

ANNEX 2

Feasibility Study

1. TABLE OF CONTENTS

1. TABLE OF CONTENTS	2
2. LIST OF ACRONYMS.....	6
3. DEFINITIONS ACCORDING TO IPCC AND FAO	7
4. CURRENCY AND CONVERSION FACTORS	8
5. PROJECT SUMMARY	9
ABSTRACT:	9
MITIGATION AND ADAPTATION BENEFITS	10
OTHER EXPECTED CO-BENEFITS:.....	10
PROJECT DEVELOPMENT TIMELINE	10
METHODOLOGY AND APPROACH:.....	10
<i>Literature Review:.....</i>	<i>11</i>
<i>FAO GeoSpatial Analysis:.....</i>	<i>11</i>
<i>Data review with the Ministry of EnvironmentEnvironment and ARMSTAT:</i>	<i>11</i>
<i>'Ground-truthing' of climate variables with representative focus groups in project areas:.....</i>	<i>11</i>
6. BACKGROUND INFORMATION	12
CLIMATE SCENARIO.....	12
EXPOSURE, VULNERABILITY, RESILIENCE AND DRR:	14
IMPACTS OF CLIMATE CHANGE ON FORESTS AND AGRICULTURE:	14
GHG EMISSIONS:	15
<i>Current GHG scenario and the identification of emission trends:.....</i>	<i>16</i>
<i>Share of GHG emissions amongst sources in the Energy:.....</i>	<i>17</i>
<i>Agriculture Sector:</i>	<i>17</i>
<i>Forestry and other land use:.....</i>	<i>18</i>
<i>Armenia's Climate Change Mitigation Targets, policies and measures (NDC, 2015):</i>	<i>18</i>
<i>National baseline net emission and mitigation target analysis per sector:.....</i>	<i>18</i>
COUNTRY ECONOMIC BACKGROUND:	20
ARMENIA'S HOUSING SOCIAL PROFILE:	21
POVERTY TRENDS:.....	22
GENDER AND INCOME PROFILE:	22
FOREST SECTOR BACKGROUND.....	23
<i>Legal framework and policies</i>	<i>24</i>
<i>Institutional setup and governance in the forestry sector:</i>	<i>25</i>
<i>Sector Performances:.....</i>	<i>29</i>
<i>SWOT Analysis of the Forest Sector:.....</i>	<i>31</i>
<i>Main Past and Ongoing Development Projects/Programmes:.....</i>	<i>31</i>
<i>Lessons Learned and Best Practices:.....</i>	<i>35</i>
ENERGY SECTOR BACKGROUND:	36
<i>Legal framework and policies:.....</i>	<i>36</i>
<i>Energy situation in rural areas:.....</i>	<i>40</i>
<i>Rural Energy Sector Performances:</i>	<i>42</i>
<i>SWOT analysis of the Sector</i>	<i>49</i>

<i>Main Past and Ongoing Development Projects/Programmes:</i>	49
<i>Existing financing schemes for EE/RE technology and financing mechanisms:</i>	52
<i>Possible appropriate non-grant incentives to cover the additional cost of EE technologies:</i>	52
<i>Lessons Learned and Best Practices:</i>	53
7. PROJECT AREAS AND TARGET GROUP	54
PROJECT AREAS:	54
<i>Lori</i>	55
<i>Syunik</i>	58
TARGET GROUPS:	61
8. THE THEORY OF CHANGE	63
9. THE LOGICAL FRAMEWORK	67
10. DETAILED PROJECT DESCRIPTION	72
BENEFICIARIES.....	72
COFINANCING:	72
COMPONENT 1:	72
OUTCOME 1:	73
<i>Output 1.1</i>	74
<i>Output 1.2:</i>	76
<i>Output 1.3:</i>	81
COMPONENT 2	83
OUTCOME 2:	84
<i>Output 2.1:</i>	84
<i>Output 2.2:</i>	84
<i>Output 2.3:</i>	85
COMPONENT 3:	86
OUTCOME 3:	87
<i>Output 3.1:</i>	88
<i>Output 3.2:</i>	92
<i>Output 3.3:</i>	94
COMPONENT 4	96
11. PLANNED PROJECT’S COORDINATION AND COLLABORATION	96
12. INSTITUTIONAL ARRANGEMENT AND PROJECT MANAGEMENT	100
INTRODUCTION:	100
PROJECT EXECUTION:.....	100
PROJECT PARTNERS:.....	100
PROJECT STEERING COMMITTEE AND GOVERNANCE:	101
PROJECT MANAGEMENT:	101
PROJECT ORGANIZATION	102
<i>Operational Partners roles and responsibilities:</i>	102
<i>FAO’s roles and responsibilities:</i>	102
<i>FAO Role as Accredited Entity</i>	103
<i>FAO’s role as executing entity</i>	105
13. TIMETABLE	107

14. PLANNING, M&E AND LEARNING AND KNOWLEDGE MANAGEMENT.....	110
PLANNING:.....	110
MONITORING AND EVALUATION.....	111
<i>M&E Unit Composition and Functions:.....</i>	<i>112</i>
<i>Project's Baseline:.....</i>	<i>113</i>
<i>Description of Selected Indicator:.....</i>	<i>114</i>
<i>Contribution to SDGs Indicators.....</i>	<i>116</i>
<i>Monitoring Strategy</i>	<i>119</i>
<i>Reporting, Supervision and Evaluation</i>	<i>119</i>
<i>M&E Outputs and budget:.....</i>	<i>121</i>
LEARNING AND KNOWLEDGE MANAGEMENT:	121
15. CARBON ACCOUNTING ANALYSIS.....	122
CARBON BALANCE:	122
METHODOLOGY:	124
METHODOLOGY OF THE MODULE USED FOR THE ANALYSIS	125
<i>Afforestation reforestation module:.....</i>	<i>125</i>
<i>Perennial module:.....</i>	<i>125</i>
<i>Forest degradation & management module:.....</i>	<i>125</i>
<i>Energy consumption and infrastructures module:.....</i>	<i>126</i>
<i>Detailed project analysis per activity for the project:.....</i>	<i>126</i>
<i>Carbon monitoring system based on EX-ACT for the project:.....</i>	<i>130</i>
<i>Results provided by EX-ACT:</i>	<i>130</i>
16. PROJECT COST AND FINANCING	132
INTRODUCTION:	132
PROJECT COSTS:.....	132
TABLE 1: PROJECT BENEFICIARIES	9
TABLE 2: PROJECT'S BENEFITS 20Y (MITIGATION/ADAPTATION)	10
TABLE 3: PROJECTS CO-BENEFITS	10
TABLE 4: PROJECT'S DEVELOPMENT TIMELINE	10
TABLE 5: GHG EMISSIONS BY SECTORS AND BY GASES FOR 2014 (TNC, 2016)	16
TABLE 6: TOTAL GREENHOUSE GAS EMISSIONS FOR 2010, AND PROJECTIONS BY 2030	19
TABLE 7: COUNTRY ECONOMIC VARIABLES (2014-2018)	20
TABLE 8: FOREST COVER IN ARMENIA (SFF) FROM HAYANTAR RECORDS, 2018	23
TABLE 9: INSTITUTIONAL STRUCTURE OF THE RA MOE WITH RESPECT TO FOREST AND FOREST LANDS	27
TABLE 10 VOLUMES OF WOOD PRODUCTION BY HAYANTAR (SOURCE: UNPUBLISHED DATA FROM HAYANTAR)	29
TABLE 11 BUDGET STRUCTURE OF HAYANTAR	31
TABLE 12: SWOT ANALYSIS OF THE FOREST SECTOR IN ARMENIA	31
TABLE 13: HEATING CHOICES IN RURAL ARMENIA	41
TABLE 14 TREE SPECIES UTILIZED FOR WOOD FUEL (FAO, 2015) AND (UNECE, 2015)	44
TABLE 15: SAMPLE OF LOCALLY PRODUCED BRIQUETTES AND PELLETS (PASOYAN, 2018)	45
TABLE 16 ENERGY EFFICIENCY OF DIFFERENT WOOD BURNING TECHNOLOGIES (216)	46
TABLE 17 SUMMARY OF THE REQUIRED ENERGY SAVINGS IN THE FRAME OF THE PROJECT	47
TABLE 18: SWOT ANALYSIS OF THE RURAL ENERGY SECTOR IN ARMENIA	49
TABLE 19: BRIEF DESCRIPTION OF SELECTED PROJECT AREAS	54
TABLE 20: LIST OF PROPOSED SPECIES FOR FOREST RESTORATION IN LORI MARZ	57

TABLE 21: LIST OF PROPOSED SPECIES FOR FOREST RESTORATION IN SYUNIK MARZ	61
TABLE 22: PROJECT BENEFICIARIES	61
TABLE 23: PROJECT'S PARADIGM SHIFT OBJECTIVES	65
TABLE 24: PROJECT BENEFICIARIES	72
TABLE 25: COMPONENT 1 EXPECTED BENEFITS	73
TABLE 26: COMPONENT 2 EXPECTED BENEFITS	83
TABLE 27: COMPONENT 3, EXPECTED BENEFITS	87
TABLE 28: PROJECT'S PLANNED COORDINATION AND COLLABORATION WITH ONGOING PROJECTS IN ARMENIA	99
TABLE 29: BASELINE SUMMARY ACCORDING TO LFM	114
TABLE 30: PROJECT'S MEANS OF VERIFICATION	114
TABLE 31: INDICATORS AND MEANS OF VERIFICATION	116
TABLE 32: PROJECT'S CONTRIBUTIONS TO SDGS	118
TABLE 33: PROJECT REPORTING FRAMEWORK	120
TABLE 34: SPECIFIC OBJECTIVES RELATED TO GCF RMF IMPACT AREAS IMPACT	122
TABLE 35: PROJECT STRUCTURE - WITH PROJECT/WITHOUT PROJECT- ALL GHG ARE EXPRESSED IN TCO2EQ.	123
TABLE 36: GHG CONVERSION FACTORS	124
TABLE 37: TYPE OF PLANTED VEGETATION AND CORRESPONDING SUPERFICIES	127
TABLE 38: ABOVEGROUND BIOMASS GROWTH RATE AND SOIL CARBON CONTENT PER TYPE OF VEGETATION	128
TABLE 39: CARBON BALANCE AND ANNUAL EMISSION FACTORS (EF) PER TYPE OF VEGETATION	129
TABLE 40: TYPE OF VEGETATION, CORRESPONDING AREA AND DEGRADATION LEVEL	129
TABLE 41: CARBON SEQUESTRATION POTENTIAL FOR THE TARGETED FOREST SPECIES	129
TABLE 42: FUELWOOD CONSUMPTION IN TONNES OF DRY MATTER PER YEAR	130
TABLE 43: CARBON BALANCE AND EMISSION FACTOR FROM CARBON SEQUESTRATION	130
TABLE 44: BREAKDOWN OF COSTS BY COMPONENT (USD)	132
TABLE 45: PROJECT FINANCING PARAMETERS	134
FIGURE 1: SAMPLE MAP TO SHOW REGULAR CLIMATIC DIVERSITY AND COMPLEXITY IN ARMENIA.(MOE,2018)	12
FIGURE 2: MIN AND MAX TEMPERATURE TRENDS IN ARMENIA (1981-2018)	13
FIGURE 3: PRECIPITATION ABSOLUTE CHANGE 1981-2018 (FAO 2018) IN ARMENIA AND PROJECT AREAS	13
FIGURE 4: GREENHOUSE GAS EMISSIONS BY SECTORS FOR 2014	16
FIGURE 5: GREENHOUSE GAS EMISSIONS IN THE ENERGY SECTOR IN 2014.....	17
FIGURE 6: NATIONAL POVERTY PROFILE, 2008-2015	22
FIGURE 7: NEW INSTITUTIONAL SET-UP IN 2018.....	26
FIGURE 8: CORRELATION OF MOISTURE CONTENT AND HEAT VALUE OF BEECH (UNECE, 2015)	44
FIGURE 9 TRANSFORMATION OF VOLUMES FOR WOOD FUEL (SOURCE: FAO, 2015)	44
FIGURE 10: EXAMPLES OF TYPICAL WOOD STOVES IN RURAL ARMENIA.....	46
FIGURE 11 IMPROVED WOOD STOVES IN GEORGIA (TESTED EFFICIENCY APPROX. 65%) (ECOVISION, 2015)	46
FIGURE 12 EXAMPLES OF AIRTIGHT STOVES - NEW TECHNOLOGY, UP TO 85% EFFICIENCY (KARLISVIK, 2014)	46
FIGURE 13: ARMENIA, PROJECT AREAS	54
FIGURE 15: LORI MARZ, ARMENIA.....	55
FIGURE 15: LORI CLIMATE DATA.....	56
FIGURE 16: LAND USE DISTRIBUTION IN LORI ACCORDING TO ALTITUDE (500-2,900 M). FAO, 2018.....	56
FIGURE 17: SYUNIK MARZ, ARMENIA	58
FIGURE 18: SYUNIK MARZ CLIMATE DATA	59
FIGURE 19: LAND USE DISTRIBUTION IN SYUNIK, ACCORDING TO ALTITUDE (600 – 3,500 M). FAO, 2018.....	59
FIGURE 20: THE THEORY OF CHANGE – AGGREGATED PROBLEM TREE AND BAU VS PARADIGM SHIFT SCENARIO ..	63
FIGURE 21: THE THEORY OF CHANGE - PROJECT'S CONTRIBUTION TO THE PARADIGM SHIFT	64
FIGURE 22: PROJECT COFINANCING STRUCTURE	72
FIGURE 23: COFINANCING STRUCTURE - COMPONENT 1	73

FIGURE 24: COFINANCING STRUCTURE - COMPONENT 2	83
FIGURE 25: COFINANCING STRUCTURE - COMPONENT 3	87
FIGURE 26. PROJECT ORGANIZATION STRUCTURE	106
FIGURE 27: TIMEFRAME SCHEME OF THE PLANNING AND APPROVAL PHASE OF THE AWPB	111
FIGURE 28:M&E UNIT COMPOSITION	112
FIGURE 29: RELEVANCE OF MOV ACCORDING TO COMPONENTS.	114
FIGURE 30: THE PROJECT REPORTING FLOW	121
FIGURE 31: TOTAL WITHOUT AND WITH PROJECT AND BALANCE.....	124
FIGURE 32: EX-ACT RESULTS. ALL GHG ARE EXPRESSED IN TCO2EQ.....	131
FIGURE 33: FIGURE A: PROJECT EXPENDITURES BY CATEGORY	133
FIGURE 34: PROJECT BUDGET BY COMPONENT AND FINANCIER	134
FIGURE 35: FINANCIERS CONTRIBUTIONS BY COMPONENT	135

2. LIST OF ACRONYMS

AAC	Annual Allowed Cut
ADA	Austrian Development Agency
ADB	Asian Development Bank
AF	Adaptation Fund
AGBU	Armenian General Benevolent Union
AMA	Accreditation Master Agreement
AMD	Armenian Drams
APB	Autonomous Province of Bolzano
ARMSTAT	Armenia Statistic Committee
ATP	Armenia Tree Project
AWHHE	Armenian Women for Health and Healthy Environment
BH	Budget Holder
CBM	Cubic Meter
CC	Climate Change
CCA	Climate Change Adaptation
CCF	Climate Change Finance
CIF	Climate Investment Fund
CCM	Climate Change Mitigation
COM	Covenants of Mayors
CSO	Civil Society Organization
EBRD	European Bank for Reconstruction and Development
EE	Energy Efficiency
EECA	Eastern Europe and Central Asia
EIB	European Investment Bank
EPIU	Environmental Projects Implementation Unit
ESF	Foundation to Save Energy
EU	European Union
FAO-AM	Food and Agriculture Organization Representation in Armenia
FAO	Food and Agriculture Organization
FAO-HQ	Food and Agriculture Organization Head Quarter
FAO - REU	Food and Agriculture Organization
FLR	Forest Landscape Restoration
FNC	First National Communication
GCF	Green Climate Fund
GEF	Global Environment Facility
GHG	Green House Gasses
GoA	Government of Armenia
HH	Household
HfH	Habitat for Humanity
Kcal	kilocalories
KJ	kilojoule
kWh	kilowatt-hour
IFAD	international Fund for Agriculture Development
IFI	International Finance Institution
INGO	International Non Governmental Organisation
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
LFM	Logframe Matrix
LPD	Land Productivity Dynamics
LUCF	Land Use Change and Forest
MAB	Multi Apartment Building
MDB	Multilateral Development Banks
M&E	Monitoring and Evaluation
MEP	Municipal Energy Plans
MJ	Mega Joule
MoE	Ministry of Economy
MoE	Ministry of Environment (former Ministry of Nature Protection)
MoENR	Ministry of Energy Infrastructure and Natural Resources
MoESR	Ministry of Education and Scientific Research
MoNP	Ministry of Nature ProtectionMoLSA
MoTD	Ministry of Territorial Development
NAP	National Adaptation Plan
	Ministry of Labour and Social Affaires

NAMA	Nationally Appropriate Mitigation Actions
NDA`	National Designated Authority
NDC	Nationally Determined Contribution
ND-GAIN	Notre Dame Global Adaptation Index
NDVI	Normalized Difference Vegetation Index
NC	National Communication
NIF	Neighbouring Investment Facility
NWFP	Non Wood Forest Product
NTFP	Non Timber Forest Product
OECD	Economic Cooperation and Development
OP	Operational Partner
OPA	Operational Partner Agreement
OPIM	Operational Partner Implementation Modality
OSCE	Organization for Security and Co-operation in Europe
P SC	Steering Committee
RoA	Republic of Armenia
RE	Renewable Energy
R2E2	Renewable Resources and Energy Efficiency Fund
SAP	Simplified Approval Process
SAPs	Sustainable Energy Action Plans
SD	Sustainable Development
SDC	Swiss Agency for Development and Cooperation
SDG	Sustainable Development Goal
SFL	State Forest Land
SFMC	State Forest Monitoring Center
SIDA	Swedish International Development Cooperation Agency
SNC`	Second National Communication
SWH	Solar Water Heaters
TNC	Third National Communication
UN	United Nations
CBD	Convention on Biological Diversity
UNCCD	United Nation Convention to Combat Desertification
UNDP	United Nations Development Program
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nation Framework Convention on Climate Change
UNEP	United Nation Environmental Program
UNISDR	United Nation International Strategy for Disaster Reduction
USD	United State Dollar
USAID	United States Agency for International Development
VET	Vocational Education and training
WB	The World Bank
WWF	World Wildlife Found
WRI - CAIT	World Resource Institute Climate Analysis Indicators Tool

3. DEFINITIONS ACCORDING TO IPCC AND FAO ¹

Adaptation: In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate.

Adaptive capacity/Readiness The combination of the strengths, attributes, and resources available to an individual, community, society, or organization that can be used to prepare for and undertake actions to reduce adverse impacts, moderate harm, or exploit beneficial opportunities.

Anthropogenic: Resulting from or produced by human beings.

Baseline/reference: The baseline (or reference) is the state against which change is measured. It might be a 'current baseline,' in which case it represents observable, present-day conditions. It might also be a 'future baseline,' which is a projected future set of conditions excluding the driving factor of interest. Alternative interpretations of the reference conditions can give rise to multiple baselines.

Biomass: Biomass is defined – from a scientific and technical point of view – as material of biological origin form (EN 14558:2010). Biomass is organic material that is plant or animal based, including but not limited to dedicated energy crops, agricultural crops and trees, food, feed and fibre crop residues, aquatic plants, alga, forestry and wood residues, agricultural waste, processing by-products and other non-fossil organic matter (prENISO/DIS 16559:2013).

Biofuels: Biofuels are solid, liquid or gaseous fuel produced directly or indirectly from biomass.

Climate change: A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcing, or to persistent anthropogenic changes in the composition of the atmosphere or in land use.

Climate projection: A projection of the response of the climate system to emissions or concentration scenarios of greenhouse gases and aerosols, or radiative forcing scenarios, often based upon simulations by climate models. Climate projections are distinguished

¹ Sources: [IPCC](#) and [Wood Fuels Handbook, FAO 2005](#)

from climate predictions in order to emphasize that climate projections depend upon the emission/ concentration/radiative-forcing scenario used, which are based on assumptions concerning, e.g., future socioeconomic and technological developments that may or may not be realized and are therefore subject to substantial uncertainty.

Climate scenario: A plausible and often simplified representation of the future climate, based on an internally consistent set of climatological relationships that has been constructed for explicit use in investigating the potential consequences of anthropogenic climate change, often serving as input to impact models. Climate projections often serve as the raw material for constructing climate scenarios, but climate scenarios usually require additional information such as about the observed current climate.

Disaster risk reduction (DRR): Denotes both a policy goal or objective, and the strategic and instrumental measures employed for anticipating future disaster risk; reducing existing exposure, hazard, or vulnerability; and improving resilience.

Early warning system: The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities, and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

Exposure: The presence of people; livelihoods; environmental services and resources; infrastructure; or economic, social, or cultural assets in places that could be adversely affected.

Forest Fuel: Forest fuel (fuel wood) is produced directly from forest wood or plantation wood through mechanical process, the raw material has not previously had another use (prENISO/DIS 16559:2013).

Hazard: The potential occurrence of a natural or human-induced physical event that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, and environmental resources.

Land use and land use change: Land use refers to the total of arrangements, activities, and inputs undertaken in a certain land cover type (a set of human actions). The term land use is also used in the sense of the social and economic purposes for which land is managed (e.g., grazing, timber extraction, and conservation). Land use change refers to a change in the use or management of land by humans, which may lead to a change in land cover. Land cover and land use change may have an impact on the surface albedo, evapotranspiration, sources and sinks of greenhouse gases, or other properties of the climate system and may thus have radiative forcing and/or other impacts on climate, locally or globally.

ND-GAIN Index: the Index summarizes a country's vulnerability to climate change and other global challenges in combination with its readiness to improve resilience. It aims to help governments, businesses and communities better prioritize investments for a more efficient response to the immediate global challenges ahead.

Non-wood forest products: Goods derived from forests that are tangible and physical objects of biological origin other than wood.

Vulnerability: The propensity or predisposition to be adversely affected

Wood Fuels or Fuelwood: Wood fuels are defined as all types of biofuels originating from woody biomass, where the original composition of the wood is preserved and unaltered from its original form.

4. CURRENCY AND CONVERSION FACTORS

United States Dollar = 483.5 Armenian Drams

1 kWh = 860 kcal = 3.600 kJ (3.6 MJ) 1 MJ = 239 kcal = 0.278 kWh 1 kcal = 4.19 kJ = 0.00116 kWh

1 toe = 41.87 GJ = 11.63 MWh

5. PROJECT SUMMARY

Abstract: WB ranked Armenia among the top 4 vulnerable countries in the Eastern Europe and Central Asia (EECA) region. Forests - already under stress due to fuelwood harvesting - are reported as most sensitive to climate change (CC)² and the EU defines rural population as energy poor. Available trends and projections indicate exposure to: (i) Average temperature increases (ii) Precipitation and river flow decreases³; and; (iii) Snow cover reduction. Forests and agriculture are identified as the most vulnerable to climate change.

1. The Third National Communication to the UNFCCC (TNC) estimates that under a business as usual scenario (BAU) 5-6% of existing forests might be lost by 2030 as unhealthy trees and forest stands will become more sensitive to pests, diseases and fires. Additionally, rural communities are still heavily dependent from forests and, reportedly, responsible for the harvesting of up to 2 million m³ of fuelwood yearly against an annual growth of forests of about 0.6 million m³/y. Recent surveys on households' energy consumption concluded that due to raising prices of fossil fuels, fuelwood consumption per energy unit output will increase. Concerning adaptation challenges, forestry represent one of the less adapted sub-sector.

2. Total national emissions (2014) accounted for 10.45 MtCO₂eq (2.82 tCO₂eq/capita) with the energy sector being the main contributor (>67%). Forests remove yearly about 4.6% of total emissions. Armenia's Nationally Determined Contribution (NDC-2015) aims to reach by 2050 20% of forest cover and to emit 2.07 tCO₂eq/capita. Mitigation will be mainly from renewable energy (RE), energy efficiency (EE), forests, and carbon storage in soil. Compared to 2010 levels, literature forecasts + 57% emissions' increase by 2030 while the already decreased carbon removals (-11% 2010-2014) is projected to further contract in the BAU scenario. Introducing climate adaptive silviculture⁴ practices and reducing degradation drivers of forest (i.e. fuelwood) will contribute to achieve NDC targets with the aimed ecosystem based approach.

3. The project will invest in Lori and Syunik Marzes (47% of total forest cover) with the highest forest degradation by: (i) **C1**- increasing forest cover by 2.5%, (ii) **C2** - reducing fuelwood demand of rural communities by at least 30%, (iii) **C3** - enabling sustainable and climate adaptive forest management on at least 135,800 ha⁵ of forests (20 y) and ensuring technology transfer to rural communities, private sector and institutions.

4. Beneficiaries of the project are: the total rural population of Project Areas (Table 1) (15 municipalities and 207 rural communities), the private sector and line ministries including, among the others, the Ministry of Economy and Innovation, the Ministry of Territorial Administration and Development and the Ministry of Energy and Nature Protection. Rural communities in the two Marzes are mostly poor or very poor with the higher direct dependency on forest ecosystem services for fuelwood (average 8 m³/y) and livelihood (agriculture, beekeeping, NWFP). Indirect beneficiary is the entire Armenian population.

	Project Areas	Direct Beneficiaries	% Total Population	Women ⁶ %	Indirect Beneficiaries
Component 1	Lori/Syunik	377,308.00	12%	52%	3,018,854.00
Component 2	Lori/Syunik	10,000.00	0.3%	90%	3,018,854.00
Component 3	Lori/Syunik	377,308.00	12%	52%	3,018,854.00
Total		377,308.00	12%	52%	3,018,854.00

Table 1: Project Beneficiaries

5. The project will be financed over an eight years period with a total budget of USD 19.2 million: **52%- GCF**, **31%- Republic of Armenia**, **9% Austrian Development Agency (ADA)**, and **8% as FAO, WWF-**

² See Climate Scenario Under Section 5

³ Forecasts can vary substantially by month and by climate model

⁴ Tailored to the Armenian context from the experience of the [US Forest Department](#), of the Spanish forestry sector as well as from concrete experiences in Lebanon where adaptation of forests is considered a series of practices and actions (from seedling to maintenance) needed to enhance the ability of ecosystems to adapt and survive in the projected climate scenario.

⁵ Equivalent to Forest Cover in Lori and Syunik.

⁶ avoid escalation of the VAW caused by involvement of women in the project activities, the most important undertaking of the project should be a profound awareness raising work with communities and families, especially men.

ARMENIA and the Autonomous Province of Bolzano (APB, Italy). Due to the level of public debt (> 61% GDP), the Country is undertaking an important fiscal adjustment. Increasing the foreign currency debt (e.g. from IFIs) would represent an additional source of vulnerability. Therefore, the Country will not be able to provide additional resources to the project and GCF funding is needed to ensure the aimed paradigm shift. Executing entities of the project will be the Ministry of Environment (MoE) and the FAO Armenia. Project's management will be delegated by the MoE to its Environmental Project Implementation Unit (EPIU) while FAO Representation in Armenia (FAO-AM) will manage the transfer of technology and the capacity development. The project will work under the guidance of a steering committee (SC) representing all relevant stakeholders.

Mitigation and Adaptation Benefits

Project Objective	Mitigation Benefits tCO ₂ eq (20Y)	Adaptation Benefits
<i>by 2027, CO₂ removals from the forests sub-sector are increased by at least 7 % via sustainable climate adaptive forestry investments and fuelwood energy efficiency with effective involvement of communities</i>	19,975 million	Increased Resilience of forests (e.g. higher survival rate, increased growth per ha, reduced impacts of fires) and households in forest adjacent communities

Table 2: Project's Benefits 20Y (Mitigation/Adaptation)⁷

Other Expected Co-Benefits: The project will have additional positive impacts on the environment, gender and youth and the economy. Table 3 below briefly summarized major expected impacts on Armenia's sustainable development (SD).

Environment	Biodiversity, on air quality, on soil quality and water availability.
Gender	Improved Participation of Women in Forest's and Energy Governance in rural areas ⁸
Economic	Annual fuelwood's expenditures of rural households in forest adjacent communities is reduced by about 30% (related savings represent at least 70-80 USD/household/year, or 8 % of the annual income); improved forest management and support to EE adoption generate economic opportunities ⁹ and improves the hedonistic value of forests hence the potential relevance for ecotourism.
Social	Economic vulnerability and exposure of rural communities to shocks is reduced and new market opportunities are created as well as job opportunities for youth
Health	Improved stoves and design standards will reduce in house pollution due to inefficient combustion of biomass

Table 3: Projects Co-Benefits

Project Development Timeline

	Jun-17	Oct-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18
I round of national consultations and stakeholders engagement - Needs' identification / Targets	Field Mission														
II round of national consultations and stakeholders engagement - Concept Note Drafting / Selection of Target areas		Field Mission													
Concept Note Submission to the NDA															
NDA No Objection (CN)															
GCF Review of the CN															
Start of the Full Funding Proposal (FFP)									Field Mission		Field Mission				
III round of national consultations and stakeholders engagement - FFP development and fine tuning															
FFP Submission to the NDA															
FFP Submission to the GCF															

Table 4: Project's development timeline

Methodology and approach: As mandated by the NDA, FAO as Accredited Entity approached the preparation of the proposed climate investment project by analyzing results deriving from the four types of sources:

- Comprehensive literature review including ongoing and past projects;
- FAO Geospatial analysis of forests / natural resources¹⁰;
- Data review with the Ministry of Environment and its Climate Change Information Center; and
- Ground-truthing of data in project areas.

⁷ Details are available in chapter 14

⁸ Kindly refer to Annex 4 of the SAP proposal for further details on gender involvement and mainstreaming.

⁹ Details are provided in Annex 9

¹⁰ FAO has developed a new application that allow access to and elaboration of the main international databases on remote sensing and climatic data.

6. Additionally, data have been collected both at national and local levels, to determine current exposure of ecosystems and communities and to understand vulnerability to CC. The next chapters will highlight and summarize main findings at national, local and project areas level.

Literature Review: FAO and NDA teams collected and analyzed over 350 publications, project documents and national communications/policy papers. Of these, priority was given to: **(i)** national communications to UNFCCC, UNCCD, CBD and others; **(ii)** national action plans and strategies; **(iii)** national legal frameworks, **(iv)** UN assessments and reports; **(v)** publications from national institutions, academia (national and international) and CSO; and **(vi)** bilateral donors' reports / projects. References listed in Annex 11.

FAO GeoSpatial Analysis: As part of its mandate to support member countries, FAO developed a set of tools and methodologies to allow rapid and tailored geospatial analysis in support to project cycle management. One result of such effort is Earth Map, an open source application that allows for the interpretation of large remote sensing datasets in near real time as an open source.

7. [Earth Map](#) is an innovative tool that facilitates and empowers users in performing historical and current climate-environmental analysis for a given area (regional, inter-regional, national, district, and sub-district) through a graphical interface that has been developed by FAO thanks to its partnership with Google. The tool ensures an objective evidence-based approach not only to support project design but to be accessible in future for monitoring and evaluation activities, as well.

8. FAO deployed Earth Map in Armenia (among other countries) in order to ensure evidence-based project cycle management and to understand the climate risk and vulnerability of project areas. The application, using available data published from internationally accredited organizations and research institutes¹¹, allowed for a clear understanding of Armenian climatic patterns, trends and anomalies. The tool also allows to look, with high accuracy, at local realities and determine vulnerability and risk of each forest or community identified in project areas.

Data review with the Ministry of Environment and ARMSTAT: Data and analysis produced by FAO experts have been verified with the Ministry of Environment. In particular data have been reviewed with the Forest Monitoring Center, Hayantar, the Climate Change information Center and by the office of the first and second Deputy Ministers. Additionally, presented data have been verified with representatives of the Armenia Statistic Committee (ARMSTAT)

'Ground-truthing' of climate variables with representative focus groups in project areas: As part of the national engagement process / national ownership and given the importance of community participation in the project, the FAO validated project's baselines with communities via meetings with locally active CSOs and local institutions. Additionally the FAO hired a specialized Armenian [NGO](#)¹² with longstanding experience with international organizations such as UNDP, OSCE, USAID and others to undertake a household socio-economic, energy and climatic appraisal in project areas so to complement and update the baseline available in literature. Results of the survey allowed the project not only to understand climate change perceptions among target and control communities but also to evaluate their dependency from forests and in particular from fuelwood.

¹¹ Earth Map uses only peer reviewed and internationally accepted models and algorithms to run queries and process data.

¹² [Armenian Women for Health and Healthy Environment](#)

6. BACKGROUND INFORMATION

Climate Scenario: Armenia has a highland continental climate with hot summers and cold winters. A recent report on Armenia's vulnerability to climate change [31] defines the Country as an “ecosystem island” with its very own specifics and risks. Given its orography and geography, Armenia present a wide climate diversity (Figure 1), from arid subtropical in the east and south to cold high mountainous climates in the north. [160]

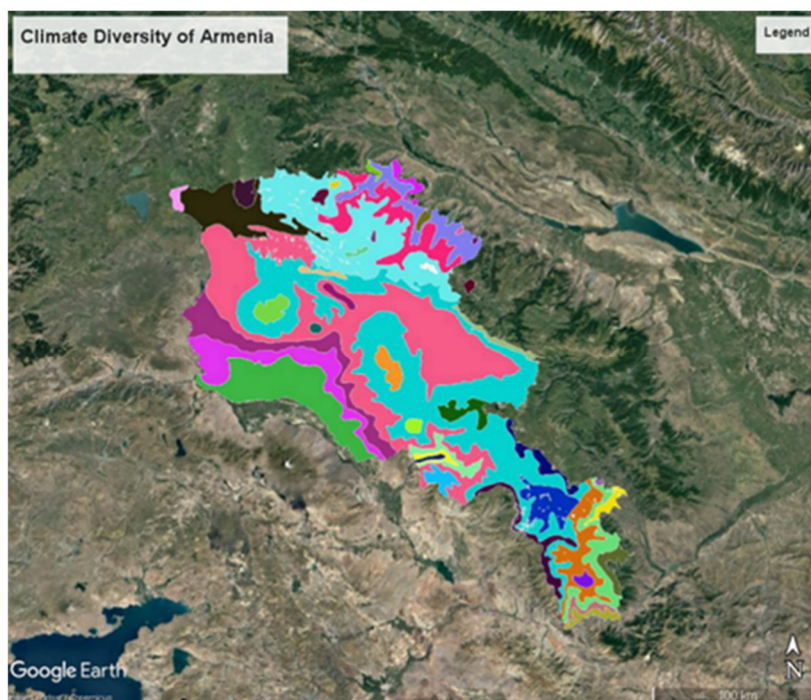


Figure 1: Sample map to show regular climatic diversity and complexity in Armenia. (MoE, 2018)

9. The average annual air temperature is 5.5°C. The maximum average annual temperature is 12-14°C. The whole territory is characterized by a temperate climate, with an average summer temperature of 16.7°C; however, in the Ararat valley the summer temperature fluctuates from about 24 to 26°C. The highest recorded temperature is 43°C. Winters are cold and January is the coldest month of the winter, with an average temperature of 6,7°C. The lowest recorded temperature was -42°C. In the north eastern and south eastern regions of the Republic the winter is temperate. [160]

10. The average annual rainfall is 592 mm. The most arid regions are the Ararat Valley and Meghri Region with an observed annual precipitation of 200-250mm. The maximum precipitation is observed in alpine regions, about 1000 mm. In summer, the average rainfall does not exceed 32-36mm in the Ararat valley, which consequently can be described as arid or semiarid. In some regions, especially in the Ararat Valley, mountain-valley winds are common. In summer, their speed reaches 20m/s or more [320].

11. The Third National Communication (TNC) to the UNFCCC [160] reports evidence of climate change impacts, having documented (1934-2012) a 1.1C° increase in the average summer temperature and a 10% reduction in average precipitation over the past 80 years. Since the 60s average annual temperature has increased by 0.2 °C (1960 – 2015) per decade, hot summer days ($T^{\circ} \text{Max} > 25^{\circ} \text{C}$) have increased by over 10% while cold summer days have decreased by 6%. The FAO analysis of climatic trends for the period 1989-2018 confirms trends as reported in figure 2. [100]



Figure 2: Min and Max Temperature Trends in Armenia (1981-2018)

12. While for temperature, reviewed data set are coherent, the same cannot be stated on precipitations. According to the TNC, rain trends (1935-2012) show a 10% decrease but with different spatial distribution due to Country's orography. North-eastern and central (Ararat Valley) regions have turned more arid, while precipitations have increased in the southern and north-western regions, as well as in the western part of the Lake Sevan basin. Since 1961, snow cover shows a declining trend (-5%) and rivers' flow is reportedly reduced by around 6%. According to USAID [320] and to FAO [100] (Figure 3), the analysis of data derived from processing Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS v2) grids at 5 day temporal resolution (1981-2018), precipitations appear to be unchanged or increasing with slight differences between north (increase) and south (slight decrease).

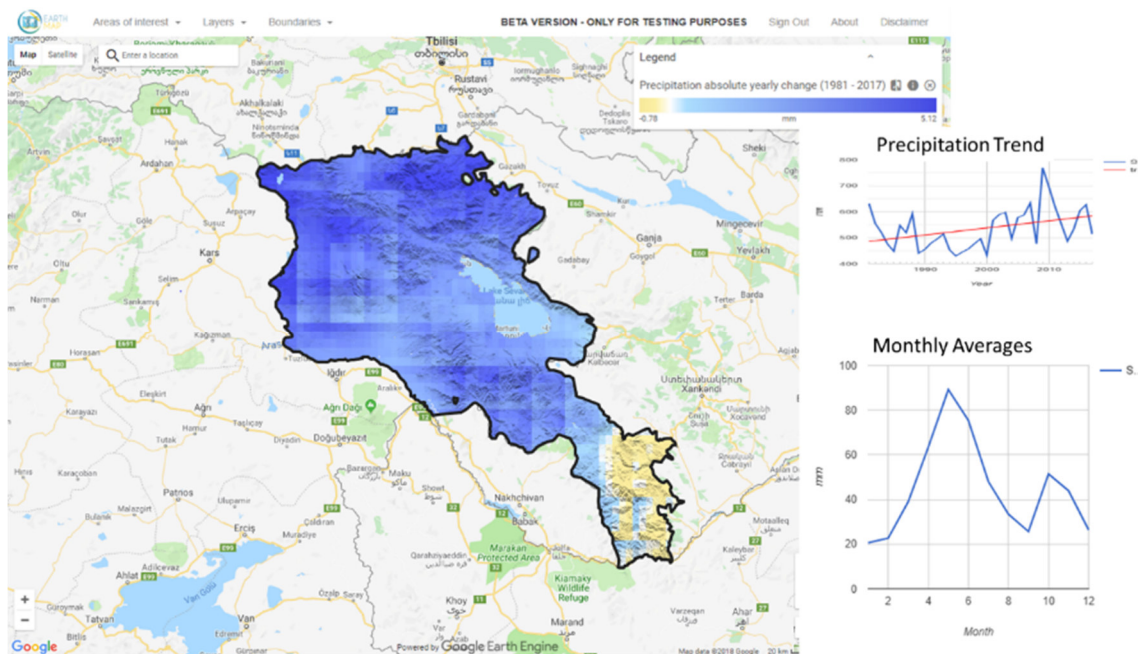


Figure 3: Precipitation absolute Change 1981-2018 (FAO 2018) in Armenia and project areas¹³

13. Projections reported by the IPCC (Ar5 RCP8.5 A2) [206] as well as recent reports from the World Bank and others¹⁴, future climate projections indicate that Armenia might need to confront the followings:

- Average temperature increases of 2°C by the 2070, and 4°C by the 2100, with a range from 1.5 C to 3 C in 2050;
- Precipitation decreases of 3% by 2030, 6% by 2070, and 9% by 2100, 2 but the forecasts can vary substantially by month and by climate model;
- River flow decreases of 6.7% by 2030, 14.5% by 2070, and 24.4% by 2100 compared to the 1961 to 1990 baseline period;
- Snow cover decreases of 7% in 2030, 16 to 20% in 2070, and 20 to 40% in 2100;

¹³ For direct connection to Earth Map kindly click on the picture

¹⁴ Sources: [21-31-94-102-123-170-190-214-220-228-255-257-258-263-264-267] Annex 12

14. In terms of impacts, reviewed literature agrees that Armenia will face a more marginal and risky agricultural production environment, as increases in temperatures and reduced precipitation during critical crop and pasture growth periods will cause a large moisture deficit. Also, increased exposure to new pests and diseases for crops, forests and livestock due to temperature increases is to be expected.

Exposure, Vulnerability, Resilience and DRR: According to various documents from the Republic of Armenia, the World Bank, UNEP, UNDP, the GEF and others¹⁵ - due to its orography, biodiversity, climate diversity, economic dependency from agriculture and socio economic vulnerability of about 29% of the population¹⁶ - Armenia is especially vulnerable to climate change. The World Bank in 2012 ranked Armenia among the top 4 vulnerable countries in the Eastern Europe and Central Asia (ECA) region.

15. Recent literature reports that about 80% of the Armenian population is exposed to climate related hazards such as river overflows / flooding, mudflows, landslides as well as to hazardous hydrometeorological phenomena such as droughts, frost, hail and heat waves.

16. Agriculture and forestry are the sectors reporting the highest level of vulnerability with tangible negative impacts on rural population that is overall the poorest in Armenia. Negative impacts, as reported by USAID and others, will impact infrastructures, agriculture, health, ecosystems and water resources.

17. The [ND-GAIN index for Armenia](#) reports a slight improvement (1995-2016) in terms of vulnerability and readiness of the Country to face climate change. Exposure, sensitivity and Adaptive capacity are relatively stable. Nonetheless, indicators related to Water Dam Capacity, Food Import Dependency and Dependency on Imported Energy reports worsening scores. While the situation appears improving especially the Energy Imports indicator would raise attention. As detailed in the forthcoming sections of this document, over 74% of rural population rely entirely on fuelwood to secure basic heating of single houses. Increase dependency from energy imports might negatively impact the cost of energy increasing, as it happened in the energy crises of the mid-nineties leading to forest degradation and deforestation.

18. Concerning readiness, the same positive trend is observed with the exception of the indicators related to Control of Corruption, and Innovation. Therefore, adaptation challenges still exist in the Country, but Armenia is well positioned to adapt. Armenia is the 85th least vulnerable country and the 55th most ready country. Concerning adaptation challenges, forestry represent one of the less adapted sub-sector.

19. Described climate changes might also have repercussions on the risk profile of the Country especially if forest cover is not maintained and expanded. As reported in 2016 by UNISDR Armenia is one of the most disaster-prone countries in the southern Caucasus. Natural hazards, including, droughts, floods, landslides, avalanches, mudslides, strong winds, snowstorms, frost and hail are common in the Country. The lack of recent data on disasters and disaster preparedness does not allow for further understanding of possible correlation between described projection and described risks. Therefore, applying the precautionary principle, investments in forest cover might be, in the medium / long run, instrumental in reducing exposure of communities to climate induced risks.

Impacts of climate change on forests and agriculture: Reportedly, Armenia is already experiencing the effects of the changing climate on nature and on its people. Currently, the country experiences non-sustainable use of natural resources and significant land degradation (from overgrazing, soil pollution, and erosion). The expected changes in climate, such as increasing temperature, decreasing water availability, and increasing frequency and magnitude of extreme events, will intensify these issues and impede development

20. The Republic of Armenia, the World Bank and USAID estimate that by 2030 yields are forecasted to decline by 8-14% (agriculture), by 4-10% (pastures). Projected climate changes will increase the need for irrigation and contribute to increasing water scarcity. Wheat is projected to decline in this region by 6 to 8 % in 2040 to 2050 due to rising temperatures and water stress.

21. The TNC forecasts that a shift in forests' boundaries associated with the development and spread of other ecosystems, forest wildfires, diseases and mass generation of pests. Similarly a recent publication

¹⁵ Sources: [21-31-94-102-123-170-190-214-220-228-255-257-258-263-264-267] Annex 12

¹⁶ 34% of national employment is accounted in agriculture (2017), 16% of total GDP (2016) is generated by agriculture, forestry and fishery (aquaculture mainly) and about 29% of the population is still considered poor

from USAID includes ecosystems among the sectors that are more vulnerable to climate change and where impacts will be extensive and tangible. According to various sources¹⁷, plant and animal species are likely to shift upwards in elevation due to climatic changes, altering both ecosystem structure, habitat biodiversity and ecosystem services. More than 15 % of Armenia's higher plant species are reported in danger of extinction due to projected climate change [\[320\]](#). Semi-desert and desert areas are projected to expand by 30 %, which will accelerate desertification. More frequent summer droughts and water stress will reduce the growth rate of trees and increase susceptibility to pests and diseases; this will also create conditions conducive to more frequent and intense wildfires, leading to an estimated 14,000 to 17,000 ha of forest loss by 2030. Additionally, studies from the Armenian academia [\[7\]](#) UNDP [\[277\]](#) and the World Bank [\[355\]](#) confirm that climate change is expected to have significant effects on the population dynamics of forest pest species. Armenian forests are expected to suffer significant growth losses caused by insect attacks under climate change. Severe and repeated pest infestations can lead to increased tree mortality, which also contributes to the accumulation of drying dead organic matter in forests increasing the risk of wildfires.

22. Research concludes that alien pests - such as the Browntail Moth - that was introduced in Armenia in the 1940s' - are a major threat to Europe's forests, endangering their current role as important carbon storage to help mitigate climate change. Since human impact is high in the Armenian forest ecosystems, the combined effect of unhealthy forestland, pest outbreaks and climate change predictions can compromise their provision of important ecosystem services such as carbon storage in the absence of appropriate adaptation and mitigation interventions.

23. According to UNDP¹⁸, forests are particularly sensitive to changing climate conditions, as the long life span of trees prevents rapid adaptation in forest ecosystems. Many climatic factors such as changes in temperature and precipitation or more frequent heat waves and droughts will affect tree growth under climate change. Wind storms, wildfires and heavy rains are other abiotic factors, which can become more frequent and intense under changing climate conditions with consequent significant effects on forests. As a result of changing climate conditions, suitable ranges of forest tree species will likely shift upwards on the mountain slopes. Changes in forest composition are more likely than uniform shifts of the forest belt. Additionally, penetration of deserts, semi-deserts and arid open forests into the lower forest areas can be expected in Armenia. The "aridifying" climate will increase the risk of wildfires by drying vegetation and making the dead organic matter in forests more flammable. In addition to the aforementioned pest outbreaks, fuel availability might also be increased as a result of for example wind storms. The reduced growth rates, changes in forest composition, increased tree mortality as well as loss of forest areas can hamper the provision of ecosystem services such as carbon sequestration, fuelwood, and water regulation. The changing conditions may also affect NWFP, which can have, in addition to the loss of crucial ecosystem services, significant impacts on rural populations and their livelihood as well as on recreational values of forests with possible impacts on ecotourism strategies of the Country. In the provided framework, Armenia has seen extreme wildfire seasons during the last two decades. Both forest and grassland fires saw a pronounced increase in the number of incidents and total burnt area. According to the latest available data from satellite¹⁹, analyzed by FAO and confronted with data from the Armenian Ministry of Emergency Situations, the total area (forest, agriculture and other land) burned in the period 2010-2018 is equivalent to over 340,000 hectares corresponding to about 11.5% of Armenia.

24. The described limited resilience of forests appears rooted in three main factors (i) excessive harvesting of fuelwood in all the Country but especially in the Marzes of Lori and Syunik and illegal fuelwood harvesting, (ii) lack of technical capacities to face climate change challenges, and (iii) weak national policy framework related to forest management. The combination of such bottlenecks and their improvement become therefore the precondition to secure carbon removal from forests.

GHG Emissions: The Republic of Armenia ratified the UN Framework Convention on Climate Change (UNFCCC) in May 1993 as a developing country not included in Annex I to the Convention. In December 2002, Armenia ratified the UNFCCC Kyoto Protocol. Armenia's greenhouse gas emissions in 2014 totaled 10,450.710 tCO₂ equivalent (Table 5). The emissions were some 4 % higher than those in 2012. The Table below provides the greenhouse gas emissions estimates in Armenia for 2014.

¹⁷ Sources: [21-31-94-102-123-170-190-214-220-228-255-257-258-263-264-267] Annex 12

¹⁸ Sources: [7-277-278-281] Annex 12

¹⁹ [MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006](#)

Sectors	Total CO ₂ eq.
Energy	7,012,260
Industrial Processes ²⁰	250,790
F gases ²¹	53,1740
Agriculture	204,4730
Waste	611,190
Total Emissions	10,450,710
Forestry and Other Land Use	-477,140
Net Emissions	9,973,570

Table 5: GHG emissions by sectors and by gases for 2014 (TNC, 2016)

25. Reducing greenhouse gas (GHG) emissions while ensuring food and energy security will be a challenge in Armenia, as the energy sector is the largest producer of greenhouse gas emissions. According to the national GHG inventories reported in Armenia's Second Biennial Update Report (Figure 4), the Energy sector represents the most significant share of net emissions (67.1 %) of Armenia's total greenhouse gas emissions, followed by the Agriculture, Forestry and Other Land Use (AFOLU) sector the region (19.6 %) in 2014 and the Forestry and Other Land Use sector represents a net sink (-477,140 tCO₂eq), followed by IPPU and Waste sectors 7.5 % and 5.8 %, correspondingly.

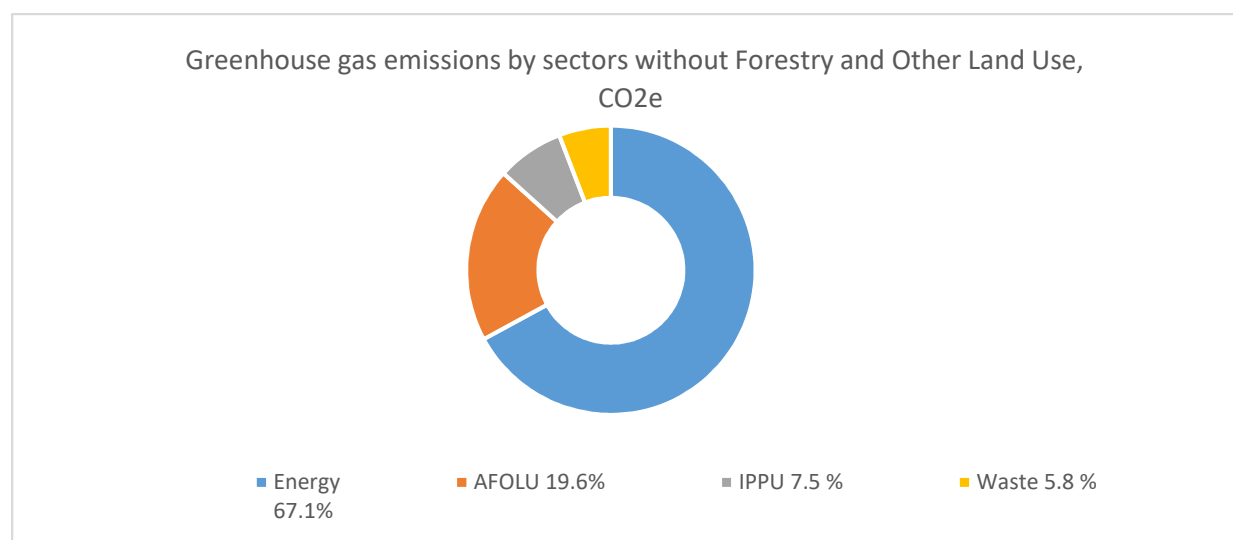


Figure 4: Greenhouse gas emissions by sectors for 2014

Current GHG scenario and the identification of emission trends: According to WRI CAIT, Armenia's GHG emissions decreased by 14 MtCO₂e from 1990 to 2013. The dramatic decline in GHG emissions in the 1992-1994 period corresponds to a sharp economic downturn following the collapse of the Soviet Union in 1991.²² The average annual change in total emissions in the period 1990-2013 was -1.3%, with sector-specific average annual changes as follows: energy (-3.1%), waste (0.7%), and IP (6.9%).²³ The average annual change for agriculture (0.6%) and LUCF (-10.5%) is for the period 1992-2013. The change in emissions in the two highest emitting sectors is mostly due to the decrease of emissions in the sectors of "Energy" and "Agriculture, Forestry and Other Land Use".

26. The Energy sector is the largest producer of greenhouse gas emissions in Armenia. Armenia's energy sector emissions decreased by 15.69 MtCO₂e from 1990 to 2013. In its 2014-2025 Development Strategy, Armenia articulates plans to maximize use of domestic energy resources (especially renewables), replace old power plants, diversify energy supply for regional integration, and promote energy efficiency in all energy-consuming sectors.

²⁰ F gases refer to fluorinated greenhouse gases (HFC compounds)

²¹ Excluding F gases

²² Republic of Armenia. Armenia's Third National Communication (TNC) to the UNFCCC, 2015.

²³ WRI CAIT 2.0, 2017. WRI does not show agriculture, LUCF, and total GHG emissions for 1990 and 1991. Energy, waste, and IP emissions are approximated for 1990-1991 according to the methodology WRI uses to calculate emissions for newly formed countries. (WRI. CAIT Country Greenhouse Gas Emissions: Sources & Methods, 2015). Total GHGs in 1990-1991 are calculated based on emissions from energy, IP, and waste only. 1992 is the first year for which emissions from all sectors are included in the national total.

Share of GHG emissions amongst sources in the Energy: The Energy Sector is by far the largest producer of greenhouse gas emissions. In 2014, the Energy Sector accounted for 67.1% of Armenia's total greenhouse gas emissions. The Energy Sector includes emissions from all use of fuels for generating energy including fuel used in transport, and the fugitive emissions related to the transmission, storage and distribution of natural gas. In 2014, its share of the total greenhouse gas emissions, including transport, was 67.1 % (7,012,260 tCO₂eq.). The Energy Sector emissions in 2014 made 30.9 per cent of 1990 emissions level and were up 1.4% on the 2012 level. Energy Sector emissions can be divided into emissions resulting from fossil fuel combustion and fugitive emissions from natural gas. The majority of the sector's emission (78%) results from fossil fuel combustion.

27. The Overall greenhouse gas emissions sources in the Energy Sector in 2014 (Figure 5) are **Fugitive emissions from natural gas (22 %)** and Electricity and Heat Production (23 %), Manufacturing Industries and Construction (9 %), Road Transportation (23 %), Commercial/ Institutional (6 %) Residential (15 %) and Off-road Vehicles and Other Machinery (2 %).

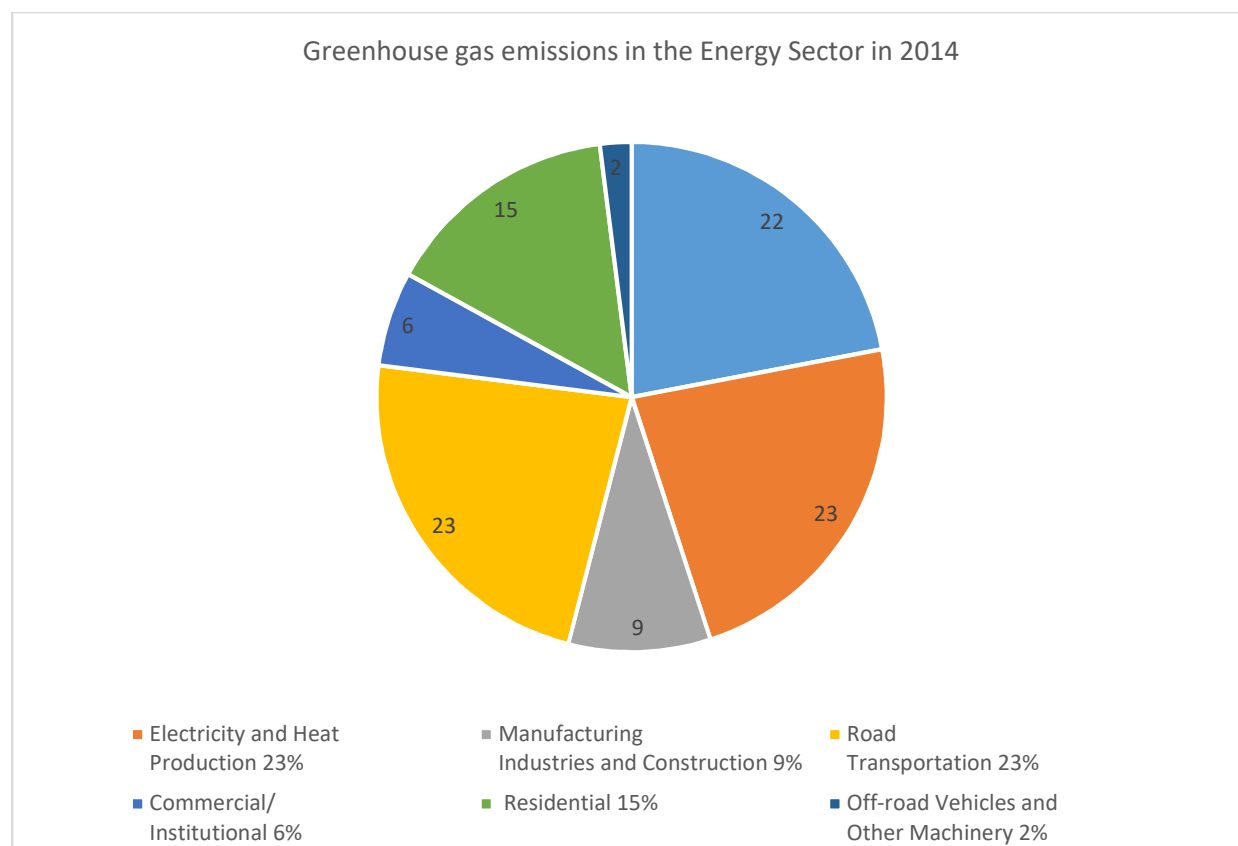


Figure 5: Greenhouse gas emissions in the Energy Sector in 2014

Agriculture Sector: Emissions from the Agriculture sub-sector were 2,044,700 tCO₂eq in 2014. Agricultural emissions include methane (CH₄) emissions from the enteric fermentation of domestic livestock, manure management and biomass burning, CO₂ emissions from urea application as well as nitrous oxide (N₂O) emissions from manure management and direct and indirect emissions from managed soils following additions of urea containing fertilizer and crop residue.

28. The Agriculture sub-sector accounted for 19.56 % of Armenia's total greenhouse gas emissions in 2014. The CH₄ emissions from enteric fermentation were 59.15 %, the CH₄ emissions from manure management were 4.74 %, the N₂O emissions from manure management were 7.54 % and the N₂O emissions from managed soils were 28.55 % of the total agricultural emissions.

29. The prevailing part of the CH₄ emissions from enteric fermentation (90.3 %) is generated by cattle,

but emissions generated by horses, pigs, sheep, goats, buffalos and asses are reported as well and most of the N₂O emissions (78.8 %) from the Agriculture sub-sector are direct and indirect N₂O emissions from managed soils.

Forestry and other land use: The Forestry and other land use sector in 2014 as a whole acted as a CO₂ sink for –477,140 tCO₂eq. The sink in 2014 was **4.57 %** of the total national emissions excluding the Forestry and other land use sector. In forest land, the largest sink in 2014 was tree biomass: **–534,280 tCO₂eq**. The prevailing part of annual carbon loss is caused by harvested fuelwood. Other emission sources in the Forestry and Other Land Use Sector include settlements and wetlands. Emissions from croplands are negligible.

Armenia's Climate Change Mitigation Targets, policies and measures (NDC, 2015): The Republic of Armenia strives to achieve ecosystem neutral GHG emissions in 2050 (2.07 tons/y/per capita) with the support of adequate (necessary and sufficient) international financial, technological and capacity building assistance. In case of non-exceeding its total emissions quota (633 million tons) set for the period of 2015-2050 Armenia can credit non-utilized reduction to 'carbon market', or transfer it to the balance of emissions limitation envisaged for the period of 2050-2100.

30. In its Nationally Determined Contribution (NDC), Armenia describes its approach to establishing a level of GHG emissions of 633 MtCO₂e that it will not exceed during the period 2015-2050. This is based on Armenia's estimate of 1990 global average emissions of 189 tons per capita, multiplied by Armenia's 1990 population of 3.35 million. The NDC notes Armenia's 2010 GHG emissions of 2.14 tons per person. It also states that Armenia will strive to achieve GHG emissions of 2.07 tons of CO₂e/y/per capita in 2050 if it receives adequate international financial, technological and capacity-building assistance. The main sectors included in the mitigation contribution are:

- a. Energy (including renewable energy and energy efficiency)
- b. Transport (including development of electrical transport)
- c. Urban development (including buildings and construction);
- d. Industrial processes (construction materials and chemical production)
- e. Waste management; (solid waste, waste water, agricultural waste),
- f. Land use and Forestry (afforestation, forest protection, carbon storage in soil)

31. Considering 20.1 % as an optimal forest cover indicator of the territory of the Republic of Armenia according to the Armenia's First National Communication to UNFCCC (1998) and Government Decision No 1232 of 21 July 2005 "On Adoption of the National Forest Program of the Republic of Armenia" to achieve that indicator by 2050 and consider the obtained organic carbon absorptions and accumulations in the NDC and expand the impact period up that measure till 2100. Ensure organic carbon conservation, accumulation and storage in all categories of lands through comprehensive measures and include achieved balance in the NDC. Apply the Nationally Appropriate Mitigation Actions (NAMA) format: as well as national and international Measuring Reporting and Verification (MRV) system for implementation of NDC mitigation component.

32. GHG mitigation will be mainly from renewable energy and energy efficiency, development of electrical transport, urban development (buildings and construction), IP (construction materials and chemical production), waste management, and afforestation, forest protection, and carbon storage in soil.²⁴ Armenia ratified the Paris Agreement in March 2017.²⁵

National baseline net emission and mitigation target analysis per sector: On the aggregate level, economy-wide net emissions in Armenia reported in the third national communication of the republic of Armenia are expected to increase by 57 % between 2015 and 2030. On the other hand, full implementation of both conditional (with measures including new power unit in ANPP) and unconditional (with measures) mitigation targets set forth in the NDC would limit national net emissions to roughly 29 % below the baseline

²⁴ Republic of Armenia. Armenia's Intended Nationally Determined Contribution (INDC) to the UNFCCC, 2015.

²⁵ UNFCCC, Paris Agreement – Status of Ratification, viewed on April 3, 2017

equivalent to a cumulated net emission reduction of 6,000,000 tCO₂eq in 2030. However, despite implementation of the NDC, national net emissions would nevertheless increase by 46 % in 2030 compared with the 2010 level.

	2010	2015	2020	2025**	2030**
Business as usual	7,463,600	8,433,200	12,867,500	16,197,400	19,658,700
With measures	7,463,600	7,989,400	11,075,600	<u>13,361,100</u> 11,878,600	<u>15,496,800</u> 13,771,500

Table 6: Total greenhouse gas emissions for 2010, and projections by 2030²⁶

33. **Agriculture sector:** The key sources of GHG emissions from agriculture in Armenia are the following: CH₄ emissions from enteric fermentation, CH₄ and N₂O emissions from manure management, and N₂O emissions from agricultural soil. Enteric fermentation accounts for 75% of all emissions of the sector.

34. In the agriculture sector national emissions are projected to increase by roughly **29.2 %** between 2015 and 2030. However, full implementation of sectoral mitigation targets scaled to the national level would limit net emissions to approximately one-third below the projected baseline – equivalent to a cumulated net reduction of **5 %** by 2030.

35. **Forestry sector:** Forests cover 9.3% of the total area of Armenia. Forests are essential players in climate change mitigation. In recent years, average CO₂ removal through forests have totaled as high as 14% of CO₂ emissions. There is large-scale illegal logging in forests for fuel, which experts estimate to be between 1,5 and 2 million m³ annually. This value is much greater than the forest annual growth rate. The legacy of this large-scale logging has essentially reduced the CO₂- removal potential of forests.

36. **Energy sector:** Energy is the main source of GHG emissions in Armenia, accounting for 70% of all national emissions. At the same time, the Energy sector has the greatest potential for reducing GHG emissions. The realization of this potential is a major contribution to climate change mitigation processes on the national level. For 2010-2030, projections of GHG emissions are calculated based on the future operations of energy sub-sectors envisaged by the Energy Development Strategy of Armenia, and long-term energy (fuel) demand. Two scenarios are considered.

37. In the energy sector national emissions are projected to increase by roughly 63.3% between 2015 and 2030. However, full implementation of sectoral mitigation targets scaled to the national level would limit net emissions to approximately one-third below the projected baseline – equivalent to accumulated net reduction of 34.7 % by 2030.

38. **Industrial processes and product use sector:** GHG emission sources in IPPU in Armenia include:

- Cement production (CO₂);
- Refrigeration and air conditioning, fire protection and aerosols with hydrofluorocarbons (HFCs);
- Production of food and non-alcoholic beverages, asphalt production and paving, and use of paints and solvents (NMVOC).

39. In the Industrial processes and product use sector national emissions are projected to increase by roughly 48 % between 2015 and 2030. However, full implementation of sectoral mitigation targets scaled to the national level would limit net emissions to approximately one-third below the projected baseline – equivalent to accumulated net reduction of 16.6 % by 2030.

40. **Waste sector:** 84% of all emissions of the Waste sector are generated by solid waste, and 16% by wastewaters. The sector accounts for 8.7% of total GHG emissions (11% of CH₄ emissions, and 13% of N₂O emissions). In the Waste sector national emissions are projected to increase by roughly 9.8 % between 2015 and 2030. However, full implementation of sectoral mitigation targets scaled to the national level would limit net emissions to approximately one-third below the projected baseline – equivalent to

²⁶ Without forestry and other land use Denominators in energy and total rows describe emissions in mitigation scenario with new unit in ANPP. In the mitigation scenario, GHG emissions in 2030 will amount to 68% - 55% (business-as-usual scenario – 79%) of the 1990 level.

accumulated net reduction of 7.7 % by 2030.

Country Economic Background: The Armenian economy has passed from the substantial drop after the collapse of the Soviet Union during the 90s and early 2000s to substantial growth. While the growth has slowed after the international financial crisis in 2008, the economy has recently lived a new boost, exceeding the growth expectations in 2017-18, strongly rebounding from the previous slowdown. Real GDP grew by 7.5% in 2017 (sharply from 0.2% growth in 2016). Such performance was mostly driven by the mining, manufacturing and construction sectors, with private consumption playing a central role (+8.8 % in 2017, coupled with government consumption rising + 13.1%, investment + 7.7%, exports of goods and services + 19.7%, and imports by 26.8%. Real GDP growth is expected to reach an average 4.6 % for the period 2018-2023.

	2014	2015	2016	2017	2018 ²⁷
Real GDP growth (%)	3.6	3.2	0.2	7.5	7.6
Origin of GDP (% real change)					
Agriculture	6.1	13.2	-5	-5.3	-1
Industry	-2.3	2.8	-0.3	5.4	5.5
Services	8.3	-0.4	6.8	21.2	14.3
GDP per head (USD at PPP)	8368	8718	8847	9649	10552
Recorded unemployment (%)	17.6	18.5	18	17.8	17.4
Consumer prices (%)	3	3.7	-1.4	1	2.4
Trade balance (m USD)	-2055	-1186	-944	-1375	-1793
Debt stock (m USD)	8554	8928	9953	10387	10947
<i>Source: Economist Intelligence Unit</i>					

Table 7: Country economic variables (2014-2018)

41. In 2015, just over one third of Armenia's population lived in rural areas and one-third of the population lives in the capital city of Yerevan with the balance of the population in numerous small towns. **Agriculture** constituted about 20% of GDP in 2015 and the contribution of the sector has remained at that level for several years despite it suffered from a drop in growth in 2016-17. The sector, including livestock and downstream processing of agricultural products, is the main source of livelihoods for rural communities. Some 335,000 households are involved in the sector, with an average landholding of around 1.4 ha per household and a diversified production system involving both crops and livestock. The agriculture sector provides employment to more than 44 % of the country's economically active population, including 65 % in rural areas.

42. **Rural Poverty.** Poverty in rural areas has followed the general trend of the economy, with an increase from 27.5 % in 2008 to 36 % in 2010, then decreasing to 34.5 % in 2011. Rural poverty is related to the insufficient availability of basic and productive infrastructure, particularly irrigation which allows a more consistent production in most areas and usually more remunerating cropping patterns, also due to the geography of the country (with rural areas prevailingly mountainous). Other constraints hindering the development of the agricultural sector which is still the main source of income for rural populations include limited diversification of rural off-farm activities, insufficient access to basic services and infrastructure, inefficient irrigation infrastructure, low value-addition for agricultural products along the value chain. Nevertheless, the recent increase of access to financial services is expected to increase economic opportunities even in rural areas.

43. **Rural/Urban gap.** At household level in rural areas, income from formal employment represent 37.6 % of the total income (1.6 times smaller than for urban households). The share of income from self-employment increased from 4.1 to 7.3 % in rural communities between 2008-2015 (remaining stable in urban areas). In the same period, the share of income of rural households from agriculture decreased from 17.6 to 14.0 %. Important role plays the share of non-monetary income (self consumption of food), was

²⁷ EIU Estimates.

incomparably larger for rural than for urban households, although decreasing since 2008.²⁸

44. **Youth.** Youth is the category most affected by unemployment (about 38 % among people between 20–24 years old). In general, youth unemployment derives from difficulty to enter into the labor market (the majority of the unemployed are persons without previous work experience). In rural areas youth suffer from limited livelihood options, caused by a generally low access to tertiary education and vocational training (especially in distant cities), limited access to financial sector (for insufficient possibility to provide collaterals) and limited possibilities to engage in agricultural activities – youth typically lack access to land, which makes it particularly difficult for them to start farming.

45. **Remittances.** International remittances in Armenia represent 13 % of the GDP.²⁹ They represent the opportunity especially for rural households to manage their livelihoods. Despite the population has a relatively high access to credit, remittances are the most used financial services. Most of the foreign remittances flowing into Armenia continue to come from Russia (0.9 billion, about two thirds of the total), followed by the United States (160 m USD), Kazakhstan (45 m USD), and Germany (35 m USD)³⁰.

46. **External debt (EIU).** Armenia has traditionally run large current-account deficits and has a significant external debt stock (estimated at 90% of GDP). As a consequence, the external financing requirement is usually large, especially as a share of GDP. Due to the level of public debt (> 61% GDP), the Country is undertaking an important fiscal adjustment and increasing the foreign currency debt (e.g. from IFIs) would represent an additional source of vulnerability (IMF, 2017).³¹

47. **Financial sector.** Armenia's financial system is bank-dominated (accounting for 85.5% of the financial system assets, CBA, December 2017), followed by Credit organizations. While the largest share of loans focuses on Manufacturing and Trade (respectively 20% and 17%, typically with over 1 year term), consumer loans represent more than 22% and last less than one year (CBA).³² While the share of the agricultural portfolio seems relatively small (between 5 and 6% of the total portfolio of the banks), in terms of volume the agricultural portfolio has been steadily growing in the past 10 years, and it is even higher when considering that CBA statistics do not fully capture lending to smallholders for agriculture disbursed as consumer loans.

48. **Use of financial services.** While Armenia is generally characterized by relatively low levels of financial services use, significant progress has been achieved in the past years. Account ownership has increased significantly,³³ from 17.5% in 2011 to 48% in 2017, but it is still lower than in peer countries. Savings is particularly low with 31% of population compared to 37% of ECA countries and almost 40% in lower middle-income countries (39.7%). On borrowing the country is well ahead of its peers – 55.3% of adults in Armenia borrowed in the past year, including 31.2% from financial institutions, and the share of people borrowing formally grew by almost 50% since 2014 and more than doubled when considering loans to start a farm or business (from 9% to 17% between 2014 and 2017. The share of rural residents borrowing formally is almost the same as country average – 28%.

Armenia's Housing Social Profile: Poverty in Armenia has been assessed since 1996. Starting from 2009, the country has used a revised methodology developed with the assistance of the World Bank. The poor are defined as those with consumption per adult equivalent below the upper total poverty line; the very poor are defined as those with consumption per adult equivalent below the lower total poverty line, whereas the extremely poor or the undernourished are defined as those with consumption per adult equivalent below the food poverty line. In 2015, poverty rate was 29.8% with only 0.2 %age point reduction from its 2014 level. This means that every third person in the country were below the upper poverty line of AMD 41,698. The graph below shows the three poverty lines using the 2009 Methodology in 2015 prices.

²⁸ Armstat, Household income, expenditures, and basic food consumption, 2016 (https://www.armstat.am/file/article/poverty_2016_eng_3.pdf)

²⁹ <https://data.worldbank.org/indicator/BX.TRF.PWKR.DT.GD.ZS?locations=AM&view=chart>

³⁰ <http://hetq.am/eng/news/85058/overseas-individual-remittances-to-armenia-up-182.html>

³¹ <https://www.imf.org/~media/Files/Publications/CR/2017/cr17226.ashx>

³² <https://www.cba.am/en/sitepages/statmonetaryfinancial.aspx>

³³ The account penetration level is the indicator commonly used to assess the number of the “banked” people in a country and the level of financial inclusion.

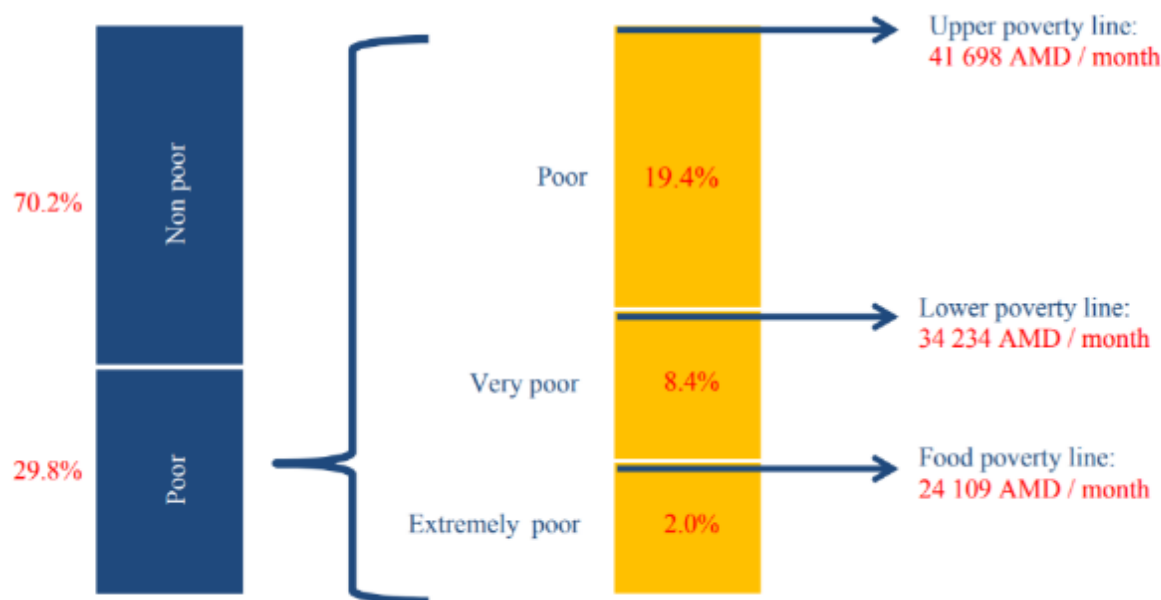


Figure 6: National Poverty Profile, 2008-2015³⁴

Poverty trends: In 2015, poverty rate in Armenia was 29.8% as compared to 27.6% recorded in 2008. The share of the very poor in 2015 was 10.4% as compared to 12.6% observed in 2008, and declined by 2.2 %age points .The share of the extremely poor in 2015 was 2.0% as compared to 1.6% observed in 2008. The number of the poor in 2015 was around 900 thousand (per resident population2), of whom around 310 thousand were very poor (including the extremely poor), and of the latter around 60 thousand were extremely poor. Among the total 29.8% share of poor population, 8.4% are very poor (excluding the extremely poor) and 2.0% are extremely poor, while the remaining 19.4% are just poor.

49. In 2015, 38.5% of the rural population was poor. The estimated extreme poverty was 1.3%. The poverty rate in Shirak, Lori, Kotayk, Tavush and Gegharkunik regions was higher than the country average. With 45% of the population below the poverty line, Shirak region was still the poorest in Armenia. Over the period of 2008-2015, the poverty rate increased countrywide. And as a multi-dimensional poverty measure, “healthy heating” is a basic need, which a household is deprived of if uses wood, carbon or other heating means as primary source for heating. Hence, those currently regularly using firewood as heating option are socially deprived of basic needs. ³⁵

Gender and Income Profile: In rural communities, 27.2 % of households are female-headed households.³⁶ The high rate of long-term, male labour migration has increased the prevalence of women-headed households (FHH), since women tend to be regarded as heads of the households only in the absence of men. FHHs are more likely to suffer from extreme poverty compared with male-headed households (31.5 % and 29.4 % respectively) due to women’s limited economic opportunities, the gender pay gap and, above all, because FHHs tend to be single-parent households, with fewer economically active family members who bring in household income. On an individual basis, the proportion of women suffering from poverty is higher than that of men (54.7% and 45.3%, respectively), which is, inter alia, a reflection of women’s limited economic opportunities in comparison with men³⁷. Women also face material barriers to engaging in investment including:

³⁴ Source: ARMSTAT, 2015

³⁵ Source: Armenia : National Poverty Profile, 2008-2015, National Statistical Service.

³⁶ Source: Armstat.am National Statistical Service.

³⁷ Note: The 2014 UNDP Human Development Index (HDI) score for Armenia was 0.73, ranking it 87th out of 187 countries (UNDP, 2015). The Gender Inequality Index (GII) of that same year was 0.318, with Armenia ranking 62nd out of 155 countries (UNDP, 2015). Another global indicator, the World Economic Forum’s Gender Gap Index (GGI), ranks Armenia at 105 out of 145 countries, and the country’s position has steadily deteriorated since 2007 (World Economic Forum, 2015). The most problematic spheres in the Gender Gap Index are the economy, politics and the health sector.

- Difficulties in obtaining loans;
- Limited access to monetary funds and property for collateral; and
- Burdensome interest rates.

The unsecured loan accessibility for rural households is limited, commonly, to monthly income. Most banks view home renovation loans as mortgage loans and collateralize the client's property

Forest Sector Background: Armenia is a mountainous country with limited forest resources, only about 9.3% of the country is covered by forests. In particular Armenia's mountain forests play a vital role in providing ecosystem services such as provision of water, regulating climate, erosion control, soil protection etc. but also in providing habitats for rare and endangered animal species. However, a large share of Armenia's forests (up to one half) is located on difficult to reach terrain, either on steep hillsides or in ravines, with major implications on the country's overall forest resources with inaccessible, often overaged forests with significant wood resources which cannot be utilized to meet the fuel wood needs of rural population, on the one hand, and heavily degraded forests due to overexploitation (illegal logging, grazing, etc.), on the other hand.

50. According to official data provided through Hayantar website the total area under management by Hayantar is 334,010 ha out of which 227,134 ha is forest (9.3% of the country's territory [361]. Results of a remote sensing (RS) data analysis suggest a forest area of 11.2% or 332,333 ha for Armenia [149]. The main reason for the discrepancy between the area of forest reported by Hayantar (reported under "forest cover" in the table 8) and the RS study results to lies in the definition of forests, 63,000 ha are reported by Armenia to FAO as category "other wooded land" [93]. However, a discrepancy of about 4,000 ha would remain.

51. Forests are concentrated in 3 out of the 11 marzes of Armenia. 68% of forests are found in the north and northeast (Marzes of Tavush and Lori), 18% in the southeast (Marz of Syunik), and only 2.6% in the eastern part of Armenia (Marzes of Aragatsotn and Shirak). With 0.1 ha forest per capita, Armenia is far below Commonwealth of Independent States (2.7 ha) and world averages (0.5-0.8 ha) [214]. Forests in Armenia are distributed in the lower and middle mountainous zones at the slopes with inclination of 20-30°. Most of the Armenian forests are found in mountainous terrain between 500 and 2400m altitude [93].

Region (marz)	Area under Hayantar [ha]	Forest cover [ha]	Forest cover [%]
Tavush	118,087	104,857.60	37.8%
Lori	101,212	85,799.60	31.0%
Syunik	60,203	49,990.50	18.0%
Kotayk	23,238	15,068.00	5.4%
Vayots	15,051	7,656.20	2.8%
Gegharkunik	9,022	6,547.20	2.4%
Aragatsotn	12,629	5,215.00	1.9%
Shirak	4,737	2,000.00	0.7%
Total of marzes	344,179	277,134.10	100%

Table 8: Forest Cover in Armenia (SFF) from Hayantar records, 2018

52. Production of forest's seedlings is mainly covered by Hayantar that disposes of only one nursery. The Hayantar Hrazdan Branch tree nursery, established in 2013 under a FAO project, has produced so far 112,000 seedlings/year of few tree species (e.g. *Pinus sylvestris*, *Quercus macranthera*, *Fraxinus excelsior*, *Acer trautvetteri*, *Malus orientalis*, *Pyrus caucasica*, *Juglans regia*, in the form of bareroot and in trays with alveoli. The only producer of forest seedlings, outside the public sector, is the Armenia Tree Project (ATP) nurseries (up to 60,000 seedlings annually).

53. Armenia is considered by the International Union for Conservation of Nature (IUCN) as one of the 34 worldwide biodiversity hotspots [362]. More than 274 species of trees and bushes occur in Armenia's forests, with oriental beech (*Fagus orientalis*), Georgian oak (*Quercus iberica*), oriental oak (*Quercus macranthera*), Caucasian hornbeam (*Carpinus caucasica*) and pine (*Pinus Sosnovski*, *Pinus kochiana*) being the main natural forest species.

54. Oak and beech forests are of the highest productivity and can be found at altitudes between 1300 - 1600 m above sea level. For Armenian forests it is estimated that the mean annual increment is about 3.6 m³/ha, the average canopy cover about 55%, the average standing volume about 125 m³/ha [256].

55. Extensive logging of forests in the period between 1990 and 1995, driven by the economic and energy crisis, led to significant losses and severe degradation of valuable forests. Logging and grazing changed species composition and structure of forests, their capacity to naturally regenerate as well as their productivity. Forests of seed origin with economically high value oak and beech have often been replaced by coppice forest of low value hornbeam and secondary tree and bush species.

Legal framework and policies: Armenia has signed and ratified 26 international environmental agreements, conventions such as CBD, UNFCCC, UNCCD, Ramsar etc), protocols, etc., which are related to forests and their management and are integral part of the legal system and have supremacy over national laws. The relations in the field of forestry are mainly regulated by the Constitution of the Republic of Armenia, the Civil Code, Forest code and Land Code of the Republic of Armenia, other legal acts may have indirect impact for the forest sector.

56. The Forest Code regulates relations with respect to sustainable forest management (guarding, protection, rehabilitation, afforestation and rational use of forests and forest lands) as well as to forest stock-taking, monitoring, control and forest lands.³⁸

57. Article 4 of the Forest Code defines that forests and forest lands can be under state, community and private ownership. However, the forests existing in the RA are considered state property and managed by state entities. The Forest Code clarifies the competences of the Government, state authorized bodies, territorial bodies and local self-governing bodies in the field of sustainable forest management. Unfortunately, the law enforcement mechanisms are not clearly defined in forest related by laws and regulations and stakeholders miss both guidelines and technical capacity to effectively engage communities in forest governance.

58. Forests are classified by their purpose-oriented significance in forests of (i) protection (water protection zones, steep slopes etc.), (ii) special (nature protection, forest close to cities, etc.) and (iii) production significance [140]. The latter are very fragmented due to the predominant protection character of mountainous forests in Armenia and which hampers comprehensive introduction of sustainable forest management.

59. Forest use in forests within specially protected nature areas is regulated by the Law on Specially Protected Nature Areas (SPNA), however, there are contradictions and duplications between Forest Code and SPNA legislation. The State Forest Service (protection agency) provided for by Article 26 to control the enforcement of forest legislation and provide forest guarding (against fires, illegal logging, waste dumping etc.) and protection (pest and diseases) is still not functioning.

60. The Forest Code provides wider competences to territorial and local self-governing bodies in respect to forest management, but stakeholder engagement and participatory decision making and planning processes are not well regulated. In 2016, the EU-funded FLEG II Program analyzed the current legislation and administrative structures governing the forestry sector in an effort to address issues with respect to existing gaps, conflicts and discrepancies in the existing forestry and main related legislation and regulations, as well as to the existing institutional arrangements of the responsible forest authority (Hayantar), identify strengths and weaknesses, as well as possible duplications with various state forest authorities. Most recently, in spring 2018 (23.03.2018) Article 7.1 of the Forest Code has been amended, defining the functions of the newly established Forest Committee.

61. In the past decades, a number of policy documents have been developed in relation to forests and their management with support and assistance from international institutions and donors, namely (i) the

³⁸ Forest lands comprise i) forested lands; ii) lands allocated or envisaged for flora and fauna protection, nature protection; as well as iii) non-forested lands allocated or envisaged for implementation of measure determined by forest management plans

National Forest Policy and Strategy (2004), (ii) the National Forest Program (2005); (iii) the Illegal Loggings Action Plan (2005); (iv) the State Forest Monitoring Program (2006); along with a number of by-laws and other documents to reverse the trend of forest degradation and overexploitation.

62. The National Forest Program (2005), for example, suggests activities on mitigation and prevention of illegal loggings, eradication of economic and social causes of illegal logging, improvement of environment, institutional improvement, scientific-educational development and capacity building. However, lack of financial, human and technical capacities have impeded their implementation.

63. A “Forestry reform Concept” document was prepared by Hayantar in September 2017 to address “Basic Principles and Forestry Reform” in Armenia, in particular to address issues related to sustainable management, forest conservation, as well as the effectiveness of combating illegal felling. Subsequently, the Head of Government instructed the ministers of Agriculture, Nature Protection, Territorial Administration and Development to jointly develop and submit a revised draft of the concept of forestry reform [\[Link\]](#) which became available in February 2018 and led to changes in administrative structures and responsibilities.

Institutional setup and governance in the forestry sector: Up to November 2017 the RA Ministry of Agriculture (MoA) was the state management body authorized by the RA Government in the sphere of sustainable forest management, developing and implementing the state’s policies in the areas of conservation, protection, reproduction, and utilization of the forests. The MoA carried out its functions through its Forestry Department, as well as through Hayantar SNCO and the State Forest Monitoring Center (SFMC) SNCO. The “State Forest Monitoring Center”) SNCO was established by Government Decision (N1152-N of July 28, 2005) to protect the forests and forest lands from the various types of man-made and natural impacts, as well as the prevention of illegal logging, transportation, sale and other negative actions, ensuring transparency of forest related activities. The State Forest Monitoring Center SNCO is also responsible for the control of implementation of forest management plans (FMPs), as well as contributes to law enforcement by detecting illegal logging activities.

64. Environmental control has been implemented by the authorized state body in the mentioned sphere, namely the Ministry of Environment (MoE) in accordance with the Forest Code. This resulted in the situation that the responsibilities for forests and forest lands of Armenia were split between two ministries, namely the MoA (about 75% of forests) and MoE (about 35%), with remaining ambiguities (only about half of the sanctuaries were under MoE. In 2018 the Forestry Department, the Hayantar SNCO and the newly established State Forest Committee were moved from MoA to MoE. MoE thus having all forests and forest lands in Armenia now under the responsibility of one ministry. The SFMC is still under the subordination of MoA, but preparation for its transfer to MoE and a change in its legal status are well advanced.

65. The MoE is principally responsible for environmental protection and biodiversity conservation matters, housing the focal points for the UNCBD, UNFCCC, and UNCCD, and oversees implementation of related issues. As a consequence of the expanded responsibilities with respect to forests, the new Department of Biodiversity and Forest Policy was set up in the MoE in April 2018. The MoE became also responsible for the approval of the Forest Management Plans of state forests which are prepared at forest enterprise level for a duration of 10 years. In addition, the MoE approves the Charter of the newly established State Forest Committee and its institutional structure, as well as supervises and defines the main directions of the Committee and its activities (Figure 4).

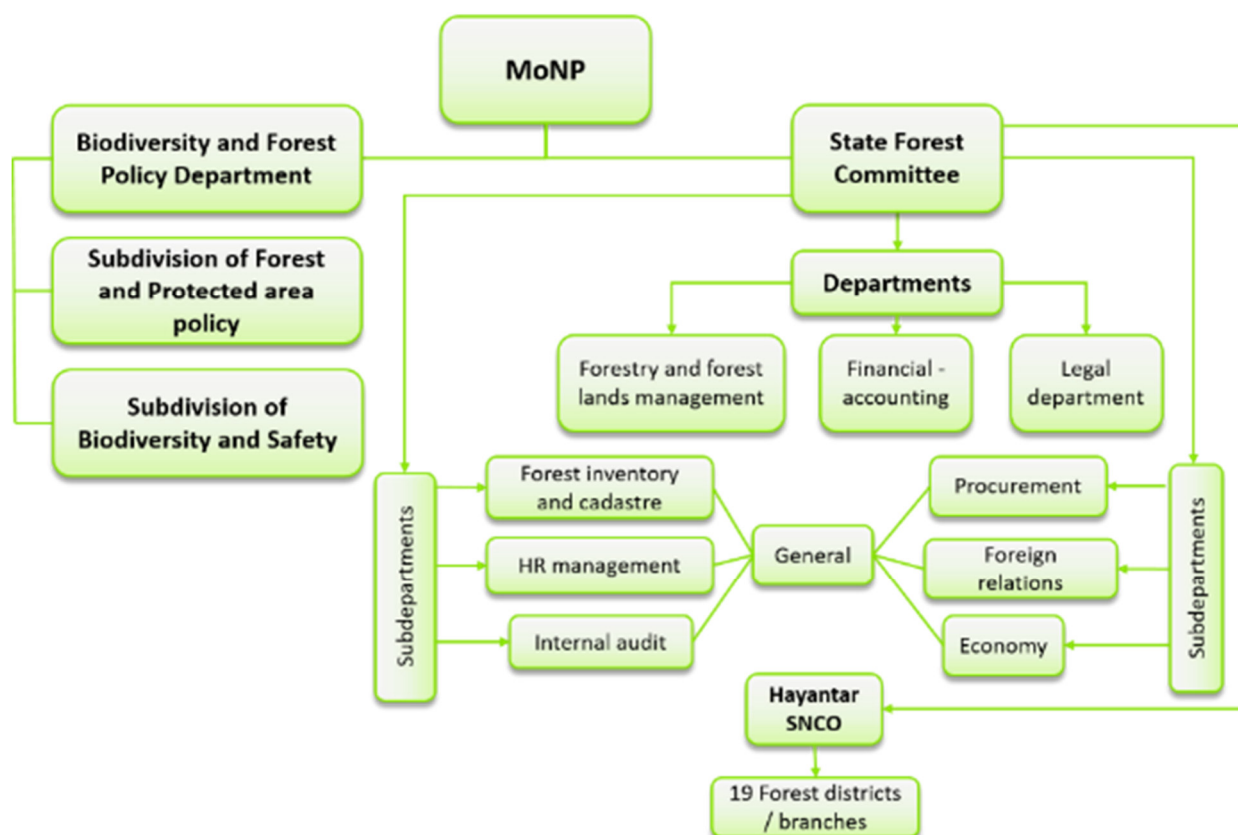


Figure 7: New institutional set-up in 2018

66. Biodiversity and Forest Policy Department of MoE: The Department consists of two subdivisions, namely i) Forest and Specially protected areas policies; and ii) Biodiversity and safety, with the main tasks of drafting legal acts, programs and strategies and guidelines, as well as developing mechanism for and coordinating the implementation of the respective state policies. In addition, the Department is involved in the elaboration of economic mechanisms for protection and reasonable use and recovery of biodiversity, including payment schemes for nature use.

67. The “Bioresources Management Agency” (BMA) in charge of managing all State Reserves, National Parks, State sanctuaries (nature reserves) and Natural Monuments, as well as respective subordinate SNCOs managing SPNAs are all under the RA Ministry of Environment.

68. With the law “On the state bodies of governance systems”, dated 23.03.2018, MoE’s former State Environmental Inspection came under the subordination of RA Government. The Inspection is responsible for supervision over maintenance and protection of forests and SPNAs, as well as for controlling the compliance of cutting and harvesting activities with related regulations.

Institutional structure	Functions/duties
Department of Biodiversity and Forest Policy	Development of state policy on protection, control, reproduction and use of forests.
State Forest Committee	Ensuring sustainable forest management
Haynatar SNCO	Control, protection conservation of biodiversity, restoration, re/afforestation and efficient use of state forests.
State Environmental Inspection (supervision moved to RA Government)	Control over implementation of the instructions and requirements set forth by environmental legislation.

Bioresources Management Agency	Coordination of activities on SPNA protection and sustainable use, support to development and implementation of the state policy. Provision of services in SPNA for implementation of the forest management policy, in particular safeguarding implementation of works on state forest stock-taking, inventory and forest management planning.
--------------------------------	--

Table 9: Institutional structure of the RA MoE with respect to forest and forest lands

State Forest Committee: The Committee was established according to the President Decree in 2017, December 19 on The Committee is governed by a chairman who is appointed and resigned by the Prime Minister after consultation with the Minister of Nature Protection. The Committee's goals and objectives are conservation, protection, restoration, afforestation and effective use of state forests; ensuring sustainable forest management, the implementation of measures to increase the productivity of the state forests; the protection of biodiversity of state forests; efficient use of the environmental, social and economic potential of state forests; provision of complete and reliable information on the forest lands and forests. The Committee is structured into departments (Forestry and forest lands management, Financial-Accounting, Legal) and Sub-departments (Forest inventory and cadastre, HR management, Internal Audit, Procurement, Foreign Relations, Economy, General department). The Committee exercises the powers assigned to the state forest service by the Forest Code (Article 26 and 58). As the Committee is still in the development phase, the exact division of responsibilities and tasks between departments of MoE, the State Forest Committee and Hayantar are not yet clarified.

Hayantar: Since 2018 Hayantar is under the subordination of the State Forest Committee and its status and institutional set-up is under revision due to ongoing reforms in the forestry sector. Main functions of Hayantar are to ensure control, protection, conservation of biodiversity, restoration, re/afforestation and efficient use of state forests and forest lands.

69. The management of forest lands under supervision of “Hayantar” is performed by the Head Office (comprised of 10 departments) and 19 “Forestry” branches located in the Marzes of **Lori**, Tavush, **Syunik**, Kotayk, Shirak, Vayots Dzor, Gegharkunik and Aragatsotn [361]. Hayantar is financed by the state budget (approx. 65-70%) and revenues from selling forest products (approx. 30-35%).

70. Hayantar has the following types of entrepreneurial activities: 1) Timber harvesting, processing and sale; 2) Cultivation and sale of planting material (seedlings, seeds); 3) Procurement, processing and sale of secondary forestry (stubble/wood residues); 4) NWFP forest use (harvesting, cattle grazing, installation of beehives, collection of wild fruit, nut, mushrooms, berries, herbs and technical raw materials), as a result of which processing and sale of purchased Bioresources; 5) production, processing and sale of agricultural products; 6) provision of recreational and tourism related services; 7) provision of consulting and information.

71. About 75% of forests and forest lands of Armenia (including 13 out of total 27 sanctuaries) are managed by Hayantar and its 19 branches based on approved Forest Management Plans (FMP) prepared at forest enterprise level (one enterprise per forest branch). The annual allowable cut (AAC annual quantity of wood for harvesting) is determined in the FMP and based on respective proposal from Hayantar. In general, wood harvesting in the forests of Armenia is limited to thinning and coppicing operations, and to sanitary cuttings, although in forests of production significance the Forest Code would also allow for cuttings in (over)mature forests to initiate forest regeneration.

The regional (Marz) administrations: Marz administrations are part of the Ministry of territorial administration and development (MoTD). The competences of territorial bodies of state management (Marz administrations) in the sphere of sustainable forest management are regulated in article 8 of the Forest code and comprise a) participation in the elaboration of state programs and ensuring their implementation in administrative areas of the Marz/region; b) involvement of specialized services, forest users and population in forest fires in the administrative areas of the Marz; c) implementation of state programs aimed to the protection and use of forests and forests lands; and d) other powers defined by the legislation of the Republic of Armenia [11]

Local self-administration bodies (i.e. communities): The competences of local self-governing bodies in the sphere of sustainable forest management are regulated in article 9 of the Forest Code and comprise a) possession, use, disposal of community forests and running of forest economy (i.e. implementation of measures prescribed in the FMPs); b) participation in the development of state programs and safeguarding of their implementation within their administrative territories according to the order determined by the law; c) involvement of specialized services, forest users and population in the works to fight forest fires; d) management of state forests given for community management; and e) giving consent to change special-purpose significance of lands and carry out engineer-geological studies for the activities on construction, blasting, extraction of useful minerals, installation of cables, pipe-lines and other communications, drilling and others having no connection with the running of forest economy and forest use on community forest lands [11]. The Forest Code also stipulates in Article 59 that “community forest control” shall be carried out by the local self-governing bodies within the administrative borders of the communities in accordance with the procedure determined by the law [11]. So far, the de facto involvement of Marz administrations and communities in forestry matters is rather limited.

72. In 2006 the Government of Armenia provided through Government Decree N 583-N **“Provision of state forests to concessional management for the community organizations without competition”** (i.e. without tendering) the legal basis for involving communities in management of forests within the administrative boundaries of the given community. State owned forests can be leased or assigned for concessional management to forest users group of communities (or Community based organizations or NGO) for up to ten years with possible renewal, without tender. The Decree also stipulates that

- a) State forests may be handed over to concessional management only in case of existing Forest Management Plans, and
- b) Community organization must have a specialist(s) educated in the field of forestry with at least five years of experience in forestry or agronomy.

73. However, local communities have currently difficulties to meet this preconditions for applying for concessional management without support from outside the community (international donor) and, hereafter, manage the forest in a sustainable and climate adaptive manner. The reasons are manifold, to name a few:

- a) Lack of financial resources to establish and operate a community based organization.
- b) Lack of financial resources for any kind of forest investments.
- c) Lack of technical knowledge and experience in timber and NWFP production and use.
- d) Lack of professionals specialized in forest management.
- e) Lack of skills and equipment for forest operations.

74. In addition there is a general lack of awareness and knowledge about 1) the values of forests for sustainable livelihood, 2) the potential of sustainable use of forests recourses and land planning as basis for poverty reduction, and 3) the interrelation of unsustainable forest management with climate change, etc.

75. In 2004 a World Bank/GEF project on poverty alleviation elaborated forest management plans (FMPs) for several pilot areas in communal (villages) forests. With support of the project the respective communities established “communal forest management organizations” for implementing the FMPs. However, those pilot schemes could not be sustained beyond the project’s lifetime for reasons of economic viability, but also community attitude. Management of lower quality and fragmented forests result in causes higher cost for their management and most communities were not able to finance the management of their forests in compliance with the elaborated FMPs.

76. Up until now, forest areas management rights and responsibilities have not been transferred to any local forest user group or community-based organization, which means that “concessional management” was never put to use.

Involvement at household level in forestry activities: In accordance with the Decree on “Providing privileges to the forest communities of RA for the use of fallen wood as fuel-wood”, households in villages located directly close to forests (up to 5 km) are allowed to collect up to 8 m³ dead wood for free. However, often fallen

dead wood is available in remote locations only and not accessible due to absence of forest roads. Regional and local administrations in consultations with Hyanatar decide on the villages actually to be considered for free collection of fallen wood in state forest lands.

Sector Performances: About 75% of forests and forest lands of Armenia are managed by Hayantar and its 19 branches (forest enterprises), timber and fuel wood supply in the country originates mainly from those 19 Forest Enterprises. FAOSTAT data for Armenia for the period 2013-2017 suggest a level of annual production of “Wood fuel, non-coniferous” of about 1.546 million m3 for year 2013 (reported official data) and in the years hereafter till 2017 (FAO estimates), and of “other industrial round wood, non-coniferous” of about 2,200 m3 in 2016 and 2,100 m3 in 2017 (for 2013 to 2015 neither official data reported nor FAO estimates available) [15]. However, production figures received from Hayantar for the same period 2013-2017 are substantially lower. However, production figures received from Hayantar for the same period 2013-2017 are quite different in the table 10 (2018, information provided by Hayantar).

Year	INDUSTRIAL WOOD (m3)	FUEL WOOD (stored, m3)	FALLEN TREES (stored, m3)
2013	2,774	39,650	60,950
2014	1,635	38,455	52,934
2015	1,620	27,630	52,161
2016	3,313	34,438	53561
2017	2,913	40,733	68152

Table 10 Volumes of wood production by Hayantar (Source: unpublished data from Hayantar)

77. According to the State Forest Monitoring Center in 2013-2014, the firewood consumption was about 25 times higher than the volume of timber produced from legal felling. This study results may have been the source for the official data in FAOSTAT and explain the discrepancy between FAOSTAT data and data provided by Hayantar. The results of a survey done by UNDP reported the national consumption of fuel wood at an even higher level of about 2 million m3 per year [4]. The gap between officially recorded supply and estimated consumption of fuelwood is an indicator of lack of law enforcement and unauthorized or uncontrolled forest use.

Wood harvesting is carried out on the basis of forest management plans regulated by the Forest Code and the Instruction of the RA Government on “Development of Management Plans for Forest Enterprises”. The FMPs define for a 10-year period the locations, timeframes of measures on protection, guarding and use of forests, as well as the volume of the annual allowable cuts (AAC). Most of the FMPs were introduced and developed with donor assistance in 2006-2008 and approved in 2010. A revision and update of FMPs in North-Eastern Armenia are currently ongoing within the framework of a UNDP/GEF project (UNDP, Mainstreaming Sustainable Land and Forest Management in Mountain Landscapes of North-eastern Armenia PFG 2016) on Sustainable Land and Forest management. However, 3 out of the 19 forest enterprises do not have FMPs at all, and for 2 enterprises (“Ijevan” and “Sevkar” branches) FMPs have expired in 2016. FMPs are not always implemented, in part based on lack of capacities on their utilization. In addition, there is political imperative regarding the AAC, which overrides the cutting levels prescribed in the FMPs [5].

Official supply is insufficient to meet domestic demand, in particular for fuel-wood consumption, creating a shadow market which relies on large volumes of informally or illegally harvested wood. Fallen wood and sanitary cuttings by their very nature are not predictable in volume but can make up a significant share of the volume of wood supplied to the domestic market. Estimates from technical experts and Hayantar suggest that fallen wood could be as much as 1 m3/ha annually and, thus, fallen wood from accessible forest sites could potentially add up to 170,000 m3 to the wood supply in Armenia [5]. However, the information on fallen wood provided by Hayantar for the years 2013-2017 suggest that their actual annual contribution to the wood supply is between 50,000 – 70,000 m3 (2018, information provided by Hayantar).

Wood market: Wood supply is basically limited to harvesting within the scope of thinning and coppicing operations, and sanitary cuttings. Hayantar has been selling wood, both fuel wood and so called “technical wood” (i.e. poor quality wood for construction purposes) at minimum established rates in three different ways: 1) selling of standing trees on demarcated plots; 2) selling of wood cut into pieces (1 meter length) piled up close to a forest road; and 3) selling of wood cut into pieces (1 meter length) collected in designated storage places outside the forest.

78. Minimum prices in autumn 2018 are 10,800 ADM/m³ for option 1 (standing trees), 14,400 ADM/m³ for option 2 (cut, piled next to road) and 21,600 ADM for option 3 (cut, stored outside forest). The minimum prices have been fixed upon decision by the chairman of the newly established State Forest Committee and contain 20% VAT and the “environmental tax” as per Government decree No. 864 of December 30, 1998. For comparison purposes, prices at the local market in towns and villages in the pilot regions may range between 20,000 – 25,000 ADM/m³ (2018, information provided by Hayantar).

79. Before 2018, cutting of trees and transport of logs to the place of storage (above-mentioned option 2 and 3) were organized by the respective forest enterprises either by employing Hayantar workforce and equipment, or by hiring a company. In the second half of year 2018 the system has been changed, all tree cutting and transport work will be outsourced to external service providers (direct selection only if the tender failed).

80. In 2018 Hayantar also tested for the first time to sell wood via auctioning of demarcated forest plots. The bidders visit the plots and depending on their estimation of the volume of the trees earmarked for cutting, they submit an offer. Staff of Hayantar will supervise and control wood harvesting activities of the winner of the auction to ensure that only marked trees are cut.

81. The RA Governmental decision (1535-N, 27 October 2011) has had certainly a positive impact on prevention of illegal logging at the time of its introduction. However, contrary to common perceptions, only a minority of people collect their own fuel-wood. In 2003 40% of households still collected fuel-wood directly from the forest, dropping to 28% in 2010 [5]. Most households buy fuel-wood through intermediaries for various reasons (e.g. physical burden for elderly people, unable to get permit, missing equipment for harvesting and transport).

82. Keeping in mind that less than two thirds of forests in Armenia are accessible due to difficult terrain conditions, the continued high demand for fuel wood at current rates will intensify already existing widespread degradation and accompanying environmental problems. To address these issues, supply must be increased and demand must fall. Supply can be increased in at least three ways: i) improved forest management; ii) increased investments in afforestation and reforestation; and iii) higher imports of fuel wood. Demand can be reduced by i) promoting affordable alternative fuels, ii) measures promoting home energy efficiency, and iii) facilitating imports [5].

83. However, communities rely on forest not only for fuelwood but also for Non Wood Forest Products (berries, mushrooms, edible plants, nuts, wild fruits, etc.) and benefit from environmental services, such as prevention of erosion and flooding.

84. Over the past decade, the government has undertaken several initiatives to address the issue of overexploitation and related further deterioration in the condition of forest lands in Armenia, however multiple challenges are still ahead to halt the extensive, mainly illegal fuel wood cutting, as well as to bring the other two main drivers of forest degradation, namely forest grazing and forest fires under control. In particular, the government passed the decision on “Providing privileges to the forest communities of RA for the use of fallen wood as fuel-wood” (RA Governmental decision, 1535-N, 27 October 2011), and embarked in 2017 on a reform project in the forestry sector. As a first result of the latter, the sole responsibilities for forests and forest lands have been assigned to the MoE and the State Forest Committee has been established.

85. In terms of financial support to government has been financing Hayantar from the state budget. Approximately 65-70% of Hayantar budget come for the state, and 30-35% from revenues generated from the sale of forest products, mainly fuel wood.

Years	Annual cutting, m ³	Funding 1000AMD	Including		
			State funding	Own income	From timber sale
2012	40,803	1,277,885	708,700	56,9185	438,838
2013	31,671	1,309,311	734,478	57,4833	360,144
2014	30,159	1,493,379	971,822	52,1557	385,109
2015	26,792	1,655,381	1,201,230	45,4151	378,442

Table 11 Budget structure of Hayantar

86. Indirect support by the government to the forest sector is also provided through financing the Chair of Forestry at the Faculty of Agronomy of the “Armenian National Agrarian University”. The chair of Forestry was established in 2003 to conduct scientific research and teaching forestry subjects.

87. In addition the government finances the “Zikatar Environmental Centre” from state budget which occasionally provides trainings on forest related issues depending on availability of additional, mainly external funding from projects or donors.

SWOT Analysis of the Forest Sector: Consequently the forest sector in Armenia requires diverse set of actions to secure enforcement of the existing policy frameworks and to ensure their update to also include climate change. Weaknesses, strengths, opportunities and threats of the sector are reported in table 12.

Strengths	Weaknesses
<ul style="list-style-type: none"> ➤ Signed and ratified international environmental agreements and conventions ➤ Legal framework and policies are in place ➤ Growing political concern will push forward forest sector reform and institutional development ➤ Growing public pressure against illegal cutting of trees ➤ Public engagement in the monitoring of forests (with support by ENPI-FLEG II - joint monitoring by the civil society and the state was established) 	<ul style="list-style-type: none"> ➤ National Forest Policy and Program documents outdated (2004, 2005) ➤ Lack of institutional, financial, human and technical capacities to implement National Forest Programme ➤ Weak stakeholder participation and inter/cross sectoral coordination ➤ Forest education and research inadequate ➤ Lack of reliable data and publicly available information on forest resources and their actual use (weak forest monitoring) ➤ Imperfect institutional set up and duplication of control functions
Opportunities	Threats
<ul style="list-style-type: none"> ➤ “Forest reform Concept” document (2017) paves the way for comprehensive sector reform ➤ NDC commitment to increase the forest cover (to 20.1% by 2050). ➤ Ongoing reorganization of forest institutions (possible revision of the structure of Hayantar) ➤ Economic potential of wood and non-wood forest products ➤ Extremely rich biodiversity, high ecotourism potential ➤ Potential for community engagement to state forest, management and use 	<ul style="list-style-type: none"> ➤ Continuation of uncontrolled forest use and Illegal logging ➤ Overexploitation of forests, non-regulated grazing, hay-making, land occupation, use of NWFP, reduce the benefits from forests ➤ Changes in species composition and forest structure due to climate change ➤ Loss of stands capacity of natural regeneration and reduced productivity ➤ Incomplete legislation to implement the RA National forest policy and program ➤ Inadequate forest pest and fire management ➤ Deforestation and forest degradation caused by inadequate governance

Table 12: SWOT Analysis of the Forest Sector in Armenia

Main Past and Ongoing Development Projects/Programmes: There have been numerous projects in Armenia with direct or indirect potential impact on forest resources and their use by addressing the main drivers of deforestation in the years 1990-1995 and forest degradation hereafter, namely i) extensive, mainly illegal fuel wood cutting at levels which cannot be sustained without further depleting forest resources, ii) uncontrolled grazing in forests and iii) forest fires. Those considered most relevant during the national engagement and consultation process are reported in the next coming paragraphs.

88. **Mainstreaming Sustainable Land and Forest management in North-Eastern Armenia** (2016 – 2019): The UNDP/GEF project’s goal is to ensure sustainable land and forest management to secure

continued flow of multiple ecosystem services. The project will promote an integrated approach towards fostering sustainable forest management, seeking to balance environmental management with development and community needs. Project works on updating the management plans for 10 forest enterprises in Lori and Tavush Provinces are ongoing. Among others, this project emphasizes biodiversity issues and High Conservation Value Forests (HCVF).

89. **“Addressing climate change impact through enhanced capacity for wildfires management in Armenia”** (2017 – 2020): The UNDP implemented project is funded the Government of the Russian Federation and its goal is to develop well-educated, trained and equipped forest and wildfire fighting community-based rescue teams for prevention and mitigation of forest and wildfire risks. The project is also supposed to develop and support alternative entrepreneurship-based activities for the prevention and mitigation of wildfire risks.

90. “Eco-corridors fund for the Caucasus” (2015 – 2020): The WWF implemented programme is funded by the Government of Germany and covering the countries Azerbaijan, Armenia and Georgia. The purpose of the programme is to secure the ecological stability of the region by linking protected areas and securing sustainable land use through contractual nature conservation. **“The Promotion of Eco-Corridors in South Caucasus”** project implemented in Armenia forms part of the Eco-corridor programme aims at both, to conserve the biodiversity of the Caucasus and to increase incomes for the local rural population.

91. WWF priority areas include developing and strengthening protected areas (PA) in Armenia (reserves, national parks, sanctuaries, etc.); conservation of threatened species; conservation and restoration of ecosystems; mitigation of and adaptation to climate change; introduction of economic mechanisms for alternative livelihood for local communities in order to promote sustainable use of natural resources and to protect biodiversity; as well as supporting environmental awareness and education. In the field of climate change, WWF has been implementing projects on forest rehabilitation and transformation of monoculture pine stands into mixed broadleaf forests to make them more resilient to climate change.

92. The “Environmental Project Implementation Unit” (EPIU) of the RA Ministry of Environment (MoE) is an organization without the status of juridical person within the structure of the MoE. The EPIU is the successor of the previously operating PIU of the “Natural Resources Management and Poverty Reduction Project” and the “Center for Environmental Projects” (SNCO), merged and reformed on the bases of the latter. EPIU was established in 2011 for the implementation of projects in the field of nature conservation, but for the moment project activities are limited.

93. The **“Integrated Biodiversity Management, South Caucasus (IBiS)”** Program implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) follows up on the achievements of the Programs “Sustainable Management of Biodiversity, South Caucasus” (SMBP) and “Integrated Erosion Control in Mountainous Regions”, and lasts from December 2015 to November 2019. The Program is implemented by the German development agency (GIZ) on behalf of the German Federal Ministry of Economic Cooperation and Development (BMZ) with co-funding from the Austrian Development Agency (ADA) in both participating countries Armenia and Georgia. The GIZ IBiS program’s goal is to improve the management of biodiversity and ecosystem services, coordinated across various sectors, through the use of solid data. The program aims towards mainstreaming integrated biodiversity management into national policies/strategies and to ensure sustainable forest management (SFM) through targeted field activities. One of the indicators of IBiS is to establish pilot forest enterprises in Armenia which are managed in compliance with (national) principles for SFM.

94. The new **“EcoServe”** Program commissioned by BMZ and implemented by GIZ (is expected to start in 2018 and last until end of 2020). The overall goal of the Program is to improve the preconditions for the sustainable and biodiversity-friendly use of natural resources in the pasture and/or forest land use systems of Armenia, with particular attention to the energy security of the rural population.

95. The **“Support Programme for Protected Areas – Armenia (SPPA-A)”** supported by the German government-owned development bank (KfW):on behalf of BMZ (2015 - 2020), aims at the protection of natural resources by improving the management of protected areas as well as the socio-economic situation

of adjacent local rural communities. In particular the existing conflicts on fuel wood access in concerned communities will be addressed by providing short- and long-term solutions. The programme area covers Syunik Province in southern Armenia and targets 7 PAs and 32 rural and urban self-governing communities located in the support zones of the PAs.

96. The KfW is currently in the process of developing a new project on biodiversity conservation and sustainable use in Armenia together with the MoE. The preliminary objective of the project is the conservation of biodiversity through enhanced natural resource management and socio-economic development in adjacent communities.

97. The UN Development Account (UNDA) funded regional project ***“Accountability Systems for Sustainable Forest Management in the Caucasus and Central Asia”***, is implemented by the UNECE/FAO Forestry and Timber Section (Geneva) and aims at strengthening the national capacity of the five participating countries in the Caucasus and Central Asia, namely Armenia, Georgia, Kazakhstan, Kyrgyzstan and Uzbekistan, to develop national criteria and indicators (C&I) for SFM. During the four years of project implementation national C&I that are applicable, communicable, measurable, feasible and relevant to assess sustainability of forest management, should be identified in each country participating in the project. The process of designing a set of national criteria and indicator will combine national priorities and specific needs of each country with international experience of existing regional and global C&I. This process will also develop the necessary capacities in the participating countries to actively participate in international processes related to forests, and contribute to the sustainable development of the sector towards a green economy.

98. Another actor in development initiatives is the World Bank (WB) which has been funding “Community Agricultural Resource Management And Competitiveness (CARMAC) and CARMAC II Projects. CARMAC builds on WB experience and successes in agriculture, rural development, pastures and livestock management, and participatory community development. CARMAC II will: a) develop and support the implementation of participatory management plans to improve productivity and sustainability of pasture and livestock systems; b) support the development of selected value chains to help strengthen links between producers and processors, promote food safety, and support processing and marketing; and c) improve the capacity of public sector institutions that can support improved market access and selected value chain development.

99. The International Fund for Agricultural Development (IFAD) in Armenia focuses on poverty alleviation through agricultural growth in the poorest rural areas in the country, mainly in the highlands and border areas. IFAD also builds and strengthens local institutions by involving grassroots groups in implementing and managing activities, and by making them responsible and accountable for those activities. Currently IFAD funds implementation of two projects in Armenia, but none of them focuses on animal husbandry sector.

100. The ADA funded animal health management initiatives in Lori and Shirak regions through improvement of animal husbandry and health control practices and, therefore providing better conditions for their economic activities. The Project focused on shifting from traditional farming to new animal husbandry approaches, such as (a) herd and labour management; (b) reproduction; (c) housing and environment; (d) nutrition; (e) calf rearing; (f) trans-boundary animal diseases prevention and control and such that may lead to development of a more diversified rural economy.

101. The Swiss Development Cooperation (SDC) funds the implementation of the Technical and Institutional Support to Veterinary Services in Armenia Project having an overall goal to strengthen veterinary services, contributing to the improvement of the food safety system and sustainable agricultural development in Armenia.

102. The US Agency for International Development (USAID) funds the implementation of the “Partnership for Rural Prosperity” (PRP) and the “Advanced Rural Development Initiative” (ARDI) programs. PRP promotes rural economic development in Armenia and the ARDI will develop competitive rural value

chains to increase incomes and improve livelihoods of 48 rural communities in the Marzes of Syunik, Shirak and Lori.

103. **Other relevant projects implemented by FAO in Armenia and in the Region: *National forest programme (nfp) Facility (2004/2012) – Armenia***. Improved capacity of forestry stakeholders to implement the National Forest Program 2005, leading to compliance of forest legislation, better governance and increase public awareness of multiple benefits of forest. This will lead to better protection of existing forest and increased forest area in Armenia. The Government-led process attracted the interest of the most advanced non-state stakeholders, but not all of these stakeholders took part because of a lack of the necessary capacity to allow them to respond to the call for proposals. This has limited the opportunities of stakeholder participation in the nfp Facility supported activities. ***Afforestation and Reforestation (2009-2011)***. The project basically resulted in the upgrade of the Hrazdan nursery, other important activities such as establishment of pilot seed collection stands (under outcome 2), never happened for various reasons beyond FAO's control. ***National forest programme (nfp) Facility – Georgia (2004/2010)*** The project aimed at: developing a National Forestry Policy and Strategy that connects with other sectors and reflects the needs and aspirations of the people of Georgia; enabling stakeholders to engage meaningfully in the development of the Sector; and building the capacity of stakeholders to share forest management responsibility at the local level. With the Facility support a National Forest Programme Strategy Concept was developed in 2006 after a nationwide consultation and was disseminated after it was adopted by the Government. ***Support the Institutional Development of the Forest Sector for Georgia (2010/2012)***. The project had the objective of: identifying options for the institutional development of the forest sector for Georgia and advising to the Government in the implementation of the institutional reforms, with specific emphasis on actions to promote employment and the contribution of the forest sector to sustainable development and poverty alleviation in rural areas. ***Support to Development of National Forest Program and Forest Legislation – Azerbaijan (2012/2013)*** to improve contributions of forests to the economy, poverty reduction, environmental sustainability and sustainable development of the country.

104. **Relevant projects implemented by ADA in the region: *Sustainable forest governance in Georgia: strengthening local and national capacity and developing structured dialogue phase I (2012/2015)***. Forest cover is an important economic resource of Georgia. Forest legislation and policies, in accordance with international standards, must take into account the rights of use of the local population and the preservation of the environment. The project therefore aims to systematically involve local stakeholders (local government, civil society and private sector actors) in the current formulation and future implementation of Georgian forestry legislation and to strengthen state forest management capacity. ***Sustainable forest governance in Georgia phase II (2015/2018)***. Overarching goal is to contribute to the successful implementation of the forest reform in Georgia. The objectives are: (1) Developing National Forest Policy implementation tools and mainstreaming forestry priorities in relevant sectors' policy documents; (2) Modernization of Forest Management Practices, based on the best international experiences; (3) Supporting forest management decentralization. ADA-BMZ/GIZ forest sector reform programme in Georgia (2014/2017). The overall objective of this project is the improved management of the forests of Georgia according to international standards for sustainable forest management. Official partner is the Ministry of Environment and Natural Resource Protection (MoENRP). Project partners and target groups of the project are the institutions of the forest management, forest policy, forest monitoring and forest supervision. Final beneficiary is the rural population in Georgia, through improved management practices and legislation and secured access and use rights.

105. **ENPI East Country FLEG II Program (20013/2016)**: The project's objective was "*to support the seven Participating Countries to strengthen forest governance through improving implementation of relevant international processes; enhancing their forest policy, legislation and institutional arrangements; and developing, testing and evaluating sustainable forest management models at the local level on a pilot basis for future replication*" ADA provided parallel financing to complement project activities in Armenia and Georgia through the "ENPI East Countries FLEG II Program– Complementary Measures for Georgia and Armenia" The objectives of the Program are to support Georgia and Armenia in strengthening forest governance through improving implementation of relevant international processes, enhancing their forest policy, legislation and institutional arrangements, and developing, testing and evaluating sustainable forest management models at the local level on a pilot basis for future replication

Lessons Learned and Best Practices: Concerning past and current experiences in Armenia and in the region, the project will build on and replicate the positive experience identified and will collaborate and coordinate with those projects that could magnify the foreseen impacts or that might complemented by planned activities. Additionally, from the analysis of past experiences, the project has derived, also thanks to the national engagement and consultation process, a series of lesson learned that contributed to the design of the theory of change and related project's strategy.

The main lessons learned / best practices from past and ongoing experiences in Armenia are grouped as follows:

- a. Involvement of Communities,
- b. Ecosystem Based Approach
- c. Nexus between National Energy Security and Forests
- d. Adherence with the existing legal framework,
- e. Capacity Development,
- f. Project Design,
- g. Sufficient Timeframe.

106. Although it is important to approach complex, multifaceted issues such as forest degradation in a holistic manner, the scope of a project and areas of interventions should match available funds and timeframe to prevent fragmentation of activities and to allow understanding of impacts on a slow growing ecosystem such as the forest one. Activities need to be prioritized and well budgeted and community involvement should move from ad hoc mobilization processes to long term engagement into governance according to the existing laws and by laws.

107. The experiences in Armenia and abroad indicate that community involvement should become a greater priority in strengthening the management of forests in Armenia recognizing that people and their livelihoods and energy security rely on the health and productivity of their landscapes, and their actions play a critical role in maintaining forest's health and productivity [16]. Involvement of community in forest governance and management can represent also an improvement of incomes of local population by involving families from local communities in all types of restoration activities.

Energy Sector Background: Armenia has no fossil fuel resources and imports all of its gas resources from Russia (80% of imports) and Iran. Total primary energy supply corresponded in 2009 to 2,900 ktoe (77% imported); local resources for electricity generation are 815 MW nuclear, 1182 MW hydro and a wind pilot of 2.6 MW (55). Photovoltaic is increasing in popularity in the last years, among others due to the liberalization of the laws and the presence of financing schemes. The country foresees to implement 110 MW utility-scale solar PV (151).

108. Approximately 1/3 of the final energy consumption is attributable to the residential sector, making it the largest consumer overall (55). Gas is overall the favorite choice of energy carrier for heating (51%), especially in urban areas, due to access to the gas grid and generally better economic conditions. Villages rely however mainly on wood fuel as a primary source of heating (61).

109. The total number of private houses is 393,560, 39% of which are in urban areas (154,270 units; 26.5 million m²) and 61% in rural areas (239,290 units; 38.9 million m²). In 2017, households spent an average 20% of their total expenditures on electricity, heating, and hot water. The increasing costs of natural gas and electricity pose a problem, especially for low-income households. In the last decade (2007-2017), the electricity price rose by 94-112%, while the natural gas price rose by 250%. Up to 50% of the income of poor families is spent on heating during winter months (but still may not reach comfort level).

110. Regardless of the importance of fuelwood for heating in rural areas, woody biomass often fails to be included in the national statistics, estimations from UNECE show however that its contribution is significant and contributes approximately to 3% to the total Primary Energy Supply and 27% to the current Renewable energy sources (287).

Legal framework and policies: Government of RA's commitment to promotion of energy efficiency (EE) is reflected in the Law on Energy Saving and Renewable Energy (2004). The Law lays out the principles of the government's policy and governance structure supporting energy efficiency, and provides for energy efficiency standards, audits and awareness raising. While forming a fertile ground to ensure EE, the current laws and policies do not include fuelwood and the needs of 74% of the rural population among its main targets. Such gap could be filled as the current legal frameworks contains the elements needed to include fuelwood and EE standards for wood fueled appliances.

111. **RA Law "On Energy Saving and Renewable Energy" (ՔՕ-122-Ն) 2004:** The Law "On Energy Saving and Renewable Energy" (ESRE) is the basic legal act that incorporates regulations with regard to energy efficiency. The Law on ESRE provides for the development of mechanisms to enforce a wide array of energy efficiency measures, however, many of these have yet to be developed and implemented. Such mechanisms include the following:

- State-administered programs. The Law allows for: the development, adoption and implementation of a national, targeted program for energy savings and renewable energy, coordination among state programs to promote energy efficiency, and the incorporation of energy savings requirements in state programs on the economic development of Armenia.
- Standards. The Law commissions the Standardization National Body (the National Standardization Institute) to adopt energy saving national standards with regard to the energy efficiency of:
 - Energy-using devices
 - The production, processing, transformation, transportation, storage and consumption of energy resources
 - Building and construction technical requirements for heating, lighting, ventilation, water supply and sewage
 - Production/industrial processes.
- Training and education. The Law instructs the state administration authorized body for education to incorporate energy savings into the curricula of elementary, secondary, graduate, supplementary and post-graduate educational institutions and to develop energy savings educational training programs for engineering staff.
- Information dissemination. The Law allows for information dissemination via public hearings/discussions, broadcasting, exhibitions, and other propaganda mechanisms. Information that falls within the jurisdiction of public dissemination campaigns includes:

- Existing energy efficient devices, technologies and machinery,
 - Energy efficiency pilot projects,
 - Energy efficiency national objectives,
 - Environmental, economic and social benefits of energy efficiency.
- Energy audits. Are covered by the ESRE Law and in particular the governmental decree “on performing the energy audits” which is too general and mostly covers the industrial energy auditing process rather than residential buildings. No methodology or energy passport format are provided. The Law spells out several important factors and suggests certain prerequisite activities related to the development of the energy audit process in Armenia. Such factors and prescribed activities include:
 - The definition of purpose of the audit
 - The voluntary nature of cooperation
 - The measurement of energy efficiency indicators
 - The definition of a methodology and documentation format for carrying out an energy audit
 - The information to be included in the audit report
 - The possibility for tax and/or customs relief for a positive audit conclusion
- International cooperation. The Law recommends international cooperation with regard to the exchange of energy efficient technologies, information, the mutual recognition of standards and certification, and the development and implementation of joint energy saving programs and projects.
- Fiscal incentives. The Laws commissions the authorized state body for energy savings to submit proposals to the government on additions to the Customs Code of the Republic of Armenia and the Republic of Armenia law “On the Approval of List of Products imported by organizations and individual entrepreneurs eligible for zero (0) rate customs duty and excise duty exemption, for which the customs service does not calculate or charge value added tax”.
- Updating existing compliance certification. The Law directs the appropriate state body to submit proposals to the government to include energy savings requirements and national objectives in the Republic of Armenia law “On Certification of Compliance of Goods and Services with Normative Requirements”.

112. The adoption of the Law was followed by the adoption of National Program on Renewable Energy and Energy Efficiency (2007). The National Program on Renewable Energy and Energy Efficiency identifies the sectors with the largest energy efficiency potential and provides an outline of technical measures/solutions to be taken to realize the identified technically viable potential to be taken. The Government has vastly improved the economic efficiency of energy use through improved regulation of energy utilities.

113. Altogether, the National Program proposes 16 categories of energy efficiency measures (including technical, institutional, administrative, financial, etc.) which can result in an annual nationwide cut in energy use over 1 million t.o.e. across all sectors of the economy. The National Program also appraises the renewable energy potential in Armenia for hydro-power, biogas, solar, geothermal and wind power installations technically and economically feasible for application by 2020.

114. The National Program on Energy Saving and Renewable Energy, under which the Government plans various energy efficiency measures in all sectors of the economy. According to this program three scenarios are planned: pessimistic, average, and optimistic with 30%, 65% and 100% realization of EE measures respectively, or reduction of final energy consumption by 8%, 17.4%, and 26.7%. The National Program was further supported by the 2007-2009 Implementation Plan.

115. **Amendments to the Law on Energy Saving and Renewable Energy:** Adopted on 25 December 2015 with Government Resolution 1405 “On the implementation of energy saving and energy efficiency improvement measures in facilities being constructed (reconstructed, renovated) under state funding”. Adopted on 25 December 2014 the decision defines mandatory measures aimed at reducing energy consumption and operational costs, meeting normative comfort conditions, and raising energy saving and efficiency in buildings under state-funded construction (reconstruction, renovation). The mandatory measures are the following:

- Building envelop insulation

- Design solutions that would minimize the envelop surface
- Use of protective materials for coating building envelope
- Use of energy efficient windows and doors
- Sealing the attachments to the building outwalls and other elements
- Use of certified insulation materials
- Use of energy efficient heating, ventilation, air conditioning, hot water supply, and lighting systems.
- Use of alternative energy systems (solar-thermal, solar-PV, heat pump) if feasible.

116. **Governmental decree on Energy audit procedure³⁹ upgraded with a separate chapter on Building Energy Audit:** Decree is in place from 2006; however it was mostly covering industrial energy audit issues. With this latest amendment buildings' energy audit related procedures are well described and in detail represented.

117. **RA standard on “Energy efficiency. Building energy passport”⁴⁰ developed and registered (AST 362-2013):** Registered in accordance with the current procedures by the National Institute of Standards (SARM) on December 18, 2013 (registration ID: AST 362-2013). The standard was enacted on January 1, 2014. Standard is introducing the building energy passport format, energy efficiency certificate (label) format, as well as describes the methodology how to fill in the passport.

118. **RA standard on “Energy Audit Methodology”⁴¹ developed and registered (AST 371-2016):** Developed in the frames of 'Improving Energy Efficiency in Buildings' program and accepted by the National Institute of Standards in March 2016 the standard serves a guideline for private and legal entities implementing energy audit in residential and public buildings. It describes the procedure of energy audit from creating energy passport to further defining building's energy efficiency class. One of its theses claims a requirement to follow other four standards, namely 'Energy performance of buildings – Methods for expressing energy performance and for energy certification of buildings' (AST EN 15217-2012), Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 1: General (AST EN 15316-1-2012), Energy performance of buildings – Overall energy use and definition of energy ratings (AST EN 15603-2012), and 'Building environment design – Guidelines to assess energy efficiency of new buildings' (AST ISO 23045-2012) all accepted and enacted in 2012.

119. **1st and 2nd National Energy Efficiency Action Plans:** The Government adopted the 1st National Energy Efficiency Action Plan (NEEAP) in 2010, and further 2nd NEEAP in 2017, which aim at providing the path for Energy Efficiency in Armenia until 2020. The documents are prepared in accordance with the requirements of the EU Energy Services Directive and the NEEAP templates developed by the Energy Community Secretariat for the Energy Community countries.

120. The Republic of Armenia developed its first NEEAP in 2010 to accelerate the implementation of its national energy efficiency policy. The first NEEAP set forth a set of programmatic and policy measures for energy efficiency improvement for all economic sectors of the country. The first NEEAP, adopted by Government Resolution #43 on 4 November 2010, set the country on track for a ten-year process with intermediate targets and interim evaluations. Because adequate data were not available at the time for developing targets based on statistics, the first NEEAP provided rough estimates of the potential impact of the proposed measures as fractions of the overall target up to 2020.

121. The 2010 energy balance was prepared shortly after the completion of the first NEEAP. The indicative target for the end of the first NEEAP was thus later quantified by the team developing the second NEEAP using the energy balance data for 2010.⁴² Since the second NEEAP was prepared in 2015, the first period was assumed to cover 2011-2014. The energy saving target for the first period of the first NEEAP was baseline energy consumption of 2010 (1900.6 ktoe). The second NEEAP sets an interim target of 3.3%, equivalent to 63.3 ktoe. The assessment of the first NEEAP revealed that this target has been outperformed: The overall energy saving reached by 2014 was 8.6% (163.1 ktoe).

122. The second NEEAP also identifies barriers to more extensive efforts in this direction, proposes

³⁹ Developed with support of UNDP-GEF "Improving Energy Efficiency in Buildings" Project

⁴⁰ Developed within UNDP-GEF "Improving Energy Efficiency in Buildings" Project

⁴¹ Developed within UNDP-GEF "Improving Energy Efficiency in Buildings" Project

⁴² EC-LEDS Program In Armenia.

measures to help overcome these barriers, and offers additional energy efficiency improvement measures for the period covering 2015–2020. The development and adoption of the Second NEEAP for the Republic of Armenia is one of the steps on the pathway upon which the Government of Armenia embarked a decade ago, by adopting Armenia's first Law on Energy Saving and Renewable Energy.

123. The second NEEAP continues the relevant measures from the first NEEAP, and in addition proposes an updated bundle of measures and energy saving targets for the second period, covering 2015–2017. The second NEEAP tracks both the indicative milestone year 2018, as well as a long-term plan until 2020. The document was prepared based on the template recommended by the Energy Community, in which the Republic of Armenia has had observer status since 01.10.2011. The key pillars of the second NEEAP are:

- Reducing energy demand by improving the efficiency of energy end use;
- Improving national energy security by reducing the need for imported energy resources;
- Decreasing the energy content of the key economic outputs to reduce costs and raise the competitiveness of output;
- Addressing growing energy affordability concerns through energy efficiency solutions (instead of relying on social aid); and
- Providing impetus for behavioral change by decoupling growth from energy use, and thus enhancing the quality and sustainability of development through the introduction of knowledge and traditions for resource efficiency and smart growth.

124. **The Energy Security Provision Concept of RA:** The document was adopted in 2013. In fulfillment of the mentioned Concept, a list of measures has been developed by the Ministry of Energy and Natural Resources. The list is submitted to the government for approval. As of September 2014 the National 2014-2020 **Action Plan on Energy Security Provision Concept of RA was adopted and went into force.** The latter includes:

- Regulate energy efficiency and energy saving minimal requirements in the State construction and procurement tenders. This will affect the RA Law on Urban Development and the RA Law on Energy Efficiency and Renewable Energy.
- Introduction of Measurement, Reporting, and Verification (MRV) system for reduction of greenhouse gas emissions, which may be required by external donors or investors. Government shall maintain a cadaster of anthropogenic emissions of greenhouse gases and establish a baseline level of greenhouse gas emissions from Armenia's energy system.
- Reduce greenhouse gas emissions through improvements in energy efficiency by developing national plan for climate change mitigation to attract foreign financing that will enable investments in energy efficiency.
- Harmonization of European Norms (EN) and ISO standards in relation of energy efficiency.

125. MoENR letter No. 03/22.2/1858-13 dated May 27, 2013 initiated a harmonization process of the sector-relevant directives and standards in cooperation with the UNDP-GEF. Approved by the Order dated September 17, 2014 of National Institute of Standards CJSC of the Ministry of Economy enacted on November 1, 2014. National and international ISO standards on energy efficiency were developed and registered as of 2017:

RACN II-7.01-96 Construction climatology (under revision);
CNM II-7.101-98 Construction of settlements, buildings and structures under the climatic conditions of the RA;
RACN II-7.02-95 Construction thermal physics of envelopes; design norms;
BCM/CNM II-7.102-98 Construction thermophysics of envelopes (Manual on RACN II-70.2-95 norms/codes);
RACN II-8.03-96 (MCH 2.04-05-95) Artificial and natural lighting;
RACN IV-12.02.01-04 Heating, ventilation and air-conditioning
SNIIP 2.03.13-88 Floors;
SNIIP 2.08.01-89 Residential buildings;
SNIIP 2.08.02-89 Public buildings and structures;
SNIIP 2.09.04-87 Administrative and residential buildings; and

SNiP 3.04.01-87 Insulation and decorative coatings.
 RACN II-7.02-95 "Construction thermal physics of the building envelopes; design norms" and the CNM II-7.102-98 Construction thermal physics of envelopes"
 AST 1434-1-2010 Heat Meters: Part 1. General Requirements
 AST 1434-1-2010 Heat Meters: Part 6. Installation, Operation Delivery, Work Control and Maintenance
 ISO 16818 Building Environment Design. Energy Efficiency. Terminology
 ISO 23045 Building Environment Design. Energy Efficiency Assessment Guide for New Buildings
 EN 15316-1 Heating Systems in Buildings. A Method for Calculation of System Energy Demand and System Efficiency
 EN 15217 Energy Performance of a Building. Methods for Expression of Energy Performance and Energy Efficiency Certification of a Building
 EN 15603 Energy Performance of a Building. Shared Energy Use and Determining Energy Efficiency Ratings
 In 2004 the RA voted for the following ICNs adopted by the Interstate Scientific and Technical Commission for Standardisation, Technical Norms and Certification in Construction of CIS countries (MHTKC):
 MSN 2.04-02-2004 Thermal protection of buildings (currently under revision); and
 MSN 3.02-04-2004 Multi-apartment residential buildings.
 AST 1434-1-2010 Heat Meters: Part 1. General Requirements
 AST 1434-1-2010 Heat Meters: Part 6. Installation, Operation Delivery, Work Control and Maintenance

126. Comprehensive and Enhanced Partnership Agreement between EU and Armenia: The EU's cooperation with Armenia aims at supporting the country's resilience, security and prosperity built on democracy, human rights, the rule of law and sustainable economic growth, as well as strengthening its connection to the EU and to the region through enhanced transport connectivity, mobility of people and people-to-people contacts.⁴³ In line with the new agreement, Armenia and the European Union have jointly developed Partnership Priorities, which defined the priority areas of cooperation. These are: strengthening institutions and good governance; economic development and market opportunities; connectivity, energy efficiency, environment and climate action; and mobility and people-to-people contacts.

Energy situation in rural areas: Most of Armenia's rural households live in non-standard, stone buildings which have many common features. They are generally designed to be 1.5 floors (with used or unused attic) and area of 150m², outdoor walls 255m², windows/doors 33 m², attic 100 m². External walls of such private houses are from tuff stone, have 50 cm thicknesses, attic roof, thermal insulation is either missing or is simply <20cm layer of slag. 70% of windows are with old wooden frames, with high air infiltration losses. The remaining 30% of windows are mainly double-glazed polyvinylchloride windows, with U-value of about 2 W/m²K:

127. The Armenia - Integrated Living Conditions Survey found that households relied on the following types of fuel for heating: natural gas – 40.2% (as compared to 57.1% in 2010), wood – 35.9% (as compared to 25.8% in 2010), electricity – 18.5% (as compared to 11.7% in 2010) etc. In comparison to the previous year, the share of households using electricity and wood for heating purposes increased, respectively, from 16.8% to 18.5% and from 33.2% to 35.9%. Meanwhile, the share of households using other types of fuel for heating purposes decreased, from 6.0% to 5.3%. As of 2015, some 99.6% of households had electricity supply and 84.0% had centralized supply of natural gas. While up to 2013 use of electricity and firewood for heating purposes was a desperate choice for customers who were not connected to the natural gas network, now it is quite common for customers to go back to electric or firewood heating, or supplementing gas-fired heating with cheaper fuels.

⁴³ Source: https://eeas.europa.eu/headquarters/headquarters-homepage/37967/eu-armenia-comprehensive-and-enhanced-partnership-agreement-cepa_en

Armenia Rural Heating Options 2010 and 2015 [%]			Types of Appliances Used for Heating in Rural Communities, 2015 [%]	
	Rural			Rural
	2010	2015		
Total	100	100	Electric stove	0.3
Not heated	0.5	0.8	Electric heater	0.8
Heated, including by the use of the following options	99.5	99.2	Gas stove	0.4
Central heating	-	0.0	Home-made oven	82.0
Oil, diesel	0.1	0.0	Factory-made oven	11.6
Electricity	1.0	1.1	Local individual boiler	4.8
Natural gas	33.2	14.4	Local collective boiler (for the whole building)	0.0
Wood	52.5	71.2	Central heating	0.0
Other	13.2	13.3	Other	0.1
			Total	100.0

Table 13: Heating choices in rural Armenia⁴⁴

128. Based on the reviews, it was identified that thermal energy required for heating purposes is 52,159 kWh (DD=3779 °C days, average for Armenia), 348 kWh/m² energy use, heating costs per m² of floor area equivalent to 10.36 \$/ m², if 100% thermal comfort is guaranteed. Energy audits, however, indicate that most households are heated up to 60% of optimal thermal comfort. This provides a very low baseline energy consumption which does not create possibilities for economically justified energy efficiency improvements. It is common to expect that energy efficiency improvements do not result in reduction in energy bills, but they do deliver significant comfort improvements. This being said, the energy efficiency improvements must be calculated with normalized energy consumption as baseline, corrected for comfort sacrifice.

129. Therefore, rural population is heavily dependent on wood fuel, as financial resources are generally very limited and this energy source is considered to be the cheapest. In fact, given the low average monthly income of USD 115 per adult equivalent (12), dependency on environmental services, to cover basic needs, is the higher among rural communities where the bulk of poor is located. 74.6% of rural households use wood for heating purposes. Other energy sources (manure) are more often used in cold rural areas that are far from forests. Overall, about 10% of households in villages use manure as primary heating option, while 14% - for secondary heating option.⁴⁵ In some cases, natural gas is available as a fuel alternative, but not affordable financially. This lead to unsustainable practices and to a high consumption, exacerbated by the utilization of inefficient wood stoves in houses with a poor thermal insulation. As a result, total wood fuel consumption in Armenia corresponds to an estimated 2 million m³ per year, which is higher than the gross increment.

130. The government is aware of the unsustainable situation and implemented programs on fostering sustainable renewable energy and energy efficiency. Some of the most important strategy papers of the sector are the "Energy security concept" and the "Development Strategy for 2012 - 2025" and the "Scaling Up Renewable Energy Program" (3), which all aim at improving energy security and affordability and the use of own energy source. With regards to wood fuel, the Government appears to concentrate on offering alternatives and incentives for switching to other energy carriers, e.g. through the extension of the gas pipeline and by incentivizing Solar water heaters. What seems to be entirely missing however are strategies directly aiming at an increase of efficiency of wood fuel, or improving efficiency of energy end use in rural sector altogether. Rural energy (fuelwood) is also not addressed in the 1st and 2nd National Energy Efficiency Strategies.

131. A testimony to this is also the fact that the national renewable energy strategies and targets do not consider wood fuel and therefore the implication of fuelwood harvesting on forest and climate change mitigation. Biomass sources (incl. forest) have been analyzed for potential electricity production but have been found as not feasible for the moment while the potential of biomass for space heating has not been analyzed in detail so far (151).

132. Since rural HHs are often not connected to the gas pipeline or cannot afford alternatives, they are destined to continue to utilize wood fuel. Moreover, the Residential energy survey commissioned by UNDP (4) found that after the 2015 increase of gas tariffs, 6.7% of the customers connected to the natural gas distribution network have switched back to firewood as the gas tariffs crossed their affordability limits. The average household in villages is estimated to use 8.1m³ per heating season, and the trend is increasing. Moreover, as already mentioned, woody biomass contributes approximately 3% to the total Primary Energy

⁴⁴ Source: 61

⁴⁵ Source: EDRC 2015 Residential Energy Consumption Survey.

Supply (287) and should therefore also be addressed accordingly.

133. Most of the energy consumption in the residential sector is dedicated to space heating. Income levels mainly determine the choice of energy carrier, and many HH choose several options for heating. The government has invested intensively in the gas distribution throughout the country and overall this fossil fuel source is the most popular one with 51% of the HH utilizing it for space heating (61).

134. Fossil fuel use is however lower than expected due to rising prices and the lack of pro poor energy based subsidies have increased reliance on wood and the dependency trend is growing along with rural poverty indicators (12, 27). Fuelwood is still the cheapest and often freely available energy source and therefore the favorite source for cooking and heating in rural areas. In villages, 66,9% of the HH use it as the primary energy source for space heating and spend an average USD 250 for 8 m3 of wood per year. The main reason for the preference of this source is its relative low cost and availability (61).

135. Accordingly, energy costs are a high burden on rural HH incomes and more than 30% of the population is considered energy poor. Given that space heating is on average responsible for 14-20% of household expenditures (61) many HH can afford only to heat their households partly (1 room) and to less than comfortable degrees (<19 C°). According to a recent survey commissioned by UNDP, the space area corresponds to 121 m2 (61). This means that adding up all numbers, the specific energy consumption of a rural HH with 8 m3 of wood use would be 115 kWh/m2/year. Considering however that most of the rural HH heat the house only partially and to temperatures that are below 19 degrees (national norm requiring 20-22°C), the real consumption per m2 is therefore much higher. Studies from Albania in a similar context reveal in fact that in similar cases the consumption could correspond to 300 kWh/m2/year (287), which is very high/inefficient.

136. Traditionally, the wood cut from sanitary cutting of city green spaces is provided to at-risk families, including low-income families, families who have lost or injured members in military conflict, etc. This is a common practice in Yerevan, for example.⁴⁶ However, in other communities the municipality may chose to establish a social support initiative with additional procured wood. For example, the municipality of Ejmiadzin procures wood on large scale and distributes to registered socially vulnerable families throughout the heating season.

137. With the growing gas tariffs, as more households switched back to firewood for heating, the applications for social assistance also increased two-fold.⁴⁷ On a national level, the sanitary cutting was sold as firewood to forest-adjacent communities at a below-market price of 1200 AMD/m3. In some years, for example 2011, the decision was made to provide the sanitary cut free of charge (waiving the nature use fee)⁴⁸. Such decisions are made and implemented because according to the Law on Local Self-Government prescribes the social protection function in the residential sector to the local authorities. Considering the dedication local governments have illustrated to this function – through fuelwood subsidies, cash support for utility bill support, and alike – the local authorities can become an important partner in supporting the improved efficiency of energy end-use in rural households. Specifically, local authorities can co-financing the EE-retrofits, partially subsidize the cost of EE fuelwood stove purchases, adopt green procurement policies by supplying sustainable biomass fuels (briquettes and pellets) to the officially registered low-income households.

138. Concerning heating of water for sanitary purposes, main energy source for hot water production in villages is gas with 62% in the heating season and 81% off heating season, followed by wood with 22.3% in the heating season and electricity with 17% in the off season. In case wood is utilized for heating, the ratio of using wood also for hot water purposes in the heating season is with 30% higher. Summer consumption of wood appears to be negligent (61).

Rural Energy Sector Performances: Fuelwood value chains are not well developed and confined to few SMEs that purchase resources from the state or obtain licenses for exploitation. This is also expressed by the fact that only a small part of the total economic value of the local economy is from wood resources (i.e. 1,5% in Lori, 4,4% in Syunik). Of these, slightly more than half (58%) are for wood fuel. Researches hints that the sources might be largely underreported and suggest that this data is to be considered as the bare

⁴⁶ Source: <https://www.aravot.am/2015/12/01/634572/>

⁴⁷ Source: <http://ejmiatsin.am/main/619-.html> for 2012 and <http://ejmiatsin.am/main/2897--varelapayt.html> for 2015

⁴⁸ Source: <https://www.a1plus.am/51222.html>

minimum, given that many times asked persons were not available to provide full information ([229](#)).

139. As reported in the initial paragraphs the Country has largely invested in connecting rural areas to the natural gas grid, but 30% of the country area is not connected to the gas grid and it is economically not viable to extend the grid further. Regardless, energy needs of about 5% of the population that will remain excluded.

140. The State has released several laws in the last years for the liberalization of the Renewable Energy market, among others it is now possible for private persons (up to 150kW) and for business (up to 500kW) to install PV-systems without requesting licenses. Furthermore these installations have access to a net-metering scheme and any surplus can be sold to the national authority. There other programs in place subsidizing other renewable energy sources, mainly wind power and hydropower in order to reach the government goals. With regards to space heating there is little regulations in the renewable energy sector but for schemes producing up to 5 MW no license has to be required.

141. Excluding the output from the large hydroelectric plants, renewable energy generation represented roughly 6 % of total generation in 2012. The Government's target is for such generation to represent 21 % of total generation by 2020, and 26 % by 2025 and this %age if properly sustained with the adequate technical and policy support, biomass (fuelwood) might be a substantial contributor to the target.

142. Fuelwood is the main choice of heating of the rural population. Household income in rural Armenia is lower than average, the limited resource have therefore to be buffered by accessing natural resource (wood fuel), many times by utilizing unsustainable practices. As reported in the previous sections of this document, logging is so far only allowed for cleaning and thinning the forest, so far there is no timber production, but according to laws each HH living in a community adjacent in vicinity of a forest (5Km) has the right to collect from fallen wood 8 m³ of fuel wood per year requesting a permit to collect it to Hayantar. In this way approximately 60,000 m³ of fuel wood are distributed per year (2017, information provided by Hayantar). Still, many eligible HH are not collecting wood directly from the forest and prefer to purchase it through middlemen or vendors, because they are not able to carry out the work or because of difficulties in obtaining the permits ([229](#)).

143. Several studies confirm that final user has to pay on the informal market average prices for fuel wood of approximately 250 USD ([229](#), [61](#)) (8m³ per year). If more firewood is needed, there are several options for households to obtain the wood: a) they may collect it illegally from the forest, b) they can buy fuel wood if they pay a nature consumption tax or if there are already allocated cleaning and thinning areas nearby, c) they can buy fuel wood directly from «Hayantar» at the price of 11,000 AMD per one cubic meter. In 2017 the Forest Enterprise has sold in this way 33.000 m³, in 2018 it has been tested for the first time auctions for SMEs (2). Wood is often delivered to HH in trunks that have to be cut in order to be stocked and utilized. Site visits confirmed that the population often does not store wood over longer times, but buys fresh cut wood when needed for immediate utilization. Given that the fuel has therefore no time to dry as required the water content has obvious negative effects on the energy obtained.

144. As a result, total wood fuel consumption in Armenia corresponds, according to estimations, to approximately 1.6 to 2 million m³ per year ([61](#)). The national consumption is hence unsustainable as it surpasses the annual forest growth rate corresponding to a gross increment of about 594 thousand m³ or less.

145. Furthermore, given that wood in Armenia is often directly used after being freshly cut, energy consumption is not efficient and should be improved substantially with a complete and sustainable value chain allowing the drying to less than 20% humidity.

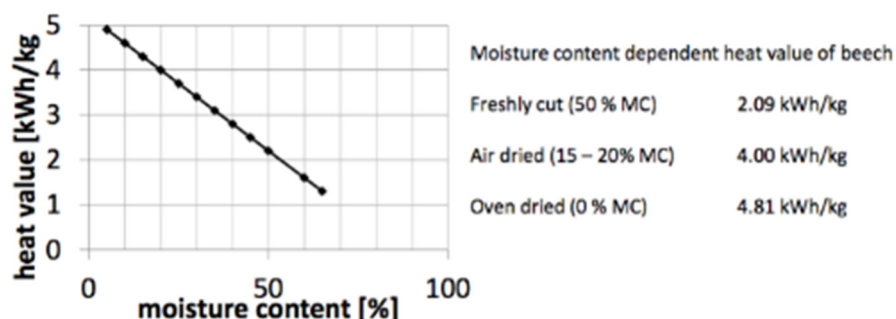


Figure 8: Correlation of moisture content and heat value of beech (UNECE, 2015)

146. In terms of tree species used as fuelwood table 14 reports a realistic scenario based on literature review and field observations.

Tree species	% tree of total forest	% used as fuelwood ⁴⁹	kg/m ³	kg/m ³ fuel wood
Oak	36%	41%	690	286,04
Beech	29%	33%	720	240,28
Hornbeam	17%	19%	830	158,14
Pine	5%	6%	510	31,21
Total	100%	100%	-	715,67

Table 14 Tree species utilized for wood fuel (FAO, 2015) and (UNECE, 2015)

147. Rural HH buy their wood in stacked cubic meters, one can therefore estimated that the average m³ bought corresponds to approximately 511 kg⁵⁰ (1 m³ of round wood = 716 kg). This corresponds to an energy content of 1,738 kWh⁵¹. The average 8 m³ for rural HH correspond hence to an estimated total of 13,904 kWh, equivalent to 1,636 liters of light oil.

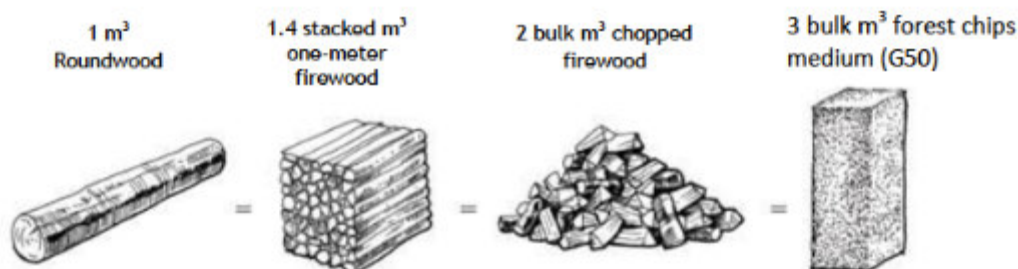


Figure 9 Transformation of volumes for wood fuel (source: FAO, 2015)

148. In terms of carbon emissions, the observed use of biomass as fuel cannot be considered sustainable (extraction > regeneration), therefore fuelwood use in Armenia is a net emitter of GHG and a potential bottleneck in reaching mitigation targets due to emissions and negative impact on forests.

149. From a climate change mitigation perspective fuelwood demand requires attention and precise strategies to reduce demand and increase quality. As demonstrated in other similar contexts (i.e. Georgia, Lebanon, Serbia) such reduction can be achieved through the following activities:

- I. Increase **Fuel wood Quality (reducing moisture contents)** to increase energy content per kg wood. This objective can be achieved with specific activities aiming at behavioural change and sensitization of end users.
- II. Utilize the best **Conversion Technology** and Increase efficiency of combustion. This activity requires minor/medium investments in technology transfer and capacity development of the private sector.
- III. Decrease energy demand by applying **Thermal Insulation** of the buildings. This activity requires medium/large investments and is often not accessible for the poor.

⁴⁹ Author's calculation based on the assumption (confirmed during the site visits by local authorities) that shrubs are not significantly utilized for wood energy.

⁵⁰ Transformation of volume from solid cubic meter to stacked cubic meter, see figure 1: 716 kg / 1.4.

⁵¹ Wood with moisture content of 25%-35% has an energy content of 3.4 kWh/kg. 511 kg * 3.4 kWh/kg = 1,738 kWh.

IV. **Optimizing Consumer Behavior** and technology transfer to practitioners and professionals in the architecture, building and administrative sectors.

150. **Increase Fuel wood Quality and Alternative Biomass Fuels:** The energy value of the wood utilized (calorific value) depends in the first place on the corresponding tree species and its moisture content (which should be ideally below 20%). In many households this is not done appropriately and wood is often burned right after cutting decreasing drastically the amount of energy that is transformed into space heating. The relation between moisture contents and energy content is well known in literature and there are several examples from similar contexts (i.e. Serbia) where the energy obtained could be increased by more than 35% when utilizing wood with 23% instead of 45% humidity (14). Therefore, improvements in fuelwood handling are to be considered. Depending on the behavior of the user, energy consumption can be significantly different (5). With regards to wood fuel, the HH can improve its behavior in first place related to the times and modalities of combustion and of heating. Awareness raising campaigns are very important to improve these aspects.

151. In order to increase the quality of the wood activities have to be carried out in support to the whole value chain of wood collection and distribution. There should be several moments allowing wood to dry in a proper manner (to less than 20%) from harvesting to burning. There are several International standards for Quality of wood (For example ISO 17225-1:2014 Solid biofuels), for a long term reduction of fuelwood demand the implementation of these standards should be addressed, so far it does not appear that Armenia has adopted any type of standards related to fuelwood management or energy efficiency of heating appliances fueled with wood.

152. Also, it is relevant to highlight that wood can also be part of fuel and not necessarily the solo source of energy. **Alternative Biomass Fuels:** It is also noteworthy, that local startups have attempted to enhance the fuelwood value chain by offering biomass waste – based alternatives, such as briquettes produced based on straw and wood-waste, coupled with paper/cardboard waste.

Eco Briquettes by "Range Ilc.z"			<p>Source: Straw 1 ton equivalent to 3.3. m3 firewood Price: 80,000 AMD/ ton Humidity: 6-10% Density: 1050-1300 kg/m3 Ash: 4-7% Calorific Value: 4000-4200 kCal/kg</p>
			
Hoorak Briquettes			<p>Source: waste cardboard, waste wood Price: 40-48,000 AMD /m3, or 1 m3 = 800 pieces Humidity: 9-13% Calorific value: 3500- 4900 kcal/kg</p>
			

Table 15: Sample of locally produced briquettes and pellets (Pasoyan, 2018)

153. To be noted that the efficiency of current prevalent stoves would remain less than 40% when utilizing briquettes and pellets, meaning that most of the high energy content of these energy carriers would be wasted when utilizing the obsolete technology. The use of these energy carriers will therefore not reduce expenditures for rural households, on the contrary, the combined use of non EE stoves and briquettes can

potentially have major negative impact on household finances and on forest health.

154. **Increase efficiency of combustion/conversions technology:** Effective combustion wood is essential. Wood is burned in different phases demanding, among others, effective air supply to avoid inefficient burning and the release of lost heat and unhealthy gases for the environment.

155. Stoves, like the once largely used in Armenia (table 16), have a very low efficiency ranging from 20% to 40% maximum (216) with a marked tendency to be located at the lower end of aforementioned spectrum. Inefficient stoves in Armenia range from USD 15 to USD 200, which might be one of the reasons for short term oriented investment decisions (5 to 6 year). Operation of stoves is generally very basic, without air control and worrisome safety characteristics. In conclusion wood stoves appears mainly as fireboxes with chimneys attached, lacking important features of improved wood stoves, like combustion chambers, air inlet control, smoke chambers and being air tight (352)



Figure 10: Examples of typical wood stoves in rural Armenia

Wood firing technology	Energy Efficiency
Observed stoves	20 - 40%
Open fireplaces	10 - 15%
Fireplaces with insert - old technology	35 - 50%
Fireplaces with insert - new technology	60 - 80%
airtight stoves - old technology	35 - 50%
airtight stoves - new technology	60 - 85%
Tile and Soap stone stoves	75 - 85%
boilers - old technology	60 - 75%
boilers - new technology	80 - 90%

Table 16 Energy Efficiency of different wood burning technologies (216)



Figure 11 Improved wood stoves in Georgia (tested efficiency approx. 65%) (Ecovision, 2015)



Figure 12 examples of airtight stoves - new technology, up to 85% efficiency (Karlsvik, 2014)

156. Improving the efficiency of wood-stoves in Armenia is feasible and should involve both the existing producers of stoves and the retailers. While it is possible to import efficient stoves from Russia, Germany and South Korea, none of the local producers dispose of the necessary technical capacities to upgrade their production and to reach out consumers (rural house holds) that would greatly benefit from more efficient heating appliances.

157. Technology transfer and adoptions of standards to secure efficiency and quality of locally produced

appliances is paramount in reducing fuelwood demand. Fuelwood demand can be decreased by at least 30% only improving the efficiency of heating appliances. There is a potential rebound effect present, which has been set to 20% in line with estimations of the project "De-risking and scaling-up investment in energy efficient building retrofits in Armenia"(279). This means that, in order to obtain the saving effect of at least 30%, efficiency of the stoves has to be improved by at least 36%. The energy efficiency of the currently predominant technology in Armenia is assumed to be 20-40%. Applying a very conservative approach, the value of the wood stoves that are currently available is set at <40%. In order to save the required 36% of energy, the new wood stoves have hence to have an efficiency of above 54% (table 17).

Decrease of wood use for heating per average HH expected	< 30%
Rebound effect	20%
Total minimum savings required of wood stoves	> 36%
Efficiency of current prevalent wood stove	< 40%
Required minimum energy efficiency of improved wood stove	> 54%

Table 17 Summary of the required energy savings in the frame of the project

158. **Decrease energy demand with thermal insulation:** thermal insulation of buildings is an important tool to decrease the energy demand and hence fuelwood consumption. Two main types of buildings can be distinguished: Small rural homes and multi storey buildings (MAB) built in the Soviet era with little focus on the energy consumption and low quality of thermal regulation of the buildings.

159. Buildings in rural areas have an average age of 44,9 years and are by 89% made of stone (61). As previously reported the main combustion technologies for space heating are locally manufactured wood stoves. The possibilities for increasing energy efficiency are mainly roof and wall thermal insulation and windows and doors exchange with more efficient solutions. Costs are however often unaffordable for most of the rural population.

160. There are several programs providing subsidies/incentives for retrofitting buildings, the most prominent one of these is the GCF project " De-Risking and Scaling-up Investment in Energy Efficient Building Retrofits" (279). Most of the programmes focus however on urban areas and on MAB or public buildings. The focus of this Working Paper is small households in rural areas and is therefore complementary to what has been implemented so far. The only program at the moment supporting retrofitting of rural HH is the one of Habitat for Humanity (HfH) that provides microfinance with relatively low interest rates (see chapter 7). The activities described in this WP will collaborate with both mentioned initiatives.

161. **Technology transfer to stakeholders:** One of the priority for developing EE in Armenia is the education and training of all stakeholders:

- Professionals: university teachers, architects, engineers,
- Civil officers: from ministries, from municipalities
- Manufacturers: insulating materials, heating equipment
- Construction firms:
- Other people having responsibility in this field: chairmen or representatives of HOA, Consumers Associations.

162. With the exception of small, often interchanging, professional teams working for donors (UNDP, WB/R2E2, EIB, EBRD, GCF) specifically targeting energy efficiency, there broad sector lacks sufficient capacity to identify and develop quality investment projects in energy efficiency, renewable energy, material efficiency and clean production. Professionals have almost no experience on monitoring and financing of EE upgrading of buildings and municipal infrastructures.

163. The lack of these capacities can be remedied through standardized toolkits, templates, detailed instruction manuals, user-friendly software tool for linking audits and energy passports/labels, enterprise- or building-level planning tools for developing benchmarking, specific energy consumption analysis, projections and impact analysis.

164. This sector could strongly benefit from expert trainings about the above EE matters, energy auditors training and certification, energy efficiency planning and preparation of energy managers.

165. Another niche is the vocational education and training, where technicians and craftsmen can be

prepared. During Soviet times, most of the vocational education and training (VET) institutions and preliminary craftsmanship schools had well-functioning workshops and laboratories. However, after the transition to a market-based economy, most workshops became dysfunctional, equipment obsolete and teaching in colleges mainly theoretical. During the first years after independence, practical education in Armenia was modeled on outdated learning conditions and pedagogy and had out of date industrial facilities.

166. Presently a lot of donor support from UNDP, World Bank and European Union is directed to help develop this sector, through policy advice, supplying selected VET colleges with new laboratories and setting industrial workshops at the premises of the VET colleges; providing large-scale vocational training and job placement for the registered young unemployed, with special focus on rural unemployed, long-term unemployed women and just graduates from the VET colleges to match supply and demand of the labor force in the sub-regional labor markets.

167. It is also noteworthy, that even at VET centers, the main focus has not been hands-on crafts, but rather IT and innovation. 21 colleges have been refurbished and supplied with state-of-art educational laboratory equipment (31 technical labs addressing more than 11 different professional occupations and 12 software packages for modern IT equipment), resulting in the upgrade of about 24 % of the country's colleges with foreign funding.⁵²

168. To help promote local manufacturing of energy efficient heating devices, lab testing and certification of these pieces of equipment would help market them and provide comparable technical specifications, which could rank them in the market and allow consumers to make an informed purchasing decision. The VET educational network universally needs all kind of services and utilities for to the established and startup EE technological businesses. In addition, the Center offers a wide range of assistance, cooperation and consultancy services ensuring a safe, stable and interconnected business environment.

169. **Renewable Energy alternative options:** Armenia has a good solar energy potential, this corresponds to both, photovoltaic and solar thermal for heating. The country has an average of 1720 kWh/m²/a (MoENR), which is much higher than other regions in the world were the energy source is more developed. The costs of Solar Water Heaters available on the market correspond to approximately USD 800 - 1000. The efficient types of SWH present in the Armenian market appear to have a potential production of 3,000 kWh per 300l system per year (costs approx. USD 1,000).

Energy Efficiency Market: The market of EE appliance providers is still very much confined to the capital Yerevan, due to fact that financial resources and public incentives are more readily available. However, some of the operators are already creating offices in the different regions and have declared willingness to expand activities to other regions and also to diversify its products to include biomass stoves, in case "signals" of interest and relevance (potential consumers and enabling factors) are given for investments.

170. Currently 21 registered enterprises are mostly active in the solar water heating and solar energy distribution (import, installation and maintenance). To these several informal stove makers are active in Armenia. Due to the fact that traditional stoves are usually built by local welders as part of their regular activity it is not possible to provide an accurate estimation of their numbers. Some have been met and local energy efficiency experts confirm that it has to be assumed that they operate at least in each municipality (minimum number of informal stove makers: 15).

171. Concerning technical capacity there is no formal or informal training currently available for youth to acquire knowledge and skills on EE/RE but the growing market is now starting to be in need of skilled workers to further expand their operations.

172. Concerning the efficiency of firewood use no state program is currently in place to support the development of such market but the Ministry of Economy has already initiated discussions with the private sector in view of including fuelwood efficiency among national targets and is preparing to develop a series of national standards to ensure efficiency of heating appliances as well as to guarantee safety and health of consumers.

173. There are no formal restrictions on import of any equipment, particularly energy efficiency

⁵² Armenia TVET Database available at https://unevoc.unesco.org/wtdb/worldtvtdatabase_arm_en.pdf

technologies into the market. Moreover, if granted a policy priority, a given technology can be added into the list of customs waiver products, which usually refers to RES technologies, and in the past has also been applied to EE technologies. Given the Eurasian Customs Treaty and the Favorable Trade rules with the EU, there are favorable conditions for the import of EE technologies from Belarus, Kazakhstan, Russian Federation and the EU.

174. Since the energy crisis of the 1990s, local craftsmen have been making wood stoves with great success and non-declining sales. While wood heating has been declining until 2015, since 2015 markets reported nearly doubling of wood stove sales. The most basic ones are simply a plain combustion chamber with an exhaust pipe. However, local craftsmen have attempted making both firewood stoves and boilers.

175. The main barrier is the lack of easily accessible and known laboratories, where these prototypes, which are already being actively sold in the flea-markets across country, could be tested and certified. The customers could then receive adequate information which they could compare with other certified equipment.

SWOT analysis of the Sector: Consequently, the rural energy sector in Armenia requires diverse set of actions to secure NDC and SDG targets. Weaknesses, strengths, opportunities and threats of the sector are reported below (Table 18).

Strength	Weaknesses
<ul style="list-style-type: none"> Fuelwood is potentially renewable and local energy source Fuelwood utilization has long tradition National Pride for forest resources National and local stakeholders involved in project development and hence in development of rural biomass sector 	<ul style="list-style-type: none"> Limited access to energy efficient wood stoves Quality and safety standards for EE/RE technology unclear/not existent Lack of local expertise for engineering planning and installations Incomplete biomass value chain Limited access to funding sources for rural households; Limited involvement of private sector and banks because of high risks. Lack of high quality fuelwood Little awareness on efficiency issues No national strategies in place related to fuelwood efficiency
Opportunities	Threats
<ul style="list-style-type: none"> Fuelwood can be mixed with locally available agricultural waste products Job creations especially for the youth creation of rural small business opportunities Enhanced cooperation among actors can complement project activities and synergies 	<ul style="list-style-type: none"> Resistance to Change Rebound effect could decrease energy savings Prices of other energy increase and foreign powers can cut access to energy. Higher energy prices can lead to increased wood use Lack of experience in efficient technology could lead to bad examples and impact public opinion significantly. Increased poverty increases wood fuel use

Table 18: SWOT analysis of the Rural Energy Sector in Armenia

Main Past and Ongoing Development Projects/Programmes: In the building sector there are a variety of projects, some of them also best practice examples. However, by large the focus of past and ongoing projects is on MAB/public buildings with gas supply in the capital Yerevan or other urban centers. In rural areas the context is however very different and most of the buildings are of small size comprising single HH with wood space heating and de facto excluded by most of the EE/RE initiatives.

176. **"Renewable Resources and Energy Efficiency Fund" (R2E2):** established within the 2004 "Law on Energy Savings and Renewable Energy". The World Bank initially financed R2E2 as a non-governmental agency in order to create an enabling environment for private sector involvement in EE/RE. This fund financed small hydropower stations and utilized its revolving budget among others especially for the retrofitting of Public buildings. (Kindergartens, prisons, schools etc.) ([151](#)).

177. **Solar energy program by R2E2:** started October 2017 based on the estimations that 30% of the country area is not connected to the gas grid. Since there is only 5% of the population living in these areas it is economically not viable to extend the grid further. In order to provide however these parts of the population with a support and prevent furthermore excessive deforestation R2E2 started promoting solar water heaters as sustainable solutions. The initiative provides a soft loan to the local population (duration: 8 years with 8% interest (4% of the interest is for one of the 3 commercial partner banks and 4% for the revolving fund of R2E2). Solar suppliers are actively promoting the program by visiting the different villages and "raising awareness" on its advantages. Since October 2017 the program has financed approximatively.

1000 solar systems (ca. 950 SWH with 300 liter hot water tank and ca. 50 PV) to rural families in all Armenia with costs of 800-1000 USD per SWH and ca. 1000 USD per kWp PV. Also, under the working title "Green Steps", R2E2 is currently exploring the possibility to expand its activities to reforestation/biomass energy. Such activity shows interesting potentials for collaboration and synergies and will therefore be followed closely to identify possibilities for pellets production from agricultural/ biomass waste.

178. De-risking and scaling-up investment in energy efficient building retrofits in Armenia (17): The project, financed for the main part by the GCF and implemented by UNDP, is focusing on improving energy efficiency through investing in building retrofitting. The initiative carries out a set of different activities aiming at the removal of market barriers and a combination of policy and financial de-risking instruments. It aims at catalyzing private and public sector investment in the amount of about USD 100 mln and operates mainly in Yerevan on MABs.

179. Energy Projects by EBRD and other IFIs - The EBRD is one of the main IFIs active in Armenia with a current portfolio of 312 mln Euro, 24% of the invested funds are related to energy. Main aim of the activities in the field of sustainable energy are the enhancement of the regulatory and institutional framework, to finance RE and EE for the industrial and residential sector and to support power generation (30). Additionally, household energy efficiency loans are available in local commercial banks on on-lending basis from IFIs, including not only EBRD "Energocredit" facility, but also French Development Agency (AFD) "Warm Home" loans under EUR 10,000 with grant co-financing for energy efficient renovations, from KfW for energy efficient renovations and mortgages above EUR 10,000 through National Mortgage Company (NMC), and the Green for Growth Fund (GGF) lending for small household energy efficiency improvements. Despite the variety and the fact that nearly all banks offer at least one household energy efficiency loan, all IFIs report a low utilization rate, which is largely due to lack of awareness of the opportunities that energy efficiency offers, and the high interest rates due to continued inflation and high foreign currency hedging costs. With lending at 12-14 % interest rate, the loans stop being attractive or affordable to those households who live in villages and chose firewood as the sole affordable heating option.

180. Covenant of Mayors: is a European co-operation initiative aiming at increasing energy efficiency and renewable energy use and GHG emission reduction of local and regional signatory authorities in support of the European Union 20% reduction to be reached by 2020 (or 30% by 2030). Out of the 21 member municipalities, 8 are from the Marzes of Lori and Syunik.

181. Habitat for Humanity: Housing Microfinance Project. In partnership with microfinance institutions HfH implements Housing Microfinance Projects that help low- and middle income families to, renovate and repair the homes, upgrade energy efficiency, Improve water and sanitation conditions, access renewable energy.

182. Habitat for Humanity: Renewable Energy Financing project: HfH Armenia launched this microfinance initiative in 2016 to give low-and middle-income families access to loans for purchasing and installing solar equipment at home. Within the framework of this project, HfH cooperates with Global Credit UCO in developing affordable loan products. In 2017, 53 families were supported, the number for 2018 are projected to be 182. The average costs for Solar Water Heaters are 500k ADM (1000 USD) for 1 family (5-6 persons), for PV installations 1mln ADM (ca. 2,000 USD) per 1 family. In the last 2 years in Syunik 2 families have been supported and in Lori 8 families.

183. Habitat for Humanity, Renovation for small HH project: HfH is collaborating with Kamurj UCO on loans for retrofitting that include also Energy Efficiency upgrade components (doors, windows, roof, heating system etc.). HfH provides the consultancies for definition of the measures and quality insurance of the implementation. HfH finances its activities by obtaining 10% of the interest of the loans. 30% of the benefits are utilized for quality assurance, the remaining 70% are utilized as a revolving fund. Maximum loan for the projects is 2 MM ADM with 18% interest and 5 years duration. The average loan taken is 1 MM ADM with 18% interest and 3 years duration. In the last 2 years the programme supported in Syunik 34 families and in Lori 8 families. .

184. Concerning biomass and heating efficiency the GEF small grant Program has developed

several relevant initiatives in Armenia and in the region that might of relevance:

- a. [Expanding production of solid bio-fuel and application of energy-efficient stoves in Akhuryan community of Shirak region](#): This project introduced biomass as a sustainable source of energy in the Akhuryan community (population approx. 17 thousand). Although gas is present, only 20-25% of the agricultural community can afford it, the rest of the population preferred manure for heating purposes. The initiative focuses therefore on the introduction of biomass fuel from agricultural waste and EE boilers, accompanied by awareness and training activities. Overall, the average annual savings of the project will make up around 37,000 USD for 50 households. Akhuryan community will be considered a model “low carbon community” in Shirak region, which will serve as a demonstration site for replication, scale-up and knowledge sharing of innovative locally adapted low carbon technologies across the region and beyond.
- b. [Popularization of Biomass in Georgia](#): The project concentrated on the introduction of an efficient biomass heating system in a school. Further activities were national capacity development and awareness raising activities.

185. Other pertinent biomass projects in the UNECE region:

- a. [Biomass heating solutions for rural development – BioRuralHeating](#): Implemented for an amount of 0,3 mln Euro in the frame of the EU4Energy programme. The activities promoted partnerships among the local agriculture, applied research and development centers, public institutions and the private sector and was active in six villages throughout Armenia. Among others it was possible to utilize agricultural waste to produce pellets with locally fabricated machines and install efficient biomass heating in public buildings.
- b. [Development of a sustainable bioenergy market in the Serbian republic](#), financed by the German government (2013 -2017). Wood is a main source for heating and cooking in rural areas of the country and characterized by wood with a high humidity and inefficient stoves and regulatory framework. Three main activities were therefore carried out within the project: promote efficient utilization of wood fuels and wood-based technologies in selected pilot regions (i), contribute to the sustainable development of the market for wood fuels and wood-based technologies (ii) enhance an enabling environment for wood fuels and wood-based technologies (iii). Among the outcomes achieved are a baseline study, educational guideline for end-user in printed and video format and combination with educational sessions (45) and open-air demonstrations with manufacturers. Due to its success the project is currently entering in a second phase (2018-2020) addressing the aspects policy advice, development of local biomass supply and institutionalization for capacity development and promotion of modern heating technologies like district heating.
- c. [A financing mechanism for warmer and more energy efficient Moldovan homes \(MoREEFF\)](#), financed by EBRD, EU NIF, SIDA. The MoREEFF facility providing loans and incentives for technical and investments for Energy efficiency solutions (retrofitting of buildings) and sustainable renewable appliances to the following beneficiaries: householders, condominiums/associations of apartment owners, housing management companies, with technical assistance loans and investment incentives through local participating banks. Until 2017 the project supported 1636 projects for a total of 1.7 million Euro (13).
- d. [Sustainable energy solutions for Georgian communities](#), financed by Germany (2008 - 2017). The activities were implemented in the Dedoplistskaro municipality, a region highly affected by Climate Change and other environmental degradation, and aimed at identifying and testing energy efficient solutions for HH. Next to the implementation of the activities in 4 schools, a kindergarten 32 families were also tested locally fabricated improved wood stoves with an efficiency higher than 60% (13).
- e. [Sustainable regional supply chains for woody bioenergy \(BioRES\)](#) - Experiences from Bulgaria, Serbia and Croatia, funded by EU Horizon 2020. The project introduced the concept of Biomass Logistic and Trade Centres (BLTCs) as regional hubs. Other important activities are the training of more than 400 actors on how to implement and manage regional supply chains for woody bioenergy.
- f. [Efficient use of natural resources in Kyrgyzstan and Tajikistan](#), funded by SDC. The project

tackled sustainable natural resource use in rural areas. 12 houses have been isolated utilizing local materials and involving local craftsmen, 180 energy efficient multifunctional stoves were installed in the houses of the poorest families in the target region. This led to a decreased wood consumption of approx. 35%, which is very beneficial for the already intensively used wood resources (13).

g. Production and marketing of energy-efficient wood stoves in Tajikistan. The country has only 3% wood surface, but wood and cow dung continue to be important fuel sources for the rural poor population. To increase efficient utilization 15 wood stoves were tested and a new-patented model was developed that saves 30% wood fuel. Manuals were distributed to local manufacturers that develop the model according to market prices (13).

Existing financing schemes for EE/RE technology and financing mechanisms: Most banks view home renovation loans as mortgage loans and collateralize the client's property. In practice, main EE improvement was so far at the supply side carried out mainly by international investment into modernization of the power sector, although major inefficiencies still remain in this sector. In the near future, the substantial international support available for implementation of the planned EE and RE activities might remain a major driver. The "green" or "energy efficient" loans are generally offered at more favorable conditions.

186. These and many other efforts by IFIs (EBRD, IFC, KfW, USAID, ADB, GGF, AFD) aim at eliminating investment barriers and channelling relatively affordable finance and technical assistance for sustainable energy lending. Selected IFI examples were analyzed for sectoral scope of lending based on 2016 data: As part of these IFI-funded credit lines, numerous commercial banks have access to credit specifically for energy efficiency activities:

- › **ACBA Leasing**, Ineco, Ararat and ACBA Banks have received multi-million credit lines for EE loans from the Green for Growth Fund (GGF) – Finance in Motion.
- › **International Finance Corporation (IFC):** The Sustainable Energy Finance Project is working with Byblos Bank on EE lending for households and HSBC for EE in SMEs. Program closed in 2017.
- › **AFD** works with the National Mortgage Company and 14 PFIs on household energy efficiency loans and EE mortgage loans with an overall EUR 10 million credit line and a target of 3,000 households to be reached within the first year of the program. Social housing and energy efficiency – a Euro 10 million investment led by AFD with a NIF grant of Euro 1 million for technical assistance and grant co-financing for energy efficiency loans

187. Under the European Bank for Reconstruction and Development (EBRD), Armenia Sustainable Energy Financing Facility⁵³ has set up the EnergoCredit facility which provides energy efficiency loans for residential and business clients. EBRD has also been working with the MUD to assess the market for residential energy efficiency lending which would target the energy savings potential in existing residential buildings.

Possible appropriate non-grant incentives to cover the additional cost of EE technologies: The Article 20 of the Energy Saving and Renewable Energy Law of Republic of Armenia provided for the possibility of adding the energy saving and renewable energy products in the list of "0%" customs clearance. Specifically, the "Transitional Provisions" of the 5th Chapter of the Law stipulated that *"...The state administration authorized body in the area of energy saving and renewable energy shall submit proposal to the Government to make required additions to the Customs Code of the Republic of Armenia and Republic of Armenia law "On the Approval of List of Products imported by organizations and individual entrepreneurs eligible for zero (0) rate customs duty and excise duty exemption, for which the customs service does not calculate or charge value added tax".*⁵⁴ Article 16, in turn, defines, that "Energy examination/audit positive conclusion shall be the basis, in the fields defined in the article 3 of the present law, for the provision of privileges defined under the tax and customs legislation of the Republic of Armenia".

⁵³ EBRD Armenian Sustainable Energy Financing Facility (ArmSEFF), which was branded as "EnergoCredit", <http://www.energocredit.am/>.

⁵⁴ Non-official translation of the Law on ES&RE available at <http://parliament.am/legislation.php?sel=show&ID=2119&lang=eng>

Hence, should relevant technological solutions be adequately examined, and conclusions formed about their features, the Government of the Republic of Armenia can interfere to request their inclusion in the list for 0% rate customs clearance. Note, that there is no active provision in place as of November 2018 for efficient fuelwood stoves.

For activities related to procurement of goods and services through any of the United Nations organizations, according to the Standard Basic Assistance Agreement (SBAA) signed with the Government, taxes are not applicable. Section 7 of the Convention on the Privileges and Immunities of the United Nations provides, inter alia, that the United Nations, including its subsidiary organs, is exempt from all direct taxes, except charges for utilities services, and is exempt from customs duties and charges of a similar nature in respect of articles imported or exported for its official use. If the services are procured directly by the Government implementing partners, then the national procedures apply, which entail the payment of Value Added Tax (VAT) amounting to 20% of the turnover of taxable goods and services, which is equal to 16.67% of VAT-inclusive prices.

Lessons Learned and Best Practices: Despite efforts from the state to decrease fuelwood consumption, a large part of the population (74,6%) is still dependent on forest resources for energy use. One of the main reasons is that the vulnerable population has limited economic resources and cannot afford switching to other sources of energy. The experience from other countries shows that the use of woody biomass can indeed be sustainable and even a creator of jobs and business for local development. In the neighbouring Georgia past experiences show that improved wood stoves can be introduced/produced locally with reasonable prices and positive impacts on forests.

188. Many countries in the UNECE region face or have faced the same problems related to unsustainable wood energy use than Armenia, i.e. fuel wood with high humidity content, incomplete value chains, and inefficient boilers/stoves and missing regulatory and support framework. Experience shows that with a strong involvement of all stakeholders, barriers can be overcome and the sector can be developed offering business opportunities for SMEs and the local population.

189. One of the main lesson learned globally is that the key to a sustainable biomass market is the customers' confidence in the entire supply chain from wood fuels to the installation of efficient appliances and ongoing maintenance. Important in this regard is also the implementation and widespread use of quality standards. It is crucial to work on the whole supply chain, improving therefore demand side measures in parallel with supply side measures.

190. EE measures are so far not feasible without donor intervention for vulnerable populations, and even in the case subsidies are provided, the potential beneficiaries are reluctant to implement them as own financial resources are dearly needed to cover for the most urgent needs. EE/RE projects cover mainly urban areas, while rural areas poorer and more dependent from direct exploitation of ecosystem services, had been quasi excluded by the large majority of project or their fragility ignored.

191. The Armenian market has a dynamic structure and in the last years several companies emerged in the renewable energy field, mainly active in the PV and Solar Thermal Market. This can be mainly attributed due to favorable conditions provided by the government, international donors and the local banks. It has been shown therefore that once the conditions are in place, the market reacts quickly and the private sector will become one of the main drivers for a behavior change. Nonetheless, the straight nexus between forests, energy security of rural population and climate change had not been taken into consideration leaving fuelwood efficiency de facto out of the private sector radar. There is a need to expand the transfer and diffusion of technology further to provide also rural areas with appliances and knowledge supporting them in being more efficient and reducing the heavy burden of energy costs from their already stretched incomes.

192. Thermal insulation is an important milestone for diminishing energy demand. Efforts in this field concentrate mainly on urban centers and on MABs, while there is so far little experience for small rural HH. Given the low income of the rural population, investment can only be afforded by few HH, even in case of special relatively favorable investment conditions.

7. PROJECT AREAS AND TARGET GROUP

Project areas: Project areas reflects the following criteria: a) relevance of forest cover for the Country, b) exposure of ecosystems to climate variability and change as well as to anthropogenic stressors; c) vulnerability of ecosystems and communities to climate change; d) mitigation potential in terms of forest rehabilitation as a function of availability of suitable land from the State Forest Land (SFL) and from Municipalities; and e) socio-economic vulnerability of communities / high dependency of communities from ecosystem services. Given the five criteria reported above, participants of the national engagement process, the NDA and the FAO convened to execute the project in the Marzes of Lori and Syunik.

	Criteria				
Marz	a	b	c	d	e
Lori	30%	Fragile mountain ecosystems characterized by forests	Availability of land suitable for forest restoration investments	Dependency of communities from forest for Energy, livelihood and protection)	38.5% of families located in the low/lowest income % 12% of HH involved in migration processes
		Relevant presence of forests (biodiversity hot spot) currently exposed to changing climate variables (mostly temperature) extensive exploitation for fuelwood and mining		Interest of communities to engage into forest governance and positive past and ongoing experiences of communities and municipalities willing to invest in increasing forest cover	74.6% of the population rely on fuelwood as primary source of energy
Syunik	17%	Fragile mountain ecosystems characterized by forests and grasslands			25.3% of families located in the low/lowest income % 12% of HH involved in migration processes
		Relevant presence of forests (biodiversity hot spot) currently exposed to changing climate variables (mostly temperature and precipitation), extensive exploitation for fuelwood and mining			74.6% of the population rely on fuelwood as primary source of energy

Table 19: Brief description of selected project areas⁵⁵

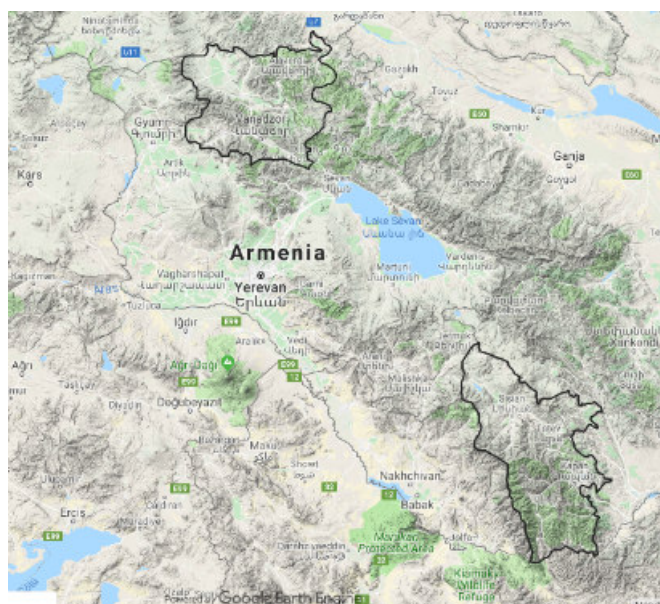


Figure 13: Armenia, project areas⁵⁶

⁵⁵ Although the district of Tavush was eligible, due to high presence of projects, low density of population and extension of protected areas and parks, the marz was not included among project areas to avoid dispersion of funds and reduce risk of duplication.

⁵⁶ Detailed Maps are available here: www.earthmapdemo.info (FAO, 2018)

193. As reported in the previous sections of this document, rural communities in Armenia represent the bulk of the poor. The same situation is identified in the two Marzes where rural communities are mostly poor or very poor with the higher direct dependency on forest ecosystem services for fuelwood (average 8 m³/y) and livelihood (agriculture, beekeeping, NWFP).

Lori: Lori is a mountainous area located in the North of the country with Vanadzor being the largest city and administrative center of the region. With 3,799 km² (12.7% of the country's territory) it is the third largest region by territory and the second largest region by its population (137.2 thousand live in towns, 97.5 thousand in villages). The density of the population in the region is 62 persons per square km. Lori consists of 113 communities of which 8 are considered urban, and 105 are considered rural [13].

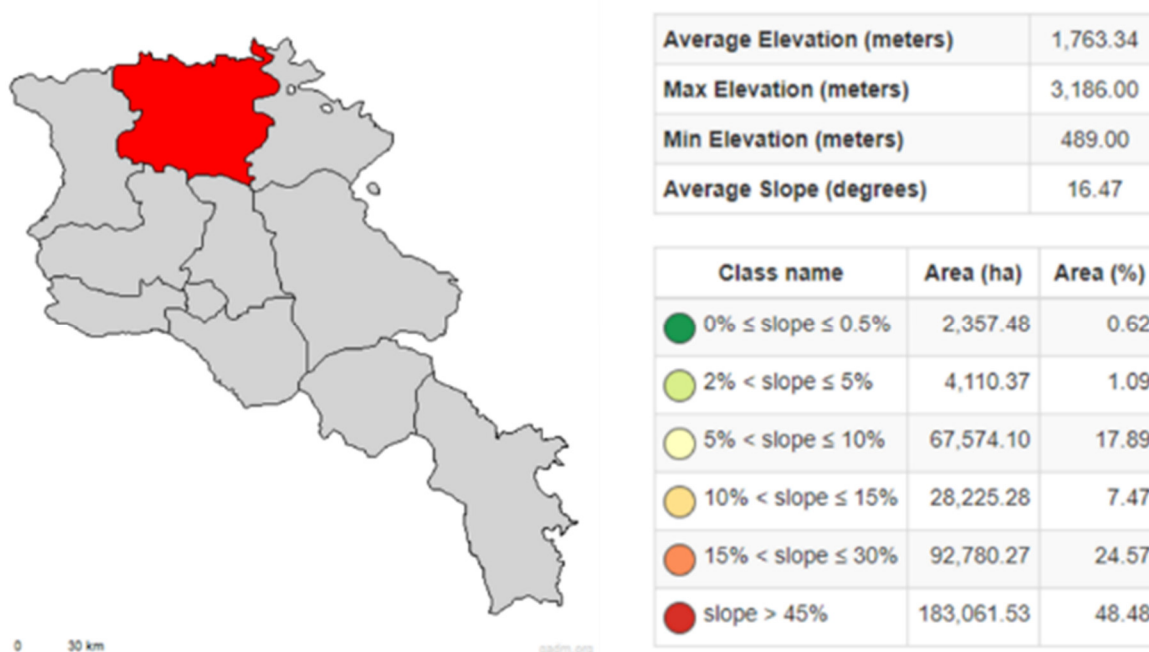


Figure 14: Lori Marz, Armenia

194. Lori's economy is mostly based on remittances from family members working abroad. Remittances are often used to create small shops and businesses. The leading branches of the economy of the region are agriculture and industry, with the metallurgy industry and food production being the prevailing ones. Based on official statistics, the total agricultural land of Lori region is 251,154 ha, out of which about 58% (145,714 ha) are grazing areas [13] with well-studied implications and effects on forests and their regeneration.

195. Lori is known as Armenia's greenest province, with some of Armenia's remaining old-growth forests and wilderness areas. The State Forest Lands of Lori region is 101,212 hectares, of which 85,799 hectares are covered with forests (30% of Armenia's forests). Forests in Lori are mountainous and are of protection, water- and climate-control importance.

196. Lori marz: Lori has a humid continental climate. The climate in the Lori province is characterized with extremely cold snowy winters and mild summers. The annual precipitation level is between 600 and 700mm. According to the Terrestrial Ecoregions of the World⁵⁷ the Lori province falls mostly in the cool temperate moist zone (78% of the total province area) and partly in the cool temperate dry climate (around 19%).

⁵⁷ Olson, D. M., Dinerstein, E., Wikramanayake, E. D., Burgess, N. D., Powell, G. V. N., Underwood, E. C., D'Amico, J. A., Itoua, I., Strand, H. E., Morrison, J. C., Loucks, C. J., Allnutt, T. F., Ricketts, T. H., Kura, Y., Lamoreux, J. F., Wettengel, W. W., Hedao, P., Kassem, K. R. 2001. Terrestrial ecoregions of the world: a new map of life on Earth. Bioscience 51(11):933-938.

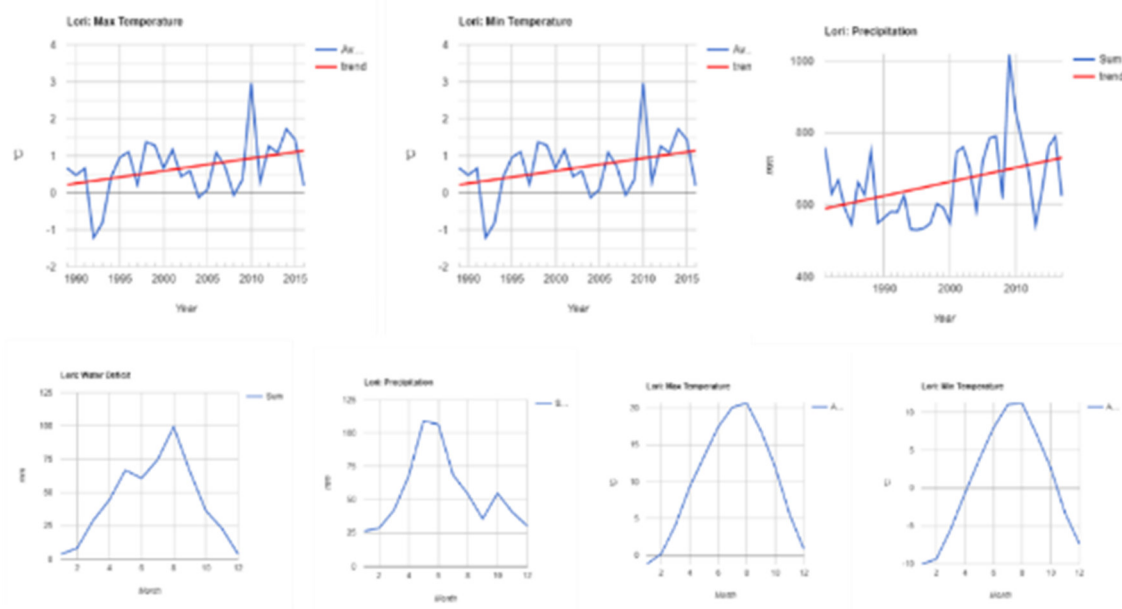


Figure 15: Lori Climate Data

197. In the Lori province, forests were found mostly between 700 m and 2200 m, while for higher altitudes grassland prevails. Cropland are more frequent between 1400 and 2000 m, but they are present at all altitudes, from 500 m up to 2200 m. Settlements are concentrated between 1100 m and 1700 m.

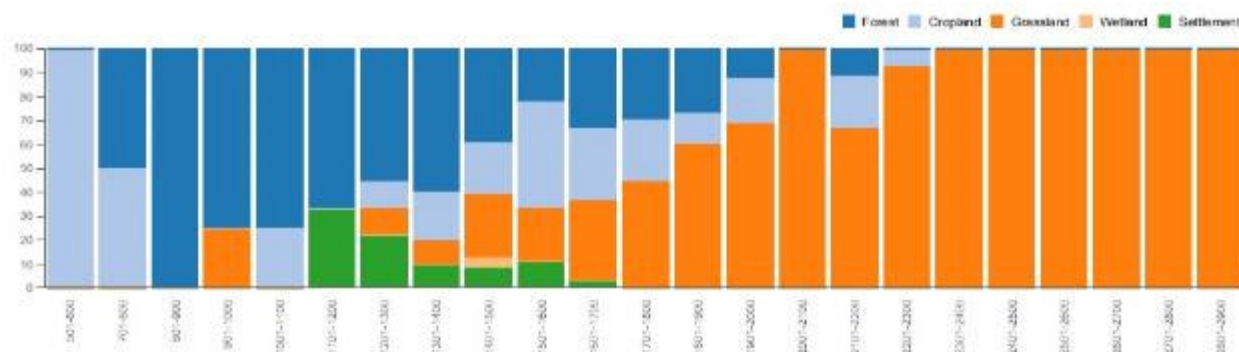


Figure 16: Land use Distribution in Lori according to altitude (500-2,900 m). FAO, 2018

198. 66,7% of the forest areas of the Lori province is concentrated in the North slopes, respectively with 25,4% North, 25,4% North-East and 15,9% North-West. Forest types are characterized by the mid to upper mountain Caucasian beech forests (at 1000 – 2000 m) and mixed deciduous forests characterized by *Fagus orientalis*, *Quercus macranthera*, *Q. petraea* subsp. *iberica*, *Fraxinus excelsior*, *Carpinus betulus*, *Ulmus glabra*, *Prunus cerasifera*, *Pyrus communis* subsp. *caucasica*, *Viburnum lantana*, *Euonymus latifolius*, *Daphne mezereum*, and *Taxus baccata*. At the subalpine belt, birch forests (*Betula litwinowii*, *B. raddeana*, *Quercus macranthera*, *Sorbus aucuparia*, *S. graeca*, *Acer trautvetteri*, *Populus tremula*, *Salix caprea*) occur, together with low juniper open communities (*Juniperus communis* subsp. *hemisphaerica*) mainly on rocks and screes, *Rhododendron caucasicum* thickets, and meadows. At lower altitudes (700-output m) *Quercus petraea* subsp. *iberica* forests predominate, including the companion trees *Carpinus orientalis*, *Fraxinus excelsior*, *Acer campestre*, *A. cappadocicum*, *Pyrus caucasica*, *Malus sylvestris* subsp. *orientalis*, *Ulmus minor*, *Tilia caucasica*, and the shrubs/small trees *Prunus spinosa*, *P. cerasifera*, *Crataegus orientalis*, *Rhamnus cathartica*, *Sambucus nigra*, and *Viburnum lantana*.

199. TNC climate projections in Lori marz indicate for the period 2041-2070 (when planted trees will reach maturity) significant increase in annual temperature, moderate increase of annual precipitation and the

intensification of summer drought. The temperate native species that show higher capacity to stand the predicted climate changes are:

Species ⁵⁸	Attributes ⁵⁹					Rationale
	DR	RS	SD	SS	FG	
<i>Quercus macranthera</i>	++	++				This oak has a wide ecological range and capacity to withstand drought. It re-sprouts well after fire, cutting and browse. The plant material for restoration could be both acorns (direct seed sowing) and seedlings produced in forest trays with alveoli of 250-300 cm ³ .
<i>Quercus petraea subsp. Iberica</i>	+	++				Considering the predicted altitudinal shifting of bio-climate zones, this oak species could be used in mid altitudinal ranges (1400-1700 m). It shows a moderate resistance to drought. The plant material could be both acorns (direct seed sowing) and seedlings produced in forest trays with alveoli of 250-300 cm ³ .
<i>Fraxinus excelsior</i>	+	++			+	This species, though often present on hydromorphic soils, shows a significant resistance to drought. The plant material could be both bareroot, and seedlings produced in forest trays with alveoli of 300-350 cm ³ .
<i>Betula litwinowii, B. raddeana</i>	+	+		+	+	This species colonizes well open areas, with moderate resistance to drought. The plant material could be both bareroot, and seedlings produced in forest trays with alveoli of 300-350 cm ³ .
<i>Populus tremula</i>	+	+		+	+	This species colonizes well open areas, with moderate resistance to drought. The plant material will be bareroot seedlings from cuttings.
<i>Pinus sylvestris</i>	+			+		The natural distribution area of this species is currently very limited in Armenia. It colonizes well open areas with instable soil. The plant material will be seedlings produced in forest trays with alveoli of 200-250 cm ³ . Pine seedlings should also be mixed with seedlings from re-sprouting species such as <i>Quercus</i> , in order to increase forest resilience to climate risks (e.g. fires).
<i>Acer trautvetteri</i>	+	+			+	This species colonizes well open areas, with moderate resistance to drought. The plant material will be seedlings produced in forest trays with alveoli of 300-350 cm ³ .
<i>Sorbus aucuparia</i>	+	+	++		+	This species colonizes well open areas, with moderate to high resistance to drought. It attracts seed-dispersal fauna and consequently seedlings recruitment from other species. The plant material will be seedlings produced in forest trays with alveoli of 250-300 cm ³ .
<i>Cornus mas</i>	++	+	++	+	+	This shrub species colonizes well open areas, with moderate to high resistance to drought. It attracts seed-dispersal fauna and consequently seedlings recruitment from other species. Useful fruit species for NWFP production. The plant material will be seedlings produced in forest trays with alveoli of 250-300 cm ³ .
<i>Pyrus communis subsp. Caucasica</i>	+	+	++			This species attracts seed-dispersal fauna and consequently seedlings recruitment from other species. Useful fruit species for NWFP production. The plant material will be seedlings produced in forest trays with alveoli of 250-300 cm ³ .
<i>Malus sylvestris subsp. Orientalis</i>	+	+	++			This species attracts seed-dispersal fauna and consequently seedlings recruitment from other species. Useful fruit species for NWFP production. The plant material will be seedlings produced in forest trays with alveoli of 250-300 cm ³ .
<i>Prunus cerasifera</i>	+	+	++			This species attracts seed-dispersal fauna and consequently seedlings recruitment from other species. Useful fruit species for NWFP production. The plant material will be seedlings produced in forest trays with alveoli of 250-300 cm ³ .

Table 20: List of Proposed Species for Forest Restoration in Lori Marz

200. According to the survey commissioned by FAO in 2018 to the Armenian NGO AWHHE⁶⁰, confirms the findings of the 2015 survey commissioned by UNDP. 76.4% of interviewed households use fuelwood as a primary source of energy. Wood stove are in all cases locally made and of very limited efficiency. Fuelwood is primarily bought for an average price of 20,000 AMD per cubic meter. A relevant aspect appearing from the survey is the increase in use of manure as biofuel.

⁵⁸ The species names are updated according to the most recent taxonomic updates: (i) The Euro+Med PlantBase (ww2.bgbm.org); (ii) The Plant List theplantlist.org).

⁵⁹ DR: Drought-resistant; RS: Re-sprouting after fire, browse and cutting; SD: fruit tree attracting seed-dispersal fauna; SS: instable soil stabilization; FG: colonizer of forest gaps and open areas

⁶⁰ Rural household survey on energy use and the main drivers of forest and other natural resource degradation focusing on women as actor of change of natural resource management in Lori, Tavush and Syunik Provinces of Armenia

Syunik: Syunik is the southernmost Marz in Armenia with Kapan being the administrative center. It borders the Vayots Dzor region in the north, Iran in the south (with a 42 km-long common border), Nakhijevan in the West and Azerbaijan in the East. Syunik consists of 109 communities of which 7 are considered urban and 102 are considered rural. According to the latest statistics, the total population of Syunik is 141,000, with 67.2% living in towns and 32.8% in rural areas. The density of the population in the region is 34 persons per square km [13].

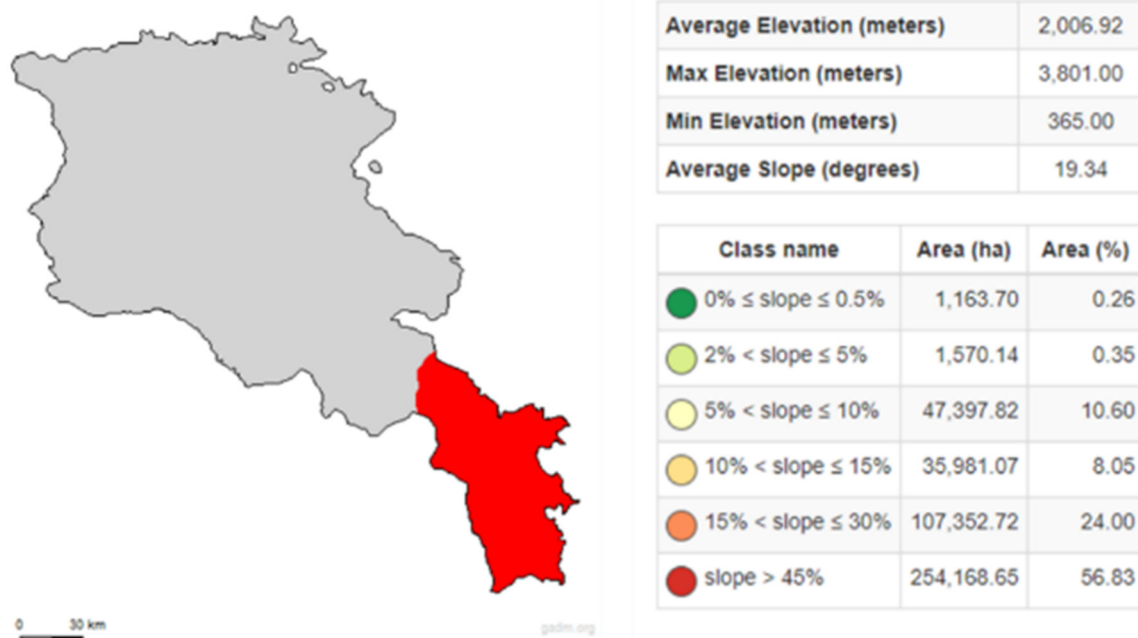


Figure 17: Syunik Marz, Armenia

201. Syunik Marz has become politically strategic and economically important for Armenia, with the new Armenia-Iran pipeline "to supply Armenia with up to 1.1 billion cubic meters of gas per year until 2019". Syunik is Armenia's richest region in minerals (copper, molybdenum, zinc, lead, gold, silver) and non metal minerals. The region is highly reliant on the mining industry and is home to many of Armenia's largest mining operations and largest tailing dams [13].

202. Despite the high industrial output in the region, rural poverty remains a wide-spread phenomenon. With 335,100 ha Syunik holds the largest share of agricultural areas in Armenia (including 43,800 of arable land) (ARMSTAT, 2018), but it has no rural population to properly cultivate the land for various reasons (military conflict with Azerbaijan, undeveloped rural road network, etc.). Agriculture in the region is mainly specialized in crop production and animal husbandry (in particular, cattle breeding) [14].

203. The State Forest Lands of Syunik region is 60,203 hectares, of which 49,990 hectares are covered with forests (18% of Armenia's forests). Forests in Syunik are mountainous and are of protection, water- and climate-control importance. Syunik, where the forest is concentrated, has the following forest protected areas: a) Shikahogh State Reserve (Armenia's second largest forest reserve, covering 100 square km of land the only place where the forest remained intact) and b) Plane Tree Grove, the largest natural relict plane grove in the world occupying 60 hectares.

204. Syunik has a sub-humid continental climate. The Syunik province is comprised in the warm temperate dry climate (around 20%), the cool temperate moist (around 28%) and in the **cool temperate dry** (51.81%). Summer temperature in Syunik can reach up to 40 °C, although the average temperature is around 22 °C, while in winter it may reach down to -12.5 °C.

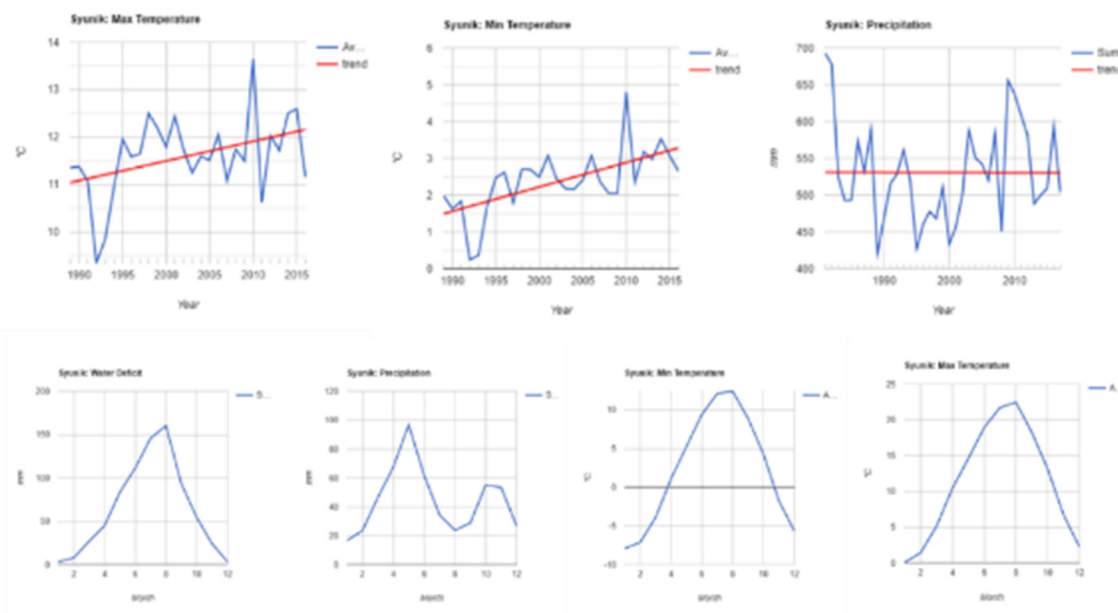


Figure 18: Syunik Marz Climate Data

205. Land use classes in Syunik are more spread out among different altitudes: forests may be found at all the elevation ranges, up to 2800 m, while cropland are present up to 2500m. Settlements are scattered between 700 and 2300 m.

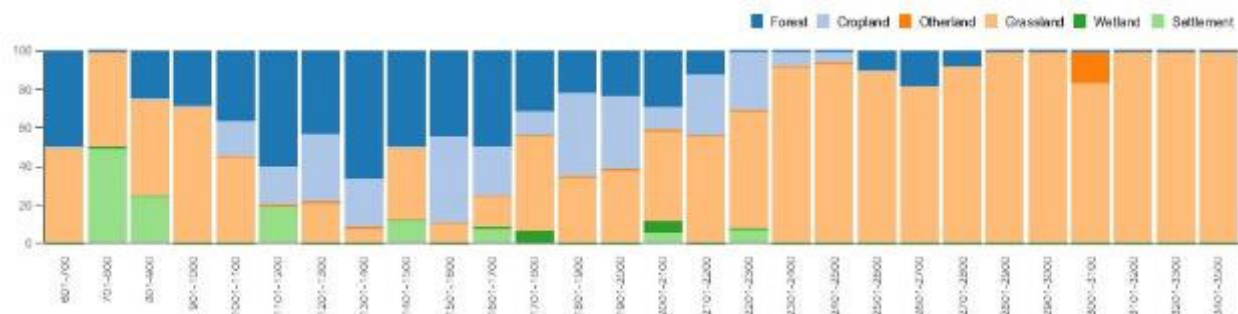


Figure 19: Land Use distribution in Syunik, according to altitude (600 – 3,500 m). FAO, 2018

206. In the Syunik province, 55.7 % of forests lies on East-facing slopes, respectively 22.2% on a South-East aspect, 20.6% East and 14.3% North-East. The reason might be that in Syunik forests need a greater insolation. In fact, maximum temperatures are higher and minima lower on east-facing slopes, associated with their greater insolation due to clear mornings commonly being followed by cloudy afternoon. Forest types from 1300 m up to tree limit are characterized by mixed oak forests, including *Quercus macranthera*, *Q. petraea* subsp. *Iberica*, *Carpinus orientalis*, *Corylus avellana*, *Fraxinus excelsior*, *Acer hyrcanum*, *Pyrus communis* subsp. *caucasica*, *P. oxyprion*, *Malus sylvestris* subsp. *orientalis*, *Ulmus minor*, *Tilia caucasica*, *Prunus cerasifera*, *Crataegus orientalis*, *C. pentagyna*, *C. meyeri*, *Mespilus germanica*, and the shrub-like *Prunus spinosa*, *Rhamnus cathartica*, *Sambucus nigra*, *Viburnum lantana*, *Cornus mas*, and *Lonicera caucasica*. At lower altitudes and in drier south-facing slopes, oak forests include xeric tree species such as *Fraxinus angustifolia* subsp. *oxycarpa*, *Celtis planchoniana*, *Acer ibericum*, *Carpinus betulus*, *Crataegus monogyna*, *Juglans regia* (mainly as riparian species), *Sorbus torminalis*, and the shrub-like species *Paliurus spina-christi*, *Colutea cilicica*, *Cornus mas*, *Rhamnus cathartica*, *Rhus coriaria*, *Lonicera iberica*, *Ligustrum vulgare*, *Jasminum fruticans*, *Spiraea hypericifolia*, *Cotoneaster integerrimus*, and *Rosa pimpinellifolia*. Semi-natural communities of *Hippophae rhamnoides* were created 50 years ago, which nowadays became often very dense, sometime impassable. In south-facing slopes with rocky substrate

juniper woodlands are abundant, characterized by *Juniperus excelsa*, *J. foetidissima*, *Quercus macranthera*, *Carpinus orientalis*, *Celtis planchoniana*, *Celtis australis* subsp. *caucasica*, *Pistacia atlantica* subsp. *mutica*, *Prunus fenziiana*, *Pyrus salicifolia*, *Pyrus syriaca*, and the shrub-like species *Rhamnus cathartica*, *Berberis orientalis*, *Spiraea crenata*, and *S. hypericifolia*.

207. The TNC climate projections in Syunik marz indicate for the period 2041-270 (when planted trees will reach maturity) moderate to significant increase of annual temperatures, slight decrease in annual rainfall and the intensification of summer drought conditions. Forest fire risk might significantly increase, and shorter heavy rainfall events will increase the risk of landslides. Under these conditions, the most suitable native species for forest restoration are:

Species ⁶¹	Attributes ⁶²					Comments
	DR	RS	SD	SS	FG	
<i>Quercus macranthera</i>	++	++				This oak has a wide ecological range and high capacity to withstand drought. It re-sprout well after fire, cutting and brose. The plant material for restoration will be both acorns (direct seed sowing) and seedlings produced in forest trays with alveoli of 250-300 cm3.
<i>Quercus petraea</i> subsp. <i>iberica</i>	+	++				Considering the predicted altitudinal shifting of bio-climate zones, this oak could be used in mid altitudinal ranges (1400-1700 m). It shows a moderate resistance to drought. The plant material will be both acorns (direct seed sowing) and seedlings produced in forest trays with alveoli of 250-300 cm3.
<i>Pinus sylvestris</i> ⁶³	+			+		The natural distribution area of this species is currently very limited in Armenia. It colonizes well open areas with instable soil. The plant material will be seedlings produced in forest trays with alveoli of 200-250 cm3. Pine seedlings should also be mixed with seedlings from re-sprouting species such as <i>Quercus</i> , in order to increase forest resilience to climate risks (e.g. fires).
<i>Carpinus orientalis</i>	++	++		+	++	This species rapidly colonizes forest gaps, and grows well in steep rocky slopes; it shows a significant resistance to drought. The plant material will be seedlings produced in forest trays with alveoli of 250-300 cm3.
<i>Celtis planchoniana</i> , <i>Celtis australis</i> subsp. <i>caucasica</i>	++	+		++	+	These species colonize well open areas with rapid growth in gravel soils, and are highly resistance to drought. The plant material will be seedlings produced in forest trays with alveoli of 300-350 cm3.
<i>Juniperus excelsa</i> subsp. <i>polycarpus</i>	+	+		+		This species is highly resistance to drought. Planting is recommended as it suffers a lot from forest fires that prevent natural regeneration. The plant material will be seedlings produced in forest trays with alveoli of 250-300 cm3.
<i>Acer hyrcanum</i>	+	+			+	This species colonizes well open areas, with moderate resistance to drought. The plant material will be seedlings produced in forest trays with alveoli of 300-350 cm3.
<i>Sorbus torminalis</i>	+	+	++		+	This species colonizes well open areas, with moderate to high resistance to drought. It attracts seed-dispersal fauna and consequently seedlings recruitment from other species. The plant material will be seedlings produced in forest trays with alveoli of 250-300 cm3.
<i>Pistacia atlantica</i> subsp. <i>mutica</i>	+	+	++	++		This species colonizes well open areas, with high resistance to drought. Useful fruit species for community-based NWFP production (e.g. grafting of edible <i>Pistacia vera</i>). The plant material will be seedlings produced in forest trays with alveoli of 250-300 cm3.
<i>Juglans regia</i>						This species is resistant to drought in areas with sufficient soil humidity (e.g. near river beds and ravines). Useful fruit species for community-based NWFP production. The plant material will be seedlings produced in forest trays with alveoli of 300-350 cm3.
<i>Pyrus communis</i> subsp. <i>caucasica</i> , <i>P. syriaca</i> , <i>P. salicifolia</i> <i>P. oxyprion</i>	+	+	++			This species attracts seed-dispersal fauna and consequently seedlings recruitment from other species. Useful fruit species for community-based NWFP production. The plant material will be seedlings produced in forest trays with alveoli of 250-300 cm3.
<i>Malus sylvestris</i> subsp. <i>orientalis</i>	+	+	++			This species attracts seed-dispersal fauna and consequently seedlings recruitment from other species. Useful fruit species for community-based

⁶¹ The species names are updated according to the most recent taxonomic updates: (i) The Euro+Med PlantBase (ww2.bgbm.org); (ii) The Plant List theplantlist.org).

⁶² DR: Drought-resistant; RS: Re-sprouting after fire, browse and cutting; SD: fruit tree attracting seed-dispersal fauna; SS: instable soil stabilization; FG: colonizer of forest gaps and open areas

⁶³ The species names *Pinus sosnowskyi* Nakai, *Pinus hamata* (Steven) Sosn., and *Pinus kochiana* K. Koch that are mentioned in Armenia, are synonyms of *Pinus sylvestris* L. according to the most recent taxonomic updates: (i) The Euro+Med PlantBase (ww2.bgbm.org); (ii) The Plant List theplantlist.org)

						NWFP production. The plant material will be seedlings produced in forest trays with alveoli of 250-300 cm3.
<i>Prunus cerasifera</i>	+	+	++			This species attracts seed-dispersal fauna and consequently seedlings recruitment from other species. Useful fruit species for community-based NWFP production. The plant material will be seedlings produced in forest trays with alveoli of 250-300 cm3.
<i>Crataegus monogyna</i> <i>C. orientalis</i> , <i>C. pentagyna</i> , <i>C. meyeri</i> ,	+	+	++		+	This species attracts seed-dispersal fauna and consequently seedlings recruitment from other species. Useful fruit species for community-based NWFP production. The plant material will be seedlings produced in forest trays with alveoli of 250-300 cm3.
<i>Cornus mas</i>	++	+	++	+	+	This shrub species colonizes well open areas, with moderate to high resistance to drought. It attracts seed-dispersal fauna and consequently seedlings recruitment from other species. Useful fruit species for NWFP production. The plant material will be seedlings produced in forest trays with alveoli of 250-300 cm3.
<i>Hippophae rhamnoides</i>	++	++	++	++		This species endures the summer drought and winter cold well and, at the same time, thrive well on dry soils, with minimal risks in the first years. Useful fruit species for NWFP production, and for shelterbelt protection of restored communal land. The plant material will be seedlings produced in forest trays with alveoli of 200-250 cm3.
<i>Rhus coriaria</i>	++	++		++	++	This species endures the summer drought and winter cold well and, at the same time, thrive well on dry and gravel soils, with minimal risks in the first years. Useful fruit species for NWFP production. The plant material will be seedlings produced in forest trays with alveoli of 200-250 cm3.

Table 21: List of Proposed Species for Forest Restoration in Syunik Marz

208. Concerning the nexus between energy security and forest, according to the survey commissioned by FAO in 2018 to the Armenian NGO AWHHE⁶⁴, confirms the findings of the 2015 survey commissioned by UNDP. 78% of interviewed rural households use fuelwood as a primary source of energy. Wood stove are in all cases locally made and of very limited efficiency. Fuelwood is primarily bought for an average price of 20,000 AMD per cubic meter. A relevant aspect appearing from the survey is the constant increase in use of manure as biofuel.

Target Groups: Beneficiaries of the project are the rural population of project areas (Table 22) distributed in the 15 municipalities and 207 rural communities, the private sector and line ministries including, among the others, the Ministry of Economy and Innovation, the Ministry of Territorial Administration and Development and the Ministry of Energy and Nature Protection.

209. Rural communities in the two marzes are mostly poor or very poor with the higher direct dependency on forest ecosystem services for fuelwood (average 8 m3/y) and livelihood (agriculture, beekeeping, NWFP). Indirect beneficiary is the entire Armenian population.

	Project areas	Direct Beneficiaries	% Total Population	Women / Men %	Indirect Beneficiaries
Component 1	Lori/Syunik	377,308	12%	52%	3,018,854.00
Component 2	Lori/Syunik	10,000	0.3%	75%	3,018,854.00
Component 3	Lori/Syunik	377,308	12%	52%	3,018,854.00
Total		377,308	12%	52%	3,018,854.00

Table 22: Project Beneficiaries

210. **C1:** Beneficiary will be the rural population of the two marz (direct) and the entire population as benefits will be enjoyed in different forms by all (Carbon Storage, increase hedonistic value of forests, air quality and others). Concerning technology transfer and capacity development the project will target stakeholders as follows: **Institutions:** the entire staff of Hayantar involved in field operations. **Community:** open to all members of community actively involved in forestry operations. **Private Sector:** representatives of the enterprises active in plant production and in forestry. According to the data collected during the design phase the project will target directly 1,700 persons from both project areas and the rest of the Country.

⁶⁴ Rural household survey on energy use and the main drivers of forest and other natural resource degradation focusing on women as actor of change of natural resource management in Lori, Tavush and Syunik Provinces of Armenia

211. **C2:** Beneficiary will be the Country for what concerns the official adoption of EE standards and at least 15 enterprises active in the EE market. Given the size and population of Armenia as well as the magnitude of the EE market the project will target over 75% of the active companies (21) and at least 15 local manufactures in project areas. Additionally, via the agreement with the Ministry of Education the project will extend introduced technologies into national curricula scaling up the project at the national level.

Households (9,000): Concerning, the technology shift grant, the project will identify beneficiaries jointly with local CSOs and Municipalities according to the following criteria agreed with the MoE and stakeholders during the national engagement process and related consultations: **(i)** Permanent resident of a forest adjacent community in Lori or Syunik, **(ii)** Registered in the Social Welfare assistance program⁶⁵, **(iii)** Full attendance of the fuelwood management training. The target represents 35% of rural households in project areas and considering that the project will aim at targeting prevalently women also via existing formal and informal groups/associations it is expected to reach directly and exclusively at least 5% of the female population in project areas.

212. **C3:** Beneficiary is the rural population of project areas and involved institutions at the national level. The project will work actively with central and local institutions and with local communities. Beneficiaries from institutions will be assigned by their supervisors while community members will be selected with the support of CSOs and Municipalities within respective communities. It will be a priority for the project to engage as many women groups/associations as possible to ensure the highest possible participation of women into project activities and to enhance their active participation.

213. Concerning beneficiaries' selection and more in general project execution, the project will place particular and specific attention to ensure women participation in the project. Women participation in the project will be guaranteed as follows: **1)** Involvement of women groups and women CSO to ensure women participation as agents and main advocates for behaviour and attitude change in the families, as well as on community and at the national level. This function inter alia will be paralleled with monitoring activities implemented by the project (Section 13); **2)** Women will be involved in the project as active participants in the whole process via specific activities and awareness campaigns, **3)** Coordination and synergies with projects aimed at empowering rural women and their participation in the local/community and national government level (e.i. UNWOMEN, UNDP, AGBU). Additionally, the project will ensure women participation into training activities by adopting a gender oriented approach and by eliminating possible barriers related to logistics (time, distance, methods) or financial constraints that could prevent their participation. .

⁶⁵ Within this category priority will be given to single women headed households.

8. THE THEORY OF CHANGE

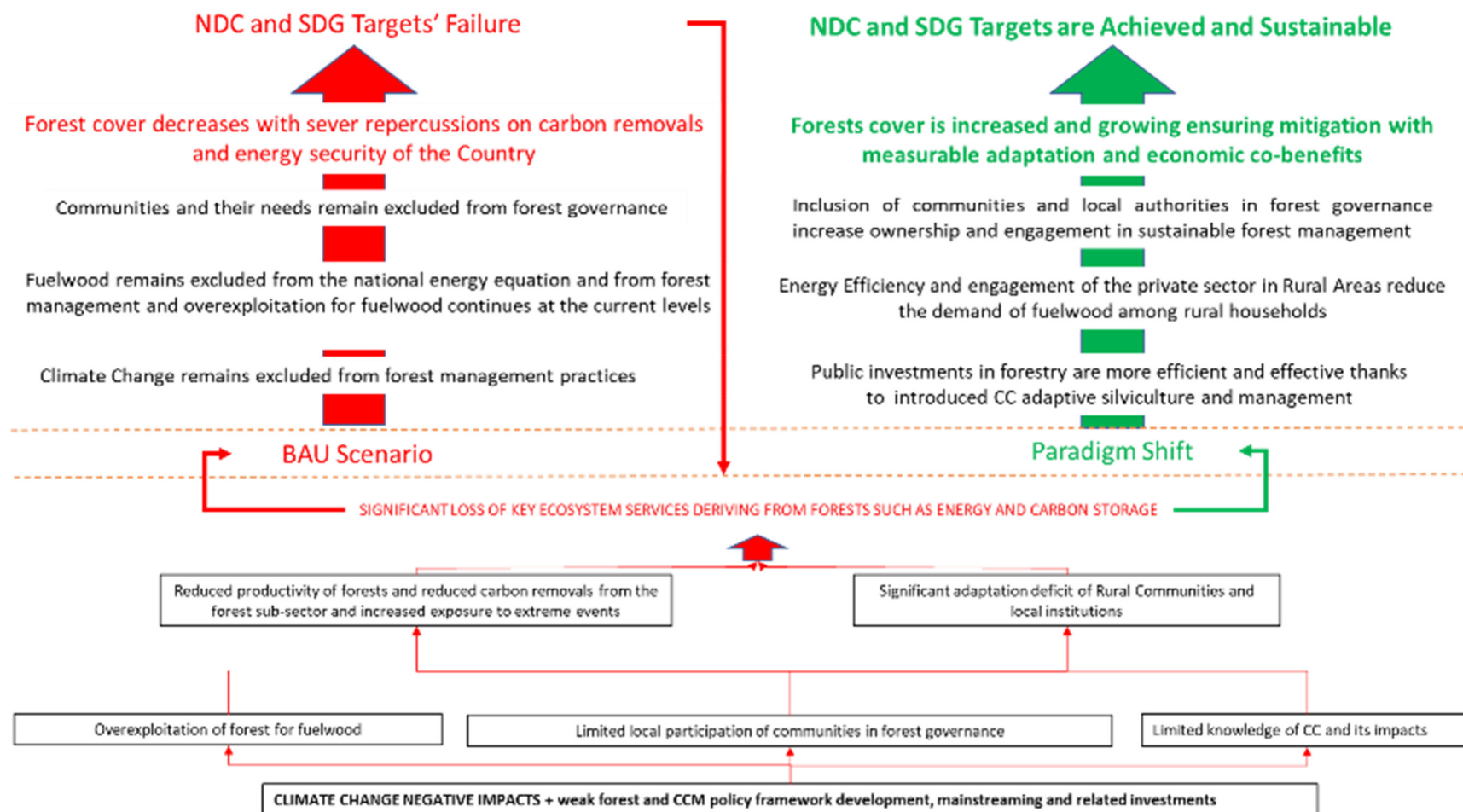


Figure 20: The theory of change – Aggregated problem tree and BAU vs Paradigm Shift Scenario

NDC and SDG Targets are Achievable and Monitorable

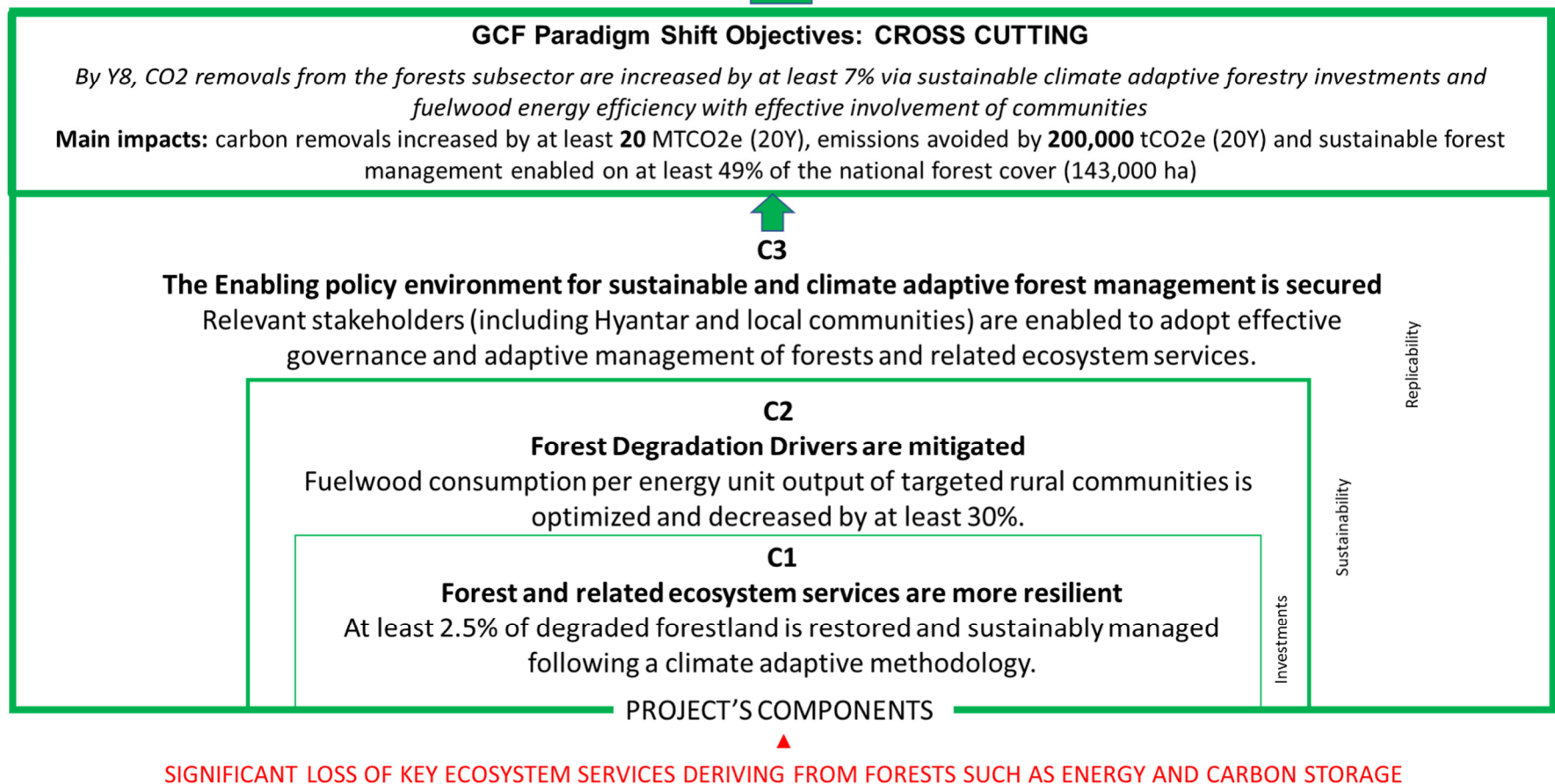


Figure 21: The theory of change - Project's contribution to the Paradigm Shift

214. BAU management of forests and energy security in rural areas has failed in guaranteeing livelihood, security and natural regeneration of forest's resources. The vast majority of Armenia's forest lands accessible for exploitation are being degraded due to inefficient management of forest resources, fuelwood harvesting, lack of law enforcement as well as lack of stakeholders' participation in forest governance issues at all levels (national, regional, community), thus limiting the role of communities to "clients" or "exploiters".

215. Therefore, addressing forest' mitigation and adaptation potential is instrumental in shifting from forest mining to a new path of development where forests are sustainably managed. This would also ensure ecosystem services that are at the base of community survival in both project areas and that are precondition to secure mitigation targets of Armenia in 2050 [24]. As previously described Armenian forest are becoming more vulnerable and less resilient to climate change. Consequently, net carbon emissions will be negative affected (forests are the only existing carbon sink in Armenia) and rural communities might be forced to accelerated migration to urban areas or abroad. In other words - without forest - national commitments toward the Paris Agreement and the Country's socio-economic development targets might be compromised.

216. Given the high dependency of rural communities from forests ecosystem services [16], the human element cannot be excluded but - on the contrary - should be capacitated and enhanced. Rural communities are the indicator of Armenia's strategies and commitments toward climate change and their contribution is key in securing SDG and NDC targets. Their dependency on forests for energy and livelihood (i.e. beekeeping, NWFP and fodder) calls for innovative strategies and approaches to factor in climate change and allow stakeholders to prepare and react rather than passively cope with impacts and consequences of forests' degradation.

217. Given the preconditions identified and discussed during the national engagement process – national commitment, enabling environment for policy improvement, availability of partners from state institutions and Civil Society – the proposal is considered cross cutting with tangible, interlinked and relevant impacts on both GCF paradigm shift objectives:

Paradigm Shift Objective	Project Contribution
<i>Shift to low-emission sustainable development pathways</i>	In line with the NDC, carbon removals from the forests sub-sector are increased via the combined effects of: (i) introducing climate adaptive practices in public and private silviculture operators, (ii) securing technology transfer to the private sector, institutions and communities, and (iii) in enhancing community participation via ecosystem based approaches.
<i>Increased climate-resilient sustainable development</i>	

Table 23: Project's Paradigm Shift Objectives

218. Forests require precise investments to expand and to provide communities with the needed ecosystem services, but it is also clear that such investments need to go *pari passu* with capacity development of concerned stakeholders as well as effective and informed inclusion of rural communities into forest governance so to ensure adaptation of forests and climate/forest awareness among people. This can only be reached via key actions to: (a) reduce pressure on forests caused by fuelwood harvesting; and (b) to "adapt" the current policy framework and technical capacities to secure mechanisms and procedures to transit communities from being passive exploiters to co-managers of forest and their unique ecosystem services.

219. Accordingly, objectives, outcomes and outputs and activities will ensure reaching the specific objective creating the enabling condition for forests to be sustainably managed without compromising needs and expectations of rural populations but increasing their participation and comparative advantage in the framework of a low emission sustainable development. Therefore, the project is structured in four (4) components briefly described as follows:

Component 1 - Climate Change mitigation and adaptation through forest investments and technology transfer: will support the Country in reaching its NDC forest cover via precise investments in forest and forestry but also ensuring that involved stakeholders' capacities are updated, while executing investments, ensuring that climate change variables and processes are well rooted into

management and technical staff. With a direct investment on 7,300 ha and on the job capacity development, the project will increase forest cover and secure transfer of adaptive technologies to deputed institutions, communities and private actors running nurseries. Concerning the involvement of the private sector, given the fact that currently the only two actors producing seedlings for forests are Hayantar and the NGO ATP, the project will also include in the practical trainings those plant producers interested in expanding their activities into forestry. In these regards considering the NDC target of doubling the current forest cover opportunities of producing for the State are tangible (Annex 9). In addition to the practical trainings for existing public and private sector's operators, practices and methodologies introduced/developed by the project will be included, as agreed with the National for Vocational Education and Training⁶⁶ of the Ministry of Education and Science, into the national curricula for future students enrolled in the "Agriculture" and "Forest Resources Reproduction and Recycling" currently offered in Armenia.

Component 2 - Promoting forest Sustainability reducing forest degradation drivers: will support forests' investments ensuring that drivers of forest's degradation are mitigated involving target communities into EE processes that will curb demand for fuelwood by at least 30% (from 8 m³/hh/y to 5.6 m³/hh/y) and pressure on forests with immediate effects and medium/long term positive impacts on forest resources and key ecosystem services such as carbon removal from forests. The component, involving specialized cofinanciers such as the Austrian Development Agency and the Autonomous Province of Bolzano (Italy), will secure technology transfer related to energy efficiency and sustainable biomass production for energy to the private sector, national institutions and consumers in project areas and the country. In addition to the practical trainings for existing public and private sector's operators, practices and methodologies introduced/developed by the project will be included, as agreed with the National for Vocational Education and Training of the Ministry of Education and Science, into the national curricula for future students enrolled in the "Light Industry", "Machine building equipment and technologies" and "Energy" specialization courses currently offered in Armenia.

Component 3 - Strengthening governance of Forest resources and climate change's impact management at community, as well as local and central government levels: will secure the enabling environment for expansion to other areas of methods and results of previous components and to ensure that best practices are well included into sector's legal and technical frameworks⁶⁷. The component will address the main technical and administrative bottlenecks related to community involvement in forest governance as foresaw by the Armenia Forest Code (2005). Via dedicated institutions and community support the project will transfer to administrations and communities the needed capacities to participate in forest governance of forests and related ecosystem services (i.e. fuelwood, NWFP, protection)

Component 4 – Project Management: will ensure efficiency and effectiveness of the project as well as monitoring and evaluation and knowledge sharing. Via this component the project will as well ensure: (i) coordination and collaboration with ongoing relevant projects (i.e. EBRD, UNDP, HfH), (ii) the national engagement process, and (iii) mainstreaming of project's results among stakeholders and decision makers.

220. The combined effects of the four interlinked components will support Armenia in shifting from the described BAU scenario towards low-emission sustainable development pathways enabled by an increased climate-resilient forest cover and the enhanced capacity and adaptability of related private sector's operators. Mitigation becomes an opportunity to increase forest cover, enhance preparedness and to secure wider participation of stakeholders into forest's governance with clear and measurable co-benefits in terms of adaptation and low emission development of the most vulnerable.

⁶⁶ Mission of NCVETD is to increase efficiency of preliminary (artisan) and vocational education and training, including adult education system reforms, to foster its development, international integration, international recognition of awarded certificates and qualifications in the Republic of Armenia

⁶⁷ Component 3 will address the main bottlenecks to sustainable forest management and community involvement highlighted in the study commissioned by FAO for the purposes of this concept note (Gevorgyan 2017, Overview of the forestry sector management in Armenia).

9. THE LOGICAL FRAMEWORK

	Description	Indicators	Baseline	Targets (mid-term)	Targets (final)	Sources and means of verification	Assumptions
Objective related to GCF RMF Impact Areas Impact	BY Y8, CO ₂ REMOVALS FROM THE FORESTS SUB-SECTOR ARE INCREASED BY AT LEAST 7 % VIA SUSTAINABLE CLIMATE ADAPTIVE FORESTRY INVESTMENTS AND FUELWOOD ENERGY EFFICIENCY WITH EFFECTIVE INVOLVEMENT OF COMMUNITIES	M.3 Total % of reduced emissions (-30%) M.4 Tonnes of CO ₂ eq removed (tCO ₂ eq/y)	Removals from > Forest Sub Sector 0 Removals from SFM (20y) 0 ⁶⁸ Emission 0		Removals from > Forest Sub Sector 386,560 8Y Removals from SFM (20Y) 18,833,290 Reduced Emission -175,697	FAO EX-ACT results informed by annual reports from the MoE State Forest Monitoring Center (SFMC) based on NFM results) and presented according to CIF FIP theme 1.1 MoE Biannual Update to UNFCCC Project Reports	Forests' losses in project areas remains in the limits identified in the baseline Economic social and political situation in the Country and in project areas remains stable Absence of major natural disaster in the Country and in project areas State budget allocated to fulfill NDCs is guaranteed during and after the project
OUTCOMES							
Outcomes	C1-Outcome 1: By Y8, at least 2.5% of degraded forestland is restored and sustainably managed following a climate adaptive methodology.	Area (ha) of forest lands restored	0	3, 800 ha	7,300 ha	SFMC via repeated assessment of the situation of the intervention areas by field inspections + aerial imagery (high resolution orthophoto maps and surface models) acquired by drones in year 1, 3, 5 and 7.	Forests' losses in project areas remains within the limits identified in the baseline
		Adoption rate of climate adaptive practices in forest restoration and management	0	20%	60%		Economic social and political situation in the Country and in project areas remains stable
	C2-Outcome 2: By Y6, fuelwood consumption per energy unit output of targeted rural communities is optimized and decreased by at least 30%.	# and % of enterprises established or expanded using low carbon and climate-resilient solutions by women and men, by type of enterprise	0	15	15	Project Reports Independent Sector survey and capacity assessment	Rebound effect of energy consumption from fuelwood at the rural household level is limited to 20% max.
		Average Volume (m ³) of yearly required fuelwood in target households is reduced by at least 30%	8	5.6	5.6	Independent HH survey and energy efficient survey Project Reports	Absence of major natural disaster including forest fires in the Country and in project areas State budget allocated to fulfill NDCs is guaranteed

⁶⁸ Not including continuity in the observed contraction in carbon removals from the forest subsector (-11%)

		(Female-headed) household expenses on energy (fuelwood) % change in expenditure on purchasing fuel for household energy needs by women	USD 250	USD 175 (-30%)	USD 175 (-30%)	ARMSTAT regional Data	during and after the project	
	C3-Outcome 3: By Y7, relevant stakeholders are enabled to adopt effective governance and adaptive management of forests and related ecosystem services.	# of Forest Management Plans (community level) adopting the sustainable and climate adaptive guidelines	0	2	10	Ministry of Environment database and official publications	Economic social and political situation in the Country and in project areas remains stable	
		# of community concessional management contracts supported by the project	0	0	4	Official communication to concessional communities		
		# and % of women and men (from remote rural areas) who attend/are actively involved in sectoral planning and consultation meetings	0	600	600	Project Reports Municipal and Governorate communication		
OUTPUTS								
Outputs	Output 1.1 By Y2, at least 3 nurseries are operational in the production of climate adaptive seedlings and Hayantar staff capacitated.	Total production capacity of climate adaptive seedlings is at least 12,000,000 units (mixed locally available species) matching established requirements	0	5,400,000	12,000,000	Independent survey and capacity assessment Project Reports ARMSTAT	Forests' losses in project areas remains in the limits identified in the baseline	
	Output 1.2: By Y5, at least 7,300 ha of forest investments are secured in project areas with sustainable and climate adaptive approaches and practices.	At least 4,700 ha of forest within the State Forest Fund restored via climate adaptive forest restoration approaches.	0	2,350 ha	4,700 ha	Reports from FAO RS Analysis, Reports from the Forest Monitoring Center (drone surveys), and Municipal certification	Economic social and political situation in the Country and in project areas remains stable	
		At least 1,000 ha of forests established in underused / abandoned Municipal lands.	0	750 ha	1,000 ha		Rebound effect of energy consumption from fuelwood at the rural household level is limited to 20% max.	
		At least 1,600 ha of degraded coppiced forests are restored	0	700 ha	1,600 ha			
	Output 1.3: By Y6 at least 1,700 people (of which at least 30% women) from Hayantar, local authorities private sector and civil society are trained in sustainable and climate adaptive silviculture.	# of obtained training certificates (disaggregated by gender)	0	600	1,700 (at least 2,100 are women)	Independent survey and capacity assessment Project Reports	Absence of major natural disaster in the Country and in project areas	
		# of National Curricula modified to include introduced topics (agriculture and forestry)	0	1	1			
	Output 2.1: By Y2, National Standards for energy efficiency of heating related appliances are approved and EE companies are	EE standards for heating appliances and fuelwood are approved	0	1	1	Ministry of Economy and Innovation Reports	Economic social and political situation in the Country and in project areas remains stable	

	trained on how to incorporate them in their operations.	# of trained companies on established EE standards	0	15	15	Independent Sector survey and capacity assessment Project Reports	Rebound effect of energy consumption from fuelwood at the rural household level is limited to 20% max.
	Output 2.2: By Y5, At least 15 private EE companies are involved on wood-stoves assembling, installation and maintenance and dispose of skilled labor in project areas.	# of obtained training certificates (disaggregated by gender)	0	100	300		
		# of National Curricula modified to include introduced topics (welding, plumbing and electricity).	0	3	3		
	Output 2.3: By Y6, At least 9,000 HH (of which at least 25% women are single women headed) use increased EE wood stoves in project areas and are trained on fuelwood management.	Number of installed and certified EE heating appliances	0	3,000	9,000 (at least 2,250 are single women headed)		
	Output 3.1: By Y5, the guidelines to enhance participation and engagement of Community in sustainable and climate adaptive management of forest and related ecosystem services are adopted.	Official approval of the guidelines by the MoE	0	1	1	Official Communication from the MoE	Current forest code remains in place or if modified does not eliminated community participation from its fundamentals. Absence of major natural disaster in the Country and in project areas Economic social and political situation in the Country and in project areas remains stable
	Output 3.2: By Y8, A National Forest Monitoring and Assessment System (NFMA) established, the first inventory cycle completed, discussed with stakeholders and results mainstreamed into relevant policies.	Official acceptance from the MoE of the NFMA	0	1	1	Official Communication from the MoE and the SFMC Major forest monitoring results published	
	Output 3.3: By Y7, at least 300,000 people (of which 52% are women) from 207 rural communities in project areas are informed, sensitized and empowered on climate adaptive silviculture, Energy Efficiency and climate change mainstreaming.	# of events, campaigns, social media initiated/supported by the project	0	12	24	Project reports	
		# and % of women and men sensitized on energy-saving and sustainable forest management in project areas	0	150,000 (78,000 women)	300,000 (156,000 women)		
ACTIVITIES	ACTIVITIES						
	List the activities:	Description:				Inputs	
	C1.OUTPUT 1.1						
	Activity 1.1.1: Establishment of 3 additional forest climate adaptive nurseries and capacity development of Hayantar staff and stakeholders on related topics	The project will develop nursery capacities for production of climate adaptive seedlings in Lori and Syunik marz and by adding two greenhouses at Hayantar existing nursery in Hrazdan. The activity will include training of stakeholders involved in nurseries' management.				USD 783,735	
	Activity 1.1.2: Production of at least 12,000,000 container seedlings	Seeds will be collected by trained Hayantar staff in selected forests close to investments' areas (well-preserved forest site in the vicinity of each plot) according to specific protocols to ensure sustainability of the process and proper selection of seedlings. Production operations will start in the nurseries				USD 1,502,450	

		<i>in order to have 12,000,000 one-year seedlings of the different target species. At least 9,000,000 seedlings will be used in project areas while remaining production will be used to sustain the regular operations of Hayantar</i>	
	C1.OUTPUT 1.2		
	Activity 1.2.1: Preparation work on selected State forest fund and municipality lands	<i>Forest Restoration areas will be selected by the MoE, Hayantar and communities according to criteria aimed at ensuring the highest survival rate and participation of communities. Species for each restoration plot will be selected based on the species composition of the reference ecosystem (well-preserved forest site in the vicinity of each plot).</i>	USD 267,290
	Activity 1.2.2: Planting and maintenance work on selected forest fund lands (6,300 ha) and Municipal Lands (1,000 ha)	<i>The project will restore an average of 784 ha every year from year 2 to year 6 of the project and ending planting activities in autumn of year 7 with replacement of dead seedlings on previous year's plantings sites. Forest restoration in Municipal lands will mainly take place in Syunik municipality, as part of a collaboration framework between the project and WWF-AM. Finally, the project will establish 1,600 ha of adaptive management measures that will be applied with stakeholders to secure health and growth of degraded stands.</i>	USD 6,887,139
	C1.OUTPUT 1.3		
	Activity 1.3.1: Development and formalization of the training curricula with the MoE and the Institute for Vocational Education and Training of required trainings.	<i>The project will involve national institutions to ensure that capacity development needs identified by the experts and initially used to train practitioners involved in nursing, planning, planting and maintenance of forests in project areas, are transferred not only to targeted Hayantar staff but included in national curricula related to agriculture and forestry.</i>	USD 36,000
	Activity 1.3.2: Capacity Development of at least 1,700 people from Hayantar, Armenian Civil Society, Academia, Vocational Schools teachers and private sector.	<i>Methodologies and techniques introduced by the project will be disseminated among stakeholders with specific trainings, courses, workshop so to ensure the highest possible technology transfer to stakeholders.</i>	USD 634,450
	C2.OUTPUT 2.1		
	Activity 2.1.1. Design and approval process of quality standards for EE heating appliances	<i>The project will develop in joint venture with the MoE and the Ministry of Economy the standards necessary to sustain a sound and long term oriented engagement of the private sector as well as to guarantee quality of EE heating appliances fueled with wood.</i>	USD 82,770
	Activity 2.1.2. Testing of appliances:	<i>Detailed analysis of the efficiency and risks of current appliances as well as of those that will be installed via the project.</i>	USD 79,020
	C2.OUTPUT 2.2		
	Activity 2.2.1. Coaching of Manufacturers, Retailers and teachers from vocational schools:	<i>Development of a manual for improved wood stoves, training of constructors and vocational schools teachers involved in the courses of light industry, energy and other disciplines related to EE.</i>	USD 305,522
	Activity 2.2.2: Development and formalization of the training curricula with the MoE and the Institute for Vocational Education and Training of required trainings.	<i>The project will involve national institutions to ensure that capacity development needs identified by the experts are transferred not only to targeted private sector enterprises but included in national curricula related to EE appliance production, installation and maintenance.</i>	USD 29,120
	C2.OUTPUT 2.3		
	Activity 2.3.1. Technology Grant Support for the adoption of the RE	<i>The project will work with institutions and civil society to identify beneficiaries according to selected criteria and will provided a technology incentive to cover</i>	USD 3,708,370

	appliances is developed and available for target households	the additional cost of technology of targeted appliances.	
	C3.OUTPUT 3.1		
	Activity 3.1.1: Development of sustainable and climate-adaptive forest governance guidelines applicable under forest concessions for community organizations	A group of national and international experts will design, with the stakeholders, the guidelines to enhance engagement of communities in forest governance and related fuelwood market applying introduced sustainable and climate-adaptive forest methodologies and practices. The guidelines will be integrated by feasibility studies developed under Activity 3.1.2.	USD 118,600
	Activity 3.1.2: Institutional and community support in applying climate adaptive forest governance guidelines including rural EE and climate change mainstreaming	The project will support relevant stakeholders in project areas in building the competencies to apply sustainable and climate adaptive management practices. Target communities will also receive specific and additional training related to energy efficiency, fuelwood management and sustainable biomass production so to increase the efficiency of the process and the interest of communities on forest management and sustainable use rather than exploitation. In addition, the project will also develop feasibility studies, to integrate the guidelines produced under Activity 3.1.1, developed together with stakeholders, for the creation of market oriented aggregation platforms, provided with or supported by viable financial inclusion mechanisms as appropriate to secure sustainable supply of fuelwood from community concessions.	USD 1,489,684
	C3.OUTPUT 3.2		
	Activity 3.2.1: Assessment of land categories and, designing of forest monitoring system and developing national capacities	A forest monitoring system will be designed by the end of year 1. The design will be presented and discussed at a survey design validation workshop in the fourth quarter of year 1 beginning of year 2. This survey will consist of the visual interpretation of sample points (plots) on the basis of high resolution imagery available.	USD 483,200
	Activity 3.2.2: Field data collection including survey data management, quality assurance, evaluation and interpretation of survey results	Field data collection will start in year 2 and continue till year 7 of the project when the plots established in year 1 of the first inventory cycle will be re-visited and re-assessed and will also serve as means of verification for Component 1.	USD 978,950
	Activity 3.2.3: Assessment of intervention areas and impact by orthophoto mapping and digital surface models	Every second year of the project the SFMC will secure orthophoto mapping and digital surface models of project areas so to monitor investments and advise on mitigation actions if and when needed.	USD 79,000
	C3.Output 3.3		
	Activity 3.3.1: Community empowerment, awareness and sensitization.	The project will involve communities in project areas and at the national level in activities that aim at increasing the awareness of citizens concerning the main topics of the project and to enhance their participation into forest governance.	USD 773,202

10. DETAILED PROJECT DESCRIPTION

Beneficiaries: the project will target the rural population of Lori and Syunik and will have direct and indirect benefits on the entire population of the two marzes. Table 24 presents expected beneficiaries per component. The project will target mainly forest adjacent communities in both Marzes and will ensure women's participation (minimum 30 %) and their share among the beneficiaries (50%, or even more). Details on beneficiaries and selection methodologies are available in Section 7.

	Project areas	Direct Beneficiaries	% Total Population	Women / Men %	Indirect Beneficiaries
Component 1	Lori/Syunik	377,308	12%	52%	3,018,854.00
Component 2	Lori/Syunik	10,000	0.3%	75%	3,018,854.00
Component 3	Lori/Syunik	300,000	10%	52%	3,018,854.00
Total	Lori/Syunik	377,308	12%	52%	3,018,854.00

Table 24: Project Beneficiaries

Cofinancing: The project is cofinanced by different donors including bilateral organizations such as the ADA, UN agencies such the FAO, multilateral funds such as GCF, regional administrations from Italy (APB) and finally from the Country. Figure 22 below reports the different inputs provided by the various cofinanciers. For additional financial details refer to the budget and related analysis.

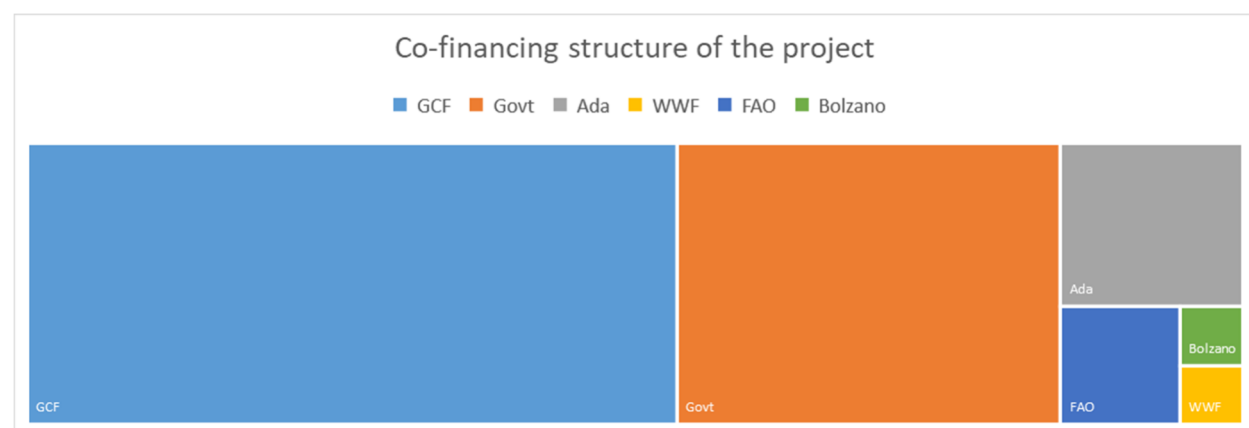


Figure 22: Project cofinancing structure

221. While Armenia will cofinance mainly the production of climate adaptive seedlings (C1) and the cost of staff and logistics, international cofinanciers will support the involvement of the private sector and the technology transfer required to support Armenia in reaching its NDC and SDG targets. Additionally, the project will see the cofinancing of the largest environmental NGO of Armenia, WWF-Armenia, which is involved since many years in supporting communities and municipalities in expanding Armenia's forest cover. In particular WWF-Armenia will support the project in supporting community's participation in forest governance.

Component 1: Under the BAU scenario, plant production capacities will remain limited and by far insufficient for larger scale forest restoration interventions. Additionally, current planting techniques in Armenia do not incorporate effective soil preparation and maintenance measures to face water constraints during the critical summer drought periods in the first two years after planting, which results in a limited survival rate (<60%)⁶⁹. Finally, stakeholder's knowledge in Armenia requires an update to ensure that climate adaptive methodologies and technologies are transferred and mainstreamed in the formal education sector. Under this scenario, it will be hard to respond to the Governmental goal of doubling forest cover in Armenia by 2050, or to meet the more realistic goal to increase 10% the forest area (about 40,000 ha) within 40 years as stated in the Armenia's National Forest Strategy.

⁶⁹ According to expert's evaluation of available sites showed by Hayantar.

222. Component 1 will mainly address the forest restoration interventions responding to the Governmental goal to increase forest cover following an ecosystem approach for climate change adaptation and mitigation (Armenia's INDC report, 2015) and enhancing community participation in forest governance (2005, Forest Code, Article 5). Therefore, the project will support the implementation of several forest restoration interventions involving communities and pursuing both climate change mitigation and adaption objectives following the concept that higher resilience to climate risks of existing and restored forests corresponds with higher capacity to store carbon (Table 25).

Intervention	Mitigation benefits	Adaptation benefits
Output 1.1: By Y2 at least 3 nurseries are operational in the production of climate adaptive seedlings and Hayantar staff / stakeholders capacitated	<ul style="list-style-type: none"> • Increased carbon sequestration. • Reduced emissions from fires. • Long term availability of climate adapted seedlings. 	<ul style="list-style-type: none"> • Increased drought/pest resistance and regeneration capacity after fires and other human induced stressors. • Enhanced ecosystem services for rural livelihoods (i.e. beekeeping and other NTFPs).
Output 1.2: By Y7, at least 7,300 ha of forest and agroforestry investments are secured in project areas with sustainable and climate adaptive approaches and practices.		
Output 1.3: By Y6 at least 1,700 people (of which at least 30% women) from Hayantar, local authorities private sector and civil society are trained in sustainable and climate adaptive silviculture	<ul style="list-style-type: none"> • Long Term Sustainability of the Intervention and Country ownership, • Increased opportunities for youth. • Replicability of the project in Armenia and the Region. 	

Table 25: Component 1 expected Benefits

223. Component 1 is cofinanced by 48%-RoA, 45%-GCF, 5%-ADA while the remaining 2% is provided by WWF Armenia and FAO. Support from cofinanciers will be invested mostly in ensuring the needed technology transfer to ensure climate adaptive seedlings and to secure climate adaptive management procedures related to forest maintenance.

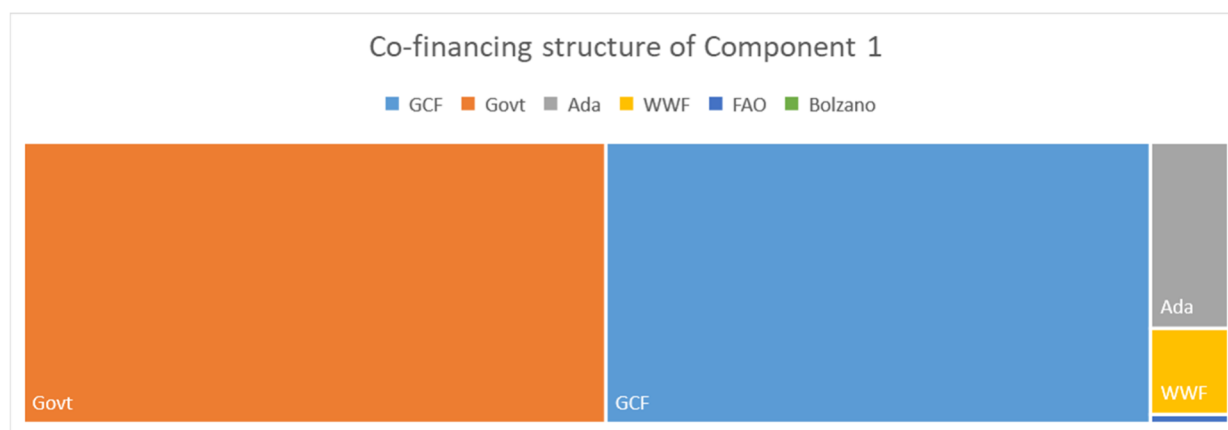


Figure 23: Cofinancing Structure - Component 1

Outcome 1: By Y8, at least 2.5% of degraded forestland is restored and sustainably managed following a climate adaptive methodology: In line with the NCD underlying principle of applying an ecosystem-based adaptation approach to the proposed national contributions on climate change adaptation and mitigation, the project aims to restore climate-resilient forest ecosystems where the ecological processes and ecosystem services are enhanced. The project will increase diversity at different levels:

- Genetic diversity from different populations of the same species in order to increase the gene pool of collected seeds and therefore the probability of having a representation of varieties better adapted to drought, frost, pests, etc;
- (ii) Species diversity by mixing different trees and shrubs in the same restoration site, as a way to accelerate the recovery of the forest ecosystem, in terms of plant composition, structure and ecological processes, and consequently enhance ecosystem services and the resilience against climatic risks.

224. The project has selected a number of native tree and shrub species of the reference ecosystems that better suits future climate conditions in the project areas of Lori and Syunik marzes (Section 7, Table 20

and 21). These species have a wide ecological range (they grow under large temperature and precipitation gradients), and the capacity to withstand drought, re-sprout after fire, attract seed-dispersal fauna and thus favour seedling recruitment of different species, among other features.

Output 1.1 By Y2, at least 3 nurseries are operational in the production of climate adaptive seedlings and Hayantar staff/stakeholders capacitated. The first activity will be to increase the capacity of the existing forest nursery in Hradzan and to establish new forest nurseries to enable Hayantar to produce the necessary seedlings for the forest restoration interventions. In order to restore at least 4,700 ha of State owned degraded forestland and at least 1,000 ha of degraded Municipal land, in total 5,700 ha, Hayantar – in the absence of other larger nurseries in the country - will have to produce at least 1,800,000 container seedlings annually. Apart from some backyard nurseries with a capacity to produce between 1,500 – 2,000 seedlings, the Armenia Tree Project (ATP) nurseries produce up to 60,000 seedlings annually, mainly bare root fruit trees, maple, ash and pine species which are just enough for ATP's Community Tree Planting program.

225. In 2018 the existing nursery which is part of “Hrazdan” Forestry Enterprise of Hayantar, has the capacity to produce 150,000 container seedlings annually, but Hayantar has already started to expand the nursery by establishing a second greenhouse to reach an annual production of 600,000 container seedlings in 2019. The current production of seedlings in Hrazdan nursery is fully used for routine afforestation and reforestation planting activities carried out by the various forest enterprises under Hayantar.

226. The project will cover the necessary investments to further increase the capacity of the existing Hrazdan nursery and to establish and make operational two new nurseries, one in the Marz of Lori and one in the Marz of Syunik, to produce 600,000 container seedlings annually at each nursery location. The project investments in forest nurseries will secure the production of seedlings needed to restore 5,700 ha of forests, and will have the long-term benefit of ensuring the minimum plant production capacity, allowing the Country to achieve its objective of expanding forest cover by 2050. Nurseries will be under Hayantar management and will be managed by their staff as part of the national cofinancing (8Y) and long terms commitments as per the NDC. In these regards the largest budgetary contribution is provided by the Country (72%). All handling of seeds after their collection in the field such as cleaning, seed extraction, seed testing, seed treatment and storage will be done at Hrazdan nursery (already established and functioning). Finally, the new nurseries are flexible and can contract and expand production of seedlings based on demand and budget availability.

Activity 1.1.1: Establishment of 3 additional forest climate adaptive nurseries and capacity development of Hayantar staff and stakeholders on related topics. The current production of seedlings in Hrazdan nurseries is fully used for routine afforestation and reforestation planting activities carried out by the various forest enterprises under Hayantar. In order to fulfill the demands for container seedlings of this new project and the one expected to fulfill the NDC targets for forest cover, it is essential to expand the existing nursery in Hrazdan and to establish 2 new greenhouses at each target Marz. As the increased seedling production also requires additional human resources, Hayantar will hire 6 full-time staff (1 Head of nursery and 1 nursery engineer for each nursery site) and 32 seasonal workers (14 workers for 8 months at each nursery) in order to bring nursery capacities in line with the project and the NDC requirements.

Therefore, the project will increase nursery capacities for production of container seedlings by establishing two new nurseries with two greenhouses each, namely in Margahovit (Lori marz) and Goris (Syunik marz) and by adding two greenhouses at Hayantar's existing nursery in Hrazdan (Kotayk Marz). A final assessment and decision concerning sites will be taken during the initial phase of the project. The infrastructure of the nurseries in Lori and Syunik marzes will include: 2 greenhouses; sunshade protection equipment; irrigation equipment; soil drainage equipment (gravel or permeable mesh); outdoors area with “mother plants” in lines and hedges for the production of seeds and cuttings; and outdoors growing and hardening area for both seedlings in containers and bareroot seedlings. Although the project intends to solely use container seedlings for all other than vegetative propagated species (poplar species, shrubs), bareroot seedlings will complement the nursery production at all three nursery production sites to

compensate for accidental loss or damage of the production in a greenhouse (e.g. due to pathogenic fungi). The new nurseries will become operational and start seedling production at the beginning of year 2.

At the existing nursery in Hrazdan the new infrastructure will include: 2 greenhouses, sunshade protection equipment; irrigation equipment; soil drainage equipment (gravel or permeable mesh). In addition, the existing building with office space, laboratory and seed storing place with refrigerator will be extended as to increase the seed storing capacity for the entire seedling production of all three nursery sites. All handling of seeds after their collection in the field such as cleaning, seed extraction, seed testing, seed treatment and storage will be done at Hrazdan nursery, and seeds will be distributed to Margahovit and Goris nurseries upon request.

In the second half of year one, the project will organize three training courses (one in each nursery) on the production of high-quality plant material (seeds, seedlings and cuttings), to train the dedicated staff and interested stakeholders from the CSO, the Academia and the private sector in charge of nursery works. The training program will include the following modules with specific information about the selected native species:

- a) **Module 1** – High quality plant material: (i) Sustainable collection of plant material⁷⁰, including issues such as region of provenance, genetic diversity, collection period, transferring to the nursery, cleaning and seed extraction process; (ii) Seed quality requirements and testing procedures, including issues such as seed viability, purity, weight determination, moisture content, and seed health; (iii) Seed conservation and treatment techniques to break seed dormancy and activate germination; (iv) Seed certification of plant material.
- b) **Module 2** – High quality plant production: (i) Selection and use of suitable containers; (ii) Preparation and use of culture substrates; (iii) Watering for nursery production; (iv) Organic Fertilization techniques; (v) Plant production growth regulators; (vi) Mycorrhizal organic treatment; (vii) Phytosanitary treatments (allowed in organic farming); (viii) Weed management; (ix) Sowing and seedling production operations; (x) the production of cuttings; (xi) Hardening treatments to induce mechanisms of drought resistance; (xii) Nutritional hardening.

Activity 1.1.2: Production of at least 12,000,000 container seedlings. With the technical support of the same expert in charge of the training, the production protocols of each selected species will be defined, including guidance for the collection of plant material in the field. Seeds will be collected in the healthy forest from selected standing trees, so-called “plus trees”, in proximity of forest restoration areas.

The selection of plant reproductive material to be collected will be based not only on the morphological quality features that help recognize healthy populations of selected plant species, but also on the genetic characteristics and variability of the species that contribute to increase the climate resilience of the produced and planted seedlings in the restored areas. The genetic features of different genotypes from the same species determine some of the future characteristics of the reproductive material, as variables related to its adaptation potential to different environmental conditions: for instance the collection of seeds from species populations in water-restricted or warmer areas which may help increase the adaptive capacity to future climate constraints of the seedlings resulting from their germination in the tree nursery.

All seeds will be collected by Hayantar through staff of respective forest enterprises. Additional Hayantar staff will be trained specifically in seed collection methods in the second half of year 1 of the project to ensure sufficient seed supply for the purpose of the project. In autumn of year 1, Hayantar staff in Lori and Syunik will gather, train and organize local workers from the municipalities where the project areas for forest restoration will be located to harvest, sustainably, the necessary plant material for the production of seedlings in the nursery. Collection sites will be selected and marked by Hayantar staff in areas with healthy plant populations and individuals for each of the target species, and workers will follow the seed collection calendars visiting the marked sites when the seeds will be mature. Once the seeds are transferred to the nurseries, the nursery staff will follow the agreed protocols for the cleaning, extraction

⁷⁰ Collection of seeds should not limit/interfere with natural regeneration capacity of the sources.

and selection of high quality seeds, their storage, and their treatment to facilitate germination throughout the late autumn and winter period.

Seeds are collected in the forest from selected standing trees, so-called "plus trees". The seeds of conifer species are collected by climbing on the selected trees and picking the cones. As felling of conifers is not allowed during the months when seeds are to be collected (November, December), tree climbing is the only method available for collecting conifer seeds. The seeds of broadleaved species are collected by spreading cloth or canvas under the plus trees so that the seeds will fall onto them. However, the seeds of ash and maple are to be collected by the same method as conifers.

All seeds are currently collected by Hayantar through staff of respective forest enterprises. Additional Hayantar staff will be trained specifically in seed collection methods in the second half of year 1 of the project to ensure sufficient seed supply for the purpose of the project.

In the spring of the year 2, when the seeds will be treated, the production operations will start in the nurseries in order to have 1,800,000 one-year seedlings of the different target species ready to be planted at the end of the same year - from mid-autumn to early winter, as soon as the first rain has moistened enough the soil and before the temperatures are too low.

Plant production will continue throughout the following years, based on the plant production protocols, with a total expected production of about 12 million seedlings over 8 years and to meet the peak in demand of 1,8 million seedlings (new planting and possible replanting requirements) per year in year 3 – 6 of the project. The same expert in charge of the training in year 1 will provide continuous technical assistance every 2-3 months, to ensure that the nursery staff follow the established protocols in an appropriate way, and to help them resolve unexpected problems that may arise. Technical assistance will be maintained throughout year 2 till year 4 until the nursery staff acquires sufficient expertise to continue autonomously.

Output 1.2: By Y7, at least 7,300 ha of forest and agroforestry investments are secured in project areas with sustainable and climate adaptive approaches and practices: One of the great challenges for forest restoration is establishing young seedlings on sites with a more or less prolonged period of summer drought, as is the case of the project areas in Marzes of Lori and Syunik. This is becoming a critical issue as climate change is exacerbating water scarcity and the intensity of drought events in Armenia. The second activity will therefore further develop the capacity of Hayantar to overcome water constraints and ensure seedlings' survival in the planting operations. The methods that the project will use to ensure the water requirements will include:

- a) Production of drought-tolerant seedlings to optimise water use efficiency;
- b) Apply effective soil preparation techniques, adequate selection of sites, and adjustment of the planting period to rainfall, to increase water supply;
- c) Use of mulching and shelters to reduce water losses.

227. The project will transfer and adapt best practices on forest restoration techniques (e.g. CEAM Research centre in Eastern Spain; LRI forest restoration project and Mediterranean Mosaics project managed by ACS in the Shouf Biosphere Reserve in Lebanon) that have successfully incorporated climate change adaptation objectives, mainly oriented to prevent seedling mortality due to water shocks and making efficient use of the limited water resources due to the current and project trend in Armenia of higher temperature (i.e. less precipitation, and more frequent and intense droughts and heat waves).

228. The selected best practices, that were analyzed and used to prepare the FAO Global Guidelines for the Restoration of Degraded Forests and Landscapes in Drylands (<http://www.fao.org/dryland-forestry/dryland-restoration-initiative/en/>), come from pilot research projects in Spain on forest restoration under increasing drought conditions in the Mediterranean region and from its successful adaptation and larger scale application in Lebanon. Best practices address the selection of adequate species, the production of high quality plant material, and the use of effective soil preparation, planting and maintenance techniques, with the main focus of improving water availability for seeds and seedlings.

229. In terms of high quality plant material, the project will develop plant production protocols for a large number of native species, as species diversification in forest restoration operations increases the resilience of the restored areas against climate risks.

230. To improve water use efficiency and water availability for seedlings, especially in the first years after their transferring to the field, the project will apply the following climate adaptive measures: (i) The selection of drought-tolerant species and ecotypes; (ii) the use of water and nutrient hardening treatments to the high quality seedlings produced; (iii) to increase water availability in the restoration sites through proper location of the planting hole (micro-relief with higher humidity), soil preparation techniques (e.g. planting hole with greater depth; adjustment of planting period to rainfall; construction of micro-catchment and dry wells); (iv) to reduce water losses (e.g. location of the planting hole in micro-relief areas with higher protection to the sun; etc.).

231. The areas where the project intend to do enrichment planting are sites where natural regeneration for one or another reason did not succeeded or where through enrichment planting the MoE want to introduce additional tree species currently not present at a particular site to enhance biodiversity and increase resilience.

232. Forest restoration in Municipal lands will mainly take place in the Marz of Syunik, as part of a collaboration framework between the project and the Eco-corridors Programme in the Southern Caucasus (Armenia, Azerbaijan, Georgia) conducted by The World Wide Fund for Nature (WWF) Caucasus Programme Office in cooperation with KfW Development Bank, as an instrument for promoting sustainable land use practices in the municipalities through which the ecological corridor is defined. The project and WWF will work together to overlap the common areas of interest and select municipalities that coincide with the project areas for forest restoration. In this way, the project will avoid excessive dispersion of the planting sites, achieving better integration between forest restoration actions on state and municipal lands.

233. In a first step local governance mechanisms for the planning, implementation and monitoring on planting interventions will be developed in the target municipalities identified by and having a concluded agreement with WWF. Hayantar will not only provide the required quantity of container seedlings for the planting interventions on the respective municipal lands, but will also implement the planting activities based on restoration plans developed by target municipalities with assistance by the project and WWF.

234. Another restoration activity planned under this project will address the issue of degraded coppice forests and how to best manage those forests. Sites where adaptive management measures will be replicated from positive experiences in Georgia, Lebanon, Spain and other countries and monitored, will be established to provide first-hand experience to Hayantar, but also communities, on alternatives to coppicing with the aim to bring back degraded forests into a healthy state, regaining their ecological functions and climate resilience, and thus enhancing human well-being.

Activity 1.2.1: Preparation work on selected State forest fund and municipality lands. For the purpose of the project Hayantar pre-identified and geo-referenced about 8,000 ha of potential areas for planting of seedlings on State-owned forest fund lands. Final selection of forest restoration investments will be determined by the MoE according the following agreed criteria:

- (i) *Identified sites will not overlap with other forestry projects;*
- (ii) *Identified sites will not correspond to areas assigned to offsets environmental damages caused by the private sectors or others;*
- (iii) *Identified sites will have the necessary biophysical requirement to secure survival of seedlings;*
- (iv) *Identified sites will be cleared by central and local institutions and will be clearly defined from a legal point of view (potentially disputed plots excluded).*
- (v) *Identified sites will not require changes in land tenure or that might cause conflicts with adjacent communities;*
- (vi) *Identified sites will not include areas under legal/illegal pasture uses.*
- (vii) *Absence of natural regeneration.*

Reforestation sites which we will be selecting are sites without tree cover. The main tree species which the project intend to plant are tree species with heavy seeds (oak, fruit trees, etc.) and would require a minimum number of trees on the sites to allow for natural regeneration. Other like Hornbeam are so-called “shade-tolerant tree species” and also need a minimum crown cover (= shade) for regenerating well. Other tree species with relatively light seeds which can fly a certain distance (e.g. pine) are prevented from naturally regenerating mainly by the grass cover (which would mean that you would have to remove at least partially the grass cover. Even if this may work to a certain extent with pine, we do not want establish pine forests).

The project will avoid the conversion of high quality pastureland, as well as the selection of excessively degraded land plots requiring the construction of very costly infrastructures, such as gabions, dykes, etc. With regard to planting on municipal lands, the project will closely coordinate and collaborate with WWF Armenia in the final selection of lands in the Syunik marz to maximize the environmental co-benefits of the envisaged forest investments, thus actively contributing to the Eco-corridors Programme in the Southern Caucasus implemented by WWF.

Forest restoration plans for the selected sites will be developed by Hayantar for forest fund lands and by the relevant partner at community level for municipal lands. All forest restoration plans will be prepared with guidance and support of an international expert hired by the project and will include information regarding issues such as:

The project will involve all concerned actors in the definition of forest restoration goals that respond to multiple needs, aiming to satisfy ecological, economic, social and cultural objectives. Interventions aim to restore multiple ecological, social and economic functions in the project areas and generate a range of ecosystem goods and services that benefit multiple stakeholder groups. The main criterion when selecting forest restoration measures and species will be the multipurpose character of the restored sites. Priority should be given to those native species that provide at the same time a number of critical environmental, social, economic and cultural benefits. Site identification and preparation works will be done by Hayantar and communities with the support of an international expert that will finalise the forest restoration plans (guiding handbook for stakeholders). Plans will include:

- a) *Site description with information of the ecological and social contexts, including photographs and maps as appropriate.*
- b) *Site history, with information of uses, disturbances and underlying causes.*
- c) *Justification of the proposed interventions and defining expected results.*
- d) *Species selection criteria, based on climate change impacts and adaptation needs (select species with wide ecological range and higher drought resistance, considering the bioclimatic type of each site and projected shifts in potential tree species range limits due to climate change, e.g. avoiding planting seedlings from species in the lower limit of their ecological range; planting seedlings from species somewhat above the upper limit of their ecological range). Tables 20 and 21 in Section 7 report the species pre-identified for both regions.*
- e) *Detailed description of the type of interventions proposed, including the list of selected tree species, proposed planting density, number of seedlings per each species, distributional pattern of seedlings from the different species in the land plot, soil preparation techniques, transferring of seedlings to the field, planting works and techniques, post-restoration maintenance activities, and the timing with very detailed schedule of the different activities.*
- f) *Description of the roles and responsibilities for the actors involved, defining the number of days and workers scheduled for each plot (based on best estimate of number of seedlings planted x worker x hour).*
- g) *Required equipment.*
- h) *Monitoring plan.*

The international expert will deliver specific training to selected workers who will act as foremen to coordinate the works in each of the selected sites for planting. Prior to the actual planting Hayantar will organize meetings in the neighbouring communities of the selected restoration sites to present the planned restoration actions, raise awareness about the socio-economic and environmental benefits of

forest restoration, and identify people interested in participating in the field works. Hayantar will seek candidates among local people with previous experience in forestation and who demonstrate a high interest in this work. The selected candidates will participate in a 3-days hands-on training (training of trainers), one organised in Lori and one in Syunik, to learn the different planting techniques employed by the project to ensure survival of seedlings in the context of climate change.

The participants will use the equipment acquired by the project and the training will focus in particular on: (i) opening the hole (at least 40-50 cm deep and 40 cm wide); (ii) distribution of the holes in the plot (following a "quincunx" pattern or staggered arrangement, as a way to catch get the most of the runoff water); (iii) seedling management during planting; (iv) hole protection with mulching - stones and / or chipped wood to avoid evaporation; (v) the construction of micro-catchments on the sides of the hole to increase runoff water uptake. The first training will take place the third quarter of year 2 involving the 26 candidates as foremen for the sites to be restored in year 2. Further trainings will take place on the third quarter of year 3, 4 and 5 to refresh the knowledge acquired and train new foremen (about 40 foremen each year). The trained foremen will become trainers who will provide "learning-by-doing" training to the teams of workers involved in the restoration activities (520 people in total).

To develop effective local governance mechanisms for the planning, implementation and monitoring of forest restoration interventions on municipal lands, the project will build on already existing conservation agreements signed between WWF, the implementing local NGO and the respective municipality. The project will organize information events in the target municipalities, involving all concerned actors (e.g. local governmental staff, local users and organizations, local Hayantar staff), to introduce the project objectives and proposed actions for improving the forest cover in the municipal land.

The project and the WWF will support the implementing local NGO with the preparation of the forest restoration plan for approval by the community leader. Support will be provided in particular with the selection of the native species to be planted, and planning the different steps of the restoration process, from the soil preparation to the planting, maintenance and monitoring tasks. Additionally, the implementing local NGOs will receive training to increase the members' skills on forest restoration techniques (Activity 1.2.2).

Activity 1.2.2: Planting and maintenance work on selected forest fund lands (6,300 ha) and Municipal Lands (1,000 ha).

State Forest Land (4,700): The project will restore an average of 784 ha of forest fund land every year from year 2 to year 6 of the project and ending planting activities in autumn of year 7 with replacement of dead seedlings on previous year's plantings sites. Two planting densities will be used: (i) 2,000 seedlings/ha in 392 ha of deforested sites; (ii) 600 seedling/ha in 392 ha of degraded forestland that maintains an average of 60% tree cover and shows regeneration problems. The proposed planting densities are lower than those used in normal afforestation, so as to reduce seedling competition for the scarce water resources, especially during the summer drought period, as an adaptive measure to climate change projections. Between 4 to 10 different native species will be used in the same restoration site, with the objective to accelerate the recovery of the ecological process and ecosystems services of the forest and build resilience to climate risks.

Species for each restoration plot will be selected based on the species composition of the reference ecosystem (well-preserved forest site in the vicinity of each plot). The %age of seedlings of the species that in the reference ecosystem dominate the forest canopy, will be between 60-80%, while the %age of seedlings of accompanying species will be 20-40%. Seedlings from different species will be placed alternately in the planting plots. When pine seedlings are used, it will be important to combine them with other re-sprouting canopy species such as *Quercus* spp. with the objective to increase resilience to climate risks, especially forest fires. In case of degraded areas with poor and/or instable soil conditions, 60-80% of the seedlings will belong to pioneer species well-adapted to grow on and fix instable soil (e.g. *Celtis* spp., *Rhus coriaria*, *Pistacia atlantica* subsp. *mutica*, *Hippophae rhamnoides*).

It is expected that about 40% of the restored hectares (314 ha annually) will need to be fenced to prevent

impacts from livestock, mainly cattle. The project will acquire the necessary equipment (wood poles, barbed wire and braces). Considering an average surface of 30 ha per restoration plot, it is expected that the project will restore 26 sites every year (13 in Lori and 13 in Syunik), which implies the hiring and organization of 26 teams of 20 workers each, led by a trained foreman. It is estimated that one worker will open, plant seedling and add mulching in 96 holes per day (8 hours of work), corresponding to the planting of 1 hectare with 2,000 seedlings or 4 hectares with 600 seedlings in 20 working days per person (which may be equal to the available days for planting between the first rainfall in autumn that have moistened enough the soil and the arrival of intense winter cold).

The project will acquire the necessary equipment for the field restoration works, including: (i) 104 lightweight, one-man, power augers for drilling holes (4 augers per team); (ii) traditional pick, forked hoe and shovel hoe, and combo pick/hoe, mainly used in hardly accessible places where the earth auger cannot be used (the project will assess the availability of this traditional equipment and buy the missing ones). The international expert who trained the foremen will follow up the planting activities during a 12-day mission over the first 4 years of planting activities, during which he/she will supervise the planting works in at least two sites a day, to cover half of the sites to be restored each year, and will assess results from previous years. The expert will discuss with Hayantar staff any planting problem and possible solutions, and will write reports with recommendations to improve planting operations in the following years.

It is expected that planting performance will improve every year, as the workers gain more experience with the practice, and mistakes of previous years will be corrected (including the replacement of workers who do not demonstrate having the necessary qualities and/or interest). On average, the project estimates that at the end of the project the survival rate will be at least 80%. This will entail a progressive improvement of the skills of the planting teams, moving from an estimated survival rate of around 50-60% at the beginning of the project to at least 80% at the end of the project. In order to replace dead seedling and close resultant gaps, it is planned to replant 30% in the year following the planting of the restoration plot.

Municipal Land (1,000 ha): With regard to municipal land, the implementing local NGOs⁷¹ will develop between June and October of year 2 forest restoration plans to guide the restoration works in the respective municipalities. The plans will be assessed and validated by the project, based on the technical input provided by the hired international expertise and WWF. WWF-Armenia had already established the necessary arrangements with both the municipalities and the communities so to enable the creation of the planned municipal forest. Arrangements have been formalized by WWF-Armenia and the involved communities in Syunik marz. Areas selected for the afforestation will be managed by a local CBO (Civil Voice NGO) that will receive equipment and training from WWF-Armenia so to ensure sustainable management of planted forests. These new forested areas will be part of the eco-corridor joining Iran with Georgia.

A major difference between forest fund and municipal lands will be that in the case of municipal lands restoration works may be close to human settlements. Restoration interventions will have lower densities (up to 1,000 seedlings per hectare) with the objective to establish open areas with scattered trees, whose maintenance is facilitated by mowing in the first years, but followed by grazing in the following years in which livestock does not pose a risk for the growth of the trees any longer. The maintenance of open areas with scattered trees and browned grass will be an effective measure of reducing the risk of fire in high fire risk areas near human settlements. The project will restore an average of 250 ha of municipal land every year, starting in autumn of year 2 and finishing in autumn of year 5. The project will use the planting density of 1,000 seedlings/ha, indicatively arranged as follows:

- a) About 400 seedlings of native fruit trees (e.g. *Pyrus* spp., *Malus* spp., *Crataegus* spp., *Juglans regia*, *Celtis* spp., *Pistacia atlantica* subsp. *mutica*) will be distributed throughout the site every 5x5 meters.

⁷¹ The local NGO (Civil Voice) is a partners of WWF-Armenia. The project will not transfer resources to the NGO as this is already fully assisted within the WWF-Armenia project ("Promotion of Eco-corridors Programme in the Southern Caucasus").

- b) Shrub-like thorny fruit species, such as the sea buckthorn (*Hippophae rhamnoides*), and other fruit shrubs, such as *Cornus mas*, will be planted approximately every 1 meter in shelters surrounding the restoration plot.
- c) Aromatic shrubs, such as *Origanum vulgare*, could be planted in lines alternating with the lines planted with native fruit tree species.

The shelterbelt of fruit shrubs will protect the restored plot against entrance from livestock and people, especially the sea buckthorn that grows very fast resulting in a very dense, impenetrable green barrier. Between 4 to 10 different native species will be used in the same restoration site, with the objective to accelerate the recovery of the ecological process and ecosystems services supplied by the forest, and build resilience to climate risks. Planting operations will be implemented by the same workers and foremen trained by the international experts for the restoration of State-owned degraded forest land. Considering the proximity to inhabited areas and roads, it is expected that all the restored hectares will be fenced to prevent impacts from livestock, mainly cattle. The project will also acquire the necessary equipment for fencing (wood poles, barbed wire and braces). The international expert who trained the foremen will follow up the planting activities over the six years of planting activities, during which he/she will supervise the planting works. The expert will also discuss with Hayantar staff planting problems and possible solutions, and will write reports with recommendations for improving planting operations in the following years.

Restoration of degraded coppiced forests (1,600): In addition to forest restoration through planting on 4,700 ha of forest fund lands, at least 1,600 ha of degraded coppice forest on forest fund lands will be restored. The project will support Hayantar to establish a minimum of 10 sites (5 in Lori, 5 in Syunik) where adaptive management measures will be applied, monitored and approved to become regulations for the community-based concessions.

Sites will be defined in forest areas of Lori and Syunik marzes that are close to the project areas for planting and where Hayantar has already planned management operations (e.g. the thinning of degraded coppice forest stands; pest management of unhealthy forest stands; post-fire management of burned forest stands) and where community groups have demonstrated interest to apply for concessional management in accordance with Government Decree N 583-N. Selected sites will be complemented by forest sites assigned for thinning operations with the aim to convert with technical support and supervision by the project degraded coppiced forests into coppice with standards. Routine coppicing activities carried out by the various forest enterprises under Hayantar (planned on 460 ha of state-owned lands in 2019) could gradually be replaced by adaptive forest management in the longer term.

The project will monitor field restoration results through several methods on both, forest fund lands and Municipal lands: (i) establishing permanent monitoring plots in the restored sites, to be assessed by Hayantar staff twice a year (early spring and early autumn); (ii) through supervision missions of the international expert during the annual planting seasons; (iii) analyzing satellite images.

Output 1.3: By Y7 at least 1,700 people (of which at least 30% are women) from Hayantar, local authorities the private sector and the civil society are empowered in sustainable and climate adaptive silviculture: The Project addresses key weaknesses of the current forest sector and aims at creating an enabling environment for its sustainable development. Sustainability of the results of the project depend on the improved capacities of professionals and civil society alike, to put sustainable and climate adaptive silviculture into practice for the benefit of Armenia's forests and Armenia as a whole.

Activity 1.3.1. Development and formalization of the training curricula with the MoE and the Institute for Vocational Education and Training of required trainings: The project will involve national institutions to ensure that capacity development needs, identified by the technical experts and initially used to train stakeholders on specific tasks, are transferred not only to Hayantar staff, other forestry professionals and workforce already working in the sector, but included in national curricula related to forestry and forest plant production.

Although special attention will be paid already during the implementation of the project to involve and empower younger professionals to ensure that knowledge remains in the Country in the longer term, the agreement with MoE will further contribute to the sustainability of the project's results, in particular in relation to adopting sustainable and climate adaptive forest management practices in Armenia.

Activity 1.3.2: Capacity Development of at least 1,700 people from Hayantar, Armenian Civil Society, Academia, Vocational Schools teachers and private sector: Through the collaboration with the Armenian Institute for Vocational Education and Trainings this activity will particularly contribute to reaching the intended national commitment on "Capacity strengthening" through establishing a consistent process for professional training and education on climate change-related issues (Nationally Determined Contribution (2015)). Through various training activities the project will significantly contribute to improve capacities of professionals and forest workforce, but also other relevant stakeholders including the private sector involved in plant production and nursing, to integrate sustainable and climate adaptive approaches in their daily work, both in planning and implementation. Since year 1 the will organize a series of workshops and dedicated trainings (based on experience developed with C1 in Lori and Syunik), involving forest administration, the private sector involved in plant production/nursing, CSO, the academia and communities. Topics of the capacity development process will be:

- a) **Climate Adaptive Plant Production** including training on principles of seed/plant material collection for seedling production and handling of seeds after collection in autumn of year 1.
- b) **Climate Adaptive Planning and soil preparation** including training courses on forestry, with particular focus on sustainable and climate-adaptive forest management approaches (1.5 days) in 207 communities from year 1 to year 4 of the project. The trainings will be held back-to-back with the WWF trainings to minimize costs.
- c) **Climate Adaptive Planting and Maintenance** including Trainings on climate adaptive Forest Investment and community ecosystem management (2.5 days) in 207 communities from year 1 to year 4 of the project. The trainings will be performed by WWF Armenia and form part of WWF's contribution to this project
- d) **Ecosystem Based Approach to Forestry and ecosystem services** including national study tours for stakeholders to sites established by Hayantar with support from the project (year 1-5).

The project will gather monitoring data about results from the project investments and field implementation interventions, to help improve management and demonstrate the effectiveness and impact of the project. In addition FAO will help the project identify successful FLR examples, with lessons learned transferable to the Armenian context. The project will then organize learning tours to countries with successful experiences on FLR applicable to the Armenian context: Already in the design phase of the project, FAO organized a visit by the Manager of the Shouf Biosphere Reserve (Lebanon) to introduce the results and lessons learned from an FLR initiative that is part of the FAO FLR Mechanism. Technical assistance will be complemented with the organization of learning tours to neighbouring countries with successful experiences in the production of drought-resistance seedlings for climate change adaptation from similar type of species, such as the FAO Forest and Landscape Restoration (FLR) supported pilot interventions in the Shouf region in Lebanon (Output 3.3). Learning tours will involve key staff from the 3 nurseries, and will take place in years 2 and 3 of the project, one every year.

Component 2: In order to stimulate the envisaged paradigm shift and support Armenia in reaching its climate change and sustainable development targets, rural areas that are typically most disadvantaged need immediate actions to adopt EE technologies in a clear framework defined by national standards and supported by capacity development and sensitization of the private sector, the administrations and the communities.

235. According the available national statistics provided by ARMSTAT, the economy of project areas is still mostly based on remittances and minor agriculture activities and highly supported by available social welfare programs. Over 70% of rural household income is invested in food and basic services such as health care (2.4%), education (0.3%) utilities (10%) and 12% in answering energy needs (for over 74% of rural population this comes from fuel wood).

236. Currently, the large majority of rural families do not dispose of the knowledge or of additional financial resources to shift from the BAU. Shifting to new EE technologies and practices require targeted technical and financial assistance. The GCF investment will not only generate a direct benefit to, but represents also an opportunity for further disseminate EE technologies via neighbor-to-neighbor self-replication. The investment will also stimulate local assembling/production of EE appliances lowering costs for communities as aimed by the national strategies on RE/EE and therefore increasing access to EE appliances also for the poor.

Intervention	Mitigation benefits	Adaptation benefits
Output 2.1: By Y2, National Standards for energy efficiency of heating related appliances are approved and EE companies are trained on how to incorporate them in their operations.	<ul style="list-style-type: none"> • Transfer and scale up of emission reduction technologies and practices. • Low emission technologies are available to citizens. • Engagement of the local private sector in securing low emission development 	<ul style="list-style-type: none"> • Introduced technologies will increase energy security of the poorest and improve management of the energy needs at the national level
Output 2.2: By Y5, At least 15 private EE companies are involved on wood-stoves assembling, installation and maintenance and dispose of skilled labor in project areas.	<ul style="list-style-type: none"> • Reduced emission from single sources. • Increased carbon storage due to avoided fuelwood related disturbance on forests 	<ul style="list-style-type: none"> • Reduced use of fuelwood will reduce pressure on forests increasing resilience against CC negative impacts
Output 2.3: By Y6, At least 9,000 HH use of increased EE wood stoves in project areas and are trained on fuelwood management	<ul style="list-style-type: none"> • Long Term Sustainability of the Intervention, • Increased opportunities for youth and women. • Replicability of the project in Armenia and the Region. 	

Table 26: Component 2 expected benefits

237. Component 2 is cofinanced by 90%-GCF, 7%-ADA, and the remaining 3% is provided by the FAO and the APB. Support from cofinanciers will be invested mostly in ensuring the needed technology transfer to reduce drivers of forest degradation via EE of wood stoves in rural households and to support institutions and private sector enterprises in acquiring introduced technologies and practices and in creating the enabling conditions for the EE market to expand in rural areas.

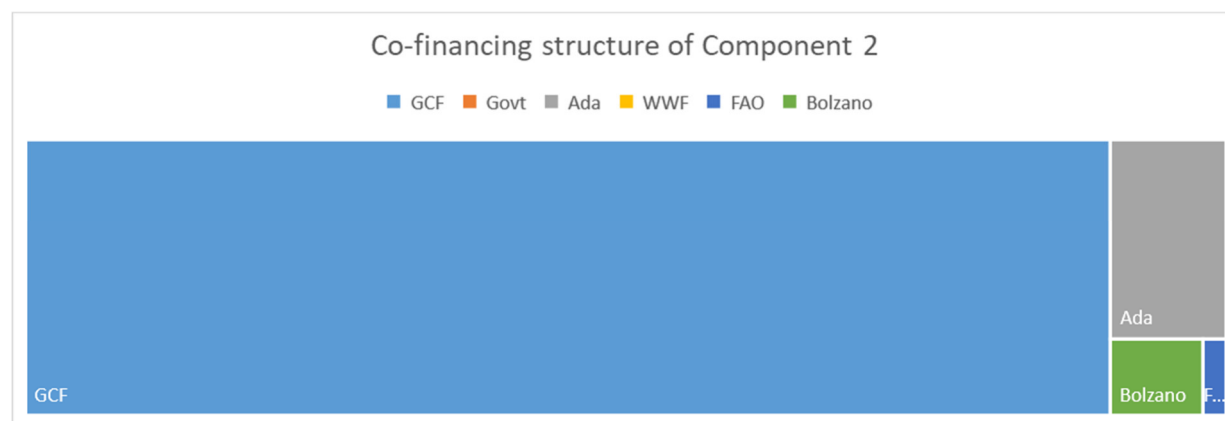


Figure 24: Cofinancing Structure - Component 2

Outcome 2: By Y6, fuelwood consumption per energy unit output of targeted rural communities is optimized and decreased by at least 30%. Since the energy crisis of the 1990s, local craftsmen have been making wood stoves with great success and non-declining sales. The most basic ones are simply a plain combustion chamber with an exhaust pipe. However, local craftsmen have attempted making both firewood stoves and boilers. Forest restoration will not be sustainable if forests are to provide to an inefficient and poorly standardized energy sector. As reported, harvesting of wood for fuel surpasses largely natural regeneration reported for Armenian forests.

238. Wood demand has to be reduced without compromising the already fragile energy needs of rural communities. Technology transfer to ensure higher efficiency of rural wood stoves becomes a precondition to mitigation and to forest long term existence. In order to stimulate the envisaged paradigm shift, rural areas that are typically most disadvantaged need immediate actions to adopt EE technologies. The GCF grant resources will constitute an effective source of funds to start the process towards low carbon emission technology use (and possibly production by the private sector), including in the most disadvantaged rural areas typically less incline to more expensive technologies, and will sparkle the shift and ensure self-funded scalability of proposed intervention.

Output 2.1: By Y2, National Standards for energy efficiency of heating related appliances are approved and EE companies are trained on how to incorporate them in their operations: Safety and efficiency standards are entirely missing for RE/EE appliances in Armenia. Since they are of fundamental importance to create market confidence for consumers and suppliers and to ensure that biomass utilization and production follows minimum quality criteria, the standards represent one of the critical success factors for the development of the sector and are of crucial importance to reach the objectives of the project

Activity 2.1.1. Design and approval process of quality standards for Biomass appliances and Biomass Fuels: An International Expert will support the MoE, the MoENR and the MoEI to develop, based on international best practice, standards for biomass stoves and biomass fuels tailored to the local market condition. During the preparation of his/her work he/she will coordinate with the MoEI, the Chamber of Commerce and representatives of the private sector. The expert will also provide, among the others, guidance on the method of construction, installations and maintenance of the stoves, combustion efficiency, safety requirements and emission limits (CO and others). Furthermore, the expert will provide proposals for standards for biomass fuels (chopped firewood, briquettes, pellets) indicating among others, where applicable, the specifications for fuel size, moisture content, calorific value, ash content etc. In addition, the expert shall provide documentation for assessing fuel wood suppliers and consult on all standards with the competent authorities. A National Expert will work jointly with the international expert so to support the process and provide insight of local legislation.

Concerning biomass fuels, the project will support the development of precise standards and will coordinate with existing private sector actors to sustain sustainable fuelwood management practices in Armenia and to coordinate with the MoE, the MoENR and the MoEI the inclusion of fuelwood and other biomasses among the renewable sources of energy for Armenia.

Activity 2.1.2: Testing of appliances: The design phase will be matched with a process of testing of available wood stoves to establish the standards' baseline as well as validation testing of energy efficient wood stoves. Main characteristics of the testing will be: (i) efficiency, (ii) power capacity, (iii) emissions, and (iv) safety. Testing will occur in the field and under controlled "laboratory" conditions. Involved experts will also have the responsibility of training the staff of the competent centers on testing (MoEI). The project will provide these centers with equipment for the testing.

Output 2.2: by Y5, at least 15 private EE companies are involved and trained on wood-stoves assembling, installation and maintenance. Proposed activities focus on preparing the private sector for supplying efficient wood-fuel technology and for developing small-scale business in the sector according to introduced standards. The project will target the entire EE sector made of about 25 registered companies,

existing unregistered companies will be identified with the support of local NGOs and CBOs⁷².

There is a large discrepancy between the efficiency of the current prevalent woodstove technology utilized in rural areas (20% to 40% efficiency) and the one that is available internationally (60% to 85%, (15)). The project aims at increasing the efficiency of the traditional Armenian wood stoves, while at the same time capacitating companies to import wood stoves from abroad. The aim of the project is to distribute stoves with more than 54% efficiency. The twofold approach of distributing both, locally manufactured stoves and imported ones is giving the beneficiary the possibility to choose from a wide variety of options, and to choose among stoves that allow for cooking and heating, as well as heating alone. In the long term, wood stoves readily available on the market shall correspond to 70+% efficiency and shall be highly automatized to allow for the appliances to be accepted as a modern form of technology, similar to the ones available in Europe and Northern America.

Activity 2.2.1. Coaching of Manufacturers and Retailers: The Armenian market has a dynamic structure, and in the last years several companies emerged that are active in the renewable energy field. Representatives of the private sector will be trained in both the production and the import of EE stoves that can work with the highest possible efficiency with fuelwood and other biomass fuels such as pellets, briquettes and others. The course will cover also the safe installation and maintenance of the EE stoves. Trainings will be practical and will ensure technology transfer to the private sector and to trainers working with the relevant vocational schools in Armenia. Overall efficiency of the stoves shall be higher than 54% (ideally more than 60%) to reach the aims of the project and shall respect the standards established or to be established with relevant institutional stakeholders. The project will also ensure training to the companies on the available technologies on the international market that allow for an efficiency of the wood burning above 70% to ensure coverage of all possible consumers.

Activity 2.2.2: Development and formalization of the training curricula with the MoE and the Institute for Vocational Education and Training of required trainings. The project, in agreement with the Institute for Vocational Education and Training will also transfer technologies and practices into the relevant curricula of national vocational schools of the Ministry of Education. To this end in addition to the trainings provided to vocational schools trainers, the project will ensure international technical assistance to the Institute for Vocational Education and Training and will support 2 vocational schools, one in each beneficiary region, with equipment for repeating the training autonomously.

Output 2.3: By Y6, at least 9,000 HH (of which at least 25% are single women headed) use increased EE wood stoves in project areas and are trained on fuel wood management.

Activity 2.3.1. Technology Grant Support for the adoption of the Renewable Energy (RE) appliances is developed and available for target HH: The activity will have three phases:

(i) Selection of the beneficiaries according to the following priority criteria⁷³:

- Being a permanent resident of a forest adjacent community in Lori or Syunik,
- Being registered in the Social Welfare assistance program,
- Full attendance of the fuelwood management training.

The activity will be done in collaboration with local CSO and municipalities to ensure transparency and effectiveness of the selection process. Local partners will be selected via an open and transparent process following the rules and covenants of the term sheet of the project.

(ii) Distribution of the RE appliances: In order to break the current lack of technology capacity and to ensure the generation of the demand for improved EE stoves, the project has set a twofold approach:

⁷² One of the requirements/ preconditions of cooperation for the selected companies will be the formal agreement of companies to ensure the participation of women in the trainings conducted by the project and/or its partners. Additionally, the project team will consult with national partners and will make every possible effort to encourage involvement of young women to trainings, and ensure that at least 30 percent of trainees are represented by them.

⁷³ The project will give priority to single women headed households that constitute about 25% of rural households.

(i) it will start by importing of EE stoves for demonstration (ranging from 60-70% efficiency, with costs comprised between 400-600 USD each). Considering the lack of alternatives and the high cost as share of rural HH income, the project set the concessionality between 50-60%, the minimum to ensure that beneficiaries enjoy reduced cost for fuelwood (net of their portion of the purchase of the appliance) already from the second or third year after the investment. These net savings represent the adoption incentive for the target beneficiaries in rural areas, and represents the opportunity to increase their use beyond the project intervention by generating awareness, trust and breaking the market barrier. As a result, the technology will start being adopted, serving as example and driver for a demand of technology shift; (ii) by supporting the local manufacturing of more affordable improved stoves (min 54% efficiency, for about 250 USD), the project will ensure sustainability of the technology transfer, and with a short term consumption loan (available in the market) the stoves can be affordable, and pay back the investment within one year (reference: EFA chapter, in feasibility Study). With the energy efficiency trainings, the awareness and information campaigns, and the support to the adoption will create a demand for stoves beyond the project area, and the local manufacturing of stoves is potentially a lucrative economic activity (the 10-year IRR and NPV are positive even with a reduction of sale price of one stove by 15%), and can moderately contribute to employment generation in rural areas (especially for youth). The prevailing low level of income and purchasing power of the target beneficiaries makes the EE appliances an unattractive investment (the imported EE stoves cost between 30 and 45 % of their annual income). The procurement would not be feasible without grant resources, allowing the beneficiary to afford the improved technology with a disbursement that ensures net savings in maximum 2 years. Among the beneficiaries' selection criteria, the proximity to the forests is the one that maximizes the benefits of the grant as it ensures emission reductions. The grants are provided with reduced concessionality for individuals depending on vulnerability, income, and HH composition. The delivery mechanism would entail that: (a) the Project or a selected party (an NGO working through letter of agreement) identifies the eligible households, against the set criteria which would include among others: gender, wealth, and proximity to the forests; (b) the Project selects the eligible households, based on the eligible list as of point a; (c) the Project procures one or more suppliers through tender; (d) after approval by the project, the HH beneficiaries pay the agreed part of the investment, and the selected supplier proceeds with the full installation of the technology; (e) a third-party entity with technical capacities assesses the successful installations and reports to the Project; (f) the Project reimburses the supplier with the remaining part of the investment.

- (iii) Compliance and technical verification.** Georeferencing of the distribution of the appliances will allow for easier monitoring of the distribution. An independent company will visit the project areas to carry out spot checks and technical tests and to evaluate both the distribution process and its reached efficiency. Other parameters of evaluation will be quality of the stoves, consumer satisfactions and actual savings occurred. Since the stoves will only be distributed to municipalities that participate actively in the project, the local administration will also play an active role in the monitoring by indicating locations of the beneficiaries and assisting the experts on the ground.

Component 3: The third component of the project will assist stakeholders in creating the enabling conditions to execute the Government Decree "*May 4 2006 N 583-N Provision of state forests to concessional management for the community organizations without competition*" and in supporting stakeholders in considering forests and biomass (fuelwood) within the sources of energy to maintain and manage to increase energy security of the Country and of rural populations. The component will provide institutional and community support so to ensure sustainability and climate adaptive management and enhancing the capacity of rural communities to engage in forest governance.

239. Forests are crucial for the well-being of humanity. They provide foundations for life on earth through ecological functions, by regulating the climate and water resources and by serving as habitats for plants and animals. Forests also furnish a wide range of essential goods such as wood, food, fodder and medicines, in addition to opportunities for recreation, spiritual renewal and other services.

240. The newly established State Forest Committee, Hayantar, administration at regional and municipal levels, as well as communities will require time and incentives to shift from the Business-as-Usual (BAU)

scenario to new approaches in governance of forest and tree resources, as well as management of climate change's impact on forest ecosystems and related land uses (agroforestry, silvo-pastoral systems) at all levels including energy security. The project will assist stakeholders to put the Government Decree "May 4 2006 N 583-N Provision of state forests to concessional management for the community organizations without competition" into practice and to change the way forests in the Marzes of Lori and Syunik are managed for the benefit of rural communities to cover rural communities' needs and reduce rural poverty.

Intervention	Mitigation benefits	Adaptation benefits
Output 3.1: By Y5, the guidelines to enhance participation and engagement of Community in sustainable and climate adaptive management of forest are approved by the MoE	<ul style="list-style-type: none"> Increased carbon storage thanks to sustainable and climate adaptive forest management. Reduced pressure on existing stands will allow higher rates of natural regeneration and therefore increase carbon storage at no cost for the national budget. 	<ul style="list-style-type: none"> Climate adaptive methods and practices introduced by the project and formalized in the guidelines will increase the resilience of forests and mitigate negative impacts of CC.
Output 3.2: By Y5, A National Forest Monitoring and Assessment System (NFMA) established, the first inventory cycle completed, discussed with stakeholders and results mainstreamed into relevant policies.		<ul style="list-style-type: none"> Increased knowledge of forests, their distribution and the ecosystem associated will increase the options available to policy makers and enhancing resilience and mitigating negative impacts of CC.
Output 3.3: By Y8, at least 300,000 people (of which at least 52% women) from 207 rural communities in project areas are informed, sensitized and empowered on climate adaptive silviculture, Energy Efficiency and climate change mainstreaming	<ul style="list-style-type: none"> Long Term Sustainability of the Intervention, Increased opportunities for youth and women⁷⁴ Replicability of the project in Armenia and the Region. Climate Change mainstreaming in National policies. 	

Table 27: Component 3, expected benefits

241. Component 3 is cofinanced by 40%-GCF, 21.4%-RoA, by 17.2%-ADA, 18.4%-FAO and the remaining 3% is provided by the APB. Support from cofinanciers will be invested mostly in ensuring the needed technology transfer to reduce knowledge and technology gap and to support institutions communities in acquiring introduced technologies and practices and in creating the enabling conditions for sustainable and climate management of forests and related ecosystem services.

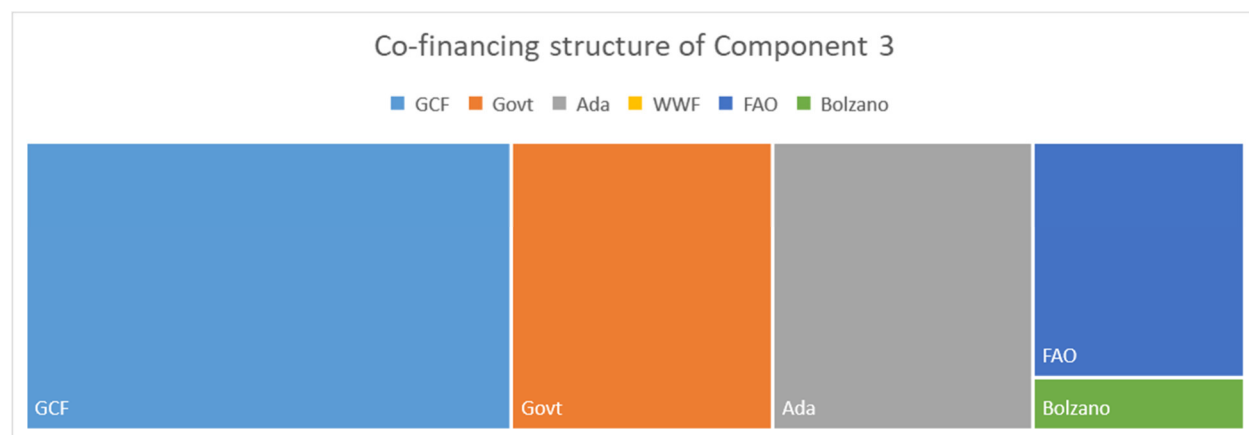


Figure 25: Cofinancing Structure - Component 3

Outcome 3: By Y8 central and local governance of forest ecosystems is strengthened and mainstreamed among local administrations and communities: Forests in Armenia have been under pressure from increasing demands of land-based products and services, which frequently led to the conversion or degradation of forests into unsustainable forms of land use. When forests are lost or severely degraded, their capacity to function as regulators of the environment is also lost, increasing flood and erosion hazards, reducing soil fertility and contributing to the loss of plant and animal life. As a result, the sustainable provision of goods and services from forests is jeopardized.

242. Lack of reliable and up-to-date information on the current status and dynamics of forest ecosystems

⁷⁴ To avoid escalation of the VAW caused by involvement of women in the project activities, the most important undertaking of the project should be a profound awareness raising work with communities and families, especially men.

of Armenia seriously hamper evidence-based decision making in relation to forest governance and management issues at local, regional and national levels, as well as developing appropriate policies and long term strategies for the forestry sector. In response to the demand for reliable information on forest and tree resources the project will support establishing a national forest monitoring and assessment (NFMA) system, to generate cost-effective information on forests and trees outside forests, including all benefits, uses and users of the resources and their management.

243. The project will place special attention on monitoring the state and changes of forests, and on their social, economic and environmental functions, to provide evidence and inform authorities as well as the public in a transparent and consistent manner on the forest sector's performance. Thus, the project will raise awareness and stimulate public discussions about the need of changes in forest governance, institutional set-up and management practices, as well as to embrace an ecosystem-based adaptation approach, holistically addressing the environmental, social and economic challenges of forest restoration in a climate change scenario with about 30% of the total population energy poor and heavily dependent on ecosystem services.

244. As reported in the previous sections (Section 6 pg.25) the Country has developed in the past years a comprehensive forest code that is operational since 2005. As described the Armenia Forest Code (2005) set the framework for communities and local authorities to participate in forest's governance and the participation of different actors. Nonetheless, although the by laws to execute the code are effective, the code is not yet operational in terms of community governance and engagement of the private sector. Therefore, the project will support the operationalization of the Forest Code (2005) enabling communities and other identified stakeholders to engage in forest governance according to laws and to organize such engagement with an ecosystem based approach thanks to the evidence build by the project and the consolidation of the national forest monitoring framework.

Output 3.1.: By Y5, the guidelines to enhance participation and engagement of Community in sustainable and climate adaptive management of forest are approved by the MoE: By engaging in community-based forest management with a climate change adaptation focus, rural communities and local actors in the Marzes of Lori and Syunik, the project, in close consultation with Hayantar will support rural communities, local actors and stakeholders in the Marzes of Lori and Syunik, in the development and testing of guidelines for community-based forest restoration and management to help translate the Government Decree "May 4 2006 N 583-N Provision of state forests to concessional management for the community organizations without competition".

Activity 3.1.1. Development of sustainable and climate-adaptive forest governance guidelines applicable under forest concessions for community organizations: In the second half of year 1, the project will hire national and international expertise to gather, analyse and map information about: (i) national regulations for the management of forest biomass, fire prevention and post-fire management, and the collection of NWFP; (ii) the implementation of regulations in Hayantar operations in Lori and Syunik forest stands; (iii) the formal and informal involvement of community organizations and individuals in the management of wood and non-wood forest products in the project areas of Lori and Syunik; (iv) other organizations and actors, including the private sector, involved in the harvesting, production and marketing of wood and non-wood products in the project areas. (v) the importance of forest and related ecosystem services in supporting energy security of Armenia.

The sustainable and climate-adaptive forest governance guidelines⁷⁵ will be developed on the basis of the in-depth analysis provided by involved expert and with support of an international forest governance expert. The guidelines will serve as a model to address - within the legal frame work of the existing Forest Code, Government Decree (2006, N 583-N) and any other relevant national legislation - the followings:

- a) Responsibility for the preparation of the Forest Management Plans (community level);
- b) Format and technical requirements of the Forest Management Plans;
- c) Public review and approval process of the Forest Management Plans;

⁷⁵ Produced polices and guidelines will be gender responsive, and the staff will be trained on how to use them, and will be also exposed to awareness raising and sensitization.

- d) Climate-adaptive management measures to be followed in forest restoration (planting and maintenance) to increase resilience to climate risks and improve carbon storage capacity.
- e) Involvement of community organizations in NWFP use (including cattle grazing, installation of beehives, collection of wild fruit, nut, mushrooms, berries, herbs and technical raw materials),
- f) Role and responsibilities of communities in fire prevention and post-fire management.
- g) Role and responsibilities of communities in monitoring forest's health and potential threats for which following the example of Georgia⁷⁶ by [the NGO CENN](#) could serve as a model.
- h) Role and responsibilities of communities in ensuring sustainable fuelwood management as well as sound harvesting, management and handling practices via organized aggregation/platforms/cooperative that will allow a sustainable and monitorable sourcing of fuelwood in the country.

In terms of best practices in adaptive forest management to increase resilience against the current and projected more frequent and intense drought and heat waves (and the consequent higher risk of large-scale fires and pest outbreaks), the project will focus on the management of the forest biomass. This will help reduce water stress and competition among trees (and among tree stems in coppice woodlands), and prevent the accumulation of dry biomass that significantly increases the risk of fire and forest pests. The project will replicate and adapt best practices on biomass management for forest and climate change adaptation developed under EU funded research projects in the European Mediterranean countries.

Forest management plans for up to 10 communities will be prepared within the lifetime of the project on the basis of the developed guidelines after their approval by the MoE. Unlike in the case of Hayantar, concessional management is a competing concept for the newly established State forest committee as the Committee has no managerial functions with regard to forests. The Committee will therefore be instrumental for providing forest areas management rights and responsibilities to local communities.

The international experts hired by the project to guide and provide technical support will write the guidelines as well the three publications - (i) plant production and planting techniques for forest restoration; (ii) adaptive forest management and (iii) sustainable fuelwood management – which will be annexed to the guidelines and that will be prepared for communities. Additionally, the expert will prepare a policy guidance paper to ensure that developed guidelines as well as other relevant experiences deriving from the project are mainstreamed across all actions taken by policy makers and institutions to support the upgrade and enhancement of the current forest Code (2005) that is currently planned for revision by the MoE. Finally, the project will hire a creative communication agency to design and publish user-friendly printed materials (e.g. handbooks, videos, factsheets) targeting practitioners (e.g. community groups, Hayantar staff, NGOs). The publications (about 8,000 sets of materials) will be distributed among the municipalities of Lori and Syunik, the central and local offices of Hayantar and concerned ministries, and among project partners. Electronic versions will be also available in the web.

The printed materials will be used by Hayantar staff to guide practitioners in the climate-adaptive forest restoration and forest management interventions planned for the years after the end of the project, and aimed at fulfilling the government's objectives of doubling the country's forest area. The project investments in capacity development of key stakeholders (e.g. Hayantar, community groups, NGOs) such as equipment, plant material (high quality seeds and seedlings), and printed materials with implementation guidelines, will ensure long-term sustainability in the pursuit of the national climate change adaptation and mitigation objectives linked to forest restoration, protection and management, as described in the NDC.

Activity 3.1.2. Institutional and Community Support in applying climate adaptive forest governance guidelines including rural EE and climate change mainstreaming: The transfer of responsibilities to the local communities in the exploitation of forest resources will require from all involved stakeholders of a solid knowledge of the ecosystem services provided by the forests, the value of the main provisioning goods such as firewood and NWFP, and the type of management that allows to reconcile forest resilience against climatic risks, a sustainable and balanced economic use that does not

condition the availability of a resource to the detriment of others, and the conservation of biodiversity.

The project will support Hayantar and respective community-based stakeholders to establish a minimum of 10 sites (5 in Lori, 5 in Syunik) where adaptive management measures will be applied, monitored and approved to become regulations for the community-based concessions. Sites will be defined in forest areas of Lori and Syunik marzes that are close to the project areas for planting and where Hayantar has already planned management operations (e.g. the thinning of degraded coppice forest stands; pest management of unhealthy forest stands; post-fire management of burned forest stands) and where community groups have demonstrated interest to apply for concessional management.

At the beginning of year 2, the project will hire an international expert with solid knowledge on the management of forest biomass with the multiple objective to reduce climate risks, increase the accumulation of carbon, enhance ecosystem services, and sustainably use wood and non-wood products. The international expert will prepare case studies, based on positive experiences from the US, Spain, Lebanon and other countries, to support decision making in designing management measures for the 10 sites and the coppice with standards sites. Based on the recommendations of the national and international experts, the project, will discuss and agree with the Forestry Committee and Hayantar on the management measures to be implemented in both the 10 selected sites and the coppice with standards sites. These measures will define concrete actions to:

- a) Apply effective thinning operations in degraded coppice stands to help reduce competition for the limited water resources among trees, and consequently reduce the weakening or death of trees, the outbreak of pests and the risk of fire spreading over the accumulated dry biomass.
- b) Understand the combined use of thinning and livestock grazing as a fire prevention measure in high fire risk areas within forest landscapes and in the urban-forest interphase areas.
- c) Assess the potential positive impact of effective thinning operations in the availability of NWFP, such as mushrooms.
- d) Understand the effect of post-fire management of snags and woody debris on forest regeneration and soil stabilization, as well as on social demand.
- e) Understand the combined effect of thinning and seedling planting in increasing resilience against pest outbreaks, dieback events and forest fire.
- f) Understand the effects OF fuel wood availability, quality and quantity ON community needs and demand.
- g) Understand the positive and negative effects of sanitary cuttings to decide whether to undertake them or not, on which %age and type of trees, etc. The aim is to avoid the artificial removal of hollow trees that are important for cavity nester insectivore birds and bats, which regulate the abundance of the imago moths preventing pest outbreaks.
- h) Fuelwood handling and management and marketing.

In the second quarter of year 2, the project will organize working sessions and meetings with the national and international experts, and the relevant stakeholders to introduce the different types of adaptive management interventions to be replicated, reach an agreement, and define a road map for the following 5 years - starting in winter year 2. A working group with representatives of the aforementioned actors will organize visits to the selected sites, where they will meet with the municipalities to discuss the proposed actions and define the terms of participation of the communities. The working group will deliver a management plan with the definition of goal, the stand description and quantification of available resources (e.g. wood, NWFP), the management practices to be done within the next years (until the end of the project), actors involved, tasks and responsibilities and calendar.

From year 2 of the project, communities will also be trained on forest restoration to help them define the forest restoration goal for their own municipality, select candidate restoration sites, identify suitable native tree and shrub species that better suit the societal demand for multiple benefits (e.g. improvement of ecological conditions, land protection, income generation), and develop the restoration plan to guide the field planting, maintenance and monitoring interventions.

The project with the support of an international expert (same expert as the one supporting Activity 1.2.2)

will develop a capacity development plan, agreed with the recipients including theoretical sessions and field training sessions following a “learning-by-doing” approach, to acquire knowledge on native species plant production protocols, field restoration techniques, the sustainable management of forest biomass through thinning and pruning, the harvesting and processing of NWFP, and monitoring of forest restoration.

The first round of training events will occur in spring year 2, with an introduction of forest restoration and its multipurpose ecological, socio-economic, and climate change adaptation/mitigation benefits. Field sessions will include visits to neighbouring forestland to identify and discuss potential benefits from the native trees and shrubs. The second round of applied training will take place in autumn year 2, in parallel with the planting activities that will occur in at least 2 of the municipalities of each cluster. Autumn training events will happen during the following 3 years, as a refreshing exercise of concepts and methodologies, and as a forum to assess successes and mistakes in the already restored areas, and propose improvements.

The international expert will support the development of the training materials and will supply practical training sessions during their annual missions of monitoring and supervision of the planting campaigns. The project will promote and facilitate exchanges of information and know-how among CFUs with the objective to develop a network of communities of mutual support in each marz (Syunik and Lori). CFU members will also benefit from the learning tours organized by the project to Hayantar tree nurseries, and to neighbouring countries with successful experiences in the production of drought-resistance seedlings for climate change adaptation from similar type of species, such as the FAO F&LR supported pilot interventions in the Shouf region of Lebanon (Output 3.1.2).

In the second quarter of year 2, the project will organize two practical training workshops of two days each in Lori and Syunik, mainly involving Hayantar personnel from the Forest Land Branches and Sub-branches in the two target Marzes (3 Branches with 11 Sub-branches in Syunik; 7 Branches with 22 Sub-branches in Lori), and open to local NGO staff and local municipality members. It is estimated that 20 people from each sub-branch will attend the workshops - 660 people in total. The project will hire two international experts (the same two experts involved in Output 1.1) to support the design of the program and to conduct the training. The program will address all the needs to design and implement adaptive forest restoration and management plans, including theoretical sessions, and practical demonstration sessions in the field and in the two tree nurseries established by the project. Considering the change of mentality entailed for moving from a classic forestry approach to a more complex one that incorporates ecosystem-based adaptation, the project will organize one-day annual workshops in the 10 forest Branches of Syunik and Lori throughout year 3, 4 and 5, to refresh concepts and methodologies among Hayantar personnel.

Throughout the implementation of the proposed adaptive management activities, the working group will give technical support to the practitioners to evaluate in quantitative and qualitative terms the impact of the measures taken on forest resources (e.g. wood and selected non-wood forest resources such as mushrooms) and on the health of the forest. This information will be used to better plan the collection of wood and non-wood forest products by local communities and to assess the feasibility of fuelwood based markets organized at the community level. This will include the preparation of feasibility plans and guidelines to organize and develop fuelwood biomass markets and possible related financial inclusion platforms linked to community concessions for coppicing.

The working group will also support interested community groups to prepare the necessary documents to apply for concessions, and will train them on the technical aspects of adaptive management and on the economic aspects of local business for the production and marketing of firewood and NWFP products. The project will support concessionary community groups with basic equipment for the harvesting and processing of firewood, such as high performance chain saw, wood-chipper machine, cut resistant foot wear, face and ear protector, chain saw leather gloves, and chain saw trousers.

The working group will periodically (twice a year) support the community groups in the implementation of the adaptive management practices, and will monitor results from the implementation of adaptive

management measures to assess impact on the forest health and its ecosystem services. Results from the 10 selected sites and the coppice with standards sites where climate adaptive silviculture practices are applied will be analysed and presented in the various training activities related to this topic.

Jointly with the work done with communities and Hayantar, the project will involve municipalities in project areas to support them in developing Development of Local Energy Efficiency Action Plans (LEEAP) (at municipality level). These plans will increase ownership and accountability of the municipalities. The action plan integrates climatic and population projections and resource needs, in particular an efficiency assessment of firewood use as well as wood-based technologies and tackles the possibilities for creating a local wood value chain with proper drying methods and distribution. The documents are complimentary to the SEAP of the CoM. Targets of the LEEAP will become part of the climate adaptive forest governance guidelines. An International biomass management expert will develop the plans with stakeholders joining the team deployed to assist communities in building capacities to manage forest concessions as planned by the forest policy framework. Each of the participating municipality will also be responsible for providing information related to energy to the citizens. The information will present in an easy and consumer friendly way the advantages of energy efficient wood stoves, solar water heaters, thermal insulation of buildings etc. and possibilities for financing these measures also via other projects.

The activity will also include a series of study tours for youth and decision makers in countries with similar contexts but with advanced policies and practices to secure sustainable and climate adaptive forest management without compromising the economic and financial needs of communities. At least 3 study tours are planned from year two to year 4 of the project. The project will also seek collaboration and twinning with similar project realities in other countries such as Lebanon with the Arz Shouf Reserve.

Output 3.2. By Y5, A National Forest Monitoring and Assessment System (NFMA) established, the first inventory cycle completed, discussed with stakeholders and results mainstreamed into relevant policies: To be in position to judge on the sustainability of management of forest resources at various levels (national, regional and forest enterprise levels), their sustainable use and provision of services require reliable and up-to-date information on their current status and dynamics. In the past, information about forests has been traditionally obtained through operational forest inventories which have been designed to support management decisions at the forest enterprise level for the next ten years. Because of the application of ocular methods and the use of prediction models (yield tables) which simplify real condition of forest, the information value obtained from operational inventories is limited as it is often seriously biased, typically underestimating tree volumes and growth. Their thematic scope is usually limited to wood production and extraction, whereas other information needs are not addressed at all (dead wood balance, growth dynamics, forest health, soil condition, biodiversity etc). For this reasons operational inventories are not the best source of information to support decision making and forestry sector development at a country level.

245. For this specific purpose statistically-sound national forest inventories have been invented, using scientifically proven methods of probability sampling to unbiasedly assess the condition and dynamics of forests at the whole country or even regional level. It has been only recently that national forest inventories started to evolve towards continuous forest monitoring systems. Considering the non-existence of any statistically sound forest monitoring in Armenia and taking account of the low quality and outdated forest management plans. the project will establish such a continuous forest monitoring and assessment (NFMA) system covering the whole of Armenia and using permanent sample plots (repeatedly assessed in the field) which proved to be most straightforward and accurate approach to estimate dynamic variables such as change of forest area, change of growing stock, biomass growth and drain (mortality and amount of cuts), etc.

246. A continuous forest monitoring system also allows for evaluation of results on an annual so that decision-makers and decision-making processes can rely on a permanent inflow of unbiased and relevant information on the actual condition of forests and latest trends in timber harvesting, etc. The continuous monitoring system with its annual design will also reduce fluctuations in budget and human resources, and lead over time to mature technological and methodological solutions.

Activity 3.2.1. Assessment of land categories, designing of forest monitoring system and developing national capacities: During the second quarter of year 1 the project will organize a national information needs assessment workshop, inviting all relevant stakeholders interested in forestry and sustainable use of forest resources of Armenia, to shape the scope of future forest monitoring activities. Based on the analysis of information needs and the country's geographical and environmental conditions a forest monitoring system will be designed by the end of year 1. The design will be presented and discussed at a survey design validation workshop in the fourth quarter of year 1. The field survey of the first inventory cycle will start in the beginning of year 2 and finish in year 6 as to allow for the second inventory cycle to start during year 7 of the project. In this way, the set of permanent plots established and visited in the field during the first year of the inventory cycle, will be surveyed a second time during the lifetime of the project and the variables describing changes and forest dynamics can be re-assessed and fine-tuned as appropriate. Thus, the information potential of the monitoring system can be fully developed and also recognized by the national stakeholders. Dynamic variables such as forest area change, forest growth, forest health and amount of wood harvesting are essential for evidence-based decision making, shaping efficient forestry policies and improving forest management practices at the whole country level.

In a first step the current situation concerning land categories will be assessed in year 1 via a Collect Earth (CE)⁷⁷ survey assessing 24,000 sample points evenly distributed over the whole country. In the following years 2- 8 the CE Survey will continue using the most up-to-date images available. This survey will consist of the visual interpretation of sample points (plots) on the basis of high resolution imagery available by Google Earth, Earth Engine and Bing Maps and regularly cover the whole territory of Armenia. Land categories and their changes are among the most important plot attributes which need to be assessed by operators for each sample plot. The main purpose of the CE survey is:

- To reduce the amount of field work by not visiting plots which are obviously outside of forest (and of any other target land category).
- To increase accuracy of estimates of key target parameters (total forest area and its changes, or total biomass and carbon stock and their changes).

International experts on forest assessment and monitoring, on GIS and Remote Sensing as well as Database/IT development and management will perform a series of trainings starting in year 1 of the project and provide technical guidance and support on demand during the implementation of the monitoring system which usually goes through several stages of technological and methodological development. In this way, trial and error situations will be avoided and the tight time schedule for the implementation of the inventory and monitoring activities be followed while at the same time ensuring that international quality standards of data and information on the forest resources are met. In total 669 participant days for workshops and trainings are planned under this component for the whole lifetime of the project. As part of the capacity development it is planned to send four Armenian experts on a two-week study tour to a country in Europe with long term experience in forest assessment and monitoring. A LoA will be signed with the respective host institution to compensate for occurred expenses and overheads due to the study tour.

Activity 3.2.2. Field data collection including survey data management, quality assurance, evaluation and interpretation of survey results: Field data collection will start in year 2 and continue till year 7 of the project when the plots established in year 1 of the first inventory cycle will be re-visited and re-assessed. In year 3 of the project (second year of the first inventory cycle) preliminary results will be evaluated using a limited number of sample plots of the inventory's first year panel. This first evaluation will be a kind of benchmark concerning the survey design and technology, adjustments will be proposed and implemented for the sake of a smooth performance of the survey in the following years.

In year 6 of the project adjustments to the working procedures, the setup of the data collection technology and variables describing changes and forest dynamics, both at individual plot and tree levels will be

⁷⁷ The accuracy of estimates for smaller regions within Armenia (marz level) or when using just one annual set of field sample plots (panel) would be insufficient without CE data. A specific training on Collect Earth interpretation is planned in the second quarter of year 1 before the actual interpretation work starts in year 2 of the project.

required, before re-visiting the plots of the inventory's first year panel in year 7. Furthermore, data of the first five-year long inventory cycle will be analysed in year 7 and results (estimates of target parameters) evaluated with support by international consultants and discussed at the national level with various stakeholders. Regular trainings in field data collection will be delivered by the project before the survey campaign in a given year is launched to maintain common quality standards, and instruct field teams for specific measurement situations they might encounter during field work. Without proper training, quality of data could be seriously compromised and consequently the credibility of results of the forest assessment and monitoring. About 420 participant days (out of the total of 669) are earmarked for these trainings.

Keeping the total surface area of Armenia of close to 30k square kilometers in mind, a grid of sample locations of 2 km by 2 km is envisaged to sample the national territory. This means about 7.5k sample locations for Armenia with an expected number of 832 sample locations within forest (based on the latest official reported forest cover for Armenia of 11.1%, according to FRA 2015). However, for various reasons, but mainly the necessary field checking of the actual land category, the number of sample locations to be visited in the field might reach up to 1.2k. Suggesting a five year long inventory cycle, seven months of field survey in each year of the cycle, a three-person field team (survey leader and two field assistants) and assuming an average performance of 0.6 sample locations per day and field survey team, would result in the need for establishing three field survey teams at national level.

The main bulk of data analysis and evaluation work of survey data will be done in year 3 of the project (second year of inventory cycle when data from the first year panel will be available), in year 7 (availability of data from the first inventory cycle) and in year 8 (availability of data from the re-assessment of the inventory's first year panel). The complexity of the survey evaluation, the need to design the statistical evaluation methodology in concordance with the data collection methodology and to meet the required quality of monitoring results will require the involvement of the international forest monitoring expert and the Database/IT development and management expert to train, guide, support and build capacities of the three hired national consultants (Database/IT, forestry statistician and publication expert), who will be capacitated to continue the forest assessment and monitoring work in Armenia after the lifetime of the project. A specific training on statistical evaluation of forest inventories will be held in the second year of the first inventory cycle. The results of the first inventory cycle will be presented at the end year 7. During the final workshop under output 3.2 (end of year 8) survey results including changes and dynamics (based on measurements in year 7 of the first re-assessed permanent sample plots) will be presented and discussed with policy-makers, authorities, academia, media and the public.

Activity 3.2.3. Assessment of intervention areas and impact by orthophoto mapping and digital surface models: A CIR (Composite Infrared) orthophoto map and a Digital Surface Model (DSM) will be used to capture the baseline situation, to monitor interventions (afforestation, reforestation, enrichment planting) and to assess the status of the intervention areas at the end of the project. These outputs will require repeated drone-based areal missions in Lori and Syunik regions. The overall area covered by orthophoto and DSM shall not exceed 10k hectares (for both regions). It is planned that the orthophoto and DSM will be delivered by the State Forest Monitoring Center (SCFU) in year 1, 3, 5 and 8 of the project (in each mentioned year up to 10 thousand hectares will be covered).

Orthophoto maps will have a spatial resolution (pixel size) of 20 cm or less, and minimum positional accuracy (RMSE, Root Mean Squared Error) of 5 meters (horizontal distance) and 10 m (z) or better. At least 15 GCP (Ground Control Points) will be visited for ground truthing purposes in each of the two regions Lori and Syunik, during the campaigns in year 1, 3, 5 and 8. The coordinate system will be UTM, file format Geo TIFF. The map will include red and green visible bands plus the infrared channel (CIR composite). The positional accuracy, coordinate system and data format of the DSM will be the same as the one of the CIR orthophoto map. The DSM Pixel size will be 0.5 m or smaller.

Output 3.3: By Y8, at least 300,000 people (of which at least 52% women) from 207 rural communities in project areas are informed, sensitized and empowered on climate adaptive silviculture, Energy Efficiency and climate change mainstreaming. Forest restoration under an

ecosystem-based adaptation approach is a quite new concept characterized by the complexity of holistically addressing the environmental, social and economic challenges of forest restoration in a climate change scenario. Very limited experience is still available worldwide in terms of implementation. FAO established the Forest and Landscape Restoration Mechanism (FLR Mechanism) in 2014 to support the global efforts to regain ecological integrity and enhance human well-being through the restoration of the world's deforested and degraded lands (150 million hectares of restored forests by 2020 under the Bonn Challenge; 200 million hectares of restored forests by 2030 under the New York Declaration on Forests).

247. This project aims to contribute to this global effort, by raising awareness and interest of key actors – the government, the private sector, land users, civil society, the media and others – on FLR, and making available innovative tools and knowledge to support Armenian practitioners and decision makers in the improvement of policies and the development of national capacities for its effective implementation. Energy efficiency issues will not be discussed in this working paper on forestry as this issue is covered by a separate working paper.

248. Innovative approaches on mainstreaming climate change adaptation and mitigation under FLR are very recent, and much work is needed to build the awareness and capacity of all practitioners – Hayantar personnel, extension agents, civil servants from the public administration, NGOs, land users and managers, private enterprises – to acquire the necessary skills to implement best restoration and management practices for the survival of seedlings and trees under higher climate constraints, such as more frequent and intense droughts and heat waves. FLR integrates a wide range of options - e.g. direct restoration actions, protection measures, adaptive management interventions - to regain the ecological integrity and climate resilience of degraded forest areas that help conciliate users' interests with the sustainable management and conservation of natural resources.

Activity 3.3.1. Community Empowerment, Awareness and Sensitization: One of the main barriers to the diffusion of sustainable and climate adaptive forest management as well as to the diffusion of efficient RE/EE appliances and practices in rural areas is the lacking of awareness on the advantages and possibilities of these practices and technologies. Communities in project areas, will be informed from year 1 of the project to a series of events and initiatives as well as on social media on the followings:

With the aim to develop effective local governance mechanisms for the planning, implementation and monitoring of forest restoration interventions in the municipal lands, the project will work with informal community based forest user groups (CFU) with priority given to women groups and organizations in the target municipalities where planting interventions will be implemented. The project will organize information events in the target municipalities, involving all concerned actors (e.g. local governmental staff, local users and organizations, local Hayantar staff), to introduce the project objectives and proposed actions for improving the forest cover in the municipal land. The project will explain the expected role of CFUs in the implementation and monitoring of the forest restoration interventions in the municipal land, and will invite participants to propose a list of people representing the different groups of interest as members of the CFU.

Communities, also involving local schools, will be informed on sustainable development opportunities linked to forest restoration under a climate change scenario. Many native trees and shrubs are undervalued species with high economic potential for rural livelihoods, linked to non-wood products. Many wild fruits (e.g. Cornus mas, Sorbus spp., Pyrus spp., Malus spp., Celtis spp., Crataegus spp., Hippophae rhamnoides, Rhus coriaria, Juglas regia, Morus alba) can be eaten fresh when ripe, or used to make juice, jams, dehydrated fruits and slices, spirits, condiments, or constitute an important dietary mineral supplementation in food and medicines. The project will support communities in assessing the economic opportunities linked to the native fruit trees and shrubs from the natural forest ecosystems which will be produced in Hayantar's tree nurseries to supply the necessary seedlings for restoring municipal lands. It is expected that this will increase the interest of the local population about forest restoration, and consequently will help reduce the underlying causes of forest degradation.

A mobile exhibition will explain and compare modern wood burning technology to obsolete one and will, therefore, include examples of different types of stoves with different efficiency showing how individual choices impacts forests and ecosystem service and on the contrary how changes will improve both the

health of forests and the finances of people. The exhibition (year 2-4-6-8), mounted on a truck, will tour throughout target regions to teach in schools at all levels and to mainstream among communities and institutions the importance of fuelwood management and handling in saving money and protecting the forests.

The project will also organize public events in the different municipalities and demonstrate the improved technology and benefits. Each year a different municipality in each beneficiary region is chosen to host the events that will be organized by local service providers and is intended to provide information and awareness raising to the citizens on the project and EE/RE possibilities in an entertaining and interactive way. A local service provider will be responsible for carrying out the preparation and the implementation, possibly in synergy with other popular local events. Ad hoc media campaigns will be organized by the project at the national level so to magnify project's outreach campaigns. Campaigns both at local and national level will include the importance of fuelwood management and handling in saving money and protecting the forests.

Based on the analysis of monitoring data and lessons learned from the interventions, the project will organize a national conference in year 7 to inform the main stakeholders about the results of the project and the opportunities for upscaling the lessons learned to achieve the government's goal of doubling the country's forest area by 2050. The conference program will include sessions on the specific experiences of the project and of other forest restoration and management interventions in Armenia, as well as on the experience from other countries with which exchanges and collaborations have been carried out under the project. The conference will propose a road map for the upscaling of the project results and lessons learned into a national forest restoration plan by 2050, including both the enabling conditions (policy improvement, capacity development and research) and the technical aspects of FLR implementation.

Component 4 does not appear in the LFM as it relates to how the project will be managed. As discussed and agreed within the national engagement process, the project will be managed by the EPIU of the Ministry of Environment, NDA and formal executing agency of the project. Component 4 will ensure smooth execution of activities, coordination of stakeholders, continuity of the national engagement process, procurement and reporting of project activities to the FAO (AE).

11. PLANNED PROJECT'S COORDINATION AND COLLABORATION

249. The project via the EPIU and the SC will establish a wide range of collaboration with a diverse group of projects and national organizations (e.g. R2E2 as well as other existing or future platforms) so as to ensure magnification of impacts and optimization of resources. When possible, the project will act as catalyzer of the different actions on going in project areas connecting municipalities and communities with projects and connected credit lines (i.e., retrofitting of houses, forest actions, community forest projects, support to market oriented initiatives) with other initiatives that could magnify and/or scale up project's impacts.

#	Title	Donor	Executor	Partner	Info	Coordination	Collaboration
1	Mainstreaming Sustainable Land and Forest management in North-Eastern Armenia	GEF	UNDP	MoE; Hayantar	Start Date 2015 End Date 2020 extended to TBD Budget (USD) 2,977,169 Project areas Lori ⁷⁸ and Tavush		Ensure that climate adaptive practices are integrated in future forest management planning and implementation.

⁷⁸ The MoE is coordinating that there is no overlapping of sites and communities. In order to avoid duplications the project introduced, in agreement with the MoNP, clear site identification criteria (Section 10, Activity 1.2.1 page 73). Each FAO preidentified site is georeferenced and available online www.earthmapdemo.info → Area of Interest (Armenia) → Boundaries (Suitable Sites in State Forest Lands and Suitable Sites in Municipal Lands).

#	Title	Donor	Executor	Partner	Info	Coordination	Collaboration
2	Addressing climate change impact through enhanced capacity for wildfires management in Armenia	Russian Federation	UNDP	MoE	Start Date 2017 End Date 2020 extended to TBD Budget (USD) 1,000,000 Project areas	Support authorities at national, region and local levels to reduce forest fires and thus forest losses through improved capacities of actors involved, in particular at community level.	Develop mechanisms aimed at increasing the level of community involvement in prevention and mitigation of forest and wildfire risks
3	Eco-Corridors Fund for the Caucasus	Gov. of Germany / BMZ through KfW	WWF	MoE Forest Committee MoTA	Start Date 2007 End Date 2017 extended to TBD Budget (USD) 15,000,000 Project areas Armenia, Azerbaijan, Georgia	Develop governance mechanism for forest restoration in municipal land, making use of : Foster Conservation Agreements with local partners	Contribute to putting into practice the provisions of the Forest Code concerning competences of local self-governing bodies in the sphere of sustainable forest management.
4	Integrated biodiversity management, South Caucasus	BMZ / co-financing ADA	GIZ	MoTD	Start Date 2015 End Date 2019 Extended to TBD Budget (EURO) 14,900,000 Project areas Armenia, Azerbaijan, Georgia	Contribute to improving communal forestry management and monitoring.	
5	Support Programme for Protected Areas – Armenia (SPPA-Armenia)	KfW	Various Consulting Firms	MoE	Start Date 2015 End Date 2020 Extended to TBD Budget (EURO) 8,250,000 Project areas Armenia,	Contribute in finding sustainable solutions for rural population to fuelwood access in forest communities.	

#	Title	Donor	Executor	Partner	Info	Coordination	Collaboration
6	Livestock development in northern Armenia	ADA	Strategic Development Agency NGO	MoA	<p>Start Date 2015 End Date 2018 Budget (EURO) 1,516,000 Project areas Armenia, Shirak, Lori, Tavush, Gekharkunik</p> <p>New Phase: North-South in 88 additional communities with SDC funding totalling 5 Mio. Euro, Ende Date 2022</p>	Contribute to improving communal capacities in management of natural resources (pasture management / forest grazing)	
7	Livestock Development in the South of Armenia	SDC	Strategic Development Agency NGO	MoTD MoA Syunik and Vayots Dzor regional authorities	<p>Start Date 2014 End Date 2020 Budget (CHF) 10,000,000 Project areas Armenia, Syunik and Vayots Dzor</p>	Contribute to improving communal capacities in management of natural resources (pasture management / forest grazing)	
8	De-risking and scaling-up investment in energy efficient building retrofits in Armenia	GCF	UNDP	MoE	<p>Start Date 2016 End Date 2023 Extended to TBD Budget (USD) 29,800,000 Project areas Armenia, Yerevan</p>	Develop mechanisms aimed at increasing the level of energy security and energy system reliability including rural areas	Contribute to improving Armenia's energy security by including biomass into the energy equation of Country's policy framework

#	Title	Donor	Executor	Partner	Info	Coordination	Collaboration
9	Green Cities Facility	EBRD	GCF	MoF	Start Date 2018 End Date 2033 Budget (USD) 613,900,000 Project areas Albania, Armenia, Georgia, Jordan, FYR Macedonia, Moldova, Mongolia, Serbia and Tunisia		Contribute to improving Armenia's energy security by bridging rural HH with existing financing schemes supporting additional actions needed to maximise EE at the single HH level. Supporting local producers of EE stoves (potential clients of EBRD) and establishing EE standards in Armenia
10	Covenant of Mayors Initiative	EU	Municipalities	MoTA	Start Date 2008 End Date continuous Budget (USD) N/A Project areas Municipalities in Armenia in Lori and Syunik ⁷⁹	Promote energy efficiency and renewable energy sectors development to optimize fuelwood use in Armenia	Support to local authorities in developing Sustainable Energy Action Plans that include energy from biomass and CC trends/projections
11	R2E2	GoA	National	MoENR	Start Date 2004. Budget (USD) >10 million Project areas National	Promotion of renewable energy in Armenia	The project will extensively collaborate to ensure the inclusion of fuelwood and other biomass energy carriers among the eligible renewable energies for financial support

Table 28: Project's planned coordination and collaboration with ongoing projects in Armenia

⁷⁹ Lori Signatories: Alaverdi, Akhtala, Spitak, Vanadzor and Tashir municipalities. Syunik Signatories: Goris, Kapan, and Vaik municipalities

12. INSTITUTIONAL ARRANGEMENT AND PROJECT MANAGEMENT

Introduction: The Food and Agriculture Organization (FAO) is the GCF Accredited Entity responsible for supervising and providing technical backstopping during project implementation. The Environment Project Implementation Unit (EPIU) nested within the Ministry of Environment (MoE) will implement the project as Operational Partner under Operational Partner Implementation Modality (OPIM – FAO Manual Section 701),⁸⁰ with specific responsibilities in achieving the project outcomes. FAO and E-PIU will involve other partners and service providers for the achievement of project results. Co-financing for the project will be provided by the Government of Armenia, the World Wildlife Fund (WWF), the Autonomous Province of Bolzano - Italy, the Austrian Development Agency (ADA), beneficiaries and FAO as part of its Technical Cooperation Programme (TCP). FAO will ensure coordination of the activities co-funded by Ada, Bolzano, and will manage its own contribution. The Government will ensure coordinating part of GCF grants, its own resources and will monitor beneficiaries' in-kind contributions.

Project execution: The project will be jointly executed by the EPIU in coordination with FAO (as Executing Entity for quality assurance). According to FAO's rules and regulations, the project will be implemented under the Operational Partner Implementation Modality (OPIM). OPIM involves the transfer of funds to Operational Partner (OP) for the implementation of project's components on the basis jointly defined and shared goals where FAO retains overall accountability to the Resource Partner and the Government for proper management of funds, technical quality and results achieved. In order to ensure E-PIU capacity to implement the project as pre-selected executing entities, FAO has commissioned an independent Operational Partners' assessment covering their programme, financial and operations management policies, procedures, systems and internal controls and depending of its finding the described procedure will be confirmed. Other stakeholders may be involved to implement specific outputs via the executing entity's respective procedures. For FAO, these include Letter of Agreement (under Manual Section 507) and direct procurement (Manual Section 502). In its role of Accredited Entity, FAO will maintain overall accountability on the project implemented by the OP, and will perform independent audits and spot checks, besides retaining a role of executing entity for quality assurance throughout the project (as part of its Supervising Entity function). The agreement between FAO and the OP is summarized in the Operational Partners' Agreement. ADA will provide additional technical assistance for the implementation in component 2, with national and international expertise designed according to the needs of the beneficiary.

Project Partners: The Environmental Project Implementation Unit State Institution is the successor of previously operating "Natural Resources Management and Poverty Reduction Project" EPIU State Institution and "Environmental Project Implementation Unit" SNCO reorganized on the bases of the latter. The EPIU State Institution of the Ministry of Environment was registered on 04.02.2011 in accordance with RA Legislation. The Founder of the EPIU is Government of Republic of Armenia. It has its statute, which stipulates the rights and responsibilities, statutory objectives of EPIU, its functions, structure, management, organization of its activities, etc.

250. The main objective of the institution is the provision of efficient implementation of the government's environmental sector projects. The principal spheres of the center activity include programs and works of the Ministry of Environment and territorial administration bodies, the State budget of environmental sector, as well as developed due to the means provided to the government by grant and international creditor organizations of foreign states approved by the Government. The EPIU has statutory reporting requirements according to the national legislation. According to the Statute of EPIU it is under the supervision of the Ministry of Environment on behalf of the Government of Armenia and directly managed by the Director. EPIU presents monthly, quarterly, annual project and financial reports to the supervising bodies.

251. The EPIU is composed of: (a) Management – 7 staff; (b) Donor funded project implementation - 4 staff; (c) eco-capacity development - 3 staff; (d) budget department - 4 staff; (e) Administration - 6 staff.

⁸⁰ The OPIM is described in the FAO Manual Section 701.

Management includes a Director; a Deputy-director; an adviser to the director; a Lawyer; a Senior financial specialist; a Senior accountant; and an accountant. All above mentioned positions are permanent and funded from the state budget.

Project Steering Committee and governance: The project will establish a project Steering Committee (PSC) as ultimate decision making body with regard to policy and other issues affecting the achievement of the project's objectives. The SC will provide policy guidance, review results-based Annual/six monthly work plans and budgets and provide recommendations for resolving any constraints faced by the project. The SC will be critical to ensuring close linkages between the project and other ongoing projects and programmes relevant to the project sustainability of key project outcomes, including up-scaling and replication, and effective coordination of government partner work under the project.

252. The SC will meet on a biannual basis unless there are issues to be discussed in between meetings. The SC will be integrated include by decision-making officials, appointed as focal points by partner institutions: MoE, Ministry of Finance, Ministry of Energy Infrastructures and Natural Resources, the Ministry of Economy and Innovation, the Ministry of Territorial Administration and Development the Ministry of Agriculture, ADA, Bolzano, WWF, and the FAO Representation in Armenia.

253. The SC functions will include: i) ensure the quality of results, and the sustainability and impacts of the project; ii) approve annual work plan and budget (AWP/B) to be sent to FAO; iii) approve six monthly project progress reports to be sent to FAO; iv) approve adjustments to the distribution of budget between items on the basis of information provided by the Project Management Unit; v) approve proposals of adjustments to indicators and the targets of results and outputs, based on information provided by the Project Management; vi) approve possible modifications to the project implementation agreements; vii) invite competent professionals to participate in steering committee meetings, in accordance with the issues under consideration; viii) endorse the selection of the Project Director, based on a competitive selection process. The SC will also support project's activities by promoting results and approaches within the Government and ensuring mainstreaming among political decision makers.

Project management: FAO and EPIU are the Executing Entities of the Project. EPIU will be the Operational Partner under OPIM. The FAO and EPIU will coordinate the project under a joint implementation unit, recruited by the project and benefitting of EPIU staff. The EPIU will be responsible for overall management, supervision, guidance and technical support.

254. **The E-PIU**, be located under MNP, will be responsible for day-to-day project management, providing human resources management, financial and procurement services and management, coordinate and monitor M&E of the project's activities, generate work plans and budgets, project reporting and documentation. The implementation unit will be working under the overall supervision of E-PIU Director and managed by the Project Coordinator (specifically recruited for the project), in charge of the overall management of the project and coordination between all operating partners and project stakeholders. The Coordinator will be supported by a Procurement Specialist, a senior Accountant and an M&E and planning team leader. The M&E and Planning team leader, under the overall supervision of the Project Coordinator, will be in charge of the overall planning, M&E and learning process of the project, and will coordinate a the team of experts composed of an monitoring / communication specialist and a GIS specialist. The E-PIU will liaise with all project partners to ensure coordination of planning and in the achievement of the project's results, and with FAO for technical assistance and support in implementation. See Project implementation unit structure in Figure 1 and Figure 2 below.

255. The **Project Coordinator** will be in charge of day-to-day project management and coordination and supervision including: (i) coordinating and closely monitoring the implementation of project activities; (ii) day-to-day management; (iii) coordination with related initiatives; (iv) ensuring a high level of collaboration among participating institutions and organizations at the national and local levels; (v) tracking the project's progress and ensuring timely delivery of inputs and outputs; (vi) Ensuring effective gender mainstreaming and social inclusion of the project, with the technical support of the gender and social development specialist (vii) implementing and managing the project's monitoring and communications plans; (viii) organizing annual project workshops and meetings to monitor progress and preparing the Annual Budget and Work Plan (AWP/B) for the SC; ix) reviewing and submitting the quarterly reports, six-monthly Project Progress Reports (PPRs) with the AWP/B and FAO; x) submitting the reports as required in OPA (e.g. six-

monthly technical and financial reports)⁸¹ to FAO and facilitate the knowledge (information) exchange between the OP and FAO; xi) preparing the regular reports; and xii) supporting the organization of OPIM quality assurance activities (spot checks, audit), FAO project supervision, the interim independent evaluation and final independent evaluation in close coordination with FAO-Armenia and the FAO Independent Office of Evaluation (OED). Likewise, under FAO-GCF rules and procedures and in conformity with this project document, the Operational Partner Agreement (OPA) and the AWP/B, the Project Coordinator will identify expenses and disbursements that should be requested to FAO for the timely execution of the project. The Project Coordinator will be accountable for monitoring, providing technical support and assessing the outputs of national experts hired with GCF funds, as well as the products generated in the implementation of the project, including products and activities carried out by project consultants.

256. Besides the overall responsibility of the coordination of the SC, under the Operational Partner Agreement (OPA) the E-PIU will be in charge of achieving results under selected sub-components (or parts of them) which is responsible for and where it holds the highest comparative advantages. It will be supported and supervised by technical assistance activities provided by FAO in the form of FAO expert or international / national consultants or partners and service providers of its trust. More specifically, the E-PIU's responsibility will include the achievement of results under outputs 1.1 and 1.2 (with solid FAO support), parts of outputs 2.3 and for parts of component 3.

Project organization

Operational Partners roles and responsibilities: The E-PIU will be the project “Operational Partner” (OP), delivering project results and responsible for the day-to-day management of project components entrusted to it in full compliance with all terms and conditions of the signed OPA. The OP will be responsible for the following:

- a) Commencing work on the responsibilities allocated to it in the Funding Proposal, results matrix and work plan promptly (but in no case prior to signing the OPA) and, as applicable, receipt of the first instalment of the funds, supplies and equipment to be transferred to it by FAO;
- b) Making designated contributions of technical assistance, services, supplies and equipment towards the implementation of the project as provided for under this Agreement, including the Funding Proposal, results matrix, work plan and budget;
- c) Completing their responsibilities with diligence and efficiency, and in conformity with the requirements set out in the Funding Proposal results matrix, work plan and budget;
- d) Performing M&E activities and providing the reports required under the OPA in a timely manner and satisfactory to FAO, and furnishing all other information covering the Funding Proposal, results matrix, work plan and budget and the use of funds, supplies and equipment transferred to it by FAO that FAO may reasonably ask for;
- e) Exercising the highest standard of care when handling and administering the funds, supplies and equipment provided to it by FAO, and ensuring that its personnel will conduct itself with the highest standards of integrity and care in the administration of public assets including money.
- f) Maintaining accurate, complete and up-to-date books and records and keep original supporting documentation as per OPA provisions.
- g) Accommodate monitoring visits of representatives of any Resource Partners that are funding the project, supervision missions organized by FAO and cooperate with auditors during performance of Spot-checks and Audits.

FAO's roles and responsibilities: This project is aligned with the Food and Agriculture Organization's (FAO) Strategic Framework (SO2 and SO3)⁸², which will serve both as: (a) GCF Accredited Entity, being responsible for overall management, implementation and supervising of GCF funded activities in line with FAO rules and Regulations and in accordance with the signed Accreditation Master Agreement between

⁸¹ Preparation of financial reports according to Accreditation Master Agreement (e.g., Disbursement report, Reflowed funds report, Statement of investment income, Unaudited annual financial statement).

⁸² The FAO Strategic Framework is comprised of five Strategic Objectives (SOs) that represent the main areas of work of FAO. This project is linked to Strategic Objective 2 (SO2), “Increase and improve provision of goods and services from agriculture, forestry and fisheries in a sustainable manner” and Strategic Objective 3 “Reduce Rural Poverty”.

GCF and FAO; and (b) as project's Executing Entity, providing quality assurance and technical assistance during the project implementation. The independency of the two roles will be guaranteed by establishing two separate functions as in the following sections.

FAO Role as Accredited Entity: FAO as Accredited Entity. The FAO's supervising role will be attributed to the FAO Regional Office for Europe and Central Asia (REU, located in Budapest) with support by the FAO Climate, Biodiversity, Land and Water Department (CB, located in Rome) and other technical divisions as required. In order to fulfil this function, a specific project supervision team will be established, including FAO staff from REU, CB, and other technical divisions. Such team is referred to as Project Task Force (PTF). The PTF will ensure effective technical, operational and administrative project management throughout the project cycle. PTF consists of designated FAO staff possessing the appropriate authority and skills mix. As per the FAO Guidelines, The PTF is formed by Budget Holder (BH), Lead Technical Officer (LTO), Funding Liaison Officer (FLO), and can possibly involve other Headquarters Technical Officers (HQ-TOs).

257. A Lead Technical Officer will be appointed in the regional office, coordinating the supervision functions. The separation from the role of executing entity will be ensured by the establishment of: (a) regular system of approval of annual work plan and budget – exercised by the Lead Technical Officer (belonging to REU) and the members of the Project Task Force; (b) regular independent supervisions of the project activities throughout the project intervention, ultimately to ensure the project management to take corrective measures if and when required, and (c) through the evaluation functions carried out by the FAO Office of Independent Evaluation (in Headquarters) at mid-term and final stage. More specifically, the FAO Lead Technical Officer (LTO) will have overall technical responsibility of the project implementation. The role of the LTO is central to FAO's comparative advantage for projects, and key to separate the functions of FAO in its role as Accredited Entity and as Executing Entity. The LTO will oversee and carry out technical backstopping to the project implementation. The LTO will support the BH in the implementation and monitoring of the Annual Work plan and Budget (AWPBs), including work plan and budget revisions. The LTO is responsible and accountable for providing or obtaining technical clearance of technical inputs and services procured by the Organization. In addition, the LTO through supervision missions (she/he may call other experts to participate and advise) will provide technical backstopping to the Project Team to ensure the delivery of quality technical outputs. The LTO will coordinate the provision of appropriate technical support from PTF to respond to requests from the Steering Committee. The Funding Liaison Officer (FLO) is responsible for maintaining corporate relations with resource partners throughout the project cycle. In particular, the FLO advises all PTF members on how to ensure all project documentation is in line with resource partner requirements. FLO manages resource partners' specific requests for information on projects and liaises with the PTF and FAO Departments accordingly. FLO plays also a key role in preparing the Funding Agreement, coordinating the appraisal process on behalf of the PTF, endorsing project budgets and budget revisions in FPMIS (FAO specific Field Programme Management Information System) after obtaining clearance from the resource partner as stipulated in the Funding Agreement and clearing project progress and terminal reports. The HQ Technical Officer (HQ-TO) is accountable for advising and supporting the LTO in ensuring project formulation, appraisal and implementation adhere to FAO corporate technical standards and policies.

258. FAO will be the GCF Accredited Entity of the project and, as such, FAO will supervise and provide technical guidance for the overall implementation of the project, including:

- h) Administrate the portion of project GCF funds that has been agreed with the OP to remain for FAO direct implementation. These funds will be managed in accordance with the rules and procedures of FAO;
- i) Monitor and oversee OP's compliance with the OPA and project implementation in accordance with the project document, work plans, budgets, agreements with co-financiers and the rules and procedures of FAO;
- j) Commence and completing the responsibilities allocated to it in the Funding Proposal in a timely manner, provided that all necessary reports and other documents are available;
- k) Making transfers of funds, supplies and equipment, as applicable, in accordance with the provisions of the OPA;

- l) Review, discuss with the OP, and approve the project progress and financial reports, as detailed in the OPA and its annexes, undertaking and completing monitoring, assessment, assurance activities, evaluation and oversight of the project;
- m) Liaising on an ongoing basis, as needed, with the Government (as applicable), other members of the United Nations Country Team, Resource Partner, and other stakeholders;
- n) Providing overall guidance, oversight, technical assistance and leadership, as appropriate, for the Project;
- o) Initiating joint review meetings with the OP to agree on the resolution of findings and to document the lessons learned;
- p) Report to the GCF, through the Annual Project Report, on project progress and provide consolidated financial reports to the GCF (including, e.g., Disbursement report, Reflowed funds report, Statement of investment income, Unaudited annual financial statement);
- q) Conduct at least two supervision mission per year;
- r) Lead the Independent Interim and Final Evaluation, through the FAO Evaluation Office;
- s) Monitor implementation of the gender action plan of the project, framed by the FAO Policy on gender equality, and the plan for social and environmental safeguards, in accordance with the FAO Environmental and Social Safeguards.

259. ADA Role as Project Partner: The Austrian Development Agency will provide additional support via the Climate Change Advisor in Vienna and the Coordination Office in Yerevan. Via an ADA framework contract and upon the needs of the project, additional expertise especially in component 2 of the project will be provided.

260. In collaboration with the EPIU and the SC, FAO will participate in the planning of contracting and technical selection processes. FAO will process fund transfers to the OP as per provisions, terms and conditions of the signed OPA.

261. The Lead Technical Officer (LTO) will have overall technical responsibility of the project implementation. The role of the LTO is central to FAO's comparative advantage for projects and to separate the functions of FAO in its role as Accredited Entity and as Executing Entity. The LTO will oversee and carry out technical backstopping to the project implementation. The LTO will support the BH in the implementation and monitoring of the AWP/Bs, including work plan and budget revisions. The LTO is responsible and accountable for providing or obtaining technical clearance of technical inputs and services procured by the Organization.

262. In addition, the LTO through supervision missions (she/he may call other experts to participate and advise) will provide technical backstopping to the Project Team to ensure the delivery of quality technical outputs. The LTO will coordinate the provision of appropriate technical support from PTF to respond to requests from the SC. The LTO will be responsible for:

1. Assess the technical expertise required for project implementation and identify the need for technical support and capacity development of the OP, including effective gender mainstreaming and social inclusion, within the framework of the FAO Policy on gender equality and the FAO Environmental and Social Standards.
2. Provide technical guidance to the OP on technical aspects and implementation.
3. Review and give no-objection to TORs for consultancies and contracts to be performed under the project, and to CVs and technical proposals short-listed by the PIU for key project positions and services to be financed by GCF resources;
4. Supported by the FAO Representation in Armenia, review and clear final technical products delivered by consultants and contract holders financed by GCF resources;
5. Assist with review and provision of technical comments to draft technical products/reports during project implementation;
6. Review and approve project progress reports submitted by the Project Coordinator, in cooperation with the BH;
7. Support the FAO Representation in examining, reviewing and giving no-objection to AWP/B submitted by the Project Coordinator, for their approval by the Project Steering Committee;

8. Ensure the technical quality of the six-monthly Project Progress Reports (PPRs). The PPRs will be prepared by the Project Coordinator, with inputs from the PT. The BH will submit the PPR to the LTO for technical clearance. The PPRs will be submitted to the SC for approval twice a year.
9. Supervise the preparation and ensure the technical quality of the Annual Performance Report (APR). The APR will be drafted by the Project Coordinator, with inputs from the PT. The APR will be submitted to the BH and the FAO-GCF Coordination Unit for approval and finalization. The FAO/GCF Coordination Unit will submit the APRs to the GCF Secretariat. The LTO must ensure that the Project Coordinator and the PT have provided information on the co-financing provided during the year for inclusion in the APR;
10. Conduct annual supervision missions;
11. Provide comments to the TORs for the interim and final evaluation; provide information and share all relevant background documentation with the evaluation team; participate in the mid-term workshop with all key project stakeholders, development of an eventual agreed adjustment plan in project execution approach, and supervise its implementation; participate in the final workshop with all key project stakeholders, as relevant. Contribute to the follow-up to recommendations on how to insure sustainability of project outputs and results after the end of the project.
12. Monitor implementation of the Risk Mitigation Plan, in accordance with the FAO Environmental and Social Safeguards.

263. The HQ Technical Officer is a member of the PTF reinforcing the role of FAO as Accredited Entity. The HQ Technical Officer is a mandatory requirement of the FAO Guide to the Project Cycle. The HQ Technical Officer has most relevant technical expertise - within FAO technical departments - related to the thematic of the project. The HQ Technical Officer will provide effective functional advice to the LTO to ensure adherence to FAO corporate technical standards during project implementation, in particular:

1. Supports the LTO in monitoring and reporting on implementation of environmental and social commitment plans for moderate risk projects. In this project, the HQ officer will support the LTO in monitoring and reporting the identified risks and mitigation measures in coordination with the OP.
2. Provides technical backstopping for the project work plan.
3. Clears technical reports, contributes to and oversees the quality of PPRs.
4. May be requested to support the LTO and PTF for implementation and monitoring.
5. Contributes to the overall ToR of the Interim and Final Evaluation, review the composition of the evaluation team and support the evaluation function.

FAO's role as executing entity: FAO as Executing Entity. Within its Budget Holder functions,⁸³ the FAO Representation in Armenia (FAO-AM) will be in charge of the execution of selected activities and of the contractual agreements with the project implementing partners. A project delivery team will be set up in FAO-AM, comprising staff covering all functions relevant to the execution of the envisaged activities. More specifically, following the principle to ensure the highest level of ownership and sustainability of the project investment at country level (i.e., within local institutions), FAO-AM's role in the project will be throughout all project components, to ensure quality delivery and to enhance the success of the project and its potential replicability, and to ensure coordination with the Operational Partner and other partners and co-financiers in charge of specific activities. FAO's mandate as a global stakeholder in the field of agriculture, forests and rangeland management, and climate change, and its related expertise represents a comparative advantage in providing technical assistance and quality assurance.

264. The FAO Representation in Armenia will be the Budget Holder (BH) of the project, and will be responsible for timely operational, administrative and financial management of GCF resources implemented by FAO directly. The budget holder will be also responsible for i) managing OPIM for results, including monitoring of risks and overall compliance with the OPA provisions; ii) review and clear financial and progress reports received from the OP and certify request for funds iii) approve and clear budget revisions and annual work plan and budgets; iv) ensure implementation of the Risk Mitigation and Assurance Plan v) follow up and ensure that the OP implements all actions and recommendations agreed upon during Assurance Activities.

265. As a first step in the implementation of the project, the FAO Representation in Armenia will establish

⁸³ The Budget Holder (BH) is accountable for managing to achieve project and proper use of resources in accordance with FAO's Financial Regulations and Financial Rules.

an interdisciplinary Project Task Force (PTF) within FAO, to guide the implementation and results delivery of the project. The PTF is a management and consultative body that integrate the necessary technical qualifications from the FAO relevant units to support the project. The PTF is composed of a Budget Holder, a Lead Technical Officer (LTO), the Funding Liaison Officer (FLO) and one or more technical officers based on FAO Headquarters (HQ Technical Officer). FAO-KG, in accordance with the PTF, will give its clearance to the AWP/Bs submitted by the E-PIU as well as corporate and donor reporting documents such as Project Progress Reports (PPRs). PPRs may be commented by the PTF and should be cleared by the LTO and the FLO⁸⁴. The Implementation structure is presented in Figure 26.

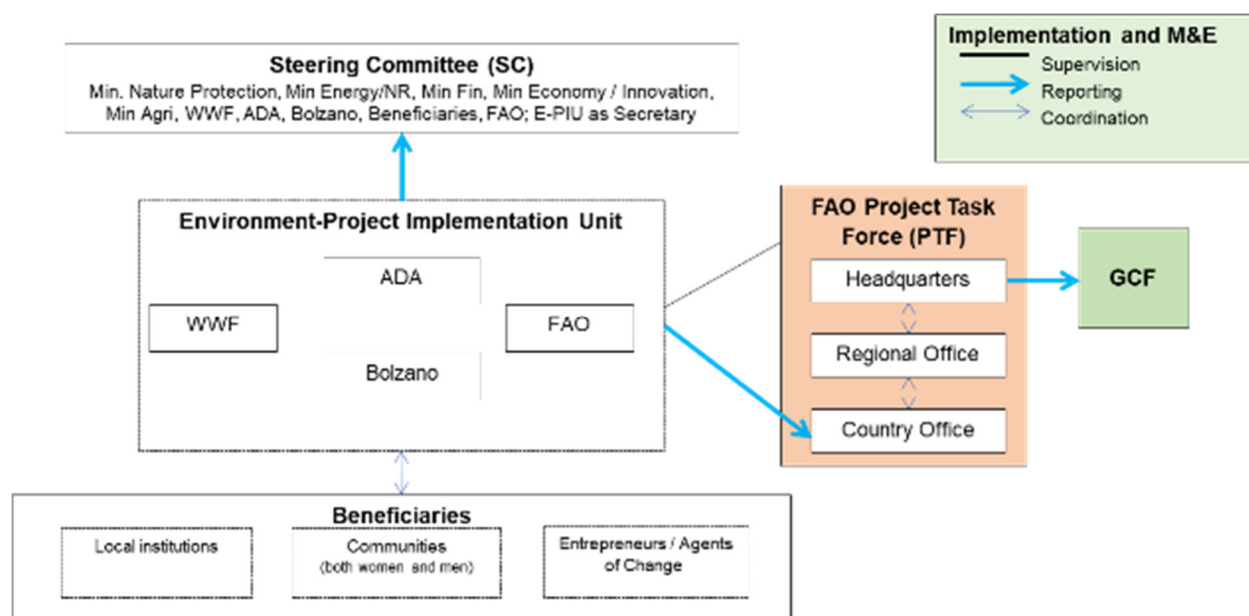


Figure 26. Project organization structure

⁸⁴ As per FAO project Handbook: accessible via intranet [here](#) or upon request.

13. TIMETABLE

	1				2				3				4				5				6				7				8			
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32
Outcome 1: By Y8, at least 2.5% of degraded forestland is restored and sustainably managed following a climate adaptive methodology.																																
Output 1.1: By Y2 at least 3 nurseries are operational in the production of climate adaptive seedlings and stakeholders capacitated.																																
Activity 1.1.1: Establishment of 3 additional forest climate adaptive nurseries and capacity development of Hyantar staff and stakeholders on related topics																																
Activity 1.1.2 : Activity 1.1.2: Production of at least 12,000,000 container seedlings																																
Output 1.2 : By Y7, at least 7,300 ha of forest investments are secured in target areas with sustainable and climate adaptive approaches and practices																																
Activity 1.2.1: Activity 1.2.1: Preparation work on selected State forest fund and municipality lands																																
Activity 1.2.2: Planting and maintenance work on selected forest fund lands (6,300 ha) and Municipal Lands (1,000 ha)																																
Output 1.3: By Y6 at least 1,700 people from Hyantar, local authorities the private sector and the civil society are empowered in sustainable and climate adaptive silviculture.																																
Activity 1.3.1: Development and formalization of the training curricula with the MoNP and the MoE (Institute for Vocational Education and Training) of required trainings.																																
Activity 1.3.2: Capacity Development of at least 1,700 people from Hyantar, Armenian Civil Society, Academia, Vocational Schools teachers and private sector.																																

[illegible]

[illegible]

14. PLANNING, M&E AND LEARNING AND KNOWLEDGE MANAGEMENT

Planning: The annual working plan and budget (AWPB) constitute the main formal instrument to ensure ownership and participation of stakeholders and beneficiaries. It represents the resultant of the national engagement process and the main planning tool of the project. To this end the EPIU, via its M&E unit, will secure constant dialogue with target communities and administrations and will ensure their participation in the AWPB formulation process.

266. The AWPB will be georeferenced and will report clearly coordinates related to planned interventions. The AWPB will contain 7 main sections as described below:

- 1) Georeferenced⁸⁵ Annual Report (after year 1);
- 2) Georeferenced Annual Sub-LFM;
- 3) Timeframe with annual milestones;
- 4) Working Plan Rational;
- 5) Communication and KM annual strategy;
- 6) Budget;
- 7) Sub-Procurement Plan.

267. **Georeferenced Annual Report.** Other than for the first AWPB, the EPIU will present on a yearly base the annual report including coordinates of each executed activity. The report will describe executed activities and reached milestones against targets including data and analysis from the M&E unit. The report will also include a detailed description of past years expenditures and highlight issues encountered in procuring goods and services. Also, the report will contain a section dedicated to media, publications, and other communication/awareness activities funded or participated by the project. A detailed outline of the annual report will be developed with partners and EPIU at start-up.

268. **Georeferenced Annual Sub-LFM.** The AWPB will include a sub logframe matrix reporting activities and expected contribution to project's targets. Proposed activities will have to clearly present geographical coordinates related to planned investments and soft activities.

269. **Timeframe with annual milestones.** The AWPB will contain the annual timeframe identifying as well reporting deadlines, SC meetings and targets to be reached for the year. The timeframe will also report, community engagement milestones as well as M&E targets for the year.

270. **Working Plan Rational.** Each activity presented in the Sub-LFM will be clearly detailed including description of planned approaches and tools deployed to achieve annual goals, milestones and community engagement. Rational will also include results of geospatial analysis performed on areas identified for the execution of activities.

271. **Communication and KM annual strategy.** The AWPB will also include clear description of project's communication and knowledge management strategies including, approaches, methodologies targets and list/rational of key stakeholders to be reached by the proposed set of actions.

272. **Budget.** The AWPB will contain a detailed budget built following the one presented in Annex 3 of the project document and will include cofinanciers. The budget will contain all planned expenditures according to FAO rules and procedures or else according to covenants of the project financial agreement.

273. **Procurement Plan:** The procurement plan will be prepared according to FAO/state rules and procedures and will related to Annex 8 of the project document.

274. Planning and approval of the AWPB will be done at the end of each fiscal year and will require formal approval of both the SC and FAO (figure 27).

⁸⁵ *Georeferencing* is the process of assigning a unique set of geographical coordinates to data, information, physical elements, areas, and any other point/action/activity/process related to your project including policy development and training.

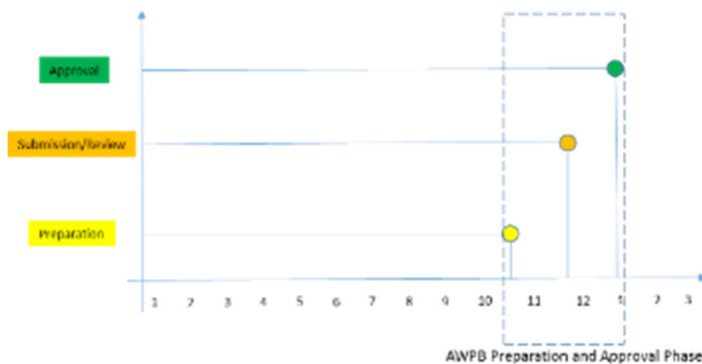


Figure 27: Timeframe Scheme of the Planning and Approval phase of the AWPB

Monitoring and Evaluation: The project will apply FAO's M&E standard procedures and will be compliant with the GCF performance measurement framework as reported in the full funding proposal and in annex 2. FAO will manage and coordinate reporting to the GCF according to agreed standards and procedures. The project will follow an Evidence Based Management (EBM) approach, which is intended to aid decision-making towards the explicit goal, outcomes and outputs identified as part of the Theory of Change reported in Sections 8, 9 and 10 of this Annex.

275. Project's achievements towards approved targets will be monitored via identified indicators and against the project baseline as reported in the logframe matrix (Section 9). As described in the next sections, the project will ensure georeferencing of activities including trainings and capacity development so to allow constant follow up via the FAO newly developed Remote Sensing application "[Earth Map](#)". The combination of georeferencing, groundtruthing with partners and communities plus the remote sensing analysis via FAO/Earth Map will allow the M&E unit, the NDA, the FAO and the GCF to have a clear understanding of project's effectiveness and efficiency. Additionally, the described approach will allow the M&E unit to advise and support the EPIU management and the MOE with evidence enhancing project's capacity not only to deliver but also to support stakeholders and beneficiaries in their decision-making processes.

276. The project cycle will be monitored using a combination of tools based on: **(i)** field data collection, **(ii)** georeferencing and **(iii)** geospatial analysis.

(i) Field data Collection: field data will be collected by the M&E unit via dedicated activities planned with communities according to the monitoring exercises planned by the Project. To this end, the M&E unit will collect data from communities following the HH survey methodological approach and specifications. Additionally the project has planned to have two additional households and institutions survey at mid-term and project completion. Finally, the project will be assisted by the Forest Monitoring Center of the MoE that will ensure (high resolution orthophoto maps and surface models) acquired by drones in year 1, 3, 5 and 7.

(ii) Georeferencing: Georeferencing will ensure a unique relation between project's activities and geographical coordinates collected according to a specific procedure (Ref: Georeferencing Procedures). This will allow the project and the Country to ensure clear identification of activities and beneficiaries in the precise context identified during project identification and design. Georeferencing will allow the project to profit from the vast geospatial data set available for the Country and will support involved institutions in sharing and mainstreaming geospatial data.

(iii) Geospatial analysis: the M&E unit will monitor activities and processes thanks to a series of remote sensing and photointerpretation analysis that have been made accessible to the Country via the newly FAO developed application Earth Map. The application will allow the project to factor in climate change variables as well as socio-economic and environmental data into the planning and decision making process. The integration of 'geo-spatial' elements will allow stakeholders to overlay different classes of data such as climate trends, hydrography, erosion, flood risks, land cover, land use, distribution of population and livelihoods that are a non-negligible part of an evidence based and

informed decision making process. Finally, the process will contribute in enhancing national and regional data collection activities that will support the understanding of Climate Change impacts at local level.

277. Having georeferenced investments as well as soft activities (i.e. trainings, capacity development⁸⁶) will allow the project to answer indicators with objective elements of evaluation. In the specific case of this project, the EPIU as well as all the other stakeholders - including GCF- will be able to understand if activities have been executed, if these have been successful and finally if there is a specific impact that could be objectively linked to project's theory of change. The use of such approach will not require special technologies, equipment or advanced IT skills. Basic software are available under license (i.e. ArcGis/ESRI) or in open source (i.e. QGIS) and most of the currently available smart phones/tables, regardless of their operative systems, can execute most of the processes required to ensure georeferencing and data management. Additionally, FAO will provide dedicated training to EPIU, M&E unit and project's partners/stakeholders during the start-up phase of the project.

M&E Unit Composition and Functions: The M&E process will be under the responsibility of the EPIU. The M&E unit (Figure 2), hired to be nested in the EPIU for the scope of this project, will be composed of one team leader and of three officers (M&E/GIS/KM-COM). The team leader will respond directly to the EPIU director and to the SC in case of internal disputes.

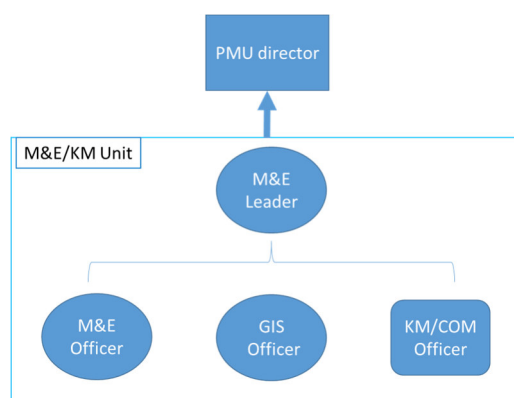


Figure 28:M&E Unit Composition

278. During execution of the project, the M&E unit will ensure, among the others, support at the following levels:

1) **Monitoring of Execution Performances:** the unit will be responsible for: (a) collecting data from identified service providers / partners / authorities and (b) submitting progress reports on approved targets on a quarterly basis to the EPIU director. The M&E unit will ensure correct and efficient filing of collected GPS coordinates. Once coordinates will start populating the M&E database, activities will be shared by the EPIU via thematic project's maps and will be monitored via consolidated remote sensing practices (geospatial analysis). This aspect of the process is paramount to ensure knowledge building within the EPIU and among stakeholders and in evaluating direct and indirect impacts of project's activities. Showing activities in their exact location - visualizing relations with the context - will allow a more objective impact's evaluation and will provide decision makers with an objective, transparent and evidence based support to national strategies. Data, collected via reports prepared by service providers/partners and verified with beneficiaries, will be disaggregated by gender, among the others, and will be georeferenced. Data will be stored in a database accessible to the SC as well as to FAO. Functions of the M&E unit also include verification and respect of the social and environmental safeguards as described in the Annex 10 and Annex 4.

2) **Community Monitoring and Ground Truthing:** The project will also apply a new approach to monitoring ensuring participation of target beneficiaries and stakeholders into the process. Given the

⁸⁶ Georeferencing trainings and other activities with communities will allow the project to understand the level of permeability of activities within communities. Thanks to georeferencing the project will be able to clearly report not only on gender, age and other socio-economic characteristics of beneficiaries but also on their distribution in target areas.

importance and relevance attributed by the theory of change to community's participation in ecosystem based forest management, the M&E unit will ensure annual consultations in project areas so to support planning and monitor execution of activities. Thanks to the described georeferencing process, communities will participate directly both in planning and in groundtruthing the results obtained via FAO spatial analysis tools and methodologies. This particular aspect of the M&E strategy will allow as well for enhanced and evidence based knowledge sharing with local communities and their administrations as well as for mainstreaming climate change among key stakeholders. As per all the other activities data deriving from this exercise will be part of the project atlas and available for consultation via KMZ files upon request.

3) **Strategic Advise:** annual results and related analysis, jointly reviewed by FAO and the EPIU, will form the base for each annual year planning exercise via the AWPB. These will be presented to the SC in order to support its strategic role and to secure transparency and evidence based strategy development.

Project's Baseline: Project's baseline is the resultant of data collected in project areas via: (i) literature review⁸⁷; (ii) questionnaire-based household survey⁸⁸ to verify energy needs and fuelwood consumption in project areas as well as to collect socio-economic data on target population and participation in forest governance; and (iii) geospatial analysis⁸⁹.

279. Goal of the baseline is to collect socio-economic and biophysical data (including climate) in project areas. Main objectives of the baseline is: **Establish the ex-ante project's climatic/environmental and socio-economic status.** Baseline data have been collected both at the national and community level. Project areas have been selected within the national engagement process and according to data and assessments available in literature review and fine-tuned by FAO with Earth Map, a full description of project areas and target communities is available in Section 7 of this document. Local data have been collected in the following marzes:

1. Lori Marz
2. Syunik Marz

280. Baseline data reported in Section 9 are fully georeferenced and available in both Earth Map and Google Earth Pro. A summary of existing baseline data is presented below (table 29). Numeric baselines are available in Section 9, within the log frame matrix of the project.

Data	Origin	Hierarchy	Main indicators	Verification period	Extension	Location
GHG Baseline (National and Local)	Third National Communication / First / Second Biannual Update	Objective	M3.1 M4.1	Annual, Mid-term / Final Evaluation / Impact Evaluation	PDF	NDA FAO EPIU GCF
Forest adaptation challenges baseline	FAO, Third National Communication / First / Second Biannual Update, MoE, UNECE	Expected Results	A4.1	Mid-term / Final Evaluation /	PDF, KMZ, HTML	
Socio Economic Baseline	FAO / National Statistics/ Service Provider (AWHHE)	Outcome 2	[...] expenses on energy (fuelwood) % change [...]	Annual	PDF, KMZ, HTML	
Energy Efficiency of heating appliances	FAO / National Statistics	Outcome 2	M7.1 a and M7.1b	Annual	PDF, KMZ, HTML	
Policy Framework Mainstreaming and Community Participation Baseline	FAO / National Statistics / Service Provider (AWHHE)	Outcome	M 9.1	Mid-term / Final Evaluation /	PDF	

⁸⁷ Literature review is available as annex to the full funding proposal.

⁸⁸ HH report and focus group findings are available up on request.

⁸⁹ Geospatial analysis are available on demand.

Table 29: Baseline Summary according to LFM

Description of Selected Indicator: The project identified a series of indicators deriving from both GCF core performance indicators and from FAO experience in the Country and in the region. Selected indicators have been discussed and agreed with the NDA and with partners during the design phase and within the national engagement process. Annex 2 reports the selected indicators.

281. Selected means of verification (MoV – table 30, figure 29 and table 31), will allow the project to secure and enhance data collection and to guarantee data analysis and processing. MoV will include independent surveys, national statistics and data collected by the project and or by its partners and service providers (table 26).

#	Means of Verification
1	Geospatial Analysis
2	Household Survey
3	Institution Survey
4	Sectorial Surveys
5	ARMSTAT
6	Project's Database
7	Forest Monitoring Center

Table 30: Project's means of verification

282. In order to ensure reduced reliance from internal data and information, the M&E unit will prioritize data collection from external sources not linked to the project or its partners. MoV have been organized according to their relevance in understanding achievements against targets. Figure 28 describes the relevance in each component of selected MoV (1= lowest – 7 = highest).

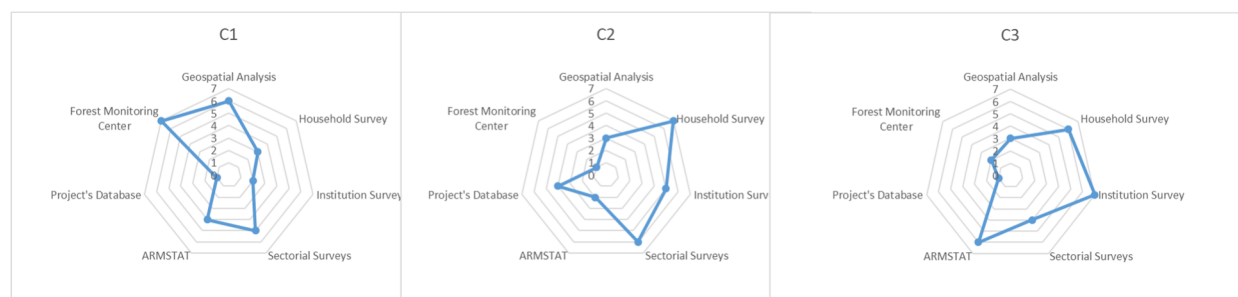


Figure 29: Relevance of MoV according to components.

Expected Result	Indicator	Detailed Means of Verification (MoV)
Fund-level impacts		
<i>M4.0 Reduced emissions from land use, reforestation, reduced deforestation, and through sustainable forest management and conservation and enhancement of forest carbon stocks</i>	GCF M4.1 Tonnes of carbon dioxide equivalent (t CO ₂ eq) emissions reduced or avoided and/or GHG removal by sinks from forestry and land use activities.	Georeferencing of activities, geospatial analysis (Earth Map) and reports from the Forest Monitoring Center will provide the project with data on investments' distribution and effectiveness (survival rate). Results will be disaggregated per district, community and type of investment. Tonnes of carbon dioxide equivalent (tCO ₂ eq) emissions reduced or avoided and/or GHG removal by sinks from forestry will be monitored and processed with FAO EX-ACT methodologies. The indicator will be informed according to CIF FIP I1 Table 1. Results will be disaggregated per district, community and type of investment. And will be presented annually to the Fund. Measurement Unit: tCO₂eq
<i>M3.0 Reduced emissions from buildings, cities, industries and appliances</i>	GCF-PMF: M.3.1 Tonnes of carbon dioxide equivalent (t CO ₂ eq) reduced or avoided as a result of Fund-funded projects /programmes	Avoided emissions will be monitored with FAO EX-ACT ₃ and applying the GEF GHG accounting for EE projects. The project will ensure at least two surveys (mid term and final) so to ensure proper follow up of energy efficiency achievements. Measurement Unit: tCO₂eq
<i>A4.0 Improved resilience of ecosystems and ecosystem services</i>	GCF-PMF: A 4.1 Coverage/scale of ecosystems protected and strengthened in response	Georeferencing of activities, geospatial analysis (Earth Map), reports from the Forest Monitoring Center and ground truthing with communities will provide the project with data on investments' distribution and effectiveness (survival rate) and climate variables. Analysis of the Land Productivity Dynamics (LPD) via FAO Earth

Expected Result	Indicator	Detailed Means of Verification (MoV)
	to climate variability and change	Map will allow the assessment of project's impacts on ecosystems. Results will be disaggregated per level of degradation (Declining productivity, Early Signs of Decline, Stable but Stressed, Stable not Stressed, Increasing productivity), district, community and ecosystem. Results will be presented at Mid Term and Project's Completion. Measurement Unit: hectares
Outcome 1: By Y7, at least 2.5% of degraded forestland is restored and sustainably managed following a climate adaptive methodology.		
Georeferencing of activities will allow the Forest Monitoring Center to perform repeated assessment of the situation of the intervention areas by field inspections + aerial imagery (high resolution orthophoto maps and surface models) acquired by drones in year 1, 3, 5 and 7. The project will commission an Independent sector survey and capacity assessment to understand the level and relevance of adoption of introduced climate adaptive practices and approaches.		
Outcome 2: By Y6, fuelwood consumption per energy unit output of targeted rural communities is optimized and decreased by at least 30%.		
The project will commission an Independent Sector survey and capacity assessment to understand the level of adoption of proposed technologies as well as to assess the capacities of the Armenian private sector to feed the EE market with efficient heating appliances. Additionally, selected indicators will be informed by project reports and statistics provided by ARMSTAT. . Data will be disaggregated by theme, area, age cohort and gender		
Outcome 3: By Y7, relevant stakeholders are enabled to adopt effective governance and adaptive management of forests and related ecosystem services.		
Indicators from component 3 will be mainly informed by reports from national partners and key ministers such as the ministry of Territorial Development, the national cadaster, the ministry of economy and innovation, the ministry of education and others. . Data will be disaggregated by theme, area, age cohort and gender		
Outcome 1 – Output level results		
Output 1.1 By Y2 at least 3 nurseries are operational in the production of climate adaptive seedlings and Hayantar staff capacitated	Production capacity of climate adaptive seedlings is at least 12,000,000 units (mixed locally available species) matching established requirements	Data will be collected via a series of independent surveys (mid-term and closure). TORs of surveys will be prepared jointly by the project M&E Unit. Seeds availability and production will be verified against the collection and production criteria established jointly by Hayantar and the FAO in year 1. Measurement Unit: # / %
Output 1.2: By Y6, at least 7,300 ha of forest investments are secured in project areas with sustainable and climate adaptive approaches and practices	At least 4,700 ha of forest within the State Forest Fund restored via climate adaptive forest restoration approaches.	Results on reforestation, natural regeneration and coppicing will be also informed by Forest Monitoring Center via repeated assessment of the situation of the intervention areas by field inspections + aerial imagery (high resolution orthophoto maps and surface models) acquired by drones in year 1, 3, 5 and 7. Measurement Unit: hectares with survival rate above 65%.
	At least 1,000 ha of forests / agroforests established in underused / abandoned Municipal lands.	
	At least 1,600 ha of degraded coppiced forests are restored	
Output 1.3: By Y7 at least 1,700 people from Hayantar, local authorities private sector and civil society are trained in sustainable and climate adaptive silviculture	# of obtained training certificates	Independent survey and capacity assessment plus Project and Ministry of Education Reports. TORs of surveys will be prepared jointly by the project M&E Unit. Reports will be prepared annually by the project and integrated with reports from the Ministry of Education. Data will be disaggregated by theme, area, age cohort and gender. Measurement Unit: # / %
	# of National Curricula modified to include introduced topics (agriculture and forestry)	
Outcome 2 – Outputs level results		
Output 2.1: By Y2, National Standards for energy efficiency of heating related appliances are approved and EE companies are trained on how to incorporate them in their operations.	EE standards for heating appliances and fuelwood are approved	The indicator will be informed by the Ministry of Economy reports and will be included in the annual project report of the project. Measurement Unit: #
Output 2.2: By Y5, At least 15 private EE companies are involved on wood-stoves assembling, installation and maintenance and	# of obtained training certificates (disaggregated by gender)	Independent survey and capacity assessment of the EE private sector plus Project and Ministry of Education Reports. TORs of surveys will be prepared jointly by the project M&E Unit. Reports will be prepared annually by the project and will be integrated with reports from the Ministry of Education. Data will be disaggregated by theme, area, age cohort and gender. Measurement Unit: #.

Expected Result	Indicator	Detailed Means of Verification (MoV)
dispose of skilled labor in project areas.	# of National Curricula modified to include introduced topics (welding, plumbing and electricity).	Independent survey and capacity assessment of the EE private sector plus Project and Ministry of Education Reports. TORs of surveys will be prepared jointly by the project M&E Unit. Reports will be prepared annually by the project and will be integrated with reports from the Ministry of Education. Data will be disaggregated by theme, area, age cohort and gender. Measurement Unit: #.
Output 2.3: By Y5, At least 9,000 HH use increased EE wood stoves in project areas and are trained on fuelwood management	Number of installed and certified EE heating appliances	Independent HH survey and project's reports. TORs of surveys will be prepared jointly by the project M&E Unit. Measurement Unit: #
Outcome 3 – Outputs level results		
Output 3.1: By Y4, the guidelines to enhance participation and engagement of Community in sustainable and climate adaptive management of forest are approved by the MoE.	Official approval of the guidelines by the MoE	Communication from the Ministry of Environment and from the Forest Monitoring Center plus major forest monitoring results published and accessible to general public. Measurement Unit: #
Output 3.2: By Y6, A National Forest Monitoring and Assessment System (NFMA) established, the first inventory cycle completed, discussed with stakeholders and results mainstreamed into relevant policies.	Official acceptance from the MoE of the NFMA	
Output 3.3: By Y7, at least 300,000 people from 207 rural communities in project areas are informed, sensitized and empowered on climate adaptive silviculture, Energy Efficiency and climate change mainstreaming	# of events, campaigns, social media initiated/supported by the project # and % of women and men sensitized on energy-saving and sustainable forest management in project areas	Project reports informed by partners assigned the various campaigns and sensitization/empowerment trainings. Outreach will be disaggregated by area, age cohort and gender. Measurement Unit: #

Table 31: Indicators and Means of Verification

Contribution to SDGs Indicators: In addition to the described indicators, the project will also contribute to several SDGs Indicators. The M&E unit will ensure data collection and description of each of the selected indicators in addition to those reported in the logframe matrix (Table 32).

PROJECT's CONTRIBUTIONS TO SDGs				
SDG #	SDG	Targets	Indicators	Project's Direct Contributions
7	Ensure access to affordable, reliable, sustainable and modern energy for all	7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption	Currently wood energy in Armenia is not a renewable energy source as the rate of utilization is higher than regrowth. The project aims at reversing this situation for it to become renewable at least in project areas and seeks furthermore synergies with other projects to increase RE/EE appliances utilized in rural areas, in particular Solar Water Heater
		7.3 By 2030, double the global rate of improvement in energy efficiency	7.3.1 Energy intensity measured in terms of primary energy and GDP	The project aims at increasing fuel wood efficiency of 9000 rural HH by at least 30%

		7.A By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	7.A.1 Mobilized amount of United States dollars per year starting in 2020 accountable towards the \$100 billion commitment	The project has already mobilized, thanks to the cofinancing of the Austrian Development Agency and the Autonomous Province of Bolzano, relevant European institutions that will support Armenia in improving sustainable biomass production/consumption, energy efficiency and energy efficiency governance.
13	Climate Action: Take urgent action to combat climate change and its impacts	13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	13.1.3 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies	By improving Forest and Energy Governance at the local/community level the project will tangibly contribute to sustainable forest management increasing the effectiveness of forest's ecosystems in ensuring protection for communities and in mitigating negative impacts deriving from CC.
15	Life on Land: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss:	15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	15.1.1 Forest area as a proportion of total land area	Kindly refer to Indicator GCF-4.1 of the LFM.
		15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally	15.2.1 Progress towards sustainable forest management	
		15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world	15.3.1 Proportion of land that is degraded over total land area	
		15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development	15.4.2 Mountain Green Cover Index	Especially via C3 the project will ensure that forests, CC and EE are included in local development processes and targets
		15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts	15.9.1 Progress towards national targets established in accordance with Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011-2020	

		<p>15.a Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems</p> <p>15.b Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation</p>	<p>15.A.1 Official development assistance and public expenditure on conservation and sustainable use of biodiversity and ecosystems</p> <p>15.B.1 Official development assistance and public expenditure on conservation and sustainable use of biodiversity and ecosystems</p>	The project will mobilize over USD 19 million to increase and sustain forest cover and related habitats in Armenia
ADDITIONAL CONTRIBUTION				
SDG #	SDG	Targets	Indicators	Project Indirect Contributions
1	End poverty in all its forms everywhere	1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	1.5.2 Direct disaster economic loss in relation to global gross domestic product (GDP)	Enhancing forest resilience and sustainable forest management will reduce exposure of rural and urban populations in project areas to disasters and related economic loss in relation to gross domestic product (GDP).
3	Ensure healthy lives and promote well-being for all at all ages	3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	3.9.1. Mortality rate attributed to household and ambient air pollution	Wood stoves with increased health and safety standards will be distributed. Furthermore, the amount of wood utilized for heating will be reduced leading consequently to less particulate matter and indoor pollution
5	Achieve Gender Equality and Empower all Women and Girls	5.1 End all forms of discrimination against all women and girls everywhere	5.1.1 Whether or not legal frameworks are in place to promote, enforce and monitor equality and non-discrimination on the basis of sex	The proposed intervention will contribute to elimination of discrimination against women in the project project areas as well as on a national level.
6	Ensure availability and sustainable management of water and sanitation for all	6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	6.6.1 Change in the extent of water-related ecosystems over time	Reduction of forest degradation drivers through this component will have a positive effect on forest management and therefore also water-related ecosystems
11	Make cities and human settlements inclusive, safe, resilient and sustainable	11.A Support positive economic, social and environmental links between urban, per-urban and rural areas by strengthening national and regional development planning	11.A.1 Proportion of population living in cities that implement urban and regional development plans integrating population projections and resource needs, by size of city	Energy actions plans will be included within the forest management guidelines prepared in C3.
12	Ensure sustainable consumption and production patterns	12.2 By 2030, achieve the sustainable management and efficient use of natural resources	12.2.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP	The resources used by the rural population for heating with wood energy sources are entirely domestic products. It is the aim of the project to transform the current unsustainable BAU into a situation where domestic forest resources become modern, profitable and fully renewable energy sources.

Table 32: Project's contributions to SDGs

Monitoring Strategy: Data will be collected by the M&E unit according to the means of verifications described in the previous sections. Data will originate from described sources and will be organized in a georeferenced M&E database. Data will be presented annually according to milestones fixed by each approved AWPB. Specific wrap section will be organized and supported by FAO at midterm and completion so to secure data availability to external evaluators.

283. Within the set of activities planned in the AWPB and approved by the AE, the EPIU will ensure that each no objection requests related to project's expenditures contains clear maps reporting investments' coordinates as well as georeferenced cadaster maps (if available) describing the areas of intervention. Absence of coordinates and maps will negatively affect the process denying automatically the authorization to proceed with expenditures. Project's data and information will be georeferenced and provided in in ArcGIS compatible formats, shapefile if vector format and GeoTIFF if raster. Each dataset and information, including maps attached to the no objection process, will be also reported as KML file for uploading and sharing via Google Earth Pro. Produced datasets will be uploaded in Earth Map where geospatial algorithms are already available and fine-tuned for Armenia in order to perform a large spectrum of remote sensing analysis. Analysis via Earth Map will support analysis of achievements and impacts in project areas.

284. Coordinates will be taken in a unique and known reference system, which by preference should be the geographic coordinate system (datum WGS84 and unit in decimal degrees). The full set of coordinates and KMZ files will represent the geographical location and distribution of the interventions in the project areas and will be included in the "Project's Atlas". Produced maps will be provided in digital format (ArcGIS or equivalent) with all the metadata and sources of information. Maps shall be reported as well as in KML/KMZ format.

285. Involved institution and stakeholders (including the Steering Committee) will be involved both directly and indirectly via dedicated communication and training processes. The EEPIU-M&E unit will ensure communication via the annual reporting processes, national ownership workshops and via the project atlas. Communication documents will be constantly updated at the disposal of stakeholders, AE as well as donors. FAO will provide stakeholders with at least 9 training session to secure full mastering and ownership of the promoted process.

286. The process is in line with existing norms and policy frameworks. The project will share data and apply standards according to existing national strategies and will provide technical assistance and data in order to facilitate such objectives and to ensure mainstreaming of georeferencing among national institutions and other actors relevant in the field of Climate Change and Natural Resources Management.

287. Finally, the project will ensure coordination and complementarity with past and current projects/programs supporting the Country in the field of GIS, remote sensing and mapping funded by donors such as UNDP, the WB, IFAD and EBRD.

Reporting, Supervision and Evaluation: FAO as accredited entity of the project will ensure annual reporting to the GCF. The report will include as well the audit report that will be commissioned by FAO to an independent firm according to FAO covenants, rules and standards. Project's reporting will consist of four elements:

- **Technical Reports (TRs) prepared by Partners / Service Providers.** TRs will describe executed activities and involved beneficiaries according to M&E indicators and means of verification as reported in the previous paragraphs. Partners and service providers will ensure Georeferencing of each executed activity and will present TRs on a quarterly base to the M&E Unit.
- **Quarterly reports (QRs) prepared by the M&E for EPIU Director.** QR will present the work and achievements of activities presented in the AWPB. It will include among the others data, comments and information from the beneficiaries and other involved stakeholders. QR are prepared by the M&E team for the EPIU and will contribute to the annual report.

- **Annual reports (ARs) prepared by the M&E for the SC and FAO.** ARs will present the work and achievements reported by the M&E unit via the QRs and will include implementation and fiduciary chapters. ARs will include findings and recommendations of FAO supervision reports (SRs). ARs will include as well independent annual audit reports (AARs) and the “Project’s Implementation Atlas⁹⁰” presenting the maps and charts obtained thanks to the georeferencing of project activities. Both will be presented as annexes of the AR. ARs are prepared by the M&E Unit, validated by the EPIU director and after inclusion in the AWPB are validated by the SC and FAO and are transmitted to the GCF by FAO-HQ.

- **Evaluation Reports are commissioned by FAO to an external and independent entity according to FAO covenants, rules and standards.** ERs are shared with the Steering Committee and the EPIU for comments and after finalization sent to the Green Climate Fund at midterm (MTE) and within six (6) months from project’s closure (FE). In accordance to the FAO procedures for the evaluation of initiatives funded by voluntary contributions,⁹¹ the project will undertake:

- An independent Mid-Term Evaluation**, when delivery will reach 50% of the initial total budget and/or mid-point of scheduled project duration, to review efficiency and effectiveness of implementation in terms of achieving project objective, outcomes and delivering outputs. The MTE will be instrumental for contributing through operational and strategic recommendations to improved implementation for the remaining period of the project’s life. FAO Office of Evaluation, in consultation with project stakeholders, will be responsible for organizing and backstopping the Mid-Term Evaluation, including: finalizing the ToR, selecting and backstopping the team and Quality Assurance of the final report.
- An independent Final Evaluation**, within six months prior to the actual completion date (NTE date) of the project. It will aim at identifying project outcomes, their sustainability and actual or potential impacts. It will also have the purpose of indicating future actions needed to assure continuity of the process developed through the project. FAO Office of Evaluation, in consultation with project stakeholders, will be responsible for organizing and backstopping the Final Evaluation, including: finalizing the ToR, selecting and backstopping the team and Quality Assurance of the final report.

Report Type:	Prepared By:	Approved By:	Proposed Timeframe:	Diffusion:
Technical Report	Service Providers/Partners	PIU-M&E	Upon conclusion of activities	Internal
Quarterly Report	PIU-M&E	PIU	3 Reports per year	Internal
Supervision Report	FAO	FAO	On an annual basis	Public
Audit Report	External Independent Auditor	FAO	On an annual basis	Internal
Annual Report/AWPB	PIU-M&E	SC-FAO	On an annual basis	Public
Mid Term Review	Independent External Evaluator	FAO	Fourth year	Public
Completion Report	PIU-M&E	SC-FAO	Eighth year	Public
Terminal Evaluation	Independent External Evaluator	FAO	Eighth year	Public
Impact Evaluation	GCF	GCF	To be determined	Public

Table 33: Project Reporting Framework

288. The M&E and reporting process (table 33) will also form the foundation of the project’s communication and knowledge sharing strategy. Thanks to data collected and analyzed during the whole project, stakeholders and general public will be constantly informed on best practices and lessons learned so to capitalize on project’s experience and to magnify impacts in project areas as well as in others not directly involved in the project. Thanks to a pressing communication activity and key formal events at Start-up, Mid Term and Completion the project will ensure a constant flow of knowledge that will as well increase ownership of stakeholders and enhance its capacity to support an effective and efficient change into the policy making environment of Armenia. Figure 4 below presents the combined flow of reporting and knowledge sharing.

⁹⁰ The project implementation atlas will be available as well via Google Earth so to appreciate in real time changes induced by the project. Its preparation will start with the baseline and will evolve with the project.

⁹¹ This report is available in electronic format at: <http://www.fao.org/evaluation>.

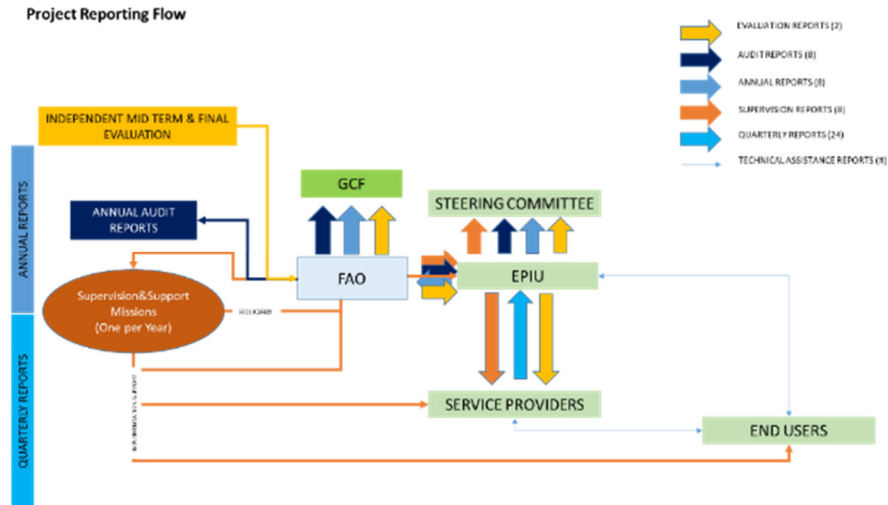


Figure 30: The project reporting flow

289. FAO will support the SC and the EPIU in reviewing and analyzing progress reports and assessing performances against baseline and targets. In addition to the support provided from FAO-Armenia, FAO-HQ will organize two or more (depending on needs) supervision mission per year.

M&E Outputs and budget: Results of the process will be available to stakeholders and partners in both project reports and Google Earth Pro Files. In order to execute evidence based and result management approach the project will ensure hiring of a dedicate M&E unit that will work under the direct supervision of the EPIU Project's Director.

290. Budget of the M&E function of the project should be comprised between 2% and 7%. Budget should include the cost of human resources, equipment as well as the cost of data collection and processing. Additionally, it should contain adequate resources to ensure activities with communities as well as with administrations and stakeholders. Cost of the process should also include the cost of Mid Term Evaluation and Terminal Evaluation. Both will be outsourced to specialized companies / professionals. The cost per year of the process is detailed in the project budget and will include all costs related to Planning, Learning and Knowledge Management.

Learning and Knowledge Management: Learning and knowledge management represents a paramount element of the project. The project will aim at transferring not only information and knowledge generated during execution of activities but also tools and skills that will support stakeholders in factoring in climate change into the decision-making process (institutions and private sector) and into livelihood strategies (communities).

291. The project will ensure transfer of knowledge to stakeholders across the 3 identified components via trainings and knowledge sharing events well identified on a yearly bases in the AWPBs and described in each of the components. To this end stakeholders' involvement from planning to monitoring will be among the main objectives of the project. Each of the identified components will support the Learning and Knowledge Management process with specific trainings targeting both communities and institutions. Key objective of the learning and knowledge management process is to mainstream relevant policy frameworks and climate change related information to all the stakeholders involved in project's activities as well as to the public.

292. To ensure sound and effective management of learning and knowledge processes the project will hire a communication and KM specialist that will be assigned to the M&E unit of the project. The specialist will ensure – among the others - socialization of project's data and information, communication with the media, and coordination of the national engagement process.

15. CARBON ACCOUNTING ANALYSIS

Carbon Balance: Two districts that are representative of the different types of forest ecosystems in Armenia are concerned by the project. Planned investments and activities will be implemented through three components in addition to Project Management:

- **Component 1:** Climate Change mitigation and adaptation through forest investments and technology transfer.
- **Component 2:** Promoting forest Sustainability reducing forest degradation drivers.
- **Component 3:** Strengthening governance of Forest resources and climate change's impact management at community, as well as local and central government levels.

293. This document is reflecting a carbon ex-ante estimation of the project interventions with a direct carbon sequestration potential. The different types of interventions within the project implementation are targeting a total area of 143,490.1 ha. This chapter is reflecting a carbon estimation of the Component 1, 2 and component 3. Notwithstanding, the other components relating to Strengthening governance of Forest resources and climate change's impact management at community, as well as local and central government levels are primordial to ensure the achievement and success of the on-site activities and the development of SLM practices.

Specific objectives related to GCF RMF Impact Areas Impact	Increase in the CO2 removals from the forests subsector	
	Total % of reduced emissions per year	Tonnes of CO2eq removed (tCO2eq/y)
	- 11.9 %	-19,799,689

Table 34: Specific objectives related to GCF RMF Impact Areas Impact

PROJECT STRUCTURE		Activity	With Project Scenario	BAU Scenario ⁹²
Component 1: Forest and related ecosystem services are more resilient..	Outcome 1: By Y7, at least 2.5% of degraded forestland is restored and sustainably managed following a climate adaptive methodology.	Afforestation/reforestation	5,700 ha of degraded land converted into forest land would sequester <u>-48,320 tCO₂eq per year</u> . -966,399 tCO ₂ eq sequestered for the entire duration of the project (20 years). ⁹³	5,700 hectares of degraded land would remain degraded.
Component 2: Forest Degradation Drivers are mitigated..	Outcome 2: By Y6, fuelwood consumption per energy unit output of targeted rural communities is optimized and decreased by at least 30%.	Fuel wood consumption	Decreasing the wood consumption from 27,605 to 19,323 tonnes of dry matter per year would sequester <u>-8,7875 tonnes of CO₂eq per year</u> . -175,697 tCO ₂ eq sequestered for the entire duration of the project.	27,605 tonnes of dry matter per year of fuel wood consumed.
Component 3: Strengthening governance of Forest resources and climate change's impact management at community, as well as local and central government levels.		Forest management and degradation	135,790.1 ha of forest land for which the degradation level will be reduced from 60 % (large) to 29.5 % (low) would sequester <u>- 941,665 tonnes of CO₂eq per year</u> . -18,833,290 tCO ₂ eq sequestered for the entire duration of the project (20y).	135,790.1 ha of forest which would stay largely degraded.
Overall carbon balance		Forest resilience of Armenia, enhancing adaptation and rural green growth via mitigation about 141,490.1 hectares with a potential <u>sequestration of – 998,769 tonnes of CO₂eq per year</u>. For the entire duration of the project <u>-19,975,387 tonnes of CO₂eq are captured over 20 years (8 years of implementation and 12 years of capitalization)</u>.		

Table 35: Project Structure - With Project/Without Project- all GHG are expressed in tCO₂eq⁹⁴.

⁹² Without the project scenario or baseline/ business-as-usual scenario, which corresponds to a description of expected conditions in the project boundaries in the absence of project activities.

⁹³ The 20 years period (accounting duration) is in line with the idea that even after the point at which a new equilibrium in land use and practices is reached at the end of the implementation phase, further changes may occur as the result of the preceding interventions. For instance, for the soil C estimates, the default values are based on default references for soil organic C (SOC) stocks for mineral soils to a depth of 30 cm (Table 2.3 of IPCC 2006). When SOC changes over time (land use change or management change), it is assumed a default time period for transition between an equilibrium of 20 years. These values are used either in IPCC 1996 or 2006 Guidelines and are gathered from a large compilation of observations and long-term monitoring.

⁹⁴ Positive result means source while negative result means sink.

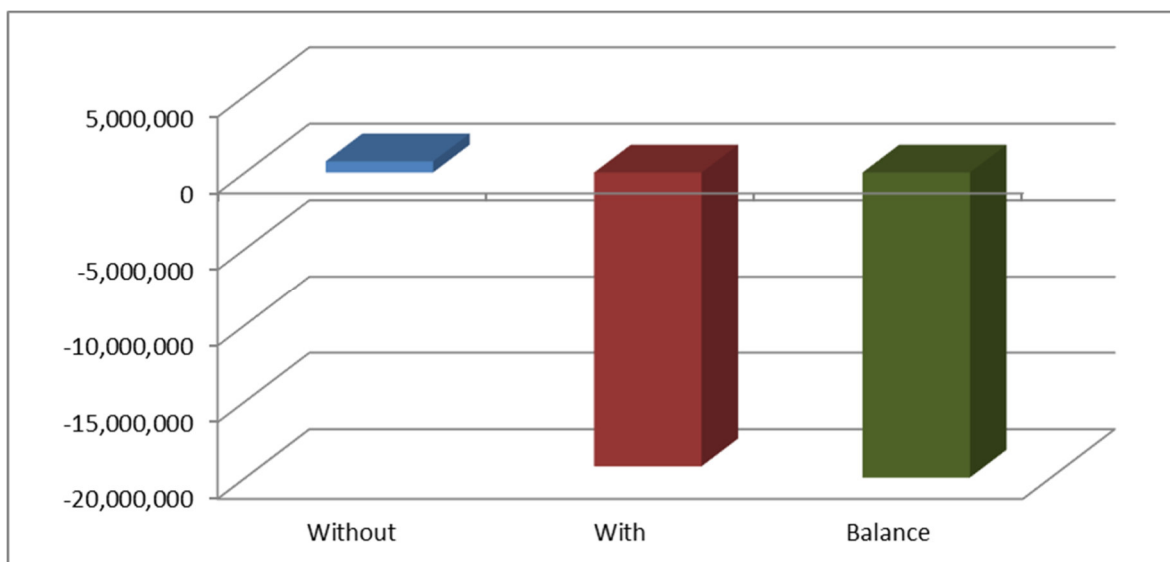


Figure 31: Total without and with project and balance

Methodology: FAO EX-ACT tool: EX-ACT was developed using the IPCC 2006 Guidelines for National Greenhouse Gas Inventories (IPCC, 2006) and augmented with the wetlands supplement (IPCC-WS, 2014). These equip EX-ACT with recognized default values for emission factors and carbon values – the so-called Tier 1 level of precision.

294. EX-ACT is also based on Chapter 8 of the Fourth Assessment Report from Working Group III of the IPCC (Smith et al., 2007) to account for more specific mitigation options not covered in IPCC 2006. Other required coefficients are taken from published reviews or international databases. For instance, GHG emission values for farm operations, transportation of inputs, and irrigation systems implementation are derived from Lal (2004). Electricity emission factors are based on data from the International Energy Agency (2013). In the fishery sector, fuel use intensity (FUI) data from the capture phase of target species at sea are taken from Parker & Tyedmers (2014).

295. Each tier of analysis represents a level of methodological complexity that is used to estimate GHG emissions, according to the definitions in IPCC 2006. Tier 1 methods rely on default values and entail less complexity. Tier 2 methods require region-specific carbon stock values and emission coefficients, demanding higher data requirements but offering higher precision. Whilst users may use the Tier 1 default values provided, EX-ACT encourages users to substitute these values for more location-specific Tier 2 data to improve the accuracy of the analysis.

296. Typically, GHG emissions are reported in units of carbon dioxide equivalent (CO₂e). Gases are converted to CO₂e by multiplying by their Global Warming Potential (GWP)⁹⁵. The emission factors listed in this document have been converted to CO₂e automatically by EX-ACT using the GWP listed in the table 36.

Gas	100-year GWP
CO ₂	1
CH ₄	25
N ₂ O	298

Table 36: GHG Conversion factors⁹⁶

⁹⁵ Global Warming Potentials: The Global Warming Potentials (GWP) used for presentation of CH₄ and N₂O in terms of CO₂ equivalent are 21 and 310, respectively. For HFCs, PFCs, and SF₆ the GWP values for a 100 year time horizon have been used. (Source of GWP: Climate Change 1995: The Science of Climate Change, table 4, p. 22, Intergovernmental Panel on Climate Change, 1996).

⁹⁶ IPCC, AR4, 2007

Methodology of the module used for the analysis

Afforestation reforestation module: Material used to develop this module can be found in Volume 4 (AFOLU) of the NGGI-IPCC2006, in Chapter 4 entitled “Forest Land”, and particularly in Chapter 2 “Generic Methodology Applicable to Multiple Land-Use Categories.

297. The first part is dedicated to the description of the vegetation used in the afforestation or reforestation (regeneration or plantation of native species, or plantation of exotic species). According to the climatic information provided in the Description Module, different kinds of most common vegetation types in the corresponding ecological zone are provided with their main characteristics. Up to eight different vegetation are divided into two main groups: natural vegetation and plantations.

298. The distinction in “Native” and “Plantation” is justified by the fact that main characteristics (e.g. the growth rate of trees) strongly depend on management regime, therefore a distinction should be made between intensively (e.g., plantation forestry) and extensively (naturally re-growing stands with reduced or minimum human intervention) managed forests.

299. For each of the default vegetation proposed, information is quantified for the five pools according to the generic methodologies outlined above, but with specific characteristics for forest vegetation. Values of annual growth rates are given for the above-ground and belowground biomass. But as IPCC 2006 highlighted, it is important, in deriving estimates of biomass accumulation rates, to recognize that biomass growth rates will occur primarily during the first 20 years following changes in management, after which time the rates will tend towards a new steady-state level with little or no change unless further changes in management conditions occur.

300. Above-ground biomass growth rate: These values derived from table 4.9 of IPCC 2006 (pages 4.57-4.58) for natural forest, EX-ACT retains either the value proposed or the central value when only a range is proposed. The values are given according to the continent and the ecological zone (Table A/R-1). When no specific numbers were available, the default value for a determined continent is proposed, this value corresponds to the default used for a full tier 1 approach Table 4.12 (page 4.63 of IPCC 2006). Table A/R-1 reported default values for a system being more or less than 20 years.

Perennial module: Material used to develop this module can be found in Chapter 8 “Agriculture” of volume “Mitigation” of the fourth Assessment Report of the IPCC (Smith et al., 2007), and in Chapter 2 of IPCC 2006 “Generic Methodology Applicable to Multiple Land-Use Categories”. The perennial systems, e.g. agro-forestry, distinguishes between two components: (1) perennial systems from other land use or converted to other land use, and (2) perennial systems remaining perennial systems.

Forest degradation & management module: The Forest Degradation Module is made up of 3 sections: (1) the definition of the vegetation, (2) the conversion details regarding the forest state (degradation level at the start, without and with project implementation, and the fire occurrence and severity), and (3) the surface area and GHG emissions. The module also includes the possibility to change the default value of carbon stocks in the biomass, litter and deadwood and soils, as well as adapting its own degradation level scale (in %).

301. Currently there are no international recognized methodologies to assess the forest degradation. The different available states within EX-ACT correspond to an average level of degradation, also expressed in terms of %age of degraded area. Available options of degradation are:

- None,
- Very low (10%)
- Low (20%)
- Moderate (40%)
- Large (60%)
- Extreme (80%)

302. There is always the possibility to change the default value of the five carbon pools with their own data (on site, country level, scientific literature...) as well as the % of degradation between the different considered levels.

Energy consumption and infrastructures module: Concerning wood energy, the emission of CO₂ is not accounted. Indeed, the growing trees remove carbon dioxide from the atmosphere during photosynthesis and store the carbon in plant structures. When the biomass is burned, the carbon released back to the atmosphere will be recycled into the next generation of growing plants; therefore the overall impact is neutral. What is accounted is the CH₄ and N₂O produced, that result from combustion process that is always partly incomplete (depending on oxygenation rate). Emission factor for CH₄ is 4.7 kg CH₄ per tonne of dry matter and 0.26 kg N₂O per tonne of dry matter for N₂O, default value for combustion factor values from Vol. 4, IPCC 2006. EX-ACT considers the sum of CH₄ and N₂O for computations, i.e. 0.11 kg CO₂-e per tonne of dry matter, which can be refined at tier 2.

Detailed project analysis per activity for the project: The impacts from project implementation on GHG emissions and carbon sequestration can be viewed at from different angles and using a diverse set of metrics. The key GHG impacts will in the following be presented using three kind of entry points: (i) *the total net GHG impacts from project implementation will be presented as they occur over time in the entire project implementation area and considering the larger set of diverse GHG emission and sequestration sources as outlined in the project description above*, (ii) *the share per GHG emissions of the balance*, and (iii) *the project contribution to the increase/decrease of GHG emissions in time*.

303. The project carbon balance provided below was analyzed with EX-ACT tool to provide a detailed GHG results distribution between all activities affected by the project. It provides results both for the whole 20 years duration of a usual project GHG appraisal, the share per GHG of the balance (highlighted in red figure 1), and per year.

304. **Baseline EX-ACT Assumptions.** The EX-ACT analysis takes into account specific environmental features (soil and climate types) of each case study. Soil and climate information are needed to determine the coefficients used in the analysis. Average climates considered in the analysis are **Warm Tropical**, the moisture regime was classified as **Dry**, and the dominant soil type was classified as **high activity clay**. The implementation phase of the project was specified as **8 years** followed by an estimated **capitalization phase⁹⁷ of 12 years**.

305. The aforementioned set of information was determined as the minimum information required by EX-ACT. Some calculation will only need the first piece of information, or also the moisture regime, whereas other calculations may particularly require the MAT, e.g. the CH₄ emissions from manure management.

Key project Activities acting on GHG: The project targets afforestation, forest management, perennial crops and agro-forestry development activities on a total area of **143,090.10 ha** and on energy needs of at least **9,000 households** via tailored investments at the household level to increase energy efficiency of key appliances and rural buildings. The project area is subject to the improvement of forest restoration and afforestation, decrease of fuelwood consumption and forest areas brought under forest management plans, as follows:

306. **Afforestation/Reforestation/Forest enrichment (5,700 ha):** The project aims at reversing the forest area decline by collaborative and more effective afforestation/reforestation on degraded lands of State-owned degraded forestland by planting forest trees, mainly Pine Forest (*Pinus* spp), Oak forest (*Quercus* spp), White ash / Poplar forests (*Fraxinus*, *Pópulus*), Hornbeam forest (*Carpinus*), and Wild fruit forest⁹⁸. With the project implementation, the afforestation/restoration activities would take place on at least **5,700 ha** of direct afforestation/reforestation (A/R) activities (table 37). Under the baseline scenario, no afforestation activities would take place. The afforestation activities are summarized in the below tables.

⁹⁷ The capitalization phase is defined in EX-ACT as the period where project benefits are still occurring as a consequence of the activities performed during the implementation phase.

⁹⁸ Under this term, a range of forest ecosystems dominated by fruit bearing woody species is subsumed, including walnut (*Juglans regia* L.), apple (*Malus* spp.), hawthorn (*Crataegus* spp.), plum (*Prunus* spp.), rose species (*Rosa* spp.), almond (*Prunus amygdalus* Stokes) and pistachio (*Pistacia vera* L.)

№	Total target		Area (ha)	Previous land use	Species
	Forest resources: Afforestation/Reforestation/Enrichment				
1	Pine	State-owned land	329	Degraded Land	Pinus spp
		Municipal land	140		
		forest enrichment	329		
Total			798		
2	Oak forest	State-owned land	493.50	Degraded Land	Quercus spp
		Municipal land	210		
		forest enrichment	493.50		
Total			1,197		
3	Hornbeam forest	State-owned land	329	Degraded Land	Carpinus
		Municipal land	140		
		forest enrichment	329		
Total			798		
4	White ash / Popular forests	State-owned land	493.50	Degraded Land	Fraxinus / Populus
		Municipal land	210		
		forest enrichment	493.50		
Total			1,197		
5	Wild fruit forest	State-owned land	705	Degraded Land	Wild fruit
		Municipal land	300		
		forest enrichment	705		
Total			1,710		
	Total		5.700		

Table 37: Type of planted vegetation and corresponding superficies

307. Based on FAO's Global Ecological Zones (FAO, 2011), experts' consultation and relevant publications, the forest in the area of influence and depending on the density of plantation have the following characteristics:

Species	Plants/ha		MAI= mean annual increment ⁹⁹	R=ABG/BGB ¹⁰⁰	Growth rates ABG	Average ABG	Growth rates BGB	Average BGB
			(t C/ha/yr)		Up to 20 years (t CO2/ha/year)			
<i>Pinus spp</i>	State-owned land	280	0.64	0.27	0.14	0.08	0.04	0.02
	Municipal land	140	0.32	0.27	0.07		0.02	
	forest enrichment	84	0.19	0.27	0.04		0.01	
<i>Quercus spp</i>	State-owned land	420	1.09	0.27	0.23	0.14	0.06	0.04
	Municipal land	210	0.54	0.27	0.12		0.03	
	forest enrichment	126	0.32	0.27	0.07		0.02	
<i>Carpinus</i>	State-owned land	280	0.97	0.27	0.21	0.12	0.06	0.03
	Municipal land	140	0.48	0.27	0.10		0.03	
	Forest enrichment	84	0.291	0.27	0.06		0.02	
<i>Fraxinus / Populus</i>	State-owned land	420	0.72	0.27	0.15	0.09	0.04	0.02
	Municipal land	210	0.36	0.27	0.08		0.02	
	forest enrichment	126	0.21	0.27	0.05		0.01	
<i>Wild fruit</i>	State-owned land	600	1.49	0.27	0.31	0.18	0.08	0.05
	Municipal land	300	0.75	0.27	0.16		0.04	
	forest enrichment	180	0.22	0.27	0.05		0.01	

Table 38: Aboveground biomass growth rate and soil carbon content per type of vegetation¹⁰¹

⁹⁹ References to be added.

¹⁰⁰ Ratio of roots to the stem: Below-ground biomass to above-ground biomass ratios (R) is taken from 2006 IPCC Guideline [Gen-1, Volume 4, Chapter 4, Table 4.4] which is chosen according to climatic zones – moderate, and ecological zone – moderate zone for mountain systems given that above-ground biomass in forests of Armenia varies in the range of 75-150 tons per 1 hectare.

¹⁰¹ (ABG: above ground biomass.)

308. No fire will be used for the conversion. Thus, the plantation of forest trees, which concerns 5,700 hectares of degraded land could sequester -48,319.964 tCO₂eq per year or -966,399 tCO₂eq for the entire duration of the project. Details per type of vegetation are described in table 39.

Species	Area (ha)	Carbon Balance tCO ₂ -eq	Carbon Balance tCO ₂ -eq.year-1	Emission Factor tCO ₂ -eq.year-1.ha-1
Pine	798	-132,454	-6,623	-8.29
Oak forest	1,197	-202,895	-10,145	-8.47
Hornbeam forest	798	-134,795	-6,740	-8.44
White ash / Poplar forests	1,197	-199,383	-9,969	-8.32
Wild fruit forest	1,710	-296,872	-14,844	-8.68
Total	5,700	-966,399	-48,320	

Table 39: Carbon balance and annual emission factors (EF) per type of vegetation

Forest degradation and management (137,390.10 ha): The project aims to improve **1,600 ha** of degraded coppiced forests, subject to severe degradation. The project will support communities and administrations in project areas in maintaining forest to ensure Sustainable use of ecosystem services (i.e. Fuel wood) and to improve the management of forest introducing with Component 3 Sustainable and adaptive management practices reducing forest degradation. As a result **135,790.10 ha** of degraded forest -equivalent to Forest Cover in Lori and Syunik- will be benefiting from Sustainable Forest Management practices.

309. Without the project implementation, no change in the level of forest degradation is foreseen. With the project implementation, it is expected that the degradation level and the corresponding %age of total biomass lost affecting all carbon pools would be improved by 31.5 % passing from an annual growth rate of 2.08 to 2.86 m³/ha/year. The state of degradation level (with and without the project implementation) as well as the main carbon forest characteristics are summarized in tables 40 and 41 below.

Type of vegetation that will be degraded	Species	Degradation level of the vegetation			Area (ha)
		Initial State ¹⁰²	Without Project	With Project	
Subtropical mountain systems		Large ¹⁰³	Large	Low	135,790.1
Total area (ha)					135,790.1

Table 40: Type of vegetation, corresponding area and degradation level

Type of vegetation that will be degraded	Above-ground biomass (t c/ha)	Below ground biomass (t c/ha)	Litter (t c/ha)	Soil carbon (t c/ha)
Subtropical mountains systems ¹⁰⁴	63.5	17.1	24.30	38.0

Table 41: Carbon sequestration potential for the targeted forest species

310. Thus, the management of 135,790.10 ha of Coppiced forest could sequester carbon at an annual rate of -941,665 tCO₂eq per year or -18,833,290 tCO₂eq for the entire accounting duration of the analysis.

±

¹⁰² Forest's level of degradation is based on expert's consultation.

¹⁰³ 60 % of biomass lost: Based on these areas, vegetation characteristics and degradation level, the GHG balances in CO₂-e is calculated for the biomass, soil and fire pool.

¹⁰⁴ Based on expert's consultation and FAO's Global Ecological Zones (FAO, 2011).

311. *Fuel wood consumption*: The project aims at diversifying renewable energy use and making biomass energy use more sustainable. By Y7, at least **9,000 households** from forest adjacent communities in project areas adopt Energy Efficiency practices/appliances and reduce pressure on forest resources deriving from livelihood activities namely fuelwood. As a result the project will decrease the fuelwood energy needs by at least 30 % (from 8 m³ per households to 5.6 m³ per households) via tailored investments at the household level to increase energy efficiency of key appliances and rural buildings. The fuel wood consumption in the area of influence and depending on the wood with moisture content of 25%-35% has an emission factor of 1.5 t CO₂eq/t of d.m¹⁰⁵. Rural households buy their wood in stacked cubic meters. One cubic metre of stacked wood is estimated to be 511 kg. The moist wood is converted to dry matter by applying a factor of 0.7. Thus, decreasing the wood consumption from 36,806 to 25,764,2 tonnes of dry matter per year would sequester -8,199 tonnes of CO₂eq per year or - 175,697 tCO₂eq sequestered for the entire duration of the project.

Description and unit to report	Quantity before the project per year		Quantity after the project per year	
	Tonnes of dry matter per year	tCO ₂ eq emitted without the project	Tonnes of dry matter per year	tCO ₂ eq emitted with the project
Wood fuel	27,605	732,071	19,323	556,374

Table 42: Fuelwood consumption in tonnes of dry matter per year

Carbon monitoring system based on EX-ACT for the project: Table 43 describes the carbon balance of each project activity. It covers the activities deployed in the project, which comprise a better forest management, afforestation activities and fuelwood consumption.

EX-ACT Module	Activities	Area (ha)	C balance (tCO ₂ -eq)	C Balance tCO ₂ -eq.year-1	Emission Factor (tCO ₂ -eq.year-1.ha)
Afforestation (under LUC)	Afforestation	5,700	-966,399	-48,320	-8.48
Forest degradation and management	Improved management of degraded forest lands	137,390.1	-18,833,290	-941,655	-6.93
		Quantity (in tonnes of dry matter per year)	C balance (tCO ₂ -eq)	C Balance tCO ₂ -eq.year-1	Emission Factor (tCO ₂ -eq.year-1.tdm)
Inputs and investment	Decreasing fuelwood consumption	8,281	-175,697	-8,785	-0.45
Net Carbon Balance			-19,975,387	-998,769	

Table 43: Carbon balance and Emission Factor from Carbon Sequestration

Results provided by EX-ACT: All calculations done in the EX-ACT tool are reported in the results module. After a short reminder of the description module (name of the appraised project, its duration, the continent, the dominant climate, and the soil chosen by the user) including the total area of the project, the following table (see figure 1) summarizes the GHGs sequestration and the share of the balance per GHG from the adopted scenario. The balance is the difference of GHG gross fluxes between the with project situation and the without project situation. Results are given in tonnes of CO₂ equivalent (tCO₂-e). Positive numbers represent sources of CO₂-e emissions while negative numbers represent sinks. The left table section summarizes estimated gross fluxes and CO₂-e emissions and sinks from the scenario without-project (left column), from the scenario with-project (middle column) and the total balance (right column). The middle table details the Carbon Balance under project implementation, showing the GHG fluxes from the different modules. The right table details annual CO₂-e fluxes for the different activities without and with-project implementation, and for the carbon balance.

312. The carbon balance (C Balance) of the project, which consists in the difference of tCO₂eq emitted or sequestered between a scenario with project and a scenario business-as-usual (BAU or baseline scenario), demonstrates the benefits of implementing the project and its different components in terms of mitigation

¹⁰⁵ 0,39 kg CO₂eq/kWh.

potential. For this project which covers 20 years in EX-ACT (eight years of implementation and 12 years of capitalization), the net carbon balance is **-19,963,673 tCO₂eq**, which means a mitigation potential of -7.1 tCO₂eq per hectare and per year compared to a scenario "without project" (BAU).

313. The highest carbon sinks will result from the forest management (-18,833,290 tCO₂eq) followed by afforestation activities (-966,399 tCO₂eq), and the decrease in fuel wood consumption (-163,984tCO₂eq).

Project Name	GCF Armenia		Climate	Warm Temperate (Dry)			Duration of the Project (Years)		20		
Continent	Asia (Continental)	Dominant Regional Soil Type	HAC Soils	Total area (ha)					141490.1		
Components of the project	Gross fluxes			Share per GHG of the Balance					Result per year		
	Without	With	Balance	All GHG in tCO2eq			N2O	CH4	Without	With	Balance
	All GHG in tCO2eq			CO2							
	Positive = source / negative = sink			Biomass	Soil	Other					
Land use changes											
Deforestation	0	0	0	0	0		0	0	0	0	0
Afforestation	0	-966,399	-966,399	-540,708	-425,691		0	0	0	-48,320	-48,320
Other LUC	0	0	0	0	0		0	0	0	0	0
Agriculture											
Annual	0	0	0	0	0		0	0	0	0	0
Perennial	0	0	0	0	0		0	0	0	0	0
Rice	0	0	0	0	0		0	0	0	0	0
Grassland & Livestocks											
Grassland	0	0	0	0	0		0	0	0	0	0
Livestocks	0	0	0	0	0		0	0	0	0	0
Degradation & Management	0	-18,833,290	-18,833,290	-16,449,359	-2,383,931		0	0	0	-941,665	-941,665
Coastal wetlands	0	0	0	0	0		0	0	0	0	0
Inputs & Investments	732,071	556,374	-175,697			-175,697	0	0	36,604	27,819	-8,785
Fishery & Aquaculture	0	0	0			0	0	0	0	0	0
Total	732,071	-19,243,315	-19,975,387	-16,990,067	-2,809,622	-175,697	0	0	36,604	-962,166	-998,769
Per hectare	5	-136	-141	-121.3	-19.9	-1.2	0.0	0.0			
Per hectare per year	0.3	-6.8	-7.1	-6.1	-1.0	-0.1	0.0	0.0	0.3	-6.8	-7.1

Figure 32: EX-ACT results. All GHG are expressed in tCO₂eq¹⁰⁶

¹⁰⁶ . Positive result = source while negative result = sink.

16. PROJECT COST AND FINANCING

Introduction: This section describes the Project's estimated costs and financing. The Project costs are based on October 2018 prices. Some of the key parameters are presented below.

- **Project Period.** The proposed project would be financed over an eight-year period.
- **Exchange rate.** The Base Exchange rate used for the project cost calculations was 483.5 Armenian Drams (AMD) per 1 United States Dollar (USD), corresponding to the average exchange rate prevailing during the design period (August-October 2018, Source: Central Bank of Armenia). The Project costs are presented in USD.
- **Inflation rate.** During 2018, the country experienced a moderate consumer price index increase (average 2.7 %), with a slight increase between 3.2 and 4.3 % for 2019-2023 (source: EIU estimates 2018).¹⁰⁷ The project has set aside a 1 % contingency allocated to each project component) to face possible effects of the generalized inflation on the project procurement.

Project Costs: The total investment and incremental recurrent Project costs including contingencies are estimated at US\$ 18,704,730. The project management cost represent 4.9 % of the total Project costs. The summary and detailed cost tables are presented as Annex 3 of the Funding Proposal. The Table 44 below presents the breakdown of costs by component.

		GCF	ADA	WWF	FAO	Bolzano	Gov.	TOTAL
TOTAL								
Comp 1	Output 1.1:	690,055	0	0	0	0	1,596,130	2,286,185
	Output 1.2:	3,535,569	325,300	0	0	0	3,293,560	7,154,429
	Output 1.3:	340,800	107,650	200,000	22,000	0	0	670,450
		4,566,424	432,950	200,000	22,000	0	4,889,690	10,111,064
Comp 2	Output 2.1:	64,740	70,800	0	0	26,250	0	161,790
	Output 2.2:	160,192	100,950	0	20,000	53,500	0	334,642
	Output 2.3:	3,166,620	88,250	0	0	0	0	3,254,870
		3,391,552	260,000	0	20,000	79,750	0	3,751,302
Comp 3	Output 3.1:	877,496	353,490	0	253,298	124,000	0	1,608,284
	Output 3.2:	402,400	0	0	300,460	0	838,290	1,541,150
	Output 3.3:	284,100	320,102	0	169,000	0	0	773,202
		1,563,996	673,592	0	722,758	124,000	838,290	3,922,636
Comp 4 (PMC)	4.1. Investment	478,028	265,000	0	0	0	176,700	919,728
		478,028	265,000	0	0	0	176,700	919,728
TOTAL		10,000,000	1,631,542	200,000	764,758	203,750	5,904,680	18,704,730

Table 44: Breakdown of costs by component (USD)

314. The project's major categories of expenditures (represented in Figure 33) include:

- (a) **Procurement** (seedlings, civil works, equipment, tools, etc.) for about 37 %,

¹⁰⁷ Economist intelligence Unit Country report, IV quarter, October 2018.

- (b) **Technology Transfer**, for about 28 %, including resources related to transfer to beneficiary institutions or individual of techniques and technologies that improve efficiency and effectiveness in energy and forest management.;
- (c) **Capacity Development**, including training, technical assistance, on the job learning and coaching to individuals as well as to the local and central institutions in order to ensure sustainability of the operation, for about 15 % of the total costs (slightly more than half is funded under GCF grant resources);
- (d) **Consultancies** (local and international) **and FAO technical support services**, representing about 11 % of the total, are dedicated to quality assurance and to support policy dialogue throughout the implementation, according to the comparative advantages of FAO (i.e., including by mobilizing FAO available expertise under the best value for money principle);
- (e) **Contracts** with local institutions for the provision of services sum up to about 3 % of the total;
- (f) **Travel** covers national and international transport and related daily subsistence allowances, including for the provision of technical support. It corresponds to about 3 % of the total.
- (g) **Administrative costs** (2 %) would cover the functioning of offices and the required operation and maintenance costs of project resources.

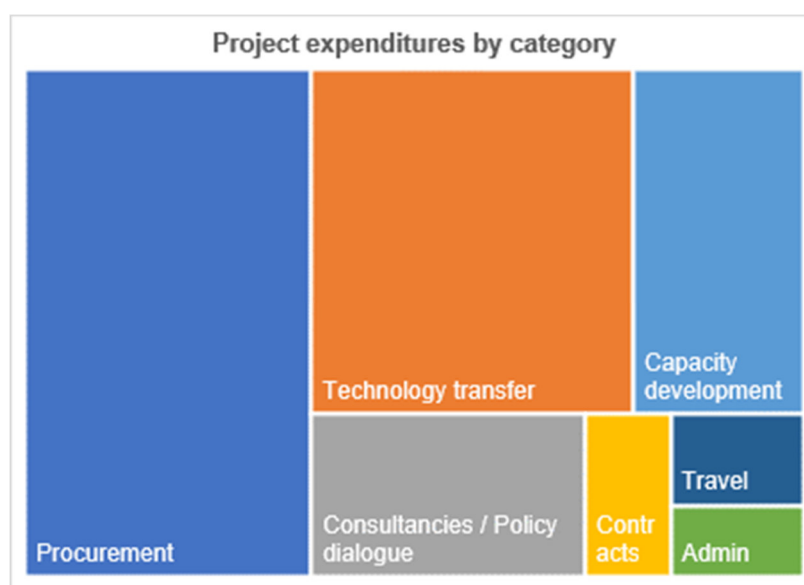


Figure 33: Figure A: Project expenditures by category

315. The project will be nationally executed jointly by the Environment Project Implementation Unit (EPIU) of the Ministry of Environment (MoE) and the FAO representation in Armenia. Two additional partners and co-financiers (WWF and Autonomous Province of Bolzano) will execute the portion of activities under their management. **Financing:** The project will receive GCF grant resources for the amount of US\$ 10,000,000, and additional co-financing resources for USD 9,158,235, with a co-financing ratio of 91.5 %. The financiers are contributing to the project costs as reported below:

- **The GCF grant** (52 % of the total): 45 % of Component 1 (USD4.51m), 83 % of Component 2 (USD3.6m); 37 % of Component 3 (USD1.41m), and 52 % of PMC (USD0.48m).
- **Government of Armenia** (31 % of the total): 48 % of Component 1 (USD4.89m) – mostly dedicated to co-finance the development of nurseries and to fund entirely the seedlings required for the forestry investment; 22 % of Component 3 (USD0.84m), specifically for the national uptake of the forest monitoring system; and 19 % of the PMC (USD0.18m), for specific salaries.
- **Austrian Development Agency** (8 % of the total): 5 % of Component 1 (USD0.43m) for the development of the biomass value chain; 6 % of Component 2 (USD0.26m) to support the EE use and

adoption analyses; 17 % of Component 3 (USD0.67m), with a specific focus on the policy dialogue for and capacity development for the biomass value chain development; and 28 % of PMC (USD0.27m).

- **WWF** (1 % of the total), will finance 2 % of Component 1 (USD0.20m) for the preparatory mobilization and training of communities for the forestry investment in municipal land.
- **FAO Technical Cooperation Programme** (4 % of the total): besides a limited contribution to Component 1 and Component 2 (totalling USD0.04m), it will fund 18 % of component 3, for activities related to policy dialogue and capacity development on forestry (USD 0.72m)..
- **Autonomous Province of Bolzano** will provide in-kind contribution for an equivalent USD0.2m, but with a very strategic and peculiar function to enhance local capacities to enhance the efficiency of the biomass use (components 2 and 3), focusing both on users of EE appliances and on manufacturers.
- **Beneficiaries** (2 % of the total): as private sector contribution, the beneficiaries of energy efficient technology transfer are expected to contribute to at least 11 % of Component 2 (USD0.45m) as their share of cost for the technologies.

316. Tables 45 and Figures 34 and 35 below provide summaries by the Project components by financier and Financing parameters.

Financing Parameters	
GCF grant share on Total Project Cost	52%
GCF grant contribution to the PMC	52%
Co-fin	48%
PMC share of total Budget	4.80%
GCF-funded PMC on GCF Grant	4.78%
Public source finance leveraged (USD)	8,504,735
Private source finance leveraged (USD)	663,500
Total Leverage ratio	91.68%
Public source leverage ratio	85.0%
Private source leverage ratio	6.6%

Table 45: Project financing parameters

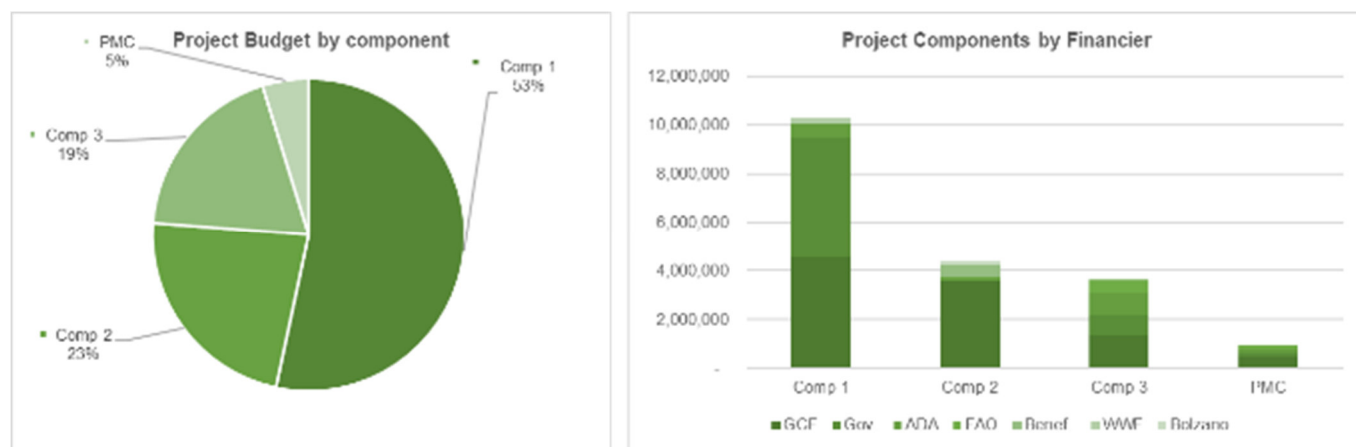


Figure 34: Project budget by component and financier

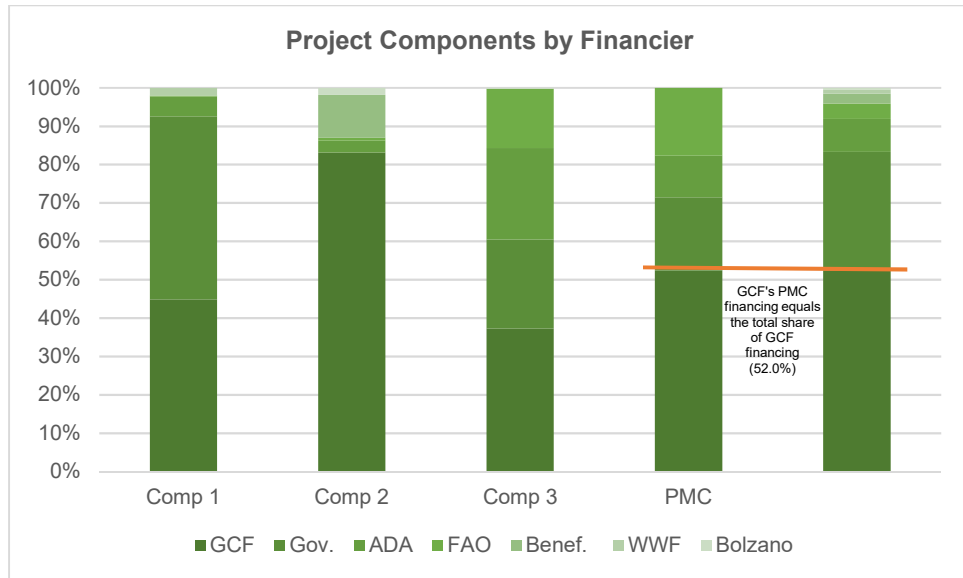


Figure 35: Financiers contributions by component