Climate Change Vulnerability in Bátya

– Municipality of Bátya, Bács-Kiskun County, Hungary –

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

Introducing Bátya

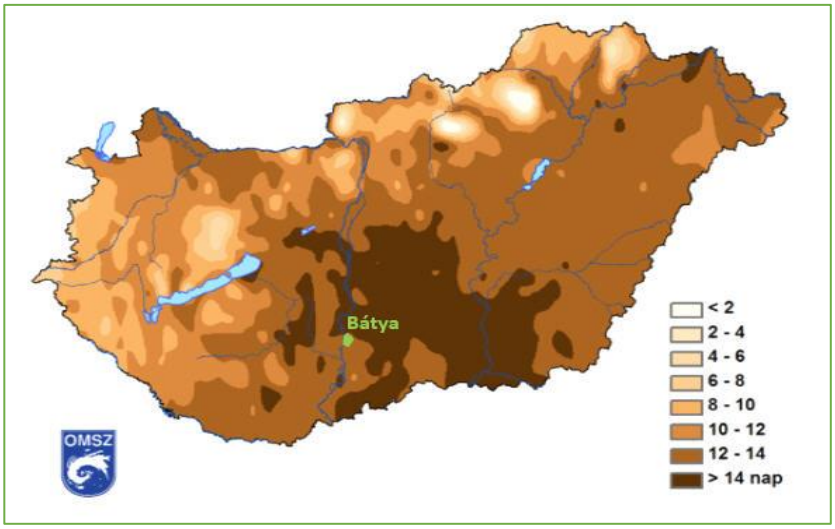
Location: Central-southern Hungary, on the east side of the Danube river. The nearest city is Kalocsa, 5 km away.
Area: 33.86 km^2
Population: 2 150 inhabitants
Geography:
The settlement lies on the lowland along the Danube river, and a main drainage and irrigation canal (Sárköz I. főcsatorna) is also crossing the settlement. The balance of the average precipitation and the calculated evaporation is negative in the region (-300 mm).
Key economic sector:
A key economic sector is agriculture, the region is renowned in Hungary for growing very high-quality spices, paprika and garlic. These products are processed and packaged locally, and there is also a small food company producing pickles and conserves. Besides the large-scale intensive agriculture, many people are producing on small plots of land for own use or the local market. 87% of the outer land of the settlement is arable land.
Infrastructure:
The village has well developed infrastructure and public facilities by local standards, which includes a kindergarten, a social day-care facility for the elderly, a community building and library, health centre, pharmacy and dentistry. There is also a sports hall, an outdoor football field, and green spaces with playground.

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 Bátya were identified using NATÉR[1], and models and data from National Meteorological Service (OMSZ); and they are summarised in the table below.

Number of hot days (daily average temperature > 25 °C) per year in 1961-2016



[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/

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Climate factor	Current state / change already seen	Future change
Mean annual temperature	1.5°C increase since year 1901	1-2°C increase till 2021-2050 compared to 1961-1990 baseline
Temperature extremes, heat waves	currently 12-14 heat wave days/year	5-30 days increase in heat days/year for 2021-2050
Mean annual precipitation	550-600 mm, modest increasing trend (6%)	Uncertain, but distribution is likely to change
Precipitation extremes (days with >30mm precipitation	0.5-1 day per year between 1961-1990	1-1.5 days per year projected for 2021-2050
Droughts (based on Pálfai drought index)	0.8-0.85 points, highest in the country between 1960-1990	Strongest increase projected (0.75-1.5 points)

Data shows that Bács-Kiskun county has seen an average annual **temperature increase of 1.5°C since 1901**. It is however the climate extremes that pose greater threat. Bátya is situated in the region that is most hardly hit by **heat waves** within the country, defined as days when the daily mean temperature exceeds 25°C. Currently Bátya is experiencing 12-14 heat days annually, a number that is projected to increase both in intensity and longevity by 5 to 30 days (note the high uncertainty) by 2050.

Distribution of precipitation is also changing: since the beginning of the century, the same amount of annual precipitation is falling on the area, but the **number of days with precipitation has decreased** by 20. It implies that **rain events** are becoming less frequent but **are intensifying**, (the frequency of 30 mm precipitation days per year will roughly double by 2050, with a higher likelihood of occurrence during the summer). Bátya traditionally has been exposed to droughts, and based on the climate projections the **periods of drought will become longer** and probability of occurrence will increase. The probability of inland waterlogging will also increase, especially on the eastern part of the settlement.

Sensitivity analysis

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

Public health: In terms of heat waves, Bátya is highly sensitive, as the **population is ageing**. Heat periods are already causing statistically significant increase in death rate, which is projected to increase by 20% compared to an average non-heat day. Elderly people, newborns and people suffering of cardiovascular diseases are especially susceptible to mortality resulting from high temperatures.

Agriculture and food industry are the most important economic sectors in Bátya. The main crops are water-demanding vegetables (e.g. red pepper, beans, cabbages) and garlic. Agriculture is highly sensitive to damage caused by drought, and moderately to damage by waterlogging. Farmers reported facing droughts in 4-6 years out of 10, and inland waterlogging in 2 years out of 10.

Housing is also highly sensitive to waterlogging and extreme precipitation. A high proportion of buildings are old (34% built before 1945), and most of them have not been modernised. The share of houses built of mud and clay is even higher (48%), although the majority of them are unoccupied, and these are highly sensitive to waterlogging or intensive rain events. Furthermore, many houses have cellars that are often flooded.

Box 2. Experiences of the local community regarding climate change

Most important local stakeholders – doctor, water management expert, local agricultural entrepreneur – were involved through face-to-face interviews.

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

Human health: heat waves, allergy to pollens, infections from tick bites.

Livelihoods: inundation of basements/cellars, weather extremities, damages by storms.

Drinking water supply in Bátya is provided from the Danube through bank-filtered wells. This system is sensitive to the extreme fluctuations in the water regime, which is predicted to become more frequent.

Adaptive capacity

Adaptive capacity is the ability to modify circumstances and improve flexibility to reduce vulnerability.
Households: in Bátya, the employment rate is relatively low (50.7%), and the unemployment rate is higher than the national and regional average. On top of this, the 32.8% of the population received only primary education (1-8 grades). As a result, due to low financial resources and education the majority of households in Bátya have a low adaptive capacity.
Health care: the health centre follows the national protocols 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: some 41% of land is farmed by 4 farmers, these large farms have better financial means and capacity to adapt. Further, the proximity of the Sárköz I. irrigation canal makes irrigation development as well as fighting inland water logging relatively easy. However, the irrigation system is not owned by the farmers, making them dependent on the water supplier company.
Water management: observation of weather and water related phenomena is carried out by farmers and public institutions. Sustainable urban drainage is currently under development.
Furthermore, within the framework of this LIFE project, the **municipality** of Bátya will gain knowledge, expertise and resources in the field of climate adaptation, as well as inform its population, making it more adaptable overall.

Key Vulnerabilities in Bátya

The below table summarizes the arising vulnerabilities based on the above analysis, and a 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	Public and social institutions	**HIGH** – no heat plans, no air-conditioning	**MEDIUM** – emergency centre within 10 minutes, in Kalocsa	Developing heat wave action plans, shading
Heat waves	Population – increased fatality, heart diseases, other health problems	**HIGH** – aging population	**LOW** - due to low income and education	Education, green spaces and shading, alarm system, drinking water
Extreme rain	Housing – flooding of cellars, damage	**MEDIUM** – old buildings	**LOW** - due to low income	Nature based water retention (NWRM)
Droughts	Agriculture – crop yield decrease	**HIGH**	**HIGH** – good irrigation and drainage opportunity, large farms	NWRM; Irrigation; education; funding opportunities, rainwater harvesting

Climate risks were assessed by their probability of occurrence and their potential impact on the settlement. Some with high probability with a relatively high impact are skin diseases due to high UV radiation, damage in agriculture, and drop of the underground water table.

Recommended adaptation measures

In Bátya, the following most important actions were identified that may be taken to reduce risks stemming from climate change.

Heat wave plans: public institutions should develop heat-wave action plans on how to respond to prolonged heat-waves. These could include shading, providing water, air-conditioning, changing ordinary routines to reduce exposure to heat.

Adapting to heat waves: increasing the proportion of green public spaces to cool the micro-climate, providing free drinking water at key points in the settlement, install shading in bus-stops and other places, and building an alarm system for elderly people who live alone and have a higher risk of suffering form heat-related diseases.

Awareness raising: promote rain water harvesting and other nature friendly approaches among people to cope with the foreseen changes. Include nature observation in the programme of the local schools. Inform people about the necessary precautions in time of heat waves.

In the **agriculture** sector, increasing **awareness of funding opportunities** among farmers for greening and sustainable water management – either through **nature based water retention or through irrigation** development – would reduce vulnerability.

Natural Water Retention Measures: the concept of NWRM is to retain water during heavy rain events for periods of drought in natural, green areas. Bátya is already implementing an NWRM measure through a LIFE project (see Box 3). Constructing green roofs on public buildings is also planned.

Box 3. Measures already being taken – Natural Water Retention Measures at Bátya

In Bátya, vulnerability to droughts, heat waves and extreme precipitation is already being addressed through a nature based cross-cutting solution. It involves the revitalization of a former clay-pit as a wetland, into which rainwater collected from parts of the settlement will be diverted. With this recreated pond of 1 ha, extreme high precipitation can be retained to recharge the groundwater level, and an open surface lake will help regulate micro-climate, and provide other ecosystem services such as recreation for people and habitat creation for wildlife.

Site of planned water retention lake where rainwater falling on the settlement will be collected, situated just outside the village of Bátya. The wetland used to be a lake with permanent open water surface, but is currently dry.

The Vulnerability Assessment of Bátya and its present summary were created in 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.**

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