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INTRODUCTION

Troodos National Forest Park (TNFP) is located in the centre of Troodos mountain range and it is one of the most important natural environments of Cyprus. TNFP has been included to the Natura 2000 network of the island due to its important natural ecosystems and its great biodiversity. The project iLIFE-TROODOS (co-funded by the European Union and the LIFE programme) aims to increase public awareness on the natural values of TNFP, for which it was included in the Natura 2000 network, and the Ecosystem Services (ES) it provides. The current work presents selected ES of TNFP, based on CICES 5.1.

METHODOLOGY

The mapping of the ES of TNFP was carried out by the experts of the Nature Conservation Unit of Frederick University and the Department of Forests utilizing the CICES 5.1 methodology (Haines-Young and Potschin 2018). TESSA (v.2) toolkit and the methods/ tools provided were utilized for the assessment of selected ES, as well as "Co\$ting Nature" (v.3) for natural capital accounting and analysing the ES provided by TNFP. The mapping of ES was carried out using 1 km x 1 km grid where a score was given to each cell (if the ES was present), ranging from 1 (least importance) to 5 (highest importance). This poster presents the first outcomes from the assessment of Global Climate Regulation and the economic value of ES of the Natura 2000 site "Ethniko Dasiko Parko Troodos" (TNFP).

ECOSYSTEM SERVICES OF TROODOS NATIONAL FOREST PARK

Section	Division	Group	Class	Examples
Provisioning (Biotic)	Biomass	Cultivated terrestrial plants for nutrition, materials or energy	Cultivated terrestrial plants (including fungi, algae) grown for nutritional purposes	apples, peaches, cherries, nectarines, pears, prunes, etc. and vegetables
		Reared animals for nutrition, materials or energy	Animals reared for nutritional purposes	honey
		Wild plants (terrestrial and aquatic) for nutrition, materials or energy	Wild plants (terrestrial and aquatic, including fungi, algae) used for nutrition	mushrooms, herbs, wild berries etc.
			Fibres and other materials from wild plants for direct use or processing (excluding genetic materials)	wood, resin
			Wild plants (terrestrial and aquatic, including fungi, algae) used as a source of energy	timber
		Reared aquatic animals for nutrition, materials or energy	Wild animals (terrestrial and aquatic) used for nutritional purposes	hunting
Provisioning (Abiotic)	Water	Genetic material from all biota (including seed, spore or gamete production)	Animals reared by in-situ aquaculture for nutritional purposes	trout
		Genetic material from plants, algae or fungi	Seeds, spores and other plant materials collected for maintaining or establishing a population	seeds
			Higher and lower plants (whole organisms) used to breed new strains or varieties	Crop Wild Relative Species
		Other	Other	essential oils, herbs
			Surface water used for nutrition, materials or energy	lakes, rivers, dams
		Ground water used for nutrition, materials or energy	Ground (and subsurface) water for drinking	boreholes
Regulation & Maintenance (Biotic)	Regulation of physical, chemical, biological conditions	Regulation of baseline flows and extreme events	Control of erosion rates	controlling or preventing soil loss
			Buffering and attenuation of mass movement	stopping landslides and avalanches harming people
			Hydrological cycle and water flow regulation (including flood control, and coastal protection)	regulating the flows of water in our environment
		Lifecycle maintenance, habitat and gene pool protection	Wind protection	protecting people from winds
			Pollination (or 'genetic' dispersal in a marine context)	pollinating our fruit trees and other plants
			Seed dispersal	spreading the seeds of wild plants
		Regulation of soil quality	Maintaining nursery populations and habitats (including gene pool protection)	providing habitats for wild plants and animals that can be useful to us
			Weathering processes and their effect on soil quality	ensuring soils form and develop
		Water conditions	Decomposition and fixing processes and their effect on soil quality	ensuring the organic matter in our soils is maintained
			Regulation of the chemical condition of freshwaters by living processes	controlling the chemical quality of freshwater
Cultural (Biotic)	Direct, in-situ and outdoor interactions with living systems that depend on presence in the environmental setting	Physical and experiential interactions with natural environment	Regulation of chemical composition of atmosphere and oceans	regulating our global climate
			Regulation of temperature and humidity, including ventilation and transpiration	regulating the physical quality of air for people
			Characteristics of living systems that that enable activities promoting health, recuperation or enjoyment through active or immersive interactions	using the environment for sport and recreation; using nature to help stay fit
			Characteristics of living systems that enable activities promoting health, recuperation or enjoyment through passive or observational interactions	watching plants and animals where they live; using nature to distress
		Intellectual and representative interactions with natural environment	Characteristics of living systems that enable scientific investigation or the creation of traditional ecological knowledge	researching nature
			Characteristics of living systems that enable education and training	studying nature
			Characteristics of living systems that are resonant in terms of culture or heritage	the things in nature that help people identify with the history or culture of where they live or come from
		Spiritual, symbolic and other interactions with natural environment	Characteristics of living systems that enable aesthetic experiences	the beauty of nature
			Elements of living systems that have symbolic meaning	Golden oak, Pinus nigra, Serpentinophilus grasslands, Peat grasslands, Juniperus foetidissima, etc.
			Elements of living systems used for entertainment or representation	the things in nature used to make films or to write books
Cultural (Abiotic)	Indirect, remote, often indoor interactions with living systems that do not require presence in the environmental setting	Other biotic characteristics that have a non-use value	Characteristics or features of living systems that have an option or bequest value	willingness to preserve plants, animals, ecosystems, landscapes for the experience and use of future generations; moral/ethical perspective or belief
			Intellectual and representative interactions with abiotic components of the natural environment	things in the physical environment that we can study or think about (eg. Rock faces for climbing)
		Spiritual, symbolic and other interactions with the abiotic components of the natural environment	Natural, abiotic characteristics of nature that enable intellectual interactions	things in the physical environment that are important as symbol (eg. Chionistra mountain peak)
			Natural, abiotic characteristics of nature that enable spiritual, symbolic and other interactions	things in the physical environment that are important as symbol (eg. Chionistra mountain peak)

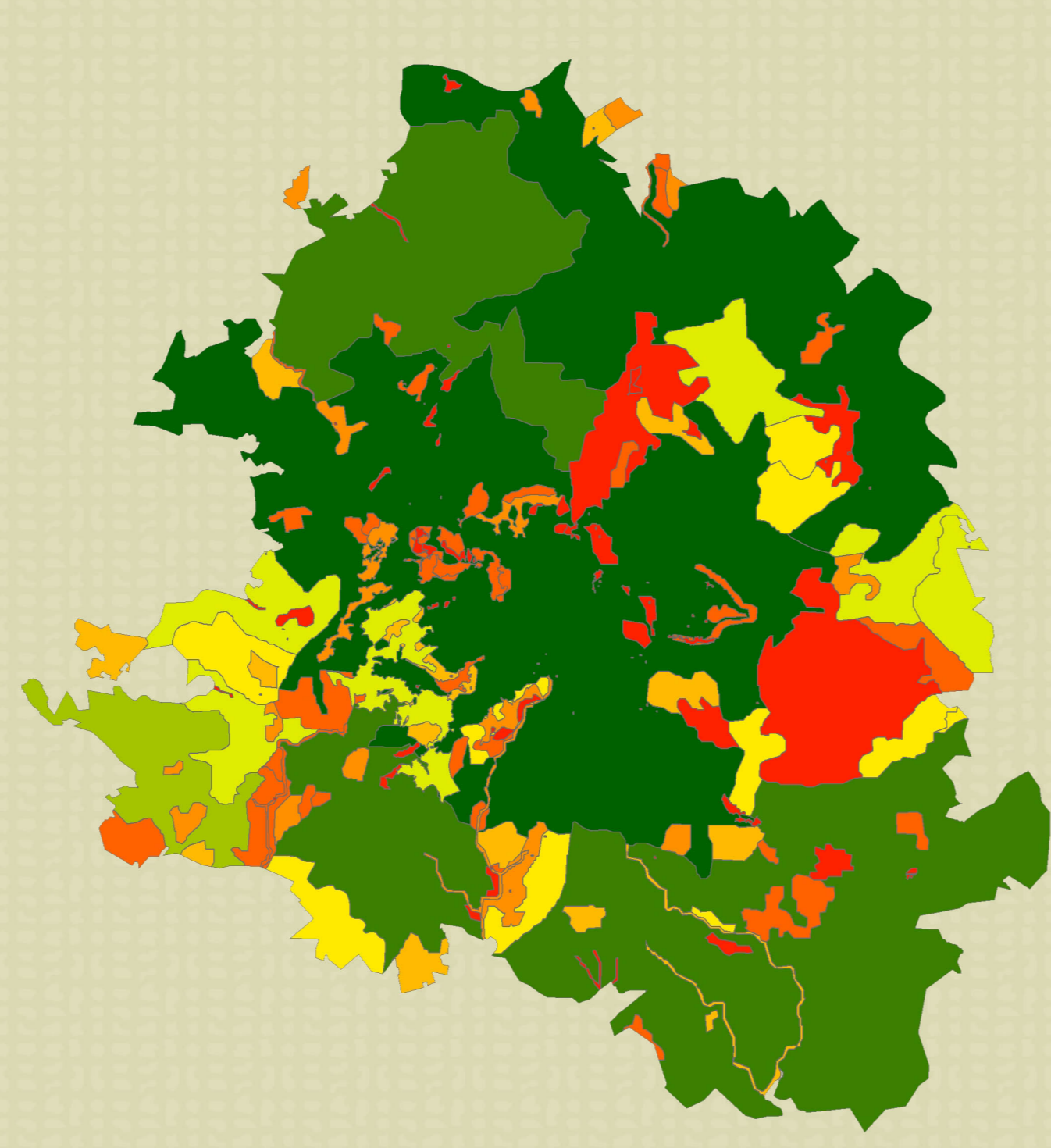
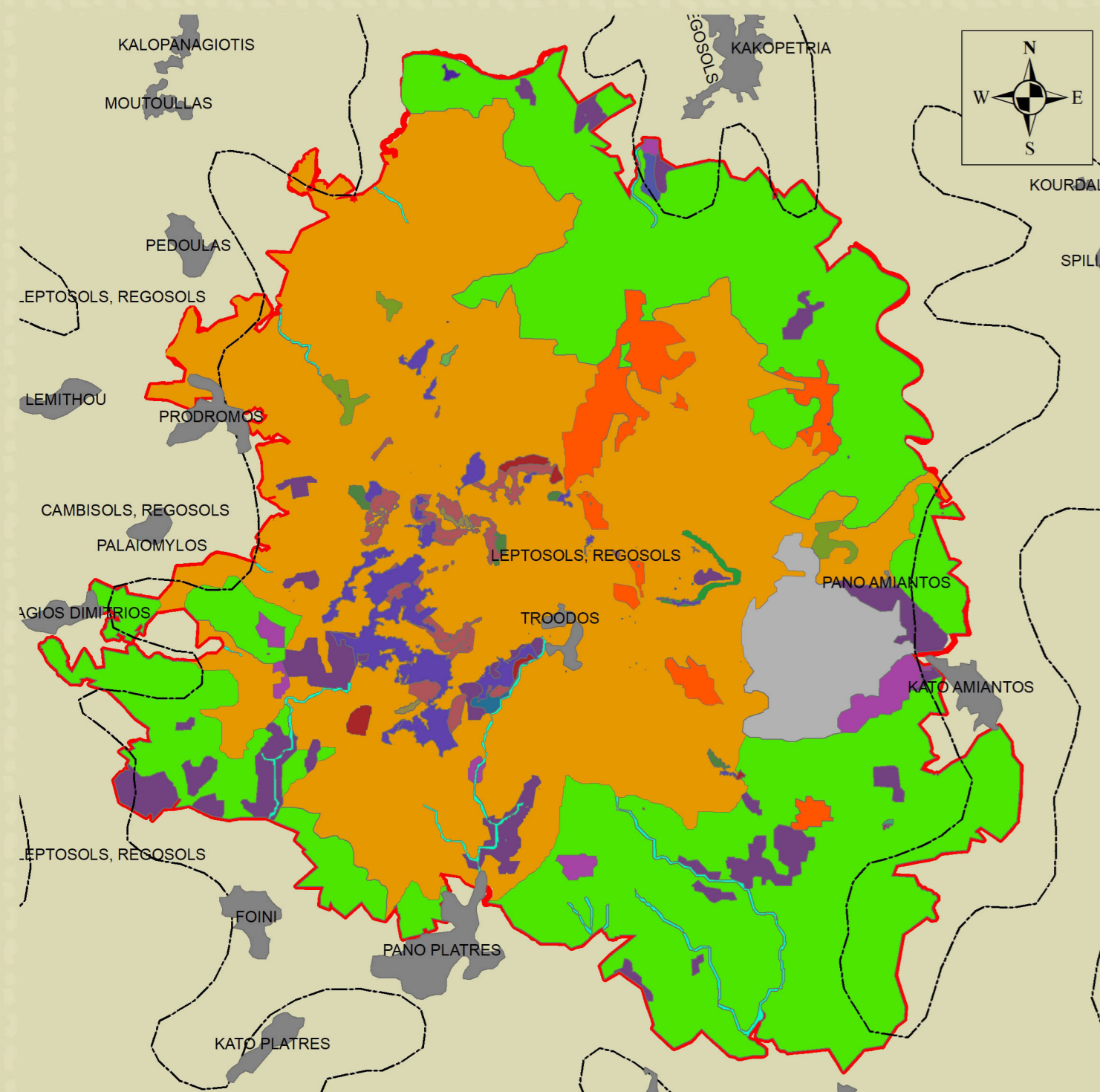
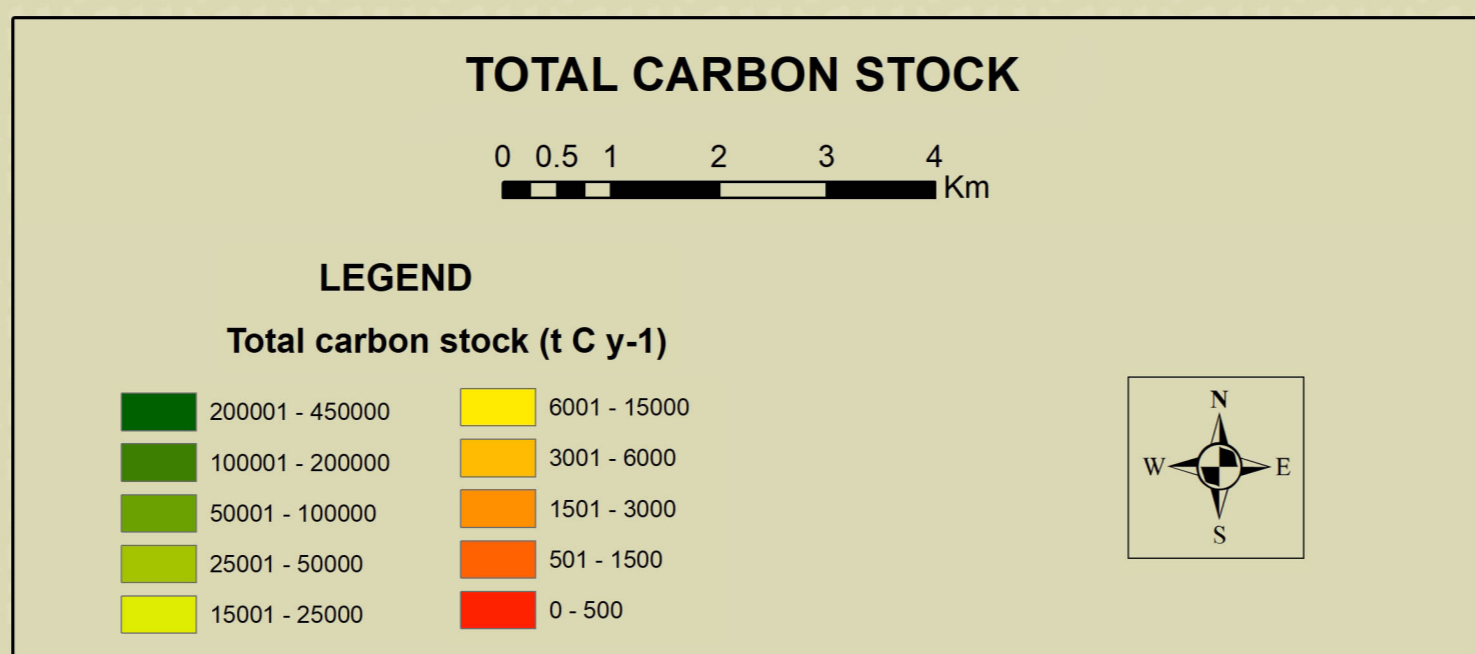
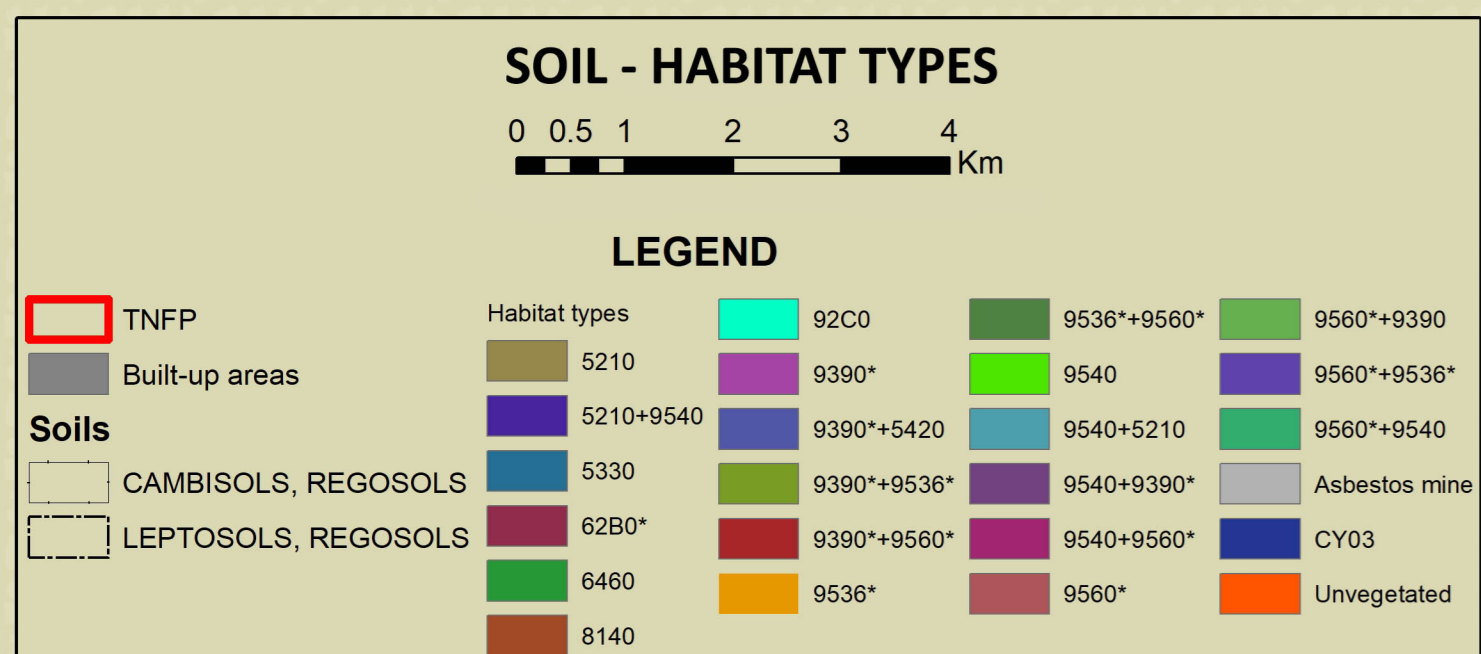
Co\$ting Nature

"Co\$ting Nature" calculates a baseline for current ES provision and allows a series of interventions (policy options) or scenarios of change. According to "Co\$ting Nature", the following ES occur within TNFP:

- Nature-based tourism
- Culture-based tourism
- Commercial timber
- Environmental quality
- Fuelwood.

It is noted that the data derived from 1 km² cell grid.

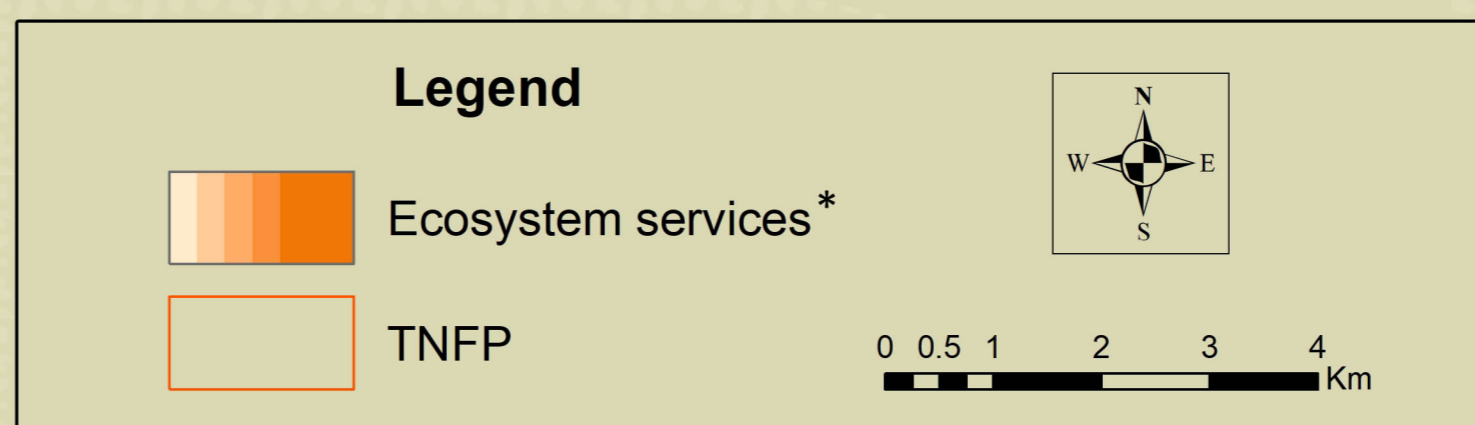
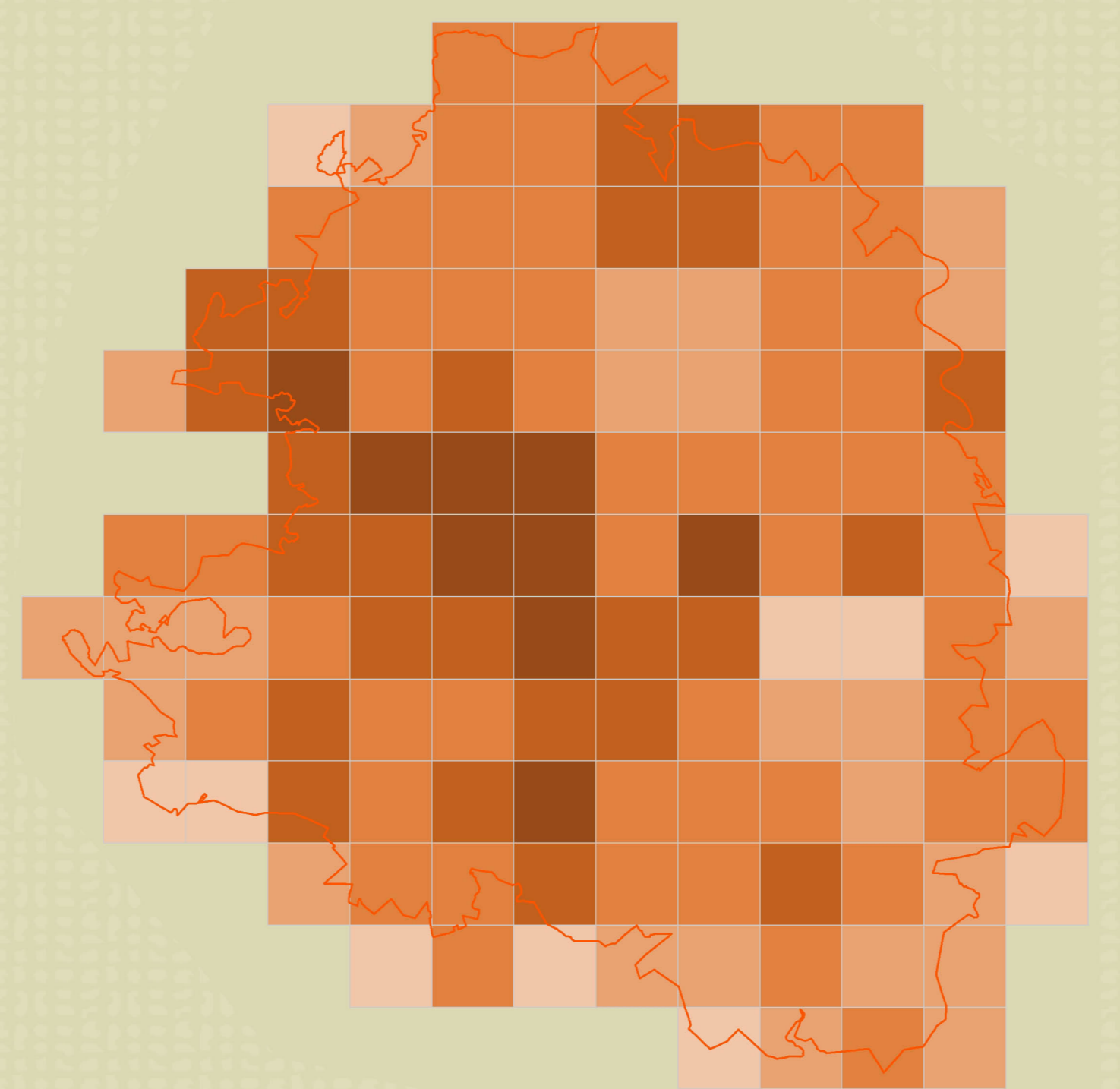
The above ES were also identified through CICES 5.1 methodology. However, the ES "Commercial timber" and "Fuelwood" are not considered to be of great importance for the TNFP, since it is a protected area of high biodiversity value with limited human intervention.



CONCENTRATION OF ECOSYSTEM SERVICES

The majority of ES are concentrated at the Troodos peak and the nearby areas. The same pattern applies to the Cultural services evaluation, too.

Provisioning and Regulation - Maintenance services seem to have similar pattern, i.e. the majority of these services concentrate at the centre and western part of the site.



* Darker colours on the maps indicate higher concentrations of ES

GLOBAL CLIMATE REGULATION

The assesment was carried out using the TESSA tools/ methodology and revealed the following:

1. Carbon stored in the plants (above-ground biomass, AGB, and below-ground biomass, BGB), dead organic matter (litter and dead wood) and soil (soil organic carbon, SOC):

- Above Ground Biomass (AGB) = 551,968 t C
- Below Ground Biomass (BGB) = 1,500 t C
- Litter και Dead wood = 605,143 t C
- Soil Organic Carbon (SOC) = 323,799 t C

TOTAL CARBON sequestration = 1,482,411 t C

2. The greenhouse gases (carbon dioxide [CO₂], nitrous oxide [N₂O], methane [CH₄]) emitted by the plants and soil over time (positive flux):

- Annual Carbon (C) Loss = 132 t C y⁻¹
- Emission of methane (CH₄) = 0.09 t C_{CH4} y⁻¹
- No agricultural activities are carried out in the area and nitrogen emissions (N₂O) are considered negligible.

TOTAL GREENHOUSE GAS FLUX = 1,187,268 t CO₂ eq y⁻¹

3. The carbon sequestered (taken in from the atmosphere) over time by the plants and soil (also known as negative flux) has not been evaluated yet, since more fieldwork is needed.



ECONOMIC VALUATION OF ECOSYSTEM SERVICES

TNFP is mainly a mountainous, state forest, part of the Natura 2000 network. Most people visit the area for a one-day trip, where 56.000 trekkers used 2 nature trails (out of 15) in 2017 and 8626 visited two Information Centers (total ticket cost: €12,599).

There is little accommodation capacity within the TNFP; for 2018, at the 78 communities located within a 10 km radius, 484 beds could be found. Lodgers from these villages visit the Park and as such, it has been estimated that the economic benefit from this activity (about 1400 people) is €917,908 (accommodation, food, other expenses). Most of the Park (appx. 96%) is open for hunting (during the hunting season), where about 2000 hunters (5% of the total) use the area every year. Based on their average spending, the amount that nearby communities benefit is about €100,280 per year.

The total benefit from the above activities amounts to €1,030,787 (the figures shown represent only the foreign visitors. The evaluation on the numbers/ expenditure of local visitors is still in progress).

Finally, the cost for restoring the area (in case of fire) has been estimated to €6,293,136, while the annual administration and management costs (2017) amount to €2,277,688.

NEXT STEPS

- Acquire more information (including field work) to draw more precise conclusions.
- Additional analyses for a more comprehensive view of the ES offered by TNFP (water services, economic benefit, etc.).