JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

AMIES II – Scenario development for sustainable land use in the Greater Caucasus, Georgia

Landscape pattern along altitudinal belts in the Central Greater Caucasus

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1. Context

The Kazbegi region is located in the *Northern Central Caucasus* of *North-Caucasia*, and is botanic-geographical classified as *High-mountain vegetation of West-Eurasia* (Doluchanow, 1966).

Traditionally, this high-mountain landscape (Fig. 1) is characterized by sheep and dairy farming. During the Soviet period sheep husbandry was intensified and extended with transhumant sheep flocks using the Caucasus mountains as highland summer pastures.

Today, dairy farming and vegetable cultivation is prevalent, mainly practiced by smallholders for self-supply.

This cultural landscape evolved throughout traditional, high-mountain management practices and boast a high level of diversity of natural and semi-natural habitats, rich in Caucasian endemic species.

Land-use abandonment is threatening this cultural landscape and may cause habitat and environmental degradation. As a consequence, this may lead to rural poverty or to increased rural migration.

Fig. 1: Picture of Stepantsminda in 2011 (in front) and Gergeti (in the back) on the opposed slope.

2. Research Goal

The aim of this study is to analyze the land-cover and land-use pattern of the Kazbegi region from the upper montane belt to the upper alpine belt (Fig. 4). Based on the GIS-maps the landscape structure in the study area is quantified and defined along altitudinal belts (Fig 2).

The pattern is majorly determined by slope dynamics and livestock grazing, i.e. the grazing pressure. As agriculture is majorly practiced in the subalpine belt, more than three quarters are used as grassland here (pasture and hay-meadows) (Fig. 2). Naturally, this belt would be covered by birch forest (*Betula litwinowii*) until the timberline at approx. 2,000 m (southern exposition) and 2,500 m a.s.l. (northern exposition).

During the period of the centralized economy of the USSR the intensified sheep grazing caused erosion problems on highly frequented pasture sites and reduced the area of natural forest and woody vegetation in favor of open grassland. Today, shrubland is extending and processes of reforestation are increasing the birch forest amount.

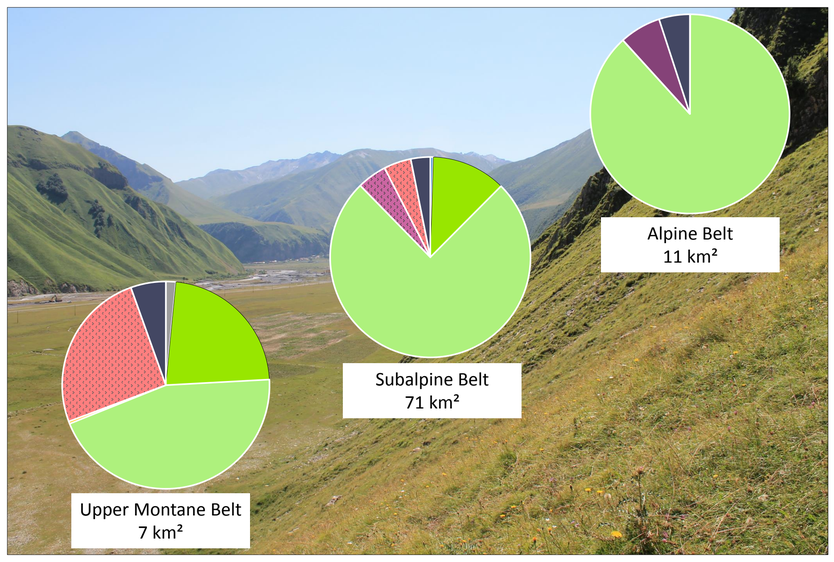

Fig. 2: Percentages of land cover and land use classes in the study area per altitudinal belt.

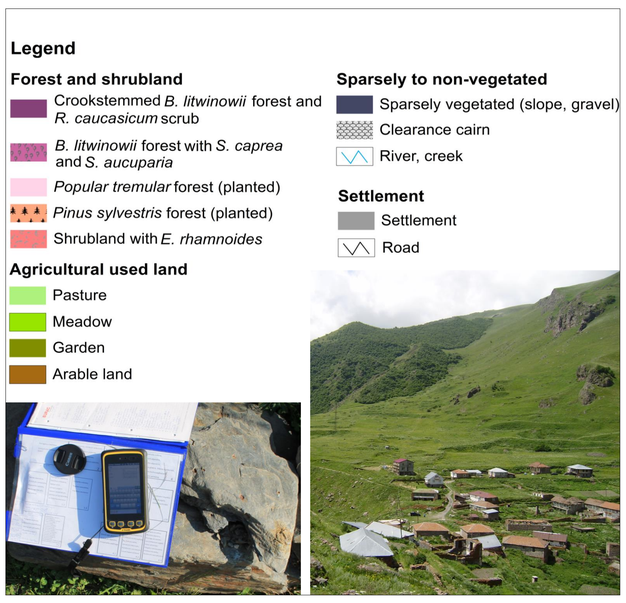

Fig. 3: Land-cover and land-use classes applied for satellite-imagery mapping and mapping during the field survey. The classes of that legend reflect the possibility of distinction in mapping from point to local scale.

3. Mapping Land use

Based on satellite images and on-site fieldwork the landscape was digitally mapped and classified (Fig. 3) to generate spatially-explicit land-use and land-cover maps of the region (Fig. 5). Linked with spatial data, these GIS-maps describe the landscape structure, the pattern of high-mountain land cover and land use, and explain the significant dependence on the pronounced topography of this region.

Combined with floristic-ecological information, GIS-maps help to analyze patterns and diversity of this species-rich, high-mountain vegetation on patch, local or regional scale.

Spatially-explicit maps in high resolution are capable of providing the necessary information for sustainable land-use planning and nature conservation to protect mountain biodiversity.

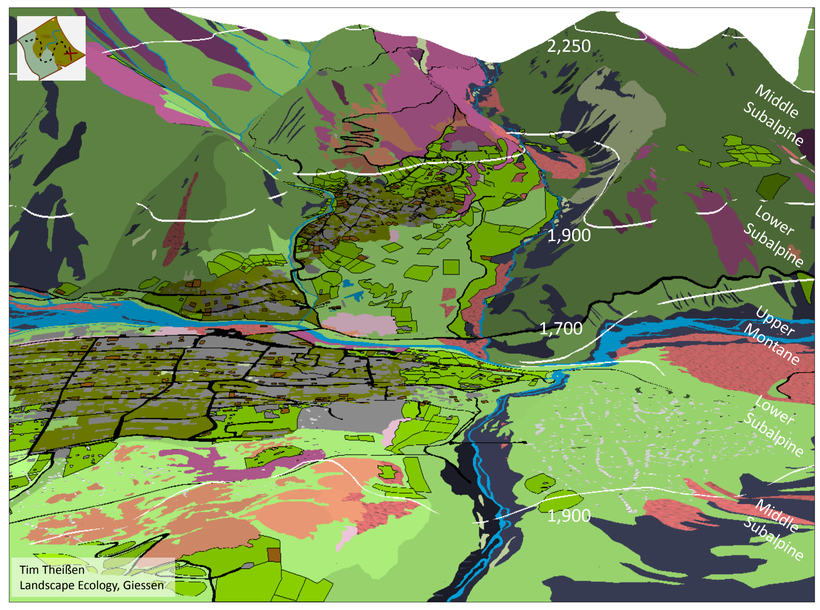

Fig. 5: Land cover and land use classes for 2015 in different altitudinal belts for a section of Stepantsminda (in front) and Gergeti (in the back) on the opposed slope.

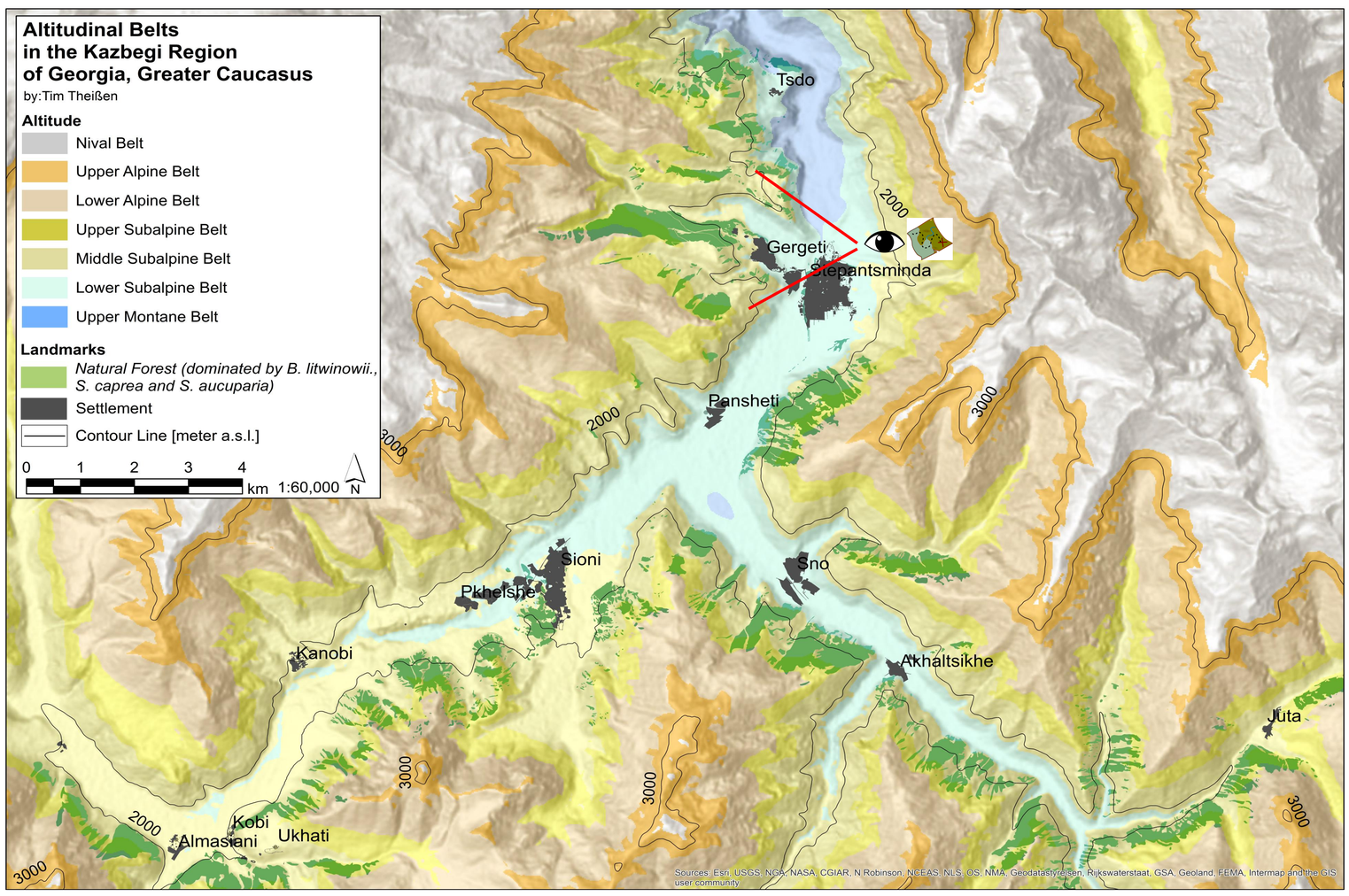

Fig. 4: Horizontal structure of the altitudinal belts in the Kazbegi region from the Montane to the Nival belt. The belts in the region ranges from: 1,000 to 1,700 (Upper Montane), 1,700 – 1,930/1850 (Lower Subalpine), 1,930/1,850 – 2,300/2,200 (Middle Subalpine), 2,300/2,200 – 2,500/2,400 (Upper Subalpine), 2,500/2,400 – 2,900/2,800 (Lower Alpine), 2,900/2,800 – 3,100/3,050 (Upper Alpine) 3,100/3,050 – 5,047 (Nival). The first stated altitude is for southern slope position, the second for northern, as the border differs in altitude, according to exposition-depending climatic conditions. = Fig. 1; = Fig. 5

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