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# Implementation of Climate Change Strategies in Hungary

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ACCORDING to the United Nations Framework Convention on Climate Change (UNFCCC) and its implementation framework, Hungary is obligated to compile a National Climate Change Strategy (NCCS). The first and the reviewed version (NCCS-2) were completed for the period of 2008-2025 and 2017-2030, respectively, with an outlook until 2050. The objectives of the UN and the EU determine the planning and interventional tasks and they are in accordance with them. As part of the Environmental and Energy Efficiency Operative Program (EEEOP), the European Union and Hungary support the development of county-level and local climate strategies. Since for the adaptation to be successful, the collaboration between different planning levels is of paramount importance, in our study we aim to investigate how well the documents compiled in the Hungarian planning levels are integrated and whether they are in accordance with the international objectives. Furthermore, we also investigate the degree of which the compiled strategies focus on locally arising problems. The county-level climate strategies have been already completed in the framework of the EEEOP tender, while the development of strategies for the settlements is currently in progress. The county-level climate strategies completely cover the national objectives, which are in accordance with the objectives of the EU. The county-level climate strategies contain specific objectives regarding the given county, depending on how the climate change is expected to impact the region, as well as the economic, social and natural attributes of the counties.

## Introduction

Climate change is one of the most important challenges facing humanity today. The socioeconomic changes of the previous 200 years have resulted in fundamental changes in the Earth's climate system (Howard-Grenville et al., 2014). Throughout the world, there are more than 1500 legal regulations and political documents directly relating to climate change (Nachmany - Setzer, 2018). Global climate policy and the foundations for the objectives laid down in international requirements are based on scientific reports developed as a result of the modelling and impact analysis investigations of the Intergovernmental Panel on Climate Change (IPCC) established by the United Nations (UN), the creation of which was initiated by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO). According to the so-called five Assessment Reports published between 1990 and 2014 by the organization, as well as several other reports, changes in the climate have had a widespread impact on both society and natural systems. During the previous thirty years the surface of the Earth has been warmer than in every other decade since 1850 (IPCC, 2014).

The operative tasks connected to climate change can be interpreted on multiple levels. Global level tasks are predominantly coordinated by UN organizations, while the requirements are determined by international regulations. The next level of strategic planning are supranational organizations which involve several countries, such as the European Union (EU). The national and subnational climate change strategies should be aligned with international objectives (in fact, they are often more ambitious in their objectives).

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The aims of our study are the following: (1) to investigate the climate change strategies of European countries; (2) since cooperation between various levels is necessary to achieve success with mitigation and adaption, to investigate the climate change strategies compiled at different Hungarian planning levels (national and county-level) and evaluate the degree to which they are aligned with each other and with international objectives; (3) to describe the existing Hungarian national and county-level climate change strategies, and based on these strategies, describe and evaluate the relevant climate changes issues from the standpoint of the individual counties; (4) to investigate the degree to which the existing county-level climate change strategies focus on problems which can be expected to emerge locally as a result of climate change.

## Material and Methods

*Description of the sample area*

Hungary is located in the center of the Carpathian basin (Fig. 1). It can be divided into six large regions, and 82.4% of its area has an altitude lower than 200 m, with only 0.6% of its area exceeding an altitude of 500 m (Kocsis, 2018). Hungary is located in the temperate zone the major characteristics of which are the alternation of four seasons and the dominance of westerly winds. One of the characteristics of its climate is the great temporal variability, mainly caused by the fact that it is impacted by oceanic, continental and Mediterranean effects due its geographic location. The number of annual sunshine hours varies between 1900 and 2000. The annual mean temperature is between 10 °C and 11 °C. In Hungary, precipitation shows great variability in both spatial and temporal senses. The national mean is 580 mm; however in the most arid regions of the Hungarian Great Plain we can find values lower than 500 mm, while the mountain regions are characterized by values above 700 mm (Bihari et al., 2018).

Hungary can be divided into 7 planning-statistical regions (NUTS2), 19 counties (Fig. 1) and 197 districts. Hungary has 3155 settlements in total, with 346 cities and 2809 towns. Its population is 9.779 million, of which 4.671 million are men (47.8%), and 5.106 million are women (52.2 %). Its population density is 105.1 people per km. The capital of Hungary is Budapest with a population of 1.749 million. As regards age distribution, 14.5%, 66.5 %, 18.9% of the population fall into the 0-14, 15-64 and above 65


**Fig. 1. Mesoregions and administrative regions of Hungary**

years of age categories, respectively (KSH, 2018). The average life expectancy at birth is 75.8 years. The rate of natural population change is -4.1 per 1000 capita. Regarding the education level of the 15-74 age group, the proportion of people with primary or lower level education is 22.1%, the proportion of people with a secondary education is 57.6%, while 20.3% of the population has a university degree. In Hungary the GDP/capita is 14 287 USD. Regarding sector composition, 4.4%, 30.9% and 64.7% of the population work in the agricultural, industrial and service sectors, respectively (KSH, 2017).

*Hierarchy of the climate change related strategies investigated*

Global level tasks are coordinated by UN organizations. We mentioned earlier the IPCC, whose working groups are dedicated to the following tasks:

- The first working group investigates the climate system and attempts to report on and analyze historical changes and make predictions about expected long-term changes.
- The aim of the second working group is to evaluate sensitivity to the global and local impacts of climate change, their socioeconomic impacts and the possibilities for adaptation.
- The third working group focuses on the factors inducing global changes and possible ways to mitigate them.
- Finally, the fourth working group attempts to investigate the methodology used to assess the climate-modifying properties of greenhouse gases (Internet1).

The IPCC does not produce new research but summarizes appropriately supported results published by various scientific institutions and researchers (Faragó, 2016b). The United Nations Framework Convention on Climate Change (UNFCCC), which was signed in 1992 and came into effect in 1994, and the Kyoto Protocol, which was signed in 1997 and came into effect in 2005 were established on the basis of the first assessment report of the organization, which was published in 1990. These were the first obligatory international agreements attempting to decrease the rate of greenhouse gas emissions. According to the report, the rate of decrease should be 5.2% relative to the base year of 1990 for the period between 2008 and 2012. In the case of Eastern and Central European regions going through a regime change in the 1990s, the base year was set as the average emissions of the period between 1985 and 1987 before the collapse of socialism. The commitments made by different states varied. The 15 member states of the European Union collectively committed to a change of 8%, whereas in Hungary the objective was 6%. The largest greenhouse gas emitting countries (USA, China, India, Brazil and Canada which withdrew in 2011) refused to sign the protocol (UNFCCC, 1992, United Nations, 1998).

In order to meet the international requirements and their supportive mechanisms (GHG trade system) the signatory countries had to establish national (majorly mitigation) strategies. Approaching the year 2012, which was included in the protocol, according to the IPCC a 25-40% decrease in global emissions by 2020 was necessary. Due to the increasingly stringent requirements, the USA, Canada, Japan, New-Zealand and Russia protested. The most recent milestone of global climate policy was the Paris Agreement, accepted on December 12, 2015, which is a legally binding internationally harmonized framework to stop climate change (Dimitrov, 2016). It aimed to prevent the global mean temperature from exceeding the +2 °C considered to be an irreversible turning point relative to the pre-industrial era, and to achieve control even at a level of +1.5 °C (Agreement, P., 2015; Obergassel et al., 2015; Obergassel et al., 2016; Oztig, 2017). The above objective was established in such a way as to allow the maintenance of food production and economic growth at the same time (Rogelj et al., 2016). This time the Agreement does not include specific values for emission decreases for individual countries, but its implementation forces the signatory countries to further significantly decrease their rate of greenhouse gas emissions and increase their adaption to the unfavorable changes in the climate (Streck et al., 2016; Faragó, 2016a; Faragó, 2016b; Falkner, 2016).

The next level of planning is supranational organizations involving several countries, such as the European Union. The EU has a leading role in the international battle against uncontrollable climate change (Keskitalo, 2010). Since 2000, sustainability, environmental protection, renewable energies and energy efficiency have been priorities in the Green Books. Since 2000, the EU emissions trading system (EUETS) for greenhouse gases has been also in operation. The most important principle of climate policy

is integration, i.e. climate policy should be integrated into community level policies with special regard to development policies. Measures taken in connection with climate change should not be planned and implemented individually but in accordance with community-founded plans and developments (European Commission, 2013; Helm, 2014). The objectives established in the Climate and Energy Package program of the EU are the following: a 20% decrease in greenhouse gases relative to the year 1990, a 20% increase in energy efficiency, and a 20% increase in the proportion of renewable energy sources (Internet2; da Graça Carvalho, 2012; Oztig, 2017). In the EU, the proportion of biofuels should be increased to 10% of all liquid fuels by 2020. The 10% commitment applies to each member state of the European Union; however, the greenhouse gas emissions decrease, the proportion of renewable energy and energy efficiency increases are community level objectives which vary from country to country. Regarding the period until 2020, discussions are currently in progress at international and community levels, and these also concern the long-term objectives and measures to be taken to reach them for the period until 2050. The objectives of the EU for 2030 are the following: a 40% decrease in greenhouse gas emissions, a 27% increase in the proportion of renewable energies and the further development of the ETS system (Internet3; Oztig, 2017). Long-term objectives until 2050 include developing a competitive economy with low $CO_2$ emissions, decreasing the rate of greenhouse gas emission by 80%, decreasing energy usage by 30% and the use of clean energy sources, and the introduction of a wide-range use of electric cars, thereby decreasing air pollution (Internet 4; Oztig, 2017).

The most important objectives of the UN and the EU determine the national planning tasks to a large degree. In Hungary, the first version of the National Climate Change Strategy (NCCS) was compiled for the period 2008-2025, and its revised version, the Second Climate Change Strategy of Hungary (NCCS-2) (with an effective date of October 31, 2018) was compiled for the period 2018-2030 with an outlook for 2050. According to the NCCS, the three main directions of the Hungarian climate change strategy are the following: 1. Mitigation 2. Adaptation 3. Change of Approach.

The objectives of the NCCS determine the framework of county level planning. In Hungary, the county level climate change strategies were compiled in the framework of the Environment and Energy Efficiency Operational Programme between 2017 and 2018, based on a standardized guideline and are in accordance with national objectives. The methodology was compiled by the National Adaptation Center Department of the Mining and Geological Survey of Hungary on behalf of the Association of Climate-Friendly Municipalities. In Hungary, there was previously no standardized guideline regarding the compilation of climate change strategies. The aim of the methodology is to make it possible to develop standardized comparable strategies (Taksz, 2017). In Hungary, the compilation of settlement level strategies is still at an early stage. The above-mentioned climate change strategies developed for various planning levels were compiled in a hierarchical structure (Fig. 2).

Generally speaking, the subnational initiatives have more stringent objectives than the national strategies (Schreurs, 2008; Antal, 2014); therefore, they play a key role in the battle against climate change (Hakelberg, 2014). Several international examples can be found of local initiatives (Antal, 2014; Pablo - Romero et al., 2015; Internet5; Betsill - Bulkeley, 2004; Mayer-Ries, 2013; Internet 6; Antal, 2018). For example, the Under2 Coalition is an umbrella organization for regions, provinces, federal states and large cities whose collective strategic commitments guarantee the achievement of global results (Internet 7).

*Data collection*

During our work, we compared two databases in which we store the various types of European climate change strategies and issues related to Hungary's county level climate change strategies. During the data collection, we used the documents in the database of the Grantham Research Institute on Climate Change and Environment to categorize the national climate change strategies on the basis of their level of complexity. During the investigation 4 groups were established (complex, adaptation, mitigation, none). In the case of county level climate change strategies, the issues were classified based on their levels of severity (high, medium, low). The thematic maps of results were created using the 10.2 version of ArcGIS Desktop.

## Results

*Strategies of the European countries investigated*

In our study we investigated 48 European countries of 28 which are members of the EU and 20 are non-members. During the study we established 4 categories: 1. Countries with a complex strategy (adaptation and mitigation); 2. Countries with only adaptation strategies; 3. Countries with only mitigation strategies; 4. Countries where

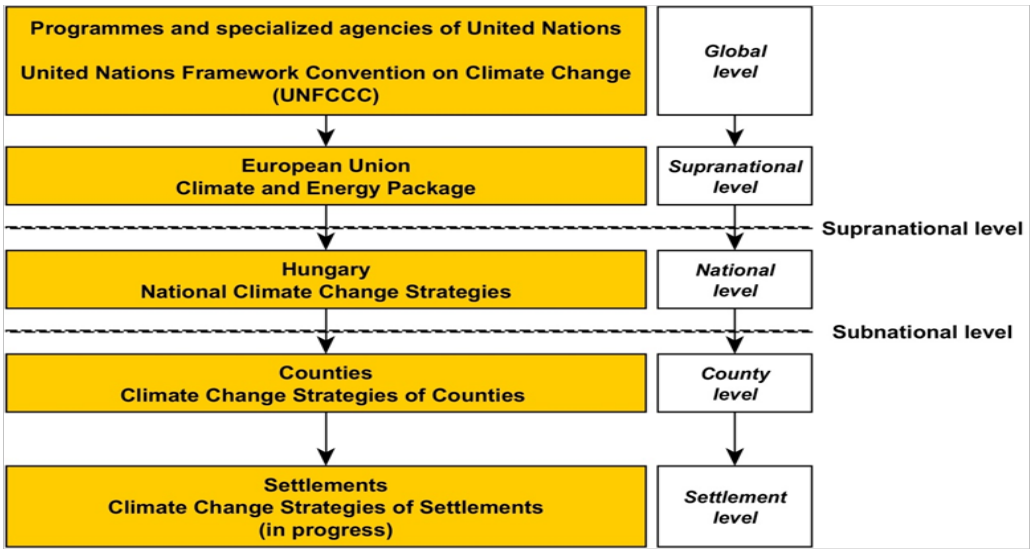


**Fig. 2. The hierarchy of Hungarian climate change strategies**

no strategy is in place (Fig. 3 & Fig. 4). It is not enough to focus either on mitigation or adaptation, because these are two complimentary aspects of climate change, and the issue should be treated with a holistic approach. The two strategies do not always complement each other; moreover, they can even be contradictory (Laukkonen et al., 2009; Pietrapertosa et al., 2017). Consequently, beyond rethinking the national mitigation strategies, newer strategic planning levels should also be introduced, with an increasing importance of adaption in the planning (Keskitalo, 2010).

Among the countries investigated, in 24 (50%) both adaptation and mitigation strategies can be found. Of these countries, 18 are members and 6 are not members of EU. Of the 7 countries with only an adaptation strategy (14.58 %) 4 are members and 3 are not members of the EU. There are 3 countries where only mitigation strategies are in place (6.25 %), all of which are members of the EU. In 14 countries there is no climate change strategy at all (29.17 %), of which 3 countries are members of the EU (Fig. 3). Of the 28 members of the EU, 18 countries (64.29 %) have adaptation and mitigation strategies (Austria, Belgium, Denmark, United Kingdom, Finland, France, Greece, The Netherlands, Ireland, Lithuania, Hungary, Malta, Germany, Italy, Romania, Spain, Sweden, Slovenia), in 4 countries (14.29 %) only adaptation strategies can be found (Bulgaria, Czech Republic, Croatia, Portugal), whereas in 3 countries (10.71 %) there is no climate change strategy in place at all (Cyprus, Latvia, Luxemburg) (Fig. 4).

From the majority of the investigated 20 non-EU countries, in 11 countries (55%) there is no strategy at all (Albania, Andorra, Azerbaijan, Bosnia-Hercegovina, Georgia, Liechtenstein, Macedonia, Moldova, Armenia, San Marino, Serbia), in 6 countries (30%) both adaptation and migration strategies can be found (Iceland, Monaco, Montenegro, Norway, Switzerland, Turkey), and in 3 countries (15%) only adaptation strategies exist (Belarus, Russia, Ukraine) (Fig. 4).

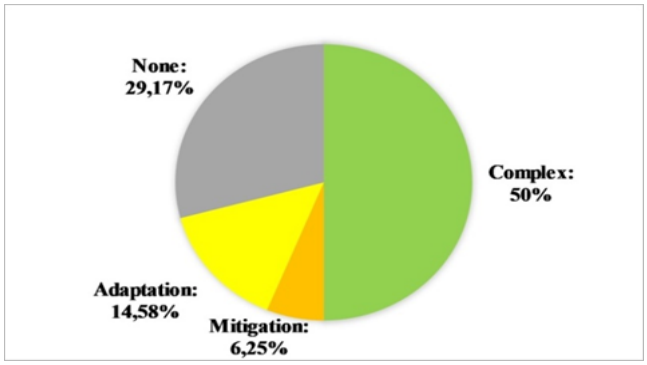


**Fig. 3. The percentage distribution of climate change strategies of the European countries investigated per category**

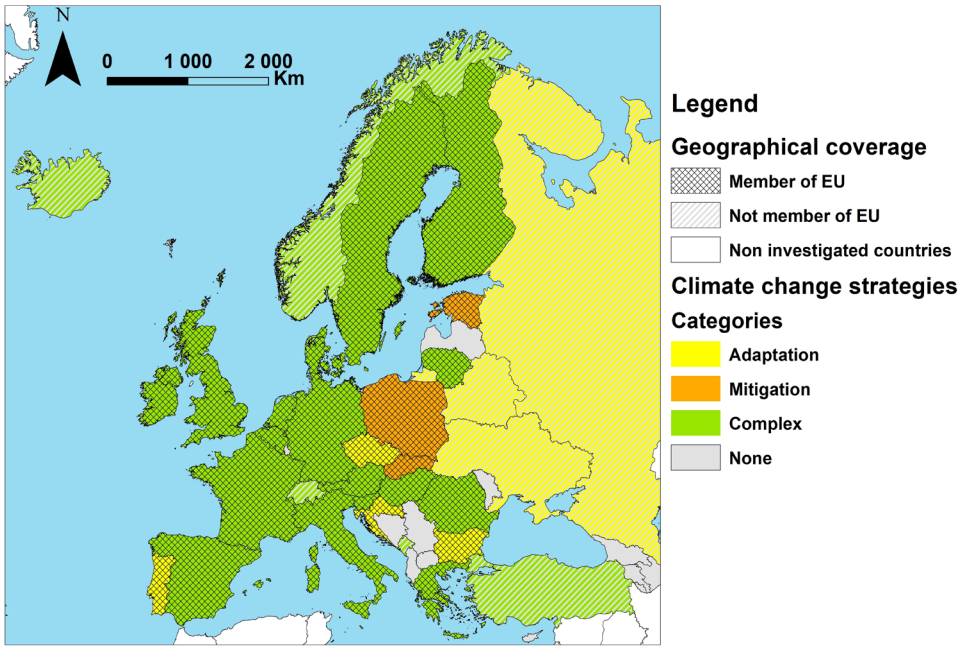


**Fig 4. The spatial distribution of climate change strategies of the investigated European countries per category**

*Analysis of county level climate change strategies*

In our study we investigated the county level strategies of Hungary's 19 counties. The county level climate change strategies were compiled in accordance with the natural resources of the counties. Based on the standardized methodological guidelines, the contents of the county level strategies mirror the structure of the national strategy:

1. General social, economic, natural assessment; expected climate changes in the county
2. Mitigation assessment
3. Adaptation assessment
4. Change of approach assessment
5. Climate-based SWOT analysis, stakeholder analysis
6. The connection points of strategies to the national and county level strategic documents
7. The prospects of county level climate change; general and county-specific objectives (mitigation, adaptation and change of approach objectives)
8. Areas of interception, measures (mitigation, adaptation and change of approach)
9. The strategic tools of implementation (management, funding)
10. Monitoring, assessment, revision

Based on the Adaptation Strategy of the EU, the Fifth Assessment Report of IPCC, the Hungarian VAHAVA (Változás, Hatások, Válaszadás; Change, Impact, Response) report, the Second Climate Change Strategy of Hungary (NCCS-2), the National Adaptation Geo-Information System (NAGiS) and other Hungarian publications, climate change is expected to have an impact in the following 10 areas:

1. Risk of river flooding
2. Risk of groundwater flooding
3. Risk of flash floods
4. Risk of drought
5. Risk to drinking water sources
6. Risk to natural heritage
7. Risk to forests
8. Risk to tourism
9. Risk to human health from heat waves
10. Risk to buildings from wind damage

The natural properties of counties are reflected in the county-specific issues of great significance included in climate change strategies. The issues - which present themselves in varying degrees in each county - are the following:

- Problems of great importance, which are key elements of the county level adaptation activities
- Problems of medium importance, for which planning of adaptation activity is recommended
- Problems of low importance, for which planning of adaptation activity is optional

Figure 5 shows the relative importance of areas of concern in the counties, according to their significance. The most vulnerable counties are the ones with several problems of great importance or few problems of low importance. In certain counties (Pest, Heves, Borsod-Abaúj-Zemplén, Komárom-Esztergom) we can find 7 problems of great importance, and a lowest value in this category is 3 (Győr-Moson-Sopron). The number of problems of medium importance range between 7 (Győr-Moson-Sopron) and 1 (Komárom-Esztergom, Bács-Kiskun, Nógrád, Szabolcs-Szatmár-Bereg, Békés). In the case of problems of low importance, the highest value is 4 (Békés); however, in a few counties (Pest, Heves, Győr-Moson-Sopron) this type of problem cannot be found at all. The NCCS and the county level climate change strategies offer explanations regarding the ranking of areas of concern in terms of importance, which will be discussed below. Among the problems caused by climate change, two (heat waves and construction risks) can be found throughout the country (although to a varying degree); therefore, these should be investigated in every county. It is important to emphasize that exposure in and of itself does not mean that every county is vulnerable regarding the given area of concern.

From the perspective of the endangerment of human health by heat waves the entire population of the country is affected, with the most vulnerable subpopulations being infants, small children, those above the age of 65, people with disabilities and people suffering from chronic cardiovascular diseases. With regards to excess mortality, the entire country is ranked among the highly endangered category considering that the rate of mortality is

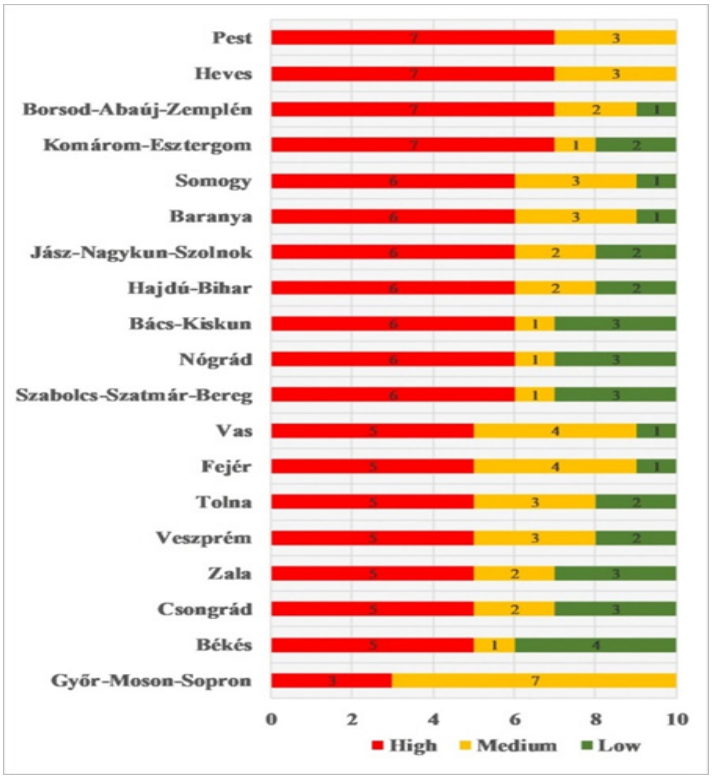


**Fig. 5. The appearance of climate change areas of concern in the counties by their significance**

expected to increase everywhere; therefore the risk caused by heat waves is a relevant climate change issue area for each county. This issue is of medium importance only in Somogy County (Fig. 6I). The same applies to the risks to buildings by wind damage, since every object in the built environment is potentially affected by wind damage, and therefore this is also a relevant issue area in each Hungarian county. Heavy storms, wind gusts and heavy precipitation could damage buildings and infrastructure items more frequently than is currently the case. The significance of this issue area is of medium importance only in Győr-Moson-Sopron and Baranya Counties (Fig. 6J).

As a consequence of global climate change, the change in annual precipitation in Hungary is uncertain – according to climate models a slight decrease or increase are both possible. It is also likely that the yearly distribution of rainfall will change, with higher amounts in the winter-spring period and lower amounts in the summer-autumn period. Our waters are vulnerable to climate change to a varying degree, which could lead to increased flood risks in certain river zones, especially in areas with extended water networks or large rivers. Regarding the risk of floods, the 7 most vulnerable counties are Győr-Moson-Sopron, Komárom-Esztergom, Heves, Jász-Nagykun-Szolnok, Csongrád, Békés and Szabolcs-Szatmár-Bereg. In 4 counties (Vas, Pest, Borsod-Abaúj-Zemplén, Hajdú-Bihar) the issue is of medium importance, whereas in 8 counties (Zala, Veszprém, Fejér, Somogy, Tolna, Baranya, Bács-Kiskun, Nógrád) this problem is not relevant (Fig. 6A).

Due to climate change, the frequency and intensity of extreme weather conditions are expected to increase; these include locally occurring extreme precipitation events which could lead to the development of flash floods. The development of flash floods is affected by the land cover, the hydrogeological and soil properties, and the geomorphology and gradient of the basin. The gradient does not play an important role in plains, therefore the term flash flood is relevant only in mountain regions. Consequently, the risk of flash floods is not relevant in the counties of the Great Hungarian Plain (Bács-Kiskun, Csongrád, Békés, Jász-Nagykun-Szolnok, Hajdú-Bihar, Szabolcs-Szatmár-Bereg Hajdú-Bihar), whereas of the 13 counties located in mountain regions, in 10 it is a problem of great importance (Vas, Zala, Veszprém, Komárom-Esztergom, Somogy, Tolna, Baranya, Nógrád, Heves, Borsod-Abaúj-Zemplén), and it is a problem of medium importance in 3 counties (Győr-Moson-Sopron, Fejér, Pest) (Fig. 6C).

Heavy rainfall, extremely fast snow melting events or an increase in groundwater levels could lead to groundwater flooding. The occurrence of groundwater flooding is impacted by several factors. Beside the relief, soil and hydrogeological conditions and the meteorological features, agricultural cultivation, vegetation and the condition of water channels are relevant factors. Groundwater flooding tends to occur in areas located near to watercourses, areas with a high groundwater level, and in areas where settlements are located at lower altitudes. The 10 most vulnerable counties in terms of this flooding risk are the following: Somogy, Baranya, Fejér, Pest, Heves, Jász-Nagykun-Szolnok, Csongrád, Békés, Hajdú-Bihar, Szabolcs-Szatmár-Bereg. The level of risk is medium in 3 counties (Győr-Moson-Sopron, Tolna, Borsod-Abaúj-Zemplén) and low in 6 counties (Vas, Zala, Veszprém, Komárom-Esztergom, Nógrád, Bács-Kiskun) (Fig. 6B).

The uneven distribution of rainfall and the increase in average annual temperature will probably lead to more arid periods, therefore more and more areas are expected to be exposed to severe droughts. The frequency and duration of drought periods may vary, which can result in negative consequences in the agricultural sector, especially in domestic crop production. In Hungary, crop production is characteristic in the high-quality soils of the plain regions, therefore, the risk of drought is an issue of high importance in the 9 counties located in the Great Hungarian Plain (Fejér, Tolna, Baranya, Bács-Kiskun, Csongrád, Békés, Jász-Nagykun-Szolnok, Hajdú-Bihar, Szabolcs-Szatmár-Bereg). The problem is of medium importance in Győr-Moson-Sopron, Vas, Veszprém, Komárom-Esztergom, Somogy, Pest, Nógrád and Heves counties. Drought is a low-level problem in Zala and Borsod-Abaúj-Zemplén Counties (Fig. 6D).

The expected increase in the annual average temperature will likely lead to increased water requirements in both the residential and industrial sectors. In Hungary, the majority of drinking water is produced from karstic aquifers, wells established along the banks of large rivers and water reserves constructed on porous aquifers. The risk to drinking water sources is a problem of high importance in regions where the above-mentioned aquifers are present, such as the Transdanubian Mountains (Veszprém, Komárom-

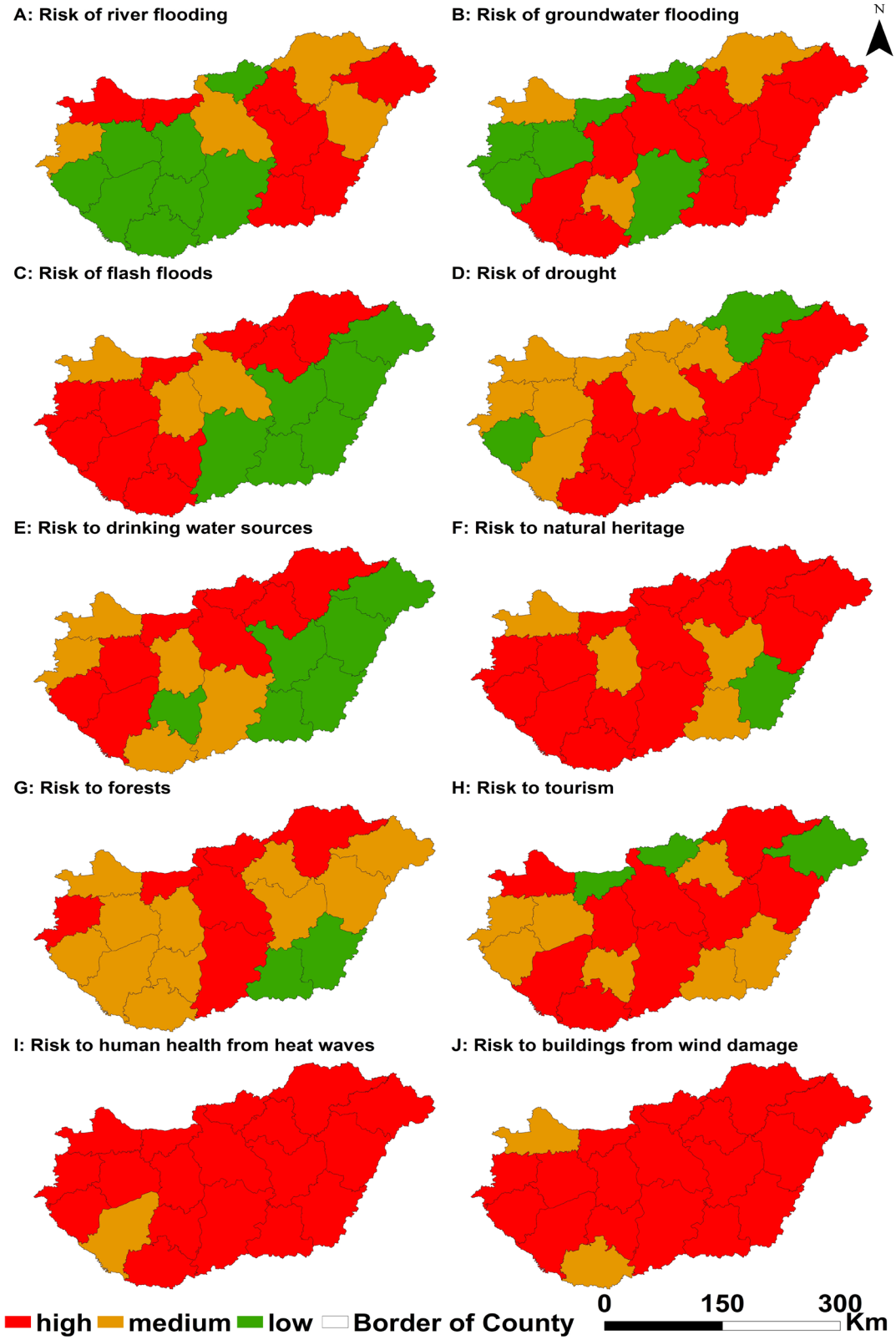


**Fig 6. The distribution of climate change areas of concern in the counties, by category and significance.**

Esztergom counties), the Transdanubian Hills (Somogy County) and the counties of the West-Hungarian Borderland (Zala County) and all counties of the North Hungarian Mountains (Pest, Nógrád, Heves, Borsod-Abaúj-Zemplén). The problem is of medium importance in 5 counties (Győr-Moson-Sopron, Vas, Fejér, Baranya, Bács-Kiskun), and of low importance in 6 counties (Tolna, Csongrád, Békés, Jász-Nagykun-Szolnok, Hajdú-Bihar, Szabolcs-Szatmár-Bereg) (Fig. 6E).

In Hungary, of the national protected areas 10 are national parks (4807 km2), 39 are landscape protection areas (3369 km2), 171 are national nature reserves (314 km2) and 88 are minor nature reserves (1 $km^2$). In total, they cover an area of 8491 km2 (KSH, 2017). They are scattered around the country; therefore, the risks to the country's natural heritage is a high priority problem in 15 counties (Vas, Veszprém, Komárom-Esztergom, Zala, Somogy, Tolna, Baranya, Pest, Bács-Kiskun, Nógrád, Heves, Borsod-Abaúj-Zemplén, Hajdú-Bihar, Szabolcs-Szatmár-Bereg). The problem is of medium importance in Győr-Moson-Sopron, Fejér, Jász-Nagykun-Szolnok and Csongrád Counties, and of low importance in Békés County (Fig. 6F).

More than 20% of the area of Hungary is covered with forest. Due to the vegetation-geographical location of the country, climate change may have an impact on approximately half of the forest areas. One of Hungary's national objectives to increase the proportion of forest cover, specifically, to achieve a forest coverage of at least 25%. One of the purposes of increasing forests areas is the absorption of $CO_2$, but at the same time, climatic changes may be mitigated by afforestation as well. With a growing number of drought periods, the frequency of forest fires could also increase. From the standpoint of the risks to forests, this is generally an issue of medium importance in Hungary: 11 counties can be classified in this category (Győr-Moson-Sopron, Veszprém, Fejér, Zala, Somogy, Tolna, Baranya, Heves, Jász-Nagykun-Szolnok, Hajdú-Bihar, Szabolcs-Szatmár-Bereg). In 6 counties the problem is of high importance (Vas, Komárom-Esztergom, Pest, Bács-Kiskun, Nógrád, Borsod-Abaúj-Zemplén) and only in 2 counties is it of low importance (Csongrád, Békés) (Fig. 6G).

Tourism is affected not only by direct climate parameters (heat waves, changing water regimes, more frequent storms) but also by the natural effects caused by climate change (biodegradation, spread of invasive species) and their socio-economic consequences (spread of infectious diseases, the increase in prices of energy and drinking water). Climate change can limit the capacity of touristic activities, make certain specific touristic destinations unattractive to visitors, or can even lead to the development of newer, alternative touristic products. The risks to tourism is a problem of high importance in counties with several touristic destinations such as the capital (Pest county), and Lake Balaton and its surrounding area (Somogy, Fejér), which are nationally significant attractions, as well as in the following counties: Győr-Moson-Sopron, Baranya, Bács-Kiskun, Jász-Nagykun-Szolnok, Borsod-Abaúj-Zemplén and Hajdú-Bihar. In Vas, Zala, Veszprém, Tolna, Heves, Csongrád and Békés Counties the problem is of medium importance, whereas in Komárom-Esztergom, Nógrád and Szabolcs-Szatmár-Bereg Counties it is of low importance (Fig. 6H).

## Discussion

The objectives of supranational organizations (UN, EU) determine the national planning tasks at the national and subnational level as well. In half of the 48 European countries investigated a complex climate change strategy is in place and their numbers are growing each year. In the near future, complex strategies will be compiled in European countries in order to meet international requirements. During the analysis of county level climate change strategies, we arrived at the conclusion that the objectives are determined in accordance with the natural characteristics of the counties. The focus of the county level climate change adaptation activities will be to solve the most relevant issues arising from climate change.

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