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Forest recreation planning in the Taxiarchis University Forest of Halkidiki

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Outline of the presentation

- Recreation needs
- Aim and objectives of the study
- Study area
- Datasets - Preprocessing and GIS database development
- Methodology
- Results and Discussion
- Conclusions

Recreation needs

- Recreation is an important human activity, because it contributes to the physical and mental health
- Forests, as natural conservatories, play a major role in recreation.
- People need these ecosystems to regain the relationship with nature. In such ecosystems someone can do various activities and sports such as climbing, mountaineering, hunting etc.
- For this reason it is important to plan and facilitate **Forest Recreation**

Aim and objectives of the study

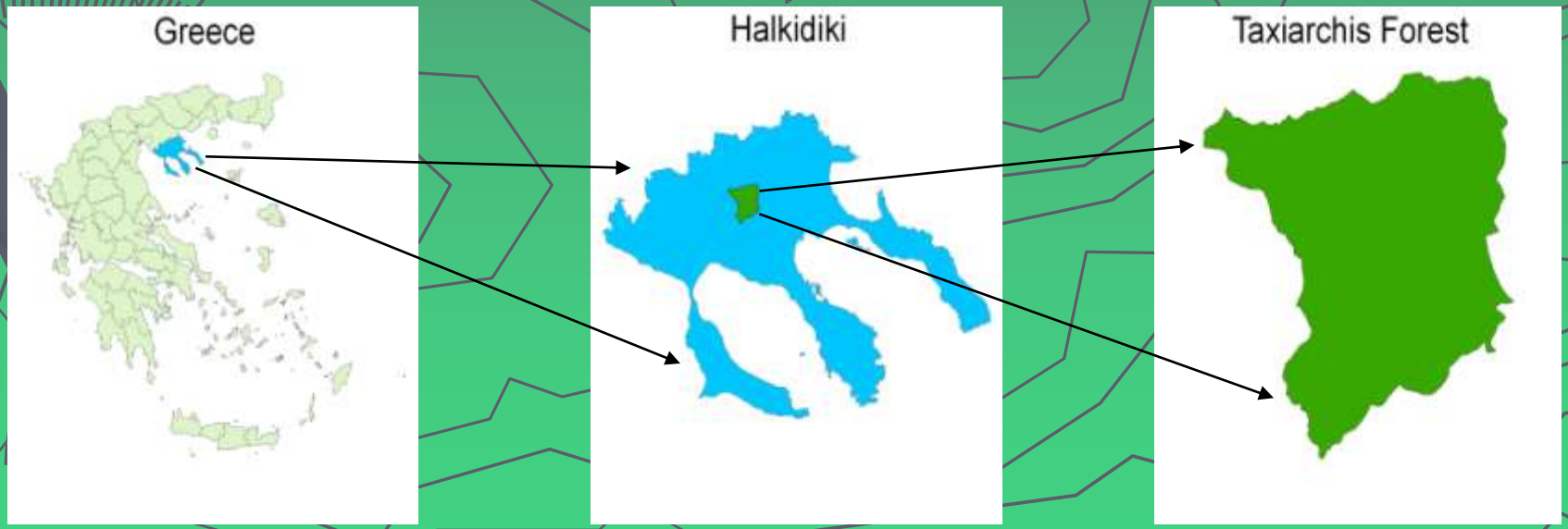
- The **aim** of this work was to investigate the use of Geographic Information System and to build a database for the Taxiarchis University Forest of Halkidiki (Greece) so as to be used in forest recreation planning

- The **objectives** of the study were:

1. To build a G.I.S. database for the Taxiarchis Forest, including the Digital Elevation Model (DEM), aspect, slope and vegetation types
2. To examine area visibility from the existing viewpoints
3. To propose new viewpoints in order to increase the visibility of the area
4. To analyze and quantify the characteristics of the region (slope, aspect and vegetation) in order to estimate the percentage of the area that is appropriate for climbing and mountaineering and also to investigate which areas are suitable for swimming and passive recreation

Study area

The study area was **Taxiarchis University Forest** which is located in northern Greece and it is visited by thousands of people on a year base. This region is characterized by abrupt slopes and dense forest vegetation cover. *Quercus, Fagus, Pinus halepensis, Pinus brutia* and evergreen broad-leaved vegetation species are the most common species of the area



Datasets - Preprocessing and GIS database development

The **data sets** used in the present study were:

- A QuickBird satellite image

  This image was used as a source of information and as well as for updating the management map of the area

- A management map of the area

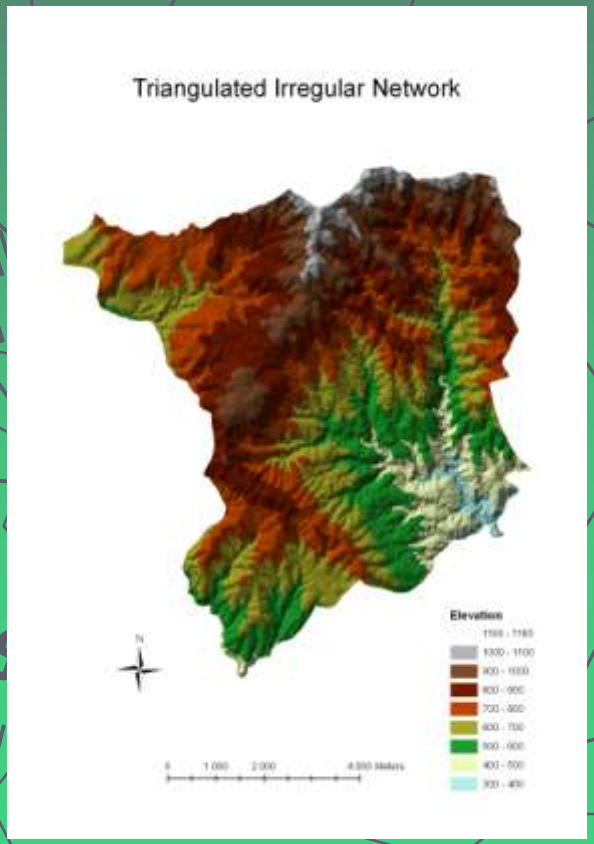
  This map obtained by the local forest office. The information extracted from this map was related to the vegetation type and the land cover of the area

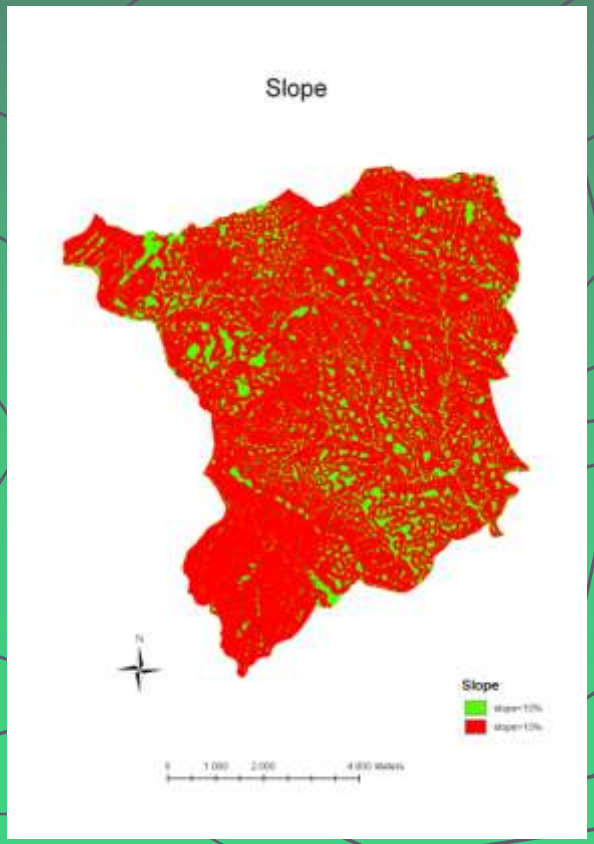
- Topographic maps

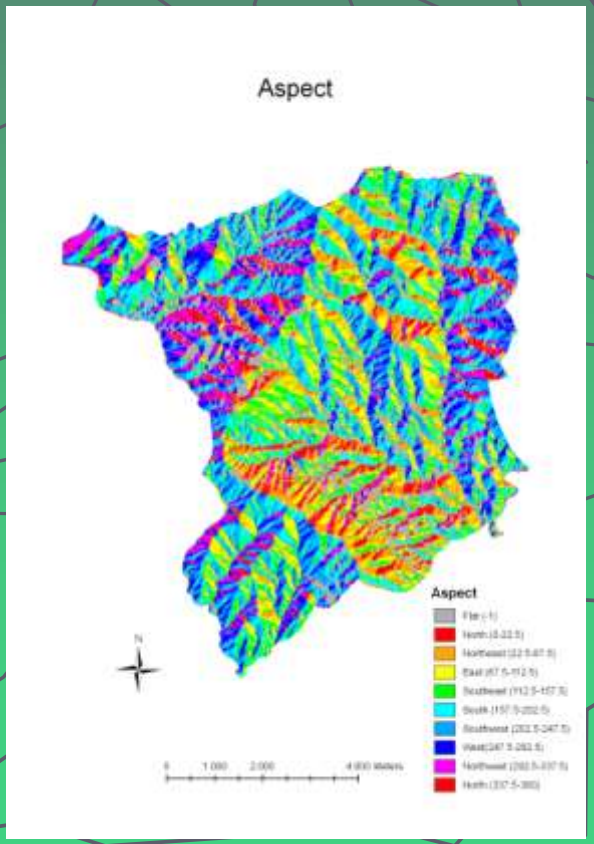
  These maps were imported into the G.I.S., geo-corrected and unified so as to cover the whole area of research. Afterwards, the contours, which were shown on the maps, were digitized using the ArcGIS software. These digitized lines were the background for the production of the Digital Elevation Model and the aspect and slope maps

Methodology

1. The first step of the process was to digitize the contours of the area in order to create the Digital Elevation Model. Slope and aspect information was obtained then by the production of slope and aspect rasters.

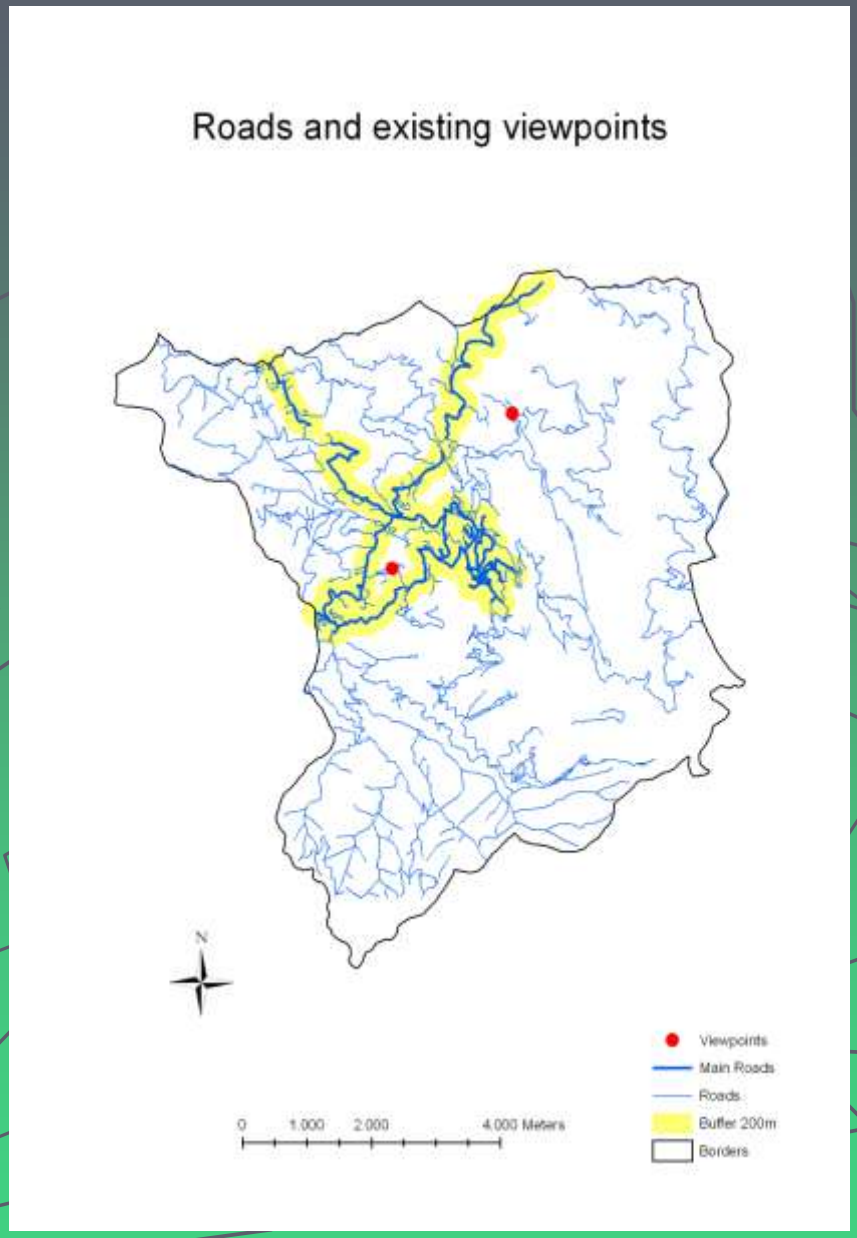






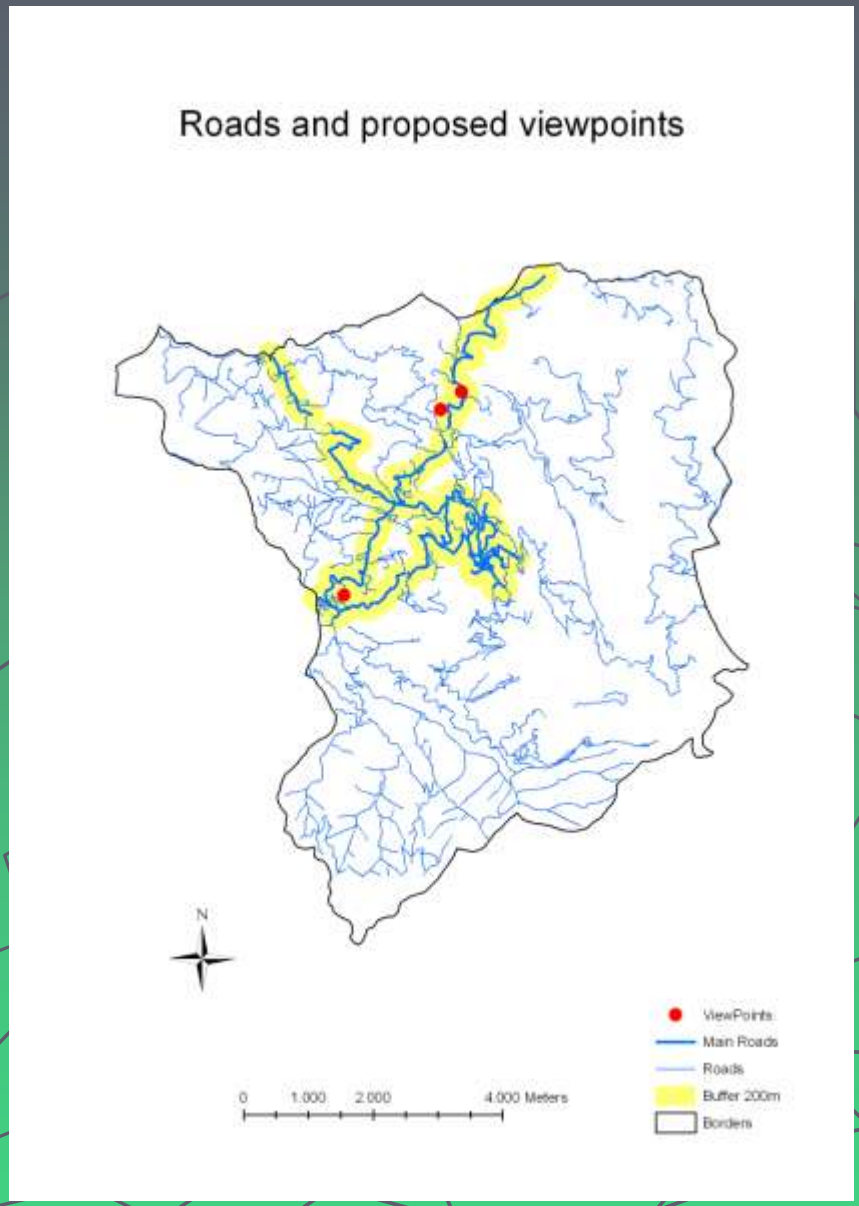
2. Buffer zones were created in a distance of 200m from the main roads, according to the suggestions of the Greek law for the places of view (viewpoints)

3. The area had already 2 viewpoints, which were located in the field and put into the G.I.S. It was then easy to confirm that the existing viewpoints were not inside the area of the existing buffer zones

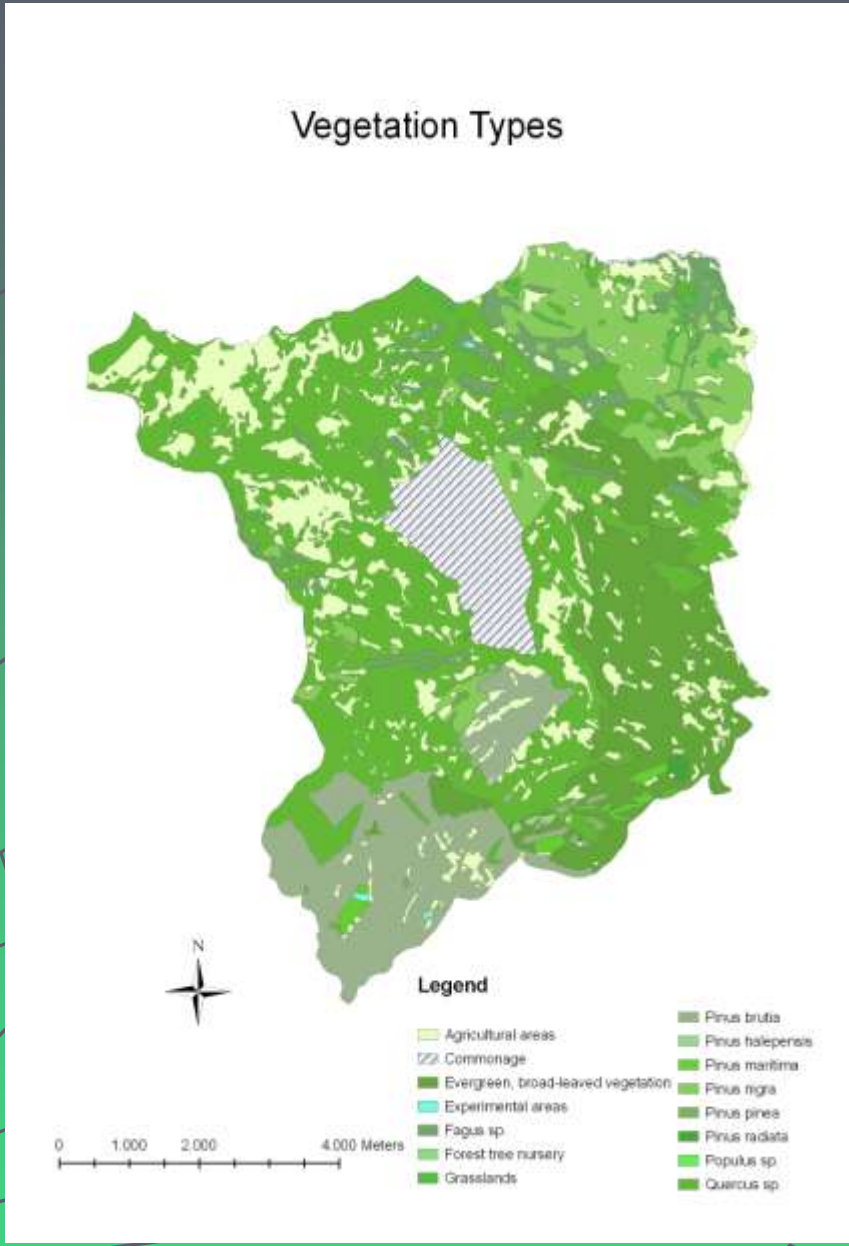


4. New viewpoints were located inside the area of the buffer zones. They were chosen also at peaks with high elevation so as to cover a large area of view

5. The viewpoints in combination with the Digital Elevation Model, were used to perform visibility analysis to examine how much of the area was visible

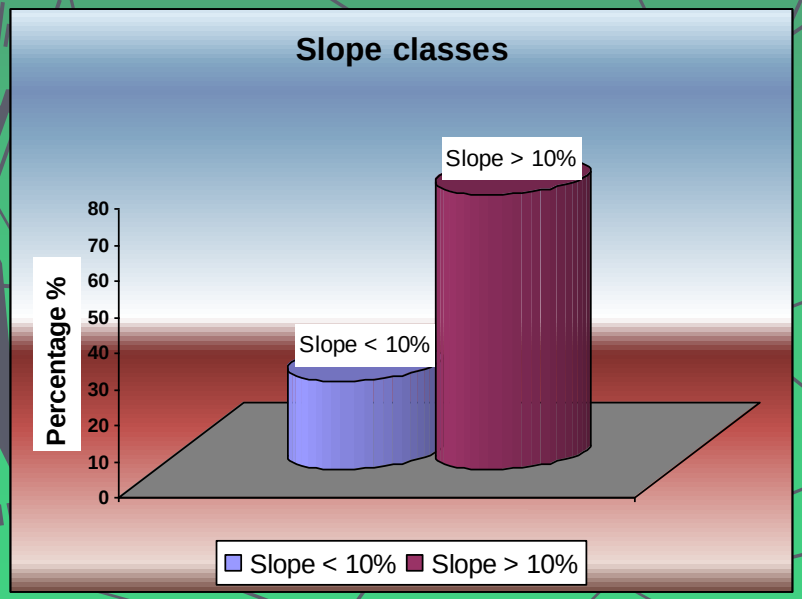


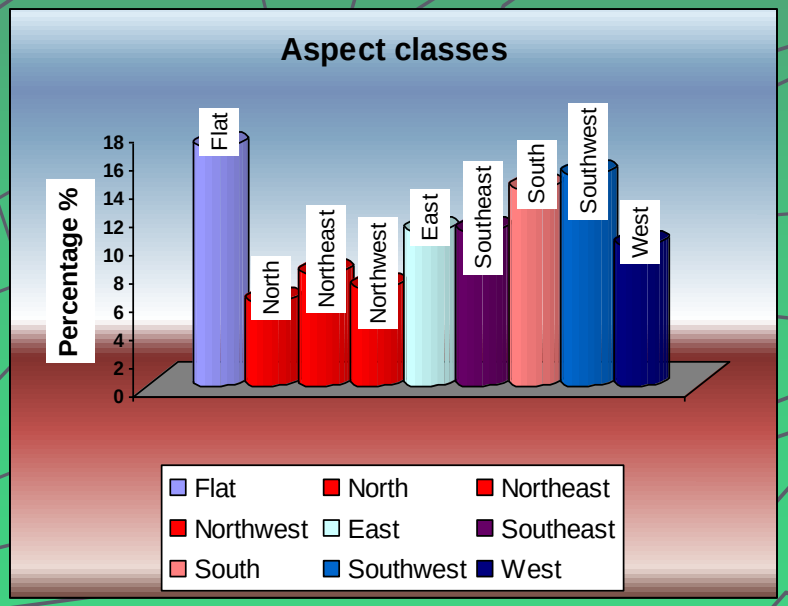
6. The land cover of the area and the areas of vegetation types were also digitized using as background the management map of the local forest office and were used for further analysis in combination with other dataset



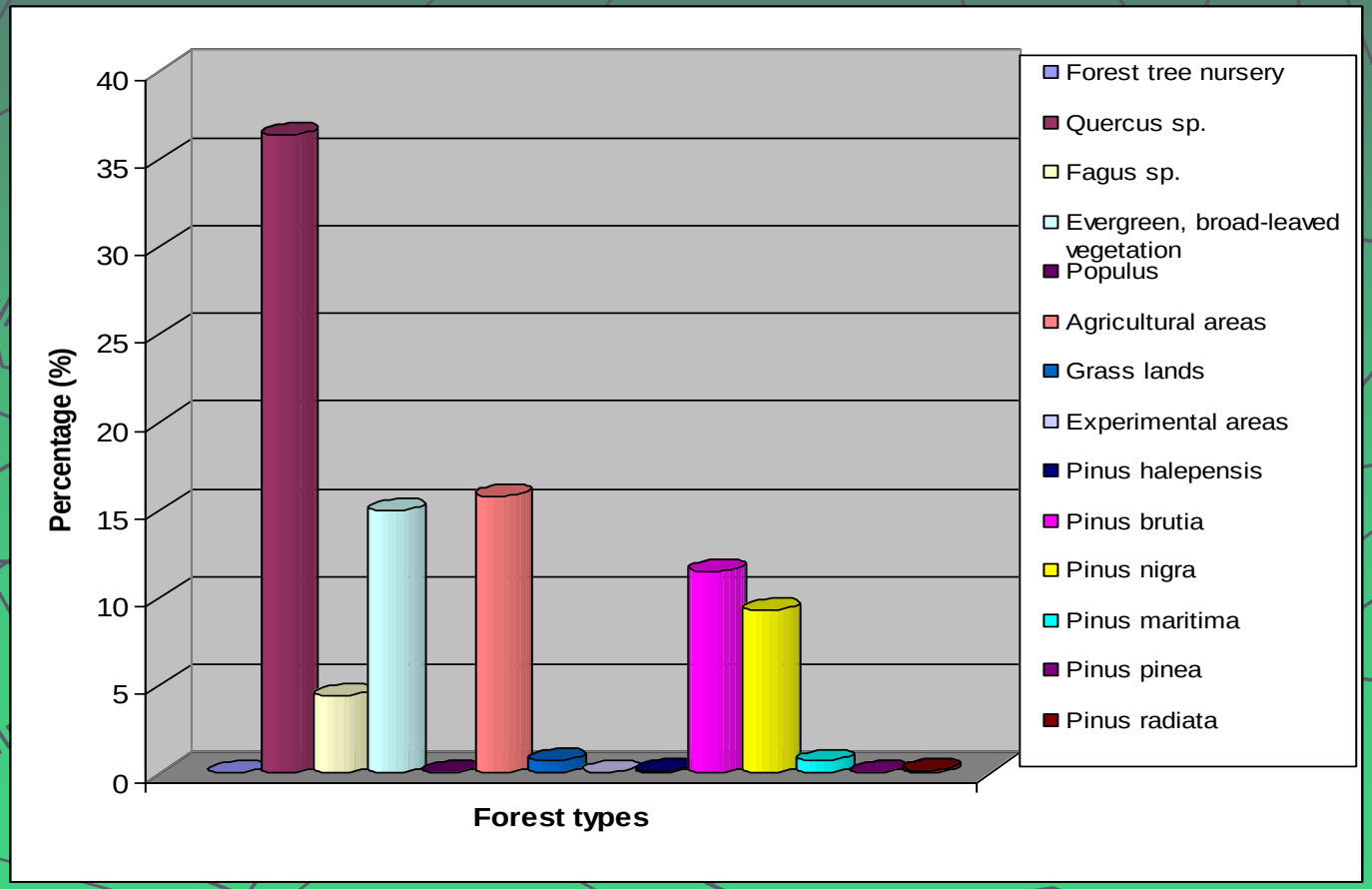
Results and discussion

- The classification of the total area in 2 classes of slope showed that 24,2% of the total area had lower slope than 10% and the main percentage (75,8%) had higher slope than 10%
- The second classification of the total area in 8 classes of aspect, showed that each class of the northern aspects (N., N.E., N.W.) covered smaller areas than every other class of aspect





- The classification of the area in vegetation types showed that the main type of vegetation is '*Quercus sp'* (36,4%) which followed by '*Evergreen, broad-leaved vegetation'*, '*Pinus brutia'* and '*Pinus nigra'* and then appears the '*Fagus sp'*., '*Pinus maritima'*, '*Pinus halepensis'*, '*Pinus radiata*' and '*Pinus pinea'* in lower percentages



- After this analysis it was considered useful to make pivot tables in order to be able to know how the area of each vegetation type is classified in the classes of slope and aspect which were previously created

Pivot table. Slope classes – Forest types

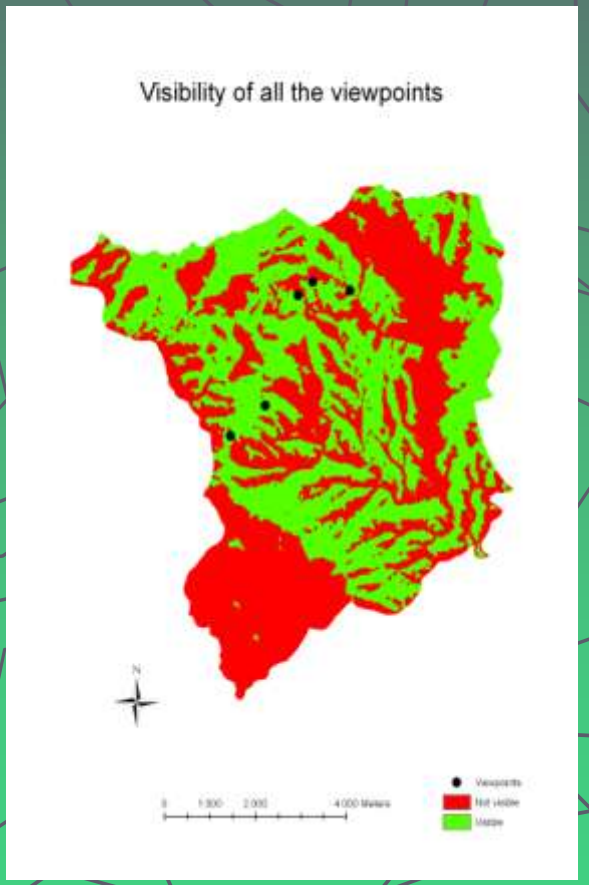
Forest types	Slope > 10%	Slope < 10%
Quercus sp.	3488450 m^2	17780400 m^2
Fagus sp.	460825 m^2	2102625 m^2
Evergreen, broad-leaved vegetation	1826775 m^2	6920500 m^2
Populus	1000 m^2	0 m^2
Pinus halepensis	3375 m^2	50025 m^2
Pinus brutia	660200 m^2	6070000 m^2
Pinus nigra	851675 m^2	4582125 m^2
Pinus maritima	71375 m^2	326600 m^2
Pinus pinea	0 m^2	5675 m^2
Pinus radiata	16850 m^2	65900 m^2
Total	7380525 m^2	37903850 m^2

- The same classification can be done with the use of aspect, instead of slope

Pivot table. Aspect classes – Forest types

Forest types	Aspect (Area: m^2)								
	FLAT	N	NE	E	SE	S	SW	W	NW
Quercus sp.	3363225	1662725	1954000	2233400	2088950	2910500	2859700	2198475	1996950
Fagus sp.	467150	424275	454750	284875	161200	128650	197425	187700	258550
Evergreen, broad-leaved vegetation	1822375	344275	738650	1149850	1044850	1281425	1182175	784100	400175
Populus	0	0	0	0	0	0	0	1000	0
Pinus halepensis	3575	26300	14175	1800	0	0	575	2625	4225
Pinus brutia	561625	306400	386225	903050	1083250	1138050	1136350	805825	412125
Pinus nigra	835900	231650	364350	410025	675525	902350	1061200	675925	276750
Pinus maritima	71025	83250	58925	30225	15075	12025	24400	48175	55175
Pinus pinea	0	0	0	0	0	0	1675	3875	25
Pinus radiata	16775	13650	23900	14400	7325	600	0	575	5300
Total	7141650	3092525	3994975	5027625	5076175	6373600	6463500	4708275	3409275

- The visibility analysis showed that the visible area covered by the existing viewpoints was 19,2% of the total area and the area covered by the three new viewpoints was 26,4% of the total area. As a result with the addition of these 3 viewpoints the visibility will be increased up to 50% of the area.



Conclusions

- An updated geo-database was created using all the datasets in order to be used to enhance recreational opportunities at the University Forest of Taxiarchis
- The visibility can easily be increased (up to 50%) with the addition of three more viewpoints and make the area more suitable for passive recreation. The new three viewpoints were also located in a distance of 200m from the main roads, which makes them more accessible to the visitors
- The slope is bigger than 10% in a percentage of 75,8% of the total area. As a result the region is recommended for passive recreation and for activities such as mountaineering and climbing
- It is possible to create areas for swimming and camp sites in the appropriate areas. South aspects (14%) are suggested for swimming places and east and S.E. aspects (22% both) for camp sites
- Quantification of the area features can be taken into account by the forest managers and contribute in the sustainable management of the University Forest of Taxiarchis

Thank you for your attention