Drought conditions and management strategies in Slovenia

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Background

Although climate of Slovenia is humid with annual precipitation totals ranging from cca. 800 mm to more than 3000 mm in mountainous areas, drought is among most damaging natural disasters. The reason lies in vulnerable agricultural practices, which are based on assumption that all water, needed for crop development, is assured by precipitation throughout vegetation season.
Agricultural drought occurs in late spring and summer and typically lasts 2-3 months. It is characterized by short to medium term negative precipitation anomaly and increased evapotranspiration caused by heatwaves and dry winds. Both phenomena cause surface water balance deficit, which results in drought stress of crops and can also result in permanent wilting of plants. Water deficit in vegetation season caused 15 droughts in last 50 years, namely in 1952, 1967, 1971, 1973 1977, 1983, 1992, 1993, 1994, 2000 2001, 2003, 2006, 2007 and 2012. Figure 1 shows damages caused by natural disasters in Slovenia between 1994 and 2008[1].

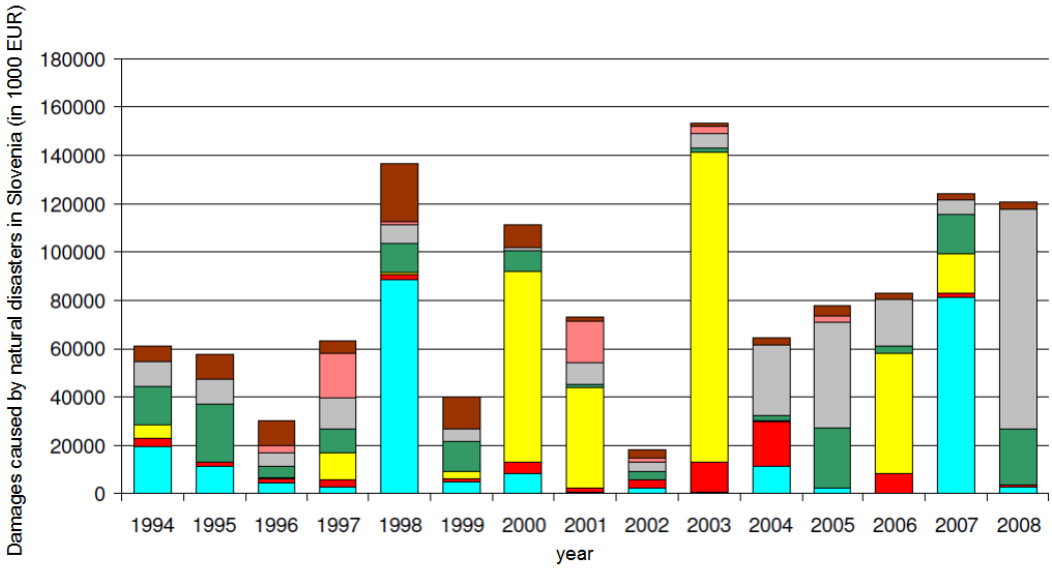

Figure 1: damages caused by natural disasters in Slovenia for period 1994 – 2008. Color codes: yellow – drought; light blue - flood; red – fire; green – wind storm; grey – hail; brown – land slides; pink – frost.

According to the data, drought is most damaging natural disaster. It has caused cca 250 million EUR damages in years 2000, 2001, 2003 and 2006. According to preliminary assessment, damages in 2012 reached 100 million EUR. By far most of the damages are

1 Statistical office: Estimated damage caused by natural disasters, Slovenia, 2008. Available on https://www.stat.si/eng/novica_prikazi.aspx?id=2672. Data beyond 2008 is not yet available.

caused by loss of yield. Few percent of damages can be attributed to costs of distribution of fresh water for small communities due to dry wells during most intense heat waves and consequently to increased costs in fishery and tourism. However the most vulnerable population remain the farmers.

Drought monitoring and early warning

In order to mitigate the effects of drought, it is important that farmers are aware of risks that they are exposed to. They can contribute to reduction of losses by choosing less sensitive crops in case the drought is developing already in early spring in time of sowing. They can mitigate drought impacts if they prepare irrigation plans in early stages of drought development and they can decide for early harvest in case outlooks are not good. For all these decisions they need information on drought development and forecasts of possible scenarios of development in next days and weeks.
Currently, available source of information is Agrometeorological bulletin, issued in 10 day interval and published on web pages of Slovenian environmental agency[2]. Content of the bulletin depends on situation and available data. Usually it contains general description of weather development in past week, 10 day period or last month. In addition to maps of temperature and precipitation departure from normals, also SPI maps for 1 month and 3 month accumulations are published once every month. If needed (in case of indication of possible water stress) more detailed information on surface water balance, available soil water and water requirements for plants are given for typical plants (grass and maize, in case of specific conditions also for other plants) for selected six meteorological stations in Slovenia covering all more or less homogene climatic areas in Slovenia. The calculations are performed with local irrigation scheduling model IRRFIB, that simulates water consumption during the vegetation period. For each of the stations, calculations are performed for all selected crops and for at least three types of soils (typical light, typical medium and typical reach soil).
More precise calculations (using more meteorological stations and data base of agricultural plots with data on soil type and planted crops) are not performed in real time due to lack of data. Such calculations (which can be used also for assessment of damages) are performed post-festum in case in-depth analysis of drought is needed.

Vulnerability assessment

According to records of past drought impacts, it is generally accepted that agriculture is by far most vulnerable sector. Other possible vulnerabilities (tourism, energy etc.) were not yet studied since in most cases they mitigate impacts by themselves (acquire additional fresh water needed for supply of tourist resorts, adjustment of power production to lower discharges of rivers and acquisition of power from alternative sources). This situation might change, mainly in light of climate change and will need future attention. However, at present situation, vulnerability to drought is mainly attributed to farmers.
Farmers represent only 5% of population in Slovenia and contribute 2% of GDP to Slovene economy. Therefore damages which do not seem catastrophic in terms of GDP (all damages due to drought from 2000 until now, including assessment for 2012

2 Bulletins are available on http://meteo.arso.gov.si/met/sl/agromet/recent/wb/currentyear/ as PDF files in Slovene language only.

damage, represent around 1% of yearly GDP in Slovenia) can be devastating for agricultural economy. Therefore vulnerability of agriculture was studied in more detail in recent years. It was attempted to explain parts of vulnerability which resulted in realization of risk in drought years to natural geophysical factors such as soil type, exposure to increased evapotranspiration and distance to available water sources (Slejko et. al. 2010). All these attributes were grouped, weighted according to subjective judgment and combined to dimensionless classes. Although results were not very satisfactory (in terms of combination of factors into single vulnerability class), it is generally accepted that these factors contribute most to final risk and exposure to occurrence of drought. Combination of unfavourable soil with small water holding capacity, exposure to high evapotranspiration (due to high solar insolation and exposure to dry winds) and high cost of irrigation due to large distance to available water sources or established irrigation systems results in high risk of drought impacts. In combination with unsustainable agricultural practices (cultivation of maize, ignoring information and advice on time of plowing and sowing), occurrence of drought can lead to high damages and can reduce income and welfare of farmers' households and whole village communities.

Emergency relief and drought response

Drought response in Slovenia is typically reactive. In case of high drought impacts (excessing few promilles of GDP), a political action is triggered which results in intervention bill (allocating funds from national budget which compensate not more than 30% of assessed damages). In case that intervention bill is passed, detailed analysis of drought is required. According to preliminary assessment of damage, commissions are set up within municipalities in order to give final assessment and priorities for compensations. The whole process can take more than one year. Apart from direct compensations, there are also possibilities of tax reductions and exemptions of social costs.

Practices to alleviate drought impacts

mainly advanced agricultural practices – promotion of irrigation (Slovenia uses only 3-5% of whole water use for agriculture in contrast to some mediterranean countries where this ration can reach 80%!). Promotion actions to establish irrigation infrastructure have been successful in some communities and less successful in others. Apart from irrigation, other practices (mainly optimization of selected cultures including diversification and optimization of other practices such as optimal plowing, application of shade nets etc.).

The need for knowledge and skills on drought management

There are no clear gaps in knowledge and skills in agricultural practices. There are many successful stories where drought periods were mitigated with optimal combination of technology and carefully scheduled irrigation. Main challenge remains planning of optimal infrastructure in terms of combination of large and small water reservoirs and irrigation systems. Main need in knowledge is in optimization of organization of stakeholders and distribution of responsibilities.

References

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