



LAND USE/LAND COVER MAP FOR ARARAT BMA
TECHNICAL REPORT

**TA-6884 REG: “Mainstreaming Natural Capital
Approaches into the Ararat River Basin
Management Plan - Armenia” project**



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Land Use Map for Ararat BMA: Technical Report

1. Introduction

This technical report describes the process of land use mapping of the land fund of the Ararat Basin Management Area (Ararat BMA) based on national cadastral data. The purpose of the report is to provide a detailed methodology for integrating cadastral data with geographic information systems (GIS) to create a land use map that meets modern cartographic requirements. The process includes data collection, pre-processing, GIS integration, and visualization.

Picture 1



The maps of land fund by categories of use are crucial for various areas of human activity, including natural resource management. The presented map includes detailed data on the communities located in the Ararat BMA, the borders between them, as well as the land use plots of different intended purposes and operational significance within the borders of each community. The creation of the land use map for the Ararat Basin Management Area significantly advances these

objectives by providing crucial data that supports the effective management of natural resources and enables comprehensive socio-economic assessments.

2. Land Classification

According to the Land Code of the Republic of Armenia, the land fund of the republic is classified according to intended purpose and operational significance:

Intended Purpose	Land, Operational Significance
Lands of agricultural purpose	Arable lands
	Perennial seedlings, including orchard, vineyard
	Grasslands
	Pastures
	Other plots
Residential areas	Residential site development
	Public site development
	Mixed site development
	Common land
	Other lands
Lands of industrial, subsoil use, and of other purpose of production	Industrial facilities
	Facilities of agricultural production
	Storage houses
	Land parcels allocated for the utilization of subsurface resources
Facilities of energy, transport, communication, utility infrastructures	Power
	Communication
	Transport
	Utility facilities
Lands of specially protected significance	Environmental
	Designed for health purposes
	Designed for leisure

Intended Purpose	Land, Operational Significance
	Historical and cultural
Lands of special significance	Special significance
Forest lands	Forests
	Croplands
	Meadows
	Pasture lands
	Bushes
	Other lands
Aquatic lands	Rivers
	Natural and artificial reservoirs
	Lakes
	Water canals
	Hydrotechnical, water economy and other facilities
Reserve lands	Saltificated lands
	Sands
	Wetlands
	Unused lands

3. Data Collection, Pre-processing, and Transformation

The digital maps of the cadastral land fund by category of use of the communities within the borders of the Ararat BMA (Table 2, Picture 2) were obtained from the electronic service delivery platform (E-services platform) of Cadastre Committee of the Republic of Armenia (<https://www.e-cadastre.am/>) on June 5, 2024.

Table 2. Communities within the Ararat BMA

Marz	Community	Inclusion of the Community Area in the BMA
Kotayk	Abovyan	Partially

Marz	Community	Inclusion of the Community Area in the BMA
	Garni	Partially
	Jrvezh	Completely
Ararat	Ararat	Completely
	Artashat	Partially
	Vedi	Completely
	Upper Dvin	Completely
Gegharkunik	Martuni	Partially
Vayots Dzor	Areni	Completely
	Yeghegis	Completely
	Yeghegnadzor	Completely
	Vayk	Completely
	Jermuk	Completely
Syunik	Sisian	Partially

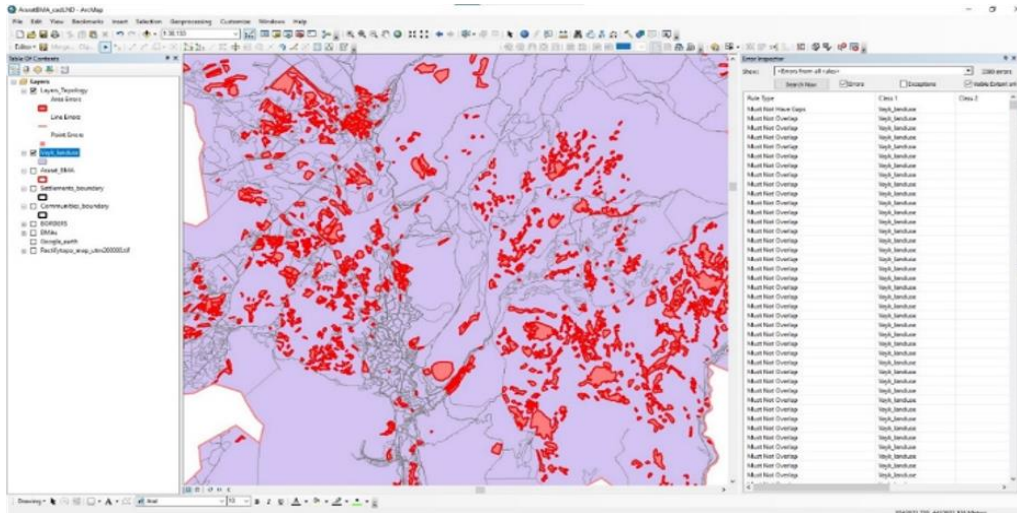
Picture 2



The Cadastre Committee issued digital layers of the land fund by communities in DWG format vector files (Picture 3), which include the administrative borders of the communities, the boundaries of plots, operational data (in the case of agricultural lands, their irrigated plots as well), and the area occupied by each plot. The spatial data provided is in the WGS-84 (ARMREF 02) National Geodetic Coordinate System (Picture 4).

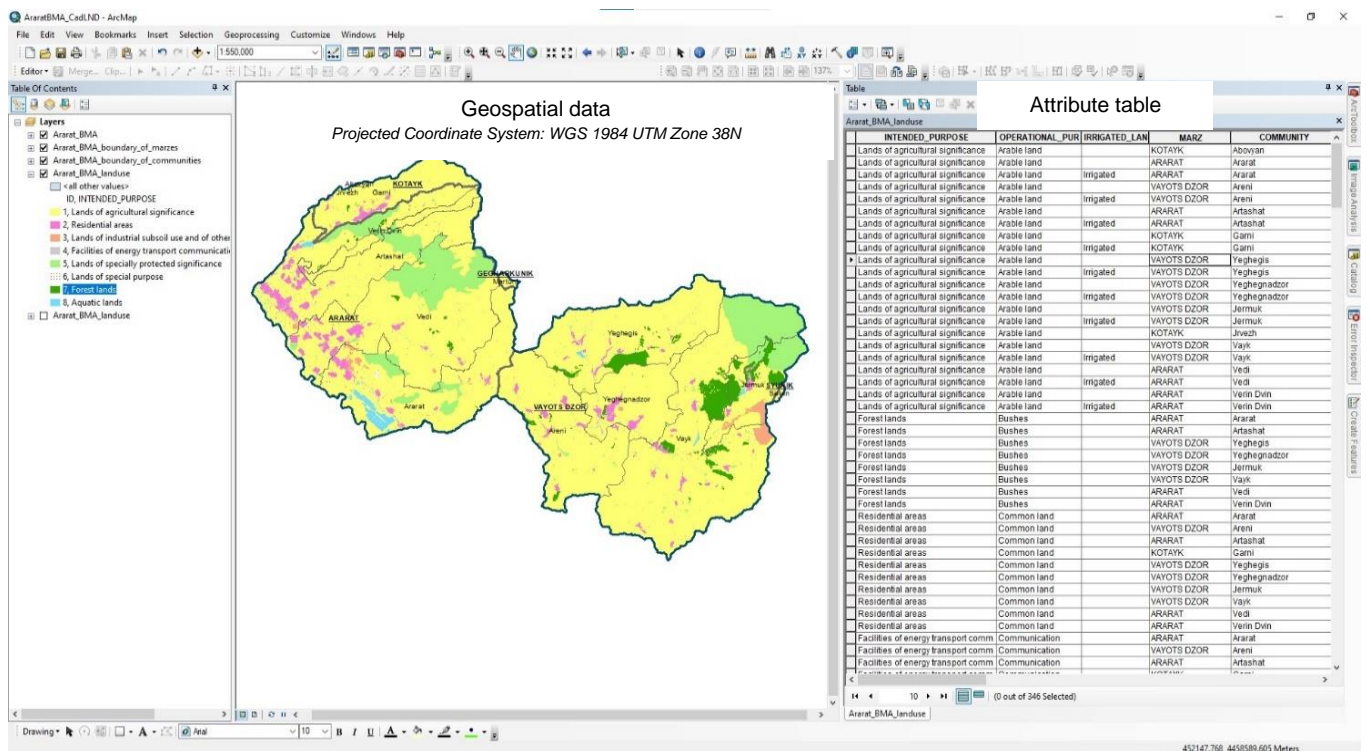
The spatial object classes of each municipality's land fund geodatabase were topologically verified to ensure the integrity of the spatial data and make it more manageable. All emerging topological errors have been corrected (Picture 6, neighboring spatial objects must not have gaps and must not overlap).

Picture 6



After the topological errors were corrected, spatial data attributes (characteristics) were updated and completed. Properly structured attribute data is important in GIS because it helps perform spatial queries and analyses, also, the projection of vector data has been reprojected from the national coordinate system to the WGS 1984 UTM Zone 38N projected coordinate system. (Picture 7).

Picture 7



4. Results and Discussion

As a result of the work carried out on the basis of the above geographical information systems, it was possible to create a multi-purpose spatial and attribute database of land fund by categories of use of the Ararat Basin Management Area. The detailed land use data compiled in this report will significantly support the project objectives by facilitating comprehensive socio-economic assessments. This data enables the extrapolation of survey and analysis results from sociological surveys conducted among different stakeholder groups regarding the importance of ecosystem services. Moreover, it provides a robust framework for valuing ecosystem services in the Ararat BMA and aids in relevant economic evaluations, such as cost-benefit analysis and general economic assessments. By combining the values of gross products obtained from irrigated agriculture, fish farms, and energy lands with those resulting from water use, a more accurate economic evaluation can be achieved. The land use mapping revealed the spatial concentration of economic activity objects in the Ararat River basin.

The geospatial database attached to the report is presented in the 'AraratBMA_Landuse' folder in ArcGIS geodatabase format, which can be accessed via this [link](#). The large-scale maps of the operational significance of lands of the Ararat BMA and separately for the Arpa, Azat and Vedi river basins are also available there.

Table 2 below presents the calculated areas, in hectares (ha) and percentages (%), for different categories of land based on their intended purpose and operational significance, derived from the mapping data of the land fund by categories of use.

Table 2

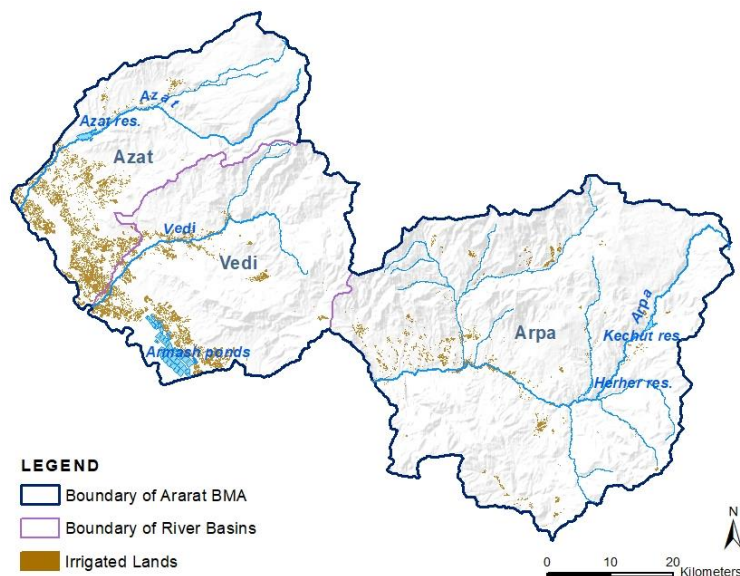
Intended Purpose	Land, Operational Significance	Area, ha	Percentages, %
Lands of agricultural purpose	Arable lands	19155.19	4.354
	Irrigated arable lands	18051.86	4.103
	Orchard	5007.42	1.138
	Irrigated orchard	261.06	0.059
	Vineyard	4107.35	0.934
	Irrigated vineyard	109.58	0.025
	Grasslands	7091.08	1.612
	Irrigated grasslands	269.23	0.061
	Pastures	198286.53	45.068
	Other plots	102471.96	23.291
Total		354811.26	80.645

Intended Purpose	Land, Operational Significance	Area, ha	Percentages, %
Residential areas	Residential site development	9679.76	2.200
	Public site development	739.12	0.168
	Mixed site development	293.20	0.067
	Common land	1590.65	0.362
	Other lands	1677.68	0.381
Total, Residential areas		13980.41	3.178
Lands of industrial, subsoil use, and of other purpose of production	Industrial facilities	1562.79	0.355
	Facilities of agricultural production	1422.83	0.323
	Storage houses	35.82	0.008
	Land parcels allocated for the utilization of subsurface resources	2231.12	0.507
Total, Lands of industrial, subsoil use, and of other significance of production		5252.56	1.193
Facilities of energy, transport, communication, utility infrastructures	Power	165.72	0.038
	Communication	10.23	0.002
	Transport	950.81	0.216
	Utility facilities	111.57	0.025
Total, Facilities of energy, transport, communication, utility infrastructures		1238.33	0.281
Lands of specially protected significance	Environmental	44704.85	10.161
	Designed for health purposes	25.36	0.006
	Designed for leisure	25.02	0.006
	Historical and cultural	1443.37	0.328
Total, Lands of special significance		46198.60	10.501
Lands of special significance	Special significance	344.18	0.078
Total, Lands of special significance		344.18	0.078

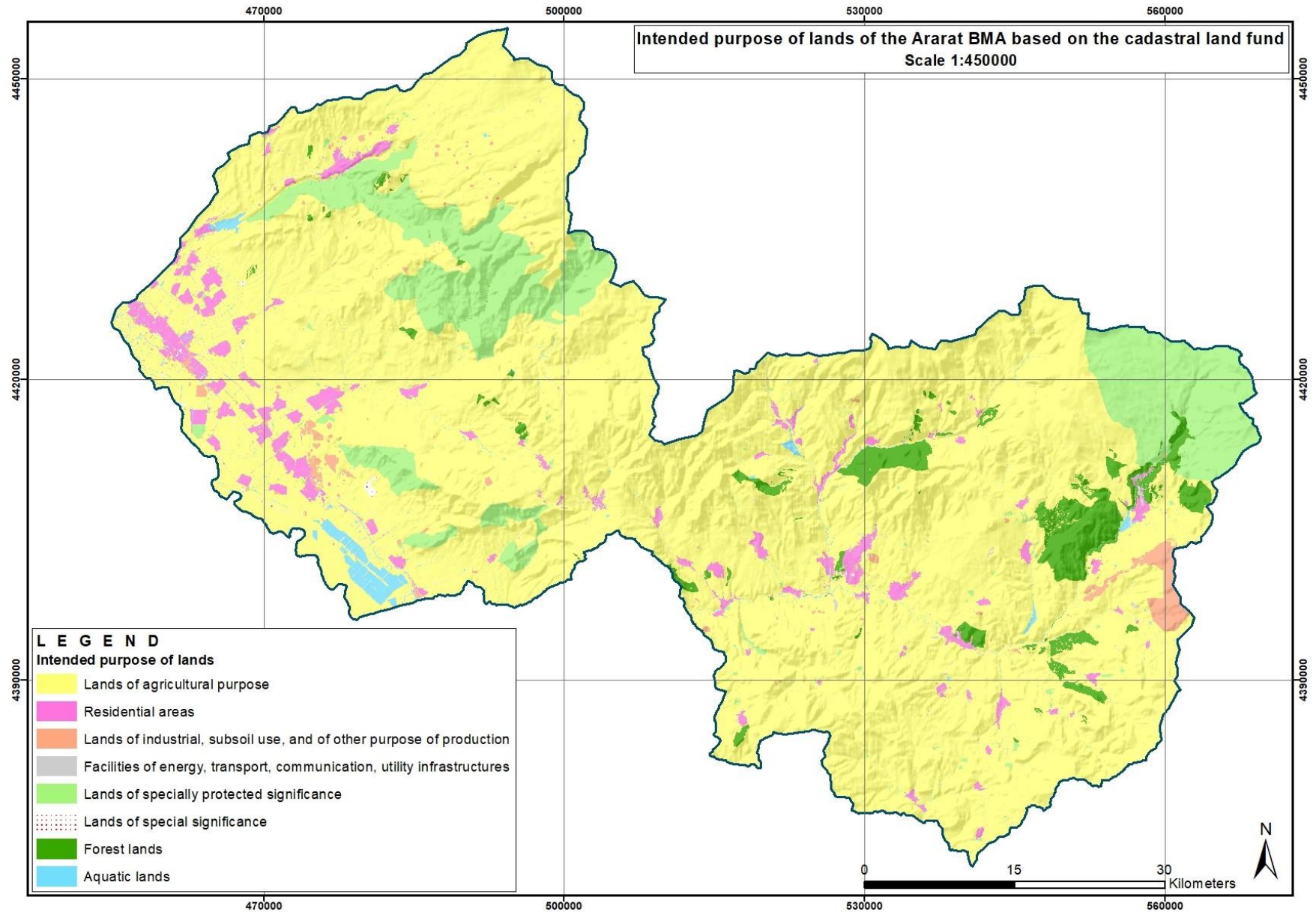
Intended Purpose	Land, Operational Significance	Area, ha	Percentages, %
Forest lands	Forests	10843.38	2.465
	Irrigated croplands	39.79	0.009
	Meadows	604.24	0.137
	Pasture lands	875.24	0.199
	Bushes	1128.98	0.257
	Other lands	214.80	0.049
Total, Forest lands		13706.43	3.116
Aquatic lands	Rivers	1122.86	0.255
	Natural and artificial reservoirs	809.35	0.184
	Lakes	1788.46	0.406
	Water canals	386.09	0.088
	Hydrotechnical, water economy and other facilities	329.88	0.075
Total, Aquatic lands		4436.64	1.008
Grand total		439968.41	100.000

Below, Picture 8 shows the irrigated lands, and Map 1 shows the intended purpose of lands in the Ararat BMA.

Picture 8



Map 1: Intended purpose of lands of the Ararat BMA based on the cadastral land fund



Detailed land use maps for the Vedi River Basin, Azat River Basin, and Arpa River Basin are presented below in Maps 2, 3, and 4, respectively (high-resolution maps available [here](#)).

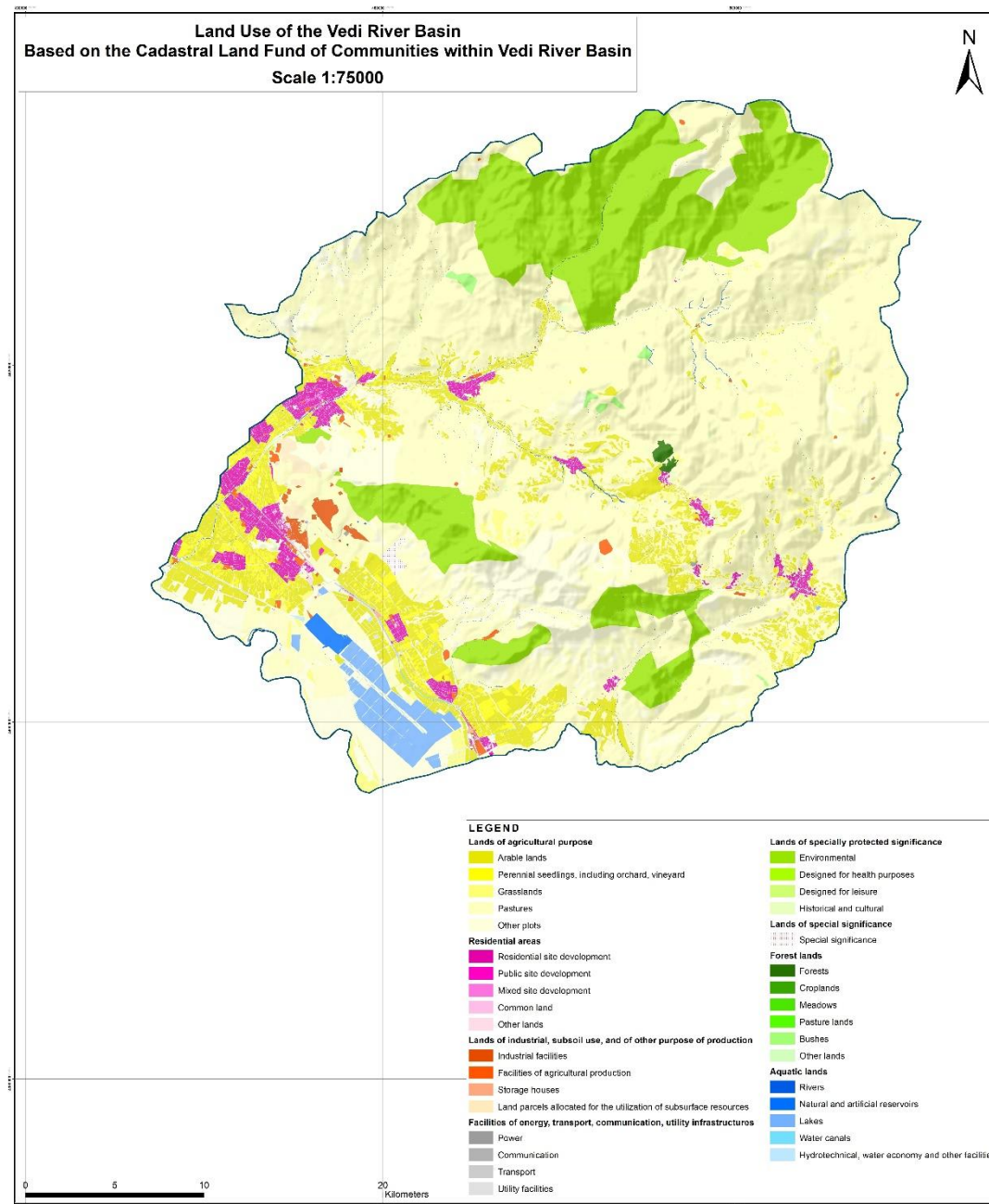
A Land Cover map (Map 5, high-resolution map available [here](#)) based on ESA global land cover data with a resolution of 90m was also created, which was used for the model runs.

The difference between land cover and land use maps is essential for understanding their specific applications within this project. The land cover map, derived from ESA Global Land Cover data with a 90-meter resolution, categorizes the physical characteristics of the land surface, such as forests, water bodies, and urban areas. This map was utilized for running the Seasonal Water Yield model, providing critical data on the natural landscape that influences hydrological processes.

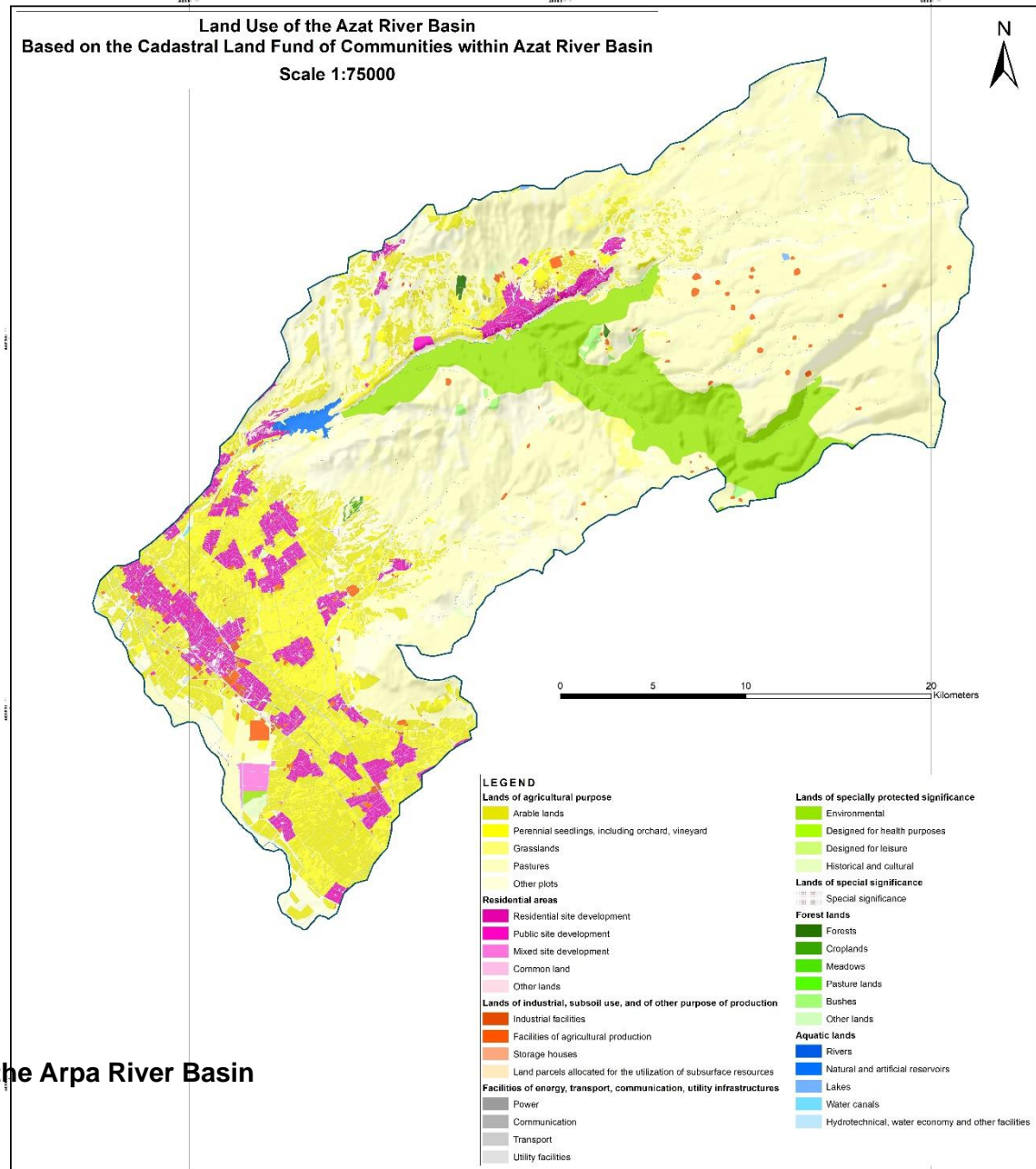
In contrast, the land use map, created using the cadastral land fund by category of use, defines how land is utilized by human activities, including agricultural purposes (e.g., arable lands, orchards, vineyards), residential areas, industrial facilities, and lands of special significance like protected environmental zones. This map is pivotal for economic assessments as outlined in the project's outcomes, which involve sociological surveys among various stakeholder groups and the evaluation of the importance of ecosystem services to develop a framework for their valuation.

The distinct roles of these maps highlight their importance: the land cover map informs ecological and hydrological models, while the land use map supports economic and sociological analyses.

Map 2: Land Use Map of the Vedi River Basin

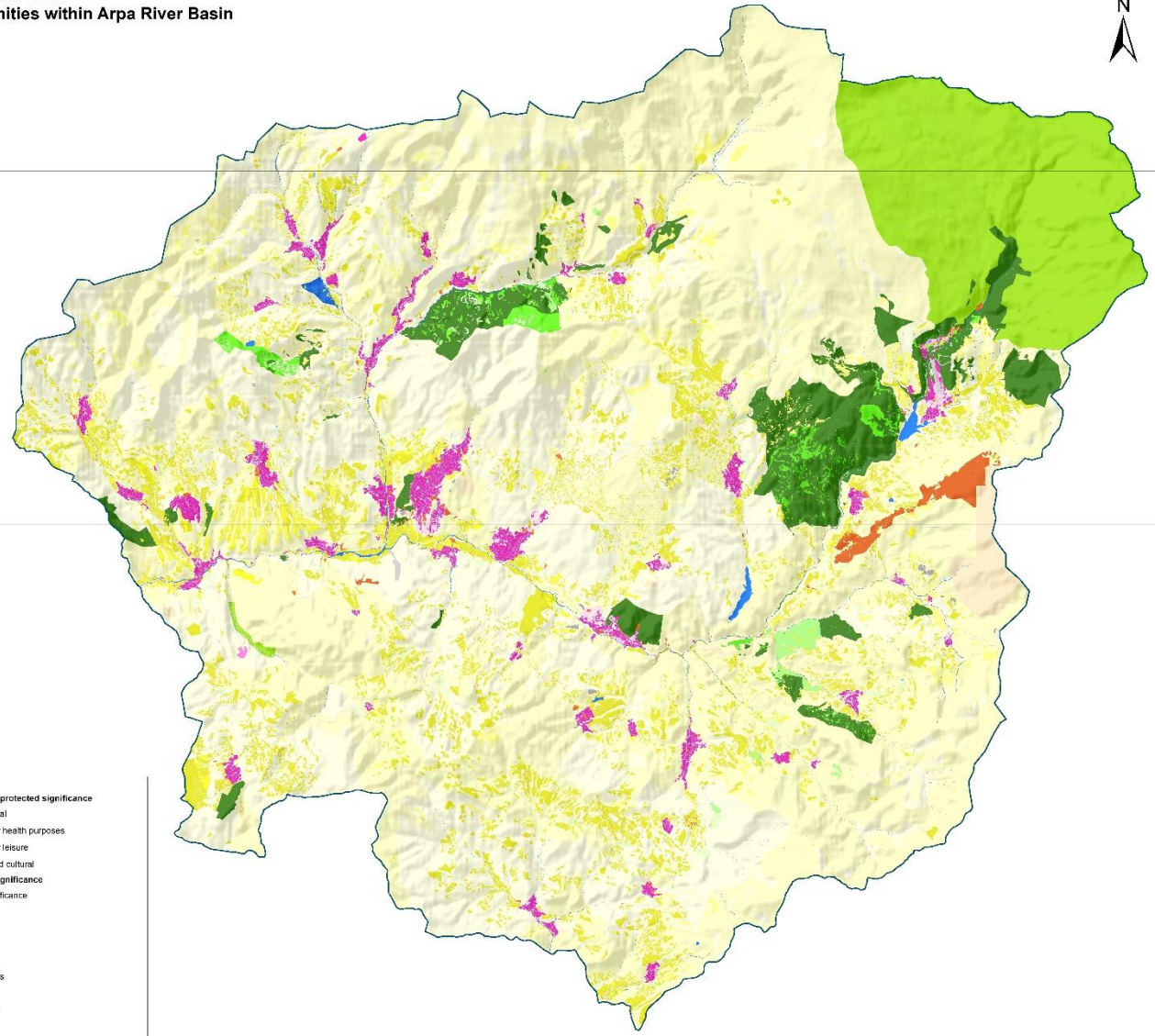


Map 3: Land Use Map of the Azat River Basin



Map 4: Land Use Map of the Arpa River Basin

Land Use of the Arpa River Basin
Based on the Cadastral Land Fund of Communities within Arpa River Basin
Scale 1:75000



- LEGEND**
- Lands of agricultural purpose**
 - Arable lands
 - Perennial seedlings, including orchard, vineyard
 - Grasslands
 - Pastures
 - Other plots
 - Residential areas**
 - Residential site development
 - Public site development
 - Mixed site development
 - Common land
 - Other lands
 - Lands of industrial, subsoil use, and of other purpose of production**
 - Industrial facilities
 - Facilities of agricultural production
 - Storage houses
 - Land parcels allocated for the utilization of subsurface resources
 - Facilities of energy, transport, communication, utility infrastructures**
 - Power
 - Communication
 - Transport
 - Utility facilities
 - Lands of specially protected significance**
 - Environmental
 - Designed for health purposes
 - Designed for leisure
 - Historical and cultural
 - Lands of special significance**
 - Special significance
 - Forest lands**
 - Forests
 - Croplands
 - Meadows
 - Pasture lands
 - Bushes
 - Other lands
 - Aquatic lands**
 - Rivers
 - Natural and artificial reservoirs
 - Lakes
 - Water canals
 - Hydrotechnical, water economy and other facilities



Map 5: Land Cover Map of the Ararat BMA

