Moldovan policies with European Union standards and regulation. Interventions in the agriculture and energy sectors would be expected to positively contribute to at least 11 of the 17 proposed Sustainable Development Goals. A deeper review of specific European Union standards would be required to identify specific targets, standards and best practices in the use of economic and fiscal environmental instruments that Moldova could aim to align itself with through its green economy efforts.

In order to achieve the projected results for the implementation of green economy measures in Moldova, policy interventions are required to bring about the modelled investments in the agriculture and energy sectors. A review of international experience with green economy policy-making indicates the following recommendations for Moldova:

- **The right "enabling conditions" are key for green economy investment.** This means setting the right network of economic incentives across a range of policy tools, including regulation, fiscal instruments, information and capacity-building for policy-makers and market actors. A comprehensive assessment of the existing incentives that are created by Moldovan market frameworks would help in identifying key barriers to targeted green investments.

- **Designing green economy policy packages that balance government revenues and expenditures.** Environmentally related taxation can provide incentives for reducing pollution while simultaneously generating funds to support green economy interventions (e.g., through subsidies). Targeted subsidies in support of green sectors can play a powerful role in leveraging private finance, though careful policy design would be required to ensure that costs and benefits are rightfully balanced. This may include facilities that confer direct payments, tax exemptions and the provision of access to low-cost capital to green producers, as well as government investments in infrastructure and commitments to send market signals through sustainable public procurement.

- **Capacity-building may be key to helping policy-makers and market actors understand and exploit green economic opportunities.** This includes improving awareness of best-practice policy-making; ensuring small and medium-sized enterprises understand and can comply with new policy frameworks; developing research that is important to green sectors; and familiarizing financial institutions with the case for green business models to ensure that risk is accurately valued in lending instruments.


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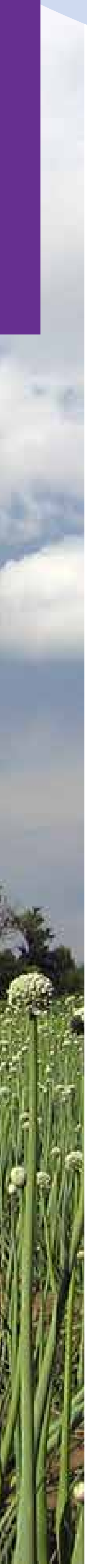
1. Introduction



This study identifies and assesses key intervention opportunities and impacts of green investments in support of Moldova's pursued transition towards a green economy. Following the implementation of significant social, economic and political reforms in the past decade, the Government of Moldova (GoM) seeks to stimulate the implementation of sustainable measures in its main economic sectors, including in the (organic) agriculture, energy and waste recycling sectors. The benefits of shifting to more sustainable consumption and production patterns are well aligned with the country's long-term development goals, as highlighted in a number of Moldova's sectoral strategies: improved energy security, boosted revenue from organic agriculture and improved energy efficiency, waste recycling and public transport.[1]

In order to frame a comprehensive policy and investment context for an inclusive green economy, a quantitative assessment of policy options is needed to measure progress towards the aspired goals and objectives.[2] In light of this, GoM requested the United Nations Environment Programme's (UNEP's) assistance to identify options for the country's transition to a resource-efficient green economy within the framework of sustainable development.

This study assesses intervention options and the effects of green economy investments in three areas that were identified as priorities among Moldovan stakeholders:

- **Development of sustainable agriculture:** Examine the potential for the expansion of sustainable (e.g., certified organic) agriculture, including returns on investments and impact on employment.

- **Energy supply (renewable energy) and energy demand (energy efficiency):** Explore the impact of integrated renewable energy and energy efficiency policies on domestic job creation and energy savings, as well as their repercussions on income.

This study involved the creation of customized sectoral simulation models based on existing biophysical and economic data. The analysis focuses on assessing the impact of green interventions, including the estimation of the investment required for achieving set goals, including avoided costs, as well as jobs and income created. The projections of a business-as-usual (BAU) case are compared with a green economy scenario.

To strengthen policy formulation and implementation, emphasis is placed on creating synergies across policy options (e.g., energy efficiency and renewable energy). This provides opportunities to leverage collective strengths for each green economy intervention.

This report was developed in consultation with national stakeholders. Its target audience includes policy-makers, civil society and business associations, as well as those interested in assessing the potential contribution of a green economy approach in support of Moldova's development. It is hoped that the results presented in this study will substantially contribute to the ongoing dialogue for designing and developing green economy policies.

2. Origins and definitions, rationale for a green economy and priorities for policy-making

2.1. Origins and definitions

Since the term "green economy" first appeared in the report *Blueprint for a Green Economy*[3] 25 years ago, global interest in a "green transition" has gathered pace. As a result of the global financial crisis in 2008, demands for a Global Green New Deal were voiced in the global policy arena and became the focus of a report commissioned by UNEP in 2009.[4] Implementation of green economic action was described as a long-term strategy for moving national economies out of the prevailing crisis. Following the Global Green New Deal, UNEP's *Towards a Green Economy* report was published in 2011. The report elaborates on the concept of a green economy, analyses its key sectors and identifies global as well as sectoral recommendations for action. At the visionary level, UNEP defines the green economy as "an economy that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities."[5]

At the operational level, the green economy is seen as one whose growth in income and employment (directly supporting social development and well-being) is driven by investments that:

- Reduce carbon emissions and pollution;
- Enhance energy and resource efficiency; and
- Prevent the loss of biodiversity and ecosystem services.

These include investments in human and social capital, and recognition of the central role of human well-being and social equity, including growth in income and employment. The approach is based on an economic analysis of current trends, risks and opportunities as well as on taking stock of national experiences in applying more integrated policy tools effectively.

At the UN Conference on Sustainable Development (Rio+20) in 2012, the outcome document affirms that the green economy should be considered as a tool for achieving sustainable development, and encourages "each country to consider the implementation of green economy policies in the context of sustainable development and poverty eradication, in a manner that endeavours to drive sustained, inclusive and equitable economic growth and job creation, particularly for women, youth and the poor."[6]

Overall, the definitions of green economy provided by international organizations are consistent in having sustainable development as their ultimate objective. They provide a means to reconcile economic development and environmental sustainability without ignoring social aspects.[7]

In this context, a green economy approach is expected to guide the post-2015 development agenda by providing policy instruments and investment options that could be adopted at the national level for accelerating progress towards achieving the Sustainable Development Goals (SDGs). Indeed, while it is clear that concerted efforts are required to overcome new global challenges, national realities remain the central elements in the development discourse. It is intended that each national government plan its sustainable future according to its distinct development vision and priorities.

2.2. Rationale for a green economy

A large number of countries and regions have adopted the idea of a green economy in their development strategies: for example, the Organization for Economic Co-operation and Development's (OECD's) Declaration on Green Growth, signed by 42 countries as of November 2014,[8] and UNEP's Green Economy Advisory service,[9] which support over 30 countries worldwide.

As stated in the UNEP *Towards a Green Economy* report, transitioning to a green economy has sound economic and social justification: our natural environment is the foundation of our physical assets; a world of constrained resources means that green investments are likely to be a main source of economic development going forward; and natural capital plays a particularly important role in the livelihoods of the poor and vulnerable.[10]

A transition to a green economy is being prioritized within key development strategies of the Republic of Moldova, especially as the country aspires to the multiple goals of investing in environmental conservation, sustaining economic growth and improving social well-being.[11] In particular, a shift to more sustainable consumption and production would contribute to improving energy security (by reducing energy imports), boosting revenues from organic agriculture (through increased access to global markets) and maximising the efficiency of Moldovan cities (through improved energy efficiency in buildings, waste recycling and the extension of public transport networks). Furthermore, green economy policies are a key instrument for achieving the mitigation targets set by Moldova in the Low Emission Development Strategy (LEDS) up to the year 2020.[12] Finally, green economy policies and tools are central topics in the ongoing global consultations on the future SDGs, in which Moldova is actively participating.

2.3. Priority areas for policy-making

According to UNEP's *Towards a Green Economy* report, priority areas for green policy-making include:

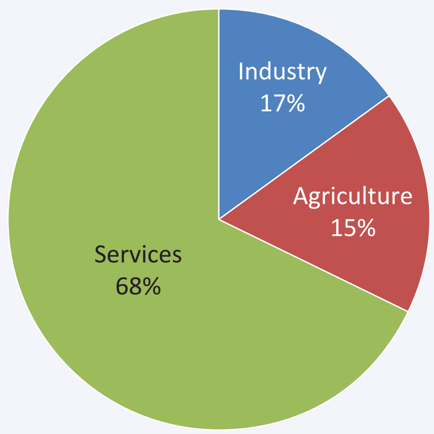
- **Addressing environmental externalities and existing market failure,** such as where the production or consumption of goods and services has negative effects on third parties and the environment, and also where social costs are not fully reflected in market prices.
- **Limiting government spending in areas that deplete natural capital,** such as subsidies that stimulate unsustainable production and over-exploitation resulting in the depletion of natural resource stocks.
- **Promoting investment and spending in areas that stimulate a green economy,** such as in areas that (a) promote innovation in new technologies vital to green markets; (b) expand infrastructure required for certain green innovations to flourish; and (c) foster infant green industries.
- **Establishing a sound regulatory framework** of legislations, institutions and enforcement to channel economic energy into environmentally and socially valuable activities.
- **Investing in capacity-building and training,** such as training and skill enhancement programs or the dissemination of knowledge to raise awareness of green economy opportunities in the private sector.

3. Moldova's socio-economic and environmental profile, and policy landscape

3.1. Economic profile

The Republic of Moldova gained its independence in 1991. It occupies an area of 32,860 km^2 and has a total population of 3.6 million.[13] European Union (EU) membership is a key priority of the Moldovan government and, to this end, an Association Agreement was signed on June 27, 2014.[14] In recent years, the country has undergone a series of social, economic and political reforms designed to meet the key criteria for EU accession.

Figure 2: Gross value added by sector, 2013



(Source: World Bank, World Development Indicators)

3.1.1. GDP growth and composition

Following the collapse of the Union of Soviet Socialist Republics (USSR) and the declaration of independence on August 27, 1991, the Republic of Moldova passed through a complex process of transition to a market economy and experienced a significant economic recession (see Figure 1). Since then, and with the exception of a slowdown caused by the global financial crisis in 2009, and a year of economic recession in 2012 due to a decrease in domestic and foreign demand, the economy has seen a steady recovery. According to the World Bank, the economy grew by 8.9 per cent in 2013 (see Figure 1). Despite the encouraging economic performance of the last decade, the GDP per capita at purchasing power parity remains among the lowest in Europe, at US$4,671 in the period 2010–2014.[15] The period of growth at the start of the 21st century (2000–2010) can be mainly attributed to an increase in the productive stock of fixed capital (increasing on average by 8.2 per cent annually) and to the improved total factor productivity (average annual growth of 4.7 per cent).[16]

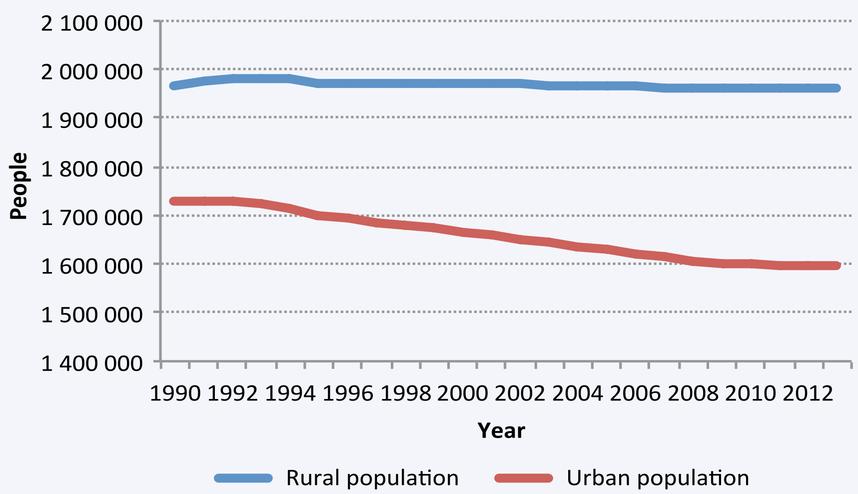
Figure 1: Annual GDP growth rate

(Source: World Bank, World Development Indicators)

Figure 3: Total population growth rate

(Source: World Bank, World Development Indicators)

Figure 4: Urban and rural population



(Source: World Bank, World Development Indicators)

Moldova's GDP is heavily dependent on services, especially transport and financial services (in particular related to emigrants' remittances). As a result, agriculture and industry sectors represent a limited share of the national economy. As shown in Figure 2, the share of gross value added (GVA) of the industry sector in 2013 was 16.6 per cent, while agriculture accounted for 14.6 per cent and services 68.7 per cent.

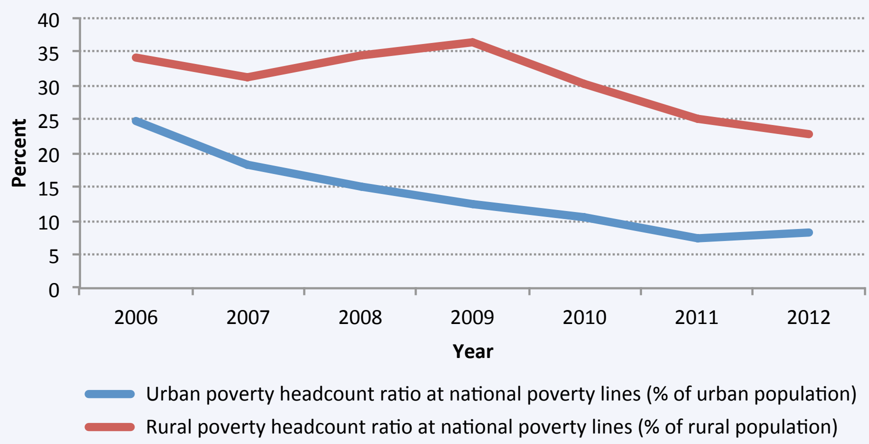
A key source of national GDP is emigrants' remittances, which has sustained private consumption and overall economic growth since 2001. The government has recognized that an economic model based on remittances is unsustainable. The Moldova 2020 National Development Strategy underlines that, without a change in the development paradigm, the economy can only grow at a maximum rate of 5 per cent per annum between 2012–2020; a growth rate that would prevent Moldova from achieving key socio-economic objectives.[17] As a result, current national development policies are centred on strengthening productive sectors, such as agriculture and industry.

3.2. Demographic profile

3.2.1. Population

Moldova has a total population of 3.6 million people, with a population density of approximately 124 persons per square kilometre.[18] Between 1998 and 2012, the country experienced a downward population trend, with the total

Figure 5: Poverty headcount ratio at national poverty line (%)



(Source: World Bank, World Development Indicators)

decreasing by about 6.6 per cent due to the combination of a declining fertility rate and increasing migratory outflow (see Figure 3). The rural population accounts for 59.9 per cent of the total population, and the country's urbanization rate is among the lowest in Europe. After a steady decline during the 1990s and the first half of the 2000s, the urban population has grown slowly and was slightly above 1990 levels in 2012 (see Figure 4). Overall, the population growth rate has registered negative values from 1993 onwards.

3.2.2. Employment, income and poverty

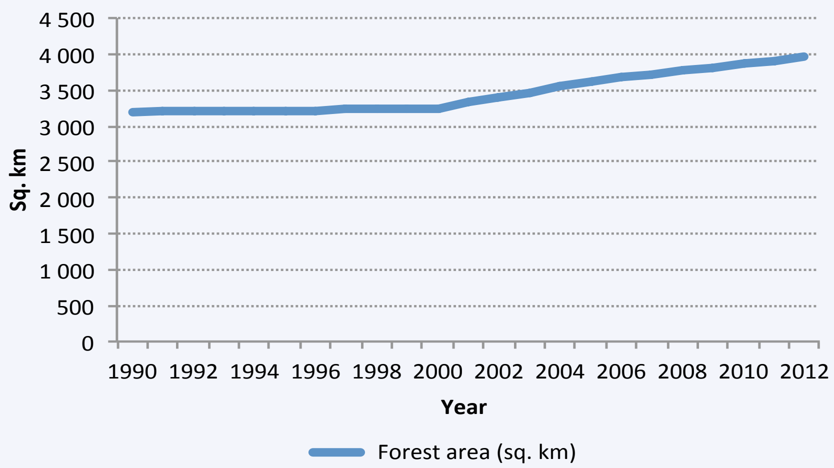
The structural challenges highlighted above explain the negative performance of the labour market. In the 10-year period between 2000 and 2011, employment of labour in the agricultural sector declined by almost 60 per cent (from 770,000 people in 2000 to 337,900 in 2013). At the same time, the number of jobs in non-agricultural sectors has grown by only 12 per cent (from 744,000 to 834,800), which has been insufficient to compensate for the loss in agricultural employment.[19] On the other hand, the unemployment rate improved from 8.5 per cent in 2000 to 5.6 per cent in 2012, though these improvements are not solely reflective of improved economic performance. Unemployment has decreased primarily because of the decrease in the absolute size of the labour force, as workers leave the country to search for employment opportunities abroad. In order to address these challenges, the country has approved the Moldova 2020 National Development Strategy, which prioritizes the alignment of the education system to labour market needs with a view to increase employment.[20]

Absolute poverty declined throughout the 2000s from 29 per cent in 2003 to 16.6 per cent in 2012 (see Figure 5).[21] This encouraging trend is mainly attributable to the impact of emigrants' remittances on disposable household income. Data show that, during 2006–2011, remittances made up between 14 and 19 per cent of household incomes.[22] Therefore, increasing the productivity and inclusiveness of the national economy is essential in ensuring the sustainability of the country's poverty reduction efforts. Additionally, social improvements are mainly taking place in urban settings, while rural areas continue to lag behind. In fact, rural poverty was at 22.8 per cent in 2012, or 6.2 per cent above the national average, with more than 80 per cent of the poor living in rural areas deriving their livelihoods from agricultural production.[23] Overall, improvements over the last decade have allowed Moldova to achieve the MDG 2010 intermediate poverty target and to be on track for achieving the 2015 final target.[24]

The average monthly salary increased by 8.9 per cent between 2011 and 2012, reaching MDL3,477.7 (about US$250).[25] However, great disparities continue to exist between men's and women's salaries across economic sectors. Women's wages are on average 25 per cent lower than men's, despite the fact that the gap has been narrowing in the last years.[26] According to the 2013 Human Development Report, Moldova's Human Development Index (HDI) score is 0.660, positioning the country at 113 out of 187 countries in 2012.[27] It is noteworthy that between 2011 and 2012, Moldova lost two HDI ranking positions and its HDI increased by only 2 per cent between 1995 and 2012. On a more positive note, the income inequality, as measured by the Gini coefficient,*

* The Gini index measures the extent to which the distribution of income or consumption expenditure among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of 0 represents perfect equality, while an index of 1 implies perfect inequality. (http://data.worldbank.org/indicator/SI.POV.GINI)

Figure 6: Trends in total forest cover area 1990–2012



(Source: World Bank, World Development Indicators)

declined over the last 10 years, from 0.379 in 2001 to 0.304 in 2010.[28]

3.3. Environmental profile

The state of Moldova's environment has declined over the last decades. Natural capital depletion and ecosystem degradation were caused by overexploitation of natural resources, combined with poor resource efficiency and a lack of adequate regulatory policies and incentive mechanisms for sustainable consumption and production.[29] In response, the government has made sustainable development a central priority in national policies and programmes. One of the key government priorities is the preservation of soil quality, as stated in the Environmental Strategy of Moldova for 2014–2023.[30] In addition, the Environmental Strategy and the Government Activity Programme include and encourage actions such as: extending the amount of protected areas; the use of biomass renewable energy; the use of solar and wind energy; closed-cycle water devices; applied research on clean technologies; and conducting national awareness-raising campaigns on ecology and sustainable development. All of these interventions would contribute to the preservation and sustainable exploitation of the stock of natural capital, thereby creating the enabling conditions for a transition to a green economy in Moldova.

3.3.1. Forests

The improved management of forest resources has led to positive results in the last decade. From 2000 to 2012, forest cover increased by 42.8 per cent, from 3,240 km^2 to 4,627 km^2, as shown in Figure 6.[31] This is mainly attributable to the successful implementation of the State Forestation Programme for the period 2003–2020, which is expected to further increase the share of total land area occupied by forests (13.7 per cent in 2012) in the next years.

However, additional efforts will be required to encourage sustainable forest management. A key challenge remains illegal logging, which amounted to about 40,000 m^3 between 2009 and 2013.[32] Another concern is the state of pristine forest areas due to the declining share of native species over the last years. Public institutions play a central role in the management of forests in Moldova, as 86.3 per cent of forest areas belong to the state.

3.3.2. Biodiversity

State-protected areas comprised about 5.6 per cent of the national territory in 2014, a share much lower than in other European countries.[33] Protected areas in Moldova do not have approved management plans and administrations and, as a consequence, are not properly managed. The government aims to increase the rate of protected areas to 8 per cent, in order to close the gap with other European countries and to enhance the protection of biodiversity from human activities. Overall, natural habitats continue to deteriorate at a rapid pace in Moldova.[34] As most biodiversity-rich and natural-resource-rich areas are in rural areas, their preservation will largely go hand-in-hand with the promotion and implementation of sustainable agricultural practices. However, ecosystem services have not yet been taken into consideration in the national budgetary process carried out by the Ministry of Finance.

3.3.3. Water

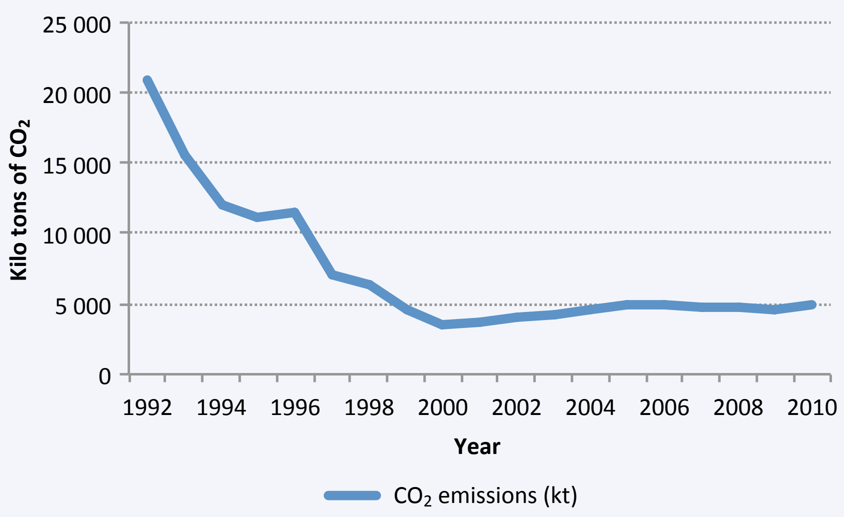
Moldova is endowed with 3,621 rivers and rivulets, with a total a length of about 16,000 km, as well as 4,126 natural and artificial lakes, comprising a total area of 40,878 hectares.[35] The main trans-boundary rivers are the Dniester and Prut, which have a total watercourse length of 1,355 km within the national territory of Moldova and provide water resources to a large part of the population. Surface water resources account for about 85 per cent of the total water supply, while 15 per cent of water consumption is derived from wells and springs.[36]

Although Moldova is rich in water resources, the volume of water currently available is about 500 m^3 per capita per year, far below the internationally recommended threshold of 1,700 m^3 per capita per year.[37] This is in part due to a large number of unoperational and outdated municipal wastewater treatment plants (only 4 per cent of which meet the legal treatment requirements), poor sanitation in rural areas (where 70 per cent of households lack access to a sewerage system), and large amounts of leachate from agricultural activities and municipal landfills contaminating the country's available water resources and depriving 44 per cent of the population of access to safe drinking water.[38] The national environmental strategy for the years 2014–2023 stresses that water availability lower than 1,000 m^3 hinders economic development and affects the health and overall well-being of the Moldovan population.[39] Key challenges that should be urgently addressed are point source water pollution (untreated water being discharged into rivers), low water efficiency across sectors and poor infrastructure development. Effort is also needed to improve the country's resilience to recurrent floods.[40]

3.3.4. Greenhouse gas emissions

In recent years, the volume of greenhouse gas (GHG) and carbon dioxide emissions has increased slower than economic growth, thus marking a relative decoupling. In the period between 1992 and 2010, total carbon dioxide emissions decreased by about 74.9 per cent, from 20.9 million tonnes (Mt) in 1992 to 4.8 Mt in 2010,[41] as shown in Figure 7. However, while carbon dioxide productivity (measured as emissions over GDP) in 2010 increased by 69.6 per cent compared to the 1995 level, it is still one of the lowest in the region especially due to inefficiency of the productive sectors,

Figure 7: Annual carbon dioxide emissions, in kilotonnes



(Source: World Bank, World Development Indicators)

increased use of motor vehicles and the proportion of buildings with poor thermal insulation. Overall, the volume of carbon dioxide emissions per capita was about one third of the average in industrialized countries and two thirds of the world average during the period 1995–2010.[42]

According to the GHG emissions inventory conducted in 2010, the main contributor to national emissions is the energy sector, which accounts for more than 67 per cent of total emissions, followed by agriculture (16 per cent), waste (12 per cent) and industrial processes (4 per cent), as shown in Figure 8.

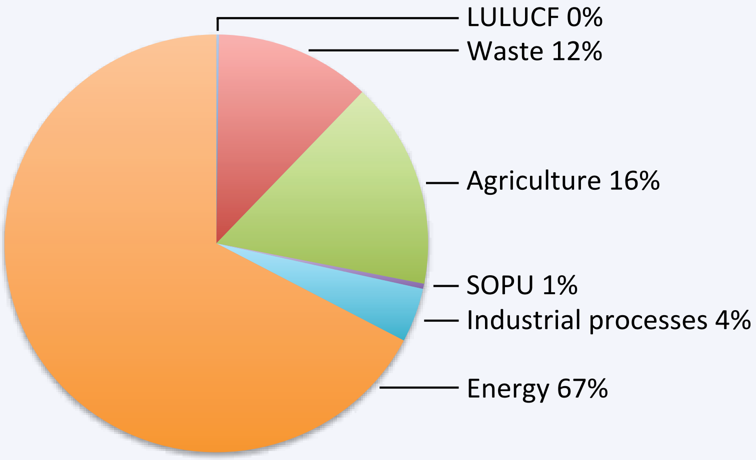
3.4. National policies of the Republic of Moldova in the field of green economy

The Republic of Moldova has elaborated a number of environment policy documents since its independence in 1991. Among these is *The Concept of Environmental Protection* adopted in 1995, which encompassed the main directions and mechanisms of environmental policy during the transition to a market economy. Later the *National Environment Strategic Action Programme* was elaborated and approved by Presidential Decree no. 321 of 6 October 1995. The action programme contained activities for its implementation up until 2005. It was followed by the *National Environmental Action Plan*, adopted in 1996, which was developed in accordance with the provisions of the Environmental Action Programme for Central and Eastern Europe.

The main directions of these documents were presented in the *Strategic Guidelines of the Social Economic Development of the Republic of Moldova to 2005* developed in 1998, which included environmental, economic and social issues. In 2001, a new policy document, *Concept of Environmental Policy of the Republic of Moldova*, was adopted, highlighting a series of new approaches including orientation towards European integration and promotion of the inclusion of environmental requirements into other sectoral policies. The report did not establish a strategic framework for the environment or develop policy documents defining measurable objectives.

The *Waste Management Strategy* for the years 2013–2017 has been approved only recently, establishing

Figure 8: GHG emissions by sector



Note: LULUCF = Land Use, Land-Use Change and Forestry
SOPU = Solvent and Other Product Use

(Source: GoM, National Inventory Report) a set of objectives and measures for the collection, transportation, treatment, recovery and disposal of waste. At the same time, provisions and actions regarding environmental protection have been included in a number of policy documents from other areas (economic, agriculture, health, national security, regional development, transport, demographic, etc.), but their implementation remains limited.

GoM decision No. 301 of 24 April 2014 approved the *Environmental Strategy* for the years 2014–2023 and the Action Plan for its implementation.[43] In terms of the transition towards a green economy, Section 2 (Sustainable development and green economy development) of the strategy acknowledges that current economic development strategies neglect issues of environmental protection and that the principles of environmental protection and sustainable development are neither integrated into all sectoral policies nor recognized as priorities.

In order to promote green economy development nationwide, this report proposes the integration of green economy, environmental protection and climate change adaptation principles into sectoral policy papers. This is consistent with a vision of green economy integration into priority sectors, such as energy and agriculture, by 2015 and into industry, transport, buildings, trade, services and other areas of social and economic development by 2020. This process presupposes the modification of sustainable production and consumption models through regulations, taxation and legal decisions.

Among other targets, the strategy presented here provides for the integration of environmental provisions into the agricultural policy to reduce the risks of environmental degradation and improve the sustainability of agricultural ecosystems. The target share of organic farming is set at 5 per cent of total agricultural production by 2015 and at 10 per cent by 2020. This target should be achieved through the implementation of the following set of measures:

- Promoting production, processing and effective management of organic products (e.g., by creating incentives for the use of organic fertilizers), to increase the farmers' income and welfare.

- Encouraging improvements in processing and marketing of primary agricultural products by supporting investments in farming practices. These improvements should be environmentally friendly, deliver useful products to society, and respect and promote the efficient use of natural resources. They should also promote renewable energy, develop new technologies and foster innovation. Ultimately, actions should compensate landowners whose properties are designated state-protected areas.

- Conducting environmental training and awareness-raising programmes for farmers and creating the necessary training and education infrastructure to further promote a sustainable agricultural system.

- Developing environmentally friendly agricultural techniques and infrastructure by creating a mechanism for the periodical verification of irrigation water quality; carrying out agrochemical and soil research to conduct a permanent monitoring of soils; providing for integrated plant protection against pests, diseases and pathogens; promoting implementation of conservative agriculture production techniques; preserving landscape/agricultural ecosystems by identifying areas with unsustainable agriculture practices; and developing mechanisms for waste management in agriculture, especially from livestock.

- Implementing climate adaptation measures aimed at promoting agricultural crops that have the potential to succeed in the changed climate conditions (drought, high temperatures), soil treatment, water conservation and reducing soil moisture loss.

Another target of this strategy is to promote the generation of renewable energy and improvements in energy efficiency. This can be pursued by diversifying the mix of domestic energy resources, including renewables; modernizing the energy system such that it is able to support non-conventional energy resources; reducing energy intensity in housing, industrial, transport and agricultural sectors; and implementing energy-efficient technologies. Special importance needs to be given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to raising public awareness on the necessity to save energy. Energy savings will have a positive effect on the environment by lowering energy consumption and emissions. The strategy envisages that by 2020 about 20 per cent of total energy used and 10 per cent of liquid fuels will be produced from renewable sources.

Adaptation measures to climate change in the energy sector will be aimed at reducing energy losses and the risks of not meeting energy demand. To this end, investments will focus on infrastructure, equipment and technologies for exploiting renewable energy such as hydropower, wind and solar energy.

4. Sectoral overview

4.1. Promoting sustainable development through organic agriculture

4.1.1. Overview

Agriculture contributed 14.6 per cent of Moldova's GVA in 2013 (or 12.5 per cent of GDP) and 26.4 per cent of the total employment.[44] The sector provides livelihoods to a significant share of the population and accounts for 50 per cent of total national exports.[45] However, the performance of the agriculture sector is being increasingly challenged by a number of factors related to social, economic and environmental dynamics. First of all, the migration of labour force to other sectors and countries, mainly caused by low wages, has reduced the availability of human capital for rural development. Furthermore, the inefficient use of natural resources, including water and soils, has resulted in the low productivity and profitability of the sector, especially for smallholder farmers who cannot benefit from economies of scale.

4.1.2. Challenges

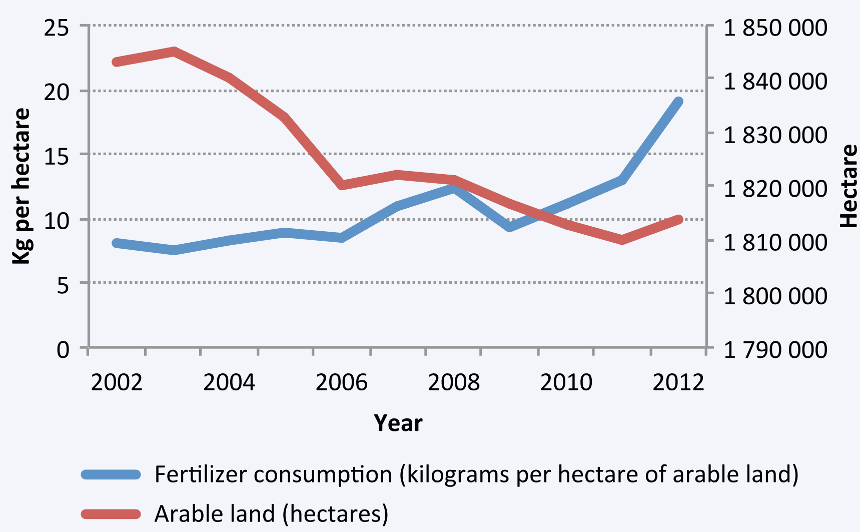
Degradation, which affects about 80 per cent of the soil, is leading to extensive crop losses. Among the main causes of soil degradation is the adoption of unsustainable agriculture practices, such as lack of crop rotation and anti-erosion measures and the intensive use of chemical fertilizers. In addition, non-compliance with recommended best practice on soil protection and conservation is leading to soil erosion and degradation.[46] Natural factors also contribute to soil depletion and reduced crop yields – in particular, recurring drought periods exacerbated by climate change that have reduced water availability for irrigation purposes. The combination of those negative trends has led to a dramatic reduction in agricultural production over the last two decades. In 2011, the total production for all categories of producers was only at 59 per cent of the 1990 level.[47]

As shown in Figure 9, the use of chemical fertilizers (in absolute amounts and per hectare of arable land) has tripled between 2002 and 2013, while the area of arable land has declined by 2 per cent.[48] A shift to organic farming has the potential to increase land productivity in the long term, while preserving soil from nutrient losses and degradation.

4.1.3. Promoting organic farming

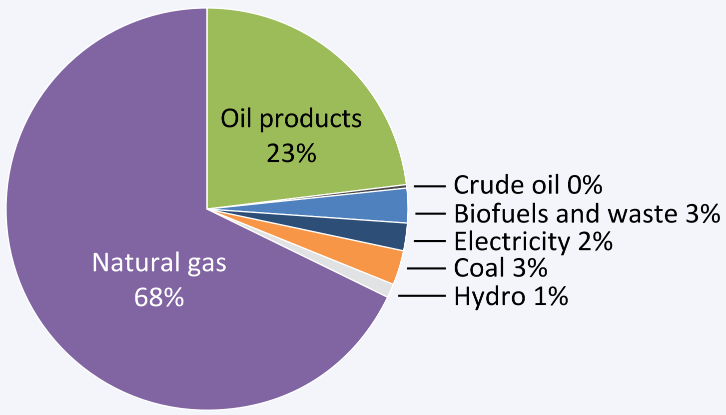
To address soil degradation and improve agricultural productivity, the government plans to promote organic agriculture. Moldova has already established

Figure 9: Arable land (ha) and fertilizer consumption (kilograms per hectare of arable land)



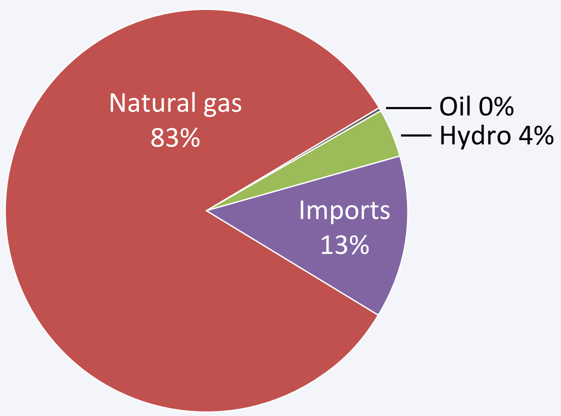
(Source: World Bank, World Development Indicators)

Figure 10: Primary energy supply by source, 2012



(Source: IEA, n.d.)

Figure 11: Electricity generation by source, 2012



(Source: IEA, n.d.)

a regulatory framework for organic agriculture by approving the 2005 Law on Organic Agri-Food Production and adhering to internationally recognized certification mechanisms and labelling schemes. In 2009, organic produce represented about 11 per cent of total agricultural exports. The target is to further expand the agricultural land cultivated under organic farming from 1.9 per cent of total agriculture area in 2011 to 5 per cent in 2015 and 20 per cent by 2020.[49]

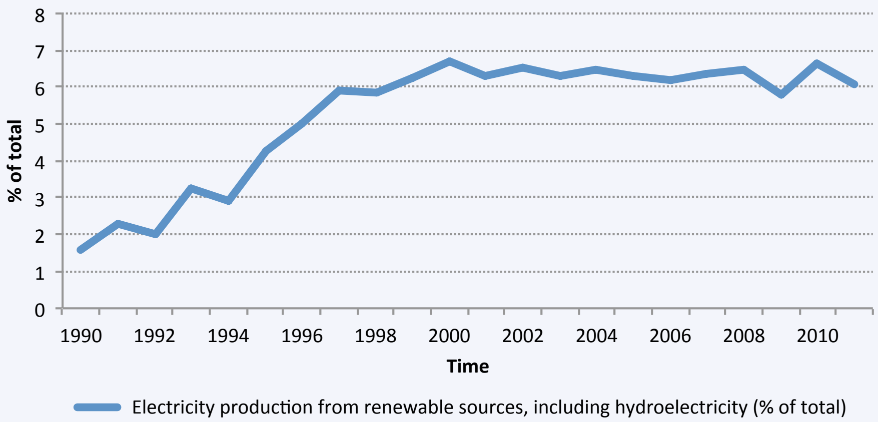
4.2. Promoting low carbon development by managing energy demand and supply

4.2.1. Overview

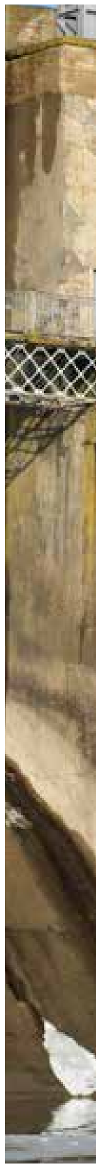
As shown in Figure 10, the primary energy supply in Moldova is dominated by natural gas, which accounted for 68 per cent of the country's energy mix in 2012, followed by oil products (23 per cent), coal (3 per cent), biofuels and waste (3 per cent), imported electricity (2 per cent) and hydropower (1 per cent). The overall constellation of the country's total energy mix has seen comparatively little change over the past years. The proportion of natural gas has retained a fixed share of the total primary energy supply between 2005 and 2012, while oil product use has grown from an initial 19 per cent share and electricity imports have declined from a former 8 per cent share of the total energy supply.[50]

The majority of electricity generation in Moldova derives from natural gas, which accounted for 83 per cent of electricity generated in 2012 (see Figure 11). The remaining electricity is sourced from imports (13 per cent), hydropower (4 per cent) and a very small share from oil (less than 1 per cent). The largest change in the source of electricity generation since 2005 has been the

Figure 12: Share of electricity production supplied by renewable energy sources, including hydroelectricity, in percentage of Moldova's total energy mix from 1990 to 2011



(Source: World Bank, World Development Indicators)



significant fall in imported electricity, which in that year represented 36 per cent of the total electricity supply.[51]

In order to meet its domestic needs, Moldova relies heavily on energy imports. In 2012, energy imports accounted for 86.5 per cent of total primary energy supply.[52] These imports originate from a small number of countries, including Russia and the Ukraine, which deliver 100 per cent of Moldova's natural gas and 70 per cent of its electricity, respectively. Its strong dependence on foreign energy makes Moldova extremely vulnerable to international price shocks and potential political crises.

Overall energy consumption in Moldova decreased over the past years, while energy efficiency in the country progressively increased. However, despite a reduction of total energy supply from 103,329 terajoules (TJ) to 98,971 TJ between 2005 and 2012,[53] and a decrease in energy intensity per unit of GDP of 25.8 per cent over the same period of time (compared to a 6.5 per cent reduction in OECD countries and 0.4 per cent reduction worldwide), Moldova's energy intensity is still higher than that of its neighbouring and European countries.[54] Energy losses associated with outdated infrastructure (e.g., for power distribution) are among the main causes of the country's poor performance in this sector. The decline of electricity losses from 24 per cent to 21 per cent of total electricity supply between 2010 and 2011 shows that there remains sufficient room for improvement.[55]

4.2.2. Green economy opportunities

Moldova's strong dependence on energy imports and its vulnerability to energy price volatility create high energy insecurity. Between 2007 and 2014, electricity prices have increased by roughly 50 per cent, which has hampered Moldova's economic growth and affected the vulnerability of the poor. Moldova can reduce its dependency on fossil fuels and its vulnerability to external shocks by diversifying and expanding the mix of domestic and renewable energy sources, modernizing the energy system and electricity infrastructure, introducing energy efficient technologies and strengthening energy efficiency standards in the housing, industrial, transport and agricultural sectors. The benefits of these measures would include lower energy consumption, improved ability to meet consumer energy demands and reduced emissions and pollution.

On the energy supply side, with a share of electricity production from renewable energy sources of only 6.1 per cent in 2011 (Figure 12), the country has an unexploited potential for increased development and use

of renewable energy sources. The government should aim to increase the share of renewable energy in total energy mix to meet the energy demands of the country.

On the energy demand side, the increase of energy consumption in households at an average annual growth rate of 3 per cent between 2003 and 2010 from 575 million to 689 million tonnes of oil equivalent[56] indicates that energy efficiency measures would lead to maximum gains in the household sector with the share of 48 per cent of total energy consumption (in 2010) for technological and economic consumption. The share is likely to increase further in the future.

These considerations are in line with the government targets incorporated in the National Development Strategy "Moldova 2020", which aims at reducing energy consumption by enhancing energy efficiency and increasing the penetration of renewable energy sources. The strategy envisages that, by the year 2020, 20 per cent of Moldova's total energy will be produced by renewable resources and 10 per cent of fuel consumption will be from biofuels, while energy imports will be minimised.[57] The strategy forms the legal and normative basis for further encouraging renewable sources of energy and efficient energy use under a green economy approach.

5. Simulation analysis

5.1. Assumptions

The analysis presented in this study is based on customized simulation models that use existing national and international statistics. Data collection was carried out across sectors for inclusion in the models. The information collected is from reliable and publicly available sources. However, due to lack of data for certain sectors and selected indicators, the model results are based on the best available information. Assumptions from literature, even if not reflecting the specifics of Moldova, were used in certain cases to simulate the scenarios. The generated projections can therefore be directly compared with national, regional or global databases.

The applied methodology is System Dynamics,[58] which uses causal relations, feedback loops, delays and non-linearity to represent complexity. It allows the generation of projections that are not as reliant on historical data as optimization or econometrics studies. Validation was carried out using behavioural and structural validation tests.[59] The simulations use data starting with the year 2000 and run to the year 2030. This allows for historical behavioural validation over a period of approximately 10 years for most variables, depending on the data availability. However, the comparative analysis of green economy interventions and certain calculations (e.g., return on investment) is only shown for future years, as there is no historic data available for comparison.

Two main scenarios are simulated and analysed in this study:

- A **BAU** case that assumes the continuation of historical trends: This scenario includes all policies and interventions currently active and enforced, and excludes policies that are planned but not yet implemented.

- A set of **green economy** scenarios (GE scenarios) that simulate additional interventions that reduce energy intensity, increase the use of renewable energy and expand organic agricultural land use. The specific interventions and assumptions simulated in the GE scenario are listed below.

All scenarios use the following assumptions:

1. GDP growth: 4.7 per cent average annual growth between 2013 and 2030[60]
2. Population growth: -0.002 per cent annual growth from 2013 to 2030
3. Energy prices: Average annual increase of 8.9 per cent (in line with observed price increases between 2008 and 2013).

Additional details on specific assumptions and sectoral scenarios are provided in the following section.

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5.2. Agriculture sector

The scenarios analysed for the agriculture sector include:

- A BAU case, which relies on the assumption that current trends will continue and that current policies and decisions will take their course. In particular, this scenario assumes that no additional investments would be made in the expansion of organic agriculture. As a result, the extent of land dedicated to organic agriculture would remain constant at 48,700 ha.[61]
- Three GE scenarios that simulate additional investments for expanding organic agriculture land, under different crop yield assumptions. In particular, the scenarios assume that organic crop yield would be lower than the BAU by 20 per cent (GE 20 per cent scenario), 30 per cent (GE 30 per cent scenario) or 40 per cent (GE 40 per cent scenario). This range was derived from observed productivity trends in Moldova.[62] The objective of GE scenarios is to expand organically cultivated land from 1.9 per cent of total agriculture land in 2014 to 3.4 per cent in 2020, and 5.8 per cent in 2030.

The GE scenario is well below the national target expansion for organic agriculture (20 per cent of agriculture land by 2020). In this respect, the GE scenario takes into account the limited availability of information about the sector. In fact, reaching the 20 per cent target is likely to considerably change the production mix, yields and profitability in ways that cannot be forecast with confidence at this stage. As a result, a more conservative GE scenario was chosen to better identify the potential thresholds to ensure profitability. Table 1 summarizes the main assumptions used for the agriculture sector.

5.3. Energy sector

The scenarios analysed for the energy sector are as follows:

- A BAU case that simulates an expansion of fossil fuel capacity from 488 megawatts (MW) in 2014 to 720 MW. Under this scenario, no additional investments are made in the expansion of renewable energy capacity or in energy efficiency improvements. However, under the BAU scenario, an improvement of up to 10 per cent in energy

Table 1: Main assumptions for the model development and scenario simulations (BAU and GE), agriculture sector

Parameter	**Value**
Conventional agriculture employment	0.132 people per hectare[63]
Organic agriculture employment	30 per cent higher than conventional agriculture[64]
Agriculture average wage	MDL24,000 (€1,314)[65]
Organic land area	48,700 hectares in 2014[66]
Organic investment	MDL2,000 (€109.5) per hectare[67]
Organic average revenue per tonne	32,000 tonnes per US$48 million in 2009 (MDL20,000 or €1,095 per tonne), or 11 per cent of total agriculture exports in 2013[68]
Organic average value added per tonne	Estimated using production and total value added, it was estimated that the average value added is MDL 6,853 (€375) per tonne, or 32 per cent of revenues
BAU average value added per tonne	MDL4,429 (€242.5) per tonne (calculated based on data from the National Bureau of Statistics).
Conventional agriculture average crop yield	8.8 tonnes per hectare (calculated as a weighted average of different crop yields, based on data from National Bureau of Statistics).

efficiency is assumed due to the change in and replacement of old capital over time.

- A GE scenario that simulates additional investments in the expansion of renewable energy capacity and energy efficiency improvements, which will reduce electricity demand. In particular, the scenario simulates an increase in renewable energy sources of up to 20 per cent of total power generation by 2020 – with an additional 26 MW for solar, 227 MW for wind and 20 MW for hydropower capacity by 2030 – while fossil fuel capacity would remain unchanged. Moreover, the GE scenario simulates an increase in energy efficiency of 10 per cent by 2020 ("Moldova 2020" target) and 30 per cent by 2030. The improvement would be achieved equally across key sectors, including agriculture, industry, residential and others.

The main assumptions used in simulations of the energy sector are summarized in Table 2.

Table 2: Main assumptions for the model development and scenario simulations (BAU and GE) for the energy sector

Parameter	**Value**
Energy efficiency employment	Method 1: Job years per GWh: 0.59[69] Method 2: Job years per million EUR: 8.37[70]
Household electricity prices	MDL1.4 (€0.077) per kWh in 2008[71] and MDL1.62 (€0.089) per kWh in 2014[72]
Industrial electricity prices	MDL1.47 per kWh in 2014
Agriculture electricity prices	MDL1.56 per kWh in 2014
Solar construction cost	MDL183,341 (€10,038) per MW[73]
Solar maintenance cost	MDL1,843 (€101) per MW[74]
Wind construction cost	MDL87,576 (€4,795) per MW[75]
Wind maintenance cost	MDL1,324 (€72) per MW[76]
Hydro construction cost	MDL132,860 (€7,274) per MW[77]
Hydro maintenance cost	MDL3,334 (€182) per MW[78]
Fossil fuels construction cost	MDL75,330 (€4,124) per MW[79]
Fossil fuels maintenance cost	MDL1,505 (€82) per MW[80]
Energy efficiency investment	MDL913 (€50) per avoided tonne of carbon dioxide emissions from electricity generation[81]
Average emissions from fossil fuel electricity generation	1.044 tonnes per MWh[82]

6. Simulation analysis: Key results

6.1. Organic agriculture

For the agriculture sector, two scenarios have been simulated and analysed: a BAU case and a GE case. In the following, the main findings are presented, mainly for the BAU case and for the GE scenario, which represent the most realistic and effective scenarios according to the national stakeholders, who helped shape this study.

Organic agriculture area and production

Organic farming in Moldova has expanded rapidly over the last decade. According to national data, the area under organic cultivation has increased from 168 hectares in 2003 to 48,700 hectares in 2014.[83] Available data show that 1.9 per cent of the total agriculture area is under organic cultivation. This figure is slightly below the European average (about 2 per cent) and significantly higher than the global average, which amounts to approximately 0.85 per cent.[84] Investments in organic agriculture are bringing considerable returns to local producers. At the end of 2009, 32,374 tonnes of organic products were exported for a total value of MDL580.7 million (€34.6 million), which corresponds to 11 per cent of the total export value of all agricultural products.[85] Given the encouraging performance of the organic agriculture sector in the last years, the conditions provide for a further increase in the organic agriculture area in the coming years.

Having considered the high potential for organic farming in Moldova, the simulation of the GE scenario assumes a yearly increase of 5,730 hectares of the organic farming area between 2014 and 2030. Under this assumption, the share of total organic farming land area would reach 3.4 per cent by 2020 and 5.8 per cent by 2030. The expansion of organic land under the GE scenario is smaller than the government's expressed target of 5 per cent in 2015 and 20 per cent by 2020. The simulation of such an aggressive scenario would in fact require more considerations on the mix of agricultural products and their yields and market access, for which only limited data are currently available. Overall, expansion of the area is a proxy for the expansion of economic activity in sustainable and organic practices. The scenarios concentrate on crop production, but the results for profitability can be considered as average values for the primary sector.

Investment

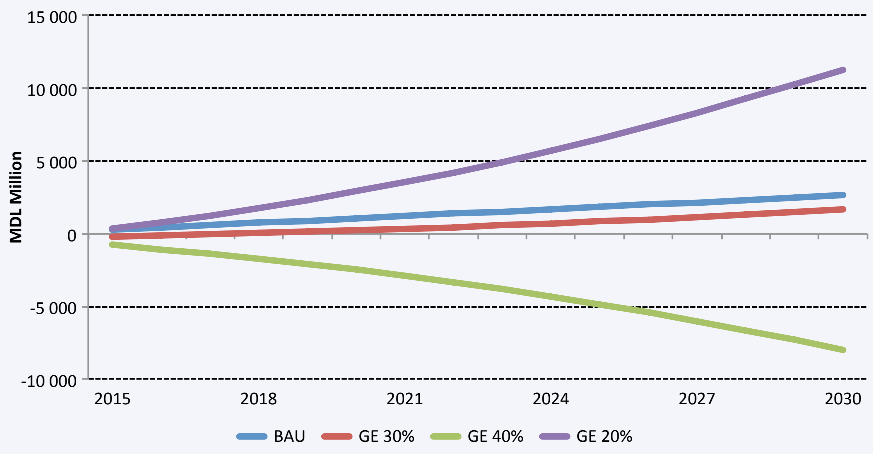
The cumulative investment needed to support the expansion of organic farming land area to 5.8 per cent of the available land is estimated to reach approximately MDL3.2 billion (€176 million) by 2030, with an annual average investment of MDL200 million (€11 million) between 2014 and 2030. This estimate derives from multiplying the assumed expansion of organic farming by MDL2,000 per hectare. The analysis does not assume that the cost of expanding organic production needs to be sustained by the public sector only. This cost could be shared with farmers by making use of incentives rather than subsidies. As a consequence, the figure presented above should be considered as the indicative total cost of the expansion of the sustainable farming area in the GE scenario, not as the cost to the government (i.e., required budgetary expenditure), to reach the projected growth in this sector.

Revenues and net investment

The expansion of agriculture production – sustainable or conventional – is likely to generate additional revenues. In the specific case of organic agriculture, it is reasonable to expect an increase in profits due to lower production costs and premium market prices of organic products.[86] A recent study of the European Commission indicated potential increased demand for organic products in Europe in recent years,[87] which can also boost revenues and profits in the sector. Sustainable farming practices would further generate a variety of environmental benefits, ranging from soil preservation (e.g., avoided soil erosion) to water purification (e.g., avoided water contamination) and higher carbon sequestration.[88] The added benefits of organic agriculture are confirmed by national data: the average value added per tonne of organic crops in Moldova is about MDL6,853 (€375) per tonne, compared to MDL4,429 (€242) per tonne for conventionally cultivated crops.[89] From these figures, it is possible to conclude that organic producers in Moldova enjoy a premium market price of about 55 per cent over conventional market prices.

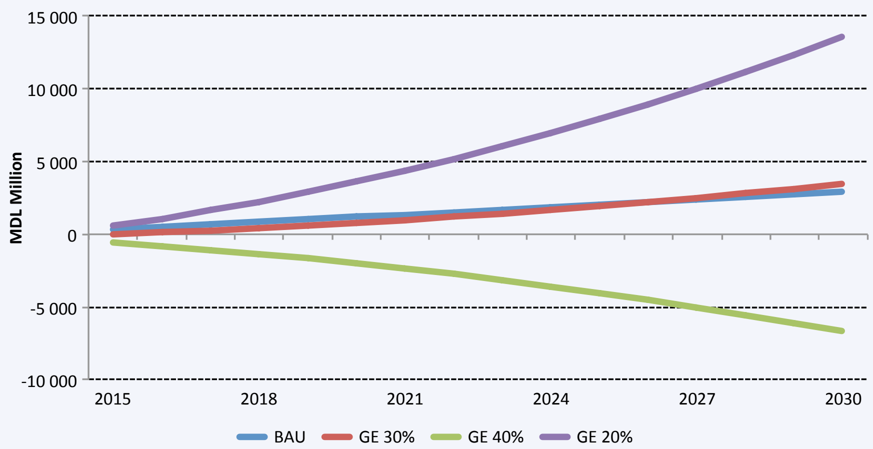
In addition to premium prices, a key factor to estimate the profitability of organic agriculture is the average crop yield. According to national data,[90] organic yield is between 20 per cent and 40 per cent lower than under conventional

Figure 13: Cumulative organic agriculture value added minus investments, under BAU and GE scenarios



(Source: Authors)

Figure 14: Total cumulative value added and additional wages minus total cumulative investment, under different scenarios



(Source: Authors)

agriculture. This gap, which might be attributable to a short-term decline in productivity due to the replacement of chemical fertilizers, is likely to be filled in the medium and long-term, when the benefits of organic farming techniques on soil fertility will be fully realized (e.g., nutrients are naturally replenished, rather than depleted).[91]

In order to estimate revenues and net investment for the expansion of sustainable farming under different yield assumptions, three GE scenarios were tested and compared with the BAU scenario. The three GE scenarios assume that organic agriculture yield is 20 per cent (GE 20 per cent), 30 per cent (GE 30 per cent) or 40 per cent (GE 40 per cent) lower than BAU, in line with the observed trends in Moldova. Projections show that annual organic agriculture revenues under the GE scenarios would be between MDL16.2 billion (€887 million) (GE 40 per cent scenario) and MDL21.6 billion (€1.2 billion) (GE 20 per cent scenario) by 2030.

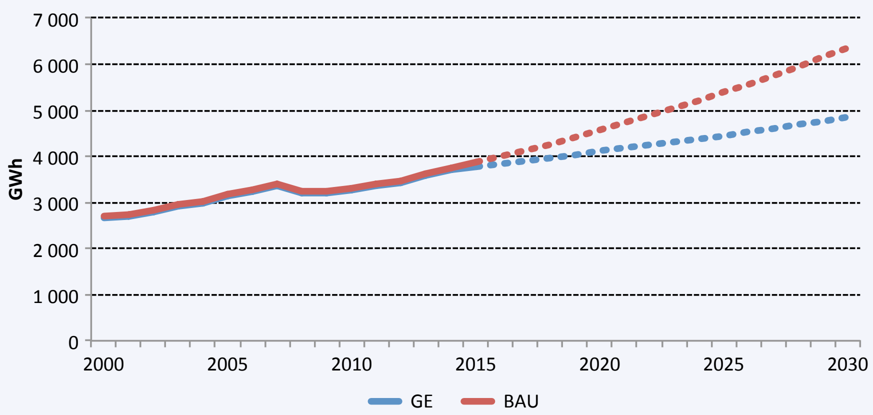
The net value added deriving from investments in organic agriculture expansion was calculated as the cumulative value added differential between BAU and organic production minus the total investments in organic agriculture expansion, under different yield scenarios. As shown in Figure 13, when organic agriculture yield is 30 per cent lower than the conventional yield, the economic results are very similar to the BAU case. This indicates that the price premium can offset most of the disadvantages posed by the lower yield.

Table 3: Main results of the analysis of the impact of green farming interventions under different scenarios						
Category	**Unit**	**Scenario**	**2015**	**2020**	**2020**	**2025**
Organic farming area	Ha	BAU	48 700	48 700	48 700	48 700
		GE scenarios	54 787	85 225	115 662	146 100
Cumulative total investment	MDL million	GE scenarios	511.1	1 209	2 212	3 519
Average annual investment	MDL million/year	GE scenarios	200	200	200	200
Organic value added	MDL million	GE (minus 20% of conventional yield)	2 643	4 111	5 580	7 048
		GE (minus 30% of conventional yield)	2 313	3 598	4 883	6 168
		GE (minus 40% of conventional yield)	1 982	3 084	4 185	5 286
BAU versus organic value added differential	MDL million/year	GE (minus 20% of conventional yield)	508	790	1 072	1 354
		GE (minus 30% of conventional yield)	177	276	375	473
		GE (minus 40% of conventional yield)	-153	-238	-323	-408
Total organic employment	Man/year	GE scenarios	9 402	14 625	19 848	25 071
Additional GE employment	Man/year	GE scenarios	2 170	3 375	4 580	5 786
Cumulative additional wages relative to BAU	MDL million/year	GE scenarios	243	575	1 051	1 672
Cumulative value added minus investment relative to BAU	MDL million/year	BAU	290	1 072	1 855	2 637
		GE (minus 20% of conventional yield)	363	2 901	6 545	11 296
		GE (minus 30% of conventional yield)	-206	227	848	1 658
		GE (minus 40% of conventional yield)	-774	-2 447	-4 849	-7 980
Cumulative value added investment and wages relative to BAU	MDL million/year	BAU	340	1 171	2 002	2 833
		GE (minus 20% of conventional yield)	606	3 476	7 596	12 968
		GE (minus 30% of conventional yield)	37	802	1 899	3 330
		GE (minus 40% of conventional yield)	-532	-1 872	-3 798	-6 308

Considering that typical yields for organic products tend to increase over time (as soil quality improves and erosion declines), the outlook is positive. On the other hand, investments in organic agriculture would not be feasible in the GE 40 per cent scenario. In this case, the net value added would follow a downward negative trend, being almost four times lower than BAU in 2030.

Finally, organic agriculture investments would be largely profitable in the GE 20 per cent scenario. Projections show that lower productivity would be more than compensated by additional production and higher market prices, with strong net cumulative value added from the very first year of policy implementation (2015). Under this scenario, net value added would grow at increasing rates throughout the simulation period (76.6 per cent higher than BAU in 2030). Net returns on investments would be higher given the additional jobs that would be created under the organic agriculture expansion scenarios. Adding the additional organic farming wages to the net cumulative value added would see investments being fully repaid under the GE 30 per cent scenario, with positive annual cash flow in the short term and overall net returns being 17.5 per cent higher than BAU by 2030. Net value added under the GE 20 per cent scenario would

Figure 15: Historical trends and future projections of total electricity consumption, under BAU and GE scenarios



(Source: Authors)

be positive and higher than BAU by almost 350 per cent in 2030, while it would be 322 per cent lower than BAU under the GE 40 per cent scenario (Figure 14).

Employment

Organic farming practices and techniques are more labour intensive. According to studies conducted in developing countries, organic agriculture has the potential to increase employment by 30 per cent when compared to traditional agricultural methods.[92] Therefore, the expansion of organic farming land in Moldova may create greater additional employment than in the BAU scenario. More specifically, projections show that 3,977 additional (direct) jobs could be created every year between 2015 and 2030. On average, additional wages for direct job creation – above BAU – would amount to MDL95.5 million (€5.2 million) every year between 2015 and 2030, with a cumulative value of MDL1.7 billion (€91.5 million). In order to sustain job creation, and in relation to the scenarios presented above, it is important to simultaneously boost productivity (or raise prices) to compensate for the additional working hours required. The performance of the sector will have to be carefully monitored, in order to safeguard income and wages throughout the transition process.

Overall impact

As indicated in Table 3, an expansion of the organic farming area is expected to generate additional value added and employment.

6.2. Energy sector

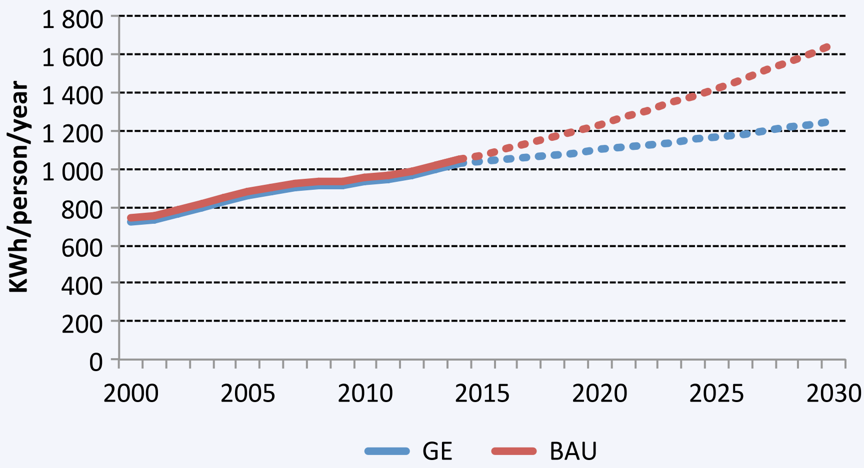
6.2.1. Energy efficiency measures on electricity demand

Under the GE scenario (assuming a 10 per cent increase in energy efficiency by 2020 [the "Moldova 2020" target] and a 30 per cent increase by 2030 compared to 2013), a reduction of 9.1 per cent and 23.1 per cent in total electricity consumption relative to the BAU case can be expected by 2020 and 2030, respectively. More specifically, total annual electricity consumption is projected to reach GWh 4,148 and GWh 4,889 by 2020 and 2030, respectively, in the case of investments in energy efficiency, and GWh 4,563 and GWh 6,356 by 2020 and 2030 under the BAU scenario, respectively (Figure 15).

It is important to note that energy demand projections are influenced by assumptions regarding GDP growth and energy prices and that energy efficiency improvements would be implemented simultaneously and across key sectors in the country. In this way, the share of energy consumption by sector would remain relatively unchanged in the two scenarios, with 24 per cent of energy consumption from commercial, 45 per cent from residential, 28 per cent from industrial and 3 per cent from other sectors in 2013; and 22 per cent from commercial, 51 per cent from residential, 24 per cent from industrial and 2 per cent from other sectors in 2030.

Annual per capita electricity consumption is also projected to be lower in the GE case relative to BAU, reaching 1,234 (BAU) and 1,122 (GE) kWh/person in

Figure 16: Annual per capita electricity consumption (KWh/person/year): Historical trends and future projections under BAU and GE scenarios



(Source: Authors)

2020, and 1,658 (BAU) and 1,275 (GE) kWh/person in 2030 (Figure 16). On average, 1,323 kWh/person would be consumed every year between 2015 and 2030 under the BAU scenario, compared to 1,151 kWh/person under the GE scenario (i.e. 23 per cent savings of annual per capita electricity consumption).

The electricity intensity (kWh/unit of GDP) is projected to decrease between 2015 and 2030 from 0.25 to 0.19 kWh/MDL under the BAU scenario (24 per cent reduction), and down to 0.14 kWh/MDL under the GE scenario (44 per cent reduction).

Investment

The annual investment required to reach the energy efficiency targets assumed under the GE scenario (10 per cent by 2020 and 30 per cent by 2030) amounts to an average of MDL223.7 million (€12.2 million) per year between 2015 and 2020, and MDL657.5 million (€36 million) between 2015 and 2030, with the peak at approximately MDL394.7 million (€21.6 million) in 2020 and MLD1.4 billion (€76 million) in 2030. The cumulative investment in energy efficiency would amount to MDL1.3 billion (€73.5 million) for the period 2015–2020 and MDL10.5 billion (€575 million) for the period 2015–2030.

Depending on the policies implemented to reach the formulated targets, investment should stem from both public and private sectors as well as domestic and foreign sources. The government should set up incentives to attract the required level of annual investment, which is estimated to be equivalent to 1 per cent of GDP by 2020 and 2 per cent of GDP by 2030.

Avoided cost

Investments in energy efficiency lead to energy and emission savings and thereby reduce costs for households and the private sector. Savings are expected to be generated in total electricity consumption, fossil fuel costs for power generation and, eventually, power capacity generation (i.e., if demand for electricity in the GE scenario is lower than in the BAU case, the pressure for investment into power generation capacity will be lower, thus the power generation capacity in the GE case will eventually be lower, relative to the BAU scenario).

More specifically, energy efficiency measures are projected to generate total savings in energy consumption of more than MDL1.8 billion (€101 million) between 2015 and 2020, and MDL15.9 billion (€871 million) by 2030, which translates to an annual average of MDL362 million (€19.9 million) by 2020, and MDL1 billion (€58.5 million) by 2030. These avoided costs can be directly compared to the energy efficiency investment (on average MDL223.7 million and MDL657.5 million per year between 2015 and 2020 and between 2015 and 2030, respectively), which shows that this intervention is very likely to have a short payback time and will generate consistent positive economic returns. Importantly, avoided costs are also expected as a result of reduced use of fossil fuels (primarily natural gas) for thermal power generation.

Energy efficiency interventions are expected to free up resources that can be invested into other sectors and thereby provide an additional stimulus to the economy and to the job market.

Employment

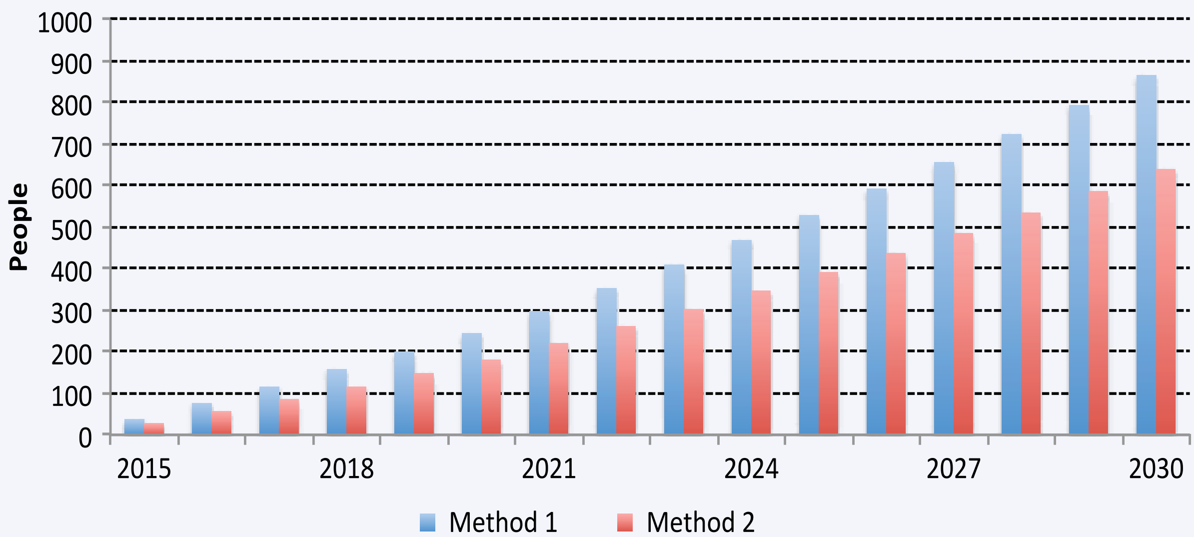
The simulated energy efficiency investments are projected to create new and additional employment. Two methods were used to estimate the potential for job creation. In the first case (method 1 in Figure 17), new jobs were calculated based on the annual avoided energy consumption (jobs/year/GWh), following the approach of Wei *et al*.[93] In the second case (method 2 in Figure 17), estimations are based on annual financial resources invested (jobs/year/million EUR), and on further studies carried out by the International Trade Union Confederation (ITUC).[94]

Figure 17 shows that under the energy efficiency scenario between around 245 (method 1) and 180 (method 2) full time direct jobs would be created by 2020, while between around 865 (method 1) and 640 (method 2) direct jobs would be created by 2030.

The cumulative additional annual wages generated from new energy efficiency-related jobs are projected to reach MDL70.9 million (€3.9 million) and MDL556 million (€30 million) by 2020 and 2030, or MDL11.8 million (€647,207) and MDL34.7 million (€1.9 million) per year, respectively.

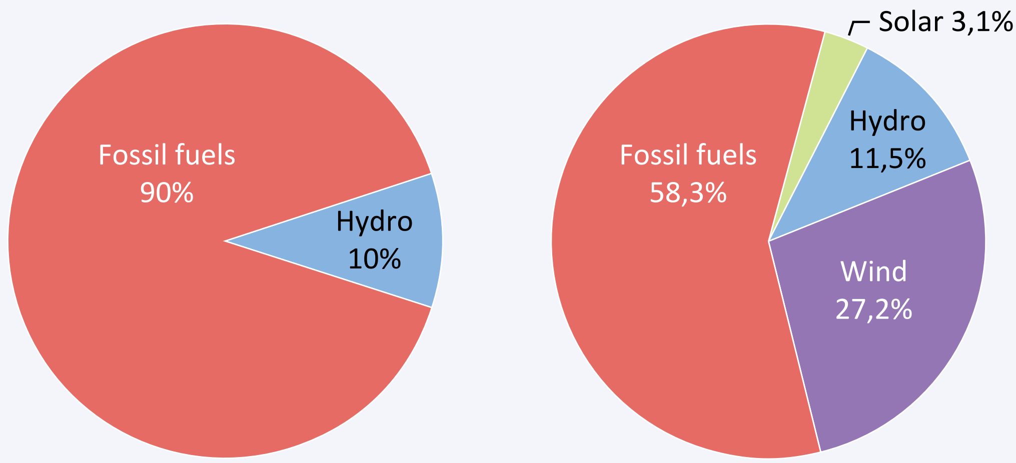
The overall implementation of energy efficiency measures thus creates positive social, economic and environmental synergies and is an invaluable component for Moldova's transition towards a green economy.

Figure 17: Projections of additional jobs created under method 1 (annual energy consumption (jobs/year/GWh)) and method 2 (number of jobs created per financial resources invested [jobs/year/million EUR])



(Source: Authors)

Figure 18: Power generation capacity by energy source in 2030, under BAU (left) and GE (right) scenarios



(Source: Authors)

6.2.2. Electricity supply

Power generation capacity

Under the BAU scenario, electricity will continue to be almost entirely generated from fossil fuels (90 per cent) and hydro resources (10 per cent). As reflected in Figure 18, projections for the GE scenario, however, show a marked increase in renewable energy sources (especially wind and solar), which would comprise 41.7 per cent of the national energy mix by 2030. More precisely, hydropower capacity would increase from 76 to 96 MW between 2015 and 2030, while solar and wind capacity would increase to 26 MW and 227 MW, respectively, over the same period.

On the other hand, fossil fuel capacity is projected to remain constant at 488 MW in the GE scenario (compared to 720 MW by 2030 in the BAU case). Under the GE scenario, total power generation capacity is projected to increase by 46.6 per cent between 2015 and 2030, reaching 837 MW, as compared to 796 MW of total power generation capacity under BAU. In 2030, power generation capacity in the GE scenario would thus be 5.2 per cent higher in comparison to BAU, due to the combined effect of reduced demand and the lower capacity factor of renewable energy sources.

Electricity generation

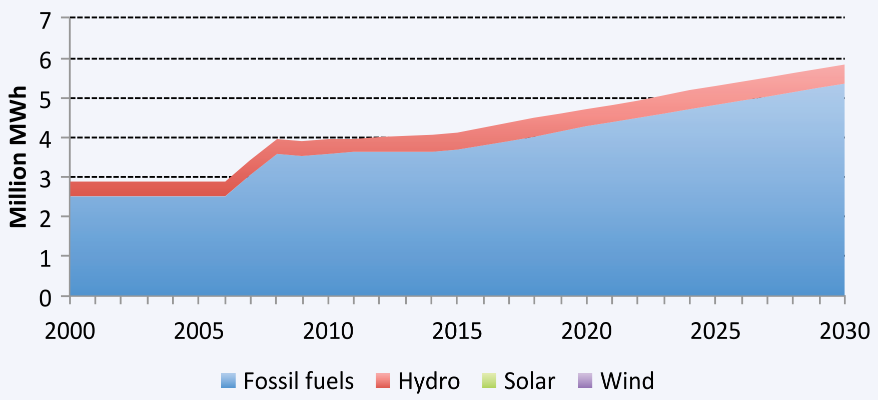
Under the GE scenario, the total electricity generated would be lower as a result of lower electricity demand due to energy efficiency improvements. In particular, the total electricity generated in 2030 would be 5,827 GWh under BAU (Figure 19) compared to 4,688 GWh under the GE scenario (Figure 20), which corresponds to a 19.5 per cent reduction.

Under the BAU scenario, electricity generation from fossil fuels would progressively increase between 2015 and 2030, while hydropower would remain constant throughout the simulation period. The projected increase in energy demand would thus be satisfied almost exclusively through an increase in fossil fuel consumption, which raises the country's GHG emissions and its dependence on fossil fuels even further.

Projections for the GE scenario, on the other hand, show a very different energy mix. Electricity supply from fossil fuels would remain almost unchanged between 2015 and 2030, while additional electricity would be produced from hydropower, solar and wind energy. Figures 19 and 20 highlight the projected electricity generation by energy source. Under the GE scenario, wind, solar and hydropower would account for 22.5 per cent of total electricity generation, with fossil fuels contributing 77.5 per cent. In the BAU scenario (Figure 19), fossil fuels would account for 92 per cent of total electricity generation, with renewables (hydroelectricity) providing the rest through 2030.

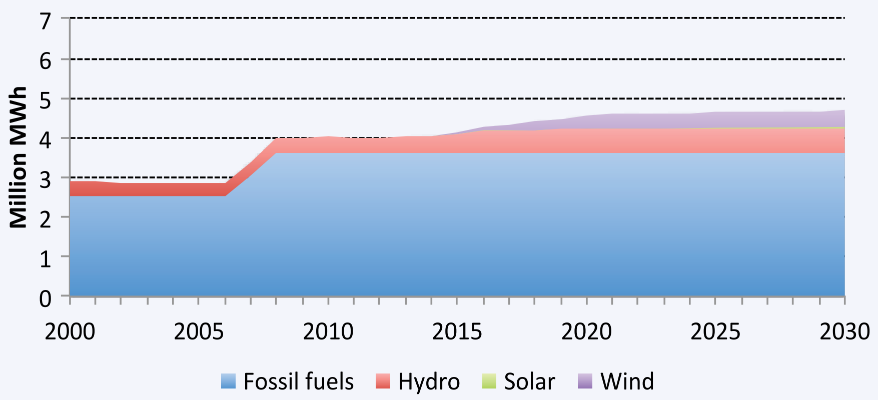
An increased share of renewable energy sources in the total electricity generation further illustrates the existing synergies between renewable energy and energy efficiency interventions. Increased energy

Figure 19: Electricity generation by energy source (million MWh): Historical trends and future projection, BAU scenario



(Source: Authors)

Figure 20: Electricity generation by energy source (million MWh): Historical trends and future projection, GE scenario



(Source: Authors)

efficiency lowers electricity demand and thus reduces the required electricity supply, which means that the same investments in renewable energy will lead to a higher penetration rate, as well as emission reductions. In other words, in order to reach the formulated penetration target, a lower level of investment in renewable energy would be required as compared to BAU.

Investment

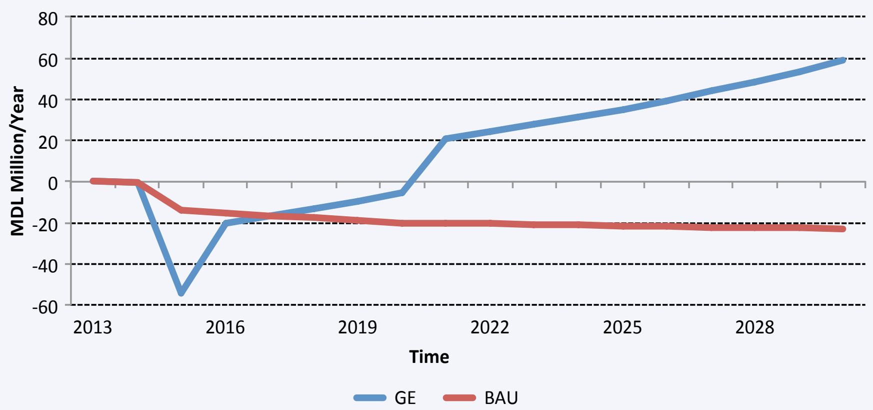
The average annual investment required to expand renewable energy power supply is projected to be approximately MDL313 million (€17 million) between 2015 and 2030, or MDL5 billion cumulatively. The required investment is thus only 14 per cent higher compared to BAU, as investments in renewable energy require a significantly lower expansion of thermal capacity.

The choice of policies and incentives will be key in determining the level of investment in the renewable energy sector, and in determining how these costs will be shared between the private and the public sectors. Economic incentives for the private sector, such as tax deductions and financial incentives, which foster the development and use of renewable energy, are a means for the Moldovan government to alleviate the overall investment cost.

Avoided cost

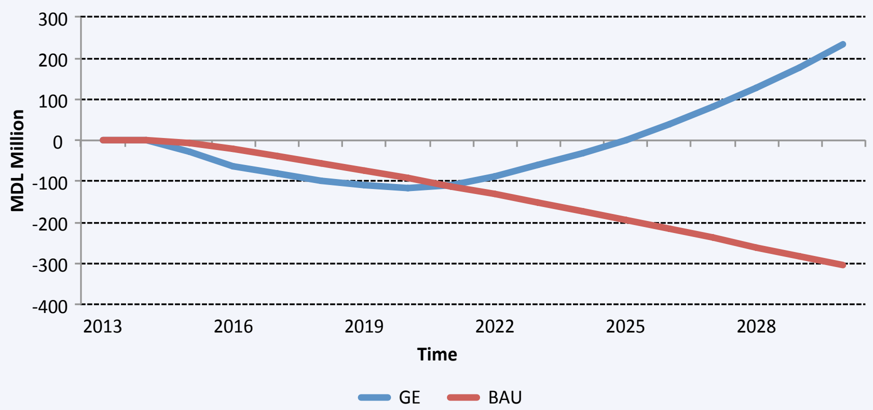
Although the upfront investment for the expansion of renewable energy power generation capacity is comparatively high, it induces lower capital costs for thermal power expansion, allows for savings in energy imports and creates jobs.

Figure 21: Annual cash flow in the energy sector (MDL million/year): Projections under BAU and GE scenarios



(Source: Authors)

Figure 22: Cumulative net returns on investment in the energy sector (MDL million/year): Projections under BAU and GE scenarios



(Source: Authors)

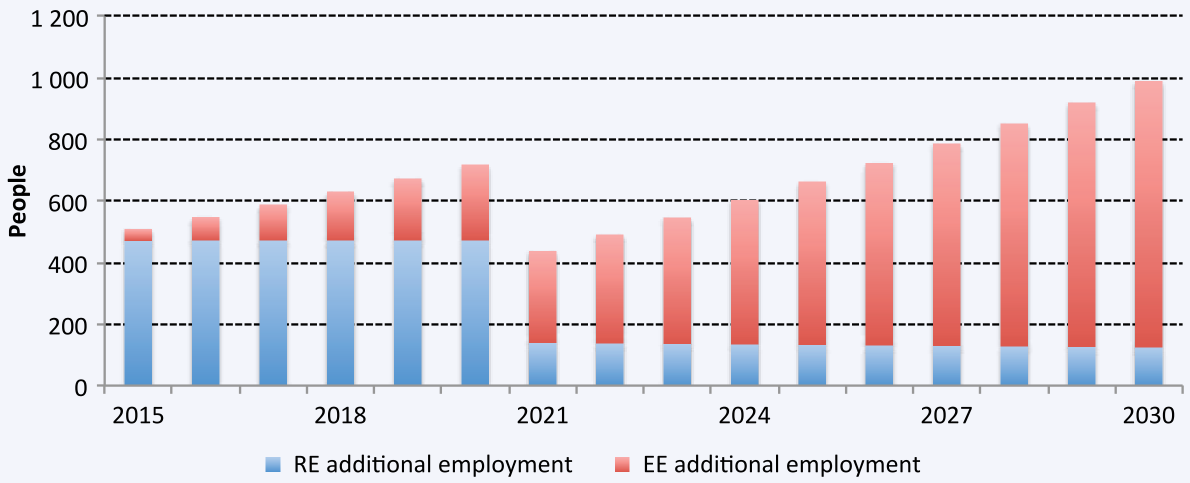
Projections show that the cost of energy imports would progressively decline with increasing renewable energy capacity: avoided annual electricity import costs would amount to an average of MDL316.2 million (€17.3 million) between 2015 and 2030, and MDL5 billion (€277 million) cumulatively.

In addition, the avoided annual cost for fossil fuel capacity expansion would amount to an average of MDL281 million (€15.4 million) between 2015 and 2030, or MDL4.5 billion (€246 million) cumulatively.

Return on investment

Based on the above calculations, it is possible to estimate the net returns on investments in both energy efficiency and renewable energy investments, as assumed under the GE scenario. Total annual net investment is calculated as the sum of renewable energy investments, energy efficiency investments and operation costs minus avoided fossil fuel capacity expansion costs, avoided electricity import costs and savings on electricity consumption.

Figure 23: Additional employment (cumulative) created in the energy sector under the GE scenario: Projections for energy efficiency and renewable energy sectors



(Source: Authors)

This calculation reveals that a significant upfront investment is required in the first years of implementation, and that added value and avoided costs result in positive and increasing returns over time. The net economy-wide annual cash flow would exceed BAU after three years by 2018, and would become positive within the first six years of implementation (i.e., from 2021 onwards) (Figure 21).

In 2030, net revenues under the GE scenario would amount to approximately MDL59 million (€3.2 million). Looking at cumulative values, investments in renewable energy and energy efficiency measures would be repaid within 10 years (by 2025), as opposed to BAU, where the cost is projected to continue to increase over time. The total cumulative net returns under the GE scenario would amount to MDL234 million (€12.8 million) by 2030 (Figure 22).

It is worth noting that these projections are based on the assumption that energy prices will remain constant in real terms between 2015 and 2030. Higher energy price increases in the projected period would result in additional savings, while declining energy prices would make the investment into renewable energies and energy efficiency measures less attractive, from an economic standpoint. Although these considerations do not include avoided fuel consumption for power generation and health improvements from reduced pollution, these benefits should also be taken into account.

Employment

The expansion of renewable energy capacity is likely to generate employment in construction as well as in the operation and management of wind turbines, solar panels and hydropower plants. The share of renewable energy jobs in total energy employment is projected to increase from 12 per cent to 57 per cent between 2015 and 2030, while it would decline from 12 per cent to about 6 per cent under the BAU scenario.

Looking at both renewable energy and energy efficiency-related jobs, an average of up to 643 additional jobs would be created between 2015 and 2030 (Figure 23), with up to 800 new energy efficiency-related jobs created in 2030. The decline of additional employment in the renewable energy sector after 2020 is entirely due to a reduced effort in expanding sector capacity (i.e., an aggressive increase up to 2020 followed by a slower expansion until 2030).

The creation of new jobs for the construction, installation and maintenance of the renewable energy infrastructure is projected to generate cumulative additional wages of approximately MDL353 million (€19 million) in 2030. The additional annual wages would thus amount to an average of MDL22 million (€1.2 million) between 2015 and 2030. This projection only accounts for employment directly created by investments in renewable energy (assuming that most of the manufacturing and installation of capacity utilises local labour force), and does not take into account the potential indirect employment creation across the value chain and other economic sectors.

The total number of new jobs created is nonetheless highly dependent on the policies deployed and on the domestic potential to manufacture and install the new renewable energy plants. Several studies indicate that the manufacturing of renewable energy plants is in fact more labour intensive than its fossil fuel counterpart (up to 8 times more than thermal power plants), but requires about the same labour intensity for operation and management.[95] This means that if solar panels, wind turbines and other technologies are imported and only installed by domestic labour force, the potential of this sector to generate new jobs would be significantly reduced.

Emissions

Investments in renewable energy sources are expected to reduce carbon dioxide emissions deriving from fossil fuel-based electricity generation. Projections show that up to 1.8 million tonnes of carbon dioxide emissions would be avoided in the year 2030. Cumulative avoided emissions over the simulated time period are estimated at 14.9 million tonnes of carbon dioxide, which will result in significant benefits for the health and productivity of the population and environment in Moldova.

Overall impact

Table 4 presents the main results of the analysis of the impact of energy efficiency and renewable energy interventions.

Table 4: Main results of the analysis of the impact of energy efficiency and renewable energy interventions				
Timescale (Year)	**2015**	**2020**	**2020**	**2025**
Annual investment (MDL Million)				
Energy efficiency				
BAU GE (RE+EE)	0 60	0 395	0 854	0 1 396
Renewable energy				
BAU GE (RE+EE)	0 60	0 30	0 6	0 5
Thermal energy				
BAU GE (RE+EE)	13 0	16 0	16 0	16 0
Total annual energy investment and operational and management costs				
BAU GE (RE+EE)	256 1 182	363 1 032	390 1 077	419 1 609
Expenditure and savings (MDL Million)				
Electricity expenditure savings				
GE (RE+EE)	98	640	1 387	2 269
Avoided thermal capacity investment				
GE (RE+EE)	13	16	16	16
Avoided energy import costs				
GE (RE+EE)	97	304	359	455
Total savings and avoided costs				
GE (RE+EE)	211	960	1 762	2 740
Net investment (savings – investment) (MDL Million)				
Total net annual savings minus investment				
BAU GE (RE+EE)	-14 -54	-20 -55	-21 35	-23 59
Cumulative total net annual savings minus investment				
BAU GE (RE+EE)	-131 -481	-1 668 -2 122	-3 548 34	-5 568 4 278
Emissions (tonnes)				
Avoided annual emissions from fossil fuel-based electricity generation				
GE (RE+EE)	54 310	637 098	1 220 930	1 803 718
Cumulative avoided annual emissions from fossil fuel-based electricity generation				
GE (RE+EE)	54 310	2 075 268	7 013 301	14 867 363
Employment				
Power and energy efficiency employment (Person)				
BAU GE (RE+EE)	265 879	274 854	287 797	300 1 123
Renewable energy employment as a share of total employment (%)				
BAU GE (RE+EE)	6% 85%	6% 81%	6% 58%	6% 57%
Additional wages generated (MDL Million)				
GE (RE+EE)	42	56	45	65

Note: RE = renewable energy; EE = energy efficiency

7. Policy considerations

The modelling described in this report estimates the impact of green economy policy interventions in Moldova's agriculture and energy sectors, selected in coordination with national stakeholders. These interventions are the expansion of organic agricultural land and increased investments in renewable energy capacity and energy efficiency improvements. The projections (Section 6) show that the policies are likely to result in economic growth, direct employment, poverty reduction, GHG emission reductions and improvements in natural capital (e.g., soil) preservation, as well as national resilience to external shocks (e.g., energy price volatility). In order to actually enact such policies, it is necessary to consider policy synergies and the role of enabling conditions. This section summarizes some broad issues of relevance under each of these themes, as well as the views expressed in some initial stakeholder consultations.

7.1. Policy synergies

Many framework policies exist that could have implications for Moldovan policy-making in the agricultural and energy sectors. Two of the most prominent for Moldova, considered here, are the SDGs and initiatives to align Moldovan policy with that of the EU.

Domestically, the Moldova Environmental Strategy for the years 2014–2023 and the Moldova Action Plan for Green Economy Promotion must be consistent with overall green economy policy for a transition to be successful.

7.1.1. Alignment with the SDGs

As the successors to the Millennium Development Goals, the SDGs will set out targets for countries to achieve regarding their development over the next 15 years. The SDGs are intended to promote sustainability as well as poverty reduction and economic development, and as such enjoy a number of natural synergies with green economy policies. The SDGs have not yet been finalized, so this review compares Moldova's potential green economy policies with the detailed proposals that have been published by the Open Working Group on SDGs.[96]

The expansion of land for organic agriculture and policies specific to renewable energy and energy efficiency in Moldova are likely to make positive contributions to at least 11 of the 17 proposed SDGs. These synergies are summarized in Table 5.

7.1.2. Alignment with the EU

Following the signing and ratification of the Association Agreement with the EU, a number of policy directives exist to align Moldova's policies with EU standards and regulations. Accelerating green economy efforts in agricultural and energy production and consumption will help in this respect. As identified by the Action Plan for Green Economy Promotion in Moldova, this may include the harmonization of legislation on emissions, biosafety, chemicals, waste, environmental impact assessment, soil and biodiversity protection and conservation.

EU policy in these areas is complex, and a dedicated review could usefully identify specific targets, standards and best practices in the use of economic and fiscal environmental instruments that Moldova could aim to align itself with through its green economy efforts. Key areas for such a review would include: performance-based building codes (Germany, France, EU Building Directive); electric utility quota obligations or renewable portfolio standards; efficiency standards and mandatory labelling for electrical appliances (all EU countries); energy efficiency obligations that can stimulate energy companies to invest in and promote energy savings in cooperation with customers and households (Denmark, France, Ireland, Italy and the United Kingdom).

More broadly – beyond this report's focus on agriculture and energy – aligning Moldova with the EU's integrated environmental monitoring systems and quality standards (e.g., monitoring of air, water and soil quality, biodiversity, protected natural areas, wetlands, noise and pollutant concentrations) can help improve transparency, accountability and environmental control and facilitate inter-ministerial coordination to promote green economy in the country. Comprehensive monitoring would facilitate

Table 5: Synergies with SDGs	
Proposed Sustainable Development Goal	**Impact of Moldovan green economy policies**
SDG 1: End poverty in all its forms everywhere	Organic agriculture provides income and employment for rural poor. Investment in renewables improves access to modern energy and employment for the poor and those living in rural areas.
SDG 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	Organic agriculture promotes sustainable agriculture.
SDG 3: Ensure healthy lives and promote well-being for all at all ages	Organic agriculture encourages and promotes healthier lifestyles and reduces health risks linked to the use of chemicals. Renewables will offset fossil fuels, with health benefits.
SDG 6: Ensure availability and sustainable management of water and sanitation for all	Organic agriculture reduces use of chemical fertilizers, improving water quality.
SDG 7: Ensure access to a¬ffordable, reliable, sustainable and modern energy for all	Investments in renewables improve access to modern energy sources and employment opportunities for the poor and those living in rural areas.
SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Organic agriculture provides additional income and employment for the rural poor. Investments in renewables improve access to modern energy sources and employment opportunities for the poor and those living in rural areas.
SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation	Energy efficiency improvements and increased domestic electricity production from clean energy sources would foster innovation, promote sustainable industrialisation and make human settlements more resilient to external factors, such as international energy price shocks.
SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable	Organic agriculture ensures sustainable food production. Energy efficiency improvements and increased domestic electricity production from clean energy sources would foster innovation, promote sustainable industrialization and make human settlements more resilient to external factors, such as international energy price shocks.
SDG 12: Ensure sustainable consumption and production patterns	Organic agriculture encourages sustainable consumption and production. Energy efficiency improvements and increased domestic electricity production from clean energy sources would foster innovation, promote sustainable industrialization and make human settlements more resilient to external factors, such as international energy price shocks.
SDG 13: Take urgent action to combat climate change and its impacts	Organic agriculture and renewables will reduce GHG emissions.
SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss	Actions to maintain soil nutrient reserves are expected to reduce land degradation and desertification. Improved energy availability through renewables will reduce illegal deforestation and help support preservation of natural capital and ecosystems.

the development of indicators and thereby support the formulation of legislation. It can further foster harmonisation with the EU product and export and energy certification, as well as with international environmental quality standards, and can support the emergence of natural capital accounting. Good monitoring also allows for financial penalties to be levied in response to violations of standards.

7.1.3. Domestic policy alignment

Section 3.4 outlines some of the influential policies for environment, social and economic development in Moldova. The two most prominent documents that influence transition are the *Moldova Environmental Strategy for the Years 2014–2023*[97] and the *Moldova Action Plan for the Implementation of the National Environmental Strategy for the years 2014–2023*.[98]

The environmental strategy speaks to the need for a break from the past economic development pathway "based on exploiting subsidised fossil fuel … inefficient and irrational use of natural heritage … and the neglect of environmental externalities."[99] Furthermore, the strategy recognizes that the green economy concept is not a replacement for sustainable development, but instead is a means, or pathway, for its achievement if implemented properly. The concept of linking environmental protection, economic development and society is gaining prominence in Moldova, and the strategy presents a specific objective contributing to the vision of a green economy for Moldova:[100]

- Integrate environmental protection, sustainable development, green economy development and climate change adaptation principles into all sectors of national economy.

This objective is supported by specific directions for action in agriculture and energy. While the analysis in previous sections looks at the potential impacts of greening agriculture and transport, these impacts cannot be achieved without supportive policies and actions. The environmental strategy suggests some actions that can be undertaken to spur transition.

For agriculture, the goal is to increase the share of organic farming to 5 per cent of total production by 2015, and 10 per cent by 2020 through:[101]

a) Promoting the production, processing and effective conduct of organic products in a way that increases farmers' income and welfare;

b) Encouraging the improvement of processing and marketing of primary agricultural products through supporting investments;

c) Conducting environmental training and awareness-raising programs for farmers and creating the necessary training and education infrastructure to further promote a sustainable agricultural system;

d) Developing environmentally friendly agricultural techniques and infrastructure; and

e) Implementing climate adaptation measures aimed at promoting agricultural crops that have the potential to succeed in the changed climate conditions (drought, high temperatures), treating soil, conserving water and reducing soil moisture loss through evaporation.

For energy, the suggested target is producing 20 per cent of total energy and 10 per cent of biofuel from renewable sources by 2020. This can be achieved by both efficiency and clean generation measures such as:

a) Public awareness about the need to save energy;

b) Reducing energy losses through investments in infrastructure, equipment and technologies; and

c) Exploiting renewable sources such as hydroelectricity, wind and solar.

The Action Plan for the Implementation of the National Environmental Strategy for the Years 2014–2023 provides 115 actions with associated time frames, responsible institutions, indicators, costs and financing sources (domestic and foreign) that contribute to the objectives of the strategy. With regards to the objective on the green economy alone (mentioned above), seven specific are actions listed, including:[102]

1. Integration of environmental protection, green economy development and climate change adaptation provisions into sectoral policy documents and relevant legislation;

2. Implementation of Green Offices through the e-Governance principles;

3. Strengthening public-private partnerships to promote principles and actions of green economy development;

4. Elaboration of the "Green Moldova" national trademark for ecologically clean products and processes; identification of "green" companies that will be entitled to use the registered trademark;

5. Introduction of an eco-labelling system;

6. Development of a green certificate system to reduce environmental pollution; and

7. Mitigating the impact of climate change and adaptation by promoting: biomass as a renewable source of energy, as well as biogas installations, to be used in rural households and communities; organic farming; and products with high energy efficiency (machinery and electrical equipment) that are operating on environmentally friendly technologies.

With a number of existing actions, policies and objectives in place already, Moldova is certainly being proactive in pursuing its green economy transition. While this indicates high motivation for transition, it also means that coordination of action, avoiding duplication of effort and cross-sectoral cooperation are all paramount to managing such a major transition. Couple this with the desire to link to SDGs and broader EU policy, and this challenging task is compounded. Ensuring a strong coordinating role, be it in the Ministry of Environment or elsewhere, is essential to achieving alignment and synergy across government and with key international frameworks and plans.

7.2. Enabling conditions

UNEP has defined enabling conditions as "conditions that make green sectors attractive opportunities for investors and businesses. If the right mix of fiscal measures, laws, norms, international frameworks, know-how and infrastructure is in place, then the green economy should emerge as a result of general economic activity."[103] Moldova recognizes the need for these conditions in the environmental strategy, specifically mentioning that change can be achieved through enabling conditions and their supporting tools, such as "regulations, taxation, [and] legal decisions."[104] Trying to create the right system of incentives is important because, ultimately, governments have a limited amount of resources to make change happen through direct means – and if incentives against sustainability are not removed, government-led changes may be ineffective or subsequently reversed. The right conditions will align the incentives of the private sector with sustainable activity and leverage their investment.

The below discussion of enabling conditions is drawn from suggestions and examples in international experience with policies that could be used to promote the changes in the agricultural and energy sectors modelled in this study (significant increases in investments for the expansion of organic agricultural land, the expansion of renewable energy capacity and energy efficiency improvements). It also notes policies that could play a more general role in promoting green economy policy-making across other sectors in Moldova.

7.2.1. Regulations, standards and informational tools

As outlined in the UNEP *Towards a Green Economy* report, a well-designed regulatory framework "can create rights and incentives that drive green economic activity, remove barriers to green investments and regulate the most harmful forms of unsustainable behaviour, either by creating minimum standards or prohibiting certain activities entirely." In addition, clear, consistent and reliable regulation "reduces regulatory and business risks, and increases the confidence of investors and markets."[105]

The design of such regulations should be specific to the Moldovan economy to ensure the implementation of measures, foster entrepreneurship and promote the growth of green economic activity. In order to assess the specific regulatory policies most relevant to Moldova, it would be necessary to carefully review existing regulation and to interview key stakeholders to better understand barriers to doing business. In the agriculture and energy sectors, for example, this might include:

- **Administrative complexity:** In some cases, administrative processes – such as around standards and permitting in the agricultural and energy sectors – may be unnecessarily complex or obstructionist, particularly where they have been created without taking into account the needs of green businesses, such as expanding organic agriculture or constructing renewable energy facilities. In such cases, administrative processes may be streamlined into a simpler, coordinated "one-stop-shop" facility; and timelines for processing administration related to green businesses can be prioritized, reducing uncertainty for investors.

- **Standards:** Weak standards related to conventional economic activity can reduce the cost of unsustainable activity, weakening the case for alternative green investments. For example, stringent standards for the environmental impacts of fertilizer use, pesticides and fossil energy generation can improve the case for investing in sustainable agriculture and energy, while reducing the environmental impacts of the conventional sector. In addition, standards are a key tool for helping businesses advertise and consumers identify sustainable goods and services. Standards that relate to food safety and animal and plant health, as well as technical product standards and labelling, are increasingly being used in international trade and can help support the competitiveness and emergence of Moldovan agriculture exports. They also tend to play a particularly important role in the promotion of energy efficiency, such as building codes and vehicle engine efficiency. They allow for branding, such as the "Green Moldova" national trademark for sustainable products and processes. Standards can range from voluntary to legally binding minimum performance requirements. This latter type of standard (e.g., reflected in EU legislation that requires a fixed percentage of biofuels to be sold within the general gasoline and diesel supply) is essentially a form of subsidy that creates a policy-driven flow of private finance to a particular sector. As such, the costs of such policies must be carefully weighed against the benefits, as well as any potential unanticipated impacts. An example here, particularly in light of the desire to further align with the EU, is the European Commission's Renewable Energy Directive, which requires EU countries to source 20 percent of their energy from renewables by 2020.[106]

- **Knowledge tools:** In some cases, a key barrier to change is a lack of knowledge about the action necessary to motivate and implement change. Governments can create public or public-private institutions intended to overcome this challenge. For example, energy efficiency measures offer rapid payback times and often stimulate employment and activity in small and large businesses. Energy savings companies can help businesses evaluate the savings from investing in areas such as improved technology or insulation, and calculate the payback time required to earn back the upfront costs of investment. Similarly, when renewable energy investors require comprehensive data on energy resources such as wind and solar intensity in order to calculate the profitability of investments, public authorities can help provide consistent and reliable data on such issues, and thereby reduce costs and uncertainty for investors. Particularly where access to new or unfamiliar technology is concerned, clear examples that demonstrate prudent cost-savings and effectiveness can be especially important in countries where there is scepticism about the benefits of a green economy.

Regulatory tools are weak without mechanisms to monitor and enforce compliance. Among Moldova's existing environmental regulations – in areas such as biodiversity, noise, water quality, waste management and planning, as well as environmental impact assessment requirements – compliance is often poor. Monitoring and enforcement for key policies should be reviewed and, where necessary, strengthened.

7.2.2. Fiscal policy instruments

Fiscal policy instruments involve either the collection of revenue, its expenditure or both. They include taxation and charges, the removal of harmful subsidies, the subsidisation of green sectors, hypothecation,* public expenditure on infrastructure, public procurement and other market mechanisms. Generally, fiscal policy instruments are able to influence prices and, as such, are powerful tools for influencing other economic actors.

- **Taxation and charges:** In addition to the general need to raise revenue, taxation and charges are

* Hypothecation of a tax is the allocation of the revenue from a specific tax for a specific expenditure purpose (as discussed at the end of 7.2.2.).

often justified on the basis of the externalities that are associated with any given good or service – that is to say, the costs to society that are not reflected in retail prices of the good or service itself. Shifting the burden of taxation onto socially harmful activities will reduce their occurrence, while improving the business case for alternatives and allowing for the reduction of taxes and charges on socially desirable things, such as labour, resulting in a so-called "double dividend." Environmentally related taxation can be used in many sectors, such as the extraction of minerals, non-renewable fuels, water, forests, wildlife and fisheries. A review of existing environmental tax legislation in Moldova can identify areas where taxes or charges can be introduced or raised. Key legislative and policy design issues that need to be considered include the impact on the poor, administrative costs and the impact on sectoral competitiveness.

- **Removal of harmful subsidies:** Most governments have a history of intervening in sectors of key importance to the security of a nation, such as agriculture and energy. Such support often takes the form of subsidies: policies that create a flow of benefits towards a company, industry or group of companies. Subsidies are often thought of as direct payments from governments to private actors, but they can also include tax reductions, low-cost loans, provision of government-owned goods and services and other forms of preferential treatment. Subsidies tend to favour incumbents and, as such, may be likely to favour traditional technologies and ways of doing business, undermining the shift to a green economy. As mentioned in section 7.1.3, Moldova recognizes the negative impact that subsidised fossil fuel has on the economy. Moldova should review the role of government intervention in key sectors of interest to the green economy and identify any support measures that are misaligned with its aims to promote organic agriculture, renewables and energy efficiency.

- **Subsidisation of green sectors:** Government resources are limited and cannot supply the level of investments required to drive the shift to a green economy. The strategic provision of subsidies can, however, play an important role in shifting large volumes of private finance, particularly where other policy tools are not possible for administrative or political reasons. Most EU Member States, for example, provide financial incentives for renewable energy, such as feed-in tariffs, value-added tax exemptions on equipment, rebates, grants and below-market loans. A study of feed-in tariffs in the EU Commission assessment of feed-in tariffs suggests that "tariffs achieve greater renewable energy penetration, and do so at lower costs."[107] While these market support mechanisms represent effective ways to drive change, they can be costly and ineffective if they are badly designed. They should be gradually phased out as soon as the market is mature and established.

- **Hypothecation:** Hypothecation refers to the practice of earmarking revenue from specific taxes and charges to specific – usually related – purposes, and as such often represents a linkage between the use of taxation and subsidisation. Such policies can be used to create facilities such as green funds, designed to lend finance at below-market rates for investments in green sectors. Similarly, revenues hypothecated to the National Environmental Fund and local ecological funds could support emerging energy needs, land management and investment in the emerging green economy, for example, by promoting biomass as a renewable source of energy, biogas installations, organic farming, products with high energy efficiency (machinery and electrical equipment) and environmentally friendly technologies. Hypothecation may reduce the flexibility of fiscal expenditure and, as such, should be considered within the larger context of Moldova's existing fiscal space.

7.2.3. Finance reform and access to credit

Access to emerging technologies may present uncertainties and carry risks, such as navigating and complying with new regulations. Therefore, access to financial markets, stable financial systems and a positive investment climate in Moldova is important in order to foster private sector investment. Public-private partnerships, if set up adequately, may be well suited to identifying market-competitive niches that Moldova has yet to exploit, and co-operatives can provide private sector approaches with broadly distributed benefits.

International finance mechanisms, such as climate change finance mechanisms, carbon accounting and national climate action plans, can stimulate and help coordinate the transition to a green economy at the national level. Many countries have been looking at the Green Climate Fund as a potential target to help bridge the financing gap in the coming regime, although it has not yet reached its ultimate objective of raising US$100 million per year.

In order to articulate their needs for mitigation, many countries have turned to Nationally Appropriate Mitigation Actions (NAMAs) as a mechanism for indicating what can be done to reduce emissions either unilaterally or with international financing support. Moldova has committed to a NAMA regarding its national 2020 emissions target,[108] but has not articulated specific NAMA actions. A focus on "financeable NAMAs" that can contribute to GHG mitigation and green economy transition in key sectors is worth considering as a follow up activity.

Furthermore, the development of an Intended Nationally Determined Contribution for Moldova will indicate to the international audience the key sectors for GHG mitigation in Moldova, and provide another opportunity for the country to indicate to potential financing bodies how GHG mitigation and green economic development can be pursued.

7.2.4. Greening government practice and expenditure

Governments should and can act as leaders in the green transition. Two direct ways in which government can reform its practices and expenditures to stimulate green transition, are fostering markets through procuring government goods from sustainable sources and targeting investment in ways that enable private sector investments in green transition. Local authorities can also help spur transition and markets at more localized levels through the same practices.

- **Sustainable public procurement:** As part of their general service, all governments are engaged in the large-scale purchase of goods and services every year. Governments represent such a large "buyer" in the national market that when they commit to making some or all of their procurement meet certain green criteria, they can send a strong message to suppliers and create economies of scale that spur innovation and efficiencies that increase supply and reduce prices for other buyers. This may include purchasing organic and sustainable agriculture in government and public facilities, such as schools, and requiring high standards of efficiency in public buildings and technology.

- **Infrastructure investments:** Some types of business require the right infrastructure in order to be cost-competitive, as no single actor can bear to supply the infrastructure alone. In such cases, government action can be vital in enabling private actors to move forward through investments. In the energy sector, for example, renewable energy generators may require the government to help connect remote facilities and adapt the electricity system to cope with variable demand.

7.2.5. Engaging capacity

One of the most important enabling conditions is capacity. Capacity may be required in the public sector, to help enable some of the policies identified above, or in the private sector, where people may lack the knowledge or skills required to take advantage of green business opportunities. Key interventions to create the conditions for policy implementation include:

- **Capacity-building programmes** for government agencies and institutions on green economy principles and policy instruments, focusing in particular on the enabling conditions needed to facilitate the introduction of innovative technologies and processes.

- **Training activities** to build national capacity prior to the implementation of key policy changes. For example, training programmes should be conducted for workers in the agriculture and fishery sectors in order to facilitate adaptation to new processes, technologies and techniques. This is particularly the case for standards and documentation requirements, which may be a particular challenge for small and medium-sized enterprises.

- **Information dissemination, outreach and awareness-raising campaigns** to increase the responsiveness of society to green policies, thereby facilitating community uptake of new practices.

- **Publicly funded research and development programmes** to ensure that green economy policy is evidence-based. Research should focus especially on the application of green economy technologies, processes and techniques in the local context, including through the establishment of testing and demonstration facilities (e.g., for sustainable agriculture technologies).

- **The synergy of efforts from relevant institutions and stakeholders** should be strengthened through the establishment of appropriate communication and collaboration channels. In particular, horizontal (e.g., inter-ministerial) and vertical (e.g., between national and local governments and NGOs) collaboration would help reduce the level of overlap between separate policies. Given Moldova's plans to increasingly harmonize its policies with relevant EU directives, coordination at the national and international levels will be helpful too.

- **The capacity of financial institutions** is a key area of importance in the private sector. Lending facilities often struggle to accurately assess the risk of unfamiliar business models, leading them to over-price the cost of capital to green businesses as a way of managing this uncertainty. Helping financial institutions to better understand and evaluate green business propositions can reduce the cost of capital and thereby facilitate a greater incentive for investors.

7.3. Incorporating stakeholder perspectives

Active discussion and engagement with local communities and municipal governments is needed to spread best practices. An inclusive, equitable green growth path requires maximising benefits from natural resources while minimising social and environmental costs and risks. Special efforts may be required to facilitate active participation and information sharing of local communities in the policy process and to ensure that benefits reach targeted stakeholders. This is particularly important given that small businesses and households may be less capable of managing unanticipated market shocks.

The following practical recommendations were elicited as part of a stakeholder input processes prior to national consultations on the green economy in Moldova:

- Environmental taxes can simultaneously provide incentives for pollution reduction and provide an important government revenue source to support forthcoming green economy interventions.

- Subsidies can promote emerging markets and green industry. Subsidy reform for organic agriculture is anticipated as a core theme on the agenda of the National Agency for Interventions and Payments.

- Employment can be stimulated through differences in import tariffs, which promote added value and may increase employment in Moldova. For example, a tariff policy can support the assembly of wind generators and solar thermal panels in Moldova by imposing a lower tariff on components than on fully assembled wind generators and solar panels.

- Industrial support interventions can include access to low-cost capital and a shortened licensing process for investments, among other incentives, to facilitate business development.

- GoM can support strategic research and development programmes linked to organic agriculture, green energy and industry, as a means of developing scientific platforms to leverage new environmental technologies. Opportunities exist to support emerging research programmes for the Moldovan Academy of Science and other universities specializing in technological innovation.

- GoM can facilitate knowledge transfer and the diffusion of green technologies through infrastructures such as science parks and business incubators. Free Economic Zones can provide needed incentives for attracting green industries.

- GoM could support green economy actions through specific projects from the National Ecological Fund and co-funding GE projects of development partners.

8. Conclusions

This study provides a quantitative assessment of the impact of green economy interventions on selected economic, social and environmental indicators for the specific context of Moldova. The results of this assessment are expected to support the national discussion on Moldova's green economy efforts in the context of the National Development Strategy "Moldova 2020" and the achievement of the SDGs. Two sectors were selected in the analysis of green economy scenarios: energy (i.e., energy efficiency and renewable energy) and agriculture (i.e., organic farming).

Results of the simulations show that the investment required to reach the stated goals is likely to generate economic and social returns. Higher agricultural value added can be obtained through increasing access to premium markets for organic products (e.g., in the expanding EU organic market) and improving soil quality in the medium-to-longer term. The transition to energy efficient technologies and the development of renewable energy sources would furthermore help cut energy costs (e.g., energy losses and fossil fuel import costs) and increase energy access across the country. Additional green jobs would be created in organic farming, energy efficiency and renewable energy sectors. Finally, investments in clean energy and organic farming are likely to reduce pressure on natural capital (e.g., soil, forests), while contributing to emission reductions and climate change mitigation efforts.

The results of this study should not be considered as definitive, as further data collection would be required to provide a fully customized analysis of sectoral trends and projections. Moreover, the study can be complemented by a more integrated and cross-sectoral analysis, possibly focusing on a larger number of sectors. Consequently, this analysis represents an exploratory exercise that seeks to highlight the benefits (and potential unintended consequences) of green economy interventions in Moldova and the potential synergies and complementarities between existing policy and investment options.

GoM is already actively engaged in the definition of institutional and policy frameworks conducive to a transition towards a green economy. The active participation of the country in international forums on sustainable development (e.g., Rio+20) and the interest demonstrated towards the realization of sustainable and environment-friendly development indicates that Moldova is ready to harness the opportunities deriving from green investments in key sectors. In this context, the results of this assessment are expected to provide guidance to national decision-makers for the selection of policy instruments that maximise economic benefits while ensuring social inclusiveness and environmental protection.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This project is funded by the EU

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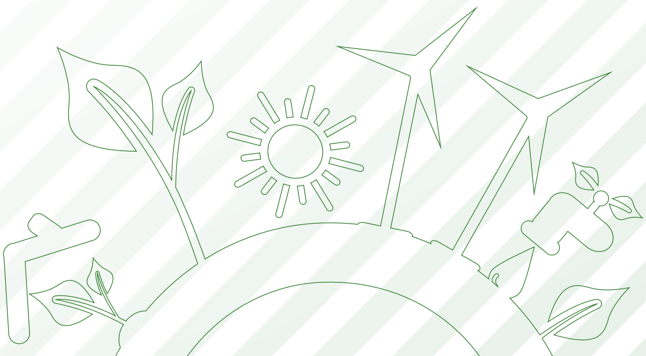

ISBN: 978-92-807-3464-5
Job number: RSO/1916/GE