Climate Change Vulnerability in Ruzsa

– Municipality of Ruzsa, Csongrád County, Hungary –

This document is an extract of a climate change vulnerability assessment prepared by the municipality of Ruzsa in 2018, as part of the LIFE-MICACC – Municipalities as Integrators and Coordinators in Adapting to Climate Change project.

Introducing Ruzsa

Location: Southern Hungary, about 38 km from Szeged
Area: 84,7 km^2
Population: 2567 inhabitants
Geography:
The village lies on the southern part of the Great Hungarian Plain the Alföld, on relatively high elevation sand dunes. Until the XIX. century the area was dominated by wetlands formed at low-laying areas without drainage, and a large portion of the settlement's surface was temporarily covered with water each year (Figure 1). After the regulations of Tisza river and development of drainage canals, a lot of inner lakes and swampy habitats disappeared. Nowadays several of these previously wet habitats along the drainage channels are being used for agricultural purposes. More than 30 km^2 of forest belongs to the village.

Box 1. What is a Vulnerability Assessment?

The aim of a climate change vulnerability assessment (VA) is to identify who and what is vulnerable to changing future climate, including increasing variability and extreme weather events. Vulnerability is usually defined as a function of three factors: **Vulnerability = Exposure x Sensitivity x Adaptive capacity**. This document observes each factor in turn and highlights some of the potential adaptation measures.

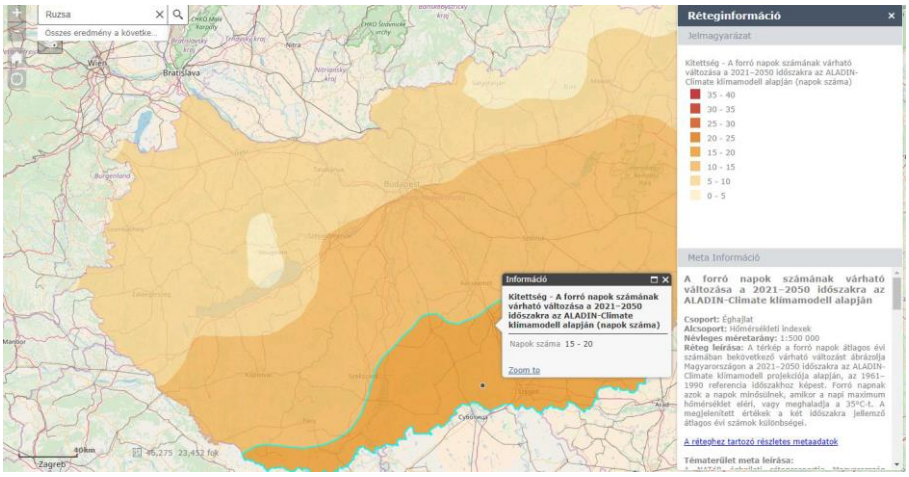
Key economic sector:
Most of the inhabitants work in the agricultural sector, growing water-intensive grains, vegetables and fruits.
Infrastructure:
The village has several public facilities which includes a social day-care facility, kindergarten, elementary school, health center and a nursing home for the elderly. However, the infrastructure of the settlement's outskirts is poorly developed. Farms are scattered around the area and the proportion of paved roads is very low (only 6km out of the 300 km total) which makes travel a lot more challenging.

Exposure: climate hazard mapping

Exposure is defined as the degree to which something experiences a climate related hazard, such as an extreme weather event that is capable of causing harm. Key climate hazards in Ruzsa were identified based on data from NATÉR[1] and are summarized in the table below.

1. Figure Waterlogged area in the outer area of the settlement. These now rare events and areas were previously common.

[1] Nemzeti Alkalmazkodási Térinformatikai Rendszer – A country level database for Hungary of projected climate impacts and various vulnerability indices. Available at: http://nater.mbfsz.gov.hu/



Rise in heat wave days 2021-2050

Climate factor	Current state / change already seen	Future change
Mean annual temperature	10-11 °C (based on the 1961-1990 baseline)	1,5-2 °C increase till 2021-2050
Temperature extremes, heat waves	0,6-0,7 heat wave days/year on average between 1961-1990	15-20 days increase in heat days/year for 2021-2050
Mean annual precipitation	525-550 mm (based on the 1961-1990 baseline)	0-25 mm decrease is expected till 2021-2050. Unevenly distributed across seasons.
Precipitation extremes (days with > 30 mm precipitation)	0,5-1 day per year between 1961-1990	1-1,5 day per year projected for 2021-2050
Droughts (expressed as aridity index: precipitation/potential evapotranspiration)	Aridity index: 0,85 between 1961-1990	Aridity index change between 2020-2050: 0,1-0,15 point decrease (meaning increased aridity)

Viewing the data above it is clear that the **annual temperature** is going to **rise** in the coming years while the **precipitation** overall will **decrease**. **Extreme weather events** related to both temperature and precipitation will **become more frequent**. However, **change in the precipitation** is predicted to vary **across seasons**. For example, it's **intensity** (mm/day) will **decline during summer** and **increase in other seasons**. **Dry periods** are expected to **decrease during spring** precipitation sum and intensity is predicted ton increase, which may result in sudden flooding, raising questions regarding water drainage and retention. Overall the **distribution of precipitation between dry and wet periods will become less even**, and this can cause more severe problems related to water management.

Box 2. Perception of climate change in the local community

We interviewed local and regional farmers, the local agricultural officer, local leaders, the regional doctor and the leader of the central medical service.

They mentioned the following as the most harmful already noticeable impacts of climate change:

- growing numbers of allergy
- increasing of the unpredictability of yield
- growing chance of diarrhoea during heat waves, especially in young and elderly population

Sensitivity analysis

Sensitivity is defined as the degree of harm a hazard can cause to something.
Healthcare: The population is most sensitive to heat waves (number of ambulance calls increased during summer) and weather fronts. Mild winter causes harmful bacteria to proliferate faster and flu epidemics can be more intense. The most endangered are pregnant women, chronic patients and elders.
Agriculture: The most important economic sector in the settlement and it is highly sensitive to droughts, late frosts, extreme weather events (e.g. strong wind, hail or large amount of rain), inland waterlogging and pests.

Adaptive capacity

Adaptive capacity is the ability to modify circumstances and improve flexibility to reduce vulnerability.
There are a lot of public facilities and NGOs that can take part in reducing the settlement's vulnerability.
NGOs: They help farmers to collaborate, they give information to residents and they can raise awareness and change attitudes.
Public facilities: They give information and help the local government in changing people's point of view.
Environment of the settlement: It's important for raising the quality of the inhabitants' life and mitigating damages. There are parks and green areas in the center of the village and there are no unnecessarily covered surfaces. Drought-resistant plants are being planted to set a good example.

Key Vulnerabilities in Ruzsa

Climate hazard	Sector and relevant threat	Sensitivity *LOW/MEDIUM/HIGH*	Adaptive capacity *LOW/MEDIUM/HIGH*	Potential adaptation measure
Heat waves	Population – there are more people feeling sick in the summer	HIGH	MEDIUM	Providing drinking water, installing humidity gates, informing about extremities
Droughts	Agriculture – diminishing water supply, microclimate getting hotter	HIGH	MEDIUM	Natural Water Retention Measures, resistant plant varieties, rainwater collection
Strong wind and hail	Agriculture – seeds being carried away, damage to fruit crops	LOW	LOW	Informing about extremities, more resistant plant varieties, restoring protective field margins
Late spring frosts and snow	Agriculture – damage to fruit crops and trees, late sowing and harvesting	MEDIUM	LOW	Informing about extremities, more resistant plant varieties
Mild winter	Population – flu and other sicknesses are more common Agriculture – pests and	MEDIUM	MEDIUM	Informing the population, resistant plant varieties

	bacteria survive			

Recommended adaptation measures

One adaptation measure targeted at vulnerability arising from changing water cycle is already implemented as part of this LIFE project (**see Box 3.**) This assessment identified further potential adaptation measures, the implementation of which is subject to further funding:

Agriculture:

- Creating pilot projects which could include water efficient agricultural techniques as well as finding and cultivating plant varieties that are adapted to the changing climate and need less water.
- Constructing more Natural Water Retention Measures (NWRMs).
- Stronger cooperation between regional towns and villages to improve water retention and create shared projects.
- Initiating tree-planting programs – restoring forested areas (protection margins) next to fields.
- Surveying and measuring the channel system of the outskirts (e.g. clarifying property relations).

Public health and infrastructure:

- Providing drinking water at the public facilities during summer months.
- Placing outdoor misting gates throughout the village.

Raising awareness:

- Giving information to farmers about the "collective greening" opportunity under CAP.
- Organizing informative events about local, climate-adapted crop production and about alternative solutions (e.g. biointensive agriculture).
- Informing the population about extreme weather events as well as about tasks and opportunities.
- Organizing competitions and informative events for children.
- Establishing Vízbarát Települések Egyesület (Union of Water-Friendly Municipalities).
- Promoting rainwater harvesting, installing rainwater harvesting systems at public facilities.

Natural habitat restoration:

Box 3: Measures already being taken – Natural Water Retention Measures at Ruzsa

In Ruzsa, a water retention plan is being developed to adapt to climate change using the channel network of the outskirts, the decanted water from the local drinking-water purification plant and effluent greywater from the sewage treatment plant. Two artificial lakes will be created – one for the decanted water (10-15 m^3/day) to be retained in a park pond within the settlement, and one for the effluent wastewater (200 m^3/day) which will be gathered in a wetland outside the settlement in order to recharge groundwater. Both lakes will improve the microclimate of the area. Four parts of the channel system are also going to be transformed for the purpose of water retention, and as a result inland water will be retained and will recharge depleted groundwater reservoirs. Moreover, it is an important part of this LIFE project to raise awareness at local level and involve farmers in the collective effort to make agricultural techniques more environmental and climate friendly under the collective greening programme of the Common Agriculture Policy (CAP).

- Rehabilitating former wetlands that were transformed to arable ladn.