Armenia Forest Landscape Restoration Note

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Forest Landscape
Restoration Note

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LIST OF ACRONYMS

AAC	Annual Allowable Cut
ATP	Armenia Tree Project
CBD	Convention on Biological Diversity
CEPA	Comprehensive and Enhanced Partnership Agreement
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
EaP	Eastern Partnership
ENP	European Neighbourhood Policy
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FLR	Forest Landscape Restoration
FMP	Forest Management Plan
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIZ	German International Development Agency (Deutsche Gesellschaft für Internationale Zusammenarbeit)
GoA	Government of Armenia
HCVF	High Conservation Value Forest
HEMC	Hydrometeorology and Environmental Monitoring Center
IBA	Important Bird Area
ICT	Information and Communication Technology
IMF	International Monetary Fund
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
LDN	Land Degradation Neutrality
M&E	Monitoring and Evaluation
MoE	Ministry of Environment (former Ministry of Nature Protection)

MoTD	Ministry of Territorial Development
NAP	National Adaptation Plan
NBSAP	National Biodiversity Strategy and Action Plan
NDA	National Designated Authority
NDC	Nationally Determined Contribution
NFI	National Forest Inventory
NFP	National Forest Program
NFPS	National Forest Policy and Strategy
NGO	Nongovernment Organization
NPV	Net Present Value
NWFP	Non-Wood Forest Product
OECD	Organisation for Economic Co-operation and Development
OSCE	Organization for Security and Co-operation in Europe
PPP	Public-Private Partnership
ROAM	Restoration Opportunities Assessment Methodology
SAP	Simplified Approval Process (GCF)
SDGs	Sustainable Development Goals
SNCO	State Non-Commercial Organization
SPA	Specially Protected Area
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests
USAID	United States Agency for International Development
WEI	Water Exploitation Index
WRI	World Resources Institute
WWF	World Wildlife Fund

Currency and conversion

$1 = AMD 390 (Oando, April 2023)

1. EXECUTIVE SUMMARY

This note synthesizes multiple reports produced under World Bank support to the Government of Armenia (GoA) in undertaking landscape restoration opportunities assessment and provides a detailed overview of opportunities and challenges in the forestry sector. The note has been developed through a consultative process and is expected to inform all relevant stakeholders on the current status of the forest sector and opportunities to further improve it.

Armenia is a forest-poor country; only 11.2 percent of the territory (334,100 hectares [ha]) is forested, which is concentrated in three marzes:[1] Tavush and Lori in the north and Syunik in the south. The predominant forest type is naturally grown broad-leaved mountain forest with a small area of pine forest. Estimates on the state of the forests, their extent, quality, health, and harvested volumes vary widely depending on the data sources and methodology used. Based on wood consumption data, harvesting volumes must be much higher than officially reported, while forest growth is lower than the current official estimates. These divergences, combined with limited silvicultural management and exacerbated by fires and uncontrolled grazing, mean that sustainable forest use is clearly far from guaranteed.

Forestry can make more of a contribution to Armenia, given its rich biodiversity and potential for social, economic, and cultural services. With only 11.2 percent of the territory forested and significant rates of land degradation, forest land restoration (FLR) has strong potential. Meeting the Bonn Challenge of 50,000 ha (achieving 12.9 percent of forest cover) afforested by 2030 is a useful intermediate target toward the stated aim of eventually reaching 20 percent forest cover by 2050.[2] Degradation pressures persist however, and recent energy cost increases will place further pressure on the resource. Comprehensive recent studies on forest landscape restoration (FLR) present a highly credible roadmap and action plan that are the outcome of broad stakeholder consultation. The field investment contained in the strategy is highly labor intensive and in the post–COVID-19 recovery represents a potential triple win of enhanced rural development, biodiversity protection, and climate benefits (both mitigation and adaptation).

The objective of this note is to strengthen the dialogue with Armenia on the forest sector in light of the ongoing reforms and to explore how the country can reverse landscape degradation and increase its contribution to post-pandemic economic recovery. Each hectare of forest is estimated to deliver on average $417 per year in total value from a number of ecosystem services[3] (or $138 million annually). The note presents an overview of the sector, highlighting these ecosystem services and outlining

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[1] Armenia is subdivided into 11 administrative divisions. Of these, 10 are provinces, known as marzes (մարզեր) and in the singular form marz (մարզ) in Armenian. It is important to note that the data on forest cover are based on the last forest inventory, which was done back in 1993 (*Source*: Ministry of Environment - MoE).

[2] This target was initially mentioned in Armenia's First National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) (*Source*: MoE).

[3] Value-transfer method is used for estimating the values of ecosystem services. The values of 10 ecosystem services are estimated — fuelwood, water, medicinal plants, wild fruits, mushroom, honey, habitat/species protection, hydrological regulation, greenhouse gas (GHG) removal, and recreation. The values of other ecosystem services could not be estimated due to the lack of required data.

opportunities to enhance the flow of value even further, including through increased jobs and forest associated livelihoods. The important drivers of degradation are addressed, as is the importance of the sector to climate mitigation, before a brief list of recommendations is given.

Key issues

Forests in Armenia face substantial challenges. A significant share of forests is considered to be degraded. The direct drivers of degradation and deforestation are: the encroachment of agriculture onto forest lands and livestock grazing on forest lands; the heavy dependence on forests by rural population, including unsustainable harvesting of fuelwood and non-wood products; conversion of forest lands to other land uses, including infrastructure and land development, mining industry, and so on; and an increase in pest, disease, and fire damage, exacerbated by climate change. Indirect drivers include the lack of awareness among the general population about the importance of sustainable forest management and the lack of enforcement of forest regulations and alternative, affordable sources of energy.

The sectoral policies could be adjusted to support the required increase in FLR. Meeting the Bonn Challenge of restoring 50,000 ha by 2030 is problematic if a business-as-usual approach to forest planning and governance is used. The state forest authorities lack physical equipment, other infrastructure, and capacities needed for climate adaptation, FLR, and nursery management. Collaborative forest management and the principles supporting it

could improve the performance of local staff and managers. A coherent and simplified regulatory support to address the challenge could be prioritized.

Priorities

Formalizing and adopting a national strategy for landscape restoration is recommended.[4] As part of a study commissioned by the World Bank, UNIQUE Forestry and Land Use GmbH applied the Restoration Opportunities Assessment Methodology (ROAM), developed by the International Union for Conservation of Nature (IUCN) and the World Resources Institute (WRI), to identify potential areas for FLR and prioritize them at national and subnational levels. The synthesis of this work is a 'Landscape Restoration Strategy and Action Plan 2022–2032' that identifies: eight FLR intervention options; required changes in legislation and policy to support the activity; the capacities required in administration, relevant government / nongovernment organizations, and local communities; a roadmap and action plan over a 10-year period; financing needs and potential sources; and a monitoring and evaluation (M&E) framework to ensure success. The initial target over 10 years is the Bonn Challenge of 50,000 ha afforested.[5]

The draft strategy has benefited from comprehensive consultation across state institutions, community organizations, nongovernmental organizations (NGOs), and others. As of mid-2023, this document is under final review by the GoA. Its formal adoption will require a clear mandate from the GoA to prepare the strategy, the lead role assumed by government agencies

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[4] Under the EU Green Deal and the EU Biodiversity Strategy 2030, the EU has pledged to plant 3 billion trees and has already exceeded this goal. https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030/3-billion-trees_en.

[5] According to the MoE, Department of Forest Policy, the Forest Policy and Strategy and National Action Program is currently under the development. FLR measures will be integrated into a single document instead of having several strategies and action plans for the same sector.

in all phases of the strategy preparation, and a binding commitment of the GoA to implement the strategy and provide it with appropriate funding, perhaps contingent on the availability of donor resources. Formal acceptance and implementation of the FLR strategy is the principal recommendation of this note and is assigned the highest priority for immediate implementation.

Adopting a comprehensive National Forest Monitoring System is advised. Linked to the FLR strategy, but with a scope that encompasses existing forests and restored landscapes, this system incorporates a national forest inventory (NFI) and land cover classification. The system will be a comprehensive monitoring system that aligns with national reporting needs and ongoing policy formation. Currently, the State Forest Inventory System of Armenia is based on forest management planning data, which are aggregated from individual plots, and is different from the wider practice of aggregating data on NFI based on sample plot networks. In addition, the comprehensive National Forest Monitoring System assumes

monitoring of forest biodiversity.

Building institutional capacity through information and communication technologies (ICTs) and a Forest Management Information System will raise the efficacy of existing staff and management and support the management of the expanded roster of contractors, contracts, equipment, infrastructure, and human resources needed to achieve the forest expansion targets. Such a system will enhance quality control and M&E of all activities and not just those associated with a single project.

A specific action plan is recommended to address energy issues, particularly fuel poverty in rural areas where forest resources are under threat. An integrated view is required to combat the use of forests as a 'backstop' source of heating fuel in any fuel or energy price crisis. This action will address the wider economic context, including the easy availability of alternatives such as a natural gas, tax treatment of imported wood (biofuel), and link with work on improved enforcement of regulations.

2. INTRODUCTION

Forests in Armenia have long been a source of a broad range of provisioning, regulating, and cultural ecosystem services that are vital for not only the economy of the country but also the health and well-being of its citizens. Fuelwood—the most important forest-based provisioning service in Armenia — is a crucial source of energy for cooking and heating, amid high costs of gas and electricity, for all households in rural areas and lower-income households in urban areas. Other important provisioning services include timber, food (wild fruits, mushroom, and honey), and medicine. However, extensive production forests cannot be accommodated within the country due to the topography, climate, and availability of land. At the same time, the service values that forests and trees can deliver provide vital support to other land uses as well as make an essential contribution to the well-being and quality of life of the whole population. Forests—by regulating watersheds—provide a significant portion of water and its more even distribution for irrigation and drinking in the country, especially during relatively dry periods of the year. Armenia's forests—by maintaining hydrological balance and water flow in rivers and streams, reducing surface runoff, and thus preventing soil erosion and siltation—play a crucial role in keeping agricultural land fertile. Also, by conserving biodiversity (habitat/species protection) and supporting pollination, forests contribute to the production of food and other crops.

Forests are also an important carbon sink, on average, removing about 0.5 million tCO$_2$eq greenhouse gas (GHG) each year

which has an estimated economic value of $33 million.[6] Furthermore, by hosting many of Armenia's over 100 ancient monasteries and cultural and religious sites and being predominantly located in mountainous landscapes, the country's forests offer several important cultural services. Most prominent of them are recreation, wilderness, scenic beauty, and spiritual values. Forests and related industries including nature-based tourism also sustain valuable rural employment.

The aggregate economic value of the ecosystem services is $417 per ha per year (in 2021 constant $). This corresponds to a total ecosystem services value of about $138 million per year for all forests of Armenia, which is equivalent to 1.1 percent of the country's gross domestic product (GDP) in 2020. It should be noted here that due to the limited availability of necessary biophysical and socioeconomic data, valuation of only 10 forest-based ecosystem services was possible for this Policy Note. Had the valuation of more ecosystem services been possible, the aggregate economic value would have been much higher than what is reported.

Continued land degradation affects the vital role of forests in providing ecosystem services. The proximate drivers of such degradation are overcutting; overgrazing; mining; infrastructure development; and forest fire, pests, and diseases. The key underlying drivers are economic activities that intensify land use competition and high costs of gas and electricity, particularly for the low-income households. Such costs are

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[6] There is a need for recalculation of the national GHG inventory estimates for the Land Use, Land-use Change and Forestry (LULUCF) sector, identified by CITEPA/ONFI reports (2021) (MoE).

likely to remain high in the foreseeable future, given the current geopolitical situation, leading to continued forest degradation for fuelwood harvesting at the same rate or faster than before. Soil erosion, uncontrolled surface runoff, landslides, disturbance to the hydrological cycle, and flooding are commonly attributed to deforestation and forest degradation in Armenia. In 1990–2020, the country lost nearly 6,300 ha of forests which resulted in a net GHG emission of about 93,000 tCO_2eq per year.[7] Other vital ecosystem services are also lost due to deforestation and forest degradation. The economic costs of deforestation—in terms of GHG emissions and loss of other ecosystem services—are estimated to be over $8 million per year (in 2021 cost $). Overall land degradation in Armenia is estimated to have a total economic cost of $111 million per year (in 2021 constant $).

Forest areas are almost entirely under public ownership. The majority is on state forest land with roughly 25 percent of its proportion in protected areas and all are under the mantle of the Ministry of Environment (MoE). Forest policy and legislation are largely defined in the Forest Code 2005, updated in 2018. It lays out requirements for control and management but generally lacks provision for consultation and wider stakeholder engagement. The Forest Policy Department, the Forest Committee, and the 'Hayantar' State Non-Commercial Organization (Hayantar [ArmForest] SNCO), all under the MoE, are the national-level institutions in charge of sustainable use of forests in Armenia. Forest landscape restoration (FLR) is a critical goal of all these institutions to protect biodiversity and ensure efficient use of the environmental, social,

and economic potential of the state forests. Armenia's National Forest Program (NFP) 2005–2015 (a new Forest Policy and Strategy and National Action Program of Armenia currently under development) identifies an optimal forest cover as 20.1 percent, which is nearly double today's forest area. Armenia's updated Nationally Determined Contribution (NDC) for 2021–2030 seeks to reduce the country's GHG emissions by 40 percent from 1990 emission levels, and with the adoption of the new NFP it is envisaged to increase the forest cover to 12.9 percent by 2030, corresponding to an increase of 50,000 ha of forests.[8] Both sustainable use of land and better forestry management will be necessary to achieve these targets. The NDC also highlights afforestation to prevent erosion as national priorities in the Strategy of the Republic of Armenia on Conservation, Protection, Reproduction, and Use of Biological Diversity from 2015.

Private forestry is not considered an attractive investment in Armenia. While Armenia's Forest Code enshrines the right to private ownership and community ownership over forests and forest lands, private forestry is not commonly practiced. Lack of adequate financial incentives and supporting policies and an underdeveloped forest industry act as barriers for investments in private forestry. Community-based organizations lack adequate technical capacity and resources to establish new forests and to carry out environmentally and economically sound management, further limiting the options for establishing private forests.

Overall, while the Armenian forest sector currently faces many problems and challenges, a range of effective actions can be taken, with outside support where

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[7] Forest Landscape Restoration in the Caucasus and Central Asia (ECE/TIM/2018/Inf.3) report by UNECE (2019) estimates "Armenia's restoration potential as 100,000 ha, which corresponds to the forest area degraded or lost between the 1990s and 2018." *Source:* UNECE 2019.

[8] The target 50,000 ha of area is recommended to cover both reforestation and afforestation activities in Armenia (MoE).

appropriate, to ensure that there is an expansion of trees and forests in the country. This will deliver products and services to support the economy and reduce the threat of damaging influences, including loss and degradation of the resource base from stagnation, overcutting, fire, uncontrolled grazing and, in the long-term, climate change.

Net present value (NPV) of the economic benefits of FLR—in terms of the incremental supply of ecosystem services—is estimated to be just over $199 million over a 30-year period. This is equivalent to about 1.44 percent of Armenia's GDP in 2021. According to UNECE (2019), Armenia has the potential to restore 100,000 ha of forest land that is heavily degraded and deforested. The supply of ecosystem services from degraded and deforested land has reduced substantially and thus restoration provides economic benefits in terms of the incremental supply of ecosystem services in the country.[8]

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[9] Heavily degraded and deforested land—that has potential for restoration in Armenia—has substantially depleted standing stock and biodiversity. Therefore, it is assumed that the land to be restored offers only 25 percent of economic benefits in terms of ecosystem services supply in comparison to fully restored forests. This means that the incremental economic benefits of restoration in terms of ecosystem services supply are 75 percent. As it takes time for forest land to be restored fully, it is assumed that 50 percent of the incremental benefits will be available in years 1–5 and 100 percent from year 6 onward. It is also assumed that 100,000 ha is restored in 10 years with 10,000 ha in each year. An ecosystem services value of $416.7 per ha per year—that is estimated for this note (see Chapter 5) — is used for estimating the economic benefits of restoration.

3. COUNTRY AND LAND USE CONTEXT

The Republic of Armenia is a landlocked country, with Türkiye to the west, Georgia to the north, Azerbaijan to the east, and Iran to the south (Figure 1).[9] Armenia has a long-standing cultural history as one of the earliest Christian civilizations. Over the last 2000 years, it frequently oscillated between Roman, Persian, Byzantine, Arabic, Mongol, Turkish, and Russian control as well as periods of independence. After independence from the Soviet Union in 1991, Armenia was quickly drawn into a long-standing violent conflict with Azerbaijan, mainly over the Armenian Nagorno-Karabakh region. Armenia is a unitary multiparty republic, based on the constitution of 1995. The country undertook a series of fundamental democratic reforms in 2018 after a nonviolent Velvet Revolution.

Figure 1: Map of Armenia[10]

With an area of 29,743 km², it is the smallest country in the Caucasus region.[11] Its population is 2.97 million (World Bank 2020b), and the population density in Armenia is 104 per km². The population is 98 percent ethnically Armenian. According to various

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[10] Summarized to large extent from Armenia – Government and society | Britannica and https://data.worldbank.org/country/AM.

[11] The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the World Bank.

[12] Areas as indicated by the World Bank.

estimates, the total number of Armenians in the world is 5–9 million[13] with the majority living in the states of the former Soviet Union and more than 1 million living in the US. The major languages are Armenian and Russian.

Construction, services, and agriculture are the most important sectors of the Armenian economy. The service and industry sectors have been the drivers of economic growth through the expansion of tourism, trade, and mining. Mining dominates Armenia's goods exports.[14] Exports of mined resources, including finished products based on raw materials such as aluminum foil and raw diamonds, account for over half of Armenia's merchandise exports annually. Mined copper resources represent the single biggest contributor to Armenia's merchandise exports. Cash remittances sent home by Armenians working abroad are another important contributor to the GDP, representing 13 percent of the GDP.[15]

An upper - middle - income country, Armenia has seen strong progress in poverty reduction. In 2021, 36 percent of the people lived in rural areas and 64 percent in urban areas, mainly in the capital, Yerevan (1.092 million people) (Statistical Committee of the Republic of Armenia 2021). Armenia is classified as an 'upper-middle-income' country by the World Bank, with gross national income per capita of $13,110, and 44.7 percent of the population was considered poor, being at the upper-middle-income class poverty line ($5.50 per capita per day) in 2020.[16] Poverty at the international poverty line ($1.90 per capita per day) has fallen drastically since 2001 and remains low, at only 0.4 percent in 2020 (Statistical Committee of the Republic

of Armenia 2021). Human Development Index is 0.776 (UNDP 2020).[17]

Current geopolitical events are a threat to the economy generally and forest resources in particular as they are a source of alternative fuel. Russia's invasion of Ukraine and ongoing tensions with Ukraine and ongoing tensions with neighboring Azerbaijan will have unpredictable consequences for the economic, energy and social environment of the country as a whole and, given the high dependency of the country on affordable energy sources from Russia, the fate of the forest resources in particular.

The climate varies with elevation but is predominantly dry. Armenia is a mountainous country characterized by a large variety of landscapes but also high geological instability. The average elevation is about 1,800 m above sea level. There are no lowlands: half the territory lies at elevation of 1,000–2,000 m with only about 10 percent of the country lying below 1,000 m. Armenia's climate is subtropical dry and continental with high regional climatic variation according to the elevation. Mean annual precipitation to potential evapotranspiration ratio delineates three major climatic zones (as defined by IPCC 2019): warm temperate dry, cool temperate dry, and cool temperate moist. The overall pattern is wet spring, dry summer, with moist autumn and winter, with winter precipitation falling as snow at higher elevations.[18][18] Average June and August temperature in the plain is 25°C and more; January temperature in the plain and foothills is –2°C to –5°C. Winter is particularly rough on the elevated, windswept plateau. The ranges of the Lesser

13 https://www.britannica.com/place/Armenia/Settlement-patterns.

14 Armenia - Mining and Minerals (trade.gov).

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

16 https://databank.worldbank.org/views/reports/reportwidget.aspx?Report_Name=CountryProfile&Id=b450fd57&tbar=y&dd=y&inf=n&zm=n&country=ARM.

17 http://hdr.undp.org/en/countries/profiles/ARM.

18 https://climateknowledgeportal.worldbank.org/country/armenia/climate-data-historical.

Caucasus prevent humid air masses from reaching inner central Armenia. On the mountain slopes, yearly rainfall is around 800 mm, while on the plains, it is low at 400 mm or less.

Though it is a relatively small country, the complexity of terrain and biogeographic regions within Armenia results in a rich fauna and flora. Armenia lies at the junction of various biogeographic regions and is characterized by a wide variety of landscapes (Figure 2). There are five altitudinal vegetation zones: semidesert, steppe, forest, alpine meadow, and high-elevation tundra. The semidesert landscape is covered with scant vegetation. Dry steppes predominate with drought-resistant grasses, thorny bushes, and juniper. The forest zone lies in the southeast and northeast of Armenia, in higher elevations up to 2,200–2,400 m above sea level. The alpine tundra, with its scant cushion plants, covers only limited mountain areas and solitary peaks. Landscape and biological diversity are a unique and important asset for nature-based tourism.

Figure 2: Landscape Zones of Armenia

Legend
- State border
- Cities
- Main rivers
- Main lakes and reservoirs

Landscape Zones
- Submountain semidesert (300-500 m.a.s.l.)
- Mountain-valley semidesert (500-1000 m.a.s.l.)
- Low and middle mountain forest shelter belt (400-1000; 1900-2100 m.a.s.l.)
- Low mountain, dry steppe (1000-1600 m.a.s.l.)
- Low and middle mountain forest (800-2300 m.a.s.l.)
- Middle mountain steppe (1400-2300 m.a.s.l.)
- Middle mountain meadow steppe (2200-2600 m.a.s.l.)
- High mountain subalpine (2400-2800 m.a.s.l.)
- High mountain alpine (2800-3400 m.a.s.l.)
- High-altitude snow-cowered (3300-3400 m.a.s.l. and above)

Source: Fifth National Report of the Republic of Armenia to the Convention on Biological Diversity 2014. https://www.cbd.int/doc/world/am/am-nr-05-en.pdf.

Agriculture is an important sector in the economy, accounting for about two-fifths of the GDP and employing 30 percent of the labor force,[19] although its contribution to the economy is on the decline, with the services and industrial sectors growing instead.[20] Agriculture has a long tradition and supports an important food business sector. The sector employs the most people but average annual earnings are low. Agricultural lands cover 64.2 percent of the territory and arable land accounts for less than 18.12 percent of the total area. Pastures and meadows cover about 46.09 percent of the territory.[21] Farmlands in mountain regions form a mosaic of cereals, orchards, vineyards, and pastures. Above 1,000 m elevation, cattle raising is important and the extensive alpine pastures are used for raising livestock (cattle, dairy cows, and sheep). Viticulture is important in various parts of the country. Extended orchard crops most commonly include peaches and apricots, together with other temperate fruit trees. On agroforestry land, walnuts, hazelnuts, almonds, pomegranates, figs, and kiwi fruits are produced. Beekeeping is widespread, and tobacco is widely cultivated.

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[19] https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=AM.

[20] https://www.adaptation-undp.org/projects/supporting-armenia-advance-their-nap-process.

[21] Based on cadastral land cover classification data of Armenia (2022 year) (MoE).

4. STATUS AND MANAGEMENT OF FORESTS AND FORESTS IN PROTECTED AREAS

4.1 FORESTS

Armenia is a mountainous country with limited and unevenly distributed forest resources. The landscapes in Armenia include semideserts and deserts, steppes, forests, and subalpine and alpine lands (Table 1). The natural vegetation of each landscape has been altered significantly due to the long history of different land use practices within them. Data on the current extent and quality of forests are contradictory and according to the various sources, the forested area varies between 249,000 ha and 334,100 ha. For this report, a Landsat 8 based remote sensing analysis was conducted and estimated the total forested area in 2021 to be about 330,000 ha or about 11 percent of the total land area (Figure 3). Forest cover is distributed unevenly,[22] occurring predominately in the mid-zone of mountains, at altitudes between 500 m and 2,100 m in the north and up to 2,500 m in the south. Approximately 64 percent of the country's forests are located in two marzes (Tavush and Lori). There is a third large forest area in the southern marz of Syunik. Small areas of primary forest totaling 17,000 ha remain in mountainous areas of the country. With 0.1 ha forest per capita, Armenia is far below averages of Commonwealth of Independent States (2.7 ha) and the world (0.5–0.8 ha).[23]

Table 1: Overall landscape types of Armenia as per bioclimatic zones

Landscape type	Altitude (m)	Percentage land cover[a]	General distribution
Semideserts and deserts	700–1,300	10	Ararat valley and adjacent hills
Mountain steppes / meadows	1,300–2,100	37	Dominant landscapes in the country
Forests and shrublands / woodlands	500–2,200	20	Mainly Tavush and Lori Mars in the north, Syunik Mars in the south
Subalpine and alpine meadows	>2,100	28	Throughout, principal extensive meadows/pasture

Note: a. Remaining 5 percent of area is wetland and water surfaces.

Forests suffer from high levels of degradation. The potential forest and woodland area (including shrubland) is estimated to have been 20 percent of the land area but this has been reduced substantially over the past. More recently, challenging socioeconomic conditions and the energy crisis in 1990/2000s contributed to significant further damage with forest-covered areas gradually turning into grasslands. Estimates from the feasibility study for a national forest inventory (NFI) in 2005 (which was not undertaken) suggest that 70 percent of Armenia's forests are degraded or overmature (Hayantar 2005). This results from cutting old high-quality mixed oak and beech forests

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[22] http://www.davidpublisher.com/Public/uploads/Contribute/5a55bae371dc7.pdf.

[23] Junge-Fripp 2011 Understanding the Forestry Sector of Armenia - Current Conditions and Choices - Final report.

mainly through sanitary cuts[24] and the lack of application of silvicultural measures. Mature forests became young low-quality coppice hornbeam forests because of high-grade cuttings, including unregulated timber exports. In the few planted conifer forests in the basin of Lake Sevan, approximately one-quarter of the forest stands around the lake have been clear-cut, leading to accelerated erosion. According to the FAO-FRA (2020b),

out of the official forest area of 328,470 ha, 310,000 ha are naturally regenerating forests. For 1990 the same statistic was 321,000 ha, suggesting a loss in natural forest cover of 11,000 ha over 30 years. Contrary to the official forest cover level of 11 percent, many national forestry experts and civil society organizations assert that the real forest cover of Armenia is 7–8 percent. This issue is explored more in Section 7 of this document.

Figure 3: Forest cover of Armenia

Author: Yann Langwieser
Date: 02.2022
Credits: Based on Landsat 8 images from 2021 and then manually improved with the google earth view from 2022 and the Serval tool, QGiS

0   50   100 km

Source: Based on Landsat images 2021, manually improved with Google Earth ©HAFL, 2022.
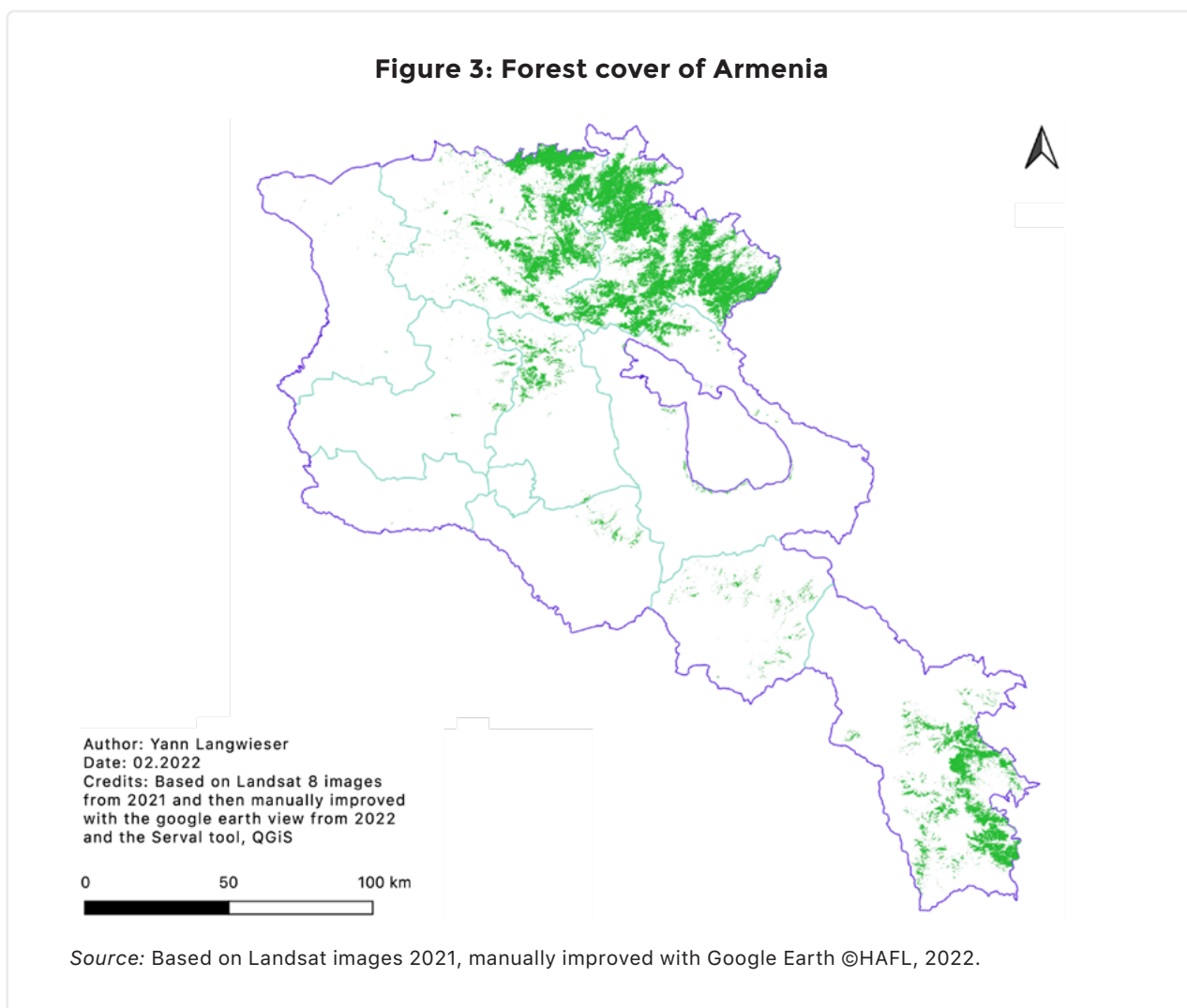
Natural forests[25] in Armenia are predominately deciduous (97 percent). There are some relict stands of the only native conifer tree species in Armenia, the Caucasian pine (*Pinus kochiana*). There are

four major forest types distributed throughout the country:

▪ Beech dominated forests (*Fagus orientalis*) make up to more than 40 percent of all forests. These are widespread in

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[24] Sanitary cut or felling is mostly defined as harvesting that is done outside medium-term FMPs due to unexpected events such as pests, disease infection, storm damage, and other comparable reasons.

[25] The term 'natural forests' is used in this report and refers to naturally regenerating forests.

northern Armenia, particularly on north-facing slopes at altitudes of 800–2,000 m, with the best growth between 1,000 and 1,800 m asl. Other tree species in the beech forests include Caucasian lime (*Tilia cordata*), Litinov birch (*Betula litwinow*), and the spindle tree (*Euonymus europaeus*).

- Oak forests with different species (for example, *Quercus macranthera; Q. iberica*) are characterized by complex and varied typological composition and grow mainly between 600 and 2,200 m asl. These cover about one-third of the forested area and often occur mixed with other broad-leaved species such as ash (*Fraxinus excelsior*), hornbeam (*Carpinus betulus*), Georgian maple (*Acer ibericum*), cork elm (*Ulmus suberosus*), and field maple (*Acer campestre*).

- Hornbeam rich forests, covering about 14 percent, occur at elevations between 800 m and 1,800 m and may also be mixed with oak and wild fruit tree species. Hornbeam also appears as a secondary species in the few remaining natural pine forests.

- Pistachio/wild fruit forest, characterized by shrub and small tree size (woodland type), is a fourth major forest type including species such as pistachio (*Pistacia mutica*), almond (*Amygdalus fenzlianum*), sea buckthorn (*Hippophae rhamnoides)*, and wild cherry (*Prunus* spp.[26] It occurs at elevations between 900 m and 1,200 m in the north and at higher elevations (1,800–2,000 m) in the south of the country (World Bank 2020a).

Beech and oak forests are of the highest productivity and the most productive forests can be found at altitudes of 1,300–1,600 m above sea level. The main forest species (beech, oak, and hornbeam) cover 81.3 percent of Armenia's total forest cover area and make up 93.96 percent of the total wood stock.[27] Other tree species—Caucasian pine, birch, elm, maple, ash, pear tree, apple tree, yew, hazel, plane, walnut, and others—are mainly represented together with forest-forming species and cover 18.7 percent of the forest cover area.

4.2 FOREST MANAGEMENT

Forests are classified according to major objectives such as protective (freshwater preservation and soil stabilization) or special purpose (that is, specially protected areas [SPAs], urban and recreational forests, and so on). Only care and sanitary cutting are allowed, and in forest reserves no felling is allowed. Production forest is available, but its extent is limited. Forest regeneration cuttings are allowed for such forest category.

Protection of soil, water, and biodiversity predominate as management objectives. Up to 50 percent of Armenia's forests are located on difficult-to-reach terrain, either on steep hillsides or in ravines, with major implications for the country's overall forest resources comprising inaccessible, partly overaged forests with wood resources that cannot be effectively managed for production and/or protection. By contrast, more accessible forests are heavily degraded due to overexploitation including illegal cutting, livestock grazing, and so on.

Forest management plans (FMPs) are key to the sector. Wood (including timber) harvesting is carried out by the state enterprise Hayantar and its technical branches on the basis of FMPs regulated by the Forest Code and the instruction of the Government of Armenia (GoA) on 'Development of Management Plans for Forest Enterprises.' The law does not provide

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[26] USAID, 2009

[27] State forest inventory data, 1993 (MoE).

private industry with licenses to harvest wood for commercial purposes (World Bank 2020a). The 10-year FMPs define the locations; time frames of measures on protection, guarding, and use of forests; and the volume of the annual allowable cuts (AACs). Most of the FMPs were introduced and developed with donor assistance in 2006–2008 (German International Development Agency, *Deutsche Gesellschaft für Internationale Zusammenarbeit*, GIZ) and approved in 2010. A revision and update of FMPs in north-eastern Armenia is currently funded by the state budget, receiving support also from the United Nations Development Programme (UNDP)/Global Environment Facility (GEF) project.[28] FMPs are not always properly implemented, in part due to lack of capacity for their implementation.

Despite the high volume of wood use and forest loss and degradation, afforestation rates are low. For example, in 2017, Hayantar carried out 423 ha of reforestation, of which only less than 60 ha were planted.[29] The remaining hectares were reforested through assisted natural regeneration. An additional 62 ha of forests were planted in 2017 with various programs and grants on non-forest fund lands.

Potential for increased levels of afforestation and reforestation exists but activity levels have historically been low. Investment in agriculture was limited following independence, meaning that the forest area lost has not been designated for agriculture. As a result, competition for land in these areas might be less pressing than in areas with a tradition of agriculture dating from before 1990. Also, former mining sites have

potential to be used as afforestation sites. However, afforestation and reforestation capacity is limited. Annually from 2000 to 2009, an average of 3,354 ha were afforested and reforested, 385 ha newly planted, 594 ha regenerated through coppicing, and 2,374 ha naturally regenerated with the help of fencing and fertilizers. Annually from 2009 to 2013 only 351 ha, on average, were afforested and reforested, in large part through international projects (Ministry of Nature Protection 2014). According to further official data, annual average reforestation activity increased to 2,289 ha between 2018 and the end of 2020. If we expect to achieve the Bonn Challenge of 50,000 ha in the remaining 10 years to 2030,[30] current levels will have to increase to over 4,300 ha annually or about 30 percent higher than the most productive period (2000–2009).[31] The Restoration Opportunities Assessment Methodology (ROAM) Report 'Report IV: Landscape Restoration Strategy and Action Plan 2022–2032' assumes that an annual target of 7,000 ha will be required.[32]

Nursery capacity is limited. Hayantar produces forest tree seedlings in one central nursery at the Hayantar Hrazdan Branch tree nursery established in 2013 with the support of the Food and Agriculture Organization (FAO). Its production capacity is more than 100,000 seedlings per year and the main seedlings produced include, among others, *Pinus sylvestris (P. kochiana)*, *Quercus macranthera, Fraxinus excelsior, Acer trautvetteri, Malus orientalis, Pyrus caucasica,* and *Juglans regia*, both bareroot and in trays with alveoli. A private sector nursery run by the Armenia Tree Project (ATP) has the capacity to produce 600,000

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[28] UNDP, Mainstreaming Sustainable Land and Forest Management in Mountain Landscapes of North-eastern Armenia PFG 2016 on Sustainable Land and Forest management

[29] Reforestation could also refer to forest regeneration cuttings.

[30] The Bonn Challenge: Armenia's 2018 pledge.

[31] Bonn Challenge of 50,000 ha is assumed to be afforestation not reforestation (MoE).

[32] According to the MoE, there will be an additional target set, which will include activities not limited to afforestation only and will aim to address reforestation needs more comprehensively.

seedlings per year. These facilities cannot meet targets for restoration, enrichment planting, reforestation, and afforestation. The seedlings produced per year might cover a planting area of 150–300 ha at a maximum. Post-COVID-19, government tree planting systems used willow cuttings to good effect, which have the advantage of being available without recourse to nurseries; however, the efficiency of these planting activities is yet to be assessed.

In some regions of the country, nongovernmental organizations (NGOs) have developed planted forests on community lands, but these cannot be officially referred to as forests according to the current state regulations. Such tree plantation projects aim to involve rural local communities and self-governmental bodies for better outcomes. The projects are mainly supported by international donors and implemented by Armenian NGOs often in cooperation with the government. Armenia's government forestry agency Hayantar provides land for afforestation and tree planting projects. Successfully planting trees is a challenge due to livestock grazing and a lack of climate-adaptive silviculture. There is considerable need to create capacity for planning, selection, installation, and management of planted forests in Armenia.

Planting trees in landscapes, on farms, and in urban and peri-urban areas is a new and growing activity in Armenia. The role of forests in peri-urban and urban contexts is a field which did not receive much attention in forest sector planning. Some Armenian settlements are located around landslide-prone sites, mainly in mountainous areas and at the foot of the mountains. Sites exposed to these risks need soil and water conservation through tree planting. The City of Yerevan 5-Year Plan

(2019–2023) proposes to restore the city's buffer forest area by 40 ha (ArmenPress 2018). Armenia launched a pan-Armenian large-scale tree planting program in 2020 where it is expected that 10 million trees would be planted on various sites. However, the program met with technical problems that were further exacerbated by the effects of the COVID-19 pandemic (HETQ 2021).

4.3 PROTECTED AREAS

Despite being a relatively small country in terms of land area, Armenia is rich in biodiversity. The country is endowed with six distinct landscape zones: deserts, semi-deserts, steppes, forests, sub-alpine and alpine meadows, and wetlands. Because of great altitudinal variations, the country is home to a large number of floral and faunal species. In particular, the steppe and mountainous terrain provide favorable conditions for biodiversity richness as well as endemism. Endemism is high, with about 4.0 percent of fauna and 3.8 percent of flora considered endemics (Perry et al. 2020).

A network of SPAs was first established in Armenia in 1958 to protect ecosystems and habitats as well as rare, endemic, and threatened species. Currently, such sites are implemented under four different national designations: (1) national parks; (2) state reserves; (3) state wildlife sanctuaries; and (4) national monuments where 60–70 percent of the species composition of the flora and fauna, including the majority of rare, endangered, and endemic species, is concentrated.[33] The number and total extent of protected areas increased substantially between 2000 and 2014. A special government program to increase the number of natural monuments focused on the Lori and Tavush provinces. As of 2014, the total

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[33] Sixth national report of the Republic of Armenia Convention on biological diversity. 2019. https://ace.aua.am/files/2019/05/2019-6th-National-Report-CBD_eng.pdf.

territory covered by SPAs was 387,054 ha or approximately 13.1 percent of Armenia's total land area. Table 2 summarizes the protected areas, and Figure 4 gives an overview of the geographic location of the major SPAs in the country.

Four national parks, Arevik, Dilijan, Lake Arpi, and Sevan, cover a total area of 233,358.2 ha or 7.9 percent of Armenia's territory (Biodiversity and Landscape Conservation Union 2014). National parks include natural and cultural landscapes and involve human activities along with nature protection issues. National parks employ a zoning system, with areas defined for strict conservation, recreation, and economic activities (Khanjyan 2004). Under the 1994 IUCN[34] international classification, national parks of Armenia are category II protected areas.

State reserves are established to protect the natural course of dynamic ecological processes and rare species of flora and fauna. Human activity, including logging, haymaking, hunting and introduction of animals, and plant gathering, is restricted. State reserves are set aside as scientific research entities with strict conservation regimes (Khanjyan 2004). Under the 1994 IUCN international classification, state reserves of Armenia fall under the 1a designation. Armenia has three state reserves (Khosrov, Shikahogh, and Erebuni) covering approximately 35,469.4 ha or 1.2 percent of the country (Biodiversity and Landscape Conservation Union 2014). The Forest State Reserve Khosrov (Ararat province) was awarded the European Diploma on Protected Areas in 2013 (Table 2).

Table 2: National Parks and State reserves of Armenia

National parks		
Arevik (established in 2009) Syunik marz	Size: 31,211.2 ha Altitude: 450–3,500 m Broadleaf forests, juniper open woodlands, subalpine and alpine meadows, semideserts, mountain steppes	Important for the protection of endangered and rare species such as the Caucasian leopard, the Armenian mouflon, and the Mediterranean turtle. Biodiversity is reflected by its location in the south of the country, where Iranian, Anatolian, Caucasian, and Central Asian fauna come together.
Dilijan (established in 2002) Tavush marz	Size: 33,765 ha Altitude: 1,070–2,900 m Year of establishment: 2002 Landscape: Woodlands, lakes and rivers, mineral springs, mountain meadows	Rich in forest and meadow fauna and flora. Well-studied biodiversity including non-wood forest products (NWFPs). Important gene pool for local tree species, important for preservation of primary forest landscapes, provides local economic benefits through nature-based tourism
Lake Arpi (established in 2009) Shirak marz	Size: 21,039 ha Altitude: 2,025–3,190 m Mountain steppes, subalpine meadows, lakes, and wetlands	Features mountain steppes, subalpine grasslands, and high alpine rocky outcrops lakes, wetlands, and rivers. The lakes and marshes of Lake Arpi National Park are globally important for breeding birds and migratory birds.
Sevan (established in 1978) Gegharqunik marz	Size: 147,343 ha Altitude: 2,000 m Freshwater ecosystems, forests, rocks, mountain steppes, alpine meadows	Encompasses the largest lake in Armenia and a buffer zone, incorporating the slopes of adjacent mountain ranges. Major source of irrigation and drinking water and provides electricity, fish, recreation, and tourism; includes special Ramsar sites

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[34] International Union for Conservation of Nature.

Table 2

Other major Specially Protected Natural Areas (SPNAs)		
Khosrov (established in 1958) Ararat marz	Size: 23,213 ha Altitude: 700–2,800 m Mountain ranges, rocks, semideserts, mountains, and high mountain steppes	Important State Forest Reserve with different forest types, open junipers woodlands, and oak forests. The reserve harbors rare animal species such as the Caucasian leopard, the bezoar goat, and brown bear.
Shikahogh (established in 1958) Syunik marz	Size: 12,137 ha Altitude: 700–2,400 m Mountain ranges, small streams, rocky massifs, subalpine meadows, caves	High biodiversity with relict and endemic flora and fauna species. The steep terrain provides diversity of climatic and site conditions. Gene pool with virgin broadleaf forests (oak and hornbeam)
Erebuni (established in 1958) Kotayk marz	Size: 118.8 ha Altitude: 1,300–1,400 m Semidesert and mountain steppes	The smallest among Armenia's three reserves. It protects a unique gene stock of wild cereals (family *Poaceae*), including more than 100 varieties of wild wheat and their habitat.

Figure 4: Nationally designated protected areas in Armenia (SPNAs)
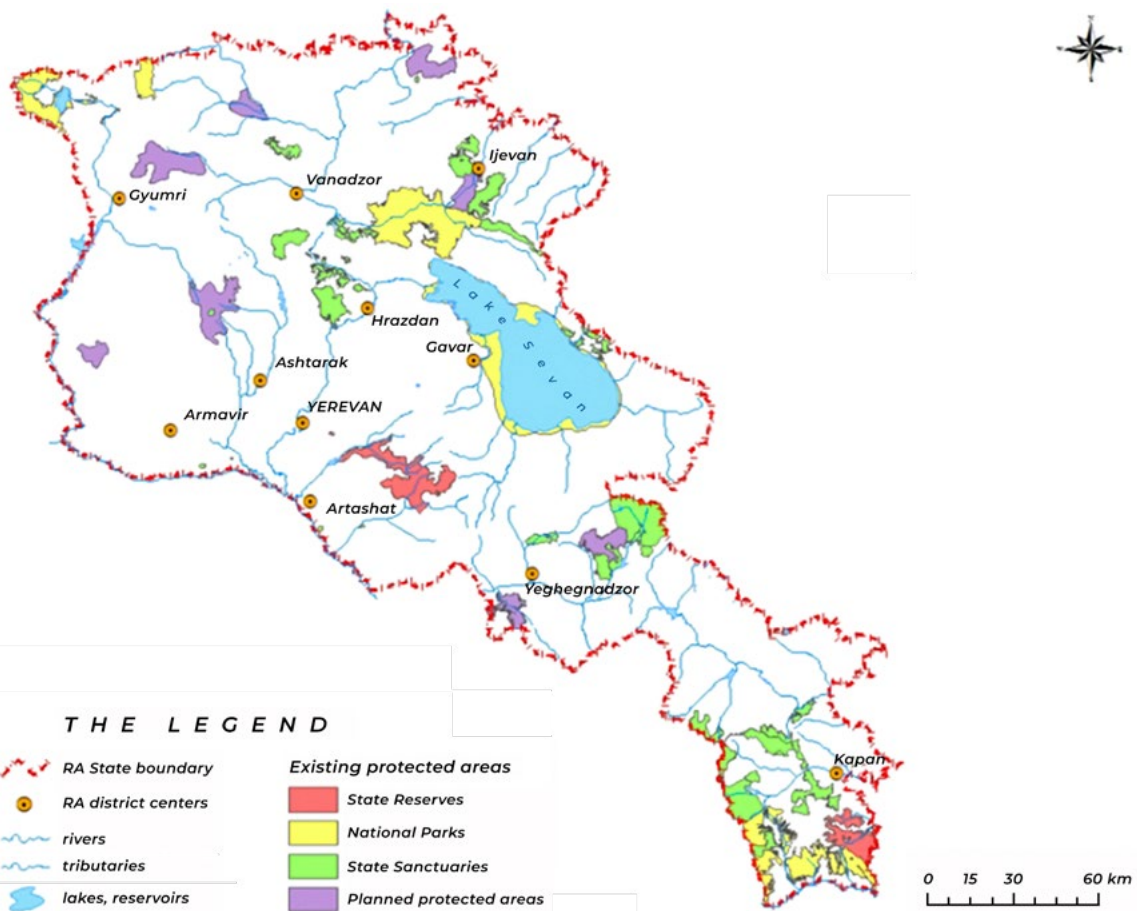
Source: MNP of Armenia Ministry of Nature Protection of Republic of Armenia, 2014. Strategy and state program of conservation and use of specially protected nature areas of the Republic of Armenia. Government Decree N1059-Ա, September 25, 2014, Yerevan.

There are currently 27 designated state and wildlife sanctuaries registered, occupying approximately 114,800 ha or 3.9 percent of the country's territory and 232 designated natural monuments (Biodiversity and Landscape Conservation Union 2014). Sanctuaries are designated to conserve specific species and their habitats and correspond to the IUCN management category IV (Ministry of Nature Protection of the Republic of Armenia 2014). Natural monuments in Armenia are natural objects having special scientific or historical-cultural significance; they correspond to category III of the IUCN classification (Khanjyan 2004).

In addition, Armenia has 18 Important Bird Areas (IBAs), 23 proposed Emerald Networks of Areas of Special Conservation Interest ('Emerald Network Sites'), 3 Ramsar sites, and 12 Prime Butterfly Areas.

Protected area management is implemented through 10-year plans rather than longer-term master plans. Armenian biodiversity conservation is mainly implemented through the designation of these sites, where, as already mentioned above, 60–70 percent of the species composition of the flora and fauna, including the majority of rare, endangered, and endemic species, is concentrated. Important to note is that there are no special long-term management plans for protected areas; they are managed based on FMPs developed with a 10-year time horizon.

4.4 BIODIVERSITY CONSERVATION IN FOREST AREAS

Armenian forests are home to over 320 species of trees and shrubs and one-third of protected areas. These include species such as pine, birch, elm, maple, ash, pear, apple, yew, hazelnut, plane, and walnut. Moreover, 56 species of birds, 17 species of mammals,

and 2,212 species of invertebrates live in these forests (Biodiversity and Landscape Conservation Union 2014). One of the main threats to forest biodiversity is the reduction and fragmentation of forested areas leading to disruption of ecosystems. A number of issues are of concern including deforestation and forest degradation, illegal grazing in forests, poaching, unsustainable use of natural resources, unauthorized construction, inefficient use of land, irresponsible mining, land and water pollution, and other pressures that lead to loss of plant and animal habitats and genetic diversity. In situ conservation of biodiversity in Armenia is carried out over about 74,074.3 ha of forest cover areas within the SPNA sites, representing 3.7 percent of the total territory of Armenia or 29 percent of the SPNA system.

However, the boundaries of many SPNAs within the forestry branches are unclear and need to be reassessed and clarified. There are no regulatory mechanisms in Armenia for identifying any of the biodiversity 'hotspots': Emerald Network Sites and IBAs; habitats for endangered, critically endangered, and endemic species; FMPs for high conservation value forests (HCVFs); eco-corridors with large seasonal concentrations of animals; and the inclusion of sites of migratory routes. There is, therefore, no basis for action for the conservation of these important areas.

A national action plan on biodiversity exists but is weakly implemented. In December 2015, Armenia adopted a revised National Strategy and Action Plan on the Conservation, Protection, Reproduction, and Use of Biological Diversity and associated Action Plan for 2016–2020, in accordance with Aichi Biodiversity Target 17. Obstacles to implementation of the strategy and action plan are related to the underestimation of the importance of biodiversity and ecosystem

services (their values and benefits are yet to be assessed and considered in economic development programs), insufficient stocktaking and monitoring of biodiversity components, insufficient cooperation between various state structures and local self-governing bodies, inadequate development of intersectoral relations and weak integration of biodiversity issues in respective sectoral policies, and a lack of mechanisms for enforcing environmental legislation.

National biodiversity targets and actions proposed in the National Biodiversity Strategies and Action Plans (NBSAPs) are clearly strongly linked to forests and reemphasized in recent reviews. The broader rationale is to include biodiversity fully in forest management planning and operations so that it is considered adequately. The reviewed NBSAP[35] was submitted on February 11, 2017, to the Convention on Biological Diversity (CBD) and the sixth assessment report in 2019. The latter lists four main targets related to forests in the country:

- Identify the ecosystem services cost estimation methodology and test it in specially protected nature areas.

- Carry out inventory and mapping of degraded and fragmented forest and pasture ecosystems, identify direct and indirect causes of habitat loss.

- Develop proposals on the introduction of incentives for biodiversity conservation in community and private lands.

- Develop and implement a program on awareness raising and provision of information on conservation and sustainable use of biodiversity.

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[35] Armenia - NBSAP v.2 (2015) | InforMEA.

5. ECONOMIC CONTRIBUTIONS OF FORESTS

5.1 PROVISIONING SERVICES

Fuelwood

Fuelwood is the mainstay of energy needs. A sizable portion of the Armenian population depends on wood—alongside natural gas—for its energy needs. In rural areas, households typically use natural gas for cooking and fuelwood for heating. Households lacking an indoor kitchen also use fuelwood for cooking. Lower-income rural and urban households tend to rely on fuelwood to meet both their heating and energy needs, as fuelwood remains the cheapest and most easily accessible energy source for many people (World Bank 2020b).

Amid the increasing cost of alternatives, fuelwood is under pressure. Amid high costs of natural gas and electricity in Armenia, the demand for fuelwood (as well as timber) has been increasing. This has led to wood harvesting exceeding sustainable limits in the country. The AAC is determined by the FMPs which are usually made for 10 years. FMPs allow thinning and sanitary cutting, not commercial harvesting of mature trees, all of which are done by Armenia's 22 state-owned forestry enterprises (World Bank 2020b). AAC falls far short of the wood demand in the country. The gap between wood demand and supply is filled by the informal sectors through unreported and illegal logging. Illegal logging has been an important contributing factor to overharvesting, which itself is the main cause of forest cover loss and forest degradation in Armenia (see Chapter 5.5 for more on this).

Most of fuelwood is harvested illegally. Several estimates of fuelwood production, demand, and consumption in Armenia are available that differ from each other. The annual report for 2021[36] of the Hydrometeorological and Monitoring Center—based on the forest monitoring data—estimated the combined fuelwood demand in five regions[37] in 2021 to be 95,000–115,000 m³. According to the annual report for 2022,[38] the combined demand in 10 regions[39] ranged from 240,000 m³ to 290,000 m³, while the total production was 51,993 m³ from Hayantar SNCO, Sevan National Park, Dilijan National Park, Zangezur National Park, and Jrvezh Park Complex. World Bank (2020b) reported a total fuelwood production of 848,000 m³ (about 0.29 m³ per person) with 99 percent of it going toward households' consumption in the country. According to the FAOSTAT, the fuelwood production in the country is nearly twice as much of the estimate mentioned earlier. During 2013–2020, the annual average fuelwood production in the country was estimated to be 1.55 million m³ (Figure 5). However, even the FAOSTAT estimate is likely to be an underestimate. The Economic Development and Research Center (2014) estimated a total fuelwood consumption of about 2 million m³ per year in the country. Another estimate by Gevorgyan (2014) puts the national average consumption at 10 m³ per household per year. This gives a total consumption[40] of 6.53 million m³ per year for Armenia. Since there is literally no overseas trade of fuelwood by Armenia—as reported

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[36] http://www.armmonitoring.am/public/admin/ckfinder/userfiles/files/texekanq/tarekan/Tarekan%202021.pdf

[37] Yerevan, Lori, Tavush, Syunik, and Gegharkunik.

[38] http://www.armmonitoring.am/public/admin/ckfinder/userfiles/files/texekanq/tarekan/annual-2022-1.pdf

[39] Yerevan, Lori, Tavush, Syunik, Gegharkunik, Vayots Dzor, Ararat, Armavir, Kotayk, and Aragatsotn.

[40] Considering an average household size of 4.50 persons (*source*: https://globaldatalab.org/areadata/hhsize/ARM/) and a total population of just over 2.96 million (World Bank data).

by FAOSTAT and UN Comtrade—the total consumption is satisfied by production within the country. This, together with the big difference between the production and consumption figures, suggests that a large amount of fuelwood is harvested by the informal sector and thus remains unreported in official statistics. Much of the informal sector harvesting is done illegally.[41] Illegal logging in Armenia is driven by both commercial interests and poverty-related factors but not well monitored. Increasing wood demand amid a restrictive harvesting regime contributes to illegal logging. It is estimated that illegal logging is about 20–30 times more than the officially reported harvesting (World Bank 2020b). UNDP (2015) puts the illegal logging figure at 0.63 million m^3 per year.

Figure 5: Fuelwood production in Armenia

Source: FAOSTAT.
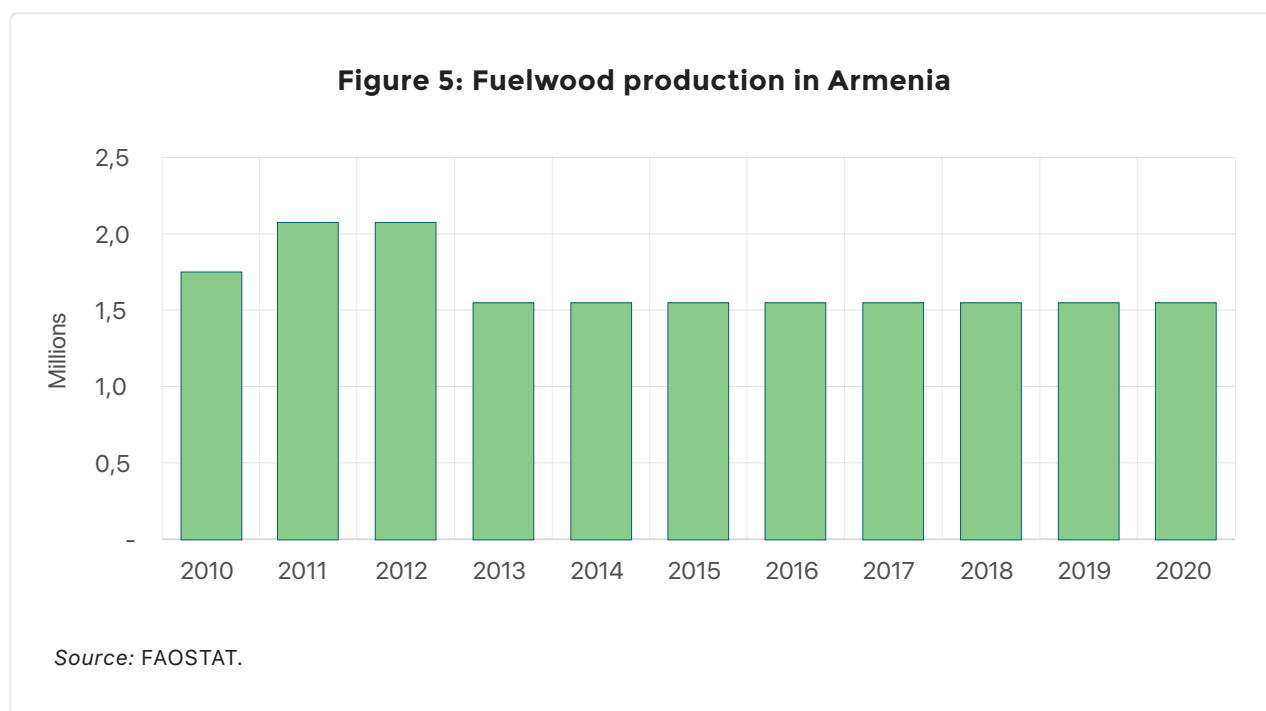
While it is not reflected in the formal economy, fuelwood use has a significant economic value. There have been considerable efforts by the GoA to reduce fuelwood consumption. However, a large part of the rural population (75 percent) is still dependent on forest resources for its energy supply. Rural dwellers make up 36 percent of the total population in Armenia, among which 14 percent are poor and 86 percent non-poor according to poverty rating.[42] The main reason is that the poor population has limited financial resources and cannot afford to switch to other sources of energy as it requires investment in stoves and the cost per energy unit of gas is far greater than that of fuelwood. Estimation done for this Forest Policy Note suggests that the annual economic value of fuelwood—in terms of subsistence value and cash income generated by selling—in Armenia is $275 per household (in 2021 constant $). This

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[41] A GoA decree on 'Providing privileges to the forest communities of RA for the use of fallen wood as fuel-wood (2011)' allows households in villages located within 5 km of forests to collect up to 8 m^3 dead wood for free. The purpose of the decree was to reduce incentives to pay for illegally harvested fuelwood. However, often fallen dead wood is available only in remote locations and is not accessible due to lack of forest roads, and thus the decree fails to serve the purpose so far.

[42] https://documents1.worldbank.org/curated/en/136121559746939925/pdf/Armenia-poverty-and-equity-brief-spring-2019.pdf.

corresponds to a fuelwood value of $200 per ha of forests per year[43] and just under $66 million for the forests in the entire country.

Timber

Commercial timber production is limited but also suffers from illegality. Armenia's current timber supply is too small to allow for a commercial logging industry amid a restrictive wood harvesting regime. Official wood harvesting in the forests of Armenia is currently limited to thinning, coppicing operations, and sanitary cuttings. According to the official records, timber harvesting never exceeded 4,000 m³ per year during 2010–2020 (Figure 6). However, the actual timber harvesting—like fuelwood—is most likely to be much higher than the official one as much of the timber harvesting in the country remains unreported and/or is illegal.

Figure 6: Timber harvesting in Armenia
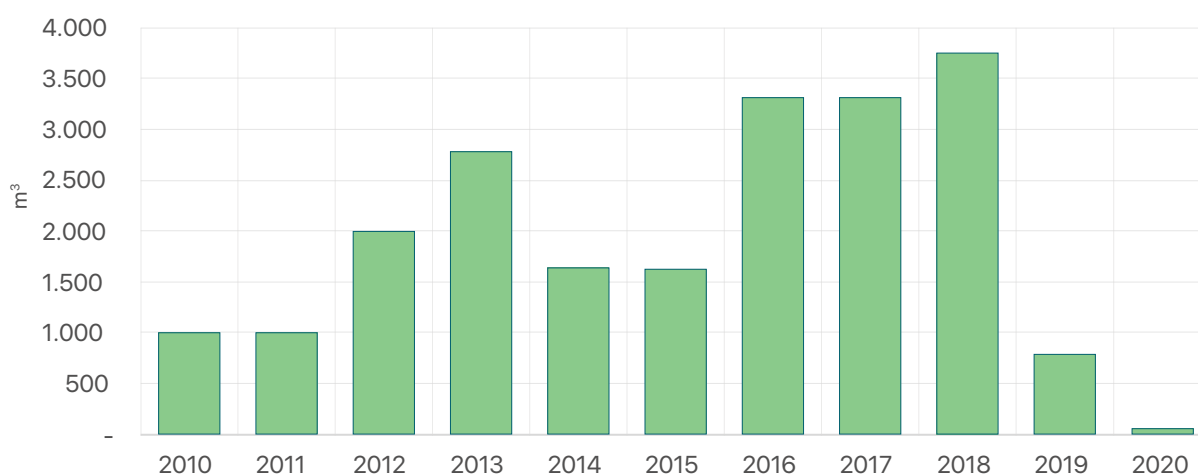
Source: Hayantar (unpublished data, 2013–2016, 2018), Armenian Ministry of Environment 2020 (2017) and FAOSTAT (2010–2012, 2019–2020).

Deadwood and branchwood collection may be significant. Fallen wood and sanitary felling are not, by their very nature, predictable in volume. Nevertheless, they can make up a significant share of the volume of wood supplied to the domestic market. Sanitary fellings are often found to violate the law and actually be part of wider illegal logging. Formal figures on the timber supply from such felling are not available while technical experts and Hayantar suggest that the removal of deadwood (fallen wood) could be as much as 1 m³ per ha per year (higher bound of the estimate). This amounts to a total wood supply of about 330,000 m³ per year[44] to the Armenian market from fallen wood itself. However, the data on fallen wood provided by Hayantar for 2013–2017 suggest that their actual annual contribution to the wood supply was only between 50,000 m³ and 70,000 m³ (Figure 7).

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[43] Valuation was done by using the benefit-transfer method. Household-level fuelwood value per year was calculated based on data from Mkrtchyan and Grigoryan (2014). The value for the entire country was derived by multiplying the household-level value with the total number of rural households in Armenia as the fuelwood is usually collected by people living the rural areas. Urbanization rate in the country is 63.3 percent, meaning 36.7 percent people live in rural area, and thus we assume that rural households in Armenia is 36.7 percent of all the total. The value for the entire country is divided by the total forest area for deriving the value per hectare. Necessary inflation adjustment was done with GDP deflation for Armenia (until 2020, year of latest data availability) and $ inflation rate (for 2021) for deriving the values in 2021 constant $. *Source:* Mkrtchyan and Grigoryan 2014.

[44] Considering Armenia has 0.33 million ha of forests. Part of this wood supply is used as fuelwood.

Figure 7: Wood supply from fallen wood in Armenia
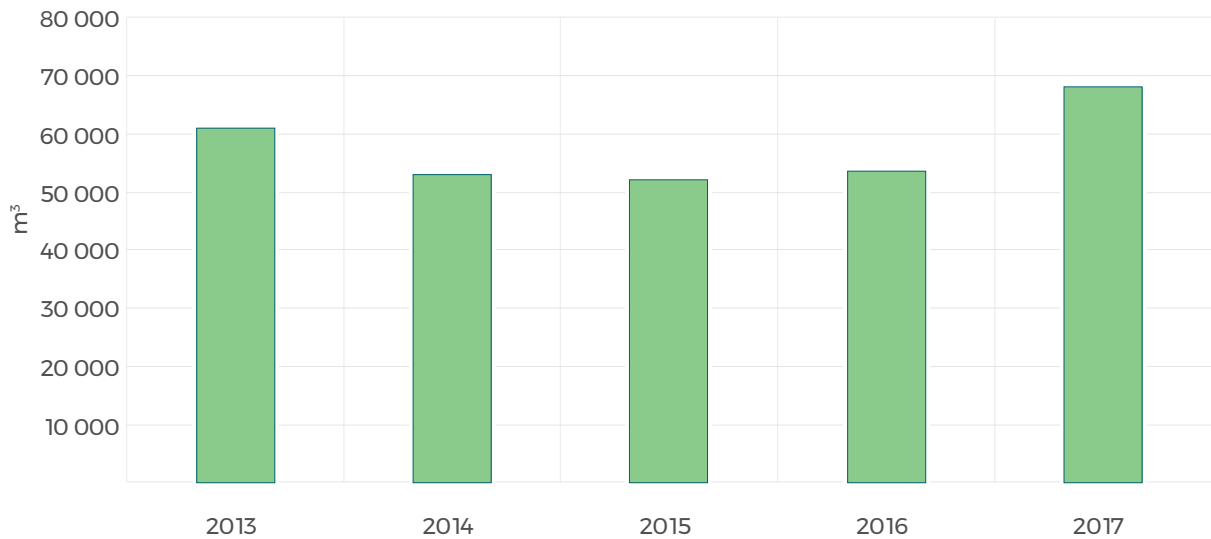
Source: Hayantar (unpublished data).

Sales procedures are in place but the level of illegal trade is estimated to be much higher than reported. Hayantar sells the limited amount of wood, both fuelwood and so-called 'technical wood' (that is, poor-quality wood for construction purposes), at fixed low prices in three different ways: (a) standing trees on demarcated plots; (b) wood cut into pieces 1 m long, stacked close to a forest road; and (c) wood cut into pieces 1 m long, stacked in designated storage places outside the forest. Estimates of actual harvesting volumes vary widely depending on data sources and methodology used. However, they all show that the actual harvesting volumes are much higher than the officially sanctioned harvesting level and this illustrates the severe challenges to the sustainability of forest use and of governance faced by the sector.

Because of the supply constraints,

Armenia has a large negative trade balance in wood and wood products. During 2010–2021, the country has not exported any industrial roundwood but imported varying quantities (Figure 8). During the same period, sawnwood production and export[45] were almost identical[46] but minimal, below 1,000 m³ in most years, while imports increased rapidly from nearly 19,000 m³ in 2016 to over 130,000 m³ in 2021 (Figure 9). Increasing demand for sawnwood in the construction and furniture industry amid minimal and falling local production might have caused the increase in imports. The total value of import of wood and wood products in Armenia varied between $34 million and $68 million,[47] while the export value never exceeded $2.2 million during 2010–2021 (Figure 10). The development of a logging and wood processing industry is constrained by limited wood supply.

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[45] In February 2020, the government passed a law banning export of wood and wood products outside of the Eurasian Economic Union (EAEU).

[46] Almost identical sawnwood production and export may have happened for two reasons. First, at least some portion of the imported sawnwood is exported after value addition through further reprocessing. Second, since official industrial roundwood production is minimal, a significant portion of exported sawnwood is produced from unreported or illegally harvested timber.

[47] In 2021, about 42 percent of the import came from Russia, 13 percent from Türkiye, and 9 percent from China (UN Comtrade).

Figure 8: Timber trade by Armenia
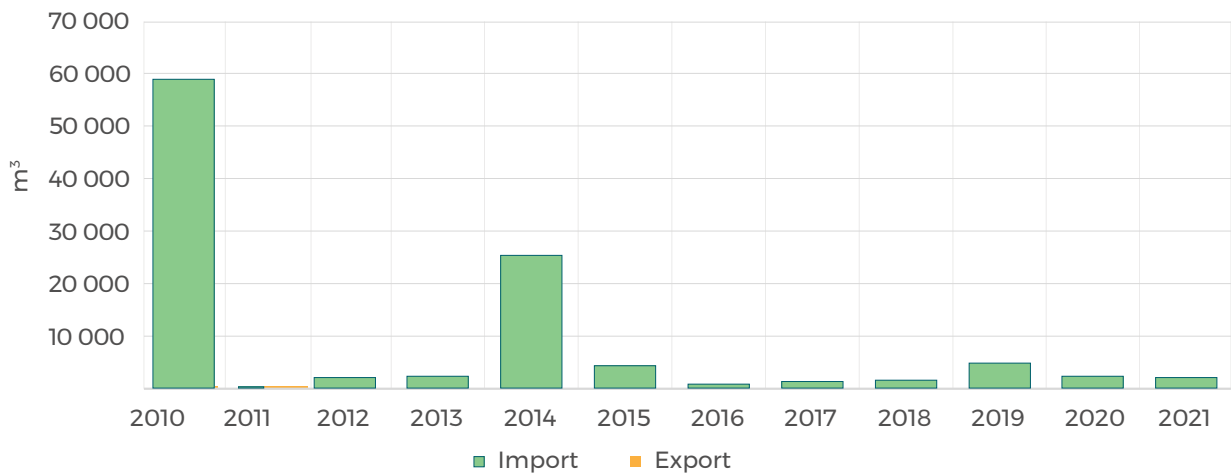
Source: UN Comtrade.

Figure 9: Sawnwood production and trade by Armenia
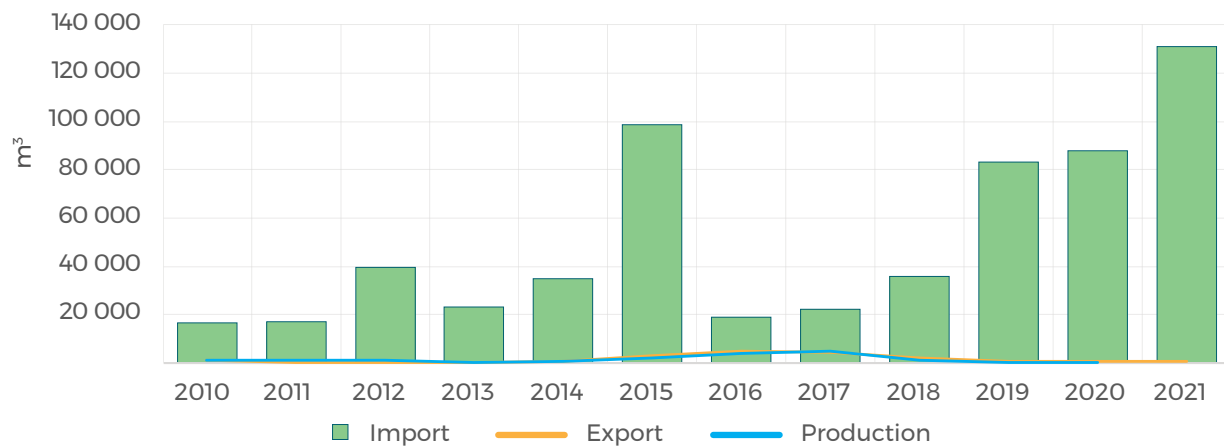
Source: UN Comtrade (trade) and FAOSTAT (production).

Figure 10: Wood and wood products trade by Armenia
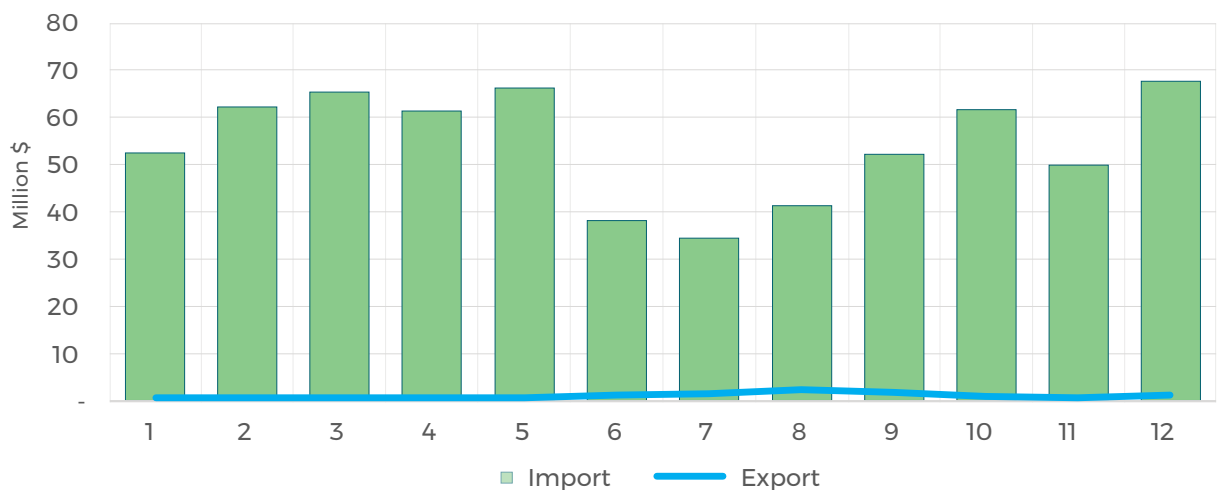
Source: UN Comtrade.

Water for irrigation and drinking

Water is a scarce resource in Armenia and forests have a positive role in its regulation and provision. With a water exploitation index (WEI) of 45 percent,[48] the country is subject to severe water stress (OECD 2015). By protecting the watershed and regulating the hydrological cycle, forests in Armenia play a crucial role in recharging groundwater and surface water sources such as streams and lakes and thus are an important source of water for drinking and irrigation purposes. Forests in the country—nearly all being located in mountainous areas—have positive effects on river flow rates and seasonal water distribution by increasing water infiltration and preventing erosion. Notably, the watersheds in the Lake Sevan Basin in the central eastern part of the country not only feed springs in the Ararat Valley in the Southwest but also regulate surface flows and provide water for irrigation and energy generation (Perry et al. 2020).

In protecting the headwaters, forests make a strong economic contribution. The economic value of water retained by the forests—estimated by using the benefit-transfer method for this Policy Note—is just over $55 per ha per year (in 2021 constant $) in irrigational use.[49] This amounts to about $19 million per year for total water value of forests in irrigation use. The estimation is based on the relevant data from OECD (2015). It is assumed that 25 percent of this irrigation water is attributed to forests of the country. This is justified by the fact that forests in Armenia constitute about 11 percent of total land area and their influence concerning water can reach an area about twice the total size of forests in

the form of recharging water sources. While most of the country's forests are concentrated in the northeast and southeast, Lake Sevan Basin, and the other watersheds, they provide water to a significant part of the country through rivers and streams.

Commercial benefits accrue to water bottling interests in these areas. The water balance and quality and quantity of drinking water resources in Armenia are directly influenced by its forests. Mineral water resources in Ararat, Kotayk (villages of Arzni, Bjni, Buzhakan, Hankavan), Tavush (Dilijan village), Vayots Dzor (Jermuk village), and Syunik (Lichk village) provinces are important sources of drinking water and bottled water sold domestically and abroad (Perry et al. 2020). According to the Statistical Committee of Armenia, just over 1.1 million m^3 of mineral water was extracted from the forest areas in 2018 (Statistical Committee of Armenia 2018).

5.2 NON-WOOD FOREST PRODUCTS (NWFPS)

Forests are vital sources of foods (plants and animals), medicines, and a range of other products and are important as a means of generating cash income and subsistence for the citizens of Armenia. Most communities particularly those in rural areas of Armenia depend—besides fuelwood—on NWFPs such as forest fruits, berries, edible plants, mushrooms, game, and medicines for their livelihoods, wholly or partially. Part of the NWFPs is used for generating income by selling them in local markets or on the roadsides,[50] but majority is used by the communities for the subsistence (Perry et al. 2020).

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[48] A country with WEI above 40 percent is considered to be under water stress (OECD 2015).

[49] The economic value of drinking water provided by the forest could not be estimated due to lack of necessary data. No previous studies on valuation of water provided by Armenian forests for irrigation and drinking exist.

[50] According to the Article 44.1 of the Forest Code, "Citizens shall have the right to be, without any permit, in the forests under the state or community ownership for recreation, collection of wild fruits, berries, nuts, mushrooms and plants for personal consumption except cases envisaged by law or other legal acts."

A total of 120 wild fruit, nut, and berry bearing plants are found in Armenian forests. They together constitute about 40 percent of the total woody species growing in the forests of the country. These plants are extensively used by the population as a source of food (Nalbandyan 2000) and are a valuable source of food security. Commonly used wild fruits include dog rose or rosehip, wild pear and wild apple, cornelian cherry, currant, dewberry, raspberry, gooseberry, hawthorn, walnut, fig, pomegranate, sea buckthorn (see Box 1), cherry plum, and hazel. Rosehip is the most common NWFP after fuelwood and is used to make a popular tea, jam, jelly, marmalade, and wine. Cornelian cherry is also popular for its multiple health benefits and is widely traded on roadsides across Armenia. Apart from the wild fruits, edible wild plants such as dock sorrel, asparagus, and mushroom are eaten by local people in Armenia. Commonly collected mushrooms include meadow mushrooms (*Agaricus campestris, A. silvaticus*), granulated boletus (*Suillus granulatus*), and chanterelle (*Cantarellus cibarius*). Beekeeping is another important activity in most of the communities adjacent to forests (Mkrtchyan and Grigoryan 2014). Medicinal plants represent a fairly high proportion of the forest flora in Armenia.

Box 1: An example of an introduced berry with income potential – sea buckthorn

As a forest crop, sea buckthorn possesses many valuable economic traits. It is one of the best land improvement species and most promising crops for the afforestation of dunes, embankments, and ravines. Armenia has accumulated extensive experience in the cultivation and processing of sea buckthorn and is producing both oil and alcohol-free beverages from it. It was introduced widely in the Altai region in the 1950s. It is said that in the past, more than 3,000 ha were enriched with sea buckthorn in Armenia, with harvests of up to 2 tons per ha and potential for much higher production. In the 1980s, Armenia produced some 300 tons of sea buckthorn fruit annually.

Sea buckthorn fruit acontains large quantities of biologically active substances (medicinal oil, vitamin C, carotene, and organic acids), making it an important raw material for the pharmaceutical and food industries—producing medicinal oil and alcohol-free beverages.

The economic value of NWFP is significant. In Armenia, literature estimating the economic values of various NWFPs per hectare of forests as well as at regional and country levels does not exist at the time of writing this Policy Note. Valuation of several important NWFPs (excluding water) was possible by using data from existing literature through benefit-transfer method. The valuation suggests that forests provide NWFPs worth nearly $28 per ha per year with wild fruits contributing the highest of $10.1 per ha per year while honey the second highest of $7.9 per ha per year. The value of NWFPs (excluding water) provided by all forests of Armenia is estimated to be just over $9 million per year (Table 3).

Table 3: Economic value of NWFPs in Armenia[51]

NWFPs	Value, $ per year (2021 constant $)	
	$/ha/year	Entire Armenia, $/year
Medicinal plants[a]	7.60	2,508,343
Wild fruits[b]	10.10	3,322,500
Mushroom[b]	2.00	664,392
Honey[b]	7.90	2,583,649
Total	**27.64**	**9,078,885**

Note: Estimation using benefit-transfer method using data from (a) Mkrtchyan and Grigoryan 2014 and (b) UNDP 2014.

5.3 REGULATING SERVICES

Forests of Armenia offer several regulating services that are vital for economic development and environmental integrity in the country as well as for maintenance of the health and well-being of its citizens. The country's forests are mostly managed for protective purposes, specifically for the protection of soil and water. Forests help maintain water balance in the ecosystems and thus river flow and seasonal water distribution by increasing infiltration rates and preventing erosion. Particularly on steep terrain, forests reduce surface water runoff and protect topsoil from erosion and flooding and thus prevent siltation and improve water availability in the long term. For example, forests in Lake Sevan Basin reduce the sediment deposition that helps counteract water pollution and keeps water levels stable (World Bank 2021d) in the lake. Reduced sedimentation also helps protects wildlife habitats in the area. By maintaining water balance and protecting the soil from floods and erosion, forests keep the soil fertile, which is vital for agriculture (Perry et al. 2020). Forests are also important for biodiversity conservation, that is, safeguarding genetic resources, species, and their habitats. Bees and other insects are vital for pollination, which in turn supports agricultural production in Armenia like elsewhere in the world.

Forests are an important carbon sink in Armenia. According to the National GHG Inventory Report (2020), during 2000–2017, the country's forests removed, on average, just over 0.52 million tCO_2eq of GHG per year from the atmosphere (Armenian Ministry of Environment 2020).[52] Forests regulate climate most notably temperature, humidity, and precipitation and thus help maintain favorable living conditions for human beings and animals. Trees in urban areas, in particular, control excessive heat and regulate microclimate. Being one of the most climate-vulnerable and water-stressed countries in the Europe and Central Asia region, the country is increasingly exposed to natural disasters such as heatwaves, droughts, flooding, landslides, and wildfires. This exposure increases the risks of agricultural productivity loss, destruction of infrastructure and tourism facilities, and further reduction of the country's already limited capacity to mitigate and adapt to climate change (World Bank 2021a). Armenia's forests play a crucial role in minimizing the impacts of or preventing natural disasters such as drought, desertification, flooding, and landslides.

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[51] See Table 1 for more detailed breakdown of NWFP.

[52] The CITEPA/ONFI reports from 2021 advise recalculation of the National GHG inventor for LULUCF sector (Ministry of Economy).

Literature estimating the economic values of regulating services does not exist at the time of writing this Policy Note and so the valuations here are an underestimate. Biophysical and socioeconomic data that are needed for valuation of such services are generally lacking in the country. By using data from existing literature and applying benefit-transfer method, valuation estimates are made for three regulating services. The economic values of these three services are $125 per ha per year with GHG removal being the highest at $101 per ha per year (in 2021 constant $). The value of these services for all forests of Armenia is estimated to be $41 million per year (Table 4). Had the economic value of numerous other regulatory services been estimated, the value per hectare and for the entire country would have been much higher than what is reported.

Table 4: Economic value of selected regulatory services in Armenia

NWFPs	Value, $ per year (2021 constant $)	
	$/ha/year	Entire Armenia, $/year
Habitat/Species protection[a]	2.8	906,459
Hydrological regulation[a]	21.6	7,107,104
GHG removal[b]	100.7	33,074,688
Total	**125.0**	**41,088,251**

Note: Estimation using benefit-transfer method based on data from (a) Siikamäki et al. 2015. (b) GHG removal data are from Armenian National NIR 1990–2017 (MoE 2020). Average of the low and high shadow prices of carbon for 2020 suggested by World Bank (2017) is used for this valuation.

5.4 CULTURAL SERVICES

Because of predominantly mountain landscapes, corresponding complex forests in Armenia provide several important cultural services such as aesthetic values, spirituality, recreation, and tourism. Armenia is endowed with over 100 ancient monasteries and archaeological and religious sites including several listed as United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Sites[53] and most of which are located inside the forests and in mountainous regions. These enhance the cultural services provided by the country's forests notably tourism, spirituality, and recreation. The recreational value of Armenian forests is estimated to be $9 per ha per year[54] (in 2021 constant $), which corresponds to a total value of about $3 million per year for all forests in the entire country.

Forests have good potential for an expanded role in recreation and tourism. Article 41 of the Armenian Forest Code describes forest use for cultural, health, sport, recreation, and tourism purposes. Nature-based tourism, as related to forests, refers to interactions that people have with forest ecosystems, including outdoor recreation, aesthetic enjoyment, education, and the intrinsic spiritual value of land and trees. Armenia's protected area network

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[53] These are the monasteries of Haghpat, Sanahin, Geghard, and the Upper Azat Valley; cathedral and churches of Echmiatsin; and the Archaeological Site of Zvartnots.

[54] Based on Siikamäki et al. 2015.

is a cornerstone for nature-based tourism; however, areas outside these hotspots also merit consideration in an expanded view on using forests for wider goods and services.

Armenia's tourism sector had been growing strongly before the COVID-19 crisis in terms of income and arrivals. Armenia welcomed over 1.65 million international tourists in 2018, and inbound tourist number has grown on average 9 percent per year between 2012 and 2018.[55] Tourism contributed $503 million to Armenia's economy (3.9 percent share of GDP) in 2018 and provided employment to 36,900 people in the travel and tourism industry—3.4 percent of the total workforce (World Economic Forum 2019). According to the Ministry of Economy, the top two reasons for choosing Armenia as a vacation destination is nature and historical and cultural heritage. Thus, forests—being closely associated with both reasons—is an important driver of tourism in the country (see Box 2).

While suffering from uncertainty currently, Armenia has significant nature-based tourism potential. The tourism sector, which relies on natural features of the country most notably forests, has unrealized potential both as a tool for supporting economic development and for fostering economic growth (Gad Bigio, Von Culin, and Karapetyan 2019). In particular, this includes adventure tourism, eco-tourism, and cultural tourism. Moreover, in view of the unpredictable security situation in the Eastern Europe and Central Asia due to Russia's invasion of Ukraine, nature-based tourism has fallen to a historic low and the future development is highly uncertain.

Box 2: Wildlife watching and recreational hunting

A particular asset of Armenia's forests is its fauna that can attract wildlife watching and recreational hunting. Forests are home to large mammals such as wolf (Canis lupus), brown bear (Ursus arctos), Syrian beer, lynx, red fox (Vulpes vulpes), red deer (Cervus elaphus), and roe deer (Capreolus capreolus).

The alpine zone of the country situated 2,000 m above the sea level is rich in birds including the mountain turkey, horned lark, and bearded vulture as well as mammals such as bezoar goat and mouflon.

Recreational hunting is allowed through licenses, and commercial hunting is limited. Hunting and fishing activities are managed by the MoE and pursuant to Article 5, Part 1, Clause 8 of the Law of the Republic of Armenia on the Management of Hunting and Hunting Economics. Permissible quantities of hunting and amateur fishing for social purposes are defined in the findings and recommendations put forth by the Scientific Center of Zoology and Hydroecology of the National Academy of Sciences of the Republic of Armenia. The institute provides the findings every year for the hunting season, but it is the MoE and specifically through the minister's decree that the final amount for each permissible hunting and fishing species is stipulated.

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55 International tourism, number of arrivals - Armenia | Data (worldbank.org).

Green job creation

Forestry can assist in recovery and rural job creation. The draft NFP of Armenia, which was developed with the support of the FAO, lays the groundwork for increasing Armenia's forest cover to 12.9 percent by 2030 and creating green jobs while fulfilling this target. The NFP aims for community engagement by offering the members permanent and temporary jobs in planting and maintenance operations. For example, using the ROAM report estimate of 20–30 person-days per hectare restored, a labor need of between 1.4 and 1.7 million person-days would be generated if this target was achieved through option 1 (restoration of degraded forests). However, large-scale and long-lasting FLR will only occur if participants have a vested interest in maintaining the tree cover, as seen in collaborative forest management.

Mass planting of willow cuttings is adopted as an efficient planting and labor engagement model. It is important to note that following the COVID-19 pandemic, the GoA launched a COVID relief program on its own finance, which contained an environmental and a socioeconomic component with a budget of $400,000. The program aimed at planting 2 million cuttings of willows in the riparian zones across the country. According to the government report, close to 1,000 people, who are from not only the communities adjacent to the riparian zones but also other parts of Armenia (from six different marzes), have been engaged in the planting. This project was deemed successful and the GIZ committed a similar amount of money to do another round of planting (employing 1,000 people and planting 1 million cuttings of willow and poplar species). This is the model that the government intends to adopt on a rolling basis, considering that for willow trees and similar species, cuttings are suitable for planting in riparian zones and there is no up-front cost on nurseries, labor, and other resources to grow seedlings. Again, 'Report IV: Landscape Restoration Strategy and Action Plan 2022–2032' of the ROAM study presents a more strategic assessment of FLR priorities and recommends the use of different and more appropriate species in each context, in addition to the required new nursery capacity.

6. FOREST AND LAND DEGRADATION, AND ITS COSTS

6.1 EXTENT OF FOREST AND LAND DEGRADATION

The country as a whole is exposed to the forces of land degradation. Currently, 82 percent of the land area of Armenia is, to varying extents, exposed to desertification and 27 percent of these lands face extremely severe desertification (UNCCD 2017). Land lost to infrastructure, building, and similar uses has also increased by 27,230 ha and now represents about 3.5 percent of the total area of Armenia. Chemical pollution occurs on 272,000 ha, with most of the land contaminated by mineral substances used in agriculture and by chemicals in urban areas. Pollution by minerals has increased due to the relatively low cost and incorrect application of chemical fertilizers, especially nitrate. Acidification is mainly associated with natural soil properties, but salinization has intensified partly due to poor irrigation practices. The area prone to overgrazing has not increased in recent years but the consequences of past overgrazing have not been eliminated and such land now covers about 170,000 ha.

Deforestation and forest degradation are the major environmental problems in the country. According to the FAO-FRA (2020), during 1990–2020 Armenia lost 6,260 ha of forests. Moreover, 11,000 ha of naturally regenerated primary forests were degraded into secondary forests during the same period. The average growing stock over bark in the Armenian forests decreased from 19.43 m³ per ha in 1990 to 11.63 m³ per ha in 2015 (FAO-FRA 2020) and the declining trend most likely continued after that period. A 1993 inventory estimate indicated the total standing wood volume to be 42 million m³ (about 127 m³ per ha) with an annual average growth of 0.45 million m³ (less than 1.5 m³ per ha and year). The figures for both wood stock and annual growth seem to be extremely low. Either they are not accurate estimates or the existing natural forests overall are heavily degraded in terms of wood stock. An Organization for Security and Co-operation in Europe (OSCE) study in 2006 estimated the standing timber stock to be even lower, 28 million m³,[56] which corresponds to 85 m³ per hectare. These findings suggest that some degree of forest degradation most likely has occurred in much larger areas beyond the 11,000 ha reported above.

Degradation levels are set to increase. Continuous land degradation and increasing drought are expected to lead to changes in Armenia's forest cover. Armenia's Fourth National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) (NC4) (MoE 2020) forecasts a potential loss of forest and woodlands of 14,000–17,500 ha (around 3–4 percent) by 2030 as a result of changes to ecosystems and growing conditions as well as an increased frequency of forest fire, pest and disease outbreaks, and invasive species. In the forest areas of the country, overuse of forest resources, exacerbated by the effects of climate change, has resulted in erosion, landslides, and disturbance to the hydrological cycle (Republic of Armenia 2015).

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[56] OSCE mandated research on 'Economic Research on Armenia's Forestry and Wood Processing Sector (2006)'.

6.2 ECONOMIC AND OTHER COSTS OF FOREST AND LAND DEGRADATION

Annual losses due to forest degradation are at least $8 million. The deforestation during 1990–2020 in Armenia (nearly 6,300 ha) is estimated to have caused a total GHG emission of about 2.78 million tCO_2eq[57] which corresponds to about 93,000 tCO_2eq per year. This deforestation also resulted in the loss of vital ecosystem services that Armenian forests usually provide (see

Chapter 5). The GHG emissions and loss of ecosystem services resulted in a total economic cost—estimated by using benefit-transfer method—of just over $8 million per year to the country (Table 5). It should be noted that due to lack of required biophysical and socioeconomic data, economic valuation was possible for just nine[58] of numerous ecosystem services that are lost due to deforestation. If the valuation of all affected ecosystem services was possible, the total economic losses would be much higher.

Table 5: Economic costs of deforestation in Armenia during 1990–2020

Item	Economic costs, $ per year
GHG emissions	5,559,717
Foregone ecosystem services	2,628,183
Total	**8,187,900**

Note: Estimated by using benefit-transfer method.

Estimates of national annual losses on all land types rise to $111 million. UNCCD (2017) suggested over 14 percent of Armenian rural population in 2010 was dependent on land that was degraded and in 2000 the rate was about 12 percent. The dependency rate is likely to have increased further now assuming that the past trend has continued. Land degradation severely affects people's livelihood by reducing the availability of vital ecosystem services such as food, wood, water, and soil fertility and thus increasing the risks of poverty particularly in rural areas of Armenia. It is estimated, based on data from UNCCD (2017), that the economic cost of land degradation in the country is over $111 million per year (in 2021 constant $). About 45 percent of this cost comes from the decline in provisioning ecosystem services (UNCCD 2017).

Prevention is more cost-effective than having to address issues that have already occurred. The implementation of ecosystem restoration (rehabilitation after fire, pests and diseases, irregular felling of trees, deforestation, or structural damage) is technically more difficult, time-consuming, and more costly than effective measures for their prevention and protection.

6.3 DRIVERS OF FOREST AND LAND DEGRADATION

The proximate drivers of forest degradation in Armenia include both anthropogenic and natural factors (Figure 11). The anthropogenic factors notably include overharvesting of forests particularly for fuelwood and timber, illegal logging, uncontrolled grazing, infrastructure development, mining including pit mining,

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[57] FAO EXACT model is used for GHG emission estimation.

[58] Fuelwood, medicinal plants, wild fruits, mushrooms, honey, water for irrigation, protection of habitat and species, hydrological regulation, and recreation.

forest fires, and water extraction for irrigation. Natural drivers include pests and diseases, salinization, and increased forest fires (Figure 11) due to droughts that are frequent, particularly in the Ararat valley and some areas of Vayots Dzor and Syunik marzes. These natural threats are enhanced by anthropogenic factors (Schulte and Harutyunyan 2020).

The underlying drivers of deforestation and forest degradation in Armenia include economic and population growth and high costs of energy (notably natural gas and electricity), particularly for lower–income households. These all lead to high demand for forest-based ecosystem services, particularly fuelwood and timber as well as intense land use competition, for example, agriculture and mining as demand for outputs from them also increases. Most

households in rural areas continue to depend on fuelwood for energy. An improvement in the gas supply after 2010 led to a short-term reduction in illegal cutting for fuelwood; however, the costs of gas and electricity remain high for poor households and are now likely to increase substantially and wood removals are likely to continue, or even increase, given the current geopolitical situation. As the proposed expansion of forest cover to 2050 will not generate increased supplies in the short term, other actions will be required if forest loss and degradation are to be controlled and reversed. Regulatory ambiguities leading, for example, to the allocation of the same land for forest use and pasture and climate change are the other key underlying drivers of deforestation and forest land degradation in Armenia (Figure 11).

Figure 11: Drivers and impacts of forest land degradation in Armenia
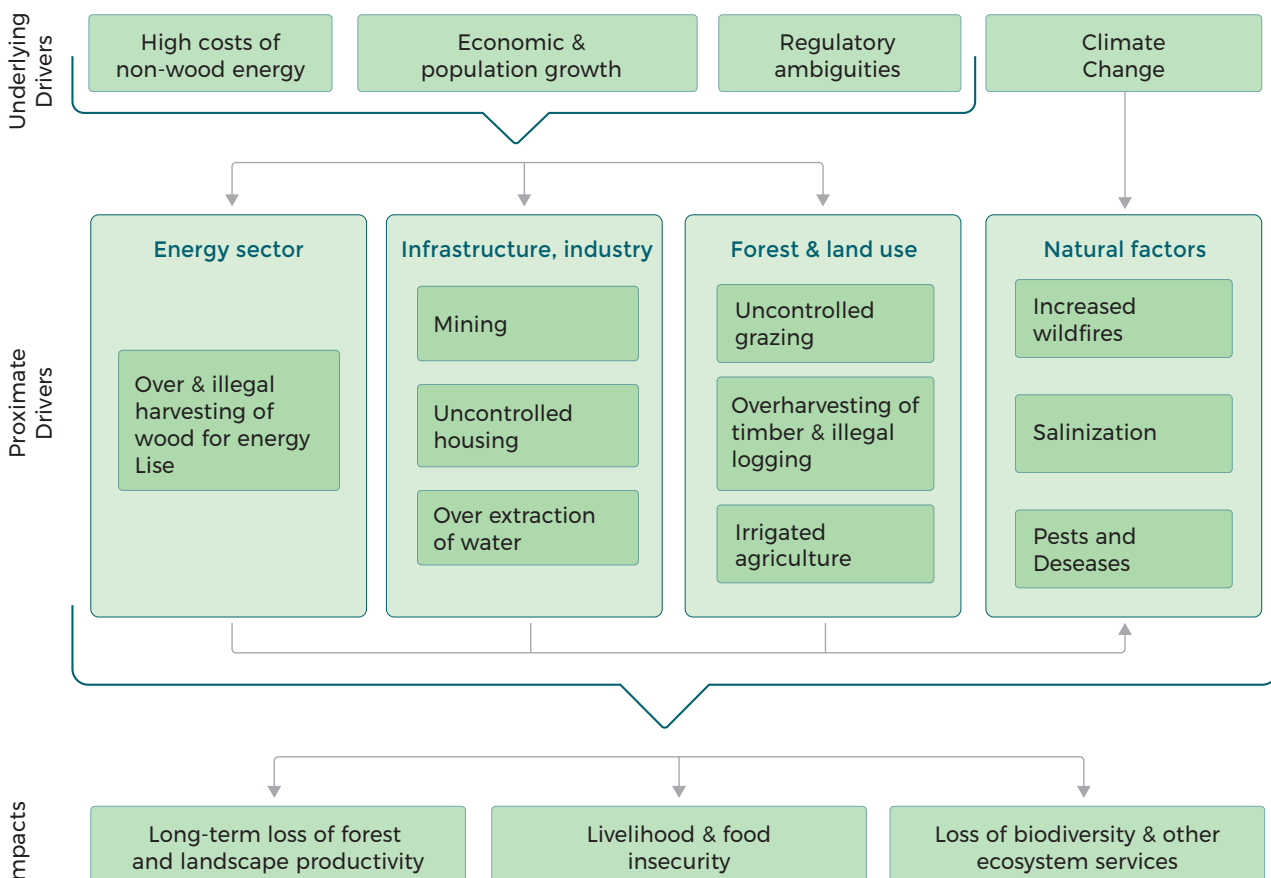
Mining causes serious direct and indirect impacts on forests and biodiversity. At the mining site level, land preparation and expansion and waste management are destructive processes, changing abiotic and biotic conditions, and in some cases, transforming natural forests, and threatening species and ecosystems. Landscape impacts on forests and biodiversity also emerge through indirect, secondary, and cumulative pathways. Negative impacts can also occur over larger distances as sediments export along rivers with the discharge of chemical and physical mining wastes. As a result of mining activities, about 8,000 ha of land has been degraded with an additional 1,500 ha used to store tailings dumps. Pollutants from these are commonly leached out, affecting waterways and local biodiversity.[59] According to recent data (2018) from the Hydrometeorology and Monitoring Center, 16 rivers in Armenia have been identified as having the highest degree of pollution as a result of mining activities.[60] There has been an expansion of mining across the country, affecting 34,900 ha of forest land in 2013, primarily in the Lori and Syunik provinces. Between 1990 and 2000, 30 percent of forests in Lori province were affected by mining (Ministry of Nature Protection 2014).

Overall, the State Forest Fund land and other rural areas in Armenia face a significant and growing threat of degradation of forests. Extensive pastures face competing land uses, with serious direct implications for local rural populations concerning food security and long-term sustainable development. The effects of climate change aggravate the current critical situation and accelerate the pathway of destruction, in particular in the few HCVFs remaining in the ravines and steep mountainous slopes of the country. It is worth mentioning that land under the State Forest Fund is often used for pastures and haymaking, which causes problems related to soil and forest degradation. Moreover, imbalances in the use of pastures and meadows are occurring due to the underutilization of some areas and severe localized overgrazing of others. In these circumstances, the forest and the extensive rangeland sectors are competing land uses, particularly in areas where there are satisfactory soil and moisture conditions.

Forests are overcut and failing to regenerate naturally. Deforestation in Armenia is driven directly by legal and illegal tree cutting for commercial purposes (construction, infrastructure, export, and mining) and indirectly by broader issues such as lack of awareness about sustainable forestry among forest-dependent communities and lack of community ownership of forests. While illegal logging fell between 2004 and 2015, there has been a sharp increase from 2016 onwards. Generally, regeneration is weak or nonexistent. Over 30 percent of coppice oak forests are low-density stands with no seed regeneration. Overstocked pine plantations are left unthinned. Many oak, beech, and juniper forests are not regenerating at all.[61]

Fuelwood harvesting is likely to increase in intensity. In general, (illegal) tree harvesting and overuse of forest resources are attributed to a large proportion of rural households being overly dependent on fuelwood as their main source of energy. This trend in deforestation for firewood can be traced back to the start of a severe energy crisis in 1992. In the Lake Sevan Basin, for example, approximately one-quarter of forest plantations were clear-cut in the

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[59] See https://documents1.worldbank.org/curated/en/289051468186845846/pdf/106237-WP-P155900-PUBLIC.pdf.

[60] *Source:* Armenian Ministry of Energy infrastructures and Natural Resources.

[61] ROAM Analysis, Report 1.

period until 2005 (Sayadyan 2005). High deforestation rates are likely to continue as the demand for biomass for heating and domestic use remains high. This is expected to adversely affect the poorest households due to a decline in firewood availability and price increase. Up to 9 percent of households in Armenia use wood as fuel for cooking and heating and more than 300 small, medium, and large wood processing companies operating in Armenia use 10 times more wood than the maximum volume set by the state for annual cutting (OSCE 2007).

Pests, diseases, and fire are crucial drivers of forest degradation in Armenia. Unregulated forest felling and early exploitation of cut blocks bring about changes to the microclimatic and sanitary conditions in forests such as high temperature, abundant light, and wood debris. These contribute to increased risk of more widespread pests and diseases as well as drying of trees and fire hazards. These phenomena can be more clearly observed in the open forests of central and southern parts of Armenia as well as in natural pine forests. In particular, some forest locations in Aragatsotn, Hrazdan, Kotayk, Vayk, Jermuk, and Meghri regions are on the verge of drying out and require continuous forest protection and fire risk reduction and control measures.

According to official statistics, the area infected with forest diseases has increased since 2000. In 2016–2021, funded by the state budget, aerial chemical control methods were used on about 19,503 ha of forests[62] infected with pests and diseases, which means on more than 50 percent of the total forested area. Chemical intervention at this scale seems excessive and raises environmental concerns. The increase in fire and pest outbreaks is at least partly attributed to changing climate, which leads to deterioration of natural forest restoration, especially in the lower mountain zone (550–1,200 m), where the annual precipitation does not exceed 600 mm on average and is less in many years.

6.4 OPPORTUNITIES FOR SUSTAINABLE MANAGEMENT OF DEGRADED LAND

Forest degradation in Armenia also presents an opportunity for sustainable land management, as illustrated in Figure 12. Zoning of forested areas and pasture, pasture management, well-defined afforestation, and forest restoration efforts as well as focused restoration efforts on former mining sites and linking of forest restoration with direct local needs (for example, firewood - eventually charcoal and woodfuel and NWFPs) are considered important measures. In areas with low forest cover, combining tree planting, such as fodder banks and shade and boundary trees, with agricultural production on private lands is a practical solution. These opportunities could also be a solution in heavily degraded sites, such as salt-affected wastelands, where the planting of multipurpose tree species, including for firewood and animal fodder, can make these lands productive again while at the same time contributing to livelihoods of local people. Simultaneously, such land improvements will also contribute to climate mitigation.

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[62] As stated in the draft NFP 2021–2030.

Figure 12: Measures for and impacts of sustainable forest land management in Armenia
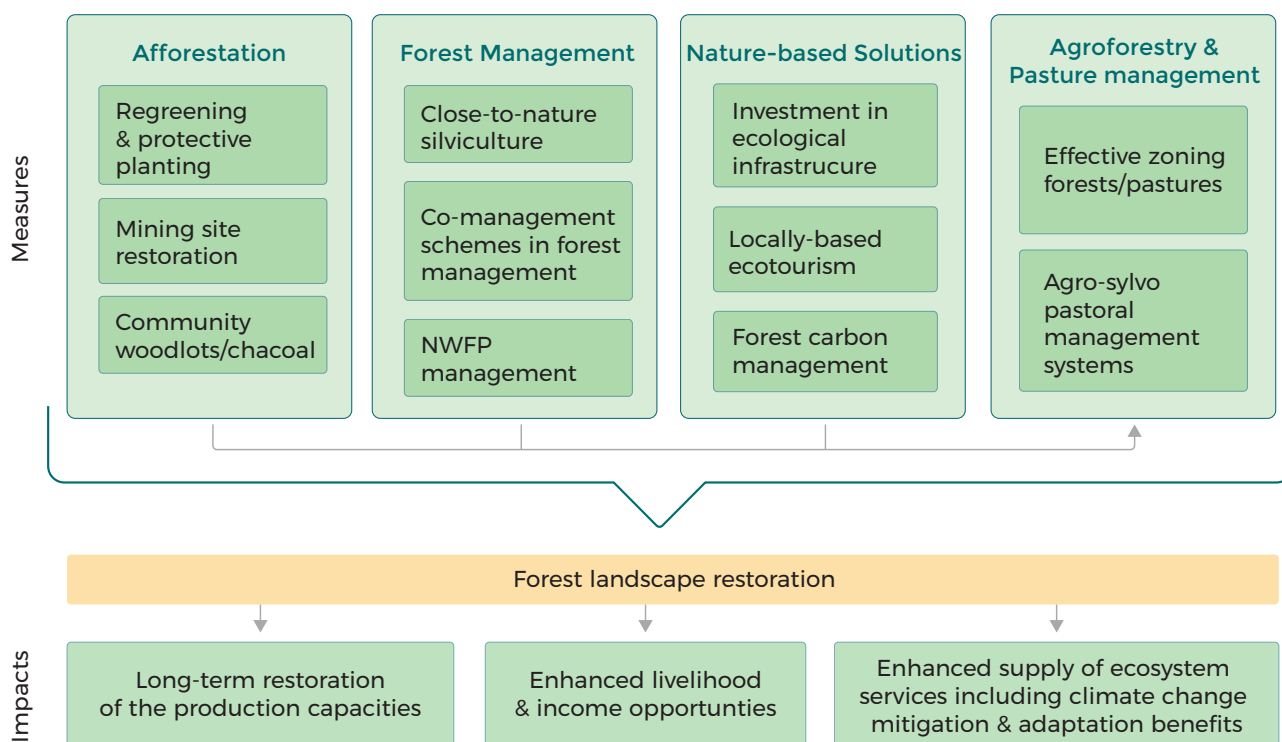
A **Land Degradation Neutrality (LDN) strategy exists but its implementation is limited.** The GoA developed its LDN strategy to address the issues identified above. This includes four targets: (a) arrest cropland degradation and promote agro-ecology (conservation plus modern 'organic' technology), (b) afforest and/or reforest two-thirds of the degraded land, (c) halt deforestation and improve forest management on 100 percent of the national territory, and (d) eliminate overgrazing and improve grassland management on 100 percent of the national territory. Despite relatively good knowledge and high-level understanding of the land degradation situation, there are at present no national programs, plans, or regulations to promote the introduction and scaling-up of LDN on lands outside the State Forest Fund land.[63] Based on current knowledge, the new Agriculture Policy (2019–2029) lacks LDN considerations. Local communities have little or no capacity to generate or invest adequate funds to enable them to move up to higher-value agricultural chains and stay competitive, thereby also increasing their livelihood opportunities. Furthermore, there is a lack of validated data on the condition of land and the state of natural resources, including forests and trees in landscapes.

Pest and disease monitoring and control requires further attention. In general, rapid detection of pests and diseases to diagnose them and take appropriate effective measures is still problematic in the field of forest protection. In recent years, active forest protection measures have been implemented but there is still a lack of special studies and regular monitoring data on pests and diseases and their spread. To implement forest protection and fire prevention measures effectively, an integrated forest protection management plan/strategy and action plan needs to be developed as well as ensuring that ecologically safe technologies are being applied.

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[63] See https://www.thegef.org/projects-operations/projects/10365.

Concerted action is needed to address rural fuel poverty and divert users away from illegal logging. An OSCE study recommends addressing the problem of deforestation on the economic level by expanding natural gas supply to remote villages through microcredits, exempting taxes for importing wood to Armenia, promoting recycling and renewable energy production, and tightening the enforcement of policies and regulations.[64] There are a number of projects under way, which also target improving the energy efficiency of stoves in rural communities as well as developing infrastructure for alternative biofuel sources such as pellets and briquettes.[65]

Agroforestry shows promise. Equally important to note is the significance of growing multipurpose trees, for example, fruit and nut trees that have a long tradition in the country and could contribute to export income. The potential for a combined landscape approach addressing forest landscape restoration through agroforestry in this part of the country is palpably possible. Additionally, as rangelands are affected by overgrazing, direct interventions in pastures will help reduce pressure on forests and allow close-to-nature silviculture, including successfully regenerating existing forests.

Scaling-up of pilot-scale interventions in sustainable land management is now needed. Afforestation and reforestation in particular have potential to be effective measures in restoring degraded forests in Armenia. However, such efforts have been hampered by a lack of resources, old practiced, and the impracticality of separating forest areas from livestock areas. The GoA, with international support, has pursued various pilot efforts to test new approaches to

land and forest management. What is needed is a closer look at 'landscape management' where from each sector of the economy the elements are combined to achieve the best overall use of scarce resources.

The Assessment of Forest Landscape Restoration Opportunities in Armenia is highly relevant, current, and comprehensive. The associated 'Landscape Restoration Strategy and Action Plan 2022–2032' identifies eight specific FLR options (see Box 3) with a total potential intervention area of over 387,000 ha. Four strategic areas identified for development in support of FLR are (1) Institutional environment and steering, to create and maintain the institutional environment needed to manage the landscape restoration process effectively and efficiently; (2) Development of the capacity of the communities and organizations involved; (3) Development of the required infrastructure (including technical equipment); and (4) Implementation of forest ecosystem improvement measures: this concerns the actual implementation of landscape restoration options with implementation ramping up swiftly, once the enabling measures are in place.

Cost estimates to achieve the Bonn Challenge by 2030 vary considerably. The 'Landscape Restoration Strategy and Action Plan 2022–2032' envisages achievement of the 50,000 ha Bonn Challenge target for FLR over 10 years from 2022 to 2032. Under the eight options, this could require a total investment from as little as $9.3 million (in 2022 $ equivalent) to as high as $663 million. The former assumes the least expensive activities of coppice forestry, wildfire prevention, and support for natural regeneration are undertaken while the latter focuses on

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[64] https://www.osce.org/yerevan/48724.

[65] Armenia is currently developing the Long-Term Low Emission Development Strategy, and it would be important to refer to any new analytics or scenarios presented there relevant to this issue.

windbreaks (the most expensive option). If all eight options are implemented over 50,000 ha, according to the area identified for each as a proportion of the total area, then the cost will be approximately $45 million. The strategy itself envisages more planning activities to define the operational plan and the proportion to be spent in each activity.

Significant attention to and expenditure on the enabling environment will also be needed. As identified in the draft FLR strategy, investment of effort will be needed in institutional strengthening and regulatory reform as well as in the equipment and technical capacity of Hayantar SNCO to enable it to fulfill its role in FLR.[66]

Box 3: Recommended FLR options from Landscape Restoration Strategy and Action Plan 2022–2032

Forest ecosystems restoration options

1. **Restoration of degraded forests through planting:** planting species with mitigation benefits as well as those that sustainably provide fuelwood, timber, building, poles, and fruit production (oak, beech, and pine.)

2. **Promotion of natural regeneration through tillage and soil mineralization:** soil mineralization and sowing seeds in plots or trenches can be implemented to support regeneration. The focus here is on oak, beech, and juniper forests.

3. **Coppicing of oak stands of secondary origin**: coppicing is a short-rotation system based on harvesting the stump regrowth of deciduous trees; stands require regular intervention and eventual regeneration by planting.

4. **Thinning of overly dense pine forests**: within already degraded forests, silvicultural practices such as liberation thinning of variably dense pine forests can replenish the quality and stocking of forests.

5. **Wildfire prevention**: through the construction of firefighting roads/access routes and tilled strips in oak, pine, and juniper forests, it aims at reducing societal impacts and mitigating the threats.

Forest plantations establishment options

6. **Establishment of anti-erosion/soil protection plantations:** to slow down or reverse erosion on mountainous or hilly sides, the creation of anti-erosion forest strips is recommended.

7. **Establishment of windbreaks and hedgerows**: windbreaking forest strips are recommended to be cultivated to prevent the negative impacts of wind on forests (especially during growing stages), protect agricultural lands, ensure better amelioration, and improve overall land productivity.

8. **Reclamation of mining sites and landfills (including phytoremediation)**: mine reclamation is the process of restoring land that has been formerly mined to a natural or economically usable state. It is highly relevant for Armenia, given the significant mining industry present in key forest provinces.

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[66] FLR interventions 6, 7, and 8 presented in the Box 3 should be considered accounting for the initial land use (afforestation on grassland, afforestation on cropland, afforestation on other land types, and so on), which is also required for national GHG inventory (MoE).

7. FORESTS AND CLIMATE CHANGE

7.1 CLIMATE CHANGE AND ITS IMPACT ON FORESTS

Armenia's climate is characterized by extremes, for example, heat waves in the summer and bitter cold in the winter[67] The large climatic contrasts are because of the diverse terrain conditions ranging from arid through subtropical to high mountains. The average annual precipitation is low at 526 mm. Altitude is the strongest controlling factor determining the spatial distribution of temperature and precipitation. Sub-zero average temperatures are common in Armenia's mountain ranges while the highest average temperatures are experienced in the relatively low-lying western plains. Similarly, Armenia's highest peaks may receive up to 1,000 mm of annual precipitation while precipitation can be as low as 200 mm in the western plains.

Armenia is considered as the fourth most vulnerable country to climate change in Eastern Europe and Central Asia (World Bank 2021b). The country's Fourth National Communication (NC4) to UNFCCC reports that it experienced an average temperature rise of 1.23°C between 1929 and 2016. This historical rise in temperature has resulted in the accelerated shrinking of the glaciers, measured to be at least around 8 m per year. Trends suggest climate variability has been increasing in the recent years, with an observed heat wave in Yerevan in July 2018 reaching 42°C. Armenia's NC4 reported a 10 percent reduction in average annual precipitation over 1935–2012. The northeast and central regions have become more arid. However, precipitation has increased in the southern and northwestern regions and in the western region of the Lake Sevan Basin. In respect to climate variability, the number of days with heavy rainfall and hailstorms has also increased.

Armenia is projected to experience warming at levels significantly above the global average, resulting in major threats to human health, livelihoods, and ecosystems. Projections reported by the Intergovernmental Panel on Climate Change (IPCC) (Ar5 RCP8.5 A2), as well as recent reports from the World Bank, indicate average temperature increase of 2°C by 2070, further precipitation decrease of 3 percent, river flow decrease of 6.7 percent, and snow cover decrease of 7 percent by 2030 in Armenia. According to the United States Agency for International Development (USAID), by 2030 yields are forecasted to decline by 8–14 percent in agriculture and 4–10 percent in pastures and reduction of natural forest cover of about one-third of the remaining 11.2 percent with over 15 percent of Armenia's higher plant species in danger of extinction.

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[67] Climate change portal of World Bank. https://climateknowledgeportal.worldbank.org/country/armenia/climate-data-historical.

Box 4: Predicted climate change in Armenia

- Armenia is projected to experience warming at levels significantly above the global average, with potential warming of 4.7°C above the 1986–2005 baseline by the 2090s under the highest emissions pathway (RCP8.5).

- Expected rise in maximum and minimum temperatures is even more significant and represents major threats to human health, livelihoods, and ecosystems.

- Warming is projected to be strongly concentrated in the summer months of July, August, and September.

- Increased drought risk is a particular threat to poor rural communities reliant on subsistence agriculture.

- Glaciers in the Caucasus will largely disappear over the twenty-first century, and the pressure and dependence on water management infrastructure is also expected to grow significantly.

- A warmer and more drought-prone environment is likely to drive significant changes in ecosystem composition, notably driving dryland expansion, forest loss, and species range shifts.

- The increased risk of both flooding and landslide hazards demands attention to disaster risk reduction, particularly in Armenia's poorer rural communities.

- Reduction in both the total arable land and the yield of staple crops will threaten food production and efforts to eradicate undernourishment in Armenia

- Without adaptation and disaster risk reduction, changes will exacerbate income and wealth inequalities and hinder attempts to reduce poverty.

Source: World Bank 2021b.

Observable climate change impacts and vulnerability are expected to increase because of the aging water and irrigation infrastructure and unsustainable land and water management practices in the country. Climate change has already led to shrinking glaciers, while droughts and storms have become more common. The changing climate is likely to cause a greater frequency and intensity of extreme weather events in the future. Climate change impacts will lead to the expansion of arid ecosystems, reduction of forest areas and subalpine and alpine landscapes, and increased vulnerability of forests as well as loss of biodiversity and increased erosion and mudflows.

The climate change patterns predicted for Armenia may lead to soil and land degradation mainly due to irregular or reduced soil moisture (FAO 2015). With the predicted increased frequency and intensity of droughts, the decline of soil quality will be significant. For the entire Caucasus region, an expansion of arid and semi-arid conditions is projected. Such changes will reduce ecosystem resilience and productivity resulting in species range shifts and potential loss of biodiversity. Thus, forest management planning and silvicultural measures, afforestation, and reforestation all need to consider the changing patterns and will need to be robust and attuned to these risks.

More than 15 percent of Armenia's higher plant species are reported to be in danger of extinction due to projected climate change.

Accelerated desertification processes will result in the expansion of semidesert and desert areas by 30 percent. More frequent summer droughts and water stress will reduce the growth rate of trees and increase their 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.[68] Additionally, studies from the Armenian academia, the UN, and the World Bank confirm that climate change is expected to have significant effects on the population dynamics of forest pest species.

Forests have a pivotal role in either continuing as sinks or becoming sources of carbon emissions. Armenian forests are expected to suffer significant growth losses caused by insect attacks under climate change. Severe and repeated pest infestations will lead to increased tree mortality, which will also contribute to the accumulation of drying dead organic matter in forests, thus increasing the risk of wildfires. As described, Armenian forests are becoming more vulnerable and less resilient to climate change. Consequently, forests may become a carbon source instead of a sink. In other words, without integrating forests into climate change strategies, national commitments toward the Paris Agreement and the country's socioeconomic development targets will likely be compromised. On September 24, 2021, Armenia submitted its National Adaptation Plan (NAP) to UNFCCC, prepared by the MoE and UNDP.[69] In May 2021, the country approved the National Action Programme of Adaptation with a list of measures for 2021–2025.[70] The action plan identifies three key types of barriers with respect to adaptation: (a) governance and institutional barriers; (b) information, knowledge, and technological barriers; and (c) financial barriers. In the analysis and measures, forests are embedded under the term ecosystems and forest fire is particularly mentioned.

7.2 ROLE OF FORESTS IN CLIMATE CHANGE MITIGATION

Armenian forests play a crucial role in climate change mitigation. During 2010–2020, forests in the country are estimated to have removed, on average, 0.54 million tCO_2eq[71] GHGs per year from the atmosphere. This amounted to a total GHG removal of 5.9 million tCO_2eq for the entire period. For the same period, the average annual economic value of this removal is estimated to be $33 million[72] (Figure 13). In fact, forestry is the only carbon sink among the major sectors of economy of Armenia. Energy, industrial process and product use, waste agriculture, and other land uses (excluding forestry) are net emitting sectors. In 2017, energy was the biggest emitting sector contributing 67 percent of the total net emissions from all sectors, and agriculture and other land uses excluding forestry were the second biggest with 18 percent contribution (Figure 14). The aggregate GHG emissions from all these sectors increased from 6.8 million tCO_2eq in 1995 to 10.2 million tCO_2eq in 2017, which corresponded to a 49 percent growth (Table 6). In 2017, the GHG removal by the forestry sector corresponded to –5.2 percent of the total net emissions from all sectors in Armenia.

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[68] Armenia Third National Communication on Climate Change 2015.

[69] FCCC/SBI/2021/INF.7 (unfccc.int).

[70] NAP_Armenia.pdf (unfccc.int).

[71] Data for 2010–2017 are from MoE (2020) and data for 2018–2020 are estimated based on trend from 2010–2017. The MoE intends to recalculate the LULUCF sectoral estimates.

[72] Average of low and high shadow prices of carbon for 2021 suggested by World Bank (2017) is used for this valuation.

Figure 13: GHG removal by forests in Armenia and its economic value
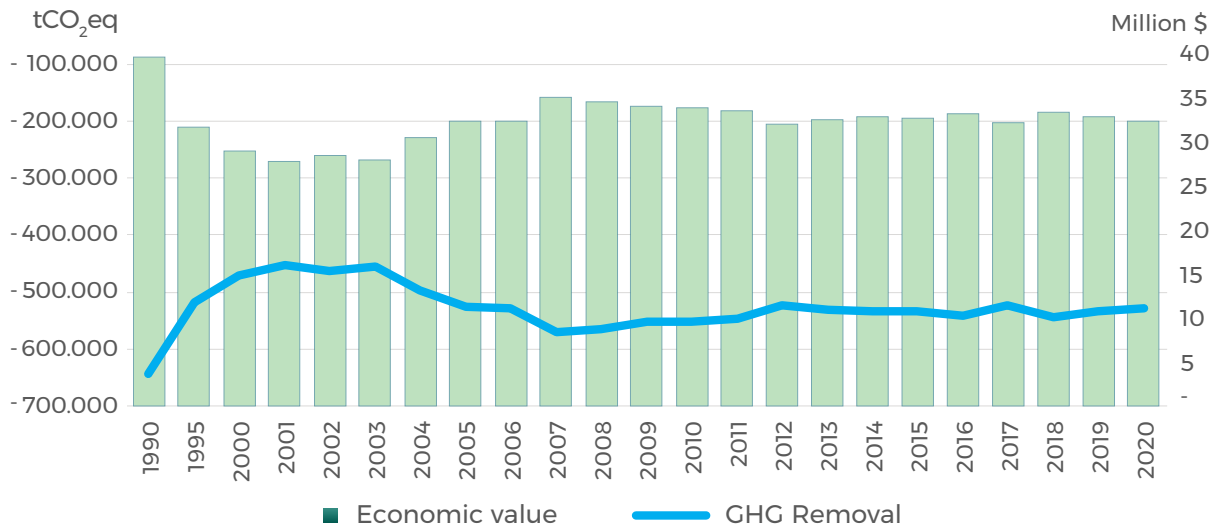
Source: GHG removal - MoE 2020 (1990–2017), estimation (2018–2020); economic value - estimation

Figure 14: Net GHG emissions from various sectors except forestry in Armenia in 2017

- Agriculture and other land uses (without forestry)
- Waste
- Industrial Processes and Product Use
- Energy
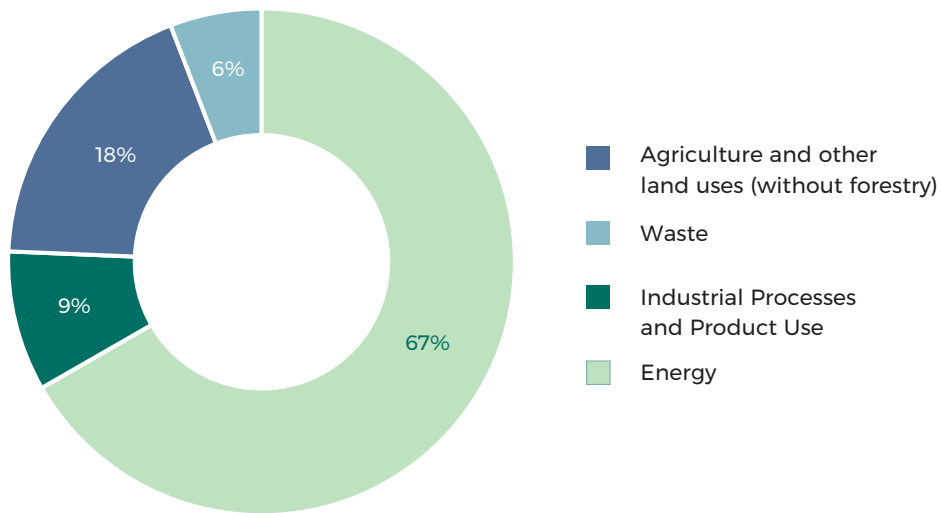
Source: Adapted from MoE 2020.

Table 6: Total net GHG emissions in Armenia

Year	Total net GHG emissions from all sectors, tCO_2eq
1995	6,814,200
2010	7,946,500
2017	10,153,500
Change during 1995–2017	49%

Source: Adapted from MoE 2020.

Armenia has an initial target of 2 percent expansion of forest cover in the 10 years to 2030 but this accelerates to 7 percent in the following 20 years. Armenia's updated NDC[73] sets a target of increasing the country's forest cover to 12.9 percent by 2030 as a strategy to reduce its GHG emissions by 40 percent from 1990 levels. Sustainable land and forest management is also necessary to achieve the NDC target.[74] Introducing climate adaptive silviculture and restoration practices, reducing the drivers of forest degradation, and increasing participation in forest governance will contribute to achieving NDCs and to low-carbon development pathways consistent with a temperature increase of less than 2°C. In the period to 2050, the share of forest cover is intended to rise to over 20 percent, a major step change in ambition.

In the NDC, adaptation policies and measures are considered of paramount importance, considering that the vast mountainous ecosystems are highly vulnerable to the negative impacts of climate change and water scarcity. Also, the NDC envisages that adaptation activities will be prioritized based on the sectors most vulnerable to climate change, including natural ecosystems (aquatic and terrestrial, forest ecosystems, biodiversity and land cover). Please see Box 5 on the potential of reducing emission from deforestation and forest degradation (REDD+) and forest carbon markets for Armenia.

Box 5: REDD+/Forest carbon as an opportunity for Armenia?

Reducing emissions from deforestation and forest degradation, conserving and managing forests sustainably, and enhancing carbon sinks (REDD+) is a mechanism developed by Parties to the UNFCCC. It creates financial incentives for developing countries to reduce CO_2 emissions in the forestry sector. Developing countries would receive results-based payments for results-based actions. The commitment of the GoA to enlarge the forested areas up to 20.1 percent by 2050 is a promising initiative in terms of participating in the REDD+ mechanism. For this purpose, appropriate organizational and other measures need to be undertaken.

A first forest project that adopts strategic approaches of REDD+ has been put in place in December 2021 by the GoA with the FAO as an accredited entity. It is majorly financed by the Green Climate Fund (GCF) (Simplified Approval Process [SAP] 14: Forest resilience of Armenia, enhancing adaptation and rural green growth via mitigation).

The question is whether forest carbon would be an attractive financing scheme for Armenia to increase its forest area and carbon stocks? This is because REDD+ requires strong political will; rigorous safeguards; active community engagement; and complex methodologies for monitoring, reporting, and verification. In addition, the total area available for forest expansion and the growing conditions for trees are relatively limited. Exceptions could be block planting of fast-growing woodfuel plantations, but the total area of these will, however, always be limited.

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[73] Nationally Determined Contribution of the Republic of Armenia for 2021–2030 under the Paris Agreement.

[74] Armenia's intended nationally determined contribution (INDC) that was submitted to UNFCC in 2015 outlined the national climate change goals up to 2050. Land use and forestry (afforestation, forest protection, carbon storage in soil) were the key sectors included in the mitigation contribution. Concerning forests, the INDC aimed to reach 20 percent of forest cover by applying an ecosystem-based approach by 2050.

8. LEGAL, INSTITUTIONAL, AND POLICY FRAMEWORK

The Forest Code of 2005 is the central legal act in the system of forest legislation which regulates the relations with respect to sustainable forest management including safeguarding, protecting, protection, rehabilitation, afforestation, and reasonable use of forests and forest lands as well as the relations with respect to inventory/stocktaking of, monitoring of, and control over forest lands.

The code has not been amended since it was adopted; forest-related legislation now needs to be clarified and simplified to ensure the functional application of legal acts. There are many bylaws associated with the Forest Code, which complicates law enforcement in the context of insufficient capacity of the sector and low public awareness. To fulfil a future wider role of forests in the sustainable development agenda of the country, the Forest Code and forest management regulations need to be amended to include biodiversity conservation, climate change mitigation and resilience, economic valuation of forests goods and services, protection of HCVFs, conservation of special protected nature forest areas, and other environmental issues.

The code is currently being reviewed. According to the National Forest Development Policy, Strategy and Action Plan 2021–2030 currently in discussion, amendments to the forest legislation should be aimed at providing legal framework for the multipurpose use of forests, contributing to the improvement of the management system, clarifying intersectoral legal relations and responsibilities, and revising regulations considering realistic opportunities and potentials for their application.

8.1 KEY FOREST INSTITUTIONS AND THEIR DEVELOPMENT

The key forestry institutions in Armenia have been organized since April 2018 under the MoE. The MoE is responsible for environmental protection and biodiversity conservation matters. It is also the focal point for UN CBD, UNFCCC, and United Nations Convention to Combat Desertification (UNCCD). With respect to forestry, MoE's functions are to oversee the forestry sector and all state forest lands in Armenia. The MoE carries out its forestry-related functions through its Forest Policy Department as well as through Forest Committee and Hayantar SNCO (Figure 15). Similarly, the Hydrometeorology and Monitoring SNCO, part of the MoE, has a department of Forest Monitoring which is focused solely on monitoring the forests. The core functions and overall duties on forest management and conservation are presented in Table 7.

Figure 15: Institutional set-up as it relates to forests and forestry
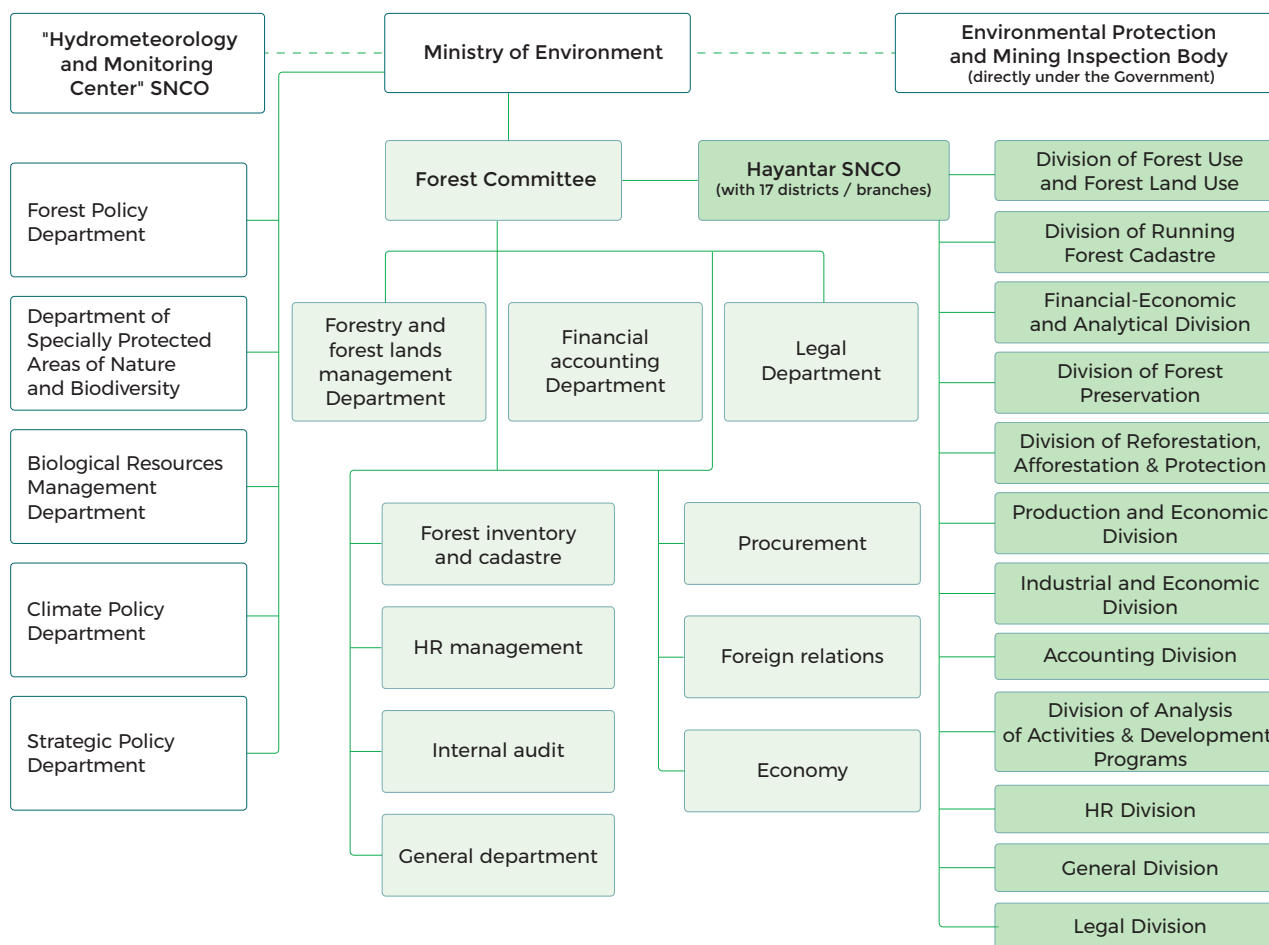
The main tasks of the Forest Policy Department are drafting legal acts, programs, strategies, and guidelines as well as developing mechanisms for and coordinating the implementation of the respective state policies. The department is involved in the elaboration of economic mechanisms for the protection and reasonable use and recovery of biodiversity, including payment schemes for nature use. The MoE approved the Charter of the State Forest Committee and its institutional structure in 2018. The MoE supervises and defines the main directions of the committee and its activities (Figure 15).

The Forest Committee's goals and objectives include conservation, protection, restoration, afforestation, and effective use of state forests; ensuring sustainable forest management;

implementation of measures to increase the productivity of the state forests; protection of biodiversity of state forests; efficient use of the environmental, social, and economic potential of state forests; and provision of complete and reliable information on the forest lands and forests. The committee exercises the powers assigned to the state forest service by the Forest Code (Articles 26 and 58) and is governed by a chairman who is appointed by the Prime Minister after consultation with the Minister of Environment. It is structured into departments: Forestry and Forest Lands Management, Forest Inventory and Cadastre, Financial and Accounting, Contractual Obligations Control, and Legal Departments and Subdepartments (HR management, Procurement, Foreign Relations, Economy, and General department) as seen in Figure 15.

Table 7: Division of selected tasks between the MoE, the Forest Committee, and Hayantar SNCO[75]

Institutional structure	Core functions/duties
Forest Policy Department	Development of state policy on protection, control, reproduction, and use of forests. Secures the legislative and regulatory framework
State Forest Committee	Supervises the implementation of forest management activities thus ensuring sustainable forest management
Hayantar SNCO	Implements forest management activities on state forest land: control, protection, conservation of biodiversity, restoration, re/afforestation, and efficient use of state forests
Environmental Protection and Mining Inspection Body (supervision moved to the GoA)	Control over implementation of the instructions and requirements set forth by environmental legislation
Hydrometeorology and Environmental Monitoring Center SNCO (HEMC SNCO)	Environmental monitoring, including natural and anthropogenic impacts on all components (forests and specially protected natural areas, biodiversity, atmospheric air, water resources, lands, waste disposal sites) of the natural environment
Department of SPNAs and Biological Diversity	Coordination of activities on SPNA protection and sustainable use, support to development and implementation of the state policy

Since 2018, Hayantar SNCO has been under the subordination of the Forest Committee. Its status and institutional set-up are under revision due to ongoing reforms in the forestry sector. The main functions of Hayantar are to ensure control, protection, conservation of biodiversity, restoration, re/afforestation, and efficient use of state forests and forest lands. About 75 percent of forests and forest lands of Armenia (including 13 of 27 sanctuaries) are managed by Hayantar through the Head Office (comprising 10 departments) and 17 forestry branches located in the marzes of Lori, Tavush, Syunik, Kotayk, Shirak, Vayots Dzor, Gegharkunik, and Aragatsotn.[76] The AAC is determined in the FMP and based on respective proposal from Hayantar; if the FMP has expired, these quantities are calculated by special commissions. Hayantar is financed by the state budget (approximately 65–70 percent) and revenues from selling forest products (approximately 30–35 percent). Hayantar has the following categories of entrepreneurial activities:

- Timber harvesting, processing, and sale
- Cultivation and sale of planting material (seedlings, seeds)
- Procurement, processing, and sale of secondary forestry (stubble/wood residues)
- NWFP forest use (harvesting; livestock 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
- Production, processing, and sale of agricultural products
- Provision of recreational and tourism-related services
- Provision of consulting and information.

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[75] Based on Grigoryan 2021. See Annex 5 for the key contacts in forestry sector in Armenia.

[76] The status of FMPs needs to be checked: there is the information that FMPs have been voided, but the new ones are not approved yet.

Reorganization is ongoing. In 2020, the former Forest Monitoring Centre related to the Forest Committee and Hayantar was merged with other environmental monitoring units as the HEMC SNCO was set up in 2020 to monitor all natural resources, including forests. In addition, a draft law implementing changes to the existing structure (which itself dates from as recently as 2018), including the substitution of the Forest Committee, is currently under political consideration. Simultaneously, there are plans to expand the Department of Forest Policy within the MoE and Hayantar SNCO—both are to be given clearer mandates and the capacity to take on meaningful roles in spearheading large-scale restoration.

There are several other institutions that undertake forest-related control or regulation functions.

- **Environmental Protection and Mining Inspection Body** (supervision moved to the GoA) is responsible for supervision of maintenance and protection of forests and SPNAs as well as for controlling the compliance of cutting and harvesting activities with related regulations. It is undertaking control functions of adhering to the environmental limitations and norms for the use of forest lands, including for sanitary and protection zones, land planning, forest planning, urban planning, and land zoning documents as well as overseeing, for example, afforestation activities in respect to the approved norms and regulations.

- **The Biological Resources Management Department of the MoE is** responsible for issuing licenses, permits, contracts, quotes, agreements, conclusions, and certificates related to use of flora and fauna and protection of the environment. The department shall also run the cadastre of wild flora and fauna as well

as for hunting sites.

- **The Department of Specially Protected Areas of Nature and Biodiversity of the MoE** is in charge of developing and implementing policy of biodiversity and SPNAs (all state reserves, national parks, state sanctuaries [nature reserves], and natural monuments) and supervising respective subordinate SNCOs managing SPNAs.

Currently there are many overlaps, duplications, and contradictions between the major institutions involved in the management of Armenia's forests. For example, Hayantar SNCO, the Forest Committee, and the newly established HEMC SNCO are all equally responsible for securing the forest monitoring according to their charters; the function to conduct forest cadastre rests both on Hayantar SNCO and the Forest Committee, whereas the Forest Policy Department leads the development of the national action plans (programs), and the Forest Committee provides support in that process. This results in a forest management regime that is considered to be inefficient and weakly transparent. Despite some reforms and improvements within the system, during the last years, a lack of capacity at all levels has further affected the quality and efficiency of forest management in the country.

8.2 FOREST OWNERSHIP

Currently, all forests are state owned (State Forest Fund) under the responsibility of the MoE, with the State Forest Committee responsible for oversight and forest management performed by Hayantar SNCO. Newly established forest plantations in community lands have not yet been transferred to the category of forests; thus, the forest ownership regime does not apply to these plantations. Pasture and

hayfields are state owned on forest fund land or community owned. Arable farmland and orchards are privately owned. On State Forest Fund land, Hayantar SNCO provides management, forest resource accounting, protection/control of wildfires and pests, and rehabilitation and reforestation of forests in areas under its control. Community members can lease grazing rights from Hayantar on non-forested State Forest Fund land. The fact that community cannot easily lease forest land will lead to an imbalance in favor of leasing for grazing purposes and a degradation of nearby forests.

The Forest Code enshrines the right to private ownership and community ownership over forests and forest lands, but to date no private forests have been put in place. This fact demonstrates a lack of interest to invest in forestry and also the lack of adequate incentives for forest management coupled with the complete absence of secondary legislation. In terms of community-owned forests, it should be noted that the capacities and resources of local self-government bodies are by far not sufficient for planting new forests and carrying out environmentally and economically sound management. This limits the capacities to become forest owner. The concept of community ownership could perhaps be revisited in favor of the forest authorities retaining ownership but leasing to community groups or individuals. The current Forest Code does not allow transfer of forest ownership to the community; however, it allows retaining the forests management to the community in the form of a trust management and this could be one potential solution.

Creation of forests on private land is possible but requires certain procedures. To enable planting trees on state forest lands meant for free use, elaboration and adoption of the existing *Order to transfer the plantation into the category of forest* is required in accordance with Article 29 of the Forest Code of Armenia. To promote private forest ownership, the lands suitable for afforestation and reforestation need to be properly mapped and the borders adjusted to ensure that cadastre maps and those of forest land are not contradictory. The existing Government Decree of the Republic of Armenia 'On Approval of the Order of Handling State Forests and Forest Lands for Use' (N806, May 24, 2007) needs to be revised to adjust the regulation to the current functions of the MoE. It needs to be mentioned, however, that state forest lands cannot be moved to private ownership at present.

8.3 DECENTRALIZED BODIES DEALING WITH FORESTS

Marz administrations are mandated to implement the state territorial policy. They are coordinated by the Ministry of Territorial Administration and Development (MoTD), which is the authorized body of the GoA for development and implementation of state policy on territorial administration. 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

- Participation in the elaboration of state programs and ensuring their implementation in administrative areas of the marz;

- Involvement of specialized services, forest users, and population in forest fires in the administrative areas of the marz;

- Implementation of state programs aimed at the protection and use of forests and forest lands; and

- Other powers defined by the legislation of the Republic of Armenia.

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. The competences of local self-governing bodies in the sphere of sustainable forest management are regulated in Article 9 of the Forest Code 2005 and comprise

- Possession, use, disposal of community forests and running of forest economy (that is, implementation of measures prescribed in the FMPs);

- Participation in the development of state programs and safeguarding of their implementation within their administrative territories according to the order determined by the law;

- Involvement of specialized services, forest users, and population in the works to fight forest fires;

- Management of state forests given for community management; and

- 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, pipelines and other communications, drilling, and others having no connection with the running of forest economy and forest use on community forest lands.

Collaborative or joint forest management is supported in law. In 2006, Government Decree N583-N 'Provision of state forests to concessional management for the community organizations without

competition'[77] outlined 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 user groups of communities (or community-based organizations or NGOs) for up to 10 years with possible renewal. The decree also stipulates that

- State forests may be handed over to concessional community management only in case of existing FMPs; and

- Community organizations must have a specialist(s) educated in the field of forestry with at least five years of experience in forestry or agronomy.

While the Forest Code provides for decentralized and co-management approaches, the de facto involvement of marz administrations and communities in forestry matters is rather limited. Local communities struggle to meet the stipulations without outside support, primarily because of lack of resources in the following areas:

- Legal knowledge and financing to establish and operate a community-based organization

- Insufficient financial resources for any kind of forest investments

- Inadequate technical knowledge and experience in timber and NWFP management and sale

- No financial resources to engage the professionals specialized in forest management

- Lack of technical skills and adequate equipment for forest operations.

Sustainable community forestry managed for and by local stakeholders is

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[77] Meaning without public tendering.

undervalued. There is a lack of awareness and knowledge about the values of forests in the longer term for sustainable livelihood, the need for forest management planning for a potential sustainable use of the forests, and the need to invest in forest and tree resilience to secure the forest assets in the long term. There is no lasting concessional management by local forest user group or community-based organization in place. This needs to be addressed as a matter of priority for Armenia to attempt to achieve its Bonn Challenge targets. The forest authorities alone cannot achieve the required scale of forest restoration.

8.4 CIVIL SOCIETY INVOLVEMENT IN FORESTS AND FORESTRY

There is no officially established platform of civil society participation in forestry decision-making in Armenia. Due to overall policy aim in Armenia to promote forest restoration and afforestation activities, civil society involvement in forestry activities is increasing. NGOs have a practical contribution to forest and tree conservation and the implementation of sustainable forestry, promotion of FLR, and capacity building of civil society actors for forest activities.[78] The active involvement of academic institutions in forest and tree development, such as the Armenian National Agrarian University, Yerevan State University, and Yerevan State Pedagogical University, is remarkable.

The following NGOs are actively engaged in capacity building of civil society actors in forest development activities (in alphabetic order, non-exhaustive list):

- **ATP,** a charitable foundation, cooperates with the MoE and different communities of Armenia to promote forest nurseries, tree propagation, community forest planting, economic empowerment of forest adjacent communities, environmental education, and awareness raising.

- **Armenian Environmental Network**

- **Armenian Forests Environmental NGO**

- **ECOLUR** informational center shares information about environmental issues including mining, small hydropower plants (HPPs), energy, air, climate change, water, nuclear energy, biodiversity, waste, forest, cities, and weather. It shares information about the Amulsar gold-bearing mining project and its potential impacts on the health of Armenian population and the habitats and species protected under the convention.

- **FPWC (Foundation for the Preservation of Wildlife and Cultural Assets) and VivaCell-MTS** works with local communities to protect and conserve unique natural and cultural heritage and run environmental education and awareness raising campaigns.

- **My Forest Armenia NGO** has established a nursery in Lori marz with a capacity of 250,000 plantings as of September 2020. The initial goal of this organization is to plant 400,000 trees per year or about 200 ha of new forest every year. The NGO is engaged in a seed program, reforestation, and environmental education.

- **Public Administration Academy** of the Republic of Armenia conducts environmental education courses for civil servants and community servants. The process is coordinated by the Civil Service Council with the assistance of the MoE, MoTD, Municipality of Yerevan, and other local self-government bodies.

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[78] The list of environmental NGOs is available on the webpage of the MoE of the Republic of Armenia. http://www.mnp.am/en/coor-organizations.

- **'Shen' NGO** in cooperation with the community Dzoraglukh is engaged in forest planting on community lands of 5 ha and repairing the local irrigation system.

- **World Wildlife Fund (WWF) Armenia,** in cooperation with the GoA, MoE of the Republic of Armenia, and communities, carries out protection and rehabilitation of the forest ecosystems in some of the most vulnerable areas in Armenia. WWF Armenia implements activities aimed at increasing the coverage of protected areas, improving forest management, halting deforestation and restoring degraded forest landscapes.

Recent engagement of civil society actors in FLR has been especially successful, as outlined in Box 6.

Box 6: Success stories of civil society actors in forest landscape restoration

ATP: It was established in 1994 and has planted 4.5 million trees in 1,200 sites all over Armenia. ATP established four greenhouses with 1,200 m^2 total area and four nurseries with 16 ha total area. ATP also implements the Backyard Nurseries' project where 38 families in Armenia have planted over 40,000 trees.

In 2005, ATP established Mirak nursery in Lori, Margahovit village to provide seedlings for forest sites in Northern Armenia. The aim of this nursery was to stop deforestation in Armenia. In this nursery, ATP has reached the goal of having a high tree survival rate. This nursery has the capacity to produce 200,000 seedlings annually. It has 500,000 trees under various stages of cultivation.

In 2019, ATP established a greenhouse in Margahovit with a forest laboratory for experimentation and exploration of best quality seeds. Currently, the greenhouse can produce 30,000 seedlings per year.

ATP organizes educational and training programs for communities and other interested parties to enhance understanding of and encourage responsibility for nature and its resources.

My Forest Armenia: My Forest Armenia is a not-for-profit organization established in 2019, with the goal to plant 1.6 million trees by 2024 in Armenia. Since its establishment, My Forest Armenia has successfully initiated a seed program, nurseries, greenhouses, and reforestation projects throughout Armenia.

The seed program aims to register trees by species using seed collection from proposed areas and data collection, analysis, and mapping. The goal is to identify native plant seeds and encourage conservation of those for the seed-based restoration of forests.

My Forest Armenia has established several nurseries in Lori (Debet and Gugark) and Tavush (Haghartsin) region forest in Armenia, and the Armenian National Agrarian University is planning the construction of a greenhouse in Vanadzor (anticipated for summer 2021) with the aim of growing seedlings in containers and establishment of a research unit for students and university staff.

> **Shen NGO**: In 2006, Shen established a nursery of forest and ornamental trees on 3 ha near Jraber community, Kotayk marz. Seedlings produced are given for free to state forestry agencies, environmental NGOs, and rural communities for reforestation purposes. In 2008, the Hrazdan branch of 'Hayantar' SNCO planted an oak forest on 8 ha using the seedlings from the Shen nursery. With the support of the local NGOs and financial support of a GEF project, over 7 ha of forest was planted in Chambarak with oak, poplar, ash, and other varieties. Since 2010, Shen has donated forest and ornamental trees from its nursery to villages in Kotayk, Aragatsotn, and Gegharkunik marzes.
>
> Since 2014, Shen has collaborated with the 'Integrated biodiversity management, South Caucasus' regional project of GIZ implemented by ECO Consult (Germany). The project envisages controlling soil erosion through planting new forests in Aragatsotn and Shirak marzes. A small nursery was established in Aragatsotn marz, where almost 20 ha of forest was planted and fenced. Another 60 ha was prepared and fenced for further forestation.

8.5 STRATEGIC FOREST AND LAND USE PLANNING

The National Forest Policy and Strategy (NFPS) (N38, September 30, 2004) was the basic legal act defining the main institutional issues and regulations around forest ecosystem protection, preservation, and restoration. It was valid until October 2021, when a government decree (N1728-N, dated October 21, 2021) invalidated it in preparation of adopting an updated strategy; however, its development has been delayed. As of May 2023, the updated Forest Policy and Strategy and National Action Plan is pending government's approval latest by the end of 2023. Based on analysis of potentials, barriers, and necessary improvements, the NFPS Forest Policy and Strategy formulates strategic directions and measures for forest management and biodiversity conservation; forest exploitation; protection from illegal activities, fires, and diseases; afforestation and reforestation; and forestry science and education.

The NFP[79] has been the main policy document since being adopted in 2005. The main objective of the NFP 2005–2015 was to guard forest ecosystems, rehabilitate degraded forest ecosystems, use forest resources in a continuous and efficient manner, and ensure a sustainable forest management strategy. The specific objectives include (a) to plan and implement activities aimed at sustainable management of forests; (b) to promote the development of state, community, and other types of ownership; (c) to stimulate cooperation at national and international levels; (d) to support the involvement of internal and external investments, and (e) to implement measures promoting sustainable forest management in compliance with international treaties of the Republic of Armenia.

An intensive process to review the NFP 2005 was launched in 2020[80] and in

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[79] Republic of Armenia, 2005: National Forest Program of the Republic of Armenia, RA Gov. Decision N 1232.

[80] Work mainly conducted in the framework of the FAO CP/ARM/3801 'Technical Support for Revision of the National Forest Policy and Strategic Framework'.

early 2022, the draft NFP 2021–2030 was prepared, which is being reviewed by the MoE. It was prepared jointly by the MoE and FAO with broad stakeholder consultation. The NFP objective includes planning 10-year measures of sustainable forest management such as conservation, protection, afforestation, and efficient use; increase of forest productivity; conservation of forest biodiversity; and effective use of the environmental, social, and economic potential of forests. Core elements of the action plan integrated in the new NFP include improving the management system, mitigating the impacts of climate change, promoting afforestation and reforestation, providing ecosystem services, improving cross-sectoral cooperation, and providing information on forest lands and forests.

The action plan contained within the NFP also identifies priority tasks, including (a) restoration of degraded forest landscapes; (b) increase of the forest cover; (c) maintenance and development of environmental, social, and economic functions of forests; and (d) continuous and effective use of forest resources. The actions presented in the program indicate the steps necessary to implement the tasks arising from the NFPS:

- Forest guarding, protection, afforestation, and reforestation
- Management system efficiency
- Multipurpose use of forests
- Collaboration, awareness, and engagement.

The topic areas within the NFPS and the subject of the proposed revisions to the Forest Code have considerable overlaps that need to be managed. The new National Forest Policy and Strategy and Action Plan is anticipated to draw up the priorities in the forest sector and cover the entire scope of forest-related issues, including the rationale of institutional set-up, planning, sustainable forest management, protection and conservation, afforestation and reforestation, running of forestry, community and private forests, monitoring of forests, socioeconomic impacts, and so on. It is essential to consider the NFP 2021–2030 in the current process of revising the Forest Code and related regulations. Some stakeholders recommended to withdraw the draft law of the Republic of Armenia 'On Making Changes and Addendums to the Forest Code of the RA' and initiate legislative amendments following the approval of NFP 2021–2030.

It will be particularly important to engage with communities to achieve forest expansion and further consultation is planned. Moving toward the government's initiative to expand forest areas, it is further recommended that the NFP addresses the issues with respect to supporting establishment of community and private forests, which have been underachieving so far. Forms of public-private partnerships (PPPs) can be designed for use in the forest sector. The draft NFP, as a key document defining the long-term development perspectives in the forest sector, might still undergo wide public participation involving all stakeholders and interested parties, including the forest-dependent communities and forest sector employees.

To date, Armenia has made a communication to the Bonn Challenge to restore 50,000 ha by 2030 but there is no written action plan, as of now, on how to achieve the Bonn Challenge. International consultants commissioned by the World Bank prepared a ROAM analysis,[81] the definition of elements for a national FLR

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[81] A Restoration Opportunities Assessment Methodology–ROAM), developed by IUCN and the World Resources Institute (WRI), provides a flexible and affordable framework for countries to rapidly identify and analyze areas that are primed for FLR and to identify specific priority areas at a national or subnational level.

strategy, an action plan, and a roadmap to implement the restoration strategy in August 2022.[82] It covers the priority areas for restoration, identifies financing needs and sources, and investigates the capacities and roles of participating stakeholders. It also outlines an M&E framework to monitor the implementation of the FLR strategy. In line with the Bonn Challenge,[83] the underlying long-term goal of FLR in Armenia is to restore the ecological functionality of deforested or degraded forest landscapes and to enhance human well-being in and through these landscapes. The main proposed objective of FLR for Armenia include the following:

- To increase the overall forest cover of the country

- To improve the conditions for natural regeneration of forests and to increase their productivity

- To increase the water retention capacity of the forest landscape and secure the water provisioning function and other ecosystem services.

The proposed national NFP 2021–2030 and the first draft of the FLR strategy require establishing strong links with national and sectoral strategies beyond the forest sector and their implementation programs. Both basic policy papers relate to broader policies and strategies that affect forest and forest policy, either at domestic level or tied to international agreements. National policies related to rural and economic development are closely linked to the goals on forest conservation, expansion of forested areas, land restoration, disaster risk reduction, enhancement of the adaptive capacity of people to climate change, transboundary water management, and food and energy security. Forest policy and strategies relate to

a variety of Sustainable Development Goals (SDGs), including SDG 15 and also SDGs 1, 2, 5, 6, 7, 8, and 13. Synergies with the SDGs and strategy programs in other sectors may strengthen and facilitate cooperation between the authorities/units in charge of implementing different documents.

The new Programme of the Government of Armenia (2021–2026) has relevance to forestry. The program was adopted in 2021 by the new government and presents activities of the GoA that will guarantee the country's sustainable development for the respective period. In terms of forestry and issues related to it, the program includes the following policy actions:

- Sustainable management of forests: protection, preservation, use, and expansion of forested areas through afforestation and reforestation and continuous development of capacities in this matter

- Protection of biodiversity and ensuring biological safety, inventory of objects of flora and fauna

- Renovation of the environmental monitoring system

- Approximation of the national legislation to the European Union (EU) environmental legislation in accordance with the EU-Armenia Comprehensive and Enhanced Cooperation Agreement.

The National Security Strategy of the Republic of Armenia[84] (2020) states "We shall take effective steps towards the sustainable management and expansion of fauna and flora, forests, and protected nature reserves, as well as reducing soil erosion and desertification. Our priorities include the reasonable use of natural resources,

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[82] Report by UNIQUE, internal paper World Bank.

[83] The Bonn Challenge; 2020: What is FLR?.

[84] National Security Strategy of the Republic of Armenia (2020).

the remediation of damaged land, ensuring the safety of tailing ponds, preserving biodiversity, and ensuring biosecurity."

With respect to the agricultural sector, the government decree 'On Approval of the Strategy 2020–2030 of Key Directions for Economic Development of Agricultural Sector, the Action Plan and Timeline Thereof' considers establishment of forest protection belts as a measure for management of agricultural risks.

8.6 ARMENIA'S INTERNATIONAL COMMITMENTS AS RELATED TO FORESTS

Armenia has ratified all major international environmental agreements, including the three Rio Conventions, the major international trade agreements, and all relevant international processes and initiatives on forests. The major environmental agreements include the following:

- The **UN CBD**, ratified in 1993, including commitment to the Aichi targets

- **The UNFCCC** ratified the Kyoto Protocol in 2003 and the Paris Agreement in 2017

- **The UNCCD** ratified in 1997 and associated LDN targets under SDG 15.3 (2018)

- The Bern Convention on the Conservation of European Wildlife and Natural Habitats (ratified in 2008)

- The **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)** (acceded in 2008) ensures that the international trade in specimens of wild animals does not threaten their survival

- The **Convention on Wetlands (Ramsar)** (acceded in 1993) is an intergovernmental treaty that provides the framework for the conservation and wise use of wetlands

and their resources

- The **European Landscape Convention** (ratified in 2004)

- The **UN World Heritage Convention** (ratified in 1993)

- The **United Nations Economic Commission for Europe** (UNECE).

Important broader international policy agreements include:

- The European Neighbourhood Policy (ENP) was developed to promote economic prosperity, stability, and security within the EU's neighbors.

- The Eastern Partnership (EaP) is a joint initiative involving the EU, its member states, and six Eastern European partners: Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova, and Ukraine, as a dimension of the ENP. The EaP aims at building a common area of shared democracy, prosperity, stability, and increased cooperation.

- The EAEU (signed 2014) is an international organization for regional economic integration, made up of Armenia, Belarus, Kazakhstan, the Kyrgyz Republic, and Russia. It creates a single integrated market, encouraging the free movement of goods, services, and common policies in transport, industry, agriculture, energy, foreign trade and investment, customs, technical regulation, and competition.

- Armenia also takes part in the Comprehensive and Enhanced Partnership Agreement (CEPA), signed in November 2017 between the EU and Armenia, strengthening cooperation in a large variety of sectors, including different aspects of environmental protection.

Forest-related agreements and commitments have been made with various institutions, processes, and

initiatives, including United Nations Forum on Forests (UNFF), UNECE/FAO Forestry and Timber Section, and FAO/Committee on Forest (COFO).

Armenia has committed to its own targets under the Bonn Challenge. The Bonn Challenge has a global target of restoring 150 million ha of deforested and degraded land by 2020 and 350 million ha by 2030. As part of its voluntary commitment, Armenia pledged in 2018 to afforest/reforest 50,000 ha of land by 2030. In 2018, Armenia also signed the Astana Resolution in which ministers and country representatives from Armenia, Georgia, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan reaffirmed their commitments to the Bonn Challenge. According to official data, 6,867 ha of forest land were restored between 2018 and 2020 although this has not yet appeared in Bonn Challenge reporting and overall; there is no strategy to support achievement of this goal.

Armenia is active in terms of commitments to the UNFCCC and Paris Agreement to limit climate warming. The INDC of 2015 stated the 2050 goal as 20.1 percent forest cover (or raising the forest cover from 330,000 ha at present to 595,000 ha by 2050). The updated NDC for 2021–2030 (from 2021) seeks to reduce the country's GHG emissions by 40 percent from 1990 emission levels and the implementation plan includes increasing the forest cover to 12.9 percent by 2030, corresponding to an increase of 50,000 ha of forests. A new international process was launched in November 2021 at the Climate Change Conference of the Parties to the UNFCCC (COP26). Armenia, among 141 countries, signed the Glasgow Leaders' Declaration on Forests and Land Use which commits Armenia, in a nonbinding way, to targets to

conserve, restore, and sustainably manage its forests.

The forest sector of Armenia has been supported by past and ongoing development projects/programs by international donors and agencies since independence of the country. The projects address long-standing issues in the sector as identified more than two decades ago: extensive illegal fuel wood cutting at levels which cannot be sustained without further depleting forest resources, uncontrolled grazing in forests, and forest fires. Most of the projects listed focus on biodiversity and the emerging threats posed by climate change.

8.7 FOREST FINANCING AND PPPS

Investment in forest management, maintenance afforestation, and restoring of degraded landscapes is largely not happening because of a lack of resources. The GoA has limited capacities to reinvest in forest management due to the low level of direct income and thus low level of profits. The state budget contribution to forests has been limited over the past years, paying mostly to maintain a critical administration to oversee and monitor forest use and forest health.

Value-for-money analysis is difficult due to lack of detailed information on public sector financing. Private and public investments in the EU for forestry amount to €20 per ha.[85] Although, there is no data on private sector financing for forestry in Armenia, state budget allocations for forestry in 2020 and 2021 were $4.6 million and $4.2 million, respectively, which is equivalent to the per-hectare budget allocation of approximately €12. However, these figures include both administrative expenses (salaries, maintenance, and so on) and

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85 ENECE. 2020. State of Europe's Forests, https://foresteurope.org/wp-content/uploads/2016/08/SoEF_2020.pdf.

specific programs in the forest sector, where the latter may include development projects which inflate the budget figures.

A review of funding and operation of the sector is even more essential now, in view of an economic slowdown and the potential impacts of climate change on forests. There are several innovative options that Armenia could seek to explore on this front, including the payments for ecosystem services (PES) programs or potentially tap into the carbon market to help finance the ambitious reforestation/restoration goals. There is also the potential to more actively engage the private sector, in particular the mining companies, to help finance major new investments, such as rehabilitation of degraded sites, for example, with fast-growing energy wood plantations.

PPPs could bring added investment and a new law controls its implementation. Since January 1, 2020, the Law of Republic of Armenia 'On Public-Private Partnership' (N113, June 28, 2019) entered into force (PPP Law) which envisages a number of safeguards and control mechanisms to ensure the due management of the public assets and infrastructures, pertaining to requirements on selection of a private partner, the conditions of the PPP contract, guarantees for rights of private partners, establishment of a database and reporting on PPPs, state support mechanisms, and settlement of disputes. PPP potentially can bring additional financing in investment to the forestry sector, given the fact that in the Republic of Armenia budget financing has never fully covered necessary expenses of the forestry sector.

The forest sector is not mentioned explicitly as a sector which would attract PPP and needs particular attention in amending the Forest Code, the FLR strategy, and the NFP. Nonetheless, Article 7.1 of the Forest Code entitles the Forest

Committee to develop investment programs in the framework of PPPs. This function of the Forest Committee has a rather limited scope as it is not linked to the national regulatory framework. The concept of PPP is indirectly referred to in the forthcoming new NFP (currently in discussion) and the draft FLR strategy (which will enter in discussion soon). The establishment of FLR and the sustainable management of forests (trust management, lease, free use, auction, tenders, and so on) is envisaged to be included in the current review of the Forest Code of the Republic of Armenia. PPP might well be considered among them, if a legislative framework was adopted and would play an important role in forest financing.

8.8 FOREST EDUCATION AND AWARENESS RAISING ON FORESTS AND TREES

The opportunities and incentives to obtain forestry education are limited. During the Soviet period, no academic forestry education was provided in Armenia. As a result, Hayantar employees have a low level of forest education, with only 4 percent of the staff members having undergone forestry education. This situation makes the formulation, implementation, and control of sustainable FMPs difficult. Nowadays, forest education is being promoted by international projects and some Armenian universities. Many international programs include an element on producing trainings on sustainable forestry models that are adaptable to local conditions using advanced analytical techniques and community capacity building. The National Agrarian University is the leading university on forestry and agricultural programs in Armenia. However, financial resources are often insufficient for training specialists, and there are few graduates from the Agrarian University able to work in the sector. Often those who graduate cannot find employment

in the forest sector due to the need to improve the attractiveness and competitiveness of the forestry profession.

As Armenia affirms its commitment to double its forest cover by 2050, the goal will require significant resources in terms of financing, seedling capacity, and human resources in the form of trained experts who are familiar with techniques such as tree propagation, nursery management, site identification, tree planting, and long-term tree care and management. Yet environmental education, especially regarding the effects of deforestation, is still lacking in most Armenian educational institutions, where a new generation unaffected by the desperation induced by the energy crisis sits. There are no specialized institutes in education that deal with forest management or forest monitoring. Recent international projects try to include capacity building for different stakeholders on sustainable forestry and resilient afforestation and reforestation, along with the aim to deliver benefits to the environment and biodiversity as well as the economy especially in rural areas.

The target to double forest cover in the period to 2050 raises the need for trained professionals. The Armenian Forest Summit[86] underlined the need for contemporary forest science labs, endowment funds to support forest education, updated training materials, and ongoing education for lecturers (see Box 7). Incentives to encourage and reward scientific research need to be supported by international partners. The forest experts stressed the importance of studying and understanding Armenia's biodiversity and the potential impact of invasive species and creating and implementing sustainable FMPs, tree nursery management, and wildfire prevention. The 30-year, large-scale afforestation and reforestation efforts described in the INDC will create many job opportunities, and creation of a trained workforce to fill those jobs is essential.

Box 7: Examples of forest capacity building in forest education

My Forest Armenia engages different communities to implement activities on seed collection, nurseries, and reforestation. The first step is training and raising awareness of environmental issues during regular training sessions. Considering the employment situation in rural areas, this program is a chance for people to get vocational training in the sphere of reforestation and gives them access to a paying job.

ATP and Agrarian University training programs respond to the request related to the lack of specialists in the fields of nursery management and forestry and the need to build the capacity of nursery and tree planting staff. A new partnership between ATP and the National Agrarian University has emerged to address this problem. Students at the university will conduct internships and field research at ATP's nurseries and greenhouses. A pilot program will be held this year with the support of UNDP. ATP's facilities and planting locations offer a number of learning opportunities, including nursery management, greenhouse management, forest management, urban forestry, and fruit tree production.

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86 The Armenian Forest Summit: Global Action and Armenia. Co-organized by the ATP and the American University of Armenia (AUA) Acopian Center for the Environment took place in October 2019 in Yerevan.

9. SUMMARY OF RECOMMENDATIONS

1. IMPLEMENT LANDSCAPE RESTORATION STRATEGY AND ACTION PLAN 2022–2032

The Assessment of Forest Landscape Restoration Opportunities in Armenia is an important analysis to guide development in the sector. A key recommendation is the formal adoption and implementation of the associated Landscape Restoration Strategy and Action Plan 2022–2032.[87] This is based on a comprehensive series of studies organized as a multistakeholder consultative process involving forestry and natural resource management (NRM) experts, government officers, private sector actors, and local communities. The four strategic priority areas are outlined in Box 8.

Box 8: Four strategic priority areas of Landscape Restoration Strategy

Institutional environment and steering: Actions in this strategic area will create and maintain the institutional environment needed to manage the landscape restoration process effectively and efficiently. Delegation of powers and duties needs to be effectively reinforced; the concept of decentralization needs to be detailed for restoration of forest ecosystems; and establishment of new plantations needs to be effectively planned and enforced by communities, the private sector, or NGOs, in parallel to governmental efforts.

Capacity development: Building capacity of the entities who implement landscape restoration will also contribute to building the capacities of the communities and other stakeholders involved.

Development of the required infrastructure: Hayantar is not sufficiently equipped to implement landscape restoration measures on large areas, involving the implementation of FLR measures on several thousand hectares every year. The implementation of the (forest) landscape restoration roadmap provides the opportunity to revamp and upgrade the existing infrastructure (office infrastructure, machinery, and communication) by the active involvement of communities, the private sector, or NGOs.

Implementation of forest ecosystem improvement measures: This concerns the actual implementation of landscape restoration options and therefore is the most important area. The implementation shall start small and shall be ramped up swiftly, especially when moving from the second to the third phase.

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87   ROAM Study prepared by UNIQUE (2021), internal document World Bank.

2. RECOGNIZE THE ROLE OF COMMUNITIES AND INVOLVE THEM IN RESTORATION EFFORTS FOR SUSTAINABILITY AND COST-EFFECTIVENESS

The public and communities are insufficiently involved in the management of the State Forest Fund. The forests and trees should be viewed through a wide lens and engage both state and non-state actors working to defined standards and with access to accurate and up-to-date information supported by a monitoring system that provides feedback on progress and identifies on a continuous basis. The restoration potential could be achieved in a sustainable and cost-effective manner by transferring significant quantities of degraded forest areas to the management of community groups or individuals on lease or through management contracts with clear benefit-sharing arrangements.

3. DEVELOP AND MAINTAIN A NATIONAL FOREST MONITORING SYSTEM AND LAND AND ECOSYSTEM ACCOUNTS

Responding **to the challenges posed by land degradation is hampered by the lack of up-to-date information on the extent and quality of tree and forest resources nationally.** The concept of economic valuation of ecosystem services is still in development for Armenian policy and planning processes. Forest-based ecosystem services are neither clearly identified nor appropriately valued economically. Rather, they are often overlooked or, at best, seriously undervalued in national planning and decision-making. The establishment of an NFI and land cover classification to identify a trusted baseline for future forest monitoring and applied research, including in close-to-nature silviculture, is required. Natural Capital Accounts (land and ecosystem services) will build on these data sources to enhance understanding of these resources and pathways to protect and enhance them. This system will align with the M&E framework needed for FLR.

The National Forest Monitoring System should feed into a Forest Management Information System. A centralized forest management information system will organize data collection, planning, and management of day-to-day activities in a structured way. This system can underpin achievement of long-term FLR targets, using a system embedded in national institutions rather than supported on an ad hoc, project-by-project basis. Functionality would include planning, data collection, storage, and reporting for monitoring, payment, quality control, and analysis. Systematic recordkeeping and application of ICT will improve transparency and the effectiveness of state forest institutions.

4. DEVELOP AN INTERAGENCY MASTER PLAN TO INCREASE THE PRODUCTION AND LEGAL USE OF WOOD FOR HOME HEATING AND OTHER RURAL ECONOMIC DEVELOPMENT ACTIVITIES

Focusing on the demand side, and in light of energy price inflation experienced in 2022, a specific focus is needed on the energy budgets of local communities. Here we recommend an interministerial action plan to promote, together with related ministries, efficient wood stoves, municipal biomass usage, and general energy efficiency. This may also include expanding natural gas supply to remote villages through microcredits and tax exemptions for wood imports to Armenia, promoting recycling and renewable energy production, and tightening the enforcement of policies and regulations. The initiative should be led by the MoE but should involve other appropriate ministries.

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