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Report No: PAD2246

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT AND
INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN
IN THE AMOUNT OF US\$18.60 MILLION

AND

PROPOSED IDA CREDIT
IN THE AMOUNT OF US\$1.40 MILLION

AND

PROPOSED GLOBAL ENVIRONMENT FACILITY GRANT
IN THE AMOUNT OF US\$2.00 MILLION

TO THE

REPUBLIC OF MOLDOVA

FOR A

MOLDOVA CLIMATE ADAPTATION PROJECT
{RVP/CD CLEARANCE DATE}

Environment & Natural Resources Global Practice

Agriculture Global Practice

Social, Urban, Rural and Resilience Global Practice

EUROPE AND CENTRAL ASIA

Note to Task Teams:

1. Please modify amounts above and provide equivalent in US\$ if applicable.
2. For RVP/CD CLEARANCE DATE, enter the same date as on MOP.
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CURRENCY EQUIVALENTS

(Exchange Rate Effective { })

Currency Unit =

SDR XX = US\$1

US\$ XX = SDR 1

FISCAL YEAR

January 1 - December 31

Regional Vice President: Cyril E Muller

Country Director: Satu Kristiina J. Kahkonen

Country Manager: Alexander Kremer

Senior Global Practice Director: Julia Bucknall

Practice Manager: Valerie Hickey

Task Team Leader(s): Anatol Gobjila, Emilia Battaglini

ABBREVIATIONS AND ACRONYMS

ACP	Agriculture Competitiveness Project
ACSA	National Rural Development Agency
CERC	Contingent Emergency Response Component
CIAT	Center for Tropical Agriculture
CIS	Centralized Irrigation System
CPESS	Civil Protection and Emergency Situations Service
CPS	Country Partnership Strategy
CSA	Climate Smart Agriculture
DCRMP	Disaster Risk Management Project
DES	Department for Exceptional Situations
DRM	Disaster Risk Management
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESMF	Environmental and Social Assessment Framework
GDP	Gross Domestic Product
GEF	Global Environment Facility
GNI	Gross National Income
GOM	Grant Operational Manual
GRS	Grievance Redress Service
GRM	Grievance Redress Mechanism
IBRD	International Bank for Reconstruction and Development
ICAS	Forest Research and Management Institute
IDA	International Development Bank
IMF	International Monetary Fund
LPAs	Local Public Authorities
M&E	Monitoring & Evaluation System
MAFI	Ministry of Agriculture and Food Industry
MCC	Millennium Challenge Corporation
MDL	Moldovan Leu
MIA	Ministry of Internal Affairs
MOE	Ministry of Environment
MSU	Monitoring and Surveillance Unit
MTR	Mid-term Review
ND-GAIN	Notre Dame Global Adaptation Index
PDO	Project Development Objective
PMT	Project Management Team
POM	Project Operational Manual
POPs	Persistent Organic Pollutants
RF	Results Framework
RPF	Resettlement Policy Framework
SAAM	State Agency Apele Moldovei
SC	Steering Committee
UNDP	United Nations Development Programme
WUA	Water User Association

**BASIC INFORMATION**

Is this a regionally tagged project? No	Country(ies)	Lending Instrument Investment Project Financing
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- ☐ Situations of Urgent Need of Assistance or Capacity Constraints
- ☐ Financial Intermediaries
- ☐ Series of Projects

Approval Date 03-May-2017	Closing Date	Environmental Assessment Category B - Partial Assessment
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Bank/IFC Collaboration No

Proposed Development Objective(s)

The PDO is to enhance adoption of climate-smart agriculture and forestry practices in targeted landscapes and strengthen national disaster management systems.

Components

Component Name	Cost (US\$, millions)
Climate-resilient Practices in the Agriculture Sector	9.07
Climate-resilient Community Land Management	7.31
Climate and Disaster Risk Management	4.79
Project Management and Monitoring	0.92

Organizations

Borrower : Ministry of Finance



Implementing Agency : Ministry of Environment

<input type="checkbox"/> Counterpart Funding	<input checked="" type="checkbox"/> IBRD	<input checked="" type="checkbox"/> IDA Credit <input type="checkbox"/> Crisis Response Window <input type="checkbox"/> Regional Projects Window	<input type="checkbox"/> IDA Grant <input type="checkbox"/> Crisis Response Window <input type="checkbox"/> Regional Projects Window	<input checked="" type="checkbox"/> Trust Funds	<input type="checkbox"/> Parallel Financing
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Total Project Cost:

22.00

Total Financing:

22.00

Financing Gap:

0.00

Of Which Bank Financing (IBRD/IDA):

20.00

Financing (in US\$, millions)

Financing Source	Amount
Global Environment Facility (GEF)	2.00
International Bank for Reconstruction and Development	18.60
International Development Association (IDA)	1.40
Total	22.00

Expected Disbursements (in US\$, millions)

Fiscal Year	2017	2018	2019	2020	2021	2022	2023
Annual	0.02	1.56	3.24	4.68	5.16	3.96	1.60
Cumulative	0.02	1.58	4.82	9.50	14.66	18.62	20.00



INSTITUTIONAL DATA

Practice Area (Lead)

Environment & Natural Resources

Contributing Practice Areas

Agriculture

Social, Urban, Rural and Resilience Global Practice

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

Gender Tag

Does the project plan to undertake any of the following?

a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF

Yes

b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment

Yes

c. Include Indicators in results framework to monitor outcomes from actions identified in (b)

Yes

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category

Rating

1. Political and Governance

● High

2. Macroeconomic

● Substantial

3. Sector Strategies and Policies

● Moderate

4. Technical Design of Project or Program

● Moderate

5. Institutional Capacity for Implementation and Sustainability

● Substantial

6. Fiduciary

● Moderate

7. Environment and Social

● Low

8. Stakeholders

● Low



9. Other

10. Overall

● Moderate

COMPLIANCE**Policy**

Does the project depart from the CPF in content or in other significant respects?

☐ Yes ☒ No

Does the project require any waivers of Bank policies?

☒ Yes ☐ No

Have these been approved by Bank management?

☒ Yes ☐ No

Is approval for any policy waiver sought from the Board?

☐ Yes ☒ No**Safeguard Policies Triggered by the Project**

Yes

No

Environmental Assessment OP/BP 4.01

✓

Natural Habitats OP/BP 4.04

✓

Forests OP/BP 4.36

✓

Pest Management OP 4.09

✓

Physical Cultural Resources OP/BP 4.11

✓

Indigenous Peoples OP/BP 4.10

✓

Involuntary Resettlement OP/BP 4.12

✓

Safety of Dams OP/BP 4.37

✓

Projects on International Waterways OP/BP 7.50

✓

Projects in Disputed Areas OP/BP 7.60

✓

Legal Covenants

**Conditions****PROJECT TEAM****Bank Staff**

Name	Role	Specialization	Unit
Emilia Battaglini	Team Leader(ADM Responsible)		GEN03
Anatol Gobjila	Team Leader	Agriculture	GFA03
Elena Corman	Procurement Specialist(ADM Responsible)		GGO03
Oxana Druta	Financial Management Specialist		GGO21
Arcadii Capcelea	Safeguards Specialist	Environment	GEN03
Aurel Lozan	Team Member	Forestry	GENDR
Daniel Werner Kull	Team Member	Disaster Risk Management	GSU09
Grace O. Aguilar	Team Member	Team Assistant	GEN03
Jeren Kabayeva	Team Member	Agriculture, Operations	GFA03
Luis M. Schwarz	Team Member	Disbursement	WFALN
Mohamed Ghani Razaak	Safeguards Specialist	Social	GSU03
Nina Rinnerberger	Team Member		GEN03
Stephen Ling	Team Member		GEN01
Tamara Ursu	Team Member	Team Assistant - Chisinau	ECCMD
Tuukka Castren	Team Member	Forestry	GEN03

Extended Team

Name	Title	Organization	Location
Bogdan Popa	Landscape & Forestry Specialist		
Henry Phillips	Forestry Specialist	FAO	
Rajgopal Srinivasan	Senior Irrigation Specialist	World Bank	
Turi Fileccia	Senior Agronomist	FAO	Rome,Italy



The World Bank

Moldova Climate Adaptation Project (P155968)



MOLDOVA
MOLDOVA CLIMATE ADAPTATION PROJECT

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I. STRATEGIC CONTEXT

A. Country Context

1. **Despite many years of solid economic growth and impressive poverty reduction gains, Moldova remains vulnerable to economic and financial shocks and political instability.** Moldova is a landlocked country between Romania to the west and Ukraine to the north, east and south. The country has a surface area of 33,840 km², and is home to 3.6 million people with a Gross National Income (GNI) per capita of US\$2,240 (Atlas methodology, 2015). In the context of overall economic growth, Moldova has made significant progress in reducing poverty and boosting shared prosperity. The economy was growing at 5 percent annually after 2000, and the national poverty rate (below US\$5 per day) dropped from 68 to 11.4 percent between 2000 and 2014. Public and private transfers, namely pensions and remittances, as well as labor markets had an important role in reducing poverty. The Moldovan economy, however, moved into recession in 2015 (-0.5 percent growth in GDP) because of weaker external flows, large-scale banks fraud, and a drought. Economic slowdown in Russia and Ukraine, together with Russia's restrictions on agro-food imports from Moldova sharply reduced remittances from these countries and halved Moldova's exports to Russia. Further, a banking crisis brought on by massive fraud in three banks has lowered confidence in the banking sector, leading to significant interest rates and reduced credit to the private sector. The monetary and fiscal resolution of the three insolvent banks (12 percent of GDP) has led to higher public debt and lower foreign exchange reserves, damaged business confidence and reduced macroeconomic buffers to sustain economic shocks.

2. **Poverty is concentrated in rural areas where livelihoods depend on agriculture and natural resources that are increasingly at risk due to climate change.** Moldova remains one of the poorest countries in Europe. Poverty (US\$5 or less per day) is largely a rural phenomenon as rural national poverty stands at close to 19 percent (2013) compared to around 8 percent for urban areas (2012). With 57 percent of the population living in rural areas, 84 percent of the poor are concentrated there. Those in rural areas, poor and non-poor, rely more on agriculture and remittances for income sources than their urban counterparts who derive more income from non-agricultural employment. For example, rural areas felt the impact of the 2007 drought much more than urban areas, with poverty rates increasing from 31 percent in 2007 to a peak of 36 percent in 2009 in the affected areas. Stocks of agricultural products vanished in many rural households, and prices and expenditure in households' budgets for food and energy rapidly grew. Similarly, a severe summer drought in 2015, along with lower remittances and higher inflation, further pushed the poverty rate up to 41.9 percent in the affected areas. As the frequency of droughts and other extreme weather events is expected to increase due to climate change, lack of climate adaption measures and coping mechanisms will adversely impact food security, livelihoods and economic growth in vulnerable rural areas and further undermine progress made in poverty reduction.

B. Sectoral and Institutional Context

3. **Moldova is highly vulnerable to climate change especially in rural areas where the majority of poor live.** Moldova ranks among the most climate vulnerable country in Europe and Central Asia based on a range of



social and economic indicators and faces a number of adaptation challenges.¹ Climate models predict future mean temperature rises exceeding 2 degrees by mid-century, and a significant decline or slight increase in precipitation, depending on the region. Climate change is expected to increase the frequency and intensity of most extreme events and natural disasters (e.g. droughts and floods, as well as other severe weather events such as hailstorms, torrential rains, late frosts, heavy winds) and present new climate-related pest and disease challenges.² This will have important implications for economic growth, and especially for the rural poor, who are more dependent on natural resources and vulnerable to climate-related shocks with fewer resources to cope. Agriculture, water resources and forestry are among the sectors considered most at risk from climate change impacts, as are human health, energy and infrastructure. Agricultural productivity will significantly decrease due to increasing water stress on crops, even without accounting for the increasing impact of extreme weather events. Total water availability will fall below total demand within a couple of decades with implications for irrigation (which constitutes a vital input to improving resilience and therefore productivity of the agriculture sector). The productivity of Moldova's forests, whose estimated total economic value is USD66.77 million (2015), will also diminish and pathology (disease) patterns are expected to change. In addition, climate change will increase the vulnerability of people and assets to the impact of natural hazards and can significantly challenge the ability of a country to mitigate, prepare and respond to natural disasters.

4. The present total cost of inaction on climate adaptation is estimated at around USD600 million, equivalent to 6.5% of GDP. This value is expected to more than double in real terms by 2050 to around USD1.3 billion. In comparison, the direct costs of climate change by 2050 (i.e., the decrease in production caused by climate change, plus the increase in damage and costs of prevention) are expected to be of a similar magnitude at around USD1 billion, 70% of which are incurred in the agriculture sector (which faces the biggest challenges but also investment opportunities). While the costs of inaction cannot be completely eliminated, it can be significantly reduced by prioritizing and undertaking climate adaptation investments in key sectors and by improving the ability to manage climate and disaster risks, including preparing and responding more effectively and efficiently once a climate-related disaster occurs.

5. *Climate vulnerability in the agriculture sector.* Agriculture has traditionally been a key sector in Moldova's economy as Moldova's rich soils and mild climate are ideal for farming. The sector represents about 15.5 percent of Moldova's GDP (2014) with a current value of about 14.88 billion MDL (about US\$800 million, 2015). Agriculture employs nearly a third (28 percent) of the country's population, and agro-food exports account for roughly 50 percent of the country's total exports. Moldovan farms are largely dominated by small holdings of 0.8-10 ha. The sector is highly sensitive to weather conditions, and small-holders lack access to rural finance for investments to improve productivity and resilience in the sector. Access to irrigation, a vital input to the sector, is limited and only around 6 percent of the previous area (under Soviet times) is currently under functional irrigation. The average agricultural sector growth rate performance has been low at 3.6 percent per annum over the last 10 years, and most crop yields are around a quarter to a third lower than other Eastern European countries. While irrigation for agricultural land is a vital component to ensure sustainable development of the sector, as vegetable and fruit growing, cereal and fodder crops, and animal breeding require permanent access to water, further investment and capacity are needed to expand the up-take of irrigation services.

¹ According to the widely used Notre Dame Global Adaptation Index (ND-GAIN, <http://index.gain.org/>), which summarizes a country's vulnerability to climate change and other global challenges in combination with its readiness to improve resilience, Moldova ranks as the fourth most climate vulnerable country in Europe and Central Asia (behind Turkmenistan, Uzbekistan and Tajikistan) (January 2017).

² World Bank. 2016. Republic of Moldova – Moldova Climate Adaptation Investment Planning Technical Assistance. Report No: ACS18562.



6. In 2010 the Government of Moldova signed a Compact Agreement with Millennium Challenge Corporation (MCC) an initiative of the United States of America to support policies and programs that advance a country's progress in achieving sustainable economic growth and poverty reduction. The Moldova Compact Program (2010-2015) was the first opportunity for the country to rehabilitate some of the centralized irrigation schemes (CIS). Within the framework of the Transition to High Value Agriculture Project with a budget of around US\$80 million, the program reconstructed 10 CISs with a command area up to 11,728 ha with possible addition of another 3,500 ha within these schemes. The system cover 23 communities along Nistru and Prut River and will serve about 9,200 land users. Unfortunately, the program concentrated on bringing water to the hydrants only, while the on-farm development aspects were left to the farmers.

7. Climate change is expected to exacerbate existing challenges in the sector: Land degradation and soil erosion are projected to worsen (around 37 percent of all agricultural lands or 953,900ha (2015) are already degraded to some degree) and the productivity of most current crops may decline by 10-30 percent. The 2015 summer drought, an unprecedented extreme weather event in terms of severity and distribution, negatively impacted both agriculture and cattle herding and is expected to further contribute to the increase of rural poverty in the country, particularly for small to medium size farmers.³ Crop losses are also incurred from flooding, late frosts, hail and windstorms, all of which may worsen as a result from climate change. The expected annual cost of climate change impacts on the agriculture sector by 2050 is around USD700 million⁴. Climate-smart and sustainable agricultural technologies will be critical to increase the productivity and resilience of the agriculture sector and for managing future climate impacts.

8. ***Climate vulnerability of forest and pasture lands:*** While Moldova's forest cover is among the lowest (11 percent) in Europe, they provide critical habitat for biodiversity and other essential environmental benefits and services such as soil protection, water regulation and carbon sequestration. The forests are mainly broadleaved - oak, ash, hornbeam, black locust and poplar being the most significant species. Protective forest belts have a long tradition in Moldova, since 1947 when shelterbelts were first established to reduce soil erosion on agricultural land, and as riparian buffers for water sources and protection of transportation routes. The total extent of forest belts is 30,300 ha. The main species in forest belts are black locust (36%) and walnut (38%). Many areas are affected by illegal logging, abusive and uncontrolled grazing, waste pollution or other degradation factors. Different studies indicate that forest belts contribute to increased agricultural productivity. Pastures (land suitable for hay and grazing) occupy 14 percent of the total land used for agriculture in Moldova. Land degradation is evident in pasture areas and 48 percent are affected by different levels of degradation. The current productivity of pasture land has been estimated at 20-50 percent of its potential. Capacity for ecological restoration is limited and there is little awareness of the necessity to collect seed stands from provenances or genotypes that are more resilient to climate change. There is currently no capacity for containerized seedling production of any species.

9. Climate change is expected to further reduce the productivity of pastures and natural forests and change pathology patterns. The key climate change impacts up to 2050 are forecast to limit growth of tree species due to a decrease in water availability (different tree species will react differently, but native oak

³ FAO drought assessment.

⁴ Calculated from the difference in future production under the climate change and no-climate change scenarios (roughly USD430 million, including USD235 million from crops and USD195 million from livestock) and the portion of the increase in damages and losses that are attributable to the increased frequency and extent of extreme events (roughly USD270 million).



species are expected to fare better than non-native species) and increase the areas affected by pests (15 percent), the areas subject to drying (25 percent) and fire risk (30 percent), and soil erosion due to temperature increase, changes in precipitation and a reduction in year-round water availability. The greatest impact is expected to occur in the South (already the lowest forest cover at 8% of land area), followed by the Centre (with the greatest proportion of forests, 209,000 ha or 15% of total land area). Annual opportunity costs of inaction are estimated to be around US\$40 million, and to increase marginally over coming decades.

10. ***Climate and disaster risk management and emergency response:*** Moldova is exposed to a range of natural hazards, many of which are weather-related: torrential rain, hail, strong wind, floods, droughts, and landslides. While not always devastating, hydro-meteorological disasters can damage property and affect livelihood and can have a large cumulative effect on the country. The 2007 drought caused estimated losses of about US\$1 billion⁵ while the 2008 and 2010 floods cost the country about US\$120 million and US\$42 million respectively⁶. During the period 2011-2016 all natural disasters reported by the Civil Protection and Emergency Situations Service (CPESS) were weather and climate related. Current annualized costs of flooding are estimated to be around US\$100 million⁷, and expected to increase by several times over the coming decades as flood frequency and the volume of assets at risk increase. Building people resilience to prepare for and respond to climate disasters is critical to manage climate impacts and eradicate poverty. In Moldova disaster risk management is performed at different government levels, with CPESS, within the Ministry of Internal Affairs in charge of planning, coordinating and managing disaster preparedness and response. While DRM has improved over time it still based on outdated technology and limited connection/coverage in some parts of the country. Effective emergency response needs further strengthening. This requires bolstering sub-national command structures, facilities and equipment, and ensuring that local first responders, authorities, public services and businesses are better prepared.

11. ***Government programs, policies and institutions for climate change:*** In 2014, the Government of Moldova, through the Ministry of Environment and with support of UNDP and the Government of Austria, developed and approved a National Climate Change Adaptation Strategy, reviewing climate change vulnerabilities in the six sectors considered most vulnerable: agriculture, water resources, forestry, human health, energy and infrastructure. The strategy includes an Action Plan to 2020, at an estimated budget of US\$155 million, based on institutional and investment activities recommended within each sector. Intended to serve as an umbrella strategy that creates the enabling environment for specific sectors and ministries to “mainstream” climate change adaptation and risk management in their existing and future strategies, its goal is to “assure that the Republic of Moldova’s social and economic development is less vulnerable to climate change impacts by becoming more resilient.” It recognizes that this will require a coordinated response across key sectors.

12. The National Plan for Afforestation (NPA) covers the period 2015-18 and envisages the afforestation of 13,000 ha (10,300 ha restoration of degraded lands and 2,700 ha of new riparian buffers and forest belts). Objectives of the NPA include increased sustainability of land resources managed by LPAs, improved landscape

⁵ World Bank (2010). *Project Appraisal Document: Disaster and Climate Risk Management Project*. Report No: 53050-MD, World Bank, Washington, D.C.

⁶ Republic of Moldova (2010). *Post Disaster Needs Assessment: Floods 2010*. Prepared by the Government of the Republic of Moldova with support from the European Union, the United Nations, and the World Bank

⁷ WBG & GFDRR (2016). *Europe and Central Asia (ECA) Risk Profiles*. World Bank Group and Global Facility for Disaster Reduction and Recovery, Washington, D.C.



level climate resilience and improved public awareness concerning sustainable land use practices. The areas identified for action in the NPA are currently mostly owned by Local Public Authorities (LPAs) and have been included in the NPA based on proposals from local communities reflecting their willingness towards allocating degraded lands for landscape restoration. Since the NPA was approved in 2015, only limited areas (around 1,000ha) have in fact been afforested.

13. In 2016, the World Bank supported the Government to carry out a more systematic analysis⁸ of the costs of inaction within the most vulnerable sectors and the potential volumes and cost-benefit of physical investments for climate adaptation. It showed that the biggest challenges and investment opportunities are in agriculture, which includes scaling up adoption of irrigation (which has proved to be the most efficient way to address drought risks), through rehabilitation and modernization of centralized small-scale irrigation systems and drainage infrastructure, combined with institutional capacity-building for management of irrigation systems. Other options include soil management and climate risk management technologies (e.g., anti-hail nets), and the potential for changes in crop mix towards perennial crops (i.e., grapes and fruit trees), which will be more resilient to climate change. In forestry, areas for immediate interventions are ecological reconstruction of the present forest estate and the expansion of forest vegetation, including the creation of new forest shelter belts. On disaster risk management, a set of modest investments, such as for emergency prevention and preparedness and improving emergency response capabilities, is expected to provide key gains for public safety as well as substantial economic returns. The proposed Project builds on the findings of the TA and will contribute to implementing some of the recommended adaptation investments.

C. Higher Level Objectives to which the Project Contributes

14. The Project will contribute to the World Bank's twin goals to end extreme poverty and to promote shared prosperity in a sustainable manner by reducing the vulnerability of rural households, which represent a disproportionately high share of the bottom 40 percent, to the impacts of climate change and enhance the capacity of government institutions, key stakeholders, communities and the public to manage climate change risks. The Project is well aligned with the FY14-17 Country Partnership Strategy (CPS) between the Republic of Moldova and the World Bank, and contributes to the third pillar on "promoting a green, clean and resilient Moldova." In addition, the Project will contribute towards the IDA-17 commitment "*to scale up support to IDA countries to develop and implement country-led, multi-sectoral plans and investments for managing climate and disaster risk*". The Project also supports the World Bank Group Climate Change Action Plan⁹, which aims to scale up climate action and integrate climate change across its operations with a major emphasis on increasing resilience and climate adaptation of client countries.

15. The Project is also fully consistent with the GEF Land Degradation Focal Area and will contribute towards Strategic Objective LD-1 – *Maintain or improve flows of agro-ecosystem services to sustain livelihoods of local communities*, and Strategic Objective LD-3 – *Reduce pressures on natural resources from competing land uses in the wider landscape*. GEF financing will contribute directly to Aichi targets 5, 7 and 15, referring to reducing the rate of loss of natural habitats, biodiversity-friendly sustainable land management and restoration of degraded ecosystems, respectively. Support to local level land management planning and community consultations will support achievement of Aichi target 14 on protection of environmental services taking into account the needs

⁸ World Bank, Technical Assistance, Moldova Climate Adaptation Investment Planning (Oct 2016), Report No: ACS18562.

⁹ World Bank Group Climate Change Action Plan (April 7, 2016), <http://pubdocs.worldbank.org/en/677331460056382875/WBG-Climate-Change-Action-Plan-public-version.pdf>



of women, indigenous and local communities, and the poor and vulnerable.

16. The Project supports the Government's Action Plan for the Implementation of the Climate Change Adaptation Strategy to 2020 that was approved in 2014 as well as the Nationally Determined Contribution (NDC) that was signed in 2016 following the UNFCCC Paris Agreement.¹⁰ To address the multi-faceted challenge posed by climate change the Project takes an integrated approach to managing climate risks in two ways. It looks at the rural landscape as a continuum between agricultural, forest and pasture lands since the livelihoods and resilience of poor rural communities depend on the mutually sustainable management of these natural resources. It also takes an ex-ante and ex-post approach to climate change adaptation by taking preventive measures to reduce the vulnerability of rural populations to climate impacts as well as strengthening the government capacity to manage and respond to climate-related disasters once they occur.

I. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

17. The Project Development Objective (PDO) is to enhance adoption of climate-smart agriculture, pasture and forestry practices in targeted landscapes and strengthen national disaster management systems.

B. Project Beneficiaries

18. The Project direct beneficiaries include individual farmers and agriculture producers, Water User Associations and their members, Local Public Authorities (LPAs) and the communities they represent, and the public institutions that are active in the agriculture, irrigation, forestry and disaster risk management sectors. While interventions aimed at rural farmers are demand-driven, the Project estimates that some 600 farmers across the country could receive direct financial support to improve the resilience of their agricultural practices and some 4,000 farmers would benefit from the education and knowledge sharing programs. Interventions to increase the up-take of irrigation target 10 WUAs and their members although the uptake will depend on actual farmers' demand. Interventions to improve the planning and management of community-owned degraded lands target LPAs in 6 raions with an estimated participation of some 100 LPAs and their communities. Training and institutional strengthening activities will benefit farmers, WUAs, and staff of institutions involved in the Project, including ICAS, SDA, Moldsilva, local state forest enterprises and the Civil Protection and Emergency Situations Service (CPESS). Finally, strengthening disaster preparedness and response will benefit the population at large.

C. PDO-Level Results Indicators

19. Project Development Objective indicators include:
- a. Area of agricultural land with climate-smart technologies adopted (hectare);
 - b. Area of agricultural land with improved access to existing irrigation services (hectares);
 - c. Area of forest land and pastures rehabilitated or under improved climate-smart management (hectare);
 - d. Average Emergency Response Time (minutes).

¹⁰ Moldova signed the Paris Agreement on September 21, 2016.



II. PROJECT DESCRIPTION

A. Project Components

COMPONENT 1. Climate-resilient Practices in the Agriculture Sector (US\$9.16 million).

20. This component aims to enhance adoption of climate-resilient agriculture practices in selected rural landscapes by supporting: (i) scale-up of farmers' climate-smart agricultural (CSA) practices and provision of related-advisory services; and (ii) expanded up-take of irrigation services.

21. **Sub-component 1.1. Scale-up of Farmers' Climate Smart Agricultural Practices (US\$ 7.09 million).** Sub-component 1.1 will provide technical advisory services and matching grants to eligible farmers and agricultural producers, including rural households and private/agricultural entities to scale up successful climate adaptation measures on agricultural farmlands. The Project will make available climate adaptation grants for on-farm climate-smart investments and technologies such as anti-hail protection, rain water/surface water harvesting, drip irrigation, greenhouse climate control systems; no-till and other soil conservation measures (examples of potential interventions are in Annex 5). It is anticipated that the great majority of grants will benefit farmers operating on small plots and will support micro-investments for low-cost solutions with the remaining grants targeted at bigger, commercial farmers for small- and medium-size investments in more complex technologies. The grant size and co-financing ratio will vary depending on the type and size of investments. Eligible micro-investments could receive a grant up to US\$2,200 and would require at least 10 percent co-financing; small-size investments could receive a grant up to US\$20,000 and would require at least 30 percent co-financing; medium-size investments could receive a grant up to US\$40,000 and require at least 50% co-financing. Eligibility criteria will include among others: (i) land titling rights; (ii) willingness to contribute financially; (iii) commitment to participate in capacity building activities; and (iv) willingness to provide access to the farm/site for knowledge and experience sharing. Extension services and matching grants will be delivered by the National Rural Development Agency (ACSA) given its experience and successful performance in managing similar grants in the agriculture sector under Bank-funded projects and its country-wide network.

22. **Sub-component 1.2. Expanded up-take of irrigation services (US\$2.07 million).** Sub-component 1.2 will provide equipment to WUAs to help their member-farmers access irrigation schemes that were recently rehabilitated under the US-funded Millennium Challenge Corporation (MCC). This activity will address the current lack of adequate and appropriate on-farm irrigation equipment (e.g. mobile aspersion irrigation machines with reel and console and a hydraulic turbine) that can satisfy the minimum pumping capacity requirement of the rehabilitated MCC schemes. This sub-component will also provide capacity building to WUAs to manage irrigation more effectively and improve their governance and management processes. Capacity building will be delivered by the Sustainable Development Account (SDA) Moldova, a public institution established to ensure sustainability of the MCC program. Finally, the sub-component will finance the review of current functions of Apele Moldovei to identify the required measures to enhance its role in monitoring and supporting WUAs.

COMPONENT 2. Climate-resilient Forest and Pasture Management (US\$7.33 million)

23. This component aims to improve climate resilience of forest and pasture lands through restoration and



improved climate-smart management. The first sub-component focuses on afforestation¹¹ and rehabilitation of degraded lands and pastures. The second sub-component will support provision of climate-adapted forest reproductive material (seeds and seedlings) and capacity building on ecological restoration of natural forests.

24. **Sub-component 2.1. Community Forest and Pasture Management (US\$4.56 million).** Activities will support integrated participatory forest and pasture management planning at the community-level (Local Public Authority, LPA), as well as investments in afforestation and rehabilitation of community lands and pastures in six priority raions (districts). The Project will finance LPA-level landscape mapping (i.e. land use “master plans”) and 10-year management plans for approximately 27,000ha of forest land and pastures that aim to a more efficient and sustainable use of these resources. Eligibility criteria for participating LPAs include, among others: willingness to participate, capacity and opportunity for collaboration with neighboring LPAs, and availability of suitable land. Investments in selected LPAs \ will include restoring approximately 700 ha of degraded pastures and 1,200 ha of other degraded communal land, as well as establishing and restoring 1,320 ha of agricultural or riparian shelterbelts. The planning process will be undertaken jointly by ICAS (Institutului de Cercetări și Amenajări Silvice)¹² and the LPAs. Technical field work will be contracted to the State Forest Enterprises (SFEs) and private sector on a competitive basis.

25. **Sub-component 2.2. Ecological Restoration of Degraded Forests (US\$2.77 million).** This sub-component will include establishment of a National Centre for Forest Genetics and Seeds (NCFGs) within ICAS to improve production capacity (both quantity and quality) of certified forest reproductive material mainly from native climate resilient species. The NCFGs will be responsible for: seed base management; regeneration material certification; seed processing and conditioning; production of containerized seedlings (nursery); and genetic research and *in vitro* multiplication. The Project will specifically invest in containerized seedling production (annual capacity of approximately 1 million seedlings), equipment for processing seeds, nursery equipment, and laboratory equipment for quality assessment, as well as related civil works. Capacity building and training activities for the benefit of ICAS and Moldsilva staff will focus on nurseries, forest reproductive material, and climate-resilient ecological restoration, as well as hands-on practice through field trials and demonstration sites.

COMPONENT 3. Climate and Disaster Risk Management (US\$4.55 million)

26. This component aims to strengthen Moldova’s climate and disaster risk management systems and, in the event of an eligible crisis or emergency, provide immediate financing to respond quickly to such emergency.

27. **Sub-component 3.1. Improving climate-related disaster preparedness and response (US\$4.55 million).** This sub-component aims to strengthen the capacity of national and regional Civil Protection authorities to prepare for and respond to extreme weather events linked to climate change by supporting (i) preparedness and response equipment and training (ii) modernization and upgrading of the Balti regional Emergency Command Center (ECC) to international standards. The provision of equipment and certified training, such as the renewal of fire and rescue units, will reduce critical response time and improve the safety and efficiency of interventions. A decrease of the environmental impact of emergency operations (due to more modern

¹¹ Includes both reforestation and afforestation.

¹² State forest research and management institute that has had previous experience with similar projects funded by the World Bank/BioCarbon Fund.



environmentally-friendly equipment), a more streamlined management process, and reduced maintenance costs are expected. The refurbishment of the regional ECC in Balti will provide redundancy and interoperability to the national emergency management system, ensuring a modern and continuous management of incidents of diverse scales at local and national levels, and will render a more efficient use of resources for emergency preparedness and response. The regional ECC will further facilitate joint disaster response with local agency representatives. Training of ECC staff will enhance crisis management decision-making processes, allowing CPESS to issue timely warnings and undertake prevention and response measures, including evacuating affected populations.

28. **Sub-component 3.2. Contingent Emergency Response Facility (US\$0 million).** The objective of this sub-component is to improve Moldova's capacity to better respond to disasters. Following an adverse natural or man-made event that causes a major disaster; the Government of Moldova may request the Bank to re-allocate project funds to this component to partially cover emergency response and recovery costs. This sub-component could also be used to channel additional funds should they become available as a result of the emergency.

COMPONENT 4. Project Management and Monitoring (US\$0.96 million).

29. This component will finance the operating costs of a Project Management Team (PMT) housed within the Ministry of Environment (MOE) to carry out project management functions for the Project. Support will be provided for procurement, financial management, environmental and social safeguards, coordination, reporting, and monitoring and evaluation. The PMT will be responsible for coordination among the implementing agencies to ensure smooth project implementation.

B. Project Cost and Financing

30. The Project has a total cost of US\$22.00 million and would be implemented over six-year period. The financing instrument is a Specific Investment Loan (SIL) of \$22 million of which US\$18.60 million are on IBRD terms, US\$1.40 million financed on IDA credit terms, and US\$2.00 million as a grant from the Global Environment Facility (GEF).

Project Components	Project cost	IBRD Financing	IDA Financing	GEF Financing
1: Climate-resilient Practices in the Agriculture Sector	US\$9.16 M			
<i>1.1: Scale-up of farmers' CSA practices</i>	<i>US\$7.09 M</i>	<i>US\$5.69M</i>	<i>US\$1.40 M</i>	
<i>1.2: Expanded up-take of irrigation services</i>	<i>US\$2.07 M</i>	<i>US\$2.07 M</i>		
2: Climate-resilient Forest and Pasture Management	US\$7.33 M			
<i>2.1: Community forest and pasture management</i>	<i>US\$4.56 M</i>	<i>US\$2.56 M</i>		<i>US\$2.00 M</i>
<i>2.2: Ecological Restoration of Degraded Forests</i>	<i>US\$2.77 M</i>	<i>US\$2.77 M</i>		



3: Climate and Disaster Risk Management	US\$4.55 M			
3.1: Improving Climate-related Disaster Preparedness and Response	US\$4.55 M	US\$4.55 M		
3.2: Contingent Emergency Response Facility	US\$0 M	US\$0 M		
4: Project Management and Monitoring	US\$0.96 M			
Total Project Costs	US\$22.00 M	US\$18.60 M	US\$1.40 M	US\$2.00 M
Front End Fees	[TBD]			
Total Financing Required	22.00			

31. *Rational for GEF Financing.* The Project will be partly financed by a US\$ 2 million grant from the Global Environment Facility (GEF) Land Degradation focal area. GEF financing will support activities under Component 2.1 and specifically afforestation and rehabilitation of forest belts and degraded pastures (LD-1 Program 1) and preparation of integrated and participatory forest/pasture management plans for selected LPAs (LD-3 Program 4). GEF support will help LPAs to develop modern management plans for community-owned land, rehabilitate degraded lands, improve and increase forest coverage and improve the overall management of lands that have suffered from inadequate management. Improved forest and pasture management practices would provide multiple benefits: improved livelihoods for rural population, carbon sequestration and prevention of further degradation. Without additional grant financing the area covered by afforestation and rehabilitation of forest belts and degraded pastures and the related demonstration effect and uptake of improved land management practices would be significantly reduced. Additionally, increased use of native oak species would replace the use of black locust (*Robinia pseudoacacia*), which is an introduced species currently widely used in Moldova. Without additional GEF support it is likely that dominance of fast growing exotic species would continue.

C. Lessons Learned and Reflected in the Project Design

32. The Bank's recent review of investment operations in the country reveals that projects can be more effective and impactful when acting as a catalyst for future reforms rather than being anchored to very difficult and lengthy reform processes. In particular, lessons show that projects that work with weak institutions are implemented more efficiently when a reform process is already underway. In the case of the proposed Project, both Moldsilva and Apele Moldovei face serious institutional constraints but have not yet initiated reform processes to address them. The Project design was therefore adjusted to take into account the risk associated with this weak institutional context and focused on working more closely with the target beneficiaries (small farmers and rural communities) by relying on technical subsidiaries, including ICAS, SDA, state forest enterprises, and WUAs for the implementation of core activities.

33. An emerging lesson from the recently completed Disaster and Climate Risk Management Project is that the use of project management teams for fiduciary and compliance purposes as well as for overall coordination is an extremely practical and valuable arrangement, particularly when the project involves several implementing agencies. To build on this lesson, the PMT has been involved early in Project preparation to



ensure that: (i) the PMTs have an organically developed understanding of the Project; (ii) other implementing agencies quickly gain a clear understanding of the PMT's role in implementation; and (iii) enable early detection of potential misconceptions about roles and responsibilities of PMTs versus implementing agencies, thereby allowing corrective action before the Project begins implementation.

34. A review of the implementation of the Bank-financed projects in the rural sector provided a clear lesson that the best stimulant for widespread adoption of new or additional technologies is demonstration of benefits. The best aid for demonstration is demonstration plots or sites, for which grant funding is required to co-finance the investment and advisory costs for the pioneering farmers. The Project will, therefore, explore opportunities for scaling-up these practices by combining a matching grant program with provision of related extension services. It is envisaged that all sub-projects of the climate adaptation grants (estimated to be 600) will become the venues for a broader audience of farmers (estimated to be around 4,000), at which they will become familiar with climate smart agriculture technologies and techniques through a Farmer Field School approach.

35. The Project design also builds on the recommendations provided in the Moldova Forestry Note and Social Accountability Review: Forestry in Moldova, as well as on the experiences derived from the ENPI East Countries FLEG II Program that highlighted the fact that engaging local public authorities in forestry management is an effective way to mainstream climate change into community-level planning. However, most often LPAs have neither resources nor capacity for forest management and do not meet the legal requirements for forest management. Therefore, preparation of forestry management plans, and rapid implementation of these plans by the LPAs are central part of the Project design. The Project will primarily focus on local needs and will aim to (i) strengthen capacity for community forests, and (ii) improve governance at the local level, including cooperation between state forest units and public and private sector.

III. IMPLEMENTATION

A. Institutional and Implementation Arrangements

36. This multi-sectoral Project will be implemented by the 3 ministries that are responsible for agriculture, forestry and civil protection respectively, under the oversight and coordination of the State Chancellery. The Ministry of Agriculture and Food Industry (MAFI) will implement Component 1 through ACSA, a service provider that will be contracted to manage the matching grant scheme and related capacity building to farmers; and through the agency SDA which will provide technical assistance and capacity building to WUAs. The Ministry of Environment (MOE) will implement Component 2 through the agency ICAS which will provide technical assistance to LPAs for the development of forest and pasture management plans; the implementation of forestry and pasture management work will be contracted competitively to local state forest enterprises and private contractor if available. The Ministry of Internal Affairs (MIA) will implement Component 3 through its Civil Protection and Emergency Response Service. An existing inter-ministerial Steering Committee (SC), chaired by the State Chancellery, will have the overall responsibility for coordinating and monitoring the implementation of the Project and will be the highest-level counterpart for the World Bank.

37. *Overall Project Management:* An existing, well experienced Project Management Team (PMT) that was established in the Ministry of Environment (MOE) to implement Bank-funded projects will manage all fiduciary arrangements for the Project. The PMT consists of the project manager, financial management officer,



procurement specialist, project assistant and a driver. Additionally, safeguards and M&E specialists will be recruited specifically for this Project.

B. Results Monitoring and Evaluation

38. The Project Results Framework (RF) is provided in Section VII of this PAD. The Project's Monitoring & Evaluation (M&E) system will be based on: (i) continuous data collection; (ii) regular monitoring of the results of all Project component interventions; (iii) the Project baseline survey; and (iv) Mid-Term review (MTR), and final impact assessment. Data collection and monitoring of outcomes and results will occur at the level of all Project entities, and will be consolidated by the PMT's M&E Specialist. Each Project entity will have adequate staffing and technical capacity to properly implement data collection and monitoring. A baseline study will be carried out to determine the initial conditions of the Project. The baseline will focus on determining the current status of variables that are directly pertinent to the Project interventions. Given the specific nature of some of the activities under Component 1 and 2, i.e., their narrow focus on easily identifiable Project beneficiaries and/or targets, the baseline variables will be defined at the inception of these activities. The key participating Project entities and service providers (ACSA, ICAS, SDA and CPESS) will provide semi-annual progress reports using a set of agreed monitoring variables as provided in the Project Results Framework, to report the implementation progress of their respective components. Adjustments, if needed, can be introduced to fine-tune the agreed monitorable variables as the Project progresses.

C. Sustainability

39. **Institutional Sustainability.** Government commitment to the Project objective is an essential requirement for Project sustainability. Climate change adaptation is high on the Government agenda as demonstrated by the commitment made for IDA-17 replenishment and the willingness to pilot climate resilient measures in previous operations. The Government ownership of this operation has been strong since the very beginning of Project preparation when it made available staff and technical experts – through a grant from the Europe and Central Asia Capacity Development (ECAPDEV) Trust Fund - to help to develop the Project concept and design the Project components and activities. The Project enjoys the support of the three implementing ministries as well as the State Chancellery, which is in charge of donor aid coordination and will lead an inter-ministerial steering committee to guide and oversee Project implementation that includes the Ministry of Finance. The fiduciary PMT includes well-qualified staff with experience in other Bank-financed projects (e.g. the Disaster and Climate Risk Management Project). ACSA, ICAS and CPESS have also had previous experience in implementing Bank-financed projects. The Project will support institutional strengthening through technical training and capacity building of WUAs, ICAS, SDA, LPAs, and state forest enterprises (SFEs).

40. **Technical and Financial Sustainability.** The Project builds on and scales up interventions previously piloted and successfully implemented under other projects. Climate-resilient agricultural technology and practices have been previously tested (in Moldova and elsewhere) and are likely to be maintained after the Project given their impact on increased productivity and livelihoods. WUAs will be responsible for the operations and maintenance of the equipment provided by the Project for the benefit of their members. The Project provides capacity building for WUAs that would include improving asset management. Maintenance of rehabilitated degraded forest and pasture land will be ensured by long-term service contracts between communities and the service providers. The long-term sustainability of investments made for the benefit of public agencies will depend upon continuing Government budgetary support and sufficient institutional



capacity. Government and implementing agencies are aware of the need to ensure adequate operating and maintenance budgets and the expectation is that financial support will continue given the level of commitment already demonstrated.

D. Role of Partners

41. Several development partners are active in the area of climate change adaptation and disaster risk management in Moldova including the European Union, EBRD, EIB, Austrian Development Cooperation, Swiss Development Agency, UNDP, USAID, IFAD. As part of the IDA-17 commitments, the government is preparing a Climate Adaptation Investment Plan that would help to coordinate climate financing from various donors and sources. The Project is a significant building block of the plan. The Project is also partnering with GEF who is providing direct co-financing for rehabilitation of degraded lands and with GFDRR who is providing a parallel technical assistance grant for disaster risk management.

IV. KEY RISKS

A. Overall Risk Rating and Explanation of Key Risks

Table 1: Risk Ratings Summary Table

Risk Categories	Rating (H, S, M or L)
1. Political and governance	H
2. Macroeconomic	S
3. Sector strategies and policies	M
4. Technical design of project or program	M
5. Institutional capacity for implementation and sustainability	S
6. Fiduciary	M
7. Environmental and social	L
8. Stakeholders	L
9. Other	n/a
Overall	M

Risk ratings: H = High; S = Substantial; M = Moderate; L = Low

42. The Project's overall risk rating for implementation is moderate. The sources of risk most intrinsic to the Project are of lower magnitude as the technical design is mostly based on activities that have already been successfully piloted in Moldova, and whose relevance for climate adaptation is well established. Project management will be conducted by an established PMT with experience of successfully implementing multiple projects, including the Bank-financed DCRMP. The incorporation of experience and lessons learned from previous and current projects in the Project design reduces the likelihood of project risks associated with design, environmental and social issues, and stakeholder participation.

43. There are more substantial macroeconomic risks associated with the financial sector, vulnerabilities to external and climatic shocks, and institutional weaknesses and related slippages in the implementation of macroeconomic and structural reforms. Institutional risks to implementation are also significant, given the



multi-sectoral nature of the operation and the weaknesses and limited managerial capacity of two state agencies, Moldsilva, the state forestry agency and Apele Moldovei, the state water agency. The former risk is mitigated by the use of the SC as the body overseeing Project implementation. The latter risk is reduced by relying on technical subsidiaries (ICAS, SDA, state forest enterprises) and WUAs for the implementation of core activities. Political and governance risks are considered high given the serious political instability that brought seven substantive or interim heads of Government and three periods without a Government between September 2014 and January 2016, and the worsening of corruption indicators.

V. APPRAISAL SUMMARY

A. Economic and Financial (if applicable) Analysis

44. The ex-ante economic and financial analysis suggests that Project-supported investments will generate substantial benefits for beneficiaries in areas served by the Project, as well as substantial benefits for Moldova's society as a whole. Overall, the NPV is projected to reach US\$ 18 million (using 6 percent discount rate). The investments evaluated for the economic analysis will generate an internal rate of return of 27 percent. The economic analysis thus shows that if Project implementation is effective and efficient, Project-supported investments will bring substantial economic benefits to the beneficiaries. Due to data limitation, this assessment focuses only on short-term impacts as well as direct impacts. It does not take into account long-term effects nor indirect impacts – which the specialized literature suggests are positive and non-negligible. Therefore, the Project estimates correspond to conservative estimates or a lower bound of potential benefits. It is important to keep in mind that relevant data is scarce and not easily available. Therefore, this economic analysis, and its results, should be interpreted with caution. More data collection at the producer level is essential to have a better picture of the associated benefits.

B. Technical

45. The Project is designed to scale-up interventions that were piloted and successfully implemented under three previous Bank operations: the ongoing Agriculture Competitiveness Project, ACP (2012-19; US\$46.54 million), which supports mainstreaming agro-environmental and sustainable land management practices as a way to enhance the competitiveness of the agro-food sector; the Disaster and Climate Risk Management Project, DCRMP (2010-16; US\$12 million), which strengthened the capacity to forecast severe weather and improved disaster preparedness and emergency responses; and the Carbon Fund Community Forestry Project (2009-18; US\$2.6M) which aimed at restoring degraded land to economic and environmental use for the benefit of rural communities and to increase carbon sequestration.

46. The Project also build on extensive analytical work, in particular the 2016 Climate Adaptation Investment Planning Technical Assistance which provides the underpinning for prioritizing the project intervention. The TA supports the project focus on resilient rural landscapes – especially on land management and upscaling the adoption of irrigation – and disaster response, and provides a strong argument for why inaction to address climate resilience in key sectors over the period to 2040 will prove to be inordinately costly. The project also follows the recommendations of the 2015 Forestry Policy Note that identified key steps to support the sustainable development of the forestry sector. Moreover, the project is anchored to and supports the implementation of government policies and strategies, such as the 2015-2018 National Plan for



Afforestation and the 2014 National Climate Change Adaptation Strategy and Action Plan to 2020.

C. Financial Management

47. Financial management function will be managed by the PMT under the Ministry of Environment (MOE) which has gained considerable experience in the past several years in the implementation of the range of World Bank-financed projects. The PMT expertise has been regularly assessed as part of World Bank reviews and was subjected to annual audits by independent eligible audit firms. The financial management arrangements established within the PMT have always been found to be satisfactory, with adequate internal control system and satisfactory compliance with legal requirements. Based on the FM assessment, it was established that the PMT has acceptable FM arrangements in place, particularly: (i) qualified and knowledgeable personnel; (ii) the well systematized filing system that allows to keep all supporting financial documentation; (iii) well-prepared quarterly IFRs received and deemed acceptable; and (iv) due annual project audits were unqualified and acceptable to the Bank. As such, these arrangements will serve as start point for the new project and will be slightly adjusted to reflect its particularities. In this sense, the accounting system will be adjusted to reflect new financing source, its components and respective chart of accounts. New account will be opened in the Treasury system to manage project funds; however, the format of financial reports per se will remain the same with few revisions on the Project components' side. Annual audits of Project financial statements will be provided to the Bank within six months after the end of each fiscal year as well as at Project closure. The Borrower has agreed to disclose the audit reports for the Project within one month of their receipt from the auditors, by posting the reports on the MOE website. Following the Bank's formal receipt of these reports from the Borrower, the Bank will make them publicly available in accordance with World Bank Policy on Access to Information. As part of Project implementation support and supervision missions, quarterly IFRs will be reviewed and regular risk-based FM missions will be conducted. More details on FM arrangements are provided in Annex 3. The overall residual financial management risk for the Project is moderate.

D. Procurement

48. An assessment of the capacity of the Implementing Agencies and PMT was carried out in January 2017. The team assessed the risks to these agencies to implement procurement processes. The key issues and risks concerning procurement for implementation of the Project include: limited knowledge and no experience with the new Procurement Framework of the Bank; limited technical capacity of the implementing agencies to accurately assess their needs and develop technical specifications and Terms of References; difficult coordination of procurement activities due to the complex Project structure with three implementing agencies carrying out activities planned under their respective components through subordinated agencies; limited technical capacity to procure specialized equipment for the National Center for Forest Genetics and Seeds; delays in implementation of contracts and approval of deliverables under consulting contracts due to internal processes.

49. The following mitigation measures have been recommended: (i) Bank team to offer a more in-depth training on the new approach to procurement and specifically on Regulations and STEP; (ii) Implementing agencies to employ technical experts to enhance their capacities in particular areas where they lack expertise; (iii) PMT to closely follow up and monitor the performance of consultants to avoid delays in contract implementation through a proper contract administration (regular inspections/meetings), suitable provisions for deliverable linked to payments where appropriate and time action in giving notice to consultants for



remedying the delays and defaults; (iv) Since the same Project structure was adopted in another Project implemented by the same agencies with the support of the same PMT, PMT to maintain the coordination mechanism established under that Project. This involves the strengthening of each implementing agency with focal points to ensure effective coordination and efficient implementation of activities and inter-ministerial Steering Committee to provide overall guidance and ensure cross-sectorial collaboration; (v) PMT to offer continuous support to the implementing agencies in needs assessment to ensure that these are accurately defined especially given the extensive experience of PMT staff with similar Projects.

E. Social (including Safeguards)

50. The Project design has been informed by the Social Assessment (SA) which was carried out as part of the preliminary social and environmental assessment process. The overall social impacts of the Project are expected to be positive. Project interventions will help different social/resource user communities including farmer groups, water user associations, pasture management and/or user groups, as well as LPAs to improve their capacities and resource endowments. All the activities foreseen to occur within this Project will be located on public lands. In order to address potential social risks and adverse impacts due to Project interventions, especially issues related to restrictions on access to livelihood resources during afforestation activities on degraded lands, rehabilitation and irrigation infrastructure improvement activities, a Resettlement Policy Framework (RPF) has been prepared by the client. The RPF focuses on social risk assessment /screening of interventions to identified appropriate mitigation measures, screening checklists and safeguards instruments, key principles for livelihood restoration, 'access restriction framework' in case there are limitations for users to access forest, pasture and other nature resources, public consultation and participation plan with affected persons prior and during Project implementation, draft entitlement matrix and institutional arrangement for RPF implementation.

51. *Citizen Engagement.* The Project is planning to engage all types of stakeholders and beneficiaries through various Project specific activities. As part of Social Impact Assessment, a stakeholder engagement plan has been prepared which outlines the key stakeholders including the Project Affected People who are supposed to be consulted and engaged in planning and implementation of interventions to build local ownership and thus contribute to sustainability and better Project outcomes. The specific elements of the framework for citizen engagement will include: (a) planning and implementation of afforestation/rehabilitation based on participatory decision making process; (b) engaging WUAs in designing and upgrading irrigation systems and develop their capacities for adequate operation and maintenance; (c) encouraging LPAs to support community engagement in determining local investment needs to ensure local communities' participation; (d) designing and implementation of training programs based on training needs assessment and designing training to meet the needs of the participants, and (e) launching a feedback mechanism to process complaints, concerns, and questions from stakeholders at different levels.

52. *Gender.* The Project includes several gender-related actions. In Sub-component 1.1: (i) interventions will be designed in a way that addresses the gender-specific constraints of farmers so that women and men benefit equally from the Project; (ii) during Project consultations, female farmers will be encouraged to apply for support under the climate adaptation grant scheme; and (iii) some capacity building and training sessions for the climate adaptation grants will be targeted exclusively at women beneficiaries to encourage and increase female participation; In Sub-component 1.2 consultation/citizen engagement processes will ensure participation of women.



F. Environment (including Safeguards)

53. Generally, the Project will provide many environmental and social benefits, such as improved farmer skills and investments in climate change adaptation technologies, improved forest management, strengthening disaster response capacity, etc. At the same time, the proposed Project activities (production of forest reproductive material for climate resilience; ecological reconstruction of priority degraded forests; rehabilitation and establishment of shelter belts to protect agricultural fields and riparian buffers to protect water bodies; afforestation of degraded land; community-based pasture management; matching grant facility which would support investments in on-farm water-harvesting structures and efficient small-scale irrigation, anti-hail net systems, agroforestry, soil and water conservation techniques; improving emergency prevention and preparedness training by constructing/rehabilitation of a regional Emergency Command Center; etc.) might generate various adverse environmental and social impacts related to the following: (a) biodiversity degradation; (b) increased pollution of ground and surface waters due to soil erosion; (c) health and environmental risks due to inappropriate pesticides handling; and (d) noise, dust, air and water pollution, health hazards and labor safety issues during the civil works; etc. All these impacts are expected to be typical for afforestation, agricultural production and pasture improvement activities as well as for small scale construction/rehabilitation works, temporary by nature and site specific and can be easily mitigated by applying best agro-forestry and construction practices or relevant mitigation measures.

54. The Project will trigger a series of WB Operational Policies (Ops). OP 4.01 on Environmental Assessment is triggered as the Project activities would generate some environmental and social impacts. While the Project will not support any commercial wood harvesting, OP 4.36 on Forests is triggered as the Project will support afforestation activities along with the forest reconstruction activities in the degraded forests. The Project also triggers OP 4.04 on Natural Habitats (NHs) as it might support forest ecological reconstruction and pastures' improvement activities which might affect NHs. While the Project will not finance purchasing and/or application of pesticides, it might support purchasing special equipment and would provide training on pest management in the forestry sector and thus the Project triggers this OP. OP 4.12 on Involuntary Resettlement is also triggered. Although it is expected all activities/subprojects will be implemented on public lands, in the cases of conducting afforestation activities on degraded lands the proposed activities might restrict access of the local population to the pasture lands.

55. To address identified environmental and social risks and impacts the client prepared an Environmental and Social Assessment Framework (ESMF) which will guide the Project activities and the Environmental Impact Assessment (EIA) for the matching grants (once identified and selected). The ESMF is targeted at specifying the set of mitigation and monitoring measures to be taken during the implementation of Project activities and matching grants to eliminate adverse environmental and social impacts, offset, or reduce them to acceptable levels. The document provides also ESMF institutional responsibilities. The document covers the following: rules and procedures for environmental screening; guidance for conducting activities/matching grants (EIA and/or preparing simple Environmental Management Plans (EMPs) as well as the EMP Checklist; possible mitigation measures for different proposed activities and matching grants to be supported by the Project; requirements for monitoring and supervision of implementing of EIA/EMPs requirements. Based on the ESMF for each matching grant and proposed Project activity with potential impacts, the client will prepare site specific EMPs which will be, per WB and national EIA rules and procedures, disclosed and publicly consulted. For the rehabilitation of the regional Emergency Command Center (ECC) and for the National Center for Forest



Genetics and Seeds, the client will prepare EMP Checklists to be disclosed and consulted and further used during Project implementation. In order to avoid or minimize potential impacts on natural habitats and biodiversity conservation, the ESMF specifies the rules and procedure for environmental screening and assessment of land plots given for afforestation or for creating forest shelterbelts as well as of the degraded forests selected for reconstruction activities. Lastly, to address pest management issues, the ESMF includes measures to raise awareness and educate foresters regarding safe pesticide handling and use of Integrated Pest Management to enhance sustainability and reduce human and environmental exposure to pesticides. Per WB requirements the ESMF was disclosed and publicly consulted in the country and in the WB Infoshop.

G. Other Safeguard Policies (if applicable)

56. The Project triggers also the OP 7.50 on International Waters. Under the sub-component 1.2. (*Support to community-based irrigation*), the Project will provide on-farm irrigation equipment (e.g. mobile aspersion irrigation machines with reel and console and a hydraulic turbine) to WUAs to help their member farmers access 10 existing large-scale irrigation systems that were recently rehabilitated under the US-funded Millennium Challenge Corporation (MCC) Program “Compact”. This sub-component will also support capacity building to WUAs to manage irrigation more effectively and improve their governance and management processes. The proposed activities do not require any new civil works and will not lead to incremental abstraction of water from the Dniestr and Prut Rivers, which are Transboundary Rivers and pass through Moldova’s territory, flowing into the Black Sea or Danube River, therefore triggering OP 7.50 on Projects on International Waterways. Accordingly, the works to be funded under the Project can be qualified as minor additions, or alterations to the existing irrigation and drainage schemes which will not (i) adversely change the quality or quantity of water flows to the other riparians; and (ii) be adversely affected by the other riparians' possible water use. Based on that the falls within the exception to the notification requirement under Paragraph 7(a) of the policy on International Waterways.

H. World Bank Grievance Redress

57. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported Project may submit complaints to existing project-level grievance redress mechanisms or the WB’s Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address Project-related concerns. Project affected communities and individuals may submit their complaint to the WB’s independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank’s attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank’s corporate Grievance Redress Service (GRS), please visit <http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service>. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.



VII. RESULTS FRAMEWORK AND MONITORING

Note to Task Teams: The following sections are system generated and can only be edited online in the Portal.

Results Framework COUNTRY : Moldova Climate Adaptation Project

Project Development Objectives

The PDO is to enhance adoption of climate-smart agriculture and forestry practices in targeted landscapes and strengthen national disaster management systems.

Project Development Objective Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Area of agricultural land with climate-smart technologies adopted		Hectare(Ha)	0.00	2500.00	Semi-annual	Progress Reports	PMT, ACSA
Description: This indicator is linked to the PDO (enhance adoption of climate-smart agriculture practices) and relates to sub-component 1.1. support for upscaling investments in climate smart agriculture technologies on agricultural farmlands.							
Name: Area of agricultural land with improved access to irrigation services		Hectare(Ha)	0.00	1650.00	Semi-annual	Progress Reports	PMT, SDA



Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
<p>Description: This indicator is linked to the PDO (enhance adoption of climate-smart agriculture practices) and relates to sub-component 1.2. support for upscaling adoption of irrigation. Improved water management, including irrigation, is considered a Climate Smart Agriculture (CSA) practice and contributes to adaptation through short- and long-term risk management of climate change impacts (such as water stress).</p>							
Name: Area of forest land and pastures rehabilitated or under improved climate-smart management		Hectare(Ha)	0.00	3220.00	Semi-annual	Progress report	PMT, ICAS
<p>Description: This indicator is linked to the PDO (enhance adoption of climate-smart forestry practices) and relates to sub-component 2.1. support for enhanced forest and pasture management. Climate-smart management includes increasing tree cover and the resilience of forest systems (e.g. through rehabilitation, improved quality of seeds) and contributes to healthy and diverse ecosystems, which are more resilient to natural hazards. Trees can be used as shelterbelts and e.g. help mitigate soil erosion.</p>							
Name: Average Emergency Response Time		Minutes	0.00	0.00	Semi-annual	Progress Report	PMT, CPESS
<p>Description: This indicator is linked to the PDO (strengthen national disaster management systems) and relates to component 3 (climate and disaster risk management). It is defined as the time from receiving the emergency call until arrival of rescue personnel (measured in minutes).</p>							



Intermediate Results Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Number of climate adaptation grants satisfactorily implemented		Number	0.00	600.00	Semi-annual	Progress Reports	PMT, ACSA
of which number of grants to female beneficiaries		Number	0.00	60.00			
Description: Beneficiaries include agriculture producers, farmers, rural households and private / agricultural entities who meet eligibility criteria set out under the project.							
Name: Rate of adoption of improved climate-smart agriculture technologies		Percentage	0.00	30.00	Semi-annual	Progress Reports	PMT, ACSA
Description: Rate of adoption of climate-smart agriculture (CSA) technologies by beneficiaries as a result of extension services provided.							
Name: Number of irrigation systems rehabilitated and operationalized		Number	0.00	10.00	Semi-annual	Progress Reports	PMT, SDA
Description:							
Name: Improved collection rate of Irrigation Service Fees by the Water User		Percentage	0.00	30.00	Semi-annual	Progress Reports	PMT, SDA



Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Associations							
Description:							
Name: Area covered by forest and pasture management plans adopted by Local Public Authorities		Hectare(Ha)	0.00	27000.00	Semi-annual	Progress Reports	PMT, ICAS
Description:							
Name: Area of new forests established		Hectare(Ha)	0.00	1200.00	Semi-annual	Progress Reports	PMT, ICAS
Description: This indicator includes rehabilitation of degraded lands through afforestation and reforestation (but not shelterbelts, which are included separately as an intermediate indicator).							
Name: Area of forest belts rehabilitated and established		Hectare(Ha)	0.00	1320.00	Semi-annual	Progress Reports	PMT, ICAS
Description: This includes shelterbelts on agricultural land and riparian belts along water basins.							
Name: Area of pastures rehabilitated		Hectare(Ha)	0.00	700.00	Semi-annual	Progress Reports	PMT, ICAS



Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Description: Pastures owned by LPAs (communal land).							
Name: Share of nursery seedlings of certified, native seeds with improved average quality		Percentage	0.00	60.00	Semi-annual	Progress Reports	PMT, ICAS
Description: This intermediate indicator measures improved average quality of seeds, in terms of both increased number and quality of seeds as well as increased share of native, climate-resilient species.							
Name: Share of professional forest engineers skilled in ecological reconstruction and climate adaptation		Percentage	0.00	30.00	Semi-annual	Progress Reports	PMT, ICAS
of which share of female professionals		Percentage	0.00	5.00			
Description: This includes technical specialists from Moldsilva, ICAS and SFE senior staff.							
Name: Average rescue time		Minutes	0.00	0.00	Semi-annual	Progress Reports	PMT/CPESS
Description: This intermediate indicator relates to component 3.1 (technical rescue needs assessment, equipment and capacity) and is defined as the time from arrival of the first unit until completion of the rescue (in minutes).							



Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Average dispatch time		Minutes	0.00	0.00	Semi-annual	Progress Reports	PMT/CPESS
Description: This intermediate indicator relates to component 3.1 (enhancement of regional Emergency Command Center) and is defined as the time from receiving the emergency call at dispatch until arrival of the first unit (in minutes).							
Name: Grievances received and addressed through the Grievance Redress Mechanism		Percentage	0.00	100.00	Semi-annual	Progress Reports	PMT
Description: As part of social risk management, a Grievance Redress Mechanism (GRM) has been developed. The GRM enables the citizens, including the project-affected persons to submit complaints about decisions, actions and activities related to project interventions, losses of livelihood, restrictions on access to livelihood resources, compensation for land and other assets							
Name: Immediate and efficient response provided in the event of an eligible crisis or emergency		Yes/No	N	Y			
Description:							



Target Values

Project Development Objective Indicators

Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	End Target
Area of agricultural land with climate-smart technologies adopted	0.00	0.00	500.00	1000.00	1500.00	2500.00	2500.00
Area of agricultural land with improved access to irrigation services	0.00	0.00	100.00	400.00	850.00	1650.00	1650.00
Area of forest land and pastures rehabilitated or under improved climate-smart management	0.00	0.00	1000.00	2000.00	2800.00	3220.00	3220.00
Average Emergency Response Time	0.00						0.00

Intermediate Results Indicators

Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	End Target
Number of climate adaptation grants satisfactorily implemented	0.00	0.00	100.00	300.00	500.00	600.00	600.00
Rate of adoption of improved climate-smart agriculture technologies	0.00	0.00	0.00	10.00	20.00	30.00	30.00
Number of irrigation systems rehabilitated and operationalized	0.00	0.00	3.00	5.00	7.00	10.00	10.00



Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	End Target
Improved collection rate of Irrigation Service Fees by the Water User Associations	0.00	0.00	0.00	10.00	20.00	30.00	30.00
Area covered by forest and pasture management plans adopted by Local Public Authorities	0.00	0.00	3000.00	9000.00	18000.00	27000.00	27000.00
Area of new forests established	0.00	0.00	100.00	300.00	600.00	1200.00	1200.00
Area of forest belts rehabilitated and established	0.00	0.00	200.00	800.00	1200.00	1320.00	1320.00
Area of pastures rehabilitated	0.00	0.00	100.00	300.00	500.00	700.00	700.00
Share of nursery seedlings of certified, native seeds with improved average quality	0.00	0.00	20.00	30.00	50.00	60.00	60.00
Share of professional forest engineers skilled in ecological reconstruction and climate adaptation	0.00	0.00	10.00	20.00	25.00	30.00	30.00
Average rescue time	0.00						0.00
Average dispatch time	0.00						0.00
Grievances received and addressed through the Grievance Redress Mechanism	0.00						100.00



Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	End Target
Immediate and efficient response provided in the event of an eligible crisis or emergency	N						Y
of which number of grants to female beneficiaries	0.00						60.00
of which share of female professionals	0.00						5.00

Note to Task Teams: End of system generated content, document is editable from here.



ANNEX 1: DETAILED PROJECT DESCRIPTION

COUNTRY: Moldova Moldova Climate Adaptation Project

1. The Project Development Objective is to enhance adoption of climate-smart agriculture and forestry practices in targeted landscapes and strengthen national disaster management systems. The overarching goal is to reduce climate vulnerability in selected rural landscapes and enhance the adaptive capacity of government institutions, key stakeholders and the public to manage climate change risks. The Project cost is US\$22.00 million (US\$18.6 million IBRD, US\$1.40 million IDA credit, and US\$2.00 million GEF grant). The Project has four components:

Component 1: Climate-resilient Practices in the Agriculture Sector (US\$9.16 million)

Component 2: Climate-resilient Forest and Pasture Management (US\$7.33 million)

Component 3: Climate and Disaster Risk Management (US\$4.55 million)

Component 4: Project Management and Monitoring (US\$0.96 million)

COMPONENT 1. CLIMATE-RESILIENT PRACTICES IN THE AGRICULTURE SECTOR (US\$9.16 MILLION).

2. This component aims to enhance adoption of climate-resilient agriculture practices in selected rural landscapes by supporting: (i) scale-up of farmers' climate-smart agricultural (CSA) practices and provision of related-advisory services; and (ii) expanded up-take of irrigation services.

3. ***Sub-component 1.1. Scale-up of Farmers' Climate Smart Agricultural Practices (US\$ 7.09 million).*** Sub-component 1.1 will provide technical advisory services and matching grants to eligible farmers and agricultural producers, including rural households and private/agricultural entities to scale up successful climate adaptation measures on agricultural farmlands.

4. The Project will make available climate adaptation grants for on-farm climate-smart investments and technologies such as anti-hail protection, rain water/surface water harvesting, drip irrigation, greenhouse climate control systems; no-till and other soil conservation measures. The agricultural producers selected to access grants will undertake an intensive training program on the specific technology for which the grant is provided. All sub-project sites of the climate adaptation grants will become venues for a broader audience of farmers (around 4,000) at which climate smart agriculture technologies and techniques will be demonstrated through a Farmer Field School approach. Several public awareness campaigns, including TV and radio programs, will be carried out in all raions to promote the Project's CSA grant program.

5. A total of 600 grants will be provided on a demand-driven basis to eligible producers, out of which a larger number of grants (roughly 500) will finance micro operations of farmers mainly operating on their backyards and small plots, and the remaining 170 grants will be provided to bigger commercial farmers. The grant size and co-financing ratio will vary depending on the type and size of investments: up to 90 percent of micro-investments with a grant size ceiling of US\$2,200; up to 70 percent of small-size investments with a grant ceiling of US\$20,000 and up to 50 percent of medium-size investments with a grant ceiling of US\$40,000.



6. Eligibility criteria will include among others: (i) land titling rights; (ii) willingness to contribute financially; (iii) commitment to participate in capacity building activities; and (iv) willingness to provide access to the farm/site for knowledge and experience sharing. Only beneficiaries of small- and medium-size grants will be required to be legally registered, while the beneficiaries of micro grants may include individuals or households with only land in possession.

7. Extension services and matching grants will be delivered by the National Rural Development Agency (ACSA) given its experience and successful performance in managing similar grants in the agriculture sector under its country-wide network and Bank-funded projects, including Rural Investment and Services Program (RISP-I and RISP-II); Disaster Risk Mitigation and Adaptation Project; and ongoing Agricultural Competitiveness Project. The sub-component will be closely coordinated and monitored by the MAFI. The PMT will prepare an Operational Manual acceptable to the Bank and approved by MAFI that will guide activities under this sub-component.

8. **Sub-component 1.2. Expanded up-take of irrigation services (US\$2.07 million).** Sub-component 1.2 will provide equipment to the WUAs to access existing large-scale pumped systems rehabilitated by the MCC. This activity will address the current lack of adequate and appropriate on-farm irrigation equipment (e.g. mobile aspersions irrigation machines with reel and console and a hydraulic turbine) that can satisfy the minimum pumping capacity requirement of the rehabilitated MCC schemes. The WUAs, in turn, will provide irrigation services to its members represented by small and medium farmers who are most disadvantaged and have limited possibilities to invest in on-farm irrigation equipment. The availability of shared on-farm irrigation equipment will create the possibility to provide water in every segment of the system, therefore facilitating a larger number of farmers to transit to irrigated agriculture.

9. This sub-component will also focus on building upon the results of MCC's institutional and investment efforts to provide further capacity training to WUAs. The training will be aimed to support the associations in managing effectively the irrigation process, improving the irrigation schemes operation and maintenance, and attain good governance and management. Capacity building will be delivered by the Sustainable Development Account (SDA) Moldova, a public institution established to ensure sustainability of the MCC program. The SDA has a proven successful record in working with WUAs' formations and participatory irrigation management. The SDA has an office in Chisinau staffed with professionals and all necessary technical means to support the successful implementation of the sub-component activities and provide necessary backstopping.

10. Finally, the sub-component will finance the review of current functions of Apele Moldovei to identify the required measures to enhance its role in monitoring and supporting WUAs.

COMPONENT 2. CLIMATE-RESILIENT FOREST AND PASTURE MANAGEMENT (US\$ 7.33 MILLION).

11. This component aims to enhance the climate resilience of Moldova's forest and pasture lands through restoration of degraded lands at the community and village level and improved climate-smart management of forest reproductive material. The first sub-component seeks to strengthen forest and pasture management planning at the Local Public Authority (LPA) level (*Primaria*, includes incorporated communes, municipalities and cities) and provides investments in afforestation and rehabilitation of degraded lands



(2,520 ha) and pastures (at least 700 ha). Selected LPAs will benefit from training and awareness raising on how to manage their lands sustainably and enhance landscape resilience to address climate change challenges. The second sub-component will help address the need for climate-smart ecological reconstruction in the Moldovan forest sector through provision of climate-adapted forest reproductive material (seeds and seedlings). Capacity building and training will be provided to the Forest Research and Management Institute (ICAS) and Moldsilva staff on nurseries, forest reproductive material, and climate-resilient ecological restoration, including field trials and best practice demonstration sites.

12. **Sub-component 2.1. Community Forest and Pasture Management (US\$4.56 million).** The Project will help address capacity needs of Local Public Authorities (LPAs) to manage their lands more sustainably by supporting elaboration of integrated landscape mapping (i.e. land use “master plans”) and operational forest and pasture management plans within six priority raions (districts): Cimislia, Glodeni, Nisporeni, Rezina, Telenesti and Ungheni. All priority raions are vulnerable to climate change, offer sufficient areas of land to be covered by Project activities, and have indicated willingness to restore degraded lands as indicated in the National Plan for Afforestation (2015-18). Activities will include informing and reaching out to LPAs and seeking their interest in participating in the Project. LPAs’ eligibility for Project support will be screened by ICAS according to the following criteria: willingness to participate; capacity and opportunity for collaboration among neighboring LPAs, readiness to contribute with own resources; and availability of suitable degraded lands. The Project will aim at preparing as many as 100 master plans for eligible LPAs. Preparation of the master plans will be led by ICAS, working jointly with the LPAs, and map land resources (forests and shelterbelts, degraded lands, watersheds, arable land, perennial plantations, pastures, ecological corridors and protected areas) to provide a foundation for the development of detailed operational management plans.

13. Based on ICAS’ assessed capacity, 10-year operational management plans will be prepared for approximately 27,000 ha: 20,000 ha covered by forest management plans and 7,000 ha covered by pasture land management plans. The forest and pasture management planning will follow a consultative process involving community members. It is expected that LPAs will seek approval of the operational management plans by the local Councils, who are also would be responsible for enforcing them.

14. Based on the operational management plans, the Project will support investments in afforestation and rehabilitation of community lands and pastures, focused on:

- a) Rehabilitation of shelterbelts: 600ha;
- b) Planting of new shelterbelts on agricultural land: 480 ha;
- c) Planting riparian belts along water basins: 240 ha;
- d) Rehabilitation of degraded land (through af/reforestation): 1,200 ha
- e) Rehabilitation of degraded pastures: 700 ha

15. Selection criteria for investment sites include: (a) land must be owned by the LPA; (b) willingness of the LPA for including the land for afforestation and rehabilitation; (c) selection needs to be based on participatory decision making process; (d) land must not be in a protected area; (e) current land use and potential for positive socio-economic impact at community level; (f) lands classified in the National Cadaster as degraded land and for afforestation activities, lands must have a bonitet¹³ <40 to ensure productive land remains

¹³ The scale to indicate the richness of the soil, from 0 to 100.



available for agriculture; (f) minimum area of 300 ha for developing pasture management plans, and 200 ha for forests and other forest vegetation, (g) minimum land area for afforestation of 5ha and a maximum of 200ha at the level of the LPA; (h) LPAs must ensure the sustainability of the investment by taking a range of appropriate measures such as allocation of staff, technical resources and operating budget for implementation of management plans; and (j) capacity of local State Forest Enterprises (SFEs) or other contractors to undertake the required Project fieldwork. Interventions will focus on degraded lands with site productivity classes of III and IV and avoid, where possible, the most severely degraded land where the chance of successful activities is low. Additional criteria for including pasturelands improvement activities are (a) importance of livestock-based economic activities for communities' livelihoods, and (b) an evident interest to engage in pastureland management jointly with neighboring LPAs. Technical field work will be contracted to the State Forest Enterprises (SFEs), private sector and other contractors available on a competitive basis.

16. Capacity building for forest and pasture management planning will be provided to the LPAs in the form of awareness raising, workshops, and study tours on best resilience practices to address climate change challenges. The Project will also provide technical assistance on how to prepare technical designs and procurement specifications for goods and services, and carry out the actual field works, including robust monitoring, technical supervision and maintenance of the rehabilitated areas. All technical work will be provided by ICAS, while procurement for forestry and pasture work will be undertaken by the PMT.

17. **Sub-component 2.2. Ecological Restoration of Degraded Forests (US\$2.77 million).** This sub-component will include the establishment of a National Centre for Forest Genetics and Seeds (NCFGs) within ICAS to improve production capacity (both quantity and quality) of certified forest reproductive material mainly from native climate resilient species. The main purpose of the NCFGs will be: seed base management; regeneration material certification; seed processing and conditioning; production of containerized seedlings (nursery); and genetic research and *in vitro* multiplication. The Project will specifically invest in containerized seedling production (annual capacity of approximately 1 million seedlings), equipment for processing seeds, nursery equipment, and laboratory equipment for quality assessment, as well as related civil works. In addition, support will be provided for identification and preparation of a national register of seed stands. ICAS and Moldsilva staff will benefit from capacity building and training on nurseries, forest reproductive material, and climate-resilient ecological restoration, as well as hands-on practice through field trials and demonstration sites.

COMPONENT 3. CLIMATE AND DISASTER RISK MANAGEMENT (US\$4.55 MILLION).

18. This component aims to strengthen Moldova's climate and disaster risk management systems and, in the event of an eligible crisis or emergency, provide immediate and effective response to said eligible crisis or emergency. The first sub-component provides investments for the establishment of one regional Emergency Control Center (ECC) in Balti, as well as support for preparedness and response capacity and equipment. The second sub-component will house a zero-budget contingent emergency response (CER) facility to be triggered in the event of an eligible climate-related emergency or crisis.

19. **Sub-component 3.1: Improving Climate-related Disaster Preparedness and Response (US\$4.55 million).** This sub-component aims to strengthen disaster management systems to support a wide range of sectors with risk management planning and response to extreme hydrometeorological events. The Project will support Moldova's national integrated risk management technical strategy by establishing one regional



Emergency Command Center (ECC). This will ensure better quality of services nationally at the local level, improve efficiency of support for remote locations, better support tactical field operations, and increase redundancy for critical Emergency Situations and Civil Protection Service (ESCPS) infrastructure.

20. **Sub-component 3.2: Contingent Emergency Response Facility (US\$0 million).** Following an adverse natural event that causes a major natural disaster, the Government of Moldova may request the Bank to re-allocate Project funds to support response and reconstruction and partially cover emergency response and recovery costs. This sub-component could also be used to channel additional funds should they become available through as a result of the emergency.

21. Disbursements would be made against a positive list of critical goods or the procurement of works, and consultant services required to support the immediate response and recovery needs of Moldova. All expenditures under this sub-component, should it be triggered, will be in accordance with BP/OP 8.0 and will be appraised, reviewed and found to be acceptable to the Bank before any disbursement is made. In accordance with BP/OP 8.00, this sub-component would provide immediate, quick-disbursing support to finance goods (positive list agreed with the Government), works, and services needed for response, mitigation, recovery, and reconstruction activities. Operating costs eligible for financing would include the incremental expenses incurred by the Government for early recovery efforts arising as a result of the impact of major natural disasters.

22. Goods, Works and Services under this component would be financed based on review of satisfactory supporting documentation presented by the Government including adherence to appropriate procurement practices in emergency context. All supporting documents for reimbursement of such expenditures will be verified by the Internal Auditors of the Government and by the Project Coordinator, certifying that the expenditures were incurred for the intended purpose and to enable a fast recovery following the damage caused by adverse natural events, before the Application is submitted to the Bank. This verification should be sent to the Bank together with the Application.

23. Specific eligible expenditures under the category of Goods include: (i) construction materials; water, land and air transport equipment, including supplies and spare parts; (ii) school supplies and equipment; (iii) medical supplies and equipment; (iv) petroleum and fuel products; (v) construction equipment and industrial machinery; and (vi) communications equipment. Specific eligible expenditures under the category of Works may include urgent infrastructure works (repairs, rehabilitation, construction, etc.) to mitigate the risks associated with the disaster for affected populations. Specific eligible expenditures under the category of Services may include urgent studies (either technical, social, environmental, etc.) necessary as a result of the effects of the disaster (identification of priority works, feasibility assessments, delivery of related analyses, etc).

COMPONENT 4. Project Management and Monitoring (US\$0.96 million).

24. This component will finance the operating costs of Project management functions to be carried out by the Project's Program Management Team (PMT), housed in the Ministry of Environment. Key functions will include procurement, financial management, environmental and social safeguards, budgeting, preparation of annual work plans, reporting, and monitoring and evaluation of the PDO and the Project Results Framework indicators. The PMT will provide support for the implementation of all three components, whilst ensuring



close cooperation between the line ministries and implementing agencies, as well as other project stakeholders. Other functions undertaken by the PMT will include technical assistance in environmental management and social development.

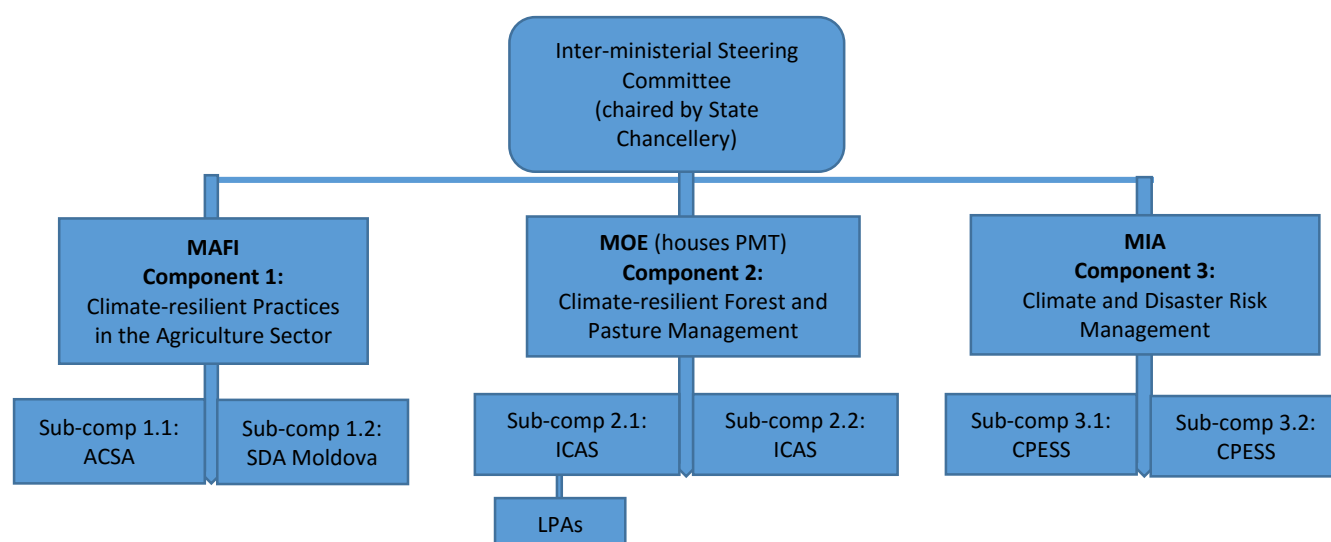


ANNEX 2: IMPLEMENTATION ARRANGEMENTS

COUNTRY : Moldova Moldova Climate Adaptation Project

Project Institutional and Implementation Arrangements

- 1. Oversight and Coordination:** The implementation of Project activities will be coordinated by an inter-ministerial Steering Committee (SC) to be chaired by the Secretary General of the General Secretariat who heads the State Chancellery and has overall responsibility for coordination and monitoring of Government's activities to implement state policies. The SC will be the same one currently overseeing the Moldova Disaster and Climate Risk Management (DCRM) Project, but will be augmented to ensure that all key implementing partners under the proposed Project are included. The SC will include representatives from the Ministry of Finance (MOF), the Ministry of Environment (MOE), the Ministry of Agriculture and Food Industry (MAFI), and the Ministry of Internal Affairs (MIA).
- 2. Overall Project Management:** Fiduciary arrangements for all components of the Project will be managed by an existing PMT housed in the MOE. The PMT supported the implementation of the Persistent Organic Pollutants Project (POPs) in the past, and is currently supporting the implementation of the DCRM Project. While implementing ministries and agencies will focus on substantive elements of Project implementation, the PMT will deal with fiduciary management in compliance with Bank policies and systems, and will facilitate overall implementation. Currently, the PMT has adequate capacity to implement the Project. The PMT consists of the project manager, financial management officer, procurement specialist, project assistant and a driver. In addition, safeguards and M&E specialists will be recruited specifically for this Project.
- 3. Implementing Agencies and Service Providers:** The Project will have three main implementing agencies: the MAFI responsible for Component 1; the MOE, which will also house the PMT, for Component 2; and the MIA for Component 3. The three ministries will assign Focal Points to assist with technical aspects (including evaluating bids) of Project activity implementation within each respective component and its sub-components. Sector-specific activities will be implemented by the appropriate agencies and/or service providers: the National Rural Development Agency (ACSA) will support farmers in upscaling adoption of climate-smart agriculture techniques (sub-component 1.1.) under a single-source contract with MAFI; the Sustainable Development Account Moldova (SDA Moldova), a public agency reporting to MOE, will support climate adaptation interventions for the Water User Associations (sub-component 1.2); the Forest Research and Management Institute (ICAS) will support the implementation of both sub-component 2.1 (jointly with the Local Public Authorities (LPAs)) and sub-component 2.2. Forestry and pasture-related work under component 2 (afforestation, shelterbelts, watersheds, pasture management) will be carried out by State Forests Enterprises and/or private contractors selected competitively. The Civil Protection and Emergencies Service (CPRESS), under MIA, will implement Component 3.
- 4.** The Project's Organizational Chart is presented below.



5. **Arrangement for the Matching Grants Program:** To ensure efficiency and transparency in the selection of grant beneficiaries under Component 1, MAFI and MOE will establish a grant evaluation and selection committee in charge of announcing competitive grant selection rounds, reviewing and evaluating grant financing applications, and making grant award decisions. To ensure the transparency of the grant review, evaluation and award process, the decisions of the committee (both awards and rejections) will be made public on MAFI's and MOE's websites. The composition of the grant evaluation and selection committee, and any subsequent compositional changes, will be approved by the Project's SC. The grant evaluation and selection committee would include representatives of MAFI, ACSA, MOF, the State Chancellery and independent technical and financial experts. To facilitate the operations of the evaluation committee, an initial eligibility screening of incoming applications could be carried out by ACSA.

6. **Project Operational Manual and Grant Operational Manual:** The Project will be implemented based on a Project Operational Manual (POM) which will be approved by the Project's SC and adopted by MAFI, MOE and MIA [through a joint Ministerial Order]. The POM would include: (i) the Project's overall operating, fiduciary and decision making procedures and (ii) results monitoring arrangements. Implementation of the Project's grant scheme will be based on a Grant Operational Manual (GOM), which will be approved by the Project's SC and adopted by MAFI and MOE [through a joint Ministerial Order]. The GOM will contain a detailed description of the operating principles and evaluation criteria for the Project's grant scheme, including environmental and social safeguard responsibilities. Only the SC will have the authority to amend the two documents above, provided such amendments are acceptable to the World Bank.

7. **Contingent Emergency Response (CER) Facility Implementation Arrangements:** Following an eligible crisis or emergency, the Government of Moldova may request the Bank to re-allocate project funds to support response and reconstruction. The CER Facility (sub-component 3.2.) would draw from the uncommitted credit resources under the Project from other Project components to cover emergency response. The CER Facility could also be used to channel additional funds should they become available as a result of an emergency. The activities financed by this sub-component will be demand and event driven and will be detailed in the Government's Action Plan of Activities. The submission of an acceptable Action Plan of Activities, along with an official declaration by the Government that a "disaster for the State" has occurred are the two conditions that must be fulfilled in order to trigger this sub-component. The specific steps for triggering this sub-component, along with the unique coordination and



implementation arrangements for the Action Plan of Activities will be contained in the POM.

8. Capacity enhancement needs for fiduciary tasks are described below in the financial management, procurement and results monitoring sections.

Financial Management

9. Since it was agreed that the PMT already established within MOE will handle financial management functions, including flow of funds, budgeting, accounting, reporting, internal controls and external audit, for the Project, the existing financial arrangements have been assessed in terms of their reliability and trustworthiness. Thus, it has been concluded that the PMT has adequate FM system in place. Besides, the PMT performance on financial management side has been assessed always satisfactory: they have in place a robust and efficient internal control, accounting, financial reporting and monitoring systems, and comply with legal requirements of financial management side. As such, these arrangements will serve as start point for the new project and will be slightly adjusted to reflect its particularities as described under this Chapter. The inherent risk of the Project is rated as Moderate; the Control Risk and the overall residual FM Risk are also considered to be Moderate.

10. **Budgeting and planning.** The PMT has acceptable budgeting and planning capacity to carry out the Project. The Project procurement plan would serve as basis for annual budget planning that is done in accordance with national regulations. The budget would form the basis for allocating funds to Project activities and requesting counterpart funds from the Government, where appropriate. The budget execution is monitored through IFRs and monthly reports to the Ministry of Finance.

11. **Accounting and Reporting.** The Project accounting will be on cash basis. The PMT would maintain its current accounting system. Project management-oriented Interim unaudited Financial Reports (IFRs) will be prepared under the Project. The PMT will produce a full set of reports every calendar quarter throughout the life of the Project. The IFRs will follow the same format used under existent Project which comprises: (i) Project Sources and Uses of Funds, (ii) Uses of Funds by Project Activities, (iii) Project Balance Sheet, (iv) Designated Account Statement, and (vi) Withdrawal Schedule. IFRs would be produced by the accounting software. These financial reports would be submitted to the Bank within 45 days of the end of each calendar quarter.

12. **Internal Controls.** The PMT internal controls systems were assessed to be capable of providing timely information and reporting on the use of Project funds. The FM chapter of the Project Operational Manual (POM) is well prepared and fully document accounting and financial reporting policies and procedures of existing projects such as internal control procedures, including authorization of expenditures and approval of the payments; bank reconciliations, verification of expenditures eligibility by the Financial Manager; description of financial documents flow/circulation; budgeting procedures, formal reconciliation procedures of project records with Client Connection and XDR/USD reconciliation, safeguards for assets, including at least annual inventory of fixed assets and regular monitoring of assets purchased for beneficiaries on their existence and use, etc. Similar internal control systems would be maintained for the purpose of the Project. Similar POM would be prepared by the PMT to reflect specific activities of the proposed Project, including Chart of Accounts, Audit TOR, frequency of submission, format of IFRs, and so forth.

13. **Staffing.** The PMT has experienced FM staff responsible for overall Project FM arrangements, including preparation of the quarterly IFRs and their submission to the Bank. One staff is considered to be adequate at the beginning of the Project. At a later stage, an additional accountant could be hired by the PMT depending on the workload.



14. **External Audit.** The Project audit would be conducted (i) by independent private auditors acceptable to the Bank, on the TOR acceptable to the Bank, and selected by the PMT; and (ii) according to the ISA issued by the International Auditing and Assurance Standards Board of the International Federation of Accountants. The annual audited Project financial statements together with the audit opinion and Management Letter would be provided to the Bank within six months of the end of each fiscal year as well as at the Project closing. In accordance with "The World Bank Policy on Access to Information" dated July 1, 2010, which requires that the audited financial statements are made publically available, the Project financial audit reports would be published within one month after their receipt. The reports would be published on MOE web-site. The World Bank will also publish them on its external site.

Disbursements

15. **Disbursements.** The proceeds of the Credit/Grant will be disbursed over a period of five years or for such longer period as will be agreed with the Bank. Credit/Grant funds will flow through Direct Payment and via disbursements to the Designated Accounts (DA) maintained by EAPF. The Project will follow transaction-based disbursement procedures (payments through Das, reimbursement, direct payments, and special commitments). Withdrawals from the Credit/Grant Accounts will be requested in accordance with the guidance to be given in a Disbursement Letter. Withdrawal applications will be signed by two persons: (i) an authorized representative of the Borrower/Recipient: and (ii) another designated person as authorized by written delegated authority from the Borrower/Recipient.

16. **Designated Accounts:** To facilitate timely disbursements for eligible expenditures on works, goods and services, the Borrower/Recipient will open and operate under terms and conditions acceptable to the Bank. Designated Accounts in US dollars in a commercial bank acceptable to the World Bank. The agency will be responsible for the appropriate accounting of the funds deposited into the designated accounts, for reporting on the use of these funds and for ensuring that they are included in the audits of the financial statements. Ceiling of the Designated Accounts and the Minimum Application size for Direct Payment or Special Commitment have been communicated in the Disbursement Letter.

Procurement

17. Procurement under the Project will be carried out in accordance with the World Bank Procurement Regulations for Investment Project Financing (IPF) Borrowers – Procurement in IPF of Goods, Works, Non-Consulting and Consulting Services, issued in July 2016 (Regulations) and with the latest Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits.

18. **Project Procurement Strategy for Development (PPSD):** During the preparation of the Project, PMT developed a PPSP which describes how the procurement approach will support the development objective of the Project and deliver the best value for money. The first draft of the strategy was shared with the Bank for comments. The PMT is currently finalizing the document. Based on the nature, size and complexity of procurement to be financed under the Project, the strategy suggests the most appropriate methods to be applied in order to achieve value for money. The strategy also analyzes the supply positioning in order to determine the positioning of specific procurement based on its relative supply risk and value within the Project. This exercise revealed that all the contracts planned to be financed under the Project have a relatively low value and low level of supply risk. Overall, Open National competition will be adopted for the contracts with no application of Best and Final Offer and Negotiations options. No packages of large value and complex nature that would require pre-qualification are foreseen. There will be procurement of non-complex goods which will be



either purchased by applying Request for Bids or Request for Quotations methods. Component 2 foresees the establishment of the National Center for Forest Genetics and Seeds which will require procurement of specialized equipment. It is advisable that an expert is hired to assist the implementing agency in the development of technical specifications. Consulting services are of various size and nature. These will also follow the Open National and International market approach and selection methods which will be decided taking into account fit-for-purpose and value-for-money considerations. Given that the PMT has limited experience in handling procurement based on the national procurement procedures and given the current situation in public procurement in Moldova with a complaints handling mechanism under development, it has been proposed that the Bank's Standard Procurement Documents are used even for contracts for which national approach is foreseen. Overall the PPSD provides an adequate justification for the selection methods in the Procurement Plan (PP). The strategy will be reviewed and agreed with the Bank.

19. Capacity Assessment: As part of the assessment, the organization structure and staffing within PMT and implementing agencies have been reviewed. PMT's Procurement Specialist has extensive experience with Bank procurement policies and procedures and the Bank Procurement and Consultant Guidelines based on which the recently closed Disaster Risk Mitigation and Adaptation Project was implemented. The Procurement Specialist attended several training courses on Bank procurement, including those organized by the Bank in the region and has already participated in a workshop organized by the Bank in Moldova on the new Procurement Framework and received a hands-on training on STEP. Another hands-on training on STEP will be organized by the Bank in the region in March 2017.

20. PMT has a strong fiduciary and technical capacity. Internal approval processes are functioning generally well without affecting the procurement cycle.

21. Given the risks identified, the existing capacity within PMT, as well as the previous experience with Bank-funded projects, the overall risk for procurement is *Moderate*.

22. Procurement Plan (PP): PMT developed a PP for the entire scope consistent with the Project implementation plan. The PP provides information on procurement packages, selection methods, procurement approach and evaluation methods to be adopted for each contract to be financed under the Project. Any updates to the PP will be submitted to the World Bank for review and approval. The detailed PP will be prepared in STEP and will be also published on the Bank's website.

23. Record Keeping: All documentation with respect to each procurement will be retained by PMT according to the requirements of the Financing Agreement. PMT will furnish such documentation to the Bank upon request for examination by the Bank or by its consultants/auditors. Documents with respect to procurement subject to post review will be furnished to the Bank upon request.

24. Procurement Prior Review Thresholds: The Procurement Prior Review Thresholds were set by the Bank based on the Project procurement risk level. All contracts at or above the set thresholds are subject to international advertising and the use of the Bank's Standard Procurement Documents. The thresholds will be specified in the Procurement Plan. While currently BAFO, procurement processes involving contract negotiations, competitive dialogue and sustainable procurement are not foreseen under the Project, these will be subject to the Bank's procurement prior review irrespective of the contract value, if the decision is taken to apply them during Project implementation.

25. Bank's procurement oversight: The Bank will exercise its procurement oversight through a risk-based approach comprising prior and post review and independent procurement reviews, as appropriate. The post reviews will be conducted on the procurement processes undertaken by PMT to determine whether they comply with the



requirements of the Financing Agreement. Procurement supervision visits will be carried out at least once in 12 months. These will include special procurement supervision for post-review. At least 1 in 10 contracts will be subject to Bank post review.

Environmental and Social (including safeguards)

26. Overall implementing arrangements and PMT Capacity to implement Project safeguards issues.

Safeguards issues will be managed by the PMT, whose staff has substantial experience in implementing environmental and social safeguards under previous WB Projects. The PMT's EA capacity has been assessed as satisfactory to date. The PMT will hire a full time safeguards specialist responsible for both environmental and social safeguards, and if needed, the World Bank Environmental and Social Specialists will provide adequate on the job training.

27. Major Safeguard responsibilities of the PMT. The PMT will ensure that all Project activities are being assessed from an environmental point of view and that when needed, the EMPs are prepared and adequately implemented. Its major responsibilities in this regard are the following: (a) coordination of environmental and EA related issues; (b) evaluation of the sub-project's eligibility from the environmental point of view and sub-projects environmental screening as well as ensuring this is adequately done by ACSA for the matching grants (see point below); (c) provision of necessary information on environmental issues for sub-project applicants and, if needed, ACSA and ICAS, in particular in terms of environmental screening criteria to be used, explaining all obligations regarding the EIA procedure etc.; (d) supervision and monitoring environmental impacts within the overall monitoring of the sub-project EMPs implementation; (e) reporting to the national environmental authorities and the WB on ESMF implementation and environmental compliance; and (f) communicating with EIA competent authorities (MOE, State Ecological Inspectorate, SEI).

28. PMT Safeguards Specialist. For the purpose of implementing environmental and social safeguards, a full-time Safeguards Specialist will be hired within the PMT during the first year of Project implementation. Thereafter, the Safeguard Specialist would be hired on a full-time or part-time basis, based on periodic assessment of Project environmental and social arrangements, and the associated level of effort required to sustain them. The Safeguard Specialist will be in charge of overall coordination for implementing and reporting on the ESMF, inspecting environmental compliance at worksites, advising ACSA and Project participants on environmental issues, and coordinating the overall environmental monitoring at Project level. The Safeguard Specialist will also be responsible for assisting, when needed, ACSA and ICAS in reviewing environmental management plans, monitoring their implementation, advising and guiding on specific environmental issues and management options, and ensuring that cumulative environmental impacts are addressed. The Safeguard Specialist will periodically collect information on changes and impact of Project activities and will study the environmental condition of the areas of supported by the sub-projects and identify main environmental parameters. The Safeguard Specialist will also be responsible for monitoring any land acquisition and/or resettlement issues under the sub-projects. The Safeguard Specialist will also have to selectively visit sub-projects, and ensure proper monitoring for all Category B sub-projects. The Safeguard Specialist would work under the supervision of the PMT Executive Director as well as in close collaboration with ACSA and relevant MOE/SEI staff and other stakeholders including local public authorities and concerned NGOs.

29. Implementing arrangements for Climate Adaptation Grants. The matching grants for climate adaptation will be implemented by ACSA, whose experience with safeguards activities is considered satisfactory given that



its staff includes highly qualified agriculture and environmental specialists. ACSA will ensure all grants are assessed from an environmental point of view and that beneficiaries conduct an appropriate EIA and, where necessary, prepare an EMP for each sub-project, per stipulations of the ESMF Environmental Guidelines. ACSA will be involved in the process of grant implementation from the very beginning, i.e. at the grant appraisal stage: they will evaluate grant proposals, assign an environmental category according to ESMF Environmental Guidelines and determine the type of EA that must be conducted for the proposed sub-project. ACSA will review the set of documents prepared by beneficiaries, complete the Environmental Screening Checklist and submit the grants documents along with the EA forms to the PMT. Before grant appraisal, ACSA will ensure that any proposed grant is in compliance with all national environmental laws and standards, as certified by the relevant local or national authorities of Moldova. All relevant documents and permits should be kept in each grant document file maintained by ACSA, and be made available for review by the PMT and WB representatives. The implementation of grant EMPs will be the direct responsibility of ACSA, and of beneficiaries, including responsibilities for grant supervision and monitoring. Compliance with the EMPs and monitoring of the impact during the implementation phase will be undertaken by ACSA and periodically by the PMT's Safeguards Specialist. The grant EMPs will be also integrated into the contracts for approved activities, and the contractors will be required to include the cost in their financial bids and grant proposals. In case of non-compliance with presumed mitigation measures during grant implementation, ACSA will propose to PMT recommendations whether or not to suspend funding. The Project's Grant Operational Manual (GOM) will set forth the rules and procedures for environmental assessment of grants as described in the ESMF. To ensure successful implementation of the grants, ACSA will hire/assign a Safeguards Specialist among its staff (who will receive capacity-building prior to approving any grants).

30. *Implementing arrangements for forest and pasture improvement activities.* The proposed activities will be implemented by ICAS who will be responsible for safeguard implementation of this sub-component. Specifically, ICAS will conduct a preliminary environmental screening during the preparation of the LPA's operational forest and pasture management plans to ensure any lands that represent environmentally sensitive areas and/or areas valuable from a biodiversity point of view are excluded to avoid adverse effects on biodiversity conservation and natural habitats. ICAS has extensive experience in safeguards activities (e.g. as the key implementing institution for a series of WB carbon sequestration Projects supported by Prototype Carbon and Biocarbon Funds) and its performance is considered as highly satisfactory to date.

31. *Implementing arrangements for upscaling adoption of irrigation.* The proposed activities do not require any new civil works and will not lead to incremental abstraction of water from the Dniestr and Prut Rivers. SDA Moldova will be responsible for conducting a preliminary environmental screening of the equipment to be procured, making sure no any environmental and social impacts will be generated. SDA Moldova's staff includes qualified environmental specialists who have proven their high environmental management performance during the implementation of the MCC Program.

32. *Environmental Monitoring and Reporting* during implementation will be carried out by the PMT and ACSA, who will provide information about key Project environmental aspects, particularly environmental impacts and the effectiveness of mitigation measures. Such information will enable the Project to evaluate the success of mitigation measures as part of Project supervision, and allow corrective action(s) to be implemented, when needed. During the sub-project's operational phase, the PMT and ACSA, along with the local (raion) environmental authorities/inspections, when required (e.g. in cases prior informed of non-compliance), will perform environmental supervision and monitoring to identify the level of compliance with



agreed design and mitigation measures to ensure that sub-projects are implemented in full compliance with the EMPs or implement the necessary corrective measures. The status of compliance with agreed environmental mitigation measures is to be reported by the PMT and ACSA in their regular (semiannually) reports to the WB on Project implementation. In cases of non-compliance, the PMT and ACSA's environmental specialists (with SEI assistance, if needed) investigate the nature and reason(s) for non-compliance, and decide on remedial actions to bring a sub-project into compliance, or whether financing should be suspended. The PMT and ACSA will make information on monitoring of EMPs and mitigation measures available via its routine reporting on sub-project implementation to the World Bank and during periodic Bank supervision missions.

33. *Integration of the EMPs into Project documents.* The ESMF and in particular EMPs' provisions will form part of the design documents for the Project, and will be included in construction contracts for proposed activities. Respectively, the contractors and matching grants beneficiaries will be required to include the cost of EMP requirements in their financial bids/Project documents and required to comply with them while implementing the Project activities.

34. **Social Safeguards:** The Project design has been informed by a Social Assessment (SA), which was carried out as part of the preliminary social and environmental assessment process. The overall social impacts of the Project are expected to be positive. Project interventions will help different social/resource user communities including farmer groups, water user associations, pasture management and/or user groups, as well as LPAs to improve their capacities and resource endowments. Following are some of the key areas that people will benefit from as a result of the Project: improved livelihood of farmers through enhanced crop production; increased land productivity with concomitant increases in employment and income; increased efficiency of land usage at community level with potential additional economic benefits; efficient and sustainable use of pasture areas with fodder crops; improved irrigation systems and water user participation in management; improved pasture areas and increased livestock rearing activities; improved natural disaster response services and so on. However, the social assessment points out that these interventions may also affect some resource user communities adversely during Project implementation. For example, activities related to restoration of degraded land and afforestation, protection/shelter belts improvements, pasture rehabilitation or establishment of the forest shelter belts, upgrading of existing irrigation systems might lead to potential disturbance or temporary restrictions to the uses of such resources.

35. All the activities foreseen to occur within this Project will be located on public lands. The proposed interventions for forest or pasture improvement will avoid land that is included in any Protected Areas (PAs), both national and local ones. Furthermore, the selection criteria for lands that will be included are as follows: (a) land must be owned by the LPA, (b) LPA's willingness for including the land for afforestation / rehabilitation; the selection needs to be based on participatory decision making process, (c) land must not be in a protected area. Although it is expected that all activities/sub-projects will be implemented on public lands, in the cases of conducting afforestation activities on degraded lands the proposed activities might restrict access of the local population to the pasture lands. In addition, protection/shelterbelt improvements, pasture rehabilitation, upgrading of existing irrigation systems might lead to potential disturbances or temporary restrictions to the uses of such resources. Thus OP 4.12 on Involuntary Resettlement is triggered in order address these temporary and rehabilitation related economic displacements/livelihood losses. All the interventions, regardless of type of land ownership, would be screened to ensure that there is no informal use or occupation. These risks are not expected to be significant, although at this stage it is impossible to estimate the levels of impact. Sub-projects specific screenings/assessments will therefore be carried out (as described



above) to determine the risks and prepare the necessary mitigation measures/plans. However, the Project will not support activities that result in any physical displacement or resettlement of population.

36. In order to address social risks and adverse impacts due to Project interventions, especially issues related to restrictions on access to livelihood resources during afforestation activities on degraded lands, rehabilitation and irrigation infrastructure improvement activities, a Resettlement Policy Framework (RPF) has been prepared by the client. The RPF focuses on social risk assessment /screening of interventions to identified appropriate mitigation measures, screening checklists and safeguards instruments, key principles for livelihood restoration, 'access restriction (process) framework' in case there are limitations for users to access forest, pasture and other nature resources, public consultation and participation plan with affected persons prior and during Project implementation, draft entitlement matrix and institutional arrangement for RPF implementation. The RPF was disclosed locally and in the WB InfoShop and publicly consulted in the country.

Monitoring and Evaluation

37. The Project's Monitoring & Evaluation (M&E) system will be based on: (i) continuous data collection; (ii) regular monitoring of the results of all Project component interventions; (iii) the Project baseline survey; and (iv) Mid-Term review (MTR), and final impact assessment. Data collection and monitoring of outcomes and results will occur at the level of all Project entities, and will be consolidated by the PMT's M&E Specialist. Each Project entity will have adequate staffing and technical capacity to properly implement data collection and monitoring. A baseline study will be carried out to determine the initial conditions of the Project. The baseline will focus on determining the current status of variables that are directly pertinent to the Project interventions. Given the specific nature of some of the activities under Component 1 and 2, i.e., their narrow focus on easily identifiable Project beneficiaries and/or targets, the baseline variables will be defined at the inception of these activities. The key participating Project entities and service providers (ACSA, ICAS, SDA and CPESS) will provide semi-annual progress reports using a set of agreed monitoring variables as provided in the Project Results Framework, to report the implementation progress of their respective components. The PMT will consolidate semi-annual progress reports for submission to the Government and the World Bank. Adjustments, if needed, can be introduced to fine-tune the agreed monitorable variables as the Project progresses.

Role of Partners (if applicable)

38. Several development partners are active in the area of climate change adaptation and disaster risk management in Moldova including the European Union, EBRD, EIB, Austrian Development Cooperation, Swiss Development Agency, UNDP, USAID, IFAD. As part of the IDA-17 commitments, the government is preparing a Climate Adaptation Investment Plan that would help to coordinate climate financing from various donors and sources. The Project is a significant building block of the plan. The Project is also partnering with GEF who is providing direct co-financing for rehabilitation of degraded lands and with GFDRR who is providing a parallel technical assistance grant for disaster risk management.



ANNEX 3: IMPLEMENTATION SUPPORT PLAN

COUNTRY : Moldova
Moldova Climate Adaptation Project

Note to Task Teams:

(Recommended length 2-4 pages.)

[All sub-sections must have a continuous paragraph numbering for the entire main text or for each annex per institutional standard.]

(a) This is the sub-para numbering for this level.

(i) This is the sub-para numbering for this level. This is the sub-para numbering for this level.

Strategy and Approach for Implementation Support

Implementation Support Plan and Resource Requirements

- (a) Procurement: The procurement related implementation support will include: continuous guidance and advice on various procurement related issues; in-depth training on the procurement framework; hands-on training on the use of STEP; procurement oversight which will include both the ex-ante reviews of the planned procurement actions to be carried out by the Borrower and post-reviews of selective contracts subject to post-review.



Note to Task Teams: What would be the main focus in terms of support to implementation during:

Time	Focus	Skills Needed	Resource Estimate	Partner Role
First twelve months				
12-48 months				
Other				

Skills Mix Required

Skills Needed	Number of Staff Weeks	Number of Trips	Comments

Partners

Name	Institution/Country	Role



ANNEX 4: ECONOMIC ANALYSIS

1. The Moldova Climate Adaptation Project aims to enhance adoption of climate-smart agriculture and forestry practices in targeted landscapes and strengthen national disaster management systems. The corresponding economic analysis is broken down by component with associated benefits and cost streams for each component: Component 1 (Climate-resilient Practices in the Agriculture Sector), Component 2 (Climate-resilient Forest and Pasture Management), and Component 3 (Climate and Disaster Risk Management). The first component represents the bulk of the budget –nearly 42 percent of the total resource allocation–, while the second and third component comprises the other half of the budget (33 percent and 21 percent for component 2 and 3, respectively). The rest finances Project management.
2. The economic analysis follows a conservative cost-benefit approach due to important data limitations. If agricultural, forestry and disaster practices are effectively adapted to climate variability, there are positive impacts both in the short and long term, as well as reductions related to climate inaction costs. However, due to information restrictions, this analysis narrows down to short term impacts as well as direct impacts displaying a conservative estimate or a lower bound of potential benefits.¹⁴
3. A recent study by the World Bank (2016) suggest that the expected annual costs of inaction¹⁵ in Moldova are substantial, amounting US\$ 600 million, equivalent to 6.5 percent of Moldova’s GDP. On average, up to 2050, the estimated cost of inaction on climate adaption is more than USD100 million per annum. The costs are mostly due to damages caused by flooding and a variety of weather impacts on agriculture, as well as the cost of climate-related health impacts.
4. Our conservative results show that the US\$ 22 million to be invested in the Project are expected to generate efficiency benefits with a net present value of US\$ 18 million using the 6 percent discount rate recently adopted by the World Bank for Project evaluation. The internal rate of return (IRR) to this investment is estimated to be 27 percent. Results are robust to adverse changes in the key parameters.
5. **Public Funding Rationale.** In addition to quantitative assessment, and considering the scarcity of public funds, the Bank’s economic analysis guidelines require an assessment of the public funding justification for all Bank lending programs. A public funding justification requires that either an important market failure be present, or that additional investment is needed to remedy a policy/government failure, and that the intervention address the relevant failure(s) in some convincing way.
6. After reviewing the Project, it is clear that in all areas of the program –agriculture, forest, irrigation, and disaster management– there are classic market failures which can justify public funding from an efficiency standpoint, as long as delivery is well designed and cost effective. In some cases, an equity goal provides an important justification as in the case of small farmers (Component 1). The Project aims to strengthen local farmer’s capacity to better respond to climate change encouraging climate smart agriculture and irrigation

¹⁴ We expect during the course of the project to gather detailed data at the farm level to promote deeper analysis for future World Bank projects.

¹⁵ The cost of inaction in this report is measured as (i) the potential savings from reducing harmful effects of climate (or from reducing the cost of defending against harmful effects), and (ii) the potential gains from enhancing primary production that is directly dependent on climate (i.e., agricultural & forest products & services, water services, and weather-based renewable energy generation).



strategies, as well as strengthening local public institutions for better disaster management and emerge response, which clearly provide public goods to the society (e.g., rapid emergency response to disasters) in several ways. Mitigating impacts at the farm level (mainly Component 1), and promoting better and more efficiently management for public institutions (mainly Component 2) clearly justify public funding in order to achieve well function markets. Consequently, given the public good nature, the justification is justified since it will strengthen small farmers and stimulate better and more efficient public agencies where the Bank could play a catalytic role.

7. **Analytical Approach.** Systematic data at the farm level is scarce and not easily available. Therefore, additional benefits were calculated based on indicative intermediate indicators prepared by the local Project preparation team which consists of local specialists working with the relevant counterparts from the Government of Moldova. Therefore, this economic analysis and its results should be interpreted with caution. For the first two benefit streams (Component 1 and 2), profitability measures were calculated at the level of individual sub-projects and then aggregated up to the Project level. For the third benefit stream (Component 3), economic analysis was carried out at the Project level. The results for all three components were then combined to derive overall measures of Project worth.
8. **Component 1 and 2.** Component 1 and Component 2 have important resources assigned to demand driven sub-project which will be competitively selected. Therefore, the precise nature, mix, and scope of the investments to be financed cannot be known with certainty in advance. Consequently, any attempt to assess the economic viability of the Project on an ex ante basis is necessarily uncertain. Nonetheless, to provide a sense of the likely economic feasibility of Project-supported investments, cost/benefit analysis was carried out on a set of subprojects of the type that are likely to be financed. Therefore, it is assumed that all sub-projects will be a combination of the main five agricultural products (apples, grapes, maize, potatoes and wheat) for which productivity and prices were obtained from FAO stats website. The composition of the basket is assumed as follow: 10% under table grapes, 10% under apple, 30% under wheat, 30% under maize and 20% under potatoes.¹⁶ See table 1 and table 2 for average productivity and prices, correspondingly, used in this analysis.

Table 1: Agricultural Productivity (tons / ha)

	Apples	Grapes	Maize	Potatos	Wheat
2010	3.6	3.6	3.5	10.2	2.3
2011	4.8	4.6	3.3	12.0	2.6
2012	5.1	3.9	1.2	7.5	1.6
2013	5.7	4.8	3.1	10.1	2.8
2014	8.3	4.4	3.3	11.8	3.2
Average	5.5	4.3	2.9	10.3	2.5

Source: FAOstat data

¹⁶ These percentages were assumed following the economic analysis for the Agriculture Competitiveness Project (P118518).



Table 2: Average Prices (US\$ / ha)

Product	Price (in 2012)
Apples	199.9
Grapes	355.7
Maize	239.9
Potatoes	113.7
Wheat	203.3

Source: FAOstat data

9. For component 1, indicative intermediate indicators assume that productivity will increase due to the Project by 10% in the 3rd year of the Project, 15% in the 4th year, and 20% in the 5th and 6th year. Similarly, it is assumed that nearly 2,500 has will be aided during the Project life.¹⁷ Finally, it is assumed that up to 4,000 producers will be trained on climate smart agriculture.¹⁸ Regarding component 2, Moldova's forest has a total economic value estimated of US\$ 66.77 million (TUB, 2015)¹⁹ suggesting that the value per hectare is nearly US\$ 149. This assessment includes the values of provisioning services (e.g., timber, fuelwood, NTFPs) and of environmental services, such as carbon sequestration, soil protection, and hydrological regulation. We also use the relevant indicative intermediate indicators defined in the Project. It assumes that the Project will attained up to 27,000 has of forest under sustainable management²⁰, and up to 1,845 has of degraded land afforested including riparian buffers and new forest belts.²¹ In the case of forest climate smart management, productivity is expected to increase by 56% (from 1.8 to 2.8 DM t/ha), while in the case of forest rehabilitation, productivity is expected to increase by 100% (from 1.5 to 3.0 DM t/ha). Considering these parameters for component 1 and 2, we are able to estimate the marginal benefits associated to the Project.
10. **Component 3.** For the third benefit stream, benefits were estimated following the methodology proposed in previous Disaster Risk Management Project²², which basically estimate the average damages due to hydro-meteorological shocks in the past and assume the marginal benefit due to similar investments based on expert's opinions. This analysis assumes that average annual loss is 0.71% of Moldova's GDP, which corresponds to the average losses from 2011 to 2016 using local data from the Civil Protection and Emergency Situations Service (CPRESS). Notice that this assumption is conservative considering that the average annual loss for the period 1994 – 2010 was 1.76% based on EM-DAT data,²³ substantially higher to the value used at this time. On the other hand, globally, assumptions on the economic loss reducing potential due to strengthening of disaster management systems and effective response to emergency ranges from 5% to 20%. In this analysis, it is assumed the lower bound of 5%, based on our conservative approach as well as the benefits start realizing in year 4 and onwards. Finally, it is assumed that the marginal contribution of the Project is 25% of the total benefit due to interviews with experts.²⁴

¹⁷ 715 has in the 2nd year, 1430 has up to the 3rd year, 2145 has up to the 5th year, and 2500 has up to the end of the project.

¹⁸ 300 in the 1st year, 1300 up to the 2nd year, 2300 up to the 3rd year, 3300 up to the 4th year, and 4000 up the end of the project.

¹⁹ TUB (2015) Evaluation of Forest Ecosystem Services (FES) in the Republic of Moldova, Transilvania University from Brasov, ENPI FLEG Program.

²⁰ Cumulative distribution per year is as follow: 4000 has on year 1, 9750 has up to year 2, 15500 has up to year 3, 21750 up to year 4, and 27000 up to the end of the project.

²¹ Cumulative distribution per year is as follow: 554 has on year 3, 1476 up to year 4, and 1845 up to the end of the project.

²² Specifically the Disaster and Climate Risk Management Project in Moldova (P115634).

²³ 1.7% was used in the previous DRM project in Moldova.

²⁴ Similar to the previous project, Disaster and Climate Risk Management Project (P115634).



11. **Combined analysis for all three Components.** For the Project-level analysis, Project management costs to be financed under Component 4 were allocated to each component on a pro-rated basis. Likewise, disbursement rate for the total Project cost is assumed as follow: 10% on year 1, 15% on year 2, 30% on year 3 and 4, 10% on year 5, and 5% on year 6. Given the expected durability of investments, this analysis assumes a 15 year horizon. Expected benefits after the end of the Project are assumed constant and similar to year 6. Using this approach, the US\$ 22 million to be invested in the Project are expected to generate efficiency benefits with a net present value of US\$ 18 million using the 6 percent discount rate recently adopted by the World Bank for Project evaluation. The internal rate of return (IRR) to this investment is estimated to be 27 percent. (See table 3 for details.) Results are robust to adverse changes in the key parameters. Assuming a more restrictive discount factor (doubling it to 12%), benefits are still positive and the net present value is US\$ 8 million. If the Project disbursement is accelerated and executed only during the first year the net present value decreases up to US\$ 16 million. Both results suggest that the Project worth are quite robust to adverse changes.
12. **Conclusions.** The ex-ante economic and financial analysis suggests that Project-supported investments will generate substantial benefits for beneficiaries in areas served by the Project, as well as substantial benefits for Moldova's society as a whole. Overall, the NPV is projected to reach US\$ 18 million (using 6 percent discount rate). The investments evaluated for the economic analysis will generate an internal rate of return of 27 percent. The economic analysis thus shows that if Project implementation is effective and efficient, Project-supported investments will bring substantial economic benefits to the beneficiaries. Due to data limitation, this assessment focuses only to short-term impacts as well as direct impacts. It does not take into account long-term effects nor indirect impacts – which the specialized literature suggests are positive and non-negligible. Therefore, our estimates correspond to conservative estimates or a lower bound of potential benefits.
13. It is important to keep in mind that relevant data is scarce and not easily available. Therefore, this economic analysis, and its results, should be interpreted with caution. More data collection at the producer level is essential to have a better picture of the associated benefits.



ANNEX 5: ELIGIBLE CLIMATE ADAPTATION INVESTMENTS

Climate Adaption Grants to Framers

Typology & Beneficiaries

Anti-hale infrastructure

An anti-hale net system is designed to provide protection from hale effects to perennial plantations (horticultural, grapes or berries), which at the same time allows for shade and sunbeam refraction. Structures include: (i) bearing pillar system (concrete or wood) on the perimeter of protected plantation area; and along the rows; (ii) anchoring elements, anti-sink support for pillars, zinc-plated wire network and multi-fiber metal cable cord, mountable locks and flanges, auto-blocking caps for the pillars, and (iii) the anti-hale net/mesh with required attachment elements. The anti-hale net is made of interweaved HDPE (*High-density polyethylene*) fiber (0.28-0.32 mm thick, specific weight of 50-70 g/m²). The mesh measures are 4x4 mm, 3x9 mm, 4x6 mm and 4x8 mm. A shading effect is granted by the mesh gray to black color grades. The anti-hale unit investment is circa 15,000-16,000 USD/ha, depending on the plantation scheme and the land profile. Structure durability is of circa 15 years; while the anti-hale mesh lasts 8 to 10 years.

Rain and surface water harvesting basins

Rain water/surface water harvesting basins are designed to mitigate drought effects and to create irrigation-water buffer systems. Investment actions include: (i) geological and environmental studies; (ii) public discussions and debates; (iii) design and construction approval issuance; (iv) construction of water basins; (v) coating with geo-membrane; (vi) safe-guard provisions. Investment works include: (i) excavations and shaping of the water harvesting body; (ii) construction of protection dam; (iii) coating with a geo-membrane (optional); and (iv) construction of the water bottom evacuator and overflow. The investment cost is circa 2 USD/m³ for constructing natural water basins, and artificial lakes and ponds, and circa 4 USD/m³ for constructing natural water basins coated with a geo-membrane. The operation period of the natural water basins and artificial lakes and ponds is of circa 25-30 years, while the water bodies coated with a geo-membrane would effectively operate for circa 10 to 15 years.

Irrigation systems

Investments include design, assembling and running the follow typical irrigation systems: (i) surface drip irrigation systems for perennial plantations; (ii) underground irrigation systems for perennial plantations; (iii) surface drip irrigations systems for vegetable plantations, nurseries and others; (iv) micro-aspersion irrigation systems, with support pillars, to mitigate drought and frost, and (v) mobile irrigation machines with roller and console. The *underground and surface drip irrigation systems* would include the following components (together with infrastructure): (i) water pumps with reduced energy consumption and a whirlpool, and afferent accessories; (ii) filtering and fertilizing stations in basic set-up and/or with optional add-ons; (iii) primary water supply irrigation pipes (HDPE, PE, PN, PVC), hydrants and main accessories; (iv) tertiary network formed of tubes or irrigation tapes with basic or optional accessories; (v) electronic systems combined with sensors for automated irrigation and irrigation monitoring (optional); (vi) photovoltaic systems combined with pumps for reduced energy consumption – optional. The *fixed micro-aspersion irrigation systems* would include the following elements: (i) water pumps with reduced energy consumption and whirlpool with main accessories; (ii) filtering and fertilizer stations in basic set-up and/or with optional add-ons; (iii) support system formed of pillars made of concrete of wood; (iv) anchorage system formed of diversely constructed anchors, anti-sink support for the pillars, zinc-plated wire network or metallic multi-fiber cable cord, locks and flanges in basic



options; (v) primary water supply irrigation pipes (HDPE, PE, PN, PVC), hydrants and main accessories; (vi) micro-aspersion systems formed of micro-sprinklers and accessories; (vii) electronic systems combined with sensors for automated irrigation and irrigation monitoring - as optional; (viii) photovoltaic systems combined with pumps for reduced energy consumption – optional. The *mobile aspersion irrigation machines* with roller and console would consist of: (i) mobile irrigation machine with a roller, hose, computer with solar module and accumulator in basic options; (ii) rap with a 360° rotating platform with sprinklers and super-thin sprinkling nozzles, a hydraulic turbine with a watering width of up to 40 m; (iii) a cart for the ramp; (iv) additional accessories and add-ons (optional), filters, pumping station operated through the tractor power socket, a shaft to connect to the tractor socket, manometer, manual pump, aspiration and repression duct. Investment costs for design, assembly and putting into operation, including infrastructure, are:

- i. surface drip irrigation systems for perennial plantations: circa 2000 USD/ha with a lifetime of 15 years for the primary system and 6-8 years for the tertiary system;
- ii. underground irrigation systems for perennial plantations: circa 2500 USD/ha with a lifetime of 15 years for the primary system and 8-10 years for the tertiary system;
- iii. surface drip irrigation systems for vegetable plantations and nurseries: circa 1500 USD/ha with a lifetime of operation of circa 15 years for the primary system and 2-4 years for the tertiary;
- iv. fixed micro-aspersion irrigation systems with pillars: circa 5000 USD/ha with a lifetime of 15 years for the primary system and circa 8-10 years for the tertiary;
- v. mobile aspersion irrigation machines with reel and console: circa 1250 USD/ha; reel, hoes and console can be used for circa 25 years; the nozzles would have to be changed after 3-5 years of operation.

Micro-climate control systems in greenhouses

To mitigate extreme temperatures and excess UV ray effects, micro-climate control systems include technical endowments, equipment and accessories that allow to set and sustain controlled temperature, humidity and a large spectrum of illumination in greenhouses, tunnels of semi-permanent structures for vegetables, berries, seedlings or flowers production. A typical investment will include designing, assembling and operating: (i) building and equipment for the boiler room and/or cooling station; (ii) heating system based on biomass combustion boilers; (iii) cooling systems and air conditioning; (iv) air heaters or coolers; (v) corrugated pipes for heating-cooling the soil base; (vi) water accumulation and expansion vessels; (vii) water circulation pumps; (viii) thermal screens for attracting infrared rays and for shading; (ix) water supply system, pipes, fittings and accessories. The specific investment would vary from 18 to 20 USD/m², depending on the area, volume and type of greenhouse construction. The expected lifetime of the boiler and water supply system is of circa 20 years. The other systems, equipment and accessories last up to 15 years, while the thermal screens can effectively operate for about 10 years.

No-till in perennial plantations

No-till technology is a technology meant to address soil erosion and drought impacts. In perennial plantations, mulching with crop residues or a permanent grass cover crop is applied between tree rows. In case of perennial plantations located on slopes with an inclination of over 5° permanent grass cover crop is preferable. The technology is also meant to rehabilitate soil fertility. Investment would include: (i) small-scale direct seeding equipment for planting perennial grass; (ii) grass cutters; (iii) drought-resistant perennial grass seeds and (iv) deep sub-soiling tillage operations in case of existing hard pans. The investment cost is 1100-1200 USD/ha, for a 20 hectare (up to, and for a minimum of 12 hectare) plantation size. The lifetime of the perennial plantations under this particular agricultural system is about 20-25 years, while the equipment depreciates over 7-10 years.



Other possible investment options

Frost control in perennial and berry plantations

Active methods of prevention and control of late spring and early fall frosts include: (i) equipment for production and reflection of infrared beams through special FrostBuster and/or FrostGuard devices; and (ii) wind machines. In both cases it is mandatory to install automated frost risk control equipment. The investment costs include the following variants:

- i. The equipment for production and reflection of infrared beams to be used 3-5 hours during night (FrostBuster) requires an investment of circa 3300 USD/ha, on a protected area of circa 7-8 ha. The lifetime of the equipment would reach 10 years;
- ii. The equipment for production and reflection of infrared beams (FrostGuard) to be used 4-6 hours during night, requires an investment of circa 5500 USD/ha, on a protected area of circa 1-1,5 ha. This equipment would depreciate over a 10 years period;
- iii. The wind machines to be used 5-6 hours during night require a specific investment of circa 5000 USD/ha, working on an area of 7-8 ha of protected field. The lifetime of the equipment would reach 10 years.

Water condensation devices

This involves investing in (i) generators that condensate water from air (atmospheric water generator AWG), polyethylene covers with fog additives and basins to collect the water; or (ii) methods like Airdrop irrigation concept, which envisage water extraction from ambient humidity via condensing vapors by cooling the air under the temperature point and transform it into dew.

Perennial grass seed production

Perennial grass seed production is a business opportunity for climate adaptation inputs provision. It would improve seed quality of existing local varieties and increase availability of varieties of herbs/grass adapted to local soil and climate conditions. This investment will enable the use of intensive technologies of seed production differentiated by ecologic zones, and provide for significant improvement of production potential while reducing the time required to obtain the first yield of seeds. The species mostly regarded are: alfalfa, red clover, white clover, common sainfoin, orchard grass, perennial and hybrid ryegrass, orchard fescue, tall fescue, bunchgrass, Timothy-grass and Sorghum Sudanese.

Other (e.g. IPM investment packages to address CC induced pest/diseases; Restoring degraded soils for climate change resilience through Integrated Soil Fertility Management (ISFM); Energy-smart technology investment; etc.)