Climate Change Vulnerability in Tiszatarján

– Municipality of Tiszatarján, Borsod-Abaúj-Zemplén County, Hungary –

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

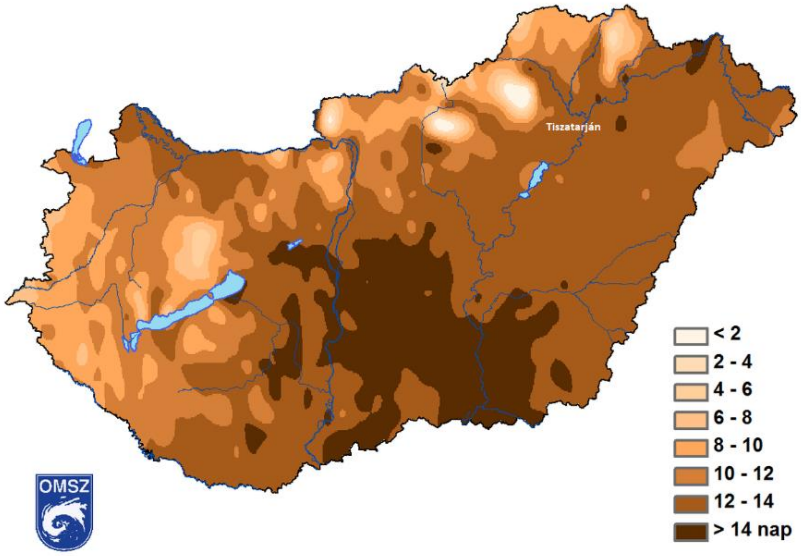
Introducing Tiszatarján

Location: North-east Hungary, on the west side of Tisza river. Tiszatarján is 8km to the east from Mezőcsát, and 5km to the north from Tiszakeszi.
Area: 40,39 km^2
Population: 1437 (in 2015)
Geography: The settlement lies on the previously flood prone but now protected lowlands along Tisza river. The still active floodplain outside the settlement is of paramount importance, a quarter of the settlement's area is part of it. The unpredictable circumstances on the floodplain are the main causes of the settlement's vulnerability. The growing frequency and amplitude of floods, length of droughts and inland waterlogging causing increasing hazards connected to agricultural losses, periodic water scarcity and spreading of invasive plants.
Key economic sector: The key economic sector is agriculture. We have a lot of farmers, typically grown crops are corn, sunflower and wheat, and willow is also grown on the floodplain to supply biomass for heating. There is also meat processing plant, a pig farm, and to a limited extent extensive cattle grazing on the floodplain.
Infrastructure: The village has a kindergarten, a study hall, a primary school, a social day-care facility for the elderly, a sports hall, a pharmacy and a doctor's office.

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.

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 Tiszatarján were identified based on data from NATéR[1] and CARPATCLIM and National Meteorological Service (OMSZ); and are summarized in the table below.



Number of hot days (daily average temperature 25 OC) per year in 1961-2016.

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Climate factor	Current state / change already seen	Future change
Mean annual temperature	10,64 °C in 2010	1,5-2 °C increase till 2021-2050 compared to 1961-1990 baseline
Temperature extremes, heat waves	0,82 day per year between 1961-2010	78-86% increase in heat days/year for 2021-2050
Mean annual precipitation	500-530 mm per year between 1961-2010	50-0mm decrease till 2021-2050 compared to 1961-1990 baseline
Precipitation extremes (days per year with >20 mm precipitation)	2-2,5 days per year between 1961-2010	0,5 – 0 days decrease projected for 2021-2050

Sensitivity analysis

Sensitivity is defined as the degree of harm a hazard can cause to something.

Public health: In terms of heat waves, Tiszatarján is highly sensitive, as the population is ageing. On heat days visits to the doctor (GP) is more frequent. Problems with blood pressure are the most common symptoms. Elderly people, newborns and people suffering of cardiovascular diseases are especially susceptible to mortality resulting from high temperature.

Box 2. Perception of climate change in the local community

The most important local stakeholders – doctor, local agricultural entrepreneur – were involved through face-to-face interview. They mentioned that the following effects of climate change are felt:

Human health: heat waves, allergy to pollen, infections caused by mosquito bites are more frequent.

Livelihoods: inundation of basements, weather extremities, and inland waterlogging are increasing.

Agriculture is the most important economic sector in Tiszatarján. The main crops are wheat, corn and sunflower. Agriculture is highly sensitive to damage caused by heat waves and inland waterlogging. The farmers mentioned that from early spring to summer the inland waterlogging, in summer the heat waves and low precipitation cause damages. Many farmers are affected by inland waterlogging, but they do not take actions.

Infrastructure is also highly sensitive to inland waterlogging. The areas that are most commonly flooded by groundwater are the newly built parts of the settlement, as these are situated on slightly lower elevations. Groundwater flooding mostly affects gardens where small scale farming is taking place; and agricultural land. Furthermore, many houses have a cellars that are often flooded.

Adaptive capacity

Adaptive capacity is the ability to modify circumstances and improve flexibility to reduce vulnerability.

Households: in Tiszatarján most of the population works in public employment, their income and level of education are both low. The majority of the population received only primary education, or skilled worker certificate. As a

result, due low financial resources and education the majority of households in Tiszatarján have a low adaptive capacity.

Healthcare: Health centre follows the national protocol for heat waves. Currently public and social care institutions do not have heat wave action plans, and there is no signal system through which lone elderly in need could ask for help.

Agriculture: Tiszatarján has many farmers. They have better financial means and capacity to adapt. There is an irrigation channel around their lands, but it is not maintained by the national water management authority.

Water management: Observation of weather and water related phenomena is not carried out currently.

Within the framework of this LIFE project, the municipality of Tiszatarján will gain knowledge, expertise and resource in the field of climate adaptation, as well as inform its population, making it more adaptable overall.

Key Vulnerabilities in Tiszatarján

The below table summarizes the arising vulnerabilities based on the above analysis, and ranking table that was prepared along with the original VA study.

Climate hazard	Sector and relevant threat	Sensitivity	Adaptive capacity	Potential adaptation measure
Heat waves	Population- blood pressure problemes	***HIGH*** – elderly and newborns	***LOW*** – due to low income and education	Education, awareness, alarm system
Heat waves	Public and social institution	***HIGH*** – no heat plan	***LOW*** - emergency centre within 40 minutes, in Miskolc	Shading, action plans developing.
Extreme rain	Households- flooding of cellars	***MEDIUM*** - old buildings	***LOW*** – due to low income	Nature based water retention (NWRM)
Droughts	Agriculture – crop yield decrease	***HIGH***	***MEDIUM*** – no good irrigation and drainage opportunity	NWRM, irrigation, education
Inland waterlogging, groundwater flooding	Agricultural, households	***HIGH***	***LOW*** – no draining system	Documentation inland water areas, Revision of settlement planning guidelines

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:

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Heat waves plan: The public institutions should develop heat wave plans detailing how to respond to heat waves. This should include shading of buildings, air-conditioning, changing ordinary routines.

Education: This is the most important recommended adaptation measure targeting local population. In the kindergarten and the primary school presentations should be given on climate change, its causes, effect and threats. Training should also be given on what precautionary measures to take during heat waves.

Knowledge: Documentation of time periods and areas affected by inland waterlogging will help in preparing and adapting the settlement planning guidelines accordingly. If we take photos, mark the location and measure the inland water level, we could monitor the amount of inland water and the damage caused.

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

In Tiszatarján, vulnerability to inland waterlogging, heat waves and droughts is already being addressed through a nature based cross-cutting solution. It involves the revitalization of a former clay-pit on the active floodplain where floodwater can be retained. Previously, invasive shrubs have been cleaned and willow has been planted on the floodplain to supply biomass for energy, and extensive cattle grazing has been re-established. As a final element of this complex land use model a visitor path will be constructed within this project to attract tourism, and provide a diversified and increased income source for the local population, in order to raise adaptive capacity.

Natural Water Retention Measure: Tiszatarján is already implementing an NWRM measure through this LIFE-project (see Box 3). The concept of NWRM is to retain water during flooding events of the Tisza river for periods of drought on the active floodplain. An other important element is learning from good practice examples and developing an international relationship.

Site of planned water retention lake in the flood basin, which is the habitat of grey cattle and water buffalo.

This vulnerability assessment was prepared by the municipality of Tiszatarján as part of the LIFE-MICACC – Municipalities as Integrators and Coordinators in Adapting to Climate Change project, LIFE16 CCA/HU/000115. For more information, visit: **www.nwrm.bm.hu** or www.tiszatarjan.hu

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