COST action FP0703 – ECHOES

Expected Climate Change and Options for European Silviculture

Country report

SERBIA

31th July 2009

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Introduction

Available observational evidence indicate that global climate change as a result of natural forcing and human activity are consistent in direction and coherent across diverse localities and regions with the expected effects of regional changes in air temperature (IPCC, 2001). Thus, from the observed climate data, there is high confidence that recent regional changes in temperature have had discernible impacts on precipitation, evaporation, streamflow, runoff and other elements of hydrologic cycle, as well as changes in the variability of climate, particularly in the frequency and intensity of some extreme climate phenomena.

Some recent studies have pointed out more frequent and severe drought in the territory of Serbia and in other parts of the Balkan peninsula (Bošnjak,1997, Dragović,1997, Jovanović Olivera and Popović,1997, Palfai,1992, Spasova et al.,1997, Spasova et al.,1999, Spasov and Zelenhasić,1990, Spasov,1997, Spasov and Spasova Danica,2001, Stanescu et al.,1994, Stojšić and Škorić,1997, Tomov et al.,1997). The most severe drought in 2000 with extremely high air temperatures, and without snowcover during winter 2000/2001 were only some of the last in the series of climate extrems in the region of South Europe. In addition to natural climate changes, their basical statistical indicators give clear signals of the existence of human induced climate variations.

Short description of Serbian forests

Serbia belongs to three biogeographical regions. This diversity has to be taken into account when studying climate change impacts as well as when implementing adaptation and mitigation strategies.

Serbian forests in short description:

- their area is about million hectares 2,713,200 ha (ha) or (29,1 %) of the Serbian territory;
- their growing stock is near to 396.577.498 cubic meters (m^3) of solid wood or about 146 m^3/ha;
- their current annual volume increment approximates 10.217.373 million m^3 of solid wood or 3,76 m^3/ha/year on average;
- roundwood removals for industrial and domestic energetic uses are estimated to be the annual net increment
- forest area in lowland region of Serbia is only 6%.
- most common species in Serbian forest are Fagus moesiaca, Quercus cerris, Quercus petrea and Quercus frainetto
- most important forest association in Serbia is Querceto frainetto-cerris. In lowland forests most common species are Quercus robur and Populus sp.

Serbian forests are state and private. Private owners are individual persons or households. Percent of private forests in Serbia is 52,2%. Since usually forestry is not the main activity of forest owners, forest policy must play an important role in order to stimulate sustainable forest management through regulations, incentives and technical assistance.

Impacts

Observed impacts are at the roots of problem identification and understanding. The latter allows simulations in order to predict expected impacts. Forest monitoring is the best way to detect and study impacts; its improvement is thus a real challenge in order to better identify, understand and predict climate change consequences. Some impacts appear progressively according to trends and can be taken into account as they go along. But many consequences result from extreme events (such as storms, floods, droughts, outbreaks…) that cause crises; crisis management has thus to be implemented when the event has just occur; it has also to be anticipated long before it happens.

Observed impacts

As climate change is a major driver of changes in forest stands, flora and fauna, it needs to be presented at first. A statistical analysis of long-term data series of annual air temperature (for period 1951-2000) showed that the territory of Serbia can be divided into two parts. But, in despite of global trend lines, the last two decades of 20th century should be taken because of extremely high rising of annual air temperature which is registered throughout the entire territory of Serbia.

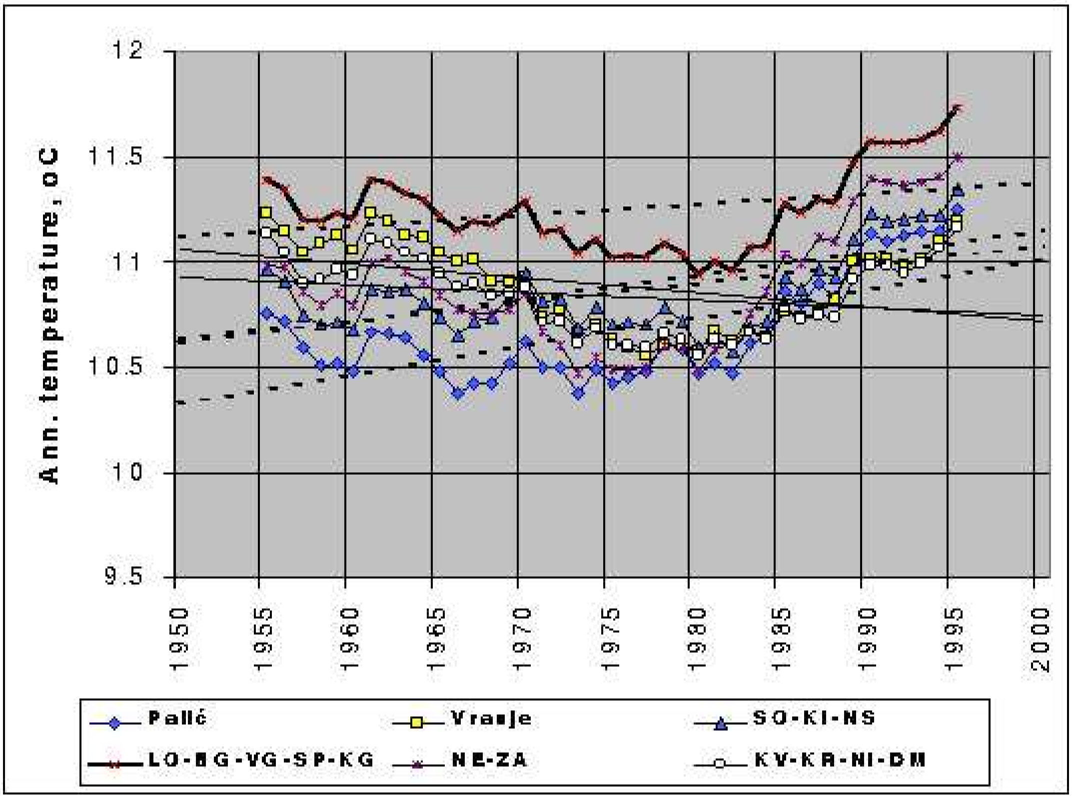

Fig.1. 10-year running mean of the annual temperatures (0C) in Serbia, 1950-2000 (Source Spasov et al.)

With regard to annual precipitations, results show that the linear trend is negative and more distinctive in south-east regions of Serbia, and less in northern half of Vojvodina (Fig. 2).

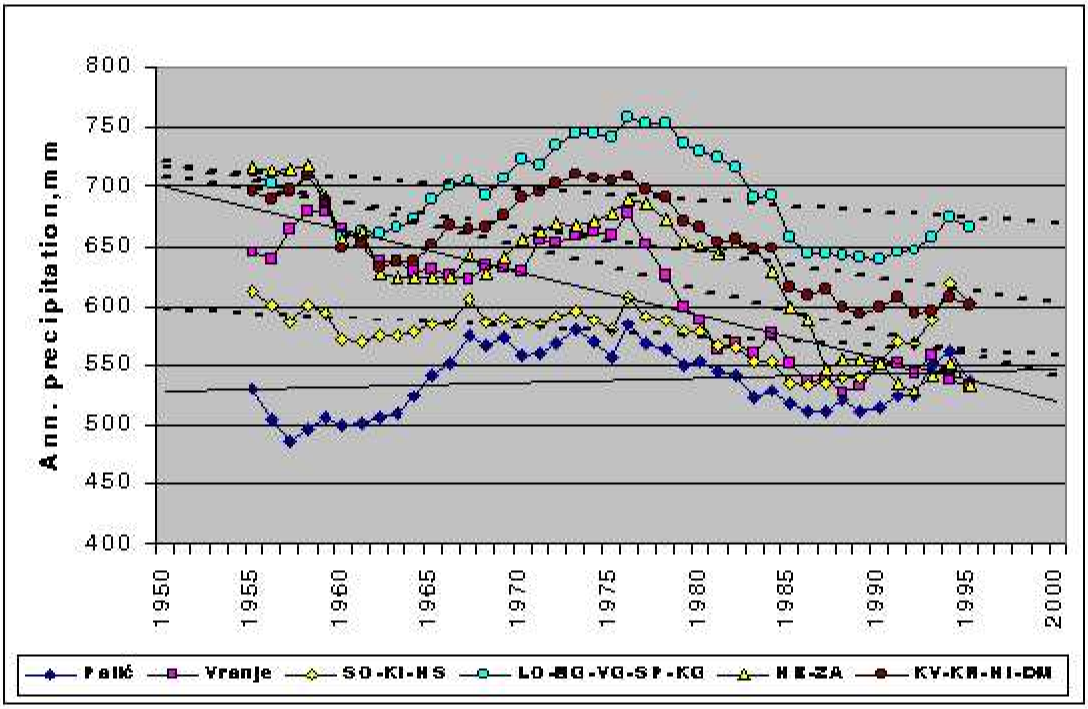

Figure 2. 10-year running mean of the annual precipitations (mm) in Serbia, 1950-2000 (Source Spasov et al.)

It is necessary, in context of these changes, to point out the fact that the number of days with snow cover has considerably decreased in last years (linear trend is negative), causing on one hand the earlier and lesser spring runoff, and on the other, greater potential for summer drought. Only significant rising of summer rains could cover this deficit, which perhaps, regarding to mentioned assessments about precipitation regime in future, can't be expected.

Few aspects, very important for each drought analysis are: time period (duration of drought), possibility (expected frequency of drought phenomenon) and deficit of precipitations (drought intensity).

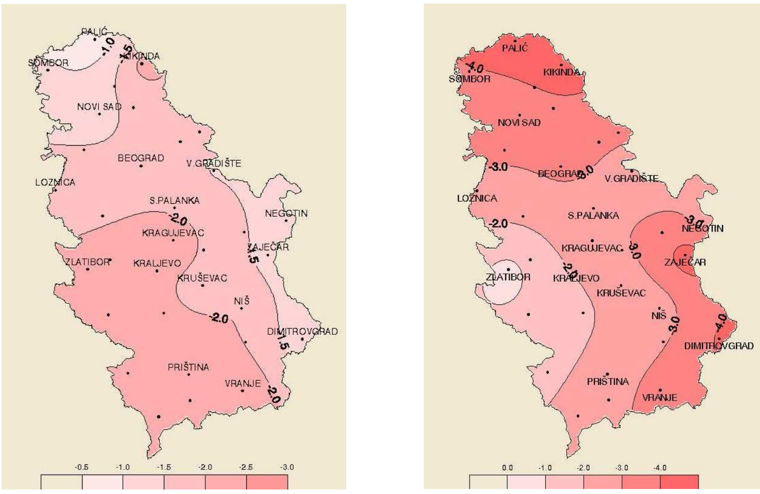

Figure 3. Spatial distribution of drought in 1990(a) and 2000(b) and its severity expressed in SPI values (Source Spasov et al.)

Impacts on ecosystem dynamics and functioning

Impacts on ecosystem dynamics and functioning do not include the effects of extreme events that are dealt with further. They concern vegetation phenology and distribution, fauna phenology and distribution, and finally global productivity.

Vegetation phenology

In Serbia is an ongoing project, to create a general database and to enlarge the network of phenological observations. Project aims is to investigate the influence of climatic parameters on the phenological stages (bud burst, yellowing…).

Vegetation distribution area

With climate warming, vegetation is supposed to shift towards the North and upwards. For the increase in temperature that has been experienced until now in a rather short period, mainly for some three decades, shifts upwards have certainly been easier to observe and characterize. Many empirical observations are carried out at the ranges of the distribution areas of the different species.

Insect phenology and distribution area

Systems to detect forest disturbances and extreme events are organized in two regional centers Forest Protection service which is financed by Ministry of Agriculture, forestry and watershed. New perspective of climate change is not affect changes in these systems because this system already analyzed changes in forest disturbances and extreme events annually.

Expected impacts

Past and recent impacts are mainly based on observations. Models could only help in attributing them partly to climate change.

Now in Serbia are project to define:

- vegetation phenology

- vegetation distribution area

- dynamics of forest ecosystems under climate change and

- climate change impacts on forest pathogens and the expected modification for the insect distribution area

Impact monitoring

Usual monitoring system/network

As in many other countries, the first forest monitoring network in Serbia has been the National Forest Inventory (IFN). In Serbia are implemented a monitoring system of forest health at the national level on level I and level II of IPCC.

Specific monitoring system/network

To identify new requirements of forest monitoring under climate change and possible solutions meteorological information from national station is in most cases not sufficient for representing forested areas. The explanation of actual forest condition and their changes over time needs a measurement from forest types. Indicators which are currently used to give account of consequences of climate in forestry precipitation, temperature, radiation, humidity, topography, underground water level. In future it must be add a CO_2 flux.

Impact management

For most of the recent extreme events (windstorms, droughts and forest fires), the impacts were both managed by Serbian State (Ministry of Agriculture, Forestry and Watersheed and Ministry of Ecology) and each organization involved in forest management.

In order to detail one example, after the 2007 forest fires, the Serbian government finance program for reforestation of this area.

Adaptation

The forests have been considered vulnerable since the extreme events that were experienced. General adaptation strategy or policy for climate change in all sectors in Serbia don’t exist. Adaptation measures may include all eight groups which covering silviculture and forest resource management at stand level and higher spatial scales (forest regeneration, including selection of species/provenances/genotypes, tending and thinning of stands, harvesting, forest protection, management planning, infrastructure and transport, nurseries and forest tree breeding, higher level adaptation options in risk management and policy). Most of research projects dealing with climate change impacts (current or expected) give some direct and practical advice for the forest adaptation.

Mitigation

The forest-based sector is particularly promoted by Serbian foresters as an important tool to mitigate climate change. Forest mitigation is highly dependent on the climate-energy policy at the international level, and on the energy markets. It means that, as for future impacts and adaptation, many uncertainties are at stake. It is also dependent on forest adaptation. As forest carbon sequestration has become a new ecosystem service, there is a possible conflict with other forest functions if it used very intensively.

Serbia signed Kyoto protocol in 2007. In Serbia do not exists a greater consumption of bio energy. The most important consumption of renewable energy is a private sector for heating. The most important research in field of forest mitigation are in possibility of afforestation on 382000 ha forest soils, and to conversion of vegetative forests to generative forests. Afforestation is possible on agriculture land to, because in the past a large areas of former forests brought into cultivation.

Conclusion

The impacts observed until now are linked with forcing by climate change. Climate change will become the predominant parameter of evolution in the future if we consider the climate forecasts (increase of dryness period). Forest manager, and all forest professionals in general, became aware of the potential impacts of climate change. Climate change impacts are strong and the extreme events too frequent. To keep this mitigation role, the forest adaptation is really important. And this one depends mostly on research in link with climate change impacts. The adaptation strategy is an evolving process to take into account new knowledge form theses studies and surveys.

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