Effect of Climatic Changes on Grasslands in Poland Using Remote Sensing – Polish Norwegian Project

Abstract Number: 567

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Introduction:

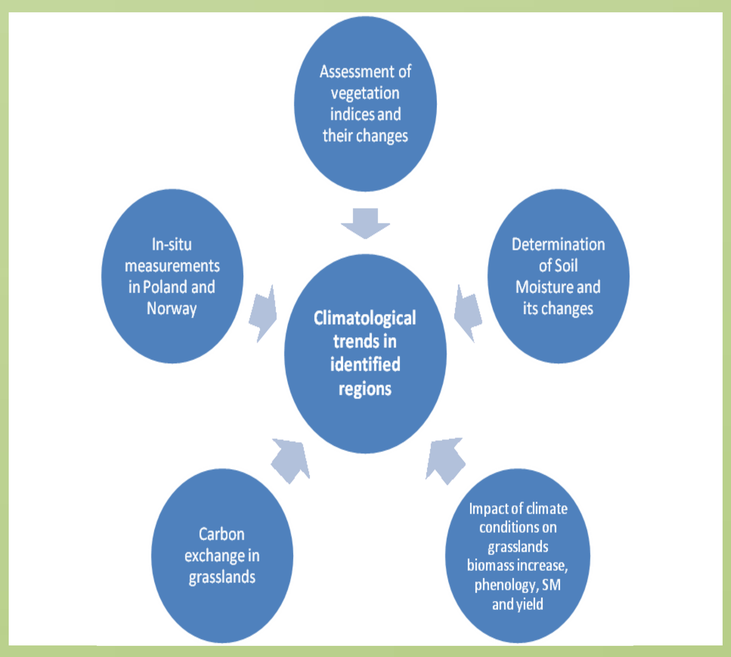
- Climate change influences grassland productivity throughout Europe.
- The extremes of the weather in winter, often lack of snow cover together with low temperatures as well as often occurrence of the increased air temperatures early in spring, cause shifts in phenology and disturbance in water balance of the grasslands areas, which influence the grass yield.
- Lack of precipitation and increase of temperature later in spring and summer cause diminishing of moisture causing changing water conditions in some of the areas.
- The investigations has been performed within Polish-Norwegian Research Programme entitled: "Effect of climatic changes on grassland growth, its water conditions and biomass" – FINEGRASS and has been realized in Poland and Norway.

The aim was to assess the effect of climatic changes on grassland growth, its water conditions and biomass and subsequently their yield with the application of the remote sensing techniques.

Materials and Methods:

- Identification of grasslands throughout the country will be done using high-resolution satellite data being prepared as the layer for the Corine Land Cover.
- The applications of remote sensing observations were the main tool for examining the differences in grasslands biomass for the whole country: NOAA.AVHRR, Terra.MODIS, SPOT5 and microwave data.
- Various vegetation indices (NDVI, EVI, and others) also surface temperature, were calculated from satellite data.
- ECMWF data base for meteorological information of particular year

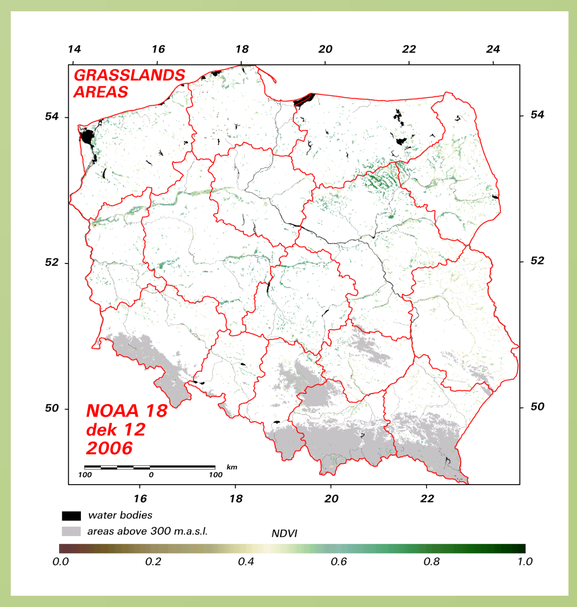
Flowchart of the major project activities

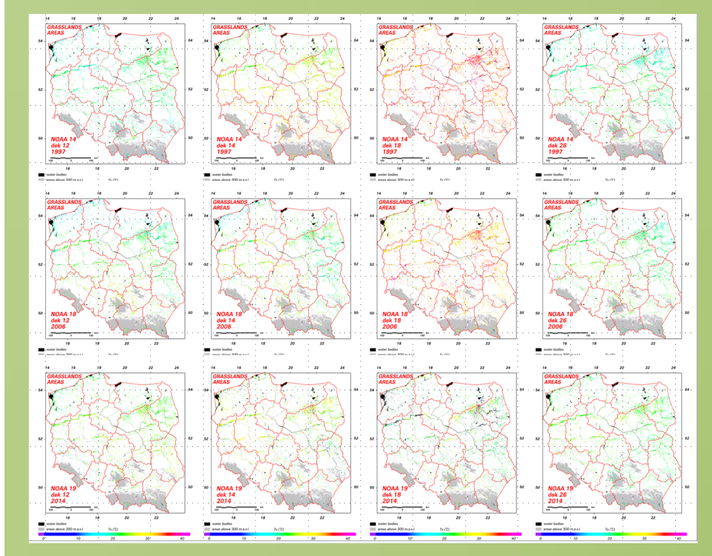


Results and Discussion:

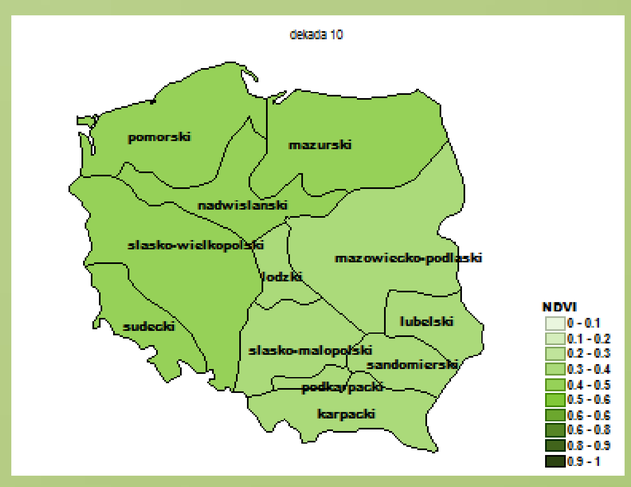
- The biomass calculated for each year (1997-2014) applying NOAA/AVHRR data has been compared to biomass from official Central Statistical Office data.
- It was also proved the differences in biomass due to variation of meteorological data in different years
- The index describing soil moisture NDVI/Ts (Ts was surface temperature from NOAA satellite).
- The start of vegetation and grassland development has been also described within the climatic zones of Poland to find the differences in grassland development in particular zones.
- Also the deviation from the average for the examined period of time of particular indices for each year has been analyzed and compared to the data base of EMCWF data base
- Building a yield model for biomass condition assessment

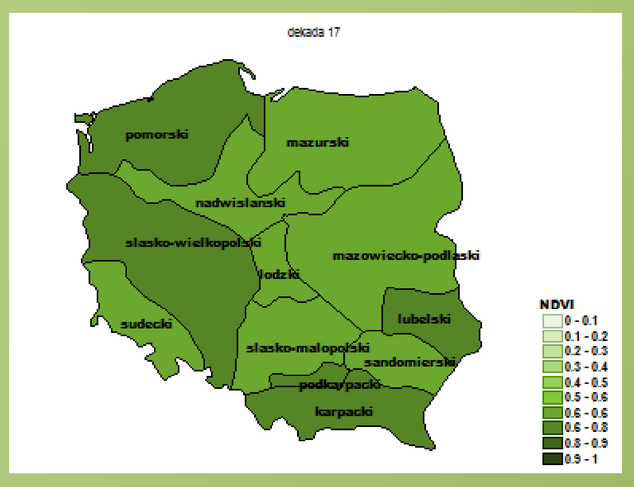
Maps of Temperature Condition Index (TCI) for Polish grasslands



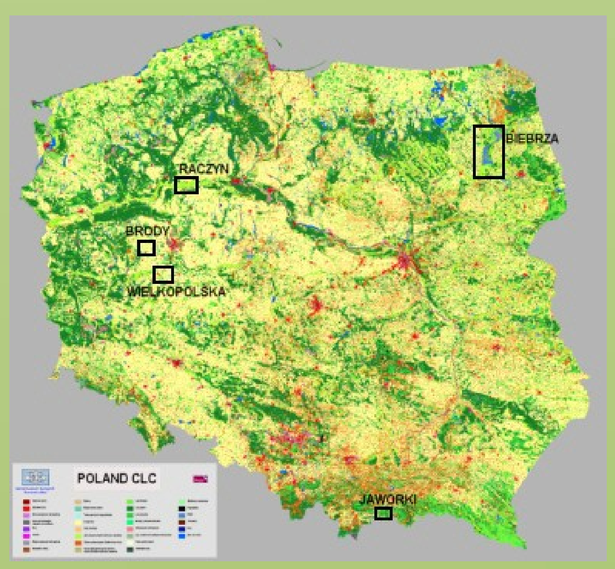


Difference in NDVI within various decades.

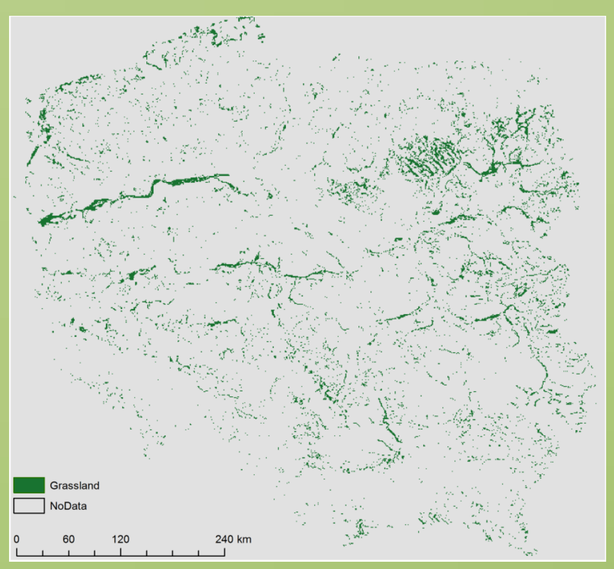




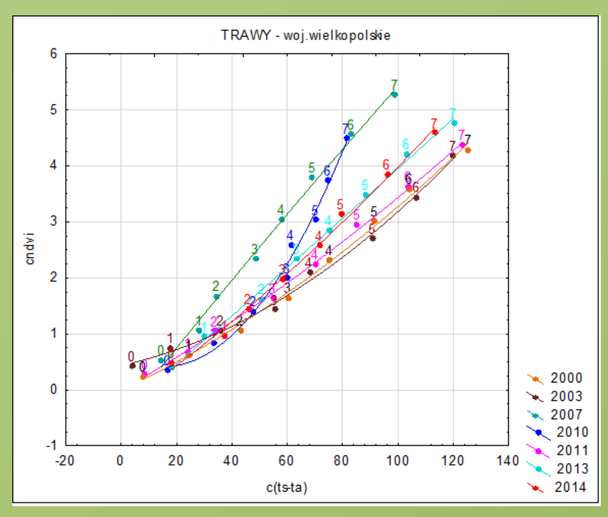
Corine Land Cover for Poland

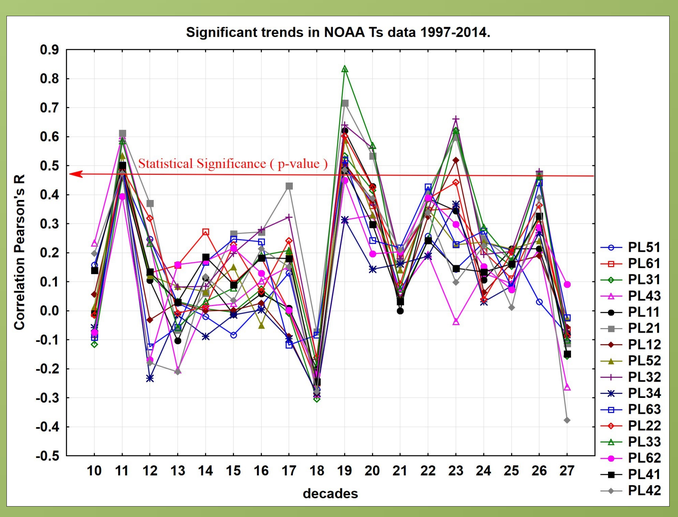


Grassland areas in Poland from CLC

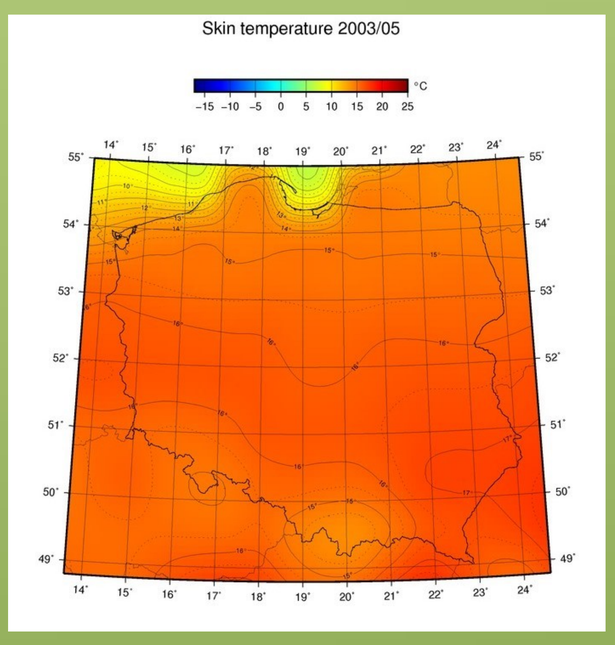


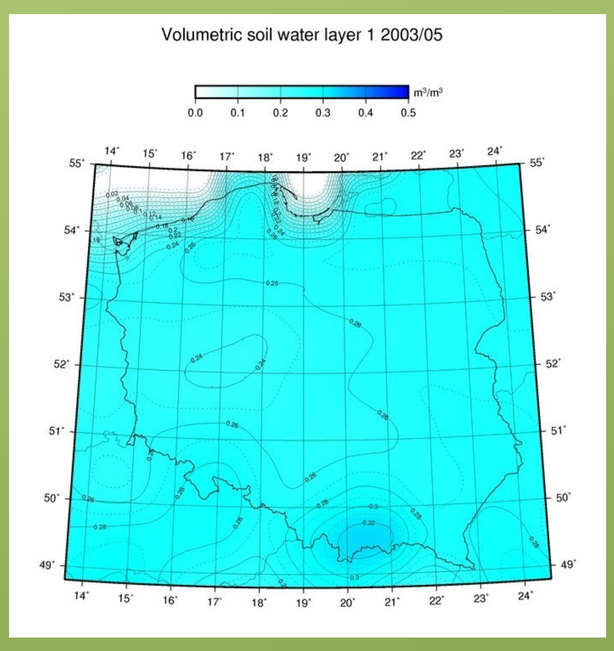
Significant trends in NOAA TS from 1997 to 2014





Meteorological data from ECMWF databses





Conclusion and References:

- Climate changes in Poland may affect positively and negatively the grassland productivity.
- The projected climate scenarios point in different directions.
- It is therefore necessary to build new and efficient methods that can be used to monitor the productivity of grasslands to understand trends and anomalies that are likely to continue into the future. This can help in planning for agricultural practices and offsetting financial risks on large scales.

- Kawamura K., Akiyama T., Yokota H., Tsutsumi M., Yasuda T., Watanabe O., Wang G. and Wang S. (2005) Monitoring of forage conditions with MODIS imagery in the Xilingol steppe, Inner Mongolia. International Journal of Remote Sensing 26, 7, 1423-1436.
- Smit H.J., Metzger M.J and Ewert F. (2008) Spatial distribution of grassland productivity and land use in Europe. Agricultural Systems 98, 208-219.

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