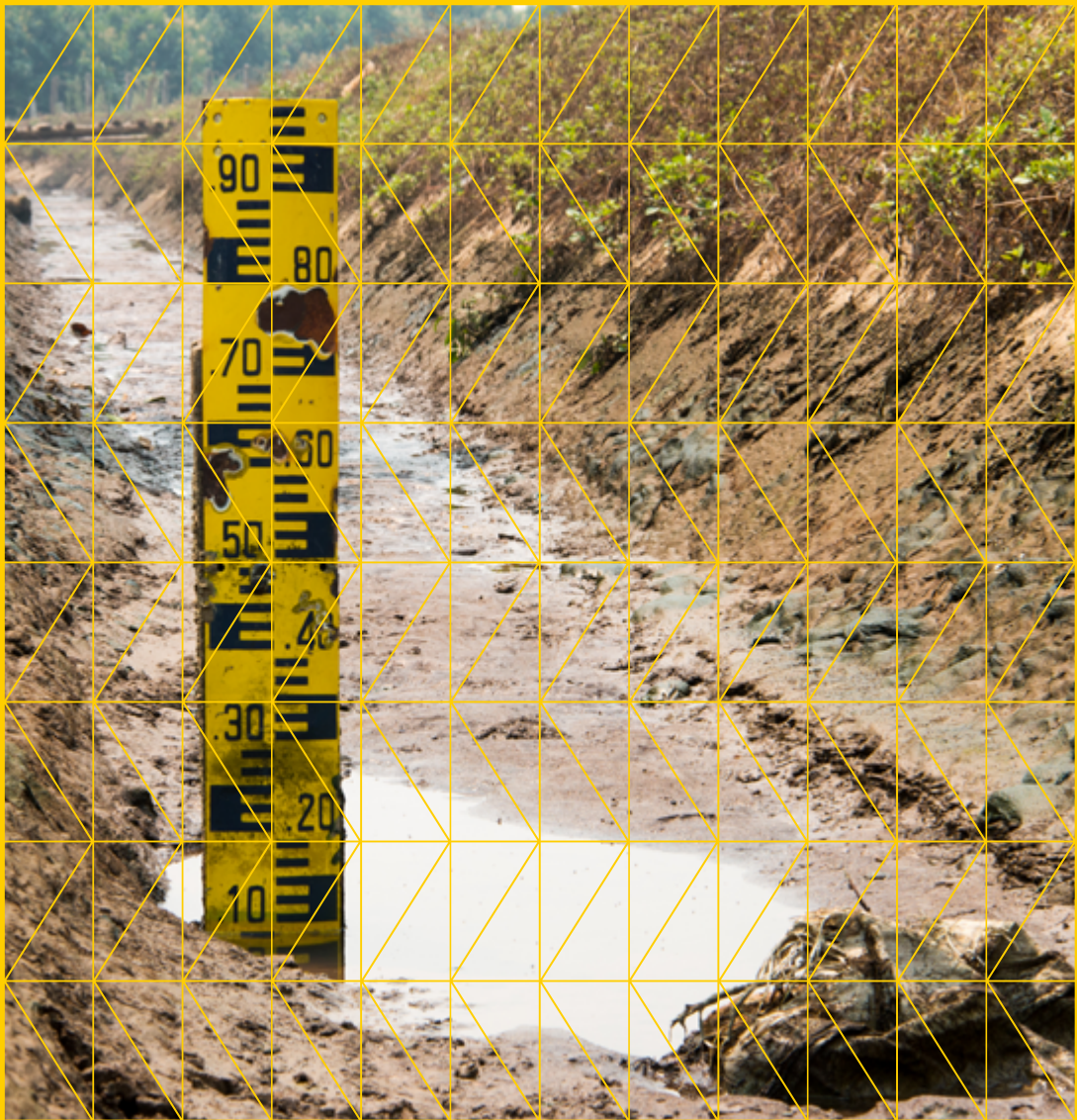


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# **DROUGHT IN THE CZECH REPUBLIC**

## THE POLITICAL, ECONOMIC AND SOCIAL CONSEQUENCES

Krzysztof Dębiec

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## INTRODUCTION

In the Czech Republic, 2020 was the seventh consecutive year of a drought which is considered the most severe in 500 years and differs from the previous ones in that it is more prolonged and characterised by considerably higher temperatures. At its peak, every fifth municipality was exposed to the risk of water scarcity, which was particularly evident in southern Moravia and in north-western regions. Abundant rainfall in spring and autumn 2020, followed by a winter that was favourable from the point of view of water replenishment, contributed to an improvement of the situation (particularly in Moravia). This was when drought became an issue of regional rather than nationwide importance. However, the problem of hydrological drought, involving groundwater scarcity, was not fully eliminated and, taking account of long-term climate change trends and structural problems faced by the Czech agricultural and forest sectors, experts are expecting a recurrence of an even more severe drought in a couple of years at the latest. The situation affecting the Czech Republic is further aggravated by the fact that this country has the EU's smallest freshwater resources (excluding island countries). Most local scientists argue that droughts are becoming an inherent element of Czech geography and water scarcity is increasingly becoming a major structural problem.

The Czech Republic is an example of a state in which drought has become a key issue in public debate – one that is affecting almost every citizen to a greater or lesser degree. The problem of water scarcity has become an important social, economic and political issue, forcing the authorities to launch costly programmes to eliminate its consequences. Sometimes, municipalities are forced to withdraw from lucrative investment projects out of concern that their implementation might expose the local area to an increased risk of water scarcity.

The situation is further complicated by the fact that for many years the Czech Republic was focusing on the construction of a flood control system and on the mitigation of the consequences of floods. In 1997–2013 alone, the country saw eight major disasters of this type, which caused the death of more than a hundred individuals. However, floods and droughts may only appear to be opposites: in a single year, unpredictable weather conditions may result in both dramatic floods and intensive droughts. In the Czech Republic, the consequences of these weather phenomena are aggravated by many decades of mismanagement of agricultural land and forests.

A closer look at the Czech Republic's struggle with drought may prompt more comprehensive analyses regarding the water management policy pursued in Central Europe, which is increasingly affected by recurrent phenomena of this type. Slovakia is the only Visegrad Group state not reporting major problems with water scarcity, although in recent years it has seen a significant decrease in its water resources. The methods applied by the Czech Republic to combat drought may serve as a valuable lesson in particular for Poland. As regards the available freshwater resources, compared to other EU member states, the situation in Poland is only slightly better than in the Czech Republic.

This report presents the causes, the extent and the consequences of drought, and discusses the actions carried out to counteract this phenomenon and to mitigate its consequences. It is based on a comprehensive set of Czech source data, official documents and statements by representatives of various levels of government, opinions voiced by Czech experts and an analysis of the debate in the Czech media. Occasionally, for comparison, statistics regarding other states (national and aggregate European ones) were used.

## MAIN POINTS

- Climate change is among the most important causes of drought in the Czech Republic. Over the last decade, a rapid increase in the number of so-called tropical days (with a temperature exceeding 30°C) was recorded – on average there were 50% more such days than in the previous decade and three times more than in the 1960s. The problem is aggravated by geographical factors, i.e. the fact that the country is located in Europe’s main watershed (according to Czechs, their country is “the roof of Europe”) from which water is quickly drained off via rivers to neighbouring countries. This is one of the main reasons behind the Czech Republic’s insignificant fresh-water resources and their strong dependence on water retention capability. Years of neglect and mismanagement of agricultural land and forests, combined with large-scale flood control programmes, have significantly increased the Czech Republic’s vulnerability to drought. As a consequence, over the last century the area of flood plains and wetlands decreased by 80%, the length of the rivers was reduced by 30%, and water outflow accelerated as a result of numerous river channels being lined with concrete and thousands of kilometres of drainage ditches being built.
- Increased vulnerability to drought is boosted by the structure of the Czech agricultural sector, which is dominated by the EU’s largest farms. Big farms used to be viewed as an asset in the context of competitive advantage and cost-effectiveness. Over time, detrimental aspects of this system came to light – it facilitates the emergence of vast monocultures (cereals, oilseed rape), which reduces biodiversity and accelerates soil erosion. As a consequence, it impairs the soil’s water retention capability. In addition, big farms have practically abandoned animal husbandry because they view it as less profitable than cereal and oilseed farming. This has disrupted the natural land fertilisation processes.
- The structural causes of drought include the afforestation policy pursued for many years using mainly spruce trees (to meet industrial needs), which created favourable conditions for bark beetle infestation, which in turn has resulted in vast stretches of forest dying. Coniferous trees (which account for around 70% of the country’s forests) are vulnerable to high temperature and temperature fluctuations, which makes them all the more exposed to bark beetle invasion. In recent years, the necessary logging covering vast stretches of forest has significantly aggravated soil erosion.

- In the Czech Republic, drought is becoming one of the most serious social issues. In 2019, the situation regarding drought was considered poor or very poor by 76% of Czech citizens, which equated to drought becoming the second most serious environmental problem (after environmental impacts linked to road transport). In 2019, the proportion of residents of the Czech Republic who viewed this phenomenon as a problem increased to almost 90%. In a survey conducted in spring 2020 to identify Czech citizens' biggest concerns, "drought and other manifestations of climate change" were indicated by 85% of the respondents; the looming recession was indicated by 85% of the respondents alike, and a subsequent wave of the pandemic by 77%.
- Drought is generating significant costs for the Czech economy. In the next couple of years, these are likely to amount to 1.6–4.8% of the country's annual GDP. This poses a problem for the agricultural sector and for numerous industrial sectors such as food processing, textiles, pulp and paper, and the chemical sector. In addition, this phenomenon undermines the prospects for the implementation of construction projects and for property market development. Concerns over water availability and increasing efforts to maintain high soil quality are resulting in vast investment projects being rejected, including due to opposition voiced by local communities. In the coming years, the requirement to prevent drought and to maintain high soil quality will reduce the prospects for implementation of so-called green-field projects in favour of revitalisation and transformation of existing sites, especially post-industrial ones (so-called brownfield projects).
- Drought has contributed to a decline in electricity production in Czech hydropower plants. In addition, it has triggered the risk of cooling system problems in the planned fifth reactor of the Dukovany Nuclear Power Plant. In the present situation, its operation could result in the entire Jihlava river drying up in just a single year.
- Water scarcity contributes to a reduction in the volume and quality of harvest in the agricultural sector. In 2019, extreme crop losses (of more than 40%) due to water scarcity were reported by farmers in every seventh district. This has resulted in an increase in the prices of produce. Local farmers and foodstuff producers are using drought, alongside trade restrictions due to the COVID-19 pandemic, as a justification for promoting the idea of "food self-sufficiency". At present the Czech agricultural sector is unable to cover the country's domestic demand – for example, as regards



vegetables it is only able to supply 30% of the Czech Republic's vegetable consumption.

- In recent years, Prague has launched intensive measures to prevent drought and to mitigate its consequences. Priorities include an improvement of drinking water availability and efforts to increase the country's water retention capability. In the coming decade, the government intends to earmark the equivalent of around 1.2 billion euros for the construction of new water supply connections and modernisation of the current waterworks. In order to prevent continued soil erosion, efforts are underway to build a large number of small fishponds (plans have been made to build one such pond daily). The purpose is to enable the adjacent fields to absorb humus from these fishponds. With regard to forests, which are affected by drought and bark beetle infestation, efforts have been launched to promote broad-leaved trees (e.g. their minimum share in newly forested areas was increased from 25% to 40%).
- The activity and influence of big agricultural companies are posing a major barrier to more decisive measures to combat drought. It is worth noting that the present Czech Prime Minister is the founder of the country's biggest agri-food company, and the present Minister of Agriculture used to work as head of an organisation dominated by big agricultural companies.
- In the field of foreign policy, Prague will likely increase its involvement in international projects focused on improving water availability, support efforts to channel EU funds into similar initiatives, and avoid implementing cross-border and international projects which might result in reduced water availability or might ignore issues related to insufficient water resources (as evidenced by the ongoing dispute with Poland over the expansion of the Turów coal mine).
- Recurring sequences of years characterised by very low harvest yields will undermine the profitability of the Czech agricultural sector and increase the country's dependence on the import of foodstuffs. However, reducing the negative impact of drought on this sector is possible, if relevant adaptive measures are taken, both in the territorial aspect and in the product-related aspect.
- If the present climate change trends persist, this will hamper the Czech Republic's struggle against drought and its costly consequences. A rapid

elimination of these issues will be difficult, due to the structural nature of some of the problems and unfavourable geographical factors. However, the water availability problems faced by Czech citizens will translate into major pressure being put on politicians, which will force them to implement further precautionary measures. In addition, they may translate into higher levels of support for parties which emphasise environmental issues, such as the Czech Pirate Party, which is becoming a leading force on the Czech political scene. Large-scale investments in water transmission infrastructure will be continued alongside incentives to use water resources in a more efficient manner. However, it should be expected that restrictions will be imposed increasingly frequently. They will involve water use limits, reduced opportunities for industrial development of land and restrictions regarding farming methods.

# I. DROUGHT - THE DEFINITION AND EXTENT

## 1. What is drought?

In the narrow sense of the word, “drought” is a prolonged period of reduced precipitation which is lower than the long-term average. In a broader sense, this term also refers to a lowered water content in soil and vegetation or reduced water resources.<sup>1</sup> This means that the key factor, which is for instance emphasised in the definition of drought formulated by the Polish Institute of Meteorology and Water Management, involves “below-average water availability as defined in specific natural conditions”.<sup>2</sup> According to the 2017 *Concept of Protection against the Consequences of Drought for the Czech Republic*, drought is a temporary phenomenon caused by a scarcity of precipitation, which leads to a decrease in the volume of water available at various stages of the hydrological cycle.<sup>3</sup> Its extent is measured by taking into account its duration, divergence from average figures compiled over many years, and territorial reach.

Depending on the specific stage of the hydrological cycle affected by this phenomenon, the following types of drought are distinguished:

- meteorological drought (also known as atmospheric drought) – a period during which precipitation is lower than the long-term average; frequently precipitation is accompanied by above-average high temperatures and reduced air humidity, with the problem being aggravated by increased evaporation (water evaporating from soil) and transpiration (active evaporation of water from above ground plant parts);
- soil drought (agricultural drought) characterised by soil humidity that is insufficient for normal plant development;
- hydrological drought, i.e. reduction in the water level in rivers and bodies of water, combined with a lowered groundwater level (which is usually recorded after some time); although, as a rule, hydrological drought – similarly to soil drought – is a natural phenomenon, it may be aggravated by human activity, such as excessive water drawing (whereas for soil drought

<sup>1</sup> Cf. ‘Drought’, UN-SPIDER Knowledge Portal, un-spider.org.

<sup>2</sup> ‘Definicja suszy’ [‘Definition of drought’], Institute of Meteorology and Water Management – National Research Institute (IMiGW PIB), imgw.pl.

<sup>3</sup> *Koncepcje ochrany před následky sucha pro území České republiky*, Ministry of the Environment of the Czech Republic, 2017, mzp.cz.

this could be through the use of artificial fertilisers, which reduce the soil's water retention capability);

- socio-economic drought – a whole array of consequences of drought for the quality of life, which emerge when this inherently natural phenomenon begins to impact on residents of the afflicted area (as for water availability), on the economy (reduced industrial activity and inland navigation due to drought, decreased volume of harvest) and on the natural environment.

The Czech *Concept of Protection...* makes a clear distinction between drought and “water scarcity”.<sup>4</sup> The former term refers to the volume of precipitation, soil water content and the level of surface water and groundwater, which are all reduced when compared to the long-term average. The latter term denotes a volume of water resources which is insufficient to meet the needs of society. Although human activity may aggravate the problem associated with drought, as a rule drought is a natural phenomenon. The same cannot be said about water scarcity which occurs when the amount of water used exceeds the amount of water that is available as a result of natural water replenishment.

## **2. The most severe drought in the Czech Republic in 500 years**

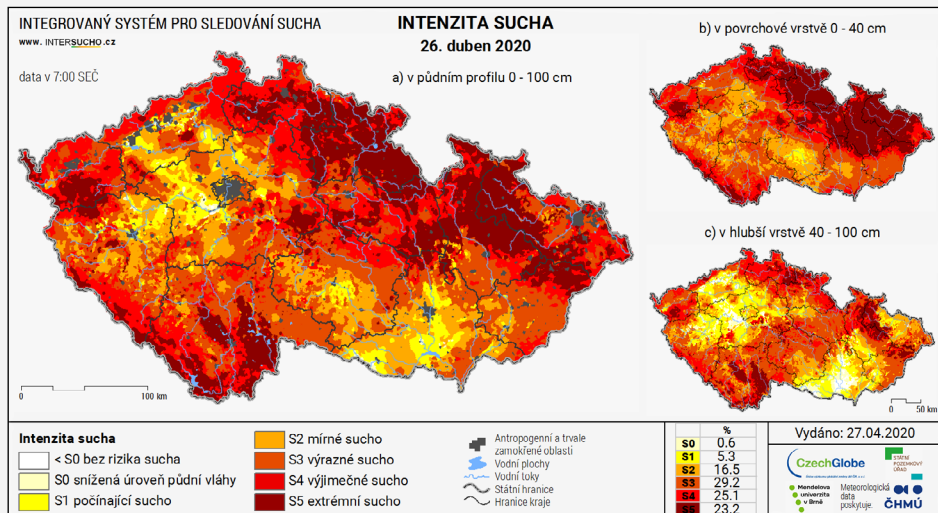
Although in the past droughts did occur in what is now the Czech Republic, the recent drought differs from the previous ones in terms of duration and higher temperatures. Formerly, the periods of droughts usually lasted no more than three years, whereas 2020 was the country's seventh consecutive year of drought. While the previous droughts were mainly caused by deviations in the amount of precipitation (as was the case in 1946–1947), at present – due to noticeably higher temperatures – drought occurs even in those years in which the amount of precipitation is close to the long-term average. According to Czech scientists involved in the Intersucho drought research project, this has been the most severe drought in 500 years, which is the earliest point in time enabling researchers to study drought on the basis of various sources (one previous drought that may be considered as intensive as the recent one happened in 1540, though it was shorter). Regions most severely affected by the recent drought include southern Moravia and north-western Bohemia, which are mostly lowlands. During summer in 2014–2019, the most frequently reported soil drought was absent in just several per cent of the country's area and half of the country was affected by the most severe soil drought intensity (as measured on a six-point scale).

<sup>4</sup> *Ibid*, p. 3.

## Mapping the drought

In the Czech debate on drought, the most frequently discussed materials are soil drought maps (compiled for a soil profile of up to 100 cm) which are compiled and regularly updated as part of the Intersucho project modelled on a similar initiative carried out in the US.<sup>5</sup> The map shown below is an example of how drought is presented in the Czech Republic. In a specific area, soil is classified using a seven-grade colour scale, where white denotes the content of water which is close to the long-term norm (1961–2010), yellow – initial stages of drought, shades of red – advanced forms of drought, and brown – the so-called extreme drought in which soil humidity is so low that it can only occur once in 100 years, and the soil saturation ratio is lower than 50% for at least one month. On the map shown as an example, presenting the situation recorded on 26 April 2020, 23.2% of the Czech Republic’s territory is affected by the most severe intensity of drought and a mere 0.6% is free from drought.

**Map 1.** Soil drought in the Czech Republic



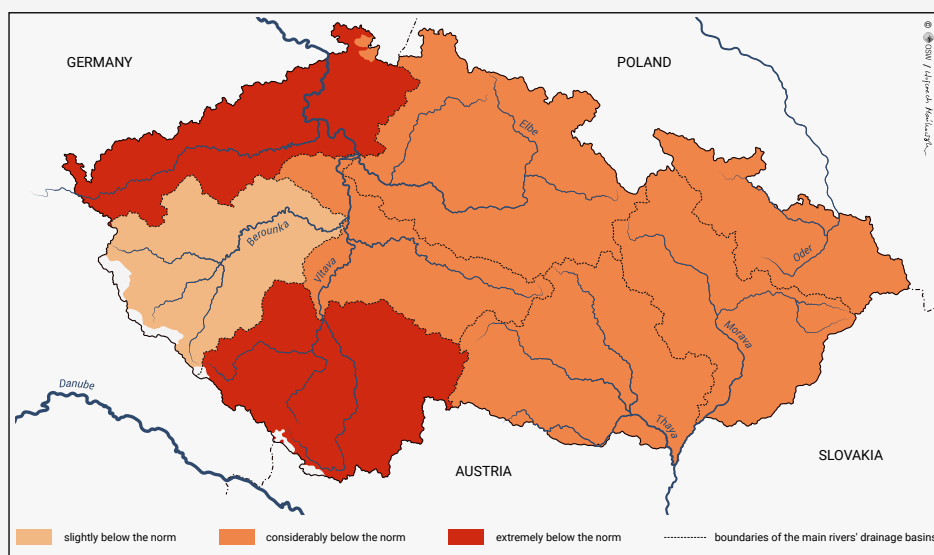
Data as on 26 April 2020.

**Source:** the Intersucho portal, [intersucho.cz](http://intersucho.cz).

<sup>5</sup> Cf. the [intersucho.cz](http://intersucho.cz) website. The project participants mainly include employees of the Mendel University in Brno, the CzechGlobe – Global Change Research Institute of the Czech Academy of Sciences (GCRI) and the Czech Hydrometeorological Institute. The American initiative that inspired Intersucho was carried out by researchers from the National Drought Mitigation Center at the University of Nebraska-Lincoln.

The other map shows the level of groundwater recorded in shallow bores, in April 2020 as well. Similar studies are compiled regularly by the state-operated Czech Hydrometeorological Institute. In these studies, the norm is the average figure for a specific month recorded in 1981–2010  $\pm 25\%$ . Dark red indicates areas in which the water level was found to be “extremely below the norm” and dark orange indicates “considerably below the norm”. These two colours combined account for 82% of the bores. Most of the remaining area is light orange, which indicates that the groundwater level is “slightly below the norm”. Grey-coloured western patches of land are elements of the Danube basin for which no data is available. None of the bores could be marked with a shade of blue which is used to indicate areas in which groundwater level is above the norm, and 8% of the bores which were within the norm had no major impact on the general situation regarding groundwater in the specific river basin. This is why the colours on the map are red and orange.

**Map 2.** Groundwater level (in shallow bores)\*



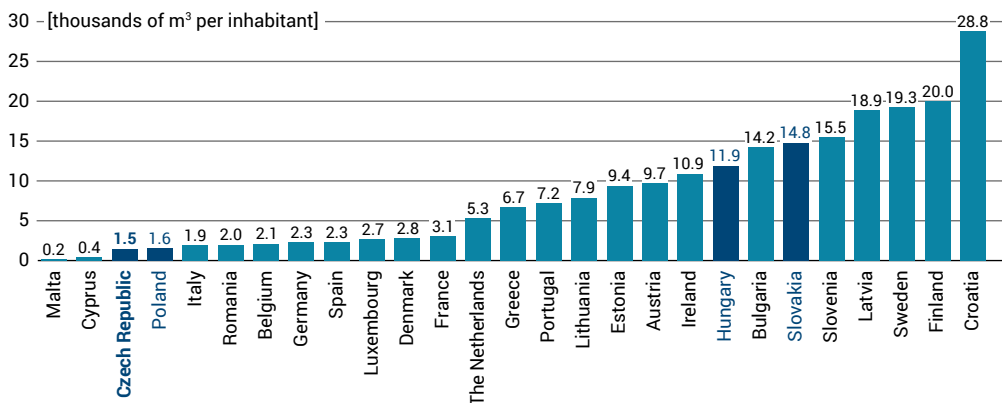
\* Measured in quaternary aquifers.

**Source:** Czech Hydrometeorological Institute.

**At present, the Czech Republic has the smallest freshwater resources (1,500 m<sup>3</sup> per one inhabitant) of all EU member states which are not island countries. This contributes to increased concerns regarding freshwater availability should lasting crises occur.** The only states in which the situation is even more difficult are the EU’s island countries: Malta and Cyprus.

The situation in Poland is only slightly better than in the Czech Republic. These four countries are the EU's only member states to meet the UN definition of water stress, which means that their freshwater resources are less than 1,700 m<sup>3</sup> per one inhabitant.<sup>6</sup> The situation regarding freshwater resources is considerably better in the Czech Republic's other neighbours: Slovakia (14,800 m<sup>3</sup>) and Austria (9,700 m<sup>3</sup>). Although Czech households use a relatively small amount of water compared to other EU member states, due to the country's insignificant water resources the Czech Republic has a high score in the water exploitation index. The only EU countries to use more water, in comparison to their respective resources, are Cyprus, Greece and Spain, all of which have significantly different climate conditions (cf. Chart 2).

**Chart 1.** Renewable freshwater resources in EU member states *per capita*

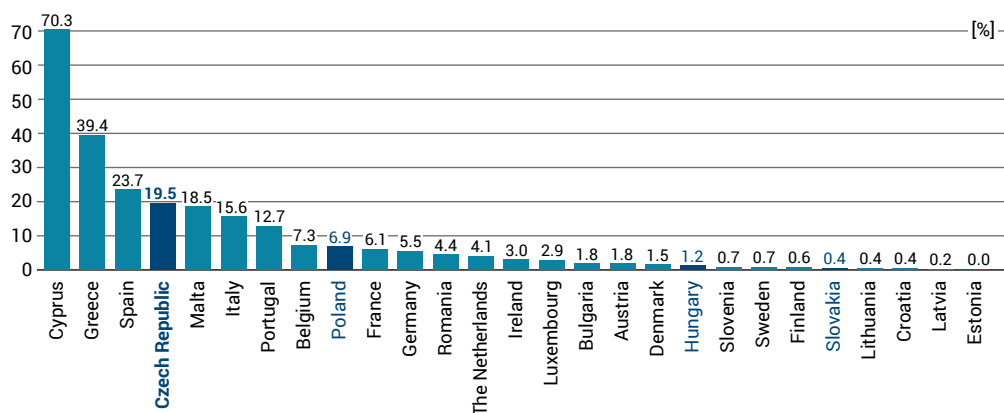


Data compiled on the basis of the long-term average, spanning at least 20 years, calculated in 2020. Darker bars indicate V4 states.

**Source:** Eurostat.

<sup>6</sup> *United Nations World Water Development Report 4. Volume 1: Managing Water under Uncertainty and Risk*, UNESCO, 2012, [unesco.org](http://unesco.org).

**Chart 2.** Water exploitation index in 2017



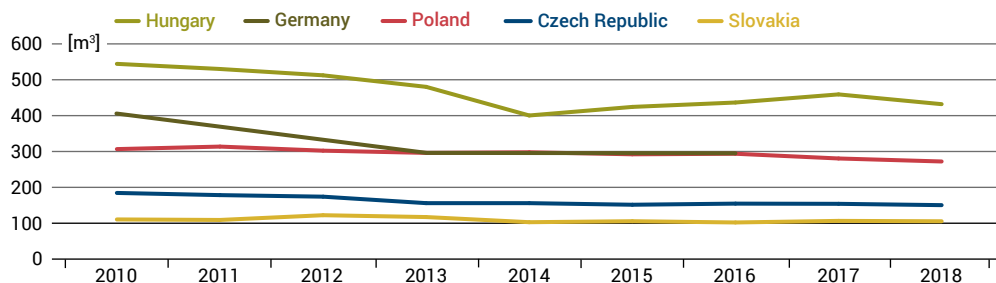
The water exploitation index illustrates the percentage of water use against renewable freshwater resources in a given time and place. Darker bars indicate V4 states.

**Source:** ‘Use of freshwater resources in Europe’, data compiled by the European Environment Agency, [eea.europa.eu](http://eea.europa.eu).

**Although the Czech Republic is in a difficult situation relative to the rest of the EU, when it comes to water availability, certain trends that may be moderately optimistic have also been recorded.** In 2010–2018, the annual freshwater abstraction (which uses both surface water and groundwater) decreased by 18%, while it should be remembered that the Czech Republic is among those EU countries in which the intake of water, calculated in proportion to the number of inhabitants, is relatively low (just as in the remaining countries which have the smallest drinking water resources *per capita*). At the same time, this trend has been recorded in other states in the region as well: in Hungary and in Germany (though for Germany the figures cover a slightly shorter period, i.e. 2010–2016) water intake decreased by more than 20% (21% and 26% respectively), whereas in Poland and in Slovakia – by 11% and 5% respectively (cf. Chart 3). **In the Czech Republic, the energy sector contributed the most to this decrease** (a drop of one third in the analysed period), whereas the public utility sector recorded a decrease of 6% and the industrial sector – 8%. This decrease was due to an increase in the price of water (of 31%), temporary limits in water availability (recorded on a larger scale since 2015) and increased public awareness regarding water efficiency. As could be expected, drought has contributed to an increase in the intake of water in the agricultural sector – of as much as 31% (cf. Chart 4).



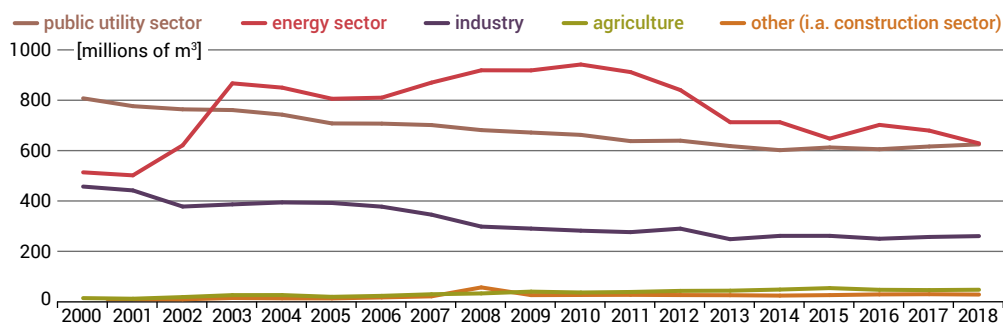
**Chart 3.** Total freshwater abstraction in selected EU member states in 2010–2018 per capita



The figures illustrate general water intake (i.e. not for the public water supply alone).

**Source:** the author’s own calculations based on data compiled by Eurostat and the Ministry of the Environment of the Czech Republic.

**Chart 4.** Water intake in the Czech Republic in 2000–2018 according to sectors



**Source:** Ministry of the Environment (data from the ISSaR system).

Due to the already low (relative to the EU average) daily running water consumption in an average Czech household (90.6 litres; only three EU states have lower figures), the potential for introducing other water efficiency measures is limited. An average Italian uses 2.5 times more water than an average Czech, and an average German 33% more (while Poles use only slightly more).<sup>7</sup> This relatively low daily water consumption was achieved following the switch to free market prices during the Czech Republic’s political transition: in 1989–2019 daily water consumption per inhabitant decreased by as much as 47%, with a major portion of this decrease (three quarters) being recorded in 1989–1999.<sup>8</sup>

<sup>7</sup> ‘Počet domácností v České republice napojených na veřejný vodovod v roce 2019 vzrostl’, Ministry of Agriculture of the Czech Republic, 13 July 2020, eagri.cz.

<sup>8</sup> At the same time, over this period the proportion of citizens living in households connected to the public water supply system increased from 82% to 95%, and drinking water losses in the water supply system decreased from 90 to 26 litres per one individual daily.

However, due to increasingly higher temperatures and consecutive years of drought since 2013 (when daily water consumption in Czech households per person stood at 87 litres), this figure has seen a constant, albeit very gradual, increase.

**In addition, drought has become an important political and social issue which received widespread media coverage.** In 2019, 76% of Czechs considered drought to be a serious or very serious problem, which equated to drought becoming the second most serious environmental problem (after environmental impacts linked to road transport).<sup>9</sup> At the same time, there was a major increase in the proportion of Czechs who view drought as a problem: from 76% in 2016 to almost 90% in 2019. In the same period, the proportion of Czech citizens who were not taking any measures to save water dropped from around 40% to 20%. In a survey conducted in April 2020 to identify Czech citizens' most serious concerns, "drought and other manifestations of climate change" was indicated by 85% of the respondents, the looming recession by 85% alike, and a subsequent wave of the pandemic by 77%.<sup>10</sup> In a survey which included a comparison of results obtained in various countries, climate change was considered a "very serious" problem by 71% of respondents in the Czech Republic, while the figure for Poland was 70% and the EU average stood at 79%.<sup>11</sup>

The spring and summer of 2020 had abundant precipitation and the following winter was favourable from the point of view of water replenishment, which resulted in a reduction in intensity of atmospheric and agricultural drought (at the beginning of summer soil water content was the highest compared to the corresponding period over the last five years). Despite this, the amount of precipitation was insufficient to completely eliminate the problem of low levels of groundwater, which had been mounting for several years.<sup>12</sup> Replenishment of water resources is a long-lasting process in which small but regular precipitation, combined with absorption and melting of the snow cover (particularly in the period from December until February), are of key importance. Relatively brief and frequently very intense precipitation

<sup>9</sup> Survey conducted by the Czech Public Opinion Research Centre (CVVM), [cvvm.soc.cas.cz/en/](http://cvvm.soc.cas.cz/en/).

<sup>10</sup> A Median Survey commissioned by the Czech Radio; cf. V. Štefan, 'Více než polovina Čechů se i během koronaviru nejvíc bojí sucha. Obavy mají také z ekonomické krize', Czech Radio, 26 April 2020, [irozhlas.cz](http://irozhlas.cz).

<sup>11</sup> A Eurobarometer survey conducted in spring 2019.

<sup>12</sup> Cf. J. Pšenička, 'Prší nám na lepší časy? Sucho se vrátí s ještě větší intenzitou', Seznam Zprávy, 21 June 2020, [seznamzpravy.cz](http://seznamzpravy.cz).

is insufficient to replenish the water resources. In addition, this shows that drought is a multi-faceted phenomenon. Czech researchers argue that at present the country should focus on preparing for subsequent periods of even worse drought, which are likely to occur after a hiatus that may last one to two years.

## II. THE CAUSES OF DROUGHT

### 1. Climate change and geographical factors

**Climate change is the main cause of drought.** One element of this phenomenon is the increase in the number of so-called tropical days recorded in recent years (with a temperature exceeding 30°C) and summer days (with a temperature exceeding 25°C), which amounts to around 40 and 100 respectively (these are average annual figures). In 2011–19, the number of both tropical and summer days recorded in the Czech Republic was three times higher than back in the 1960s, when relevant measurements were launched. The highest number of such days is recorded in southern Moravia. Increasingly high temperatures (an average increase of 0.4°C within a decade) accelerate water evaporation and (alongside the extension of the growing season) contribute to increased absorption of water by plants. This is accompanied by a decrease in the number of days on which snow cover is recorded, from around 45 in the 1960s to around 20 recently, which is unfavourable from the point of view of drought prevention because snow contributes to improved soil humidity and groundwater replenishment. In this aspect, it is more beneficial than rain. Although over the last 60 years the average amount of rainfall has been more or less stable, its frequency has been decreasing while the intensity has been increasing. Torrential rain is less effective when it comes to replenishing the aquifers (around 30% of rainwater is drained off) and a higher average temperature contributes to quicker evaporation of both torrential rain and the water contained in soil and in vegetation.

**The extent of climate warming in the Czech Republic, as compared to previous decades, is evident in average annual temperatures recorded in recent years. Moreover, according to forecasts, the coming years are expected to be even hotter.** 2018 was the hottest year since measurements were launched back in 1775, 2019 was the second hottest and 2020 was the fifth hottest. In these years, the average temperature in Prague was higher than the long-term average (1775–2014) by 3.2°C, 3°C and 2.7°C respectively. When compared to average figures recorded in 1981–2010, 2019 was hotter by 1.8°C and 2020 by 1.5°C. On a list of the ten hottest years since measurements began, the only year that does not belong to the present millennium (1994) was ranked ninth. Weather forecasts compiled in 2019 by scientists from the Technical University of Zurich (ETH Zurich) showed that the average annual temperature recorded in Prague is expected to have risen by 1.8°C by 2050 and the temperature recorded in summer months – by as much as almost 7°C (for comparison,

the figures forecast for Warsaw are 2.4°C and 6.6°C respectively).<sup>13</sup> As a consequence, the climate in the Czech Republic may start to resemble the climate in present-day Georgia and southern Romania. Czech experts argue that this will likely result in droughts becoming more frequent, longer and more intensive in the future. At the same time, the annual volume of precipitation is expected to remain unchanged, which should encourage investments in the expansion of rainwater collection tanks, reservoirs and fish ponds. Years with abundant rain and snowfall will continue to occur, although they will become increasingly rare.

**The drainage of water from the Czech Republic is facilitated by the country's geographical location, i.e. the fact that there is practically no external source feeding the Czech rivers<sup>14</sup> (the country is situated in Europe's main watershed) and around 29% of rainwater is drained off through rivers to the neighbouring countries.** As a consequence, the Czech Republic is largely dependent on its retention capability and on the volume of precipitation. Czech scientists often say that their country is located “on Europe's roof”. The sources of the Czech Republic's major rivers are located in mountainous regions neighbouring Poland: the sources of the Elbe, Morava and Oder are located in the Krkonoše mountains, on the mountainside of Králický Sněžník, and in the Oder Mountains respectively. Around 29% of rainfall that feeds the drainage basins of the Elbe is drained off to neighbouring countries, the figure for the Morava is 28% and the Oder is 41%.<sup>15</sup> These rivers' catchment areas cover 66%, 24% and 10% of the territory of the Czech Republic respectively. According to calculations, the total volume of water that is drained off to neighbouring countries annually would be sufficient to fill up the Czech Republic's largest hydroelectric dam 22 times.<sup>16</sup>

<sup>13</sup> J.-F. Bastin, E. Clark, T. Elliott et al., ‘Understanding climate change from a global analysis of city analogues’, Plos One, 10 July 2019, journals.plos.org.

<sup>14</sup> The few exceptions include the Thaya (or Dyje - a tributary of the Morava), flowing in from Austria, and the Ohře (a tributary of the Elbe), flowing in from Germany. Generally speaking, the share of freshwater flowing into the Czech Republic from foreign countries in domestic water resources is around 5%; compared to other EU member states which are non-island countries, a lower figure has only been recorded for Finland, Romania, Denmark and Spain. The figure for Poland is almost 15%, for Slovakia 85%, and for Hungary 95% (the EU's top figure).

<sup>15</sup> E.g. M. Šobr, ‘Česko na střeše Evropy’, *Geografické rozhledy* 2014, no. 1/14-15, quoted after: research-gate.net.

<sup>16</sup> The Orlík Reservoir with a capacity of 720 million m<sup>3</sup>.

## 2. The forest policy

**As regards woodlands, one of the indirect factors that facilitated the occurrence of drought has been the multi-year policy of planting mainly spruce trees (to meet industrial needs). This has created favourable conditions for bark beetle infestation which has resulted in vast stretches of forest dying.** Coniferous trees (which account for around 70% of Czech forests) have become an easy target for bark beetles, due to the fact that they are vulnerable to high temperatures and temperature fluctuations. The necessary logging performed in vast stretches of forest has resulted in an accelerated erosion of soil, now stripped of the trees above it, and in decreased water retention capability. The process of abandoning the predominance of coniferous trees and increasing forest diversity and thus resilience is ongoing, albeit at a relatively slow pace. In recent decades, the share of coniferous trees in Czech forests decreased from 86% in 1950 to 76.7% in 2000 and to 71.5% in 2018 (with spruce trees accounting for 50%, pine trees for 16.2% and other coniferous trees – mainly larch trees – for 5.3%).<sup>17</sup> For comparison, in Poland coniferous trees account for 68.4% of all forests (data from: Statistics Poland (GUS), *Statistical Yearbook of Forestry 2019*); at the same time, in the Czech Republic the share of woodlands in the country's territory is slightly higher than in Poland (34.6% versus 30.9%).<sup>18</sup>

### **The Habsburgs in the dock – the historical causes of drought**

Czech experts have traced back the underlying causes of some of the problems associated with drought to several decisions made by the Austrian Habsburg monarchs, who ruled the country during 1526–1918. These decisions included a document issued by Emperor Joseph II Habsburg in 1781 in which he ordered that fish ponds should be eliminated, mainly in order to enable cereal farming on the drained land (although sometimes entire new villages were established there), which resulted in a 50% decrease in the number of fish ponds.<sup>19</sup> This decision was intended as a remedy for repeated periods of famine resulting from food scarcity which in turn led to an increase in the price of cereals. On the other hand, many of the remaining fish ponds were neglected or eliminated following the Emperor's

<sup>17</sup> Cf. 'Ministr zemědělství Miroslav Toman v Interview ČT24', Czech Television, 15 January 2020, ct24.ceskatelevize.cz.

<sup>18</sup> Cf. 'Forest area (% of land area)', The World Bank, data.worldbank.org.

<sup>19</sup> 'Musíme zatopit údolí řek, nabízí recept na boj se suchem hydrolog Janský', MF DNES, 21 August 2018, idnes.cz.

1782 decision to disband numerous religious orders operating on his territory (excluding those which took care of sick people and ran schools; this decision affected a total of 38,000 monks and nuns in Bohemia). Many monks were involved in establishing fish ponds and tending to them to breed carps.

During the reign of Joseph II's mother – Empress Maria Theresa, who reigned from 1743 until 1780, a large-scale campaign to plant coniferous trees was launched to meet the demand from the industrial and the construction sectors. During the recent drought, this significantly contributed to the bark beetle infestation and to the need to perform logging in vast stretches of forest. However, at the time when the Empress began her rule, she had to tackle the problem of wood scarcity resulting from large-scale logging to obtain firewood and to provide timber to glassworks. Animal grazing, for its part, reduced the forests' natural regeneration potential. Maria Theresa was the first ruler to decide to remedy the situation: she prohibited grazing in forests and ordered afforestation of new areas. As part of this process, mainly coniferous trees were planted (first mainly pine, then spruce trees) due to the fact that they grow faster and make a good construction material. As a consequence, by ten years after the Empress's death the area covered by forests in Bohemia had increased more than 1.7-fold compared to the beginning of her reign, and the structure of these forests changed.<sup>20</sup>

Due to the numerous assets of coniferous trees, the practice of mainly planting this variety was continued as late as during the Communist era in Czechoslovakia. The planting activity was performed regardless of criticism which emphasised the environmental threats associated with this practice, including the fact that these trees are well-adapted to lower temperatures (this is why in Central Europe they originally grew at higher altitudes alone). The country was affected by a large-scale bark beetle infestation as early as 1947 (the fight against its consequences lasted until the 1960s). However, even back then no decision was made to significantly modify the structure of forests.

<sup>20</sup> H. Válková, 'Česko je nejlesnatější od dob Marie Terezie, ukázaly statistiky', MF DNES, 9 October 2012, idnes.cz.

### 3. The agricultural policy

**Another cause of drought is the reduction in soil water absorption capability due to increased erosion.** One hectare of high-quality arable land is capable of retaining as much as around 3,500 m<sup>3</sup> of water, which contributes to both drought and flood prevention. This is because this type of organic matter is capable of absorbing water in the amount as much as twenty times bigger than its own weight. One hectare of 1 metre-thick forest soil is capable of retaining 2,300 m<sup>3</sup> of water; this type of soil, when aerated by the tree root system and soil fauna, is capable of absorbing 75% more water than dry soil.

**As regards farmland, reduced soil quality results for example from intensive use of artificial fertilisers** (small organisms that aerate soil, such as earthworms, which get killed by the substances contained in these fertilisers, increase the soil's water retention capability two- to threefold). Over the last decade or so, the Czech agricultural sector has seen a significant increase in the amount of fertilisers used: back in 2006, 105 kilograms of artificial fertilisers were used per hectare of land, whereas in 2016 it was as much as 140 kilograms.<sup>21</sup> Moreover, the quality of drinking water available in the Czech Republic has declined. It is because another side effect of the large-scale use of chemical fertilisers and pesticides (in 2019 11,500 tons of these chemicals were used, just as in 2009)<sup>22</sup> involves the pollution of groundwater and surface water, caused by the fertilisers permeating through soil into the water, which in turn results in the proliferation of algae and cyanobacteria. In 2018, pesticides were present in more than half of groundwater samples collected by the Czech Hydrometeorological Institute and a level of pesticides in excess of acceptable norms was found in 37% of them. In addition, pollution was found in half of the drinking water sources. The structure of EU subsidies encouraged big companies and farmers to abandon livestock breeding and reorient towards cereal and oilseed farming, which is more profitable. This, in turn, has disrupted the natural soil regeneration processes that occur when soil is fertilised with manure.

In addition, another reason behind arable land's reduced water absorption is the widespread use of heavy agricultural machinery, which contributes to increased soil density. The use of such machines is necessary in vast mono-

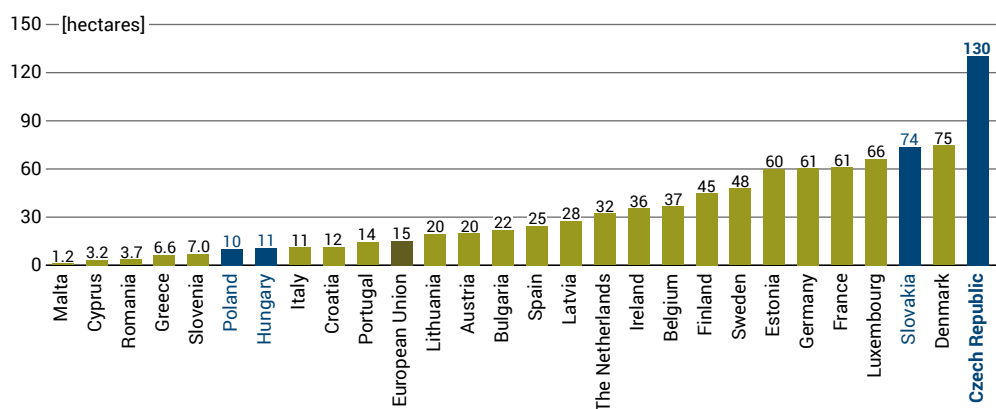
<sup>21</sup> M. Biben, 'Zemědělce deptá sucho, může za to i hospodaření na velkých lánech. Eroze v Česku už postihla pětinu orné půdy', *Hospodářské noviny*, 9 July 2019, hn.cz.

<sup>22</sup> 'Spotřeba v jednotlivých letech', Ministry of Agriculture of the Czech Republic, eagri.cz.



cultures, which dominate the Czech agricultural sector, and results from technical modernisation of the agricultural sector. The dominance of big farms, which frequently focus on monoculture farming, also hampers biodiversity.<sup>23</sup> Over the last century, during the process of establishing these farms (mainly as part of collectivisation which started back in the 1950s) 800,000 kilometres of field margins and 120,000 kilometres of dirt roads were ploughed.<sup>24</sup> The political transformation has not changed the situation much. As a consequence, as shown in charts 5 and 6, compared to other EU member states the Czech Republic has both the biggest average farm size – 130.2 hectares (the figure for Poland is 10.2 hectares) and the biggest share of large farms (with an area of 50 hectares or more) in the total farmland area – 92.5% (the proportion for Poland is 31.6%).<sup>25</sup> At present, each out of around one thousand big agricultural companies controls more than 10,000 hectares of farmland, which de facto makes it a quasi-feudal latifundium.<sup>26</sup>

**Chart 5.** Average farm size in EU member states in 2016



V4 states are marked blue. The EU average is given for 27 countries.

**Source:** ‘Common context indicators for rural development programs (2014–2020)’, European Commission, ec.europa.eu.

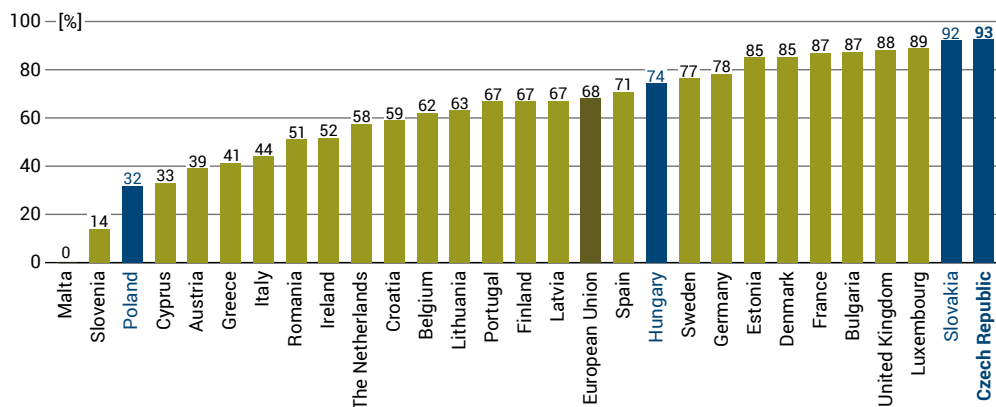
<sup>23</sup> Cf. *The factory of life. Why soil biodiversity is so important*, The European Commission, Luxembourg 2010, ec.europa.eu.

<sup>24</sup> M. Procházka, ‘Brabec: Změnu klimatu už nezastavíme, lze ji jen zpomalit’, *Právo*, 3 August 2019, novinky.cz.

<sup>25</sup> ‘CAP context indicators – 2019 update’, The European Commission, ec.europa.eu; ‘Farm structure survey 2016’, Eurostat, 28 June 2018, ec.europa.eu/eurostat.

<sup>26</sup> O. Stratilík, ‘Přestali jsme uvažovat selským rozumem, říká ekolog Josef Fanta’, *Euro*, 14 July 2018, euro.cz.

**Chart 6.** The share of big farms in the total area of farmland in EU member states in 2016



Big farms are farms with an area of at least 50 hectares. V4 states are marked blue. The EU average is given for 27 countries.

**Source:** ‘Farm structure survey 2016’, Eurostat, 28 June 2018, ec.europa.eu/eurostat.

Initially, the operation of big farms was viewed as a competitive advantage – they are easier to manage and economies of scale contribute to their cost-effectiveness. However, over time, this system’s disadvantages have become increasingly evident. Vast open stretches of land facilitate soil erosion because bushes, groves and isolated trees mitigate the wind’s erosion activity and prevent the organic layer of soil (which is crucial for soil fertility) from being washed away by rain.

**The structure of farmland ownership hampers the efforts to maintain a high quality of soil: as much as 70–80% of Czech farmland is leased (this proportion is among the EU’s highest; the EU average is around 50%), most often for one to two years.<sup>27</sup> This reduces the bond between the farmer and their land, and facilitates intensive use of farmland, which in turn accelerates soil erosion.** In addition, in their farming activity Czech farmers largely focus on meeting the demand from big retail chains, which view maximum cost-efficiency as their priority; mitigation of the negative impact of their suppliers’ activity on the environment is less important for them.

The total area affected by the problem of soil erosion is 500,000 hectares of farmland, i.e. around 20% of the Czech Republic’s arable land, with most of this

<sup>27</sup> ‘Česká půda už roky strádá. Přitom existuje nenápadný nástroj...’, Ekolist, 23 December 2019, ekolist.cz; Z. Keményová, ‘Česká krajina se blíží kolapsu a zemědělství jen čeká na průšvih, říká rektor zemědělské univerzity’, Hospodářské noviny, 19 August 2019, hn.cz.

farmland being located in southern Moravia. Nationwide, around 60% of land is affected or threatened by erosion.<sup>28</sup> Due to numerous new instances of soil erosion, in the last 30 years soil water absorption capability has decreased by as much as a third. This negative trend is most often recorded in corn planted fields, which account for half of the instances of erosion, even though corn farming accounts for a mere 12.4% of all crops.<sup>29</sup> Almost 75% of corn farmed in the Czech Republic is field corn (silage corn), which is mainly used to produce biogas. Farming this type of corn requires intensive fertilisation, which in turn contributes to reduced soil quality and creates the need to use increasingly larger amounts of artificial fertilisers. The situation is similar with oilseed rape,<sup>30</sup> which accounts for 16.7% of Czech crops (the EU's largest share)<sup>31</sup> – a third of oilseed rape grown in the Czech Republic is intended for non-food products. The last decade has seen a significant increase in the production of both oilseed rape and field corn.<sup>32</sup>

#### 4. The spatial development policy

**Another reason behind the present drought has been the land drainage programmes carried out over many years.** Over the last century, the area of wetlands and flood plains has decreased by 80%,<sup>33</sup> and the length of rivers was reduced by 30% in order to create agricultural and building land.<sup>34</sup> The draining of vast stretches of land has deprived the surrounding area of an important cooling factor (forests have a similar function), which has resulted in increased soil exposure to high temperatures. The temperature of dried-up land increases faster, triggering a positive feedback reaction that has a negative impact on soil.

<sup>28</sup> M. Biben, M. Plíhalová, 'Česko přijde denně o 30 fotbalových hřišť zemědělské půdy. Kvůli developerům i erozi, říká odborník', *Hospodářské noviny*, 6 August 2019, hn.cz.

<sup>29</sup> J. Janda, 'Problém jménem eroze půdy. Spouštějí ji hlavně kukuřice a řepka', *Deník*, 9 September 2019, denik.cz.

<sup>30</sup> Although oilseed rape enriches soil with organic substances and contributes to soil aeration, it is also an attractive food for pests, which is why it is heavily sprayed with pesticides (up to 10 times annually), which in turn reduces the biodiversity of the surrounding area. Cf. M. Černá, 'Už nás nespasí, ani kdyby přšelo celé léto. Bioklimatolog předpovídá změnu české krajiny', *Forbes*, 3 July 2020, forbes.cz.

<sup>31</sup> For comparison, in Poland oilseed rape crops accounts for 7.8% of farmland (although in Opole Province and Lower Silesia Province, which neighbour on the Czech Republic, the share is as much as 15-18%) and in Austria – for around 3%.

<sup>32</sup> In 2020, the yield of oilseed rape was 1.26 million tons (Poland's yield was twice as high, though it should be noted that in the Czech Republic the total crop area is four times smaller than in Poland), i.e. 18% more than in 2010. In 2010-2019, the yield of field corn increased by 40% (to 8.2 million tons), and the yield of sweet corn decreased by 10% (to 620,000 tons).

<sup>33</sup> i.e. by a million hectares, which accounts for around 13% of the territory of present-day Czech Republic.

<sup>34</sup> R. Brabec, 'Polemika: Dělá naše vláda dost v boji se suchem? ANO', *Hospodářské noviny*, 1 August 2019, hn.cz.

Alongside this, to facilitate the operation of heavy agricultural machinery, numerous river channels were lined with concrete to accelerate the outflow of water, and thousands of kilometres of drainage ditches were built (as a consequence, rain is only absorbed up to 80–100 cm into the soil and is drained off). These activities were carried out on a large scale, particularly in the 1960s and 1970s. The need to drain water effectively was emphasised when flood mitigation was on the agenda (in 1997–2013 there were eight major floods which took the lives of more than a hundred individuals). Several years ago, floods were viewed as the most important natural hazard. Similar proposals were put forward during wet periods (e.g. in 1975–1982) which naturally alternate with dry periods.

Economic development combined with numerous large-scale investments (e.g. warehouses, which are particularly popular due to the Czech Republic's location as a transit country, and industrial facilities) contributed to vast stretches of **land being occupied and concreted over**. Sometimes, this involved high-quality farmland (according to local data, built-up and urbanised areas account for a total of 11% of the country's territory).<sup>35</sup> According to most recent OECD comparative reports, the Czech Republic has the biggest share of built-up areas in Central Europe; when compared to other EU member states a greater share is recorded for the Benelux countries, Germany, Denmark and Italy alone.<sup>36</sup> In addition, alongside Germany the Czech Republic has the EU's densest railway network, and its road network is denser than the road network in neighbouring Slovakia and Poland, for instance.<sup>37</sup> Concreted over and asphalted areas disrupt natural water circulation because water is quickly drained off. Built-up land is affected by rapid desertification, whereas it takes up to thousands of years for fertile land to form.

<sup>35</sup> In Poland, the figure is much smaller – around 6.2%. Cf. 'Zdeněk Žalud: Proč je sucho a jak se mu bránit?', Ekolist, 28 April 2020, [ekolist.cz](http://ekolist.cz); Local Data Bank, Statistics Poland, [bdl.stat.gov.pl](http://bdl.stat.gov.pl).

<sup>36</sup> 'Built-up area and built-up area change in countries and regions', OECD, [stats.oecd.org](http://stats.oecd.org).

<sup>37</sup> 'Inland transport infrastructure at regional level', Eurostat, [ec.europa.eu/eurostat](http://ec.europa.eu/eurostat).

### III. THE ECONOMIC CONSEQUENCES OF DROUGHT

#### 1. Agriculture and food

**Water scarcity has a negative impact on the volume and quality of harvest.**

This mainly concerns cereals (including corn), oilseed rape, hops and sugar beets. In 2019, due to hot weather, harvesting began 2–3 weeks earlier than in previous years. Extreme crop losses (above 40%) were reported by farmers in every seventh district, mainly in southern Moravia and in the Bohemian Forest (*Šumava*) region. In 2020, when in late spring and in summer drought occurred in north-western Bohemia alone, crops harvested there were 15–20% smaller than in 2018 and 2019, both of which were extremely dry years.<sup>38</sup> Both in that region and previously in Moravia, one of the reasons behind this situation was the infestation of rodents, mainly the common vole. Its habitats include dry meadows, overgrown fields and orchards, and a rapid increase in its population is facilitated by the absence of cold winters and by warm springs and autumns. In addition, climate change is associated with the spread of crop-damaging insects such as the Western corn rootworm, which was spotted in the Czech Republic for the first time in 2002 (in Poland – in 2004). In recent years, it has become one of the main agricultural pests.

According to the rector of the Czech University of Life Sciences in Prague, **over the next 5–10 years Czech agriculture is likely to experience a disaster similar to the one currently faced by Czech forests.**<sup>39</sup> In the forest sector, alarm was repeatedly sounded against the threats associated with continued planting of spruce trees, whereas in the agricultural sector the consequences of maintaining intensively fertilised plant monocultures on vast fields which are not separated from each other were emphasised. Legal restrictions which are gradually being introduced (e.g. the definition of a maximum allowed area in which one specific cultivated crop can be planted – 30 hectares) are frequently viewed as belated and insufficient. The scope of these limitations results, for example, from protests voiced by top representatives of the agricultural sector, which is dominated by large, usually local, businesses whose owners have links with agriculture ministry officials. Aside from Prime Minister Andrej Babiš, the de facto owner of Agrofert (see the box on the next page), the biggest owners of Czech farmland include Radovan Víték, the second richest Czech

<sup>38</sup> M. Strnadová, M. Hálková, 'Katastrofa. Doslova sežrali úrodu, zoufají si zemědělci kvůli hrabošům', MF DNES, 27 July 2020, idnes.cz.

<sup>39</sup> Z. Keményová, 'Česká krajina se blíží kolapsu...', *op. cit.*

citizen, and Gabriel Večeřa, ranked 61<sup>st</sup> on the list of richest Czechs. The six biggest recipients of agricultural subsidies (which include these three businessmen) include just one foreign company – the British-owned Spearhead.<sup>40</sup> In the situation in which the country's prime minister de facto manages its largest agri-food company, and the agriculture minister used to work as head of an organisation grouping agricultural companies, it is difficult to expect that the state will launch comprehensive activities to divide the big farms into smaller ones or carry out state-funded expropriation in order to sell the land to its current leaseholders. Another complex and long-term task involves boosting crop diversification and biodiversity in the environment in general, which could increase the country's resilience to climate change. Proper distribution of EU subsidies could facilitate this process.

### **Agrofert – the Czech agri-food giant**

The company was established in 1993 by Andrej Babiš. He managed it from its formation until the beginning of 2014, when he became deputy prime minister and finance minister. Officially, he was the company's owner until February 2017 – when, in line with the amended law on conflict of interest, he temporarily transferred 100% of the conglomerate to two trust funds. However, in practice he continues to have a major influence on the company's operation (e.g. the trust funds are managed by his close collaborators of many years, whom he appointed and may dismiss in specific circumstances).<sup>41</sup>

Agrofert continued to expand and to take over consecutive companies from the agri-food and chemical sectors, and later on from the forestry and wood production, renewable energy sources (RES) and media sectors. At present, it includes more than 250 businesses operating in 18 countries and employing 34,000 individuals (two thirds of whom are individuals employed in the Czech Republic, where Agrofert is the second biggest private employer). Agrofert has become the leader in the production of fertilisers, the sale of seeds, lease of agricultural equipment, purchase of agricultural produce, production of and trade in processed meat products, dairy and bread. This is how the present prime minister began to control the entire value added chain in the agri-food sector. Following the

<sup>40</sup> S. Elčić, M. Řeháková, J. Kačer, 'Kdo jsou největší pobírači evropských dotací na zemědělství v Česku?', *Hospodářské noviny*, 4 December 2018, hn.cz.

<sup>41</sup> Cf. K. Dębiec, J. Groszkowski, 'Czech Republic: PM Babiš and his conflict of interest comes under European Commission scrutiny', OSW, 12 June 2019, [osw.waw.pl](http://osw.waw.pl).

formation of the ANO political movement (in 2011), in 2013 he bought the Mafra media group (which now forms a component of Agrofert) that controls two popular opinion-forming daily newspapers.

Due to the scope and scale of Agrofert's operations, since joining the government in 2014 Babiš has in practice been in a permanent conflict of interest, regardless of the fact that a dispute is ongoing between the European Commission and the Czech government as to whether he is violating Czech and EU law in this respect. Agrofert regularly receives subsidies from the Czech state and from the EU, and takes part in public tenders. In 2017, it was the Czech Republic's biggest recipient of EU agricultural subsidies (the company owns around 3.5% of Czech farmland), and under various schemes of non-repayable loans it received a sum that is almost three times higher than the amount of corporate income tax it has paid to the state budget. In 2018 and 2019, the company was the unquestioned leader among those EU companies which were the biggest recipients of EU agricultural subsidies.<sup>42</sup>

Back in his business years, Babiš successfully lobbied for the enactment in 2010 of an amended law which increased the share of biocomponents in petrol and diesel oil, which could only be adopted following a rejection of the president's veto.<sup>43</sup> The companies in his capital group not only continue to grow oilseed rape (on an area that accounts for 17% of their fields, i.e. 5% of the Czech Republic's total oilseed rape crops) but also are the country's biggest producers of a rapeseed oil-based biocomponent added to diesel oil. In 2019 alone, Agrofert accounted for 54% of biocomponent supplies to the state-controlled Čepro company, which is the biggest purchaser of this product. The remaining portion of this biocomponent was imported, while the Kratolia company – Agrofert's biggest domestic competitor in the production of fuel components obtained mainly from agricultural produce – closed down following a fiscal inspection carried out in 2015, when Babiš was finance minister. At the same time, the Czech Republic is not focusing on the development of second-generation biofuels,

<sup>42</sup> W. De Groen, R. Musmeci, D. Gojsic, D. Belicka, *The Largest 50 Beneficiaries in each EU Member State of CAP and Cohesion Funds*, CEPS, 21 May 2021, [ceps.eu](https://ceps.eu).

<sup>43</sup> This share was increased from 3.5% to 4.1% for petrol (bioethanol) and from 4.5% to 6% for diesel oil (rapeseed oil methyl ester). This move was mainly intended as a domestic method for implementing the 2009 EU directive which required the member states to ensure that 10% of fuels used in the transport sector come from RES. In 2015, due to negative consequences of using the first generation biofuels, the EU reduced the allowed share of this group of compounds in meeting the RES share target to 7% (by 2018 the share reached in the Czech Republic was roughly at the required level).

i.e. those that are produced from non-food biomass (e.g. timber industry waste). These fuels are more favourable from the point of view of environmental protection than first-generation fuels: EU legislation relating to this latter type of fuels contributed to an intensive use of artificial fertilisers and the import of palm oil (as well as to emissions generated during its transport).

In connection with the COVID-19 pandemic, Agrofert companies are producing large amounts of disinfectant liquids and their components, some of which are plant-derived: glycerol (which accounts for around 2.2% of disinfectant's composition) is obtained from oilseed rape, and ethanol from corn.<sup>44</sup>

**Local agri-food producers are referring to drought and trade restrictions due to the COVID-19 pandemic to promote the slogan of “food self-sufficiency”.** According to the arguments presented by this lobbying group, increasing the variety of crops could help to boost biodiversity, which is beneficial for soil, and increased crop acreage could improve soil water retention.<sup>45</sup> In a context of drought and limited water availability, meeting these demands would require an improvement in the organisation of irrigation systems. At present, local production is capable of covering a mere 36% of the Czech Republic's fresh vegetable consumption, 39% of its fresh fruit consumption (excluding tropical fruit), 51% of pork consumption and 65% of poultry meat consumption.<sup>46</sup> In January 2021, the Chamber of Deputies passed the law (including with votes in favour cast by ANO politicians) that envisaged the introduction of a minimum share of Czech-made foodstuffs in the total volume of foodstuffs sold in Czech stores, starting from 2022. The draft law was supported by big agricultural companies and proposed a gradual increase of this share from 55% to 73% by 2028. This was a slightly modified, more liberal version of the parliamentary proposal submitted in spring 2020 (e.g. the requirement was restricted to stores with a floor area exceeding 400 m<sup>2</sup>), which in summer 2020 triggered harsh criticism from Thierry Breton, the European Commissioner for Internal Market, and from Czech entrepreneur

<sup>44</sup> J. Pšenička, ‘„Žlutý mor“ na rukách. V dezinfekci Anti-Covid je i řepka z Agrofertu’, Seznam Zprávy, 13 April 2020, seznamzpravy.cz.

<sup>45</sup> Cf. ‘Obilí vyvážíme za nízké ceny. Ovoce dovážíme, půdu zanedbáváme. V roce 90 jsme byli soběstační. Šéf agrárníků Jandajsek vystavuje účet’, Parlamentní listy, 13 May 2020, parlamentni-listy.cz.

<sup>46</sup> P. Adamcová, J. Nevyhoštěný, D. Chripák, ‘Soběstačné Česko? Možná před 400 lety. Datový přehled ukazuje, co sníme i co vyvezeme’, Aktuálně.cz, 20 January 2021, aktualne.cz.



organisations (e.g. due to it being inconsistent with EU legislation). A new wave of criticism at the EU level, including from ambassadors of the largest EU member states, and a real threat that the EC may launch a procedure regarding this issue, persuaded Prime Minister Babiš to refrain from introducing such far-reaching changes. He hinted at this on the same day on which the amended laws were passed, and subsequently in April 2021 his deputies voted against the reform, having taken into account the reservations submitted by the Senate (which is dominated by the opposition).

A certain degree of protectionism was evident in the restrictions introduced as part of temporary measures during the COVID-19 pandemic – starting from autumn 2020 stalls run by farmers were allowed to sell Czech agricultural produce alone (this was valid until 30 January 2021, when the operation of marketplaces was suspended as part of pandemic restrictions). These types of activities may bring a double benefit to the government: if it manages to introduce such measures and to maintain them for a longer period due to decreased vigilance on the part of the EC, Czech companies linked to government officials will benefit from them. If this is not the case, these measures may help the government in the campaign ahead of the 2021 parliamentary elections anyway, because they will be presented as an illustration of the government's determination to defend Czech national interests in the EU.

However, the dispute in the Czech debate is about the methods rather than the direction of actions. The proposal supported by successive governments (including the present one) to increase the country's food self-sufficiency is not particularly controversial. For many years, the Czech Republic has been importing large amounts of foodstuffs – in both 2019 and 2020 the country's foodstuff imports were around a quarter higher than its exports. This problem is evident not only in agricultural production but also in food processing – for example, milk and livestock are exported, while processed food is usually imported (more than half of hard cheese and cottage cheese sold in Czech stores is foreign-made, while domestic milk production exceeds consumption by more than a third). One specific measure to support food self-sufficiency was the government's decision in spring 2020 to earmark CZK 4.3 billion (around EUR 170 million) from the budget reserve for the promotion of this idea.<sup>47</sup> The money is intended to support the development of domestic cultivation of vegetables, fruit and hops, as well as pig and poultry farming.

<sup>47</sup> 'Na zvýšení soběstačnosti dostanou zemědělci a potravináři navíc 4,3 miliardy korun, rozhodla vláda', Ministry of Agriculture of the Czech Republic, 26 March 2020, [eagri.cz](http://eagri.cz).

Producers promoting food self-sufficiency frequently refer to an idealised picture of “better times” for agriculture, i.e. the Communist era, criticise “excessive” market openness and the major presence in the Czech market of foreign retail chains, which are mainly focused on maximising their profits. To support their argumentation, they cite data compiled by the Czech Statistical Office, according to which domestic meat production at the end of the 1980s exceeded consumption almost twofold, while at present it satisfies a mere half of domestic demand.<sup>48</sup> Over the last 15 years, the area of potato-planted fields decreased by 50%, and the area of fruit orchards by around 25%.<sup>49</sup> At the same time, compared to its demand, the Czech Republic records a surplus in the production of cereals and sugar beets, and the acreage of oilseed rape crops has increased by more than a quarter.

## 2. The energy sector

**The Czech energy sector is traditionally based on three types of power plants which depend on water availability: coal-fired, nuclear and hydro-power plants.** The extent of this dependence is evident in the amount of water the energy sector consumes – in 2018 it used 629 million m<sup>3</sup> of water, i.e. almost 40% of the Czech Republic’s total water consumption. Compared to 2010, this equates to a decrease of as much as a third in terms of the amount of water and of 8 percentage points in terms of the share in total water consumption (cf. Chart 4 in Part I). However, as much as 83% of this water returns to rivers. Alongside this, the energy sector accounts for more than half of surface water intake (cf. Chart 7, p. 37). In the last decade, the decrease in this sector’s water consumption was faster than in the industrial sector and the public utility sector, which indicates that aside from technological improvements and savings made as a result of water price increases, other factors came into play. Due to the fact that in consecutive years energy production has remained largely unchanged (83–88 TWh), **the additional decrease in the energy sector’s water consumption was caused by changes affecting the structure of energy mix. The most important factors include the gradual**

<sup>48</sup> M. Bureš, ‘Soběstačnost ČR v mase a vejcích pokulhává’, Finance.cz, 6 March 2018, finance.cz.

<sup>49</sup> ‘Soupis ploch osevů – k 31.5.2020’, Czech Statistical Office, 3 July 2020, czso.cz; ‘Zpráva o trhu ovoce’, State Agricultural Investment Fund (SZIF), 16 January 2020, szif.cz; ‘Strukturální výsledky za zemědělství ČR podle územního členění – 2005’, Czech Statistical Office, 30 November 2006, czso.cz. Other reasons that contributed to the reduction in the area of fruit orchards included the fact that a significant portion of Poland’s apple export was diverted to the Czech Republic following the 2014 embargo on the export of apples to Russia, as well as major problems that Czech apple producers faced due to cheaper foreign competitors, cf. J. Holý, ‘Ovocnáře ničí levné dovozy, sady nahrazují řepkou’, Právo, 10 March 2019, novinky.cz.

**coal phase-out** (in 2010–2018 the share of coal in electricity production decreased by 10 percentage points) and increased utilisation of RES, which do not require major water consumption, and natural gas (by 3.8 and 2.7 percentage points, respectively).<sup>50</sup> The previously recorded increase in electricity generation at the beginning of the present century mainly resulted from the launch of two units of the Temelín Nuclear Power Plant in 2002–2003.

**Thus far, the hydropower sector has been the most affected by problems resulting from drought:** in consecutive years between 2014 and 2019 hydropower plants recorded a decrease in annual electricity production, compared to each consecutive year from at least 2007 until 2014. Back in 2013, annual electricity production by hydropower plants was 2–3 billion kWh, post-2014 it slightly exceeded the level of 2 billion kWh only twice (in 2018 electricity generated by hydropower plants covered 2.2% of domestic demand, in 2019 – 2.7%, whereas back in 2013 the figure was 4.1%). Over the last few years, the Czech Republic’s largest hydropower plant operator, the ČEZ company, reported that electricity generation in big hydropower plants accounted for 70% of the long-term average, and in small hydropower plants only 50%.

**In addition, drought has curbed the development of biogas power plants,** including as a result of a decrease in crops used by these plants, e.g. corn. Since 2014, which was the first year in which the recent drought began to be evident, biogas plants have seen a stagnation in electricity generation, and in 2018 and 2019 a small drop was recorded (in 2019 of 3% year-on-year).<sup>51</sup> This was accompanied by increased utilisation of natural gas in electricity generation. The stagnation recorded for biogas power plants is confirmed by other data: the share of these plants in electricity generation from RES increased from 13% in 2011 to 25% in 2014 and then slightly decreased to 23% in 2019. The share of these plants in total electricity generation increased from 1% in 2011 to 3% in 2014 and remained almost unchanged until 2019 (2.9%). Sometimes, biogas power plant operators (at present there are 574 of them, the number is similar to the one recorded in 2016) reduce the operation of their facilities due to drought or switch to another primary input (e.g. manure). Paradoxically, due to a poorer quality of cereal crops caused by drought, a portion of these crops is sold to biogas plants.

<sup>50</sup> ‘Zprávy o provozu elektrizační soustavy’, Energy Regulatory Office (ERÚ), eru.cz.

<sup>51</sup> ‘Hodnocení výroby elektřiny z bioplynu v roce 2019’, Czech Biogas Association (CzBA), 6 April 2020, czba.cz.

A decrease in water resources may prevent the cooling of nuclear units. However, thus far there have been no such instances in the Czech Republic (although in 2018 drought affecting Hungary forced the Hungarian government to reduce electricity production in the Paks Nuclear Power Plant).<sup>52</sup> Most likely, the problem regarding the availability of water used for cooling will no longer affect the currently operating units of the nuclear power plants in Temelín and Dukovany – this is due to the hydroelectric dams on the Vltava and Jihlava rivers. **However, the cooling of the planned fifth reactor of the Dukovany Nuclear Power Plant may pose certain challenges.** According to nuclear energy experts, the cooling process may cause the entire Jihlava river to dry up within a year.<sup>53</sup> This means that the plans to prolong the operation of the four older units until 2045–2047 and to launch the new unit in 2038 may be impossible to reconcile. Therefore, it cannot be ruled out that ultimately small modular reactors (SMRs) will be installed in this power plant, which are less dependent on water availability. It is likely that no such problems will emerge regarding the expansion of the Temelín Nuclear Power Plant, which is planned to take place following the expansion of the plant in Dukovany, because the Vltava can easily cool down another two big reactors.

**Similar cooling problems have also been recorded for some coal-fired units**, although the situation in the Czech Republic in this respect is quite favourable. This is because in most large coal-fired units (just as in nuclear units) the cooling process is mainly carried out in cooling towers, rather than in once-through open cooling systems (as e.g. in Germany and France). When cooling towers are used, water flows in a closed system, in which only the amount of water that is lost due to evaporation needs to be replenished. This means that this system is less dependent on water availability, which makes it easier to maintain during droughts. However, it cannot be implemented in all power plants – for example, the Mělník coal-fired power plant, which has a 4.4% share in the capacity of the Czech electricity generation sources, is using an open once-through system, which makes it the country's biggest consumer of water (each year it draws 330 million m<sup>3</sup> of water from the Elbe and accounts for 20% of the country's water consumption). Back in 2003, this facility had to be temporarily shut down due to the scarcity of water used for cooling. As a result of some older units being shut down and partly replaced with gas-fired units, in the next five years this power plant's water consumption

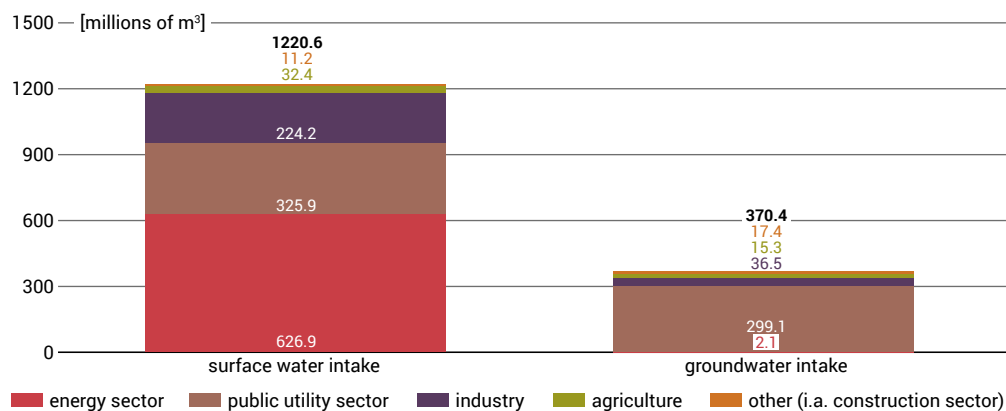
<sup>52</sup> 'Hungary makes environmental case for Paks expansion', World Nuclear News, 22 May 2019, world-nuclear-news.org.

<sup>53</sup> D. Tramba, 'Sucho: nedostatek vody trápí elektrárny i teplárny', Euro, 27 July 2019, euro.cz.

is expected to decrease by more than 60%. Due to the Elbe's minor vulnerability to drought, in recent years the Mělník power plant has not experienced any major problems with water availability. Such problems were reported by smaller power plants – the Poříčí power plant (located several kilometres from Polish Lower Silesia) and the Hodonín power plant (in southern Moravia), which were forced to reduce their electricity production.

**Continued problems with water availability will likely contribute to an increase in the importance of non-water dependent sources of energy, i.e. solar and wind power plants with additional gas turbines.** Solar power plants were indicated by ČEZ, the Czech Republic's biggest energy company, in its 2030 vision as the main alternative to the gradually phased-out coal. This is how drought is contributing to an accelerated decarbonisation of the Czech energy sector. ČEZ currently accounts for 70% of domestic electricity generation and in 2020 more than a third of electricity produced in its power plants was generated from coal.

**Chart 7.** The structure of the Czech Republic's groundwater and surface water intake in 2018



**Source:** Ministry of the Environment (data from the ISSaR system).

### 3. The construction sector

**Due to water availability problems, Czech citizens are increasingly less inclined to support in their neighbourhood new large development projects likely to use water from the local water supply system.** For example, this was the reason why in a referendum the residents of the Zdiby municipality near Prague blocked the construction of a large logistical centre (153,000 m<sup>2</sup>; 98% of the votes were cast against it). Zdiby is a member of a bigger association

known as Koridor D8 which includes 14 local municipalities opposing new investments in the region. In their arguments, they refer to their concerns regarding water availability and other issues. This is how the planned construction of a facility owned by the Daimler company was blocked. If built, it would be the Czech Republic's largest logistical facility (see below).<sup>54</sup>

### **The rejection of the Daimler investment – an example of the rising importance of environmental criteria**

In mid-2017, the Czech media reported that in Úžice (10 km north of Prague) Daimler plans to construct a logistical centre, mainly to serve as a warehouse for automotive components. Plans have been made to build a facility with an area of 22 hectares within three years (i.e. twice as big as the Amazon warehouse near Prague, which is the country's largest industrial building constructed post-1989) and the area of the investment as a whole was to be 44 hectares. The centre was to employ 900 individuals who would be working in a three-shift system seven days a week. Both Czech and Polish media reported that the investor had decided to choose the Czech bid over the Polish one due to more comprehensive investment incentives.

The construction works were to start in 2018. Initially, the authorities of the Central Bohemian Region issued a positive environmental impact assessment decision (EIA, an assessment of the investment's impact on the environment analysed from the point of view of EU legislation). However, as a result of protests organised by the local population, including the Koridor D8 association, the issue received widespread media coverage. For example, noise and environmental pollution associated with the investment were emphasised alongside the issue of water management in the situation of a drought. In February 2018, Koridor D8 intervened with the Ministry of the Environment and other bodies in connection with the EIA. Ultimately, in spring 2019 the Ministry issued a ban on transferring land owned by the state farmland fund to the investor, explaining that the investment stands in contradiction to "adaptation to climate change" because some portions of this land were high-quality farmland. This decision was possible thanks to the 2015 amendment to the law on protection of farmland, which toughened the rules for changing the category

<sup>54</sup> D. Novák, 'Stát zařizl plány na obří sklad Daimleru u Prahy', E15, 21 May 2019, e15.cz.

of farmland. According to the amended law, changing farmland categories I and II is only possible when another public interest is more important than the interest connected with farmland protection.

The decision came as a surprise to the developer, the CTP company, which had by then purchased the land and was preparing it for development activities, which cost it a total of more than 20 million euros. The company was hoping that it could carry out another investment, at least on a portion of this land, such as a business park. However, when it modified its investment plans (e.g. reduced the facility's size by half), once again the Environment Ministry refused to allow it to use land owned by the agricultural fund. At the same time, in spring 2018 the Polish media reported that Daimler was expanding its logistical centre in Ołtarzew near Warsaw, which may be viewed as partial compensation for its failure to construct a similar facility in the Czech Republic.

**In the coming years, the requirement to prevent the spread of drought and to keep high-quality land undeveloped will curb the construction of greenfield warehousing facilities and promote investments in desolate post-industrial facilities (so-called brownfield investments).** The Czech Republic's central location, high level of industrialisation and still relatively low price of land all contribute to considerable demand for warehousing facilities in this country. In mid-2019, the total area of industrial and warehousing facilities was 8 million m<sup>2</sup>; over the last decade their number increased twofold, i.e. to around 700. Another 0.5 million m<sup>2</sup> of warehousing facilities was under construction, mostly in the vicinity of Prague. Some scientists and environmental activists are calling on the government to introduce a tax on impervious surfaces (e.g. asphalted land), modelled on a similar tax in Germany, in order to reduce the number of empty buildings (at present around 5% of warehousing facilities are not leased). According to them, the state should be more active in encouraging investors to carry out brownfield investments. The potential for such initiatives is high – at present there are around 11,000 brownfields in the Czech Republic with a total area of 38,000 hectares.<sup>55</sup> However, since 2010 the Czech government has not supported a single undertaking of this type; in the last 20 years it supported a mere four, while in the

<sup>55</sup> For comparison, in Poland's Silesia Province, which corresponds to 42% of the Czech Republic's population and 16% of its territory, the area of unused post-industrial sites is around 7,000 hectares. Cf. 'Fokus na rewitalizację terenów poprzemysłowych na Śląsku', Property Design, 17 February 2020, propertydesign.pl.

same period it offered subsidies to 98 greenfield investments (including projects which involved changing the status of land so that it is no longer considered as farmland; since 1998 80,000 hectares of land, i.e. 2% of Czech farmland, was covered by these investments). These activities came under criticism from the Czech Supreme Audit Office (NKÚ) which considered them harmful from the point of view of preventing climate change. As a consequence, in July 2019 the government adopted the *National Brownfield Regeneration Strategy for 2019–2024*,<sup>56</sup> which is intended to promote these types of investments and to offer funding for their implementation similar to that available for greenfield investments. In this spirit, the Czech Ministry for Industry and Trade increased the earmarked funds in the 4<sup>th</sup> call for tenders in the Regeneration and Commercial Use of Brownfields Programme, announced in 2020. The programme has been implemented since 2017.<sup>57</sup> This time, the sum earmarked for this purpose is CZK 260 million (EUR 10 million), i.e. more than 2.5 times higher than in the first and third calls for tenders, and 1.5 times more than in the second call for tenders.

#### 4. Forests

**Vegetation dying has been one consequence of drought, in particular due to the increasingly lower level of groundwater. In forests, this mainly involves pine and spruce trees. Alongside this, drought has contributed to the spread of bark beetle infestation on a scale which is unprecedented in the history of the Czech Republic.** The first symptoms of this infestation became evident as early as 2012–2013 in Czech Silesia and northern Moravia. Over time, it has spread to almost all forests nationwide up to an altitude of 700 metres above sea level. Since 2017, the spread of this pest has doubled each year – according to estimates in 2020 it affected around 60 million m<sup>3</sup> of trees and in 2021 the figure is expected to double again. **According to estimates prepared by the ministers of agriculture and the environment, the fight against bark beetles will likely last until 2023–2025. However, it is expected that the calamity will ease in tandem with the spread of bark beetles to increasingly higher altitudes.**

**The unprecedented scale of bark beetle infestation is both a consequence of drought and one of the reasons behind its aggravation. The need to cut**

<sup>56</sup> *Národní strategie regenerací brownfieldů 2019–2024*, Ministry of Industry and Trade of the Czech Republic, 20 August 2019, mpo.cz.

<sup>57</sup> 'Regeneration and Commercial Use of Brownfields Programme', CzechInvest National Brownfield Database, brownfieldy.eu.



**down vast stretches of forest** (in the Jeseníky Mountains alone, located near the Polish border, more than 4,000 hectares of forest were logged) **has contributed to accelerated soil erosion and decreased soil water retention capability.** This is curbing the growth of newly-planted trees and reducing rainwater absorption, which in turn increases the risk of flood. In addition, forests impact on the local microclimate by cooling down the surrounding area. Therefore, cutting down vast stretches of forest contributes to an increase in temperature in the region.

Alongside this, an excessive supply of timber resulting from emergency logging reduces the price of timber and undermines the profitability of forest management. As a consequence, in 2019 the usually profitable state-controlled company Lesy České republiky (Forests of the Czech Republic, LČR), which manages more than half of the country's forested areas, recorded a loss to the tune of CZK 790 million (around EUR 30 million).<sup>58</sup> Although according to the company's internal estimates prepared in 2020, it was expected to be unprofitable until 2023, in 2020 it managed to eke out a small profit. This resulted from increased state subsidies to compensate for low timber prices. However, these subsidies can only be offered to those companies which decide to cut down and sell sick trees, which reduces the price of timber even more. While in 1990–2015, 1.3 million m<sup>3</sup> of trees affected by bark beetle infestation were cut down annually, in 2019 the figure surged to 20 million m<sup>3</sup>. In 2019, LČR alone cut down a record-high volume of 13.9 million m<sup>3</sup> of trees (an increase of 30% year-on-year) including 9.7 million m<sup>3</sup> of trees infested with bark beetles (more than 60% more than in the previous year).

## 5. Households

**Drought has a negative impact on the life of Czech citizens, it triggers an increase in the price of foodstuffs, running water and electricity, and reduces the quality of life due to various restrictions.** In 2019, foodstuffs had a 17.6% share in the average household's consumer spending, electricity had a 5.3% share, and water and sewage fees held a 1.6% share.<sup>59</sup>

**The increasingly severe agricultural drought results in increased prices of agricultural produce.** In 2019 the biggest price increase was recorded for

<sup>58</sup> In 2010–2017, the company's profit amounted to billions of korunas, while in 2018 it decreased to CZK 70 million (EUR 2.7 million). Cf. 'Lesy ČR se loni kvůli kůrovci propadly do ztráty 790 milionů korun', Czech Television, 20 May 2020, [ct24.ceskatelevize.cz](https://ct24.ceskatelevize.cz).

<sup>59</sup> 'Spotřební výdaje domácností - 2019', Czech Statistical Office, 2 November 2020, [czso.cz](https://www.czso.cz).

potatoes (44%). The price increase recorded for vegetables in general (14%) was much higher than the average price increase in the economy as a whole recorded in 2019 (2.8%). Similarly, data compiled for 2020 indicates that the price increase in foodstuffs (4.5% year-on-year) is significantly higher than the rate of inflation (3.2%). In mid-2020, in the Czech Republic foodstuff prices were 21% higher than back in mid-2012, while for the EU-27 the figure was 11%. However, the prices of vegetables alone were as much as 41% higher (24% in the EU-27) and the prices of fruit were 33% higher (26% in the EU-27).<sup>60</sup> In 2013–2019, there was an increase in the share of fruit and vegetable spending in household consumer expenditure (a rise of around 0.2 percentage points to 1.4% and 1.85%, respectively).<sup>61</sup> In the Czech Republic, spending on foodstuffs accounts for 84% of the EU-27 average, while the average level of prices of a household basket of goods stands at 75% of the EU-27 average.<sup>62</sup>

**Water availability problems have resulted in a rise in the price of running water - by more than a third in the last decade.** In the same period, the average price increase was almost 15%. This is combined with inconvenience associated with temporary limitations on the use of water for specific purposes, e.g. for watering plants and filling up private swimming pools. These restrictions are affecting a large group of citizens: on average every third house with a garden has an adjacent swimming pool. In Europe, in proportion to the number of inhabitants, the Czech Republic is ranked third in this category, after Spain and France.<sup>63</sup> At the same time, this situation contributes to society's increased water efficiency awareness.

**In addition, drought triggers a rise in electricity prices and in electricity spending during summer months due to intensive utilisation of air conditioning systems.** Due to grid overload in summer months, in the summer of 2018 electricity prices increased by more than a third compared to 2017, and by twofold in comparison to 2016.<sup>64</sup> In 2013–2019, the share of spending in the “housing, water, electricity, gas and other fuels” category in household consumer spending as a whole rose from 22% to 24%.

<sup>60</sup> ‘Food Price Monitoring Tool’, Eurostat, [appsso.eurostat.ec.europa.eu](https://appsso.eurostat.ec.europa.eu).

<sup>61</sup> ‘Vydání a spotřeba domácností statistiky rodinných účtů - domácnosti podle postavení osoby v čele, podle velikosti obce, příjmová pásma, regiony soudržnosti - 2013’, Czech Statistical Office, 10 June 2014, [czso.cz](https://www.czso.cz).

<sup>62</sup> ‘Comparative price levels of consumer goods and services’, Eurostat, [ec.europa.eu/eurostat](https://ec.europa.eu/eurostat).

<sup>63</sup> Portable swimming pools are not included in the statistics compiled by the European Union of Swimming Pool and Spa Associations. Cf. A. Váchal, ‘Bazén je už na každé třetí zahradě v Česku. Víc jich mají jenom ve dvou zemích Evropy’, [Aktuálně.cz](https://www.aktuálně.cz), 4 June 2016, [aktuálně.cz](https://www.aktuálně.cz).

<sup>64</sup> ‘Horké počasí zdražuje elektřinu. Ceny žene vzhůru spotřeba klimatizací i sucho’, *Lidové noviny*, 12 June 2018, [lidovky.cz](https://www.lidovky.cz).

**Drought is also impacting on the implementation of development projects and on the domestic property market.** Property dealers confirm a rising demand for houses that have their own water source (the price of such a house is 5–10% higher than the price of an average house) or – most preferably – two alternative sources, i.e. both a water main and a well from which water can be drawn for plant watering. At the same time, there has been no increase in Czech citizens’ interest in well sinking, but an increase was recorded in the number of applications for connecting the newly-developed buildings to the water mains. Well sinking is increasingly difficult due to additional limitations introduced in 2019 and to opposition from neighbours, who are worried that their own sources may dry up and are more inclined to appeal such plans to relevant administrative bodies. **Another reason why new buildings are not constructed in those areas which are most affected by drought is that some municipalities (e.g. in the Vysočina Region) have banned the sale of building plots and the construction of houses, due to their concerns regarding drinking water scarcity. In addition, several other regulations are impacting on the quality of life in these areas,** e.g. a seasonal ban on watering plants using drinking water.

### **The operation of the Turów coal mine – an example of asymmetry in the perception of threats posed by hydrological drought and water scarcity**

One illustrative case that the Czech media has associated the problem of drought with is that of the operation and planned expansion of the Turów lignite mine, located in the Polish-Czech-German cross-border region (in the Zittau Basin), and managed by the PGE Group – a state-owned consortium that is the biggest electricity producer in the country.<sup>65</sup> According to numerous Czech experts, politicians and environmental activists, this facility’s operation already has a negative impact on the level of groundwater on the Czech side, which aggravates the problem of hydrological drought. They argue that in these circumstances the mine’s expansion may completely deprive the inhabitants of the Czech part of the cross-border region of water which they draw from their wells.<sup>66</sup> Czech experts claim

<sup>65</sup> In March 2020, the Turów coal mine’s mining licence was extended for another six years, and in April 2021 – until 2044, i.e. until the expected depletion of coal fields (within the boundaries of an area specified in the licence issued back in 1994, i.e. the present extension process does not include any expansion of the site covered by the licence). At present, 93% of coal mined in Turów gets burnt in the nearby power plant which covers around 5–8% of Poland’s electricity demand.

<sup>66</sup> Z. Kuchyňová, ‘Polsko dalo zelenou rozšíření dolu Turów, Češi se bojí o zdroje pitné vody’, Czech Radio, 29 January 2020, [cesky.radio.cz](http://cesky.radio.cz).

that the problem regarding continued depletion of water resources, which is expected to occur following the expansion of mining activity, may affect around 30,000 inhabitants of municipalities located on the Czech side of the border. At the same time, they are distrustful of the solution that PGE is currently implementing to protect the water intake in Uhelná, involving a 1.1 km long and 1 m wide so-called anti-filtration screen (its completion is expected in autumn 2021). They argue that it has not been tested beforehand and may deprive the local inhabitants of access to water in case of its failure.<sup>67</sup> According to them, to secure a stable access to water, costly investments in water and sewage systems in the cross-border region in the Jizera Mountains would be necessary. A similar result could be reached if the Czech authorities accepted Poland's proposal to build a water supply system connecting the local area to the water mains in Bogatynia. However, in both instances the problem involves the absence of a water and sewage system in a large portion of the Czech side of this section of the cross-border region. Alongside this, Czech officials are undermining the PGE's findings contained in the report assessing the environmental impact of the mine's expansion. According to this report, the drinking water intake in Uhelná is the only water intake that may be affected by the facility's expansion.<sup>68</sup> To boost the Czech side's case, on 3 February 2020 the government in Prague allocated additional funds to initiatives focused on performing additional measurements, e.g. regarding the changes in the water level in the vicinity of the mine. In June 2020, PGE presented a report compiled by the Institute of Meteorology and Water Management, including an analysis of meteorological and hydrological droughts, which indicates that the operation of the Turów lignite mine has a negligible impact on hydrological conditions on the Czech side.<sup>69</sup> According to the report's authors, the problems regarding water resources on the Czech side are mainly due to the region's meteorological conditions, and the entire mountainous region of the Zittau Basin is particularly vulnerable to hydrological droughts. Although open-pit mines require land drainage, which frequently results in a decrease in the level of groundwater (which is why the Turów mine may have a negative impact on drinking water availability), it cannot be ruled out that Czech water resources are

<sup>67</sup> Cf. the *Stop Turów* website run by Greenpeace Česká republika, [stopturow.cz](http://stopturow.cz).

<sup>68</sup> The PGE cites the results obtained in 550 groundwater table measurement sites – cf. 'Kopalnia Turów będzie mogła kontynuować eksploatację w zmniejszonych granicach obszaru górniczego', PGE GiEK, 24 March 2020, [pgegiiek.pl](http://pgegiiek.pl).

<sup>69</sup> 'Niezależna opinia IMiGW-PIB: Kopalnia Turów ma znikomy wpływ na warunki hydrologiczne po stronie czeskiej', PGE GiEK, 22 June 2020, [pgegiiek.pl](http://pgegiiek.pl).

also affected by the unprecedented drought. This opinion was voiced by the Czech Geological Survey (ČGS) which in recent years conducted research on the changes in water level in the vicinity of the mine. In 2021, the ČGS admitted that whereas in deeper aquifers water depletion likely results from the mine's operation alone, in shallow aquifers (which serve as a water intake e.g. for Hrádek nad Nisou) the underlying factors are a combination of mining activity, local water drawing and drought, and that it is difficult to assess the exact impact of each of these factors.<sup>70</sup>

The Turów case has sparked controversy in the Czech Republic, and since the beginning of 2020 it has also been widely discussed at the European level. This was when the local authorities of the Liberec Region filed a complaint against Poland with the European Commission, in which they argued that Poland violated the EU Water Framework Directive. This move received support from the Czech Environment Minister Richard Brabec (ANO) and Czech MEPs representing various political parties (including ANO), who called for organising a debate focused on this problem in the European Parliament (the issue was covered by the Politico portal). On 17 December 2020, in response to the Czech Republic's complaint, the EC announced that Poland had indeed incorrectly applied the provisions of the EIA Directive and of the directive on public access to environmental information, although it rejected other reservations (including those regarding the alleged water directive violation).<sup>71</sup> On 26 February 2021, the government in Prague filed a lawsuit against Poland at the Court of Justice of the European Union in this case, in which it also demanded that interim measures be introduced involving ceasing the mining activity. On 21 May 2021, the Court ordered Poland to immediately cease mining. For both states, the lawsuit is unprecedented; in the history of the European Community and the European Union it is exceptional (since 1979, a mere six judgements were issued in lawsuits between two states, and two lawsuits were withdrawn). The two countries can still reach a compromise before the Court issues its judgement. According to media reports regarding Prague's claims, the possible bilateral agreement will most likely envisage that Warsaw should offer to Prague a contribution worth around 50 million euros for the implementation of environmental projects in

<sup>70</sup> H. Truchlá, 'V okolí Hrádku se něco děje, zjistily satelity. Země klesá, voda totiž mizí do Polska', Aktuálně.cz, 2 February 2021, aktualne.cz; M. Biben, 'Varování od dolu Turów. Podzemní stěna k ochraně české vody nestačí, je potřeba zbudovat delší', Hospodářské noviny, 26 May 2021, hn.cz.

<sup>71</sup> 'Environmental Impact Assessment: Commission adopts reasoned opinion in case brought by Czechia against Poland', The European Commission, 17 December 2020, ec.europa.eu.

the cross-border region as well as initiatives to improve drinking water availability.

In addition, the Czech media is using the disputes over the Turów mine to emphasise the differences between the Czech Republic and Poland and to undermine the purpose of developing cooperation within the V4 group. These disputes are likely to have an increasingly negative impact on bilateral relations. At the same time, drought and water scarcity may become important issues of shared interest for the V4 countries, particularly in light of the fact that the Czech Republic and Poland are among those EU member states that have the poorest freshwater availability parameters. Moreover, this problem is high on the agenda for the governments of Slovakia and Hungary alike. The fact that the proposal to take action to improve the situation in these fields (under “V4 Water” slogan) has been included in the agenda of the Polish presidency of the V4 group (2020–2021) suggests that the four countries are increasingly aware of their shared challenges related to drought and to depletion of water resources.<sup>72</sup>

<sup>72</sup> ‘Polish Presidency of the Visegrad Group’, The government of the Republic of Poland, gov.pl.

## IV. MITIGATION MEASURES

**In the Czech Republic, a broad public debate on water management solutions has been ongoing since 1997. Initially, it was dominated by issues related to flood prevention. The debate included two separate camps which were initially hostile to each other: the environmental camp (which advocated solutions that were as close to the natural environment as possible) and the economic camp (which was trying to push through large development projects that impacted on the environment). The present government emphasises that it is trying to carry out activities advocated by both camps.** Compromise solutions are being adopted increasingly frequently. Most environmental activists now accept certain less invasive development projects carried out to boost water retention – one example involves artificial infiltration and groundwater recharge projects which include channelling water from rivers to big bodies of water via specially-made ditches. Other projects that are less damaging to the environment (a total of around 1,000 such projects have been carried out) include the establishment of fish ponds. According to environmental activists, non-invasive projects do not include large dams, which some leading researchers consider a necessity in certain locations due to their potential role in preventing water scarcity, including drinking water scarcity (at present they account for 52% of domestic drinking water supply)<sup>73, 74</sup> The arguments presented by these researchers convinced the government – in May 2020 the Ministry of Agriculture identified 31 locations for constructing dams (the Ministry of the Environment has approved most of these locations and added them to another 65 locations secured for future surface water accumulation). Although land preparation and construction of such a facility lasts 15–20 years, the fact that a specific location was included in this list will equate to it being protected against other types of development activity. At present, preparations are underway to build six large dammed reservoirs. The work on creating two of them, in central Bohemia, is expected to be launched in 2024 (no sooner than in 2028 both will be capable of retaining a total of 1.2 million m<sup>3</sup> of water within an area of almost 48 hectares), and the work on another one, much larger than the first two (it will retain 14.5 million m<sup>3</sup> of water within an area of 130 hectares), in the vicinity of Bruntál near the border with Poland’s Silesia Province – in 2025.<sup>75</sup>

<sup>73</sup> ‘Jedenáct nových lokalit pro možnou stavbu přehrad. Ministerstvo rozšiřuje seznam’, Czech Television, 30 June 2020, [ct24.ceskatelevize.cz](https://ct24.ceskatelevize.cz).

<sup>74</sup> Cf. M. Bidrmanová, ‘Sucho: Sprchovat se vodou po někom jiném? Zvykejme si na to’, Seznam Zprávy, 14 May 2020, [seznamzpravy.cz](https://seznamzpravy.cz).

<sup>75</sup> ‘Připravuje se stavba šesti přehrad, na boj se suchem dalo ministerstvo podle Tomana loni 14 miliard korun’, Hospodářské noviny, 4 May 2020, [hn.cz](https://hn.cz).

**In the Babiš government policy statement, drought prevention is described as ‘a matter of paramount public interest’. As the problem worsens, the government is launching further measures focused on boosting the country’s water retention capability and improving water availability, as well as on slowing down the pace of climate change and adapting to it.** Richard Brabec, the Minister of the Environment (ANO; in office since 2014), emphasises that it is crucially important to switch from thinking about the threat associated with an excess of water to becoming aware that in fact it is water scarcity that is increasingly posing a threat. To achieve this, new regulations are being passed and additional funds earmarked, and various incentives are offered to local authorities to commence action. Coordination of these actions is facilitated by the National Coalition for the Prevention of Drought established in August 2018. It groups the most relevant ministries (of the environment, agriculture, industry and trade, as well as regional development), representatives of public offices dealing with related issues (e.g. the geological survey, the environmental protection fund), local governments and prominent experts representing universities and research institutes. The private sector is represented by officials from the Agrarian Chamber and the Confederation of Industry of the Czech Republic. Although the government is striving to make these activities mutually complementary, the Czech Supreme Audit Office (NKÚ) has identified an instance involving offering subsidies to mutually exclusive initiatives: the Ministry of Agriculture supported the creation of artificial river channels, while the Ministry of the Environment supported their elimination (according to the ministers this situation was exceptional and its importance was marginal when compared to the total number of projects implemented).

**As regards combating drought, key importance is attached to projects intended to boost drinking water availability and the total volume of water in the Czech Republic.** In 2019, the Prime Minister announced that in the coming decade he intended to earmark CZK 24 billion (around EUR 1 billion) for building new water supply connections and CZK 6 billion (around EUR 240 million) for modernisation of the current ones. The new connections will enable a larger group of inhabitants to have access to public water supply systems<sup>76</sup> and will facilitate the distribution of water to areas most often affected by water shortages. Modernisation of the installation, for its part,

<sup>76</sup> At present, the ratio is between 86% in the Plzeň Region and in the Central Bohemian Region to 100% in Prague and in the Karlovy Vary Region and in the Moravian-Silesian Region. Cf. ‘Podíl obyvatel zásobovaných vodou a napojených na kanalizaci pro veřejnou potřebu v roce 2018’, Czech Statistical Office, czso.cz.



will help to reduce water distribution losses (in 2019 these losses accounted for 14.5% of the total volume of water).<sup>77</sup> In addition, plans have been made to connect the Těrlicko Dam (which supplies water to mines in the Ostrava-Karviná coal basin) with the Žermanice Dam (located around 15 km west of Český Těšín, it supplies water to the steelworks in Ostrava) using a 4-kilometer underground tunnel by 2030. This is intended to enable more efficient utilisation of the former dam for industrial purposes in the context of its reduced utilisation by coal mines that are being gradually shut down.

The Ministry of Industry and Trade is carrying out a number of initiatives to encourage SMEs to optimise their water consumption<sup>78</sup> (e.g. zero interest ten-year loans) and to construct reservoirs as part of a modernisation of industrial facilities (subsidies cover 45% of the cost). The present reservoirs with a total area of 30,000 hectares are capable of accumulating 3.36 billion m<sup>3</sup> of water, and the present fish ponds with a total area of 51,000 hectares could hold around 400–500 million m<sup>3</sup> of water. Their capacity is 2.5 times bigger than the Czech Republic's annual intake of surface water and groundwater.<sup>79</sup> In order to encourage citizens to collect rainwater, the Ministry of the Environment is carrying out two rainwater harvesting programmes. One of these programmes (*Velká Dešťovka*, or “The big rainwater”) is addressed to municipalities, and the other one (*Dešťovka pro občany*, or “Rainwater for citizens”) – to local inhabitants. They enable municipalities and citizens to obtain a subsidy for activities such as the construction of storage tanks to collect rainwater that can be used for plant watering and toilet flushing. Since 2014, the ministry has co-funded the construction of new drinking water intakes in more than 400 municipalities (almost 200,000 local inhabitants benefitted from these initiatives). In addition, it has carried out measures to revitalise rivers and streams by reverting them to their old channels, which elongates them and increases the volume of water that remains in the Czech Republic – in 2014–2019 around

<sup>77</sup> Cf. ‘Odběry vody’, the ISSaR environmental statistics data base run by the Ministry of the Environment of the Czech Republic, [issar.cenia.cz](http://issar.cenia.cz). Compared to other European countries (i.e. countries grouped in the European Federation of National Associations of Water Services), this ratio is lower than the average ratio (23%), it is close to the ratio recorded for Poland and much lower than the ratio recorded for Slovakia (almost 30%). Cf. *Europe's water in figures – 2017 edition*, The European Federation of National Associations of Water Services (EurEau), [eureau.org](http://eureau.org).

<sup>78</sup> This involves encouraging them to reduce or – most preferably – abandon the practice of using water in their production processes, to build closed water circuit facilities (in particular in water-intensive sectors), to reuse waste water in other industrial processes, to install water purification technologies and to reduce water distribution losses.

<sup>79</sup> In 2018, the total intake was 1591 million m<sup>3</sup>. At the same time, 1522 million m<sup>3</sup> of water returned to the surface water circulation, however, this water requires purification and a major portion of its volume is drained off from the Czech Republic via rivers. ‘Druh vypouštěných vod do toků ve správě st. podniků Povodí v roce 2019’, Czech Statistical Office, [czso.cz](http://czso.cz).

1,000 such projects were carried out, worth a total of CZK 3.5 billion (around EUR 140 million).

In addition, to boost the country's water retention capability, the Ministry of Agriculture has carried out initiatives to revitalise wetlands, which have a particularly big water retention potential (10 m<sup>2</sup> of wetlands is capable of accumulating 9,000 litres of water). In 2019, 280 hectares of such wetlands were revitalised,<sup>80</sup> which accounts for a small portion of the total area of wetlands (around 350,000 hectares). This means that as a result of these activities the country has only slightly restored the situation recorded back in the 1950s, when the total area of its wetlands was 1.3 million hectares, i.e. almost four times bigger than at present. However, the plans are more ambitious – in the Bohemian Forest Region alone 600 hectares of wetlands were revitalised in the last 20 years, and an additional 2,000 hectares will be revitalised by 2024.<sup>81</sup>

In the coming decade, the Czech government plans to spend the equivalent of EUR 1.9 billion to resolve the problem regarding drinking water availability. EU funds make up a significant portion of this sum. In 2016–2018, the Ministry of Agriculture alone spent the equivalent of EUR 1.1 billion on boosting protection against drought; almost 70% of this sum was contributed by EU funds. Issues related to drought prevention were included in the National Recovery Plan, on the basis of which funds from the Recovery and Resilience Facility (RRF) under the Next Generation EU fund will be made available.<sup>82</sup> CZK 2.98 billion (around EUR 120 million) was allocated to the implementation of the “Supporting biodiversity and combating drought” component. These funds will support projects intended to improve rainwater management and restore aquatic ecosystems. The comprehensive water resources inventory, announced back in 2017 and launched as late as in mid-2019, is still in its early stages. The purpose of this inventory is to determine the volume of water available in the Czech Republic and to devise solutions for its efficient use. The initial results of the pilot inventory project (covering the Thaya River basin in southern Czech Republic) are expected to be published in three years. Other supported activities include research projects, e.g. regarding surface water infiltration into deeper layers of soil. The “pilot farm” project carried out by the state office for land administration, in cooperation with several scientific

<sup>80</sup> ‘Žádné peníze kvůli auditu EU vracet nebudeme, říká ministr zemědělství Toman’, Czech Television, 16 January 2020, [ct24.ceskatelevize.cz](https://ct24.ceskatelevize.cz).

<sup>81</sup> ‘Rašelina je zážrak, který se musíme naučit nepoužívat’, Ekolist, 12 June 2020, [ekolist.cz](https://ekolist.cz).

<sup>82</sup> *Národní plán obnovy* (version dated 1 June 2021), a website run by the Ministry of Industry and Trade of the Czech Republic, [planobnovy.cz](https://planobnovy.cz).

and research institutions, will likely bring very interesting results. The purpose of this project is to determine the differences between those farms that take drought adaptation measures (and climate change adaptation measures in general) and those that do not apply any novel solutions.

Not all of the drought and water scarcity prevention measures require financial outlays. The Ministry of Agriculture prepared a constitutional act<sup>83</sup> on water protection, which ultimately, following the necessary consultations, was submitted to the lower house of parliament as a draft bill. Its supporters cite the fact that back in 2016 the right of access to drinking water and water protection were enshrined in the constitution of Slovenia and that the constitution of Israel contains similar provisions. However, the future of this bill is uncertain – various institutions have protested against it. They include the Ministry of Transport, which is worried that the bill may disrupt the implementation of development projects (ultimately the government adopted a neutral stance on this matter). In addition, some senators emphasised that such initiatives are unnecessarily diverting attention away from specific actions. However, it is apparent that relatively specific actions were taken in the form of the amended water law which came into effect on 1 February 2021. The joint initiative devised by the ministries of agriculture and the environment increases the scope of the state's interference in regulating access to water in the context of water scarcity.<sup>84</sup> In addition, the amended law requires regional self-government to devise plans to combat drought and water scarcity (a similar nationwide plan will be devised as well). On the basis of these plans, the regions will be able to take specific measures in an emergency situation. An emergency situation is announced on the basis of the multi-aspect drought monitoring and forecasting system created by local experts, known as HAMR (an acronym based on words: “hydrology”, “agronomy”, “meteorology” and “retention”).

**From the point of view of the Czech agricultural sector, changes preventing continued soil erosion are of major importance.** This is the reason behind the construction of numerous small fish ponds which will provide the adjacent field with humus, i.e. the most fertile layer of soil. Miroslav Toman, the Minister of Agriculture, has even made a promise that from the beginning of his term (i.e. from March 2019) one new fish pond will be built daily.

<sup>83</sup> Constitutional acts regulate the state's most important matters. To be passed, they need to be supported by 3/5 of all deputies and senators. The Chamber of Deputies cannot reject the Senate's objection, and the President has no right to veto such an act.

<sup>84</sup> ‘Sucho pod zákonem. Parlament schválil novelu vodního zákona’, Ministry of the Environment of the Czech Republic, 1 December 2020, mzp.cz.

By January 2020, 350 such ponds were built, which means that the initial plan was implemented, at least in the first months of the minister's term. This was possible, among other things, due to the fact that administrative requirements regarding the construction of fish ponds of up to 2 hectares were reduced.<sup>85</sup> In addition, the reduction of the pace of soil erosion is to be facilitated by revitalisation of groves and by imposing limits on the allowed area of monocultures on stretches of land threatened with erosion (around 660,000 hectares, i.e. a fourth of the total area of Czech farmland) to 30 hectares starting from 2020. From 2021, the same restriction will be imposed nationwide. In addition, the Ministry of Agriculture intends to encourage farmers to reduce the amount of artificial fertilisers they use – around half of all farmland has been covered by restrictions imposing stricter limits on the use of nitrogen fertilisers and the government has launched an action plan to reduce the amount of pesticides in the agricultural sector. Plans have also been made to perform measurements of the biological soil balance in specific fields.

**As regards forests, which are affected by drought and bark beetle infestation (which is another consequence of water scarcity), the Ministry of Agriculture has taken measures focused on biodiversity and intended to boost forests' resilience to climate change.** In the case of the Czech Republic, this involves promoting broad-leaved trees – e.g. their minimum share in newly-afforested areas was increased from 25% to 40%. This plan is currently being put into practice – the share of such trees in these areas is increasing: in 2019 it was 51.3%, i.e. up by 9 percentage points compared to 2017 and almost 15 percentage points compared to 2000.<sup>86</sup> The Ministry of the Environment has initiated and supported a campaign (“We are planting our future”) targeted at citizens. Its purpose involves planting 10 million new trees over five years. From autumn 2019 until the beginning of 2021, more than 700,000 trees were planted,<sup>87</sup> which was partly possible due to the fact that the ministry had offered a subsidy to cover the entire cost connected with the purchase of the trees, their planting and maintenance (the total sum spent on this project was the equivalent of almost EUR 4 million).

<sup>85</sup> So far, this has not translated into an increase in the Czech Republic's production of fish in local fish farms – in 2011–2019 the fish production volume was more or less stable at around 21,000 tons annually. Cf. 'Produkce a trh ryb', Rybářské sdružení ČR, cz-ryby.cz.

<sup>86</sup> *Zpráva o stavu lesa a lesního hospodářství České republiky v roce 2019*, Ministry of Agriculture of the Czech Republic, Prague 2020, eagri.cz.

<sup>87</sup> For comparison, the number of trees with trunk diameter of at least 7 cm is more than 2 billion. Cf. 'O lesích', Czech Forest, czechforest.cz.

The reasons behind the bark beetle infestation include factors that are both relatively independent of the country's leadership (such as climate change – the beetle spreads in a warm and dry environment) and closely related to decades of policy failures of consecutive governments, including post-1989. Nevertheless, the plague is sometimes used as an argument in domestic political fight and to support controversial claims. President Miloš Zeman held former Agriculture Minister Marian Jurečka (a Christian Democrat) partly accountable for this plague. According to him, Jurečka failed to take decisive measures when stopping the infestation was still possible (presidential advisers argue that 2015 was the last year in which such actions could have been launched). However, according to the President, who is not particularly enthusiastic about ambitious environmental goals, “pseudo-environmental activists”, who had blocked logging activity at an early stage of the problem, are mainly to blame for the disaster affecting the Czech forests. Zeman referred to blaming climate change for the problem as “alibism”.<sup>88</sup> Although indeed groups of environmental activists continue to protest against logging, particularly in nature reserves,<sup>89</sup> their influence on key environmental decisions is limited and the Environment Minister from the Green Party, who is another figure to have come under criticism from the President, was only in office until the end of 2009. In spite of this, the Czech Supreme Audit Office offered harsh criticism regarding the sluggish pace of activities carried out by the state-controlled business entity, Forests of the Czech Republic (LČR), which manages 55% of domestic forests, and emphasised the fact that the Ministry of Agriculture, which supervises its operations, failed to force the enterprise to increase its logging activity (in the period when bark beetle infestation spread the most, i.e. since 2016, the Ministry was indeed headed by Marian Jurečka, who came under criticism from the President and currently serves as the leader of the Christian and Democratic Union – Czechoslovak People's Party, or KDU-ČSL, now an opposition party).<sup>90</sup> However, the accusations made against LČR also relate to a later period – e.g. the company was heavily fined by the regional environmental protection office for insufficient actions to curb bark beetle infestation in mid-2019, when Miroslav Toman, President Zeman's ally, was Environment Minister.<sup>91</sup>

<sup>88</sup> D. Tauberová, ‘Zeman viní z kůrovcové kalamity ekologické aktivisty’, Deník, 25 September 2018, denik.cz.

<sup>89</sup> Cf. ‘Zákaz kůrovcové těžby na Suchém vrchu požadují ekologové’, Olomoucká Drbna, 17 July 2019, olomoucka.drba.cz.

<sup>90</sup> ‘Lesy ČR měly postupovat proti kůrovcové kalamitě razantněji. Selhalo i ministerstvo, píšou kontroloři’, Czech Radio, 8 June 2020, irozhlas.cz.

<sup>91</sup> ‘Lesy ČR dostaly pokutu půl milionu. Nedostatečně bojovaly s kůrovcem’, Aktuálně.cz, 6 September 2019, aktualne.cz.

## V. EXPERTS' RECOMMENDATIONS

**Opinions voiced by representatives of expert groups are an important element of the Czech public debate. These experts have proposed that changes and additional initiatives should be implemented to resolve the problem associated with drought. In addition, they have repeatedly accused the government of failing to carry out sufficient investments to reverse the situation and to take advantage of possible synergies between the solutions that have already been implemented, due to insufficient coordination.**

Numerous Czech experts view the present pace of reforms as too slow compared to the dynamic of climate change. The Rector of the Czech University of Life Sciences (ČZU) is one such expert. He argues that the pace of implementation of mitigation measures should be stepped up and the funds earmarked for this purpose increased by at least CZK 20–30 billion (EUR 790–1 180 million) annually.<sup>92</sup> According to calculations compiled by researchers from this university, one Czech koruna invested in climate change adaptation solutions will contribute to saving two korunas that would need to be spent on mitigating the consequences of drought. However, according to the Minister of the Environment, the state administration would practically be unable to devise a sufficient number of initiatives to consume such large funds, and in 2014–2018 a total of CZK 40 billion (EUR 1.6 billion) was spent on fighting drought (this sum includes EU funds).<sup>93</sup> At the same time, large-scale investments are being prepared (e.g. involving extensive water supply system connections) which will likely enable the government to absorb larger funds than those that have been invested thus far.

The restoration of the former river network is an example of an important process being implemented at a slow pace. The purpose of this initiative is to boost water retention. In 2019, a mere 19 km of rivers were revitalised, while around 21,000 km remain lined with concrete.<sup>94</sup> This is due to complicated bureaucratic procedures, for instance. Managers of watercourses are particularly discouraged by prolonged land purchase procedures – for example, the process of increasing the length of a stream in Prague from 2 km to 2.4 km

<sup>92</sup> M. Biben, 'Voda odtéká z Česka příliš rychle. Je třeba vrátit řekám a potokům původní koryta', *Hospodářské noviny*, 24 July 2019, hn.cz.

<sup>93</sup> M. Biben, M. Plíhalová, 'Boj se suchem nás bude stát stovky miliard, říká ministr Brabec. Ochranu vody podle něj brzdí obce', *Hospodářské noviny*, 9 September 2019, hn.cz.

<sup>94</sup> 'Kam dokulhá Česko?', Czech Television, 7 June 2020, ceskatelevize.cz.

lasted a total of ten years.<sup>95</sup> The cost of this initiative amounted to around CZK 12 million (EUR 0.5 million). At the same time, many experts argue that support for initiatives to remove elements of drainage systems should be increased.

**In addition, the experts criticise insufficient prioritisation of activities focused on improving soil quality, farming techniques and forest management, whereas large-scale costly initiatives involving the construction of reservoirs that are capable of retaining considerably smaller amounts of water are widely implemented.** Reclaimed soil would be capable of accumulating 8.4 billion m<sup>3</sup> of water annually, while at present it is absorbing as much as 3.3 billion m<sup>3</sup> of water less; according to calculations the construction of as many as 340 large reservoirs would be necessary to make up for the difference. It should be noted that farmland accounts for as much as around 54% of the Czech Republic's territory, whereas forests account for around a third.<sup>96</sup> During the 1997 flood, forests and meadows in Moravia retained three times more water than all reservoirs in the Oder and Morava catchment areas. However, the expert community largely agrees that the construction of such facilities is recommended in localities characterised by insignificant groundwater resources (the investment involving modernisation of the Kružberk reservoir near Opava is one good example of such an initiative). Some scientists argue that reducing the area of monocultures to 30 hectares is not sufficiently ambitious and propose to further reduce this limit by half.<sup>97</sup> Alongside this, they say that the process of delineating field margins to divide the fields, and creating wetlands should not be based on incentives, but be obligatory or based on a strong financial stimulus which could involve making the payment of subsidies conditional on meeting minimum environmental standards. However, studies conducted by the Czech Research Institute for Soil and Water Conservation indicate that infertile land can be reclaimed within 3–4 years by cultivating specific types of plants on it.<sup>98</sup>

**In addition, experts recommend that structural adjustment measures in the agricultural sector be implemented to help farmers utilise the emerging opportunities.** In the regional context, these involve relocating the crops from lowlands to fields located at medium altitudes (around 500 metres above

<sup>95</sup> M. Biben, 'Voda odtéká z Česka...', *op. cit.*

<sup>96</sup> 'Zdeněk Žalud: Proč je sucho...', *op. cit.*

<sup>97</sup> 'Kam dokulhá Česko?', *op. cit.*

<sup>98</sup> M. Černá, 'Už nás nespasí, ani kdyby...', *op. cit.*

sea level). These areas are increasingly warmer and enjoy greater amounts of precipitation than the lowlands, snow is more frequent there during winter, which is favourable because it protects plants against ground frost and helps to replenish water in the soil. The Vysočina Region, located on the historical border between Bohemia and Moravia, near the Austrian border, will likely become one such region. Particular problems will be faced by farmers cultivating crops on lowlands (which at present are the most intensively cultivated stretches of farmland), such as southern Moravia and Polabí – stretches of fertile farmland in the vicinity of Prague (located north and east of the capital). It is likely that portions of this area will be gradually transformed into semi-deserts, similar to certain areas in Spain and Italy.

In the structural context, it is recommended to shift the emphasis in the agricultural sector from cultivating cereals and oilseed crops to fruit farming and viticulture. These types of farming will more easily compensate for increased watering expenses and do not require such vast cultivation areas (in addition, at present domestically-grown grapes could cover a mere 30% of the country's demand). Increased solar exposure will facilitate wine-growing. This will be an opportunity for wine producers, who are already developing their businesses (particularly in Moravia). With regard to vegetables, the process of improving certain varieties to make them more resilient to drought is likely, though the results of this process will take around ten years to become evident. Another opportunity involves sowing the seeds of plants that have so far not been grown in these geographical areas, such as sorghum, which is highly resilient to drought. Due to the fact that winters continue to occur, embarking on citrus farming is unlikely.

**Other proposed solutions include restricting the limits regarding the use of chemicals. In this context, the government is frequently accused of curbing the activities to improve soil quality (and, indirectly, groundwater quality), thus protecting the interests of Agrofert, a company established and de facto controlled by Prime Minister Babiš.** The Agrofert capital group is the leader in the domestic artificial fertiliser market, for instance, and a member of a larger lobby of big agri-food companies that holds great influence within the Agriculture Ministry in particular (cf. Part III.1). Some groups of experts and environmental activists argue that the Agriculture Minister Miroslav Toman is entangled in a conflict of interests – the former head of the Agrarian Chamber is now being perceived as a representative of a group of agri-food sector moguls, who is blocking certain ambitious activities intended to prevent continued soil erosion.



Although the Environment Minister does not rule out the introduction of certain limitations regarding the use of chemicals harmful to soil and groundwater, he is trying to present this issue in a different light. For example, he emphasises that a significant portion of drinking water pollutants are chemicals that have already been banned but remain present in water for decades. In recent years, the Czech Republic has seen a decrease in the amount of pesticides and glyphosate (the active ingredient in many herbicides) used in the agricultural sector: in 2017–2018 a decrease of 9% and 25%, respectively, was recorded,<sup>99</sup> and the decline in the use of pesticides recorded in 2011–2018 (of 21%)<sup>100</sup> was among the EU's biggest. In 2018, the amount of pesticides purchased in the Czech Republic, calculated in proportion to the utilised agricultural area (UAA), was four times greater than in Poland and 1.5 times more than in Hungary, while being two times smaller than in Germany and almost two times less than in Slovakia.<sup>101</sup> In addition, the Czech government is emphasising the fact that activities focused on environmental protection are more frequently blocked by local authorities than by farmers. From the point of view of the local authorities, these activities are disrupting their spatial development plans (including construction of new residential buildings), while complicating their efforts to attract investments to industrial areas.

Another problem that is difficult to solve involves compensation paid to farmers in connection with drought – due to the extent of this phenomenon insurance companies are concerned about whether they will be able to pay the potential compensation amounts. In the Czech Republic, the only insurance company to offer insurance against drought (but only in relation to seven types of crops) is the Agra company, which is controlled by Austrian capital (the amount of compensation is calculated on the basis of the precipitation deficit recorded at the nearest meteorological station). Therefore, the government has taken over the payment of some compensation claims. According to experts, these funds are insufficiently conditioned upon changes in farming practices. Specialists argue that the payments should be linked with e.g. the farm owners' approach to soil protection (their use of artificial fertilisers, efforts to maintain crop diversity) or implementation of water-efficient irrigation systems (e.g. drip irrigation).

<sup>99</sup> 'Spotřeba pesticidů v České republice za rok 2019 opět klesla', Ministry of Agriculture of the Czech Republic, 2 July 2020, [eagri.cz](http://eagri.cz).

<sup>100</sup> 'Agri-environmental indicator – consumption of pesticides', Eurostat, [ec.europa.eu/eurostat](http://ec.europa.eu/eurostat).

<sup>101</sup> The author's own calculations based on data compiled by Eurostat for 2018: 'Utilised agricultural area by categories'; 'Sales of pesticides in the EU', 3 June 2020, [ec.europa.eu/eurostat](http://ec.europa.eu/eurostat).

Despite the fact that the government views the expansion of water system connections as an important issue (due to differences in specific regions' water resources), the implementation of relevant initiatives in this field is hampered due to the ownership structure of key companies in this sector. Around 90% of water supply infrastructure is owned by local self-government institutions, but around 70% is managed by private foreign companies.<sup>102</sup> They are reluctant to invest their profit in improvement and expansion of the water supply network, while any decision to impose obligatory targets on them in this respect would result in them shifting any additional costs onto their clients, e.g. households. This is why the government had to create an incentive mechanism which includes covering a portion of investment costs related to the implementation of programmes to expand and modernise the water supply system (at present government subsidies cover up to 70% of the costs associated with these projects). Due to increasing problems regarding water availability, it cannot be ruled out that initiatives to regain the state's control of the entire water supply system or to encourage local government to do the same (most likely by way of making a free market purchase of a controlling stake in certain privately-owned water supply companies) will be carried out in the future. Such initiatives are increasingly popular: in 2018 Prague city councillors approved the purchase of a 49% stake in PVK, a water and sewage company operating in Prague and owned by the Veolia company, with an option to purchase the remaining 51% in 2028. Back in 2016, the authorities of the city of Pilsen (*Plzeň*), the Czech Republic's fourth biggest city, purchased a 98% stake in a similar company operating in this city, which had also been owned by the French giant.

Scientists from the Czech University of Life Sciences came up with a proposal to introduce "water allowances" (modelled on emission allowances allocated in the EU ETS system) in order to force end users to reduce their water consumption by increasing its price. Another proposed solution (this time presented by scientists from Brno) involves imposing a very high tax on any water use that considerably exceeds the average consumption level (the norm would be the average water consumption per individual in a household plus 30–50%). This would mean maintaining a lower price of water used for basic consumption and introducing a strong incentive to reduce the use of water for

<sup>102</sup> The French-owned Veolia is by far the biggest such company, other similar companies include the Spanish-owned Aqualia, the Austrian-owned Energie AG, the German-owned Gelsenwasser and the French-owned Suez. In 2018, the amount of profit they transferred abroad was CZK 1.23 billion (around EUR 50 million). Cf. J. Vlková, 'Z vodáren odteče do ciziny přes miliardu. Některé obce se chtějí odstříhnout', MF DNES, 20 September 2019, idnes.cz.

other purposes. Yet another initiative to reduce water consumption involves increasing the support offered to the construction of specific water supply systems, with separate mains for drinking water and for water used for other purposes.

A comprehensive approach to climate change should result in a far-reaching transformation of the education system. There is a shortage of fish pond and reservoir designers, as well as engineers and lawyers specialising in water management issues. The shortage of experts (which is recorded in spite of a strong demand for services provided by such professionals) is among the reasons why the implementation of climate change adaptation initiatives is behind schedule. The adjustment of the education system is linked to the need to increase support offered to research and development projects focusing on drought. This will make research projects focused on this topic more attractive, which in turn will result in an improvement in the knowledge and skills of specialists who will be better qualified to educate subsequent generations of engineers, etc.

### **The Danube–Oder–Elbe water corridor – an initiative to resolve or to aggravate the drought problem?**

The issue of drought is frequently mentioned in the context of the planned construction of the Danube–Oder–Elbe water corridor which includes the creation of a connection between this area and the Polish part of the Oder drainage basin. The corridor's potential role in the fight against drought (and in flood prevention) is among the main issues in the dispute between its supporters and opponents. According to numerous environmental activists, the corridor's construction could aggravate the water scarcity problem (e.g. by destroying certain ecosystems) and absorb funds that could be spent on less expensive and more relevant drought prevention initiatives, such as those focused on soil quality improvement. In addition, due to droughts, the corridor would need to draw water from the Danube, which would require consent from other states located in the Danube drainage basin. It is unlikely that they would support this investment (according to press reports, Austria has used its diplomatic channels to signal its objection to this initiative) due to similar water scarcity problems they are facing.

According to the authors of a feasibility study<sup>103</sup> commissioned by Prague, it is not certain that the drought problem will continue to prevail in the Czech Republic in 10–15 years' time, when the corridor's construction would be launched (due to weather fluctuations), and water could be replenished in the corridor during periods characterised by larger amounts of water (e.g. the snow melting period). Moreover, if this corridor is not built, a portion of this water would drain off to other countries. The most important argument used by groups supporting the construction of the Danube–Oder–Elbe water corridor relates to its potential for contributing to the fight against drought (it would retain water in the Czech Republic and enable its inflow from the Danube) and to flood prevention (in particular in Moravia which has seen the most severe floods).

It is unrealistic to expect that the project will be fully implemented in the foreseeable future. However, it is likely that some of its individual components will be completed – in particular those which at the same time can serve as elements of water retention projects. In the next two decades, a roughly 40-km long section of the “Oder” part of the corridor could also be built. The profitability of this part of the project has been favourably assessed in all scenarios covered by the feasibility study. The intention to build this section of the corridor is confirmed by the fact that on 5 October 2020 the government in Prague approved the plan to continue the preparations for making the Oder navigable between Ostrava and Kędzierzyn-Koźle, in cooperation with Poland. According to the adopted schedule, the Czech part is expected to be navigable by 2032. In the next few years (2021–24), the work will focus on carrying out environmental impact assessments of the construction of the Koźle–Ostrava canal. However, measures taken by the Babiš government do not offer any guarantee that the Czech section of this canal will indeed be built. This is due to the fact that this is a long-term investment and main political parties have so far not reached any consensus about its construction. As early as 2019, the Ministry of Transport recommended abandoning the Elbe branch of the corridor (it would account for around 52% of the total cost of the corridor's construction, which is due to altitude differences and the related need to construct tunnels and riverboat lifts).

<sup>103</sup> It was published in autumn 2018. Although according to its conclusions the water corridor (in particular its section connecting the Danube with the Elbe) would be profitable, the results presented in this feasibility study have been called into question by numerous experts. The main doubts concern the investment's profitability and its significance for the Czech Republic's water management.

Insufficient funding is the main obstacle hampering the project's implementation. Other factors making such a large-scale investment difficult to carry out include a large number of restrictions resulting from domestic and EU regulations (including regarding environmental matters). In addition, in the Czech public debate the Danube–Oder–Elbe water corridor project is inseparably connected with President Miloš Zeman, who views it as one of the flagship initiatives to be carried out during his presidency. The biggest Czech media outlets (which are mostly critical of the President) are presenting this initiative as his whim. It is due to President Zeman's involvement that the government is working on this project. At the same time, the fact that this investment is associated with a politician who is sparking divisions within society results in a situation in which support for the investment is viewed as support for the President. Therefore, whenever the water corridor project gets mentioned among the Czech Republic's priorities under the Three Seas Initiative (3SI), this is due to President Zeman's activity during 3SI presidential summits. The President's critics, both domestic and foreign, argue that this is casting a shadow on the Three Seas Initiative as a whole and undermining its status as a credible impetus for cohesion and sustainable development of the eastern part of the EU.

**In terms of water efficiency solutions, experts often refer to Israel's experience in solving water-related problems, and this idea is also supported by many politicians, including the Prime Minister.** Experts emphasise that the Czech Republic should be guided by Israel's approach to water as a strategic resource enjoying constitutional protection (at present the Czech Ministry of Agriculture is working on a similar solution modelled along the lines of that applied in Israel). Prague appreciates the Israeli methods for shaping children's water efficiency awareness beginning from an early age, and for stimulating young people's interest in studying those areas of knowledge that focus on management of water resources. In well-thought-out social campaigns, the Israeli government tried to convince citizens to use recycled water on a large scale, including not only so-called greywater, e.g. bathtub wastewater (which is what the Czech government intends to advocate), but also so-called blackwater – toilet wastewater. Drip irrigation systems are among particularly interesting technological solutions used in Israel. Their water consumption is three times lower than in standard irrigation systems, which is due to the fact that they provide water directly to plants' roots. In addition, these systems are computer-activated, mostly at night, when irrigation is most effective.

A representative of the Israeli Netafim company, which is a global leader in the production of irrigation equipment, attended a conference focused on water issues, held during the Czech Republic's biggest agri-food fair "Země živitelka" (Earth the Provider) in České Budějovice in 2019. In addition, the Czech government views cooperation in water-related issues as an opportunity to improve the country's relations with its neighbours. This is what Israel is doing – it is using certain technologies, e.g. water desalination technology (80% of water supplied to Israeli citizens is desalinated), to improve its relationship with neighbouring countries, Jordan in particular (so-called water diplomacy).<sup>104</sup> Nevertheless, several important differences need to be taken into account: Israel is managing its water resources in desert conditions – deserts account for 60% of the country's territory, a fourth of this area was reclaimed to enable farming. The Czech Republic, for its part, has deliberately carried out land drainage initiatives for many years, e.g. due to flood concerns.

<sup>104</sup> In 2013, an agreement was reached between the governments of Israel, Jordan and the Palestinian National Authority regarding the construction of a seawater desalination installation in the Jordanian city of Aqaba located near the border with Israel. The facility was opened in 2017 and plans have been made to build a canal connecting the Red Sea with the Dead Sea – cf. O. Eran, G. Giordano, *Israeli Water Diplomacy and National Security Concerns*, EcoPeace Middle East, Tel Aviv, January 2018, [ecopeaceme.org](http://ecopeaceme.org). The project came under criticism from the Israeli media, which argues that it mainly benefits drought-affected Jordan, while from the Israeli point of view it is a costly initiative that does not guarantee any major economic benefits – e.g. Israel will have to buy a portion of desalinated water from Aqaba at a price exceeding the cost of its domestic desalination of water drawn from the Mediterranean Sea. It is argued that the main benefit is political – it involves offering support to a valuable partner, i.e. the Hashemites – a royal family that rules Jordan – cf. S. Surkes, 'Sinking Israel-Jordan relations leave Dead Sea, a natural wonder, low and dry', *The Times of Israel*, 7 November 2019, [timesofisrael.com](http://timesofisrael.com).

## VI. PROSPECTS

If the present forecasting models prove correct and the climate change trends recorded thus far persist, the Czech crisis over drought and its costly consequences will aggravate. Dealing with these consequences will be extremely difficult, due to the structural nature of some of the problems and to unfavourable geographical factors. Problems with water availability faced by Czech citizens and the likely further increase in water prices will continue to exert strong pressure on politicians to take further mitigation measures. In addition, they may translate into higher support for those political parties which emphasise environmental issues, such as the Czech Pirate Party, which is becoming a leading force on the Czech political scene. The Czech state will need to adopt a more economical and more balanced approach towards the country's natural riches. Large-scale water supply investments to enable more effective water distribution will be continued alongside incentives promoting more efficient use of this increasingly valuable resource (the popularity of water reuse systems will likely increase). Despite this, increasingly frequent seasonal rationing of water use should be expected, as well as further limitations regarding utilisation of land for industrial purposes and farming methods.

**Drought will likely generate significant costs for the economy.** According to calculations compiled by researchers from the Czech University of Life Sciences, if the present trends persist, the Czech economy will suffer losses amounting to CZK 80–240 billion (EUR 3–9.5 billion) annually, i.e. 1.6–4.8% of the country's GDP, depending on the specific scenario.<sup>105</sup> These calculations only cover direct costs, e.g. those related to limitations affecting the operation of the paper-making and textile industries which are heavily dependent on water (and may ultimately be closed down). They do not, however, take into account indirect costs, e.g. environmental losses. In 2018 alone, the Czech Supreme Audit Office estimated the costs of drought borne by the Czech Republic at CZK 28 billion (EUR 1.1 billion), i.e. around 0.5% of national GDP.

**Drought will impact on strategic decisions in the energy sector, where it will likely accelerate the process of phasing out coal and influence other elements of this sector's transformation.** Water availability problems will trigger the need to use non-water dependent sources of energy, i.e. solar and wind power plants, with gas turbines serving as a back-up energy source.

<sup>105</sup> 'Nedostatek srážek může zapříčinit pokles HDP. Zaveďme trh s vodou, doporučují vědci', Czech University of Life Sciences (ČZU), 21 August 2019, [czu.cz](http://czu.cz).

Limited operation of biogas power plants, due to decreased crop yields of primary inputs, e.g. corn, should be expected. In the process of nuclear energy sector expansion, drought increases the opportunity to use small modular reactors (SMR), which are less dependent on water availability. However, this technology will need at least a decade to prove that it is capable of meeting these optimistic goals.

**Moreover, water availability problems may hamper the utilisation of the currently developed hydrogen technologies** (water is necessary for the production of hydrogen in the process of electrolysis), which would equate to the emergence of new doubts regarding the transformation of the automotive industry. Although at present this sector accounts for around 10% of GDP, it is likely that in the absence of state support for the development of future-proof infrastructure (especially if such support turns out to be too expensive), the Czech Republic will become a reservoir of automotive technologies with a smaller added value.<sup>106</sup>

**The aggravation of the problem of drought and water scarcity, combined with increased activity on the part of civil society, will increasingly result in complications regarding the implementation of investments that are harmful to the environment and troublesome for the local population**, e.g. due to their considerable water consumption. In the coming years, the requirement to prevent the spread of drought and protect valuable land against development activity will hinder the construction of vast greenfield facilities and will favour investments carried out in desolate post-industrial sites (brownfield investments).

**Significant changes will affect an agricultural sector that is increasingly troubled by instability.** In a situation of several consecutive years with very poor harvests, which – if combined with the lack of sufficient support from the state – will translate into lower profitability of the agricultural sector, drought may result in a continued decline in the number of people employed in this sector (at present it accounts for 3% of the total workforce)<sup>107</sup> and in depopulation of rural areas, which in turn will equate to a further diminishment of the country's food self-sufficiency. Despite this, it is possible to mitigate the adverse consequences of drought for this sector of the economy. In order to

<sup>106</sup> Cf. D. Klimeš, 'Škoda startuje za hranice. Pokud ji necháme odjet, teprve poznáme, jaká je to škoda', Aktuálně.cz, 28 July 2020, aktualne.cz.

<sup>107</sup> The figure is 9% for Poland, 5% for Hungary, 4% for Austria and 2% for Slovakia. 'Employment in agriculture (% of total employment)', The World Bank, 20 September 2020, worldbank.org.



achieve this relevant adaptation measures need to be taken both in the territorial aspect (relocating the crops from lowlands to higher altitudes) and in the product-related aspect (abandoning the cultivation of cereals and oilseed crops and reorienting towards fruit farming and viticulture). However, these measures need to be accompanied by a rapid departure from the model based on heavily fertilised plant monocultures in vast fields unseparated from one another. Legal restrictions which are gradually being introduced in this respect (e.g. regarding the maximum allowed monoculture area – up to 30 hectares) are frequently viewed as belated and insufficient. As a consequence, according to leading Czech scientists, within 5–10 years the Czech agricultural sector may face a similar disaster that is now affecting Czech forests due to bark beetle infestation. The infestation occurred, even though repeated warnings had been voiced regarding the threats posed by continued spruce tree monocultures.

As regards foreign policy, the Czech Republic's increased involvement in international projects focused on improving water availability should be expected, alongside support for channelling EU funds into initiatives of this type, as well as a certain reluctance to carry out cross-border and international projects that may result in decreased water availability (cf. the box 'The operation of the Turów coal mine', pp. 43–46) or fail to take water scarcity into account. **At the same time, the ongoing climate change, in particular the water availability problems which are its major consequence, may trigger migration from Middle Eastern and North African states and possibly also from certain regions in southern Europe, where the water availability situation is much worse than in Central European states.** In this scenario, the Czech Republic – alongside other increasingly affluent countries in the region – may become exposed to a mounting influx of migrants, which will reduce the availability of resources and may result in local residents migrating to Northern Europe. It should be noted that, according to Prof. Zdeňek Žalud, a prominent Czech expert in bioclimatology (and co-author of the Intersucho project), migration triggered by water scarcity poses a much more serious threat than any migration crisis caused by economic problems or an armed conflict.<sup>108</sup>

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<sup>108</sup> M. Černá, 'Už nás nespasí, ani kdyby...', *op. cit.* Several consecutive years of drought are considered as one of the main underlying causes of the war in Syria, where water scarcity triggered large-scale migration from rural to urban areas and gave rise to conflicts over this issue.