

2.7. Approaches for the inclusion of Armenia in the Global Ecosystem Atlas

The [Global Ecosystems Atlas](#) (GEA) will be the first comprehensive harmonized open resource on the extent, change, condition and risk of all the world's ecosystems. The inclusion of Armenia in the GEA is seen by us as an important step to support efforts toward launching national ecosystem accounting.

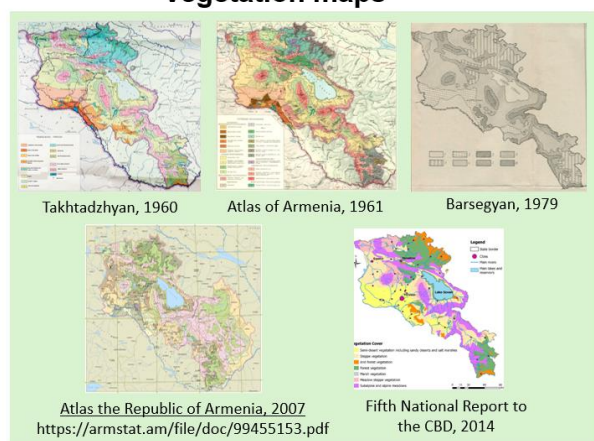
Our approach consists in the integration of academic vegetation and landscape maps with regularly updated land cover data. Academic maps take into account the ecological and biodiversity features of terrestrial ecosystems that are difficult or impossible to detect from space. Regularly updated land cover data allows for timely monitoring of changes in the extent of natural ecosystems. This approach was tested for extent accounting of natural vegetation types (Section 2.3) and natural landscapes (Section 2.4).

2.7.A. Initial data to start

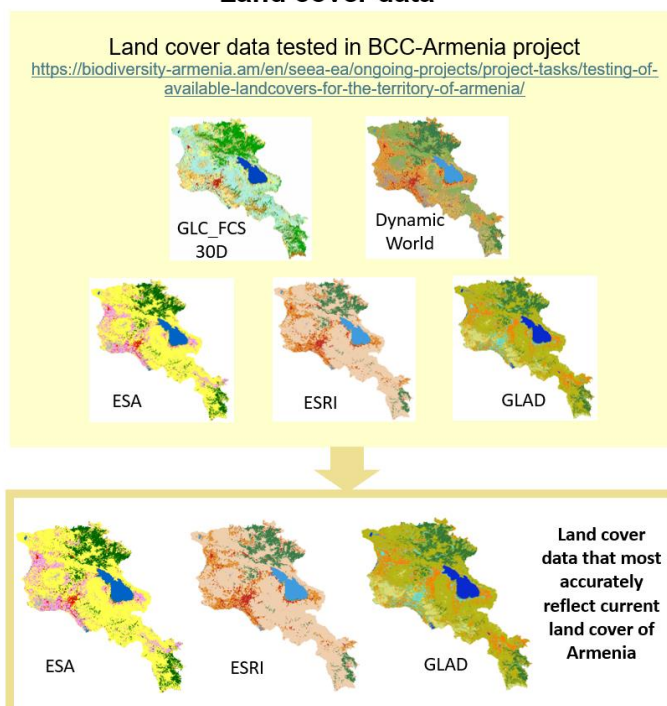
Armenia has an world-class scientific tradition in botany and geobotany. Over many decades, Armenian scientists have developed a wide range of vegetation and landscape maps with varying levels of detail. The updated vegetation map was prepared within the framework of our project (Section 2.3).

Since Armenia currently lacks a national regularly updated land cover dataset, we tested five land cover datasets available in open access (Section 2.1). Three of them — ESRI, ESA, and GLAD datasets — most accurately reflect the current land cover of Armenia and can be used for the zero version of the Armenia ecosystem map for the GEA. However, as shown by our analysis, all global land cover datasets contain significant errors, and therefore, the ecosystem map of Armenia and the ecosystem accounting should eventually be based on a corrected national land cover dataset.

Vegetation maps



Land cover data



2.7.B. Zero version of Armenian ecosystem map for the Atlas

Based on the currently available materials — the vegetation map and global land cover data (we used ESRI 2023) — a zero version of the map can be created, which clearly requires further refinement. Combination of vegetation types and land cover data can be reclassified according to the IUCN ecosystem typology adopted in the GEA.

From the land cover data, we use three classes:

- trees, which are reclassified as T2.2 Deciduous temperate forests;
- built-up areas, reclassified as T7.4 Urban and industrial ecosystems;
- croplands, which, for the zero version, are reclassified as T7.1 Annual croplands

As our analysis comparing cropland areas from land cover datasets and ARMSTAT data has shown (Section 2.1.B), tested land cover datasets include the following categories of agricultural land in the 'cropland' class:

- annually plowed areas (T7.1 Annual croplands);
- perennial agricultural plantations, i.e., vineyards and orchards (T7.3 Plantations);

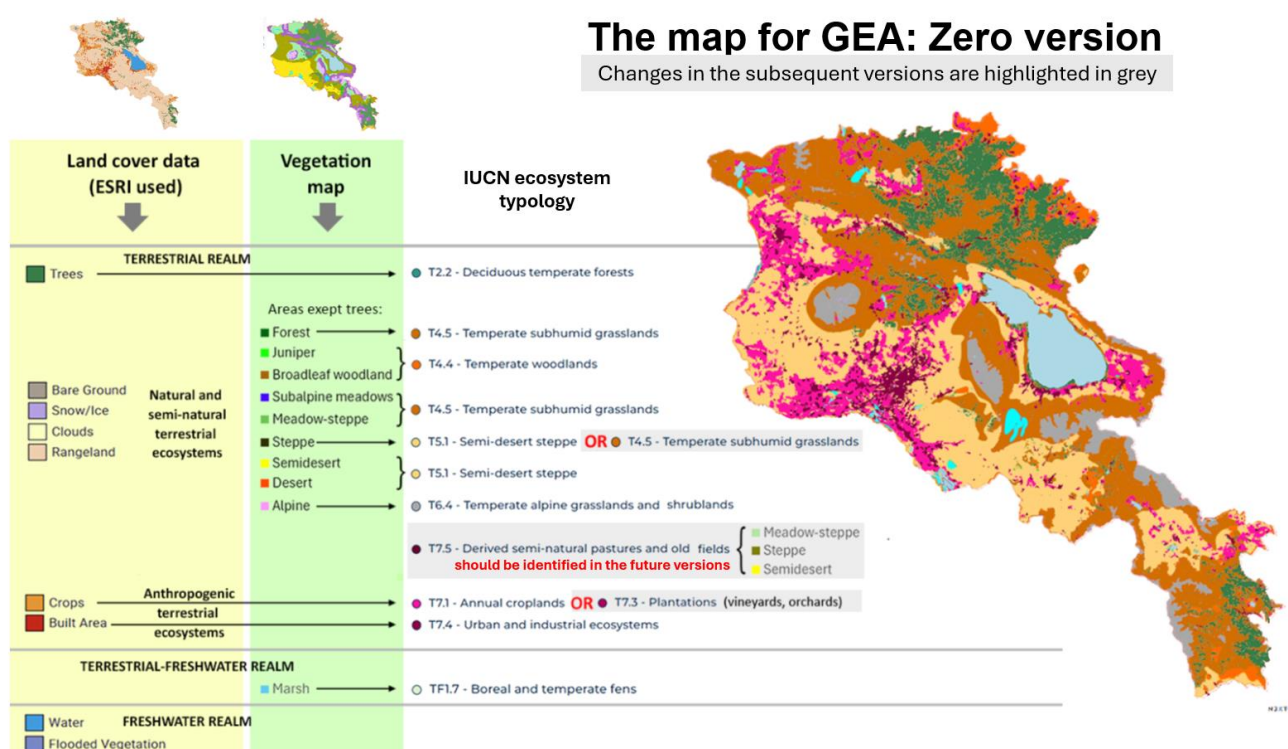
– some of the fields that have not been plowed this year (T7.5 Derived semi-natural pastures and oldfields).

At this stage, we do not have the data necessary to separate these three categories within cropland land cover class, therefore, we reclassified it as T7.1 Annual croplands. Land categories such as “T7.2 Sown pastures and fields” and forest plantations aimed at timber production are not typical for Armenia; therefore, we did not consider them.

All remaining terrestrial land cover classes — that is, all non-woody natural areas — are reclassified based on the vegetation zones delineated on the vegetation map:

- alpine vegetation is reclassified as T6.4 Temperate alpine grasslands and shrublands;
- subalpine meadows and meadow-steppe are reclassified as T4.5 Temperate subhumid grasslands;
- steppe is reclassified as T5.1 Semi-desert steppes for the zero version, however, in future versions, a part of the steppe zone may also be reclassified as T4.5 Temperate subhumid grasslands;
- grasslands within forest vegetation zone are reclassified as T4.5 Temperate subhumid grasslands;
- juniper and broadleaf woodlands are reclassified as T4.4 Temperate woodlands;
- semidesert and desert are reclassified as T5.1 Semi-desert steppes.

Category “T7.5 Derived semi-natural pastures and oldfields” can be found in three vegetation zones: meadow-steppe, steppe, and semidesert. However, at this stage, we do not have the data necessary to identify T7.5 within these zones.



2.7.C. Subsequent versions of the map

Currently, we are at the stage of the **Zero version** of the map, which can be created based on the materials of our project within a minimal timeframe. Moving forward, two main stages of improvement for this map can be foreseen. Along this path, improvements are needed both in the vegetation map and in the land cover data.

Version 1 is a refined version of the map for the GEA. On the side of the vegetation map, its development requires probably an identification of areas of T4.5 Temperate subhumid grasslands within steppe zone. On the land cover side, this requires at least the following major data refinements:

- Correction of obvious errors in land cover data (e.g., built-up areas and croplands in high mountain zones);
- Refinement of T7.1 Annual cropland areas;
- Identification of T7.3 plantation areas (vineyards and orchards)
- Identification of T7.5 derived semi-natural grasslands, which can require analysis of satellite imagery and agricultural statistics not only for the current period but also for previous years.

The creation of Version 1 will greatly contribute to the development of ecosystem accounting in Armenia, as it will provide more accurate delineation of croplands.

Version 2 provides full synergy with the process of developing ecosystem accounting in Armenia and lays the foundation for creating the Red List of Ecosystems of Armenia.

On the side of academic knowledge, it represents a map of terrestrial ecosystems map with the next level of detail in both ecosystem typology and their boundaries, including both ecosystems with an area large enough to be represented on the map at the resolution of the land cover used, and unique, rare, and relict “point” ecosystems of very small size. On the side of land cover data, it consists in national land cover dataset along with a methodology for its regular updating.

Refinement of land cover data is carried out using ground survey data, remote sensing data, Armenian agricultural statistics, land cadastre and machine learning methods

