SHERPA
Rural Science-Society-Policy Interfaces

MAP Position Paper

CLIMATE CHANGE AND ENVIRONMENTAL SUSTAINABILITY

SHERPA has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No. 862448. The content of the document does not reflect the official opinion of the European Union. Responsibility for the information and views expressed therein lies entirely with the author(s).

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Citation: Trantinová, M., Hrdoušek, V., Hartych, M. (2021) MAP Position Paper (Czechia) - Climate change and environmental sustainability.
DOI: 10.5281/zenodo.5920865

Paper finalised in October 2021

Find out more about the Czech Multi-Actor Platform!
https://rural-interfaces.eu/maps/czech-republic-moravia-silesia/

Topic and headline messages

This year, a second MAP CFV (Climate-Friendly Village) was created in the Czech Republic. The following findings were summarised, and a survey was carried out with a group of respondents. Climate change is related to mitigation and adaptation measures, which are becoming a hot topic in the EU. The MAP CFV focused on the topics of mitigation and adaptation measures that a rural municipality can contribute by implementing.

In the expert group, thematic headings that characterise CFV were identified. These themes were discussed with representatives of mayors, research and policy (regional and national level). The aim was to find out how all the headings are perceived, how well they are contributing to positive change, and what are the challenges and barriers to achieving a climate-friendly municipality.

It was clear from the interviews that the topic of climate change and sustainability is a topical one, and mayors, researchers and politicians are interested in it. However, a common debate and consensus of views leading to individual and collective action on adaptation and mitigation of climate change will still require effort.

Problem being addressed and key questions

The list of key challenges was taken from the Strategy for Community Led Local Development (SCLLD) prepared by the Local Action Groups (LAGs) for the new Common Agricultural Policy (CAP 2021+):

- Lack of strategic management in the territory and municipalities (e.g. adaptation strategy).
- Insufficient implementation of water retention measures in the landscape.
- Progress of the bark beetle calamity, aggravated by climate change.
- A willingness to implement measures to adapt to and mitigate the effects of climate change, which should be based on conceptual documents.
- Weak cooperation in municipal waste management.
- Lack of a link between the topics of community energy and energy recovery of municipal waste, circular economy.
- Promote public education on sustainability and climate change and monitoring of the impacts of activities.

LAGs in the context of SCLLD implementation can contribute to the climate neutrality objective. The research provides suggestions for action, but it is important to get more drivers across the spectrum of policymakers and rural residents.

1. Pathways to tackling climate change in rural areas

1.1. Key scientific evidence

MAP CFV divided the topic into 10 areas and discussed these with politicians, researchers and citizens (mayors).

1. The landscape

The Czech landscape consists of a mosaic of habitats that contributes to natural diversity. Climate change brings one-off extremes in the form of long-term droughts or floods. By managing the landscape sustainably, we can better adapt to ongoing changes. The use of the landscape cannot be left purely to the discretion of users pursuing their financial interests at the expense of future generations. We lack or make insufficient use of policy instruments for landscape protection, management and planning in the sense of the European Landscape Convention.

Local people are not sufficiently involved in the development of the landscape, or rather have limited decision-making power. Large-scale farming dominates in agriculture, with insufficient organic fertilisation, replaced by chemical inputs. This results in a uniform landscape with impoverished biodiversity and soil degradation (mainly through excessive erosion). The agricultural subsidy system is still largely production-oriented and does not take account of and does not sufficiently protect farmland and landscape. There is a lack of linkage of research results to coordinated policy decisions on land use.

2. Responsible use of water resources

The Czech Republic is a landlocked country "on the roof of Europe" and must therefore manage its water sparingly. The main source of water for most rivers is rain and snowfall. The Czech Republic is the European watershed of three seas - the North Sea, the Black Sea and the Baltic Sea. The concept of sustainable stormwater management faces various barriers in many ways, which is mainly because its implementation requires a comprehensive interdisciplinary approach. Changing traditional practices is not only a purely technical issue, but also has legislative, economic and institutional dimensions.

Several interesting projects have been implemented in the Czech Republic over the last 15 years that retain rainwater for further domestic, general and business use. Yet general awareness in this area is still low. At present, there is no overview of how much water is retained during rainfall and how it is used. It will be useful to find out.

3. Water retention in the landscape

A total of 28.4% of the river network in the Czech Republic is modified in some way (Langhammer, 2007). One of the reasons for this is the easier management of agricultural land. In riparian streams, soil blocks are often ploughed down to the bank edge and with it the natural riparian vegetation is destroyed and the natural functions of the riparian zone are lost (e.g. tree roots and grasses have many ecological functions, thus improving water quality in the stream, protecting the soil and maintaining the number of plant and animal species in the habitats).

In the past, the drainage of agricultural land along watercourses, associated with overlanding, fortification and significant channel deepening, was an important cause of the alteration of watercourse channels and the loss of natural retention and self-cleaning functions. The current state of these modified watercourses also has a negative impact on the state of aquatic ecosystems. According to the results of the comprehensive ecological status assessment (2010-2012 River Basin Management Plans), only 21% of natural watercourses are classified in very good or good ecological status. The low proportion of eco-stabilising elements in the

landscape, the ploughing of soil blocks down to the bank edge and the destruction of riparian vegetation have caused the loss of natural landscape functions. Accelerated water runoff from the area carries soil particles, nutrients and organic matter with it.

4. The complex land consolidation (CLC)

CLC is one of the most comprehensive tools that has enormous potential to improve soil conservation and the water regime of the landscape. In addition to the settlement of property relations with reasonable parcel consolidation, rural infrastructure is restored, and landscape revitalisation is carried out. CLCs are also of social importance, as the cooperation of municipalities (also LAGs) with the state will enable the implementation of flood and drought protection.

On the other hand, it must be said that it is a complicated and demanding process. The revival of landscape functions (e.g. wetlands, watering areas, subdivision of large blocks with monocultures, planting of trees and shrubs) has long been met with non-cooperation of citizens, farmers, municipalities and other local initiatives.

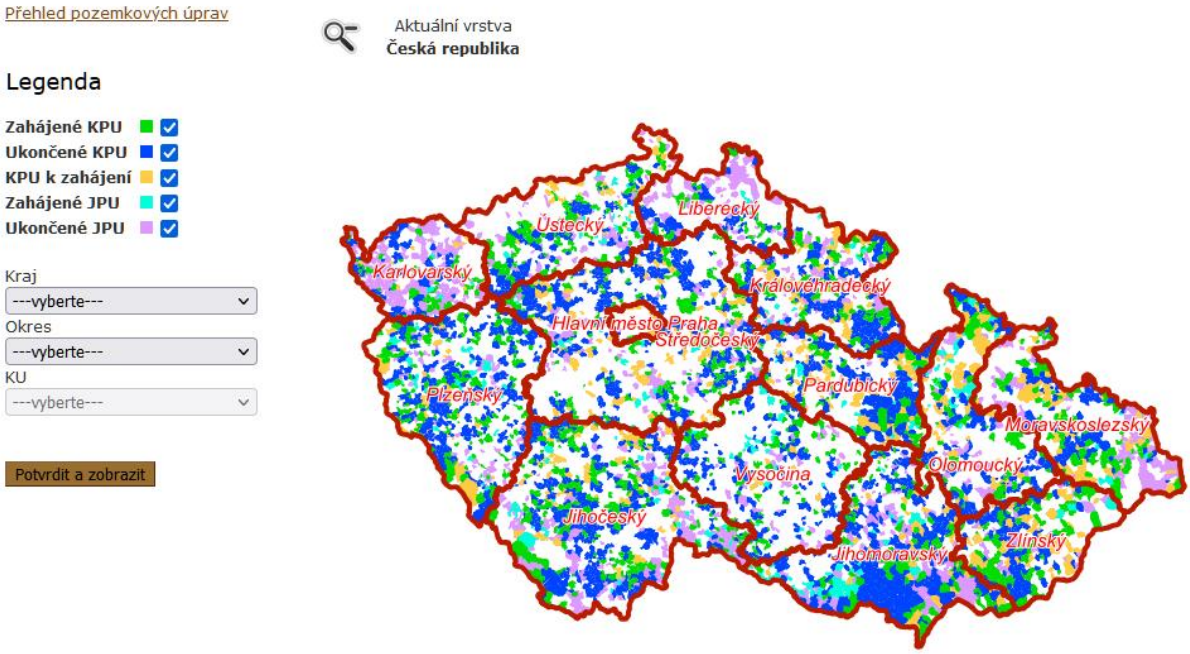

Figure 1. Overview of cadastres with indication of the status of Comprehensive Land Management in the Czech Republic *(Legend: green - started CLC, blue - completed, yellow - ready to start, cyan and pink - simple land consolidation). Source: Portál MZe 6/2021: https://eagri.cz/public/app/eagriapp/PU/Prehled/*

5. Cooperation of the municipality with farmers and foresters to preserve and build diverse landscapes increasing biodiversity and ecosystem services

Cooperation must be maintained at many levels, from conceptual to concrete implementation. This is promoted by new approaches such as:

- Collaboration on climate change adaptation in key forest and agricultural areas (TAČR TL 02000431 2019 - 2021). The aim of the project is to raise awareness of the changing "social order" for forestry and agriculture in the 21st century towards the development of ecosystem services in relation to NGOs, universities, etc.

- Renewal of Agroforestry principles in policy, research and practice. This relatively small group is trying to link these into practice through smaller farmers and legislation. In the Agroforestry Opportunities for Regional Development and Sustainability of Rural Landscapes project TAČR, TL01000298 2018 - 2020, a questionnaire survey conducted among almost 500 farmers found interest in establishing agroforestry systems, especially on their own land. Farmers pointed to the limited use of mechanisation, bureaucratisation of agroforestry subsidies, administrative costs and increased labour costs as the main barriers to the adoption of agroforestry by farmers. Lack of awareness and extension are also frequently mentioned factors.

6. Waste management in line with circular economy principles and win-win contracts

There is almost no recovery of waste for further processing in the economy of the Czech Republic, while the rate of sorting of municipal waste reaches a valuable 40%. The transition from landfilling to energy use is still not solved, similarly for the material use of bio-waste. The Ministry of Environment's target to reduce single-use plastic containers is very relevant and timely. At mayors' meetings, they often exchange views on the economics of landfilling and sorting and are interested in examples of good practice.

7. Family support, community, information systems, citizen education for sustainable development

As a social unit, the family has an irreplaceable role in the development of the individual and society. Well-functioning families contribute to social cohesion: they educate children and transmit cultural, ethical, social and spiritual values. In doing so, they create an identity for their members, but also develop wider communities. Given this, there is still insufficient appreciation and support for families, which also contributes to low birth rates and thus to the overall ageing of the population. According to the Strategic Framework of the Czech Republic 2030[1], in addition to families, the development of local communities must also be supported. The state and local government will create conditions so that local cooperatives, companies or non-profit organisations can sustainably manage water, take care of greenery, produce and distribute energy and process waste, which stabilises the local economy and increases the effectiveness of social intervention, and reduces costs.

8. Cooperation between territorial partners and regional development actors, short supply chains and local markets, social entrepreneurship

It is important to set up a network of cooperation and innovation support to rebuild short supply chains and local markets and to introduce social entrepreneurship in rural communities. The Operational Programme Environment (managed by the Ministry of Environment) supports networked environmental, waste and energy activities in the LAG's place of operation. The Operational Programme Employment (managed by the Ministry of Labour and Social Affairs) deals with increasing the involvement of local actors in addressing unemployment and social inclusion problems in rural areas. The RDP implements support for cooperation between at least two actors and leads to the creation and development of short supply chains and local markets.

[1] *The Strategic Framework Czech Republic 2030 was established as part of the project System of Long-term Priorities for Sustainable Development in the State Administration, reg. No.: CZ.03.4.74/0.0/0.0/15_019/0002185.*

9. Functional blue-green infrastructure accessible to all generations (in school gardens for school learning), the community and citizens benefit from the ecosystem services of the markets

Examples of good quality blue-green infrastructure are implemented in rural municipalities to a lesser extent and are often inefficiently used, and further interdisciplinary cooperation is needed.

On the other hand, some public spaces and buildings that manage rainwater, soakaways, green roofs or vegetated facades work well, if they are well set up.

Here is important to involve experts. It has been found, for example, that vegetated facades allow less heat to enter a building in summer (up to 50%) and less heat to escape in winter (up to 20%). This facade dimension can thus replace the function of technical air conditioning units.

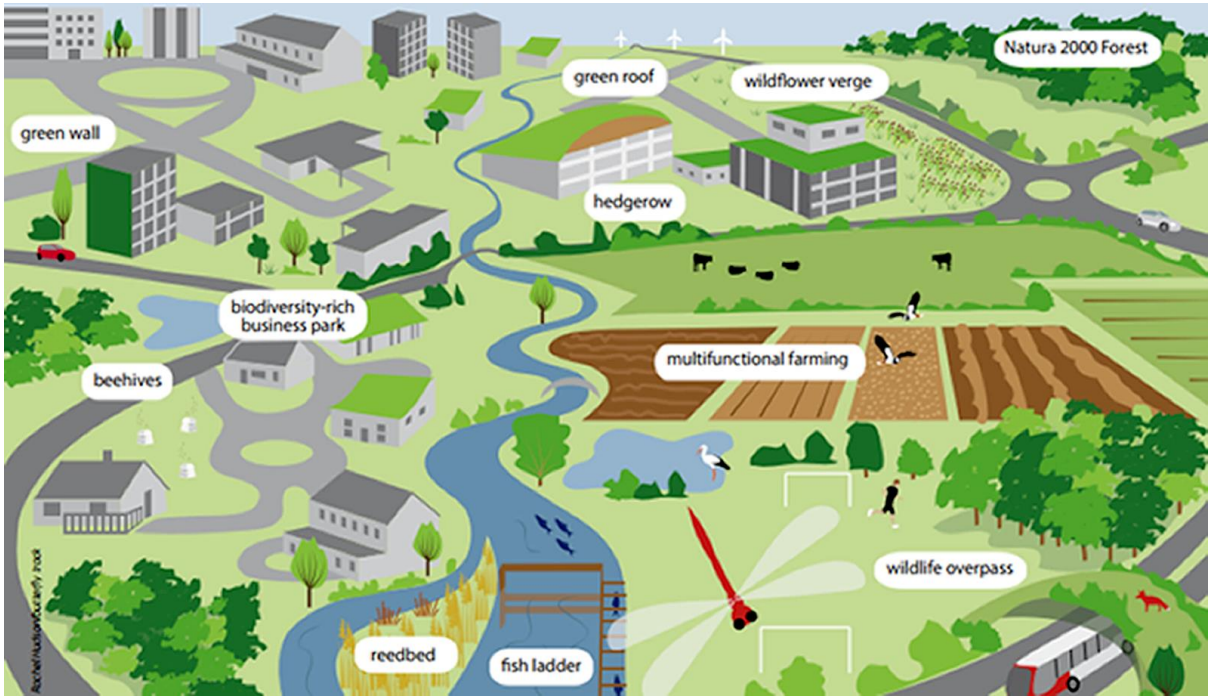

Figure 2. An illustration of types of green-blue infrastructure

10. Management and technology with circular economy principles, energy saving and RES principles and eco-mobility

The topic of renewable energy sources (RES) and energy savings was addressed in the MAP VENUS Cycle 1.

1.2. Summary of position of the regional Multi-Actor Platform

The members of the MAP CFV consider the following range of 10 headings important for the development of municipalities in the Czech Republic in the context of climate change and environmental sustainability:

1. The municipality makes sustainable use of the landscape and natural resources and implements mitigation and adaptation measures in accordance with the relevant development documents: development strategy and planning in terms of environmental sustainability.
2. Municipality and citizens use water resources safely and responsibly, e.g. using a rainwater harvesting system.

3. The municipality retains water in the soil, in green areas and in water bodies in the landscape and in the municipality's intramural area by nature-friendly measures.
4. The municipality has developed land management plans and implemented landscape measures.
5. The municipality, in cooperation with the community, farmers and foresters, plants and maintains a varied landscape increasing biodiversity and ecosystem services: implementation of the territorial system of ecological stability, agroforestry, linear, group or solitary plantings, landscape orchards, flowering strips on arable land, etc.
6. The municipality implements waste management in accordance with the principles of circular economy and concludes win-win contracts with its contractors and suppliers.
7. The smart municipality supports the family and the community: quality information systems, citizen education on sustainability, volunteers help maintain public spaces.
8. Smart municipality works with other territorial partners and regional development actors, develops and supports short supply chains and local markets, community-supported agriculture and social entrepreneurship.
9. The village has a functioning blue-green infrastructure accessible to all generations, the village and citizens benefit from ecosystem services, and schools are also involved.
10. The smart village uses modern management and technology, fulfils the principles of circular economy, monitors its ecological footprint, conserves resources and uses RES to the maximum extent possible, promotes sustainable mobility, and operates a modern system of waste and wastewater sorting and recycling.

"Increasing the proportion of green space in communities is one of the easiest, most cost-effective and efficient strategies for adapting to climate change" Andreas Roloff

Interviews with policymakers in MAP CFV on climate change and environmental sustainability yielded the following findings:

The issue of comprehensive improvement of landscape stability was consulted with a representative of the Planning Authority, who commented on landscape measures and the complex land consolidation (CLC) tool. The interviews revealed that village residents and landowners are primarily interested in problems in the built-up area. The CLC is most influenced by the mayor, majority farmers, zoning and conservationists. Societies and communities do not have much input into the design. There is still a great deal of ignorance about land development, especially among residents and businesspeople. A barrier to the land improvement plan and its implementation is the ownership of many plots. Owners often live outside the cadastre in which they have land. Negotiations are also difficult with institutions and other administrators in the area. The heavy administrative burden of all the processes associated with land consolidation. All of this requires a time-consuming CLC process.

Problems in the areas surrounding built-up areas are only a priority when buildings and transport infrastructure in the village are threatened (e.g. by torrential rain, run-off from fields). Requirements for landscape solutions are motivated mostly by the attractiveness of the environment for recreation and tourism.

Existing water resources are important and protected by all, and municipalities often demand improved access to them. Water retention is also increasingly being addressed by users (especially small farmers) who are creating or want to create wetlands and small water bodies on their land.

There is less interest in biodiversity enhancement or climate change adaptation as 'diverse landscapes'[2]. This is addressed by municipalities and farmers, foresters more rarely. On the other hand, multifunctional measures are positively received if they are well explained and there is space for them. Ecosystem services are not well explained and are not perceived by the social sector as part of village life.

Barriers identified by the PROVIDE research project, (HORIZON 2020)

The Czech case studies in the PROVIDE project focused on situations of clear demand for public goods, but which are unmet due to weak governance mechanisms.

In the first case study, the problem was recognised by the actors, but no action was taken to address the problem.

In the second case study, the local elite attempted to address the situation by establishing a foundation, which subsequently attempted to codify its position through an officially recognised Geopark. However, the foundation struggled with the interests of other major players and depended financially on short-term and special-purpose projects and sponsorship donations.

In both cases, it is proposed to use existing LAGs applying the LEADER method to achieve the objectives. This would bring the foundation closer to more local actors and allow for cooperation with volunteers as well as putting pressure on the big players to cooperate.

Recommendations from the conclusions of the PROVIDE study:

- It is important to correctly name the problems and the failure of the mechanism (even the absence of it) in the provision of public goods in regions that do not carry high natural values.
- Confirmation that the local community has the capacity to solve the problems, at least using the LAGs that are in place. However, if the LAG decides to take such action, it needs to be recognised by external authorities (who otherwise fail anyway) as a coordinator or mediator. This also points to the need to build the capacity and competence of LAGs. Investing public funds in this direction seems sensible.
- More intensive involvement of actors in research provides deeper insights into the problems and possible solutions.
- In the PROVIDE case studies, it became clear that actors need to properly explain the purpose of their involvement and offer some benefit from their participation. At the very least, projects need to plan resources for non-scientific outputs and then implement them with sufficient quality to have an impact on the actors.

[2] Valuable national activity of the Private Farmers Association.

2. Enabling environmental sustainability

2.1. Key scientific evidence

A quick survey of the opinions of key LAG staff in the Czech Republic was carried out in order to find out where the biggest problems are in the projects of the Operational Programme Environment. The aim of the survey was to highlight problems to the Management Authority and suggest changes. 31 LAGs participated in the survey, which is 17% of all LAGs in the Czech Republic. The survey came at a time when many LAGs were gaining their first experience with environmental projects.

At the beginning of the programme, the Management Authority of the Ministry of Environment offered a very limited selection of supported activities that LAGs can engage in (e.g. invasive plant eradication), but after arguments and subsequent negotiations of the National Network of LAGs and the MoE the range was extended to include planting of greenery. Planting is a very suitable type of networking activity for the LAG and the community. However, there are also a number of obstacles, for example, the problem of long maintenance time without financial support. There are complex approval processes and bureaucratic problems accompanying project implementation. According to the different types of measures that the LAG could support, it was found that:

- Eradication of invasive plant species - inconsistent approach across the country, with three planning authorities requiring an opinion in which there is consistency in the land use plan. Otherwise only partial operational issues, no need for approval.
- Linear and group planting inside the village - basic problem is with unsettled, inappropriate or unclear land ownership, where they did not apply CLC, another problem is with revegetation when cutting down old trees.
- Line and group planting in areas surrounding the village - the approach of the authorities is not uniform, in some places complex permits are required, and the building authorities see tree planting as a building (i.e. they then require the relevant planning permissions). A significant barrier in the administration is mainly the large number of required annexes and opinions, as well as methodological inconsistency of the state administration authorities and the resulting inconsistency of the issued administrative documents.

2.2. Summary of position of the regional Multi-Actor Platform

Obstacles and enablers supporting success

The current situation and trend change is described according to the ten named areas and has been discussed in the MAP CFV.

1) Development documents - the municipality has prepared spatial plans and they are linked to development strategies, depending on the quality of the documents.

2) Sustainable landscape and mitigation and adaptation measures are implemented according to the relevant development documents. The municipality manages forest land in some cases, but only minimally agricultural land. Therefore, the municipality has limited ability to influence change on agricultural land. It is difficult for the municipality to implement landscape measures in some cases because it has limited financial and staff capacity. Quite often the municipal councillors and citizens do not perceive the problems in the landscape as an important and topical issue.

3) Responsible use of water resources (in the village and landscape).

The municipality still invests little time and money in stormwater retention, and the perception sometimes survives that rainwater needs to be removed from the municipality as quickly as possible so that it does not cause damage to the municipality. If river levels do not rise, people forget the danger of flooding and do not take action. If there is no drought and the wells do not dry up, people are not interested in addressing water retention in the village and the landscape. Politicians often don't think long-term either. There is also a view that nature-based measures will only help to retain water in the soil and landscape in an insignificant way. Example of negative attitudes: *'A car park is for parking, why would I bother with water logging, water will always find a way. The water area in the village is a source of potential problems, costs and hazards. Better to divert the water quickly away from the village and complain to the government or the climate in case of drought".*

4) The complex land consolidation [3] (CLC).

Many municipalities, despite efforts of their councillors, are unable to launch CLCs for several reasons:

- The CLC process is discouraged because it takes a long time (about 10 years) and large farmers or agri-companies complicate negotiations, because of economic interests outweigh social interests.

- The municipality does not have the land, and lacks enough knowledge of CLC as a tool and cannot convince owners of the need to initiate and implement CLC.

- Personal interests override the societal ones. *Example: if a large farmer with leased land is linked to the municipal office or councillor, he gives small compensations for damages (soil erosion, biodiversity loss) and does not want to deal with CLC because he might lose part of his land lease.*

5) Cooperation with farmers and foresters for a functional and varied landscape.

There are still municipalities that are not interested in this topic, they are more concerned with infrastructure, building of municipal houses, and business development without perceiving the impacts on the environment and ecosystem services. The municipal leaders thus block for several years the possibilities to develop the landscape and biodiversity in and around the municipality.

6) Waste management in line with circular economy principles and win-win contracts.

There are municipalities that are not interested in this topic, often lacking information and examples of practice. They are also hindered by the cost of sorting waste, where collection is more expensive and further processing is lacking. However, most municipalities do separate waste, but the downside is the way the waste is processed.

7) Family and community support in the community.

It is about gaining the trust of citizens, leadership (ability to organise education, meetings, communication). If the village does not find such people, they have no success in convening events and become disenfranchised. They evaluate meetings as difficult, unimportant, etc.

8) Territorial partners, short supply chains, local markets, community supported agriculture and social entrepreneurship.

Some communities do not see the priority and are not connected within the region to other landscape and nature creation actors, farmers and foresters. Hence, there are no actions to protect the environment and individual projects are not supported by the municipality. There is also a feeling that by supporting the local farmer or food producer, there is a privileging and envy of easy income.

9) Blue-green infrastructure accessible to all generations.

[3] Czech Komplexní pozemkové úpravy (KoPÚ)

There are some municipalities that do not imagine anything under this term and do not even perceive it after explaining what it would be good for or see it as difficult to implement and especially maintain.

10) Smart village with circular economy principles, saving resources and using RES as much as possible, promoting sustainable mobility with modern green technology.

There are some municipalities that are not interested in this topic or see it as an unsolvable problem for implementation, mostly due to their own convenience, lack of understanding of new technologies and reluctance to change established systems.

Key Research Gaps

The research does not adequately address the translation of research findings into practice, and often does not look for ways to better explain the findings to policymakers and future users. Research is more concerned with publishing results in the professional press than with fieldwork.

In municipalities, among the most important topics related to climate change is the area of water in various contexts. This is about water retention in the landscape and inside of built areas too in relation to torrential rainfall, local flooding and inundation, and about the quantity and quality of water for the inhabitants. Particularly problematic are the recent dry years. Water issues are indeed a priority and municipalities are trying to address them, but they do not know how and then proceed in a non-conceptual way.

Municipalities are also addressing another climate-related topic, namely the landscape and its sustainable economic and ecological functions, and here research should also collaborate more and help in the design and implementation of projects.

The topic of short supply chains, supporting local products and businesses is one of the cornerstones of reducing negative environmental/climate impacts (e.g. reducing transport) that every individual and municipality can do. Many municipalities are aware of this and are making space for "farmers' markets" community gardens, etc., but often the initiative comes from below and is small scale. Municipalities can strongly support these initiatives, for example, by providing unused space for community gardens/hen keeping, giving preference to local entities when purchasing goods and services.

The barrier is that under legislative obligations, municipalities must manage public funds in a way that disadvantages local small businesses. These firms and small business owners are unable to offer competitive prices to large, supra-regional companies. There is a lack of consideration of society-wide benefits. For example, the price of a product could change after taking into account factors such as transport impacts or social return on investment.

We still encounter ignorance of the wide range of benefits of blue and green infrastructure for society. Here, more education is needed among citizens, municipal leaders, politicians and officials to make them understand that, for example, urban greenery is not just ornamental, but also helps to cool the surroundings, retains water, cleans the air, etc.

Functional cooperation between farmers, foresters and the municipality has several barriers, one of which is high transaction costs. Collaboration is organisationally demanding. Municipalities have many concerns and do not always give priority to sustainable projects and creating a solid community.

Some municipalities are more advanced in waste management and have containers for bio-waste and cooking oil in addition to basic sorting. There are also various re-use centres etc., but this is often more of a grassroots initiative. There is a lack of material recovery - e.g. start in start-up, social projects.

Recommendations for the local/regional/national level

In addressing the issues, policymakers are to assist municipalities in overcoming barriers to ownership of the affected land for appropriate action. Landscape measures often need to be implemented in locations that do not belong to the municipality, and land acquisition is difficult. Prices of land are unrealistic for many

municipalities. The recommendation is to implement CLC, working with experienced planners and research experts.

Good practices

On the topic of landscape care and regional production, educational and community projects that emphasise this topic are viewed positively. We recommend, for example:

- The 'One Million Fruit Trees for the Countryside' project was born out of a joint effort by local action groups (LAGs). The aim is to preserve and promote the mosaic agricultural landscape and traditional fruit growing and cultivation in Bohemia, Moravia and Silesia. The programme wants to return resilient traditional fruit species and varieties to an agricultural landscape threatened by erosion and seasonal drought, thereby promoting not only biodiversity, water retention in the landscape and the relationship of the inhabitants to the place. Fruit trees can also promote employment and increase the overall resilience of the area to climate change. Projects of this type have led to activities to conserve, map and exploit traditional fruit trees. To this day, there are areas in the Czech Republic where people have retained a relationship with trees and the landscape. There are more and more examples. A methodology has also been created for those who want to plant fruit trees in the landscape. Furthermore, the activity has expanded to a nationwide project with the support of Sázíme budoucnost[4] (more information at: www.sazimebudoucnost.cz/).

On the topic of ecosystem services in agriculture, the agroforestry approach is valuable. Agroforestry systems in the country are currently presented as remnants of traditional forms, such as grazed orchards, which have been preserved in places with conditions unfavourable for intensive agriculture. The cost savings and income increases associated with agroforestry depend on the type of system chosen and the maximisation of the benefits that this system can provide. Agroforestry brings diversification of income from production. Currently, there are agroforestry courses in the degree programmes at two agricultural universities - the Czech University of Agriculture in Prague (ČZU) and Mendel University in Brno. The Czech Society for Agroforestry (CSAL, www.agrolesnictvi.cz) was founded in 2014 to promote the development of agroforestry in the Czech Republic, organising seminars for farmers, landowners and the professional public.

The Private Farmers Association[5] is positively perceived by the public with its Diverse Landscapes programme[6], where it evaluates farmers who contribute to biodiversity and the proper function of the landscape. The words of 2020 winner Peter Sys capture the essence: *'I believe that overall, landscape creation can add more to agriculture than it takes away. More than the further pointless pursuit of increasing productivity through chemicalisation and concentration. I would see environmental improvement and landscape creation as my main task for the future. Agriculture cannot just be a factory for cheap and often over-chemicalised foodstuffs. Let us show that we are not indifferent to nature and the land and make real, visible changes for the better.'*

[4] Sázíme budoucnost – we plant future

[5] Czech – Asociace soukromého zemědělství (ASZ)

[6] Czech - Program Pestrá krajina

3. Just transitions to a climate neutral continent by 2050

3.1. Key scientific evidence

The situation in the Czech Republic is not being addressed fast enough in the context of climate change and environmental sustainability. With climate change underway, negative effects on farmland, forests, settlements and landscapes are at risk of becoming more widespread and deeper. The situation must be addressed more emphatically, and solutions for sustainable management of the landscape and the water regime must be in line with political and scientific opinion. At present, the agricultural landscape is largely influenced by large agricultural or forestry enterprises. These big companies have largely rent soil out for maximum profit and there is a lack of incentive to farm sustainably. The solution, then, is to harmonise agricultural, regional and environmental policy with a unified legislative approach without unnecessary bureaucracy and a more functional support system to encourage sustainable use of land and landscape. Even 30 years after the fall of socialism, the landscape is still perceived as a production space rather than as an environmental quality and cultural entity. Thus, the way it is managed is a measure of the cultural maturity of a society.

An important but unknown information for owners is that on eroded soils, land prices are decreasing, on some plots by up to 10 CZK/m^2 [7]. On average per cadastral area, the price of land can be reduced by up to 50%. The loss of land is irreversible and difficult to quantify on a human lifetime scale (VÚMOP[8]). Currently, the loss of arable land in the Czech Republic is estimated at 20.858 million tonnes of eroded topsoil per year. These consequences of water erosion result in financial losses of CZK 17 851 billion[9] per year, of which CZK 4.2 billion is the value of arable land and CZK 13 651 billion is the cost of remediation and repair. According to the data of VÚMOP, v. v. i., there is currently a large area of already degraded soils in the Czech Republic that are threatened by water erosion, namely 60% of the ZPF. Over 500 thousand ha of land are severely damaged. The problem of the landscape and the low organic content of the soil is also a problem of drying and wind erosion; according to data from VÚMOP, v. v. i., 24 % of the soil in the Czech Republic is currently threatened by wind erosion.

A big problem (similar to in Austria and Germany) that has become very evident since 1989 is soil sealing. Soil sealing means the complete loss of the possibility to ensure the ecological and productive functions of the soil, mainly by building on the land. In the Czech Republic, especially from the research side, the level of soil sealing has been identified for many years as alarming and associated with unregulated or poorly managed urban sprawl. The revitalisation of brownfields, which are still dilapidated today, is still underused (VÚMOP). In its Agrocenzus[10] survey, the ČSÚ[11] showed that over the last sixteen years some 148 000 ha of agricultural land have been lost. In the Czech Republic about 15 ha of land is being lost every day, mainly arable land, usually of good quality. There is less and less land per capita (0.4 ha of agricultural land and 0.28 ha of arable land), which is a key factor for sustainability and food security. One hectare of living black soil can store up to 3 500 m^3 of water. Since 1938, the water retention capacity of the country's landscape has been reduced by about 2.4 billion cubic metres due to the encroachment of agricultural land. Thus, built-up areas today drain three times more water than all the reservoirs in the Czech Republic (ENKI Třeboň). In this respect, Czechia's policy is very short-term oriented, uncritical of developers and foreign investors who are building giant warehouses here. They tend to approve of simple technical solutions (supplement nutrient loss with artificial fertilisers, use of pesticides) and have little trust in environmental tools. Rural society does

[7] 10 CZK = 0.38 euro

[8] VÚMOP - Research Institute of Land Reclamation and Soil Protection in CZ

[9] 17 851 billion CZK = 686 576 932 euro

[10] Agrocenzus - statistical survey about agriculture,

[11] ČSÚ – Czech statistical institute

not yet accept that large-scale agricultural production has a major impact on reducing resilience to climate change (drought, floods), which is reinforced by the formation of heat islands from which water with superheated air flows outside the small water cycle high into the atmosphere (ENKI Třeboň). Representatives of local and regional governments perceive that overall inappropriate management of agricultural and forest land, its loss and threat to the sustainability of resources, nutrient balance, but often do not see themselves as significant players in this situation. Monocultures without water and diversity are endangering future generations. The implementation of partial projects for climate change resilience is becoming attractive in municipalities, especially in public spaces. More and more municipalities or associations of municipalities (MAS) have recently developed strategies and action plans for adaptation to climate change, reducing energy consumption and greenhouse gas emissions. A mitigation strategy is gradually being adopted, even if municipalities do not call it that, and they are trying to implement various measures (revitalisation of rivers, ponds, green roofs, permeable surfaces in parking lots, insulation of buildings, use of RES, etc.

It is also generally accepted that food production should be linked to a reduction in transport distances from producer to consumer.

Also in our research we consider a double production of food - Environmental bio-production with extensive sustainable management in the landscape with the support of ecosystem services and on the other hand for cities technological production in a closed system of greenhouses, aquaculture, insecticulture, hydroponics, and laboratory technologies. Some fast-food companies have invested in start-up projects that address the issue of biotechnology such as synthetic meat production. The only Czech start-up dedicated to this area is Bene Meat Technologies, which cooperates with foreign partners. This company has already succeeded in developing the first samples of muscle cells produced in the laboratory. According to the available information, the main obstacles to the spread of this technology are technological capacity, hygiene and bureaucratic barriers, and potential consumer resistance.

In the area of Smart Villages, decentralised smart grids are being pilot tested in the Czech Republic and abroad. In the Czech Republic, smart grids are being tested in the Vrchlabí microregion and Opava. A Technology Platform for smart grids has also been established. The main obstacle to the implementation of smart grids in the Czech Republic - and thus decentralised energy sources - is the lack of flexible metering and demand-side management systems. The Czech government, in cooperation with the three largest energy distributors, is promoting a more centralised energy system.

In order to move to decentralised energy sources, or at least to increase their share of the electricity supply, smart grids with smart metering need to be put in place. The technology can also bring risks, such as the building of solar power plants on farmland and the potentially unpleasant reflection of light from the panels into the landscape; the vulnerability of the decentralised grid if it is not well coordinated and the participants do not cooperate; and the problem of stability of energy supply and outages of small producers.

3.2. Summary of position of the regional Multi-Actor Platform

Obstacles and enablers supporting success

There is still little awareness of climate change and environmental sustainability. There is too much information in the media that obscures the real threats and the state of the environment. Therefore, for some topics, ignorance and lack of interest in the impacts of climate change is a barrier (there is a general view that "it is far away, it does not concern us"). Government policy is mainly directed towards centralised systems, technical solutions and big players; decentralisation of power is more of a threat. This negatively affects bottom-up initiatives.

At the regional level, there are then barriers with some landowners and long-term tenants who are not willing to implement or tolerate the implementation of measures on their land or in the vicinity of the measures.

Another negative phenomenon is the increase in the price of services and investments, including the negative effect of the EU funds, which raise the price of some services and construction works; the construction material itself is a limiting element. The lack of services, the high cost of measures and materials in the approved projects according to older pricing burdens the implementation. There is also the effect of the COVID-19 pandemic.

The high level of area subsidies (SAPS and supplementary payments) does not motivate farmers to take measures such as restoration of permanent grassland, application of organic fertilisers, and increasing biodiversity. Support for individual projects still prevails over cooperation projects. When it does exist, it is limited to voluntary associations of municipalities. LAG cooperation projects, well implemented in the period 2007-2014, are severely limited in the period 2015-2020 (RDP, OPE) and in the new period it does not look any better, despite the great interventions of the National Network of LAGs on the managing authorities.

The existence of excessive bureaucracy puts small municipalities at a disadvantage, as they do not have the capacity to administer projects or the funds to outsource services.

Agrotechnical practices cannot be influenced or monitored by municipalities unless the farmer is willing to cooperate. Municipalities want to buy up land for public buildings and plantations, but often have to pay a high market price to buy land.

Key Research Gaps

In an interview with a research representative, the following findings were identified:

People are more likely to perceive technical and obvious deficiencies in their environment. For example, the destruction of local roads by large agricultural machinery, its noise and dustiness when working in the fields, soil washing and landslides. Only rarely are residents concerned about causes such as loss of biodiversity, insect die-off, deterioration of soil retention (erosion), loss of organic matter and communities of organisms (edaphon) in the soil. Rather, residents demand landscape changes to make the environment more attractive.

Farmers are now slowly becoming concerned with water retention, wanting to build ponds and pools on their land and under their direction, but still have little understanding of the climatic function of, for example, blue infrastructure, green windbreaks or agroforestry.

There is little public pressure to support CLC. Where CLCs are not implemented, there is still little knowledge of CLCs. Implementation of CLC project measures is important to the mayor but is often delayed.

An important part of the process is to assess existing knowledge about the problem, identifying gaps where the knowledge base can be improved. The purpose is to integrate existing knowledge to better understand the problem being addressed. At this stage, the TranSTEP method can be used, which aims at creating an integrated assessment carried out by an assessment group with a strong background anchored in science, society and politics. The TranSTEP method includes the following steps:

1. Setting up a TranSTEP group for dialogues across institutional and scientific disciplines.
2. Joint situational analysis and framing of the problem.
3. Transparent reflection on evaluation methods.

4. Creation of an inventory of existing evaluations within the problem.
5. Possibility to conduct new evaluations of the problem.
6. Completion of the process through integration/merging of results.
This should be followed by publication and dissemination of the results.

Recommendations for the national level

The absence of deeper state concern for environmental issues has implications for the education of the population and the preparedness of society for the consequences of climate change. The increasing urbanisation of the landscape has already begun to have negative impacts. The activities of the state and its organisations such as the Basin and Forestry of the Czech Republic and the Road Directorate are not yet exemplary. Therefore, our recommendation is to have a constructive open discussion between rural actors, politicians and researchers. The results of this discussion on the platform of the national conferences - the National Rural Conference - should be binding, and the resulting activities monitored, audited and controlled.

The theme of the societal-wide impacts of the activities of farmers, foresters, water managers and other land managers should be developed. There is a lack of interdisciplinary climate education for teachers and subsequently for pupils in education and further education. Public goods and ecosystem services, which are primarily related to the environment and its quality, should be better and more fully explained.

Involving residents in the educational process in municipal lectures, courses on climate change in a way that engages them, draws them into the issue and shows the possibility, examples of good practice.

Responsibility and attachment to the environment in which we live every day as citizens of a particular municipality or town should be developed, and everyone should try to participate in activities related to improving the environment (e.g. joint actions for local markets, food for schools, use of biomass, creation of RES, planting trees in the place of residence, etc.).

4. Interventions to mitigate and adapt to climate change and enhance environmental sustainability

4.1. Key scientific evidence

Czech agricultural policy in the field of agriculture and forestry is committed to climate change interventions. In the Strategic Plan CAP 2022-2027, climate parameters will be met by many interventions including CLC, LEADER, LAGs (SCLLD), agroforestry agro-environment programmes, non-productive investments in forests, etc.

Some farmers are interested in setting up agroforestry, with or without subsidies, but are concerned about the legislative obstacles and bureaucratisation of tree planting on farmland. Establishment requires professional assistance such as extension services.

A working group at the Ministry of Agriculture of the Czech Republic is currently preparing a new regulation on financial support for the establishment and maintenance of agroforestry, which will be newly included in the Rural Development Programme. However, based on farmers' perception, this support must be clear and simple, without legislative and bureaucratic obstacles.

4.2. Summary of the position of the regional Multi-Actor Platform

10 areas have been named to contribute to climate-friendly conditions. The importance of each point varies according to regional conditions and problems. Therefore, several questions were attached to each topic to find out the status, the attitudes of the mayors (stakeholder), relevant barriers and opportunities to achieve a better status. The results showed that the regional level is interested in pragmatic issues and already less aware of the societal benefits or impact. The results from interviews are as follows:

Strategic documents in the context of climate change and environmental sustainability

Some municipalities have development documents, created in direct cooperation with citizens. The lack of municipal land and the difficulty of implementation is an insurmountable barrier to achieving the objectives of the documents.

Complex land consolidation (CLC)

Important is the interconnection of all strategic documents, the problem is the duration of the CLC process. Area measures may not be implemented by farmers as users, thus reducing the effect of implemented linear and technical measures. However, some communities still refuse CLC for various and personal reasons.

Water management

Rainwater harvesting projects are being developed at family and municipal buildings with and without MoE subsidy. There are problems with subsidy applications; many applicants are discouraged. New home construction in recent years has had a requirement for rainwater retention basins. Rainwater use is not monitored, but it is estimated that the retained water is used mostly to water gardens and as domestic water in family and community houses. The barrier is again in property rights and consequently in poor legislation; it would be advisable to develop a methodological guide for rainwater use, including hygiene recommendations. Small water reservoirs and wetlands are being built in villages, but if there are no CLC and enough land owned by the municipality, this is a problem.

Green-Blue Infrastructure

There is no overview of the frequency of these activities and their acceptance by residents. Establishment of green infrastructure also faces problems of lack of space, and lack of understanding of owners. There are impressive examples of good practice that can augment these measures.

The plantings carried out entail considerable expenses for subsequent maintenance, which is often a great burden for the municipality.

Win-win contracts

Contracts of this type are rather rare today. Example: the use of local resources, local workers and the subsequent use of production waste in the negotiation of public contracts in the settlement and the landscape.

Family and community

Good communities support local suppliers, use local resources, manufacturers, create community activities, involve all groups of residents from school children to people of retirement age.

However, there is still a lack of volunteers, the interest of the residents is usually low, and a capable animator is important to get people to participate in common activities.

Cooperation with other LAG municipalities

Voluntary associations of municipalities and LAGs are involved in various projects, often planting greenery in the municipalities, including cross-border cooperation for planting trees and shrubs (e.g. Interreg).

Municipalities are frequently members of several associations and initiatives that give rise to, for example, activities or the transfer of information on good practice.

SMART village

Many rural villages do not know much about this topic yet, though some are developing electro-mobility, the use of RES for more municipal buildings or the processing of waste into composts. Here there is a need for awareness raising and good quality advice.

Key Research Gaps are mostly staff and professional capacity, burnout, lack of interest in transferring experience into practice. Most municipalities with extended competence do not fulfil their role in the sense of an actor of sustainable development of the whole defined administrative area. In this area, the activities of the ORP are substituted by other actors, mostly associations of municipalities, LAGs and micro-regions. Researchers are not always directly involved as actors.

Recommendations for the national level

In future it seems appropriate to involve in broad discussion other actors, primarily from relevant ministries and non-profit organisations (local governments, farmers) and to discuss the following topics with them:

The Ministry of Environment, the Ministry of Agriculture, and agricultural NGOs should support multifunctional use of small areas under construction as part of subsidy support. Thus, find a way to allow the use of these resources for irrigating pastures, and to allow extensive use for fish farming in small water reservoirs. This breakthrough would rapidly increase the interest in implementing landscape measures, especially from farmers and farmland owners.

There is a need for a fundamental debate with ministries, associations, NGOs and National Network of LAGs in the Czech Republic on: How to reduce the administrative complexity of project applications and thus remove a major barrier to their wider use by small municipalities. Alternatively, how to provide financial support to municipalities to help them cope with the complex administration of projects, especially in operational programmes. Another option is to make significant use of simplified reporting, flat rates, lump sums for administration and indirect costs.

Ministries and associations representing municipalities - it is necessary to insist on a unified procedure of the first-instance bodies issuing documents that are mandatory annexes to applications for subsidies. This is particularly the case for the inconsistency of the planting documents, which are received differently by these institutions. And it has to be said that they are often very complicated (e.g. the requirement for removal from agricultural land under a bio corridor, etc.).

There should be a fundamental discussion at the national level about who should be the actors of regional development, how the competences and competences of the different actors should be defined, how to support the activities of these actors, how to guide and support them methodically.

Municipalities are often unclear about their environmental priorities, apart from waste management and dealing with drought in years of poor rainfall. The problem is in municipalities where they apply a rejection of CLC and this is primarily by landholders who are comfortable with the status quo.

Recommendations and Conclusions

We need to remember that the concept of sustainability is defined as the practical ability to meet the basic needs of today without significantly limiting future generations to meet their basic needs. Therefore, today's society must plan and operate in such a way that its lifestyle and economic activity do not conflict with this definition. In this spirit, education and awareness-raising should be strengthened.

We need to look for unconventional ways to reach people and better explain the importance of ecosystem services, the possibilities to involve people, to strengthen the decision-making and financial support of LAGs to improve the situation in the 10 named CFV areas.

Monitoring and evaluation of outcomes and impacts is important, so it is essential to select appropriate and measurable indicators to measure change.

We need to support open discussion among Ministry of Environment, Ministry of Agriculture, Ministry of Regional Development, Ministry of the Interior, NGOs and NS LAGs of the Czech Republic focused on - support for strategic documents for the areas mentioned in the 10 points above. The Adaptation Strategy, the Landscape Study and the Municipal Development Strategy are all sub-documents that have their own justification and value. In relation to the issue under study, there should be an effort to create Resilience Strategies including action plans.

Government and agricultural NGOs should be more active in promoting CLC in terms of motivation and raising awareness of the benefits of the subsequent implementation of the measures.

References

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3) TAČR ÉTA Collaboration on climate change adaptation in key forest and agricultural areas TL 02000431 2019 – 2021, https://starfos.tacr.cz/cs/project/TL02000431#project-results
4) TAČR ÉTA Opportunities for Regional Development and Sustainability of Rural Landscapes project, TL01000298 2018 - 2020, Certifikovaná metodika, ISBN978-80-2133061-0, 68p., ČZU Praha
5) The Strategic Framework Czech Republic 2030 Administration, reg. No.: CZ.03.4.74/0.0/0.0/15_019/0002185, https://www.cr2030.cz/strategie/
6) PROVIding smart DElivery of public goods by EU agriculture and forestry is a three-year project (2015-2018) funded by the HORIZON 2020 Framework Programme of the European Union.. (Rattinger,T. ad al.) https://provide.strast.cz/cs/dokumenty

Annex 1: Key scientific evidence cited

1) www.eagri.cz
2) www.szif.cz
3) www.vumop.cz
4) www.tacr.cz
5) https://www.enki.cz/cs/o-nas

Appendix

Table 1. Compilation of noteworthy projects / initiatives / tools / methods implemented

Name	Time of implementation	Contact & Internet address
Počítáme s vodou (This website deals with near-natural stormwater management.)	2021	https://www.pocitamesvodou.cz/about-project/
Adaptace na změnu klimatu	2016	http://www.adaptacesidel.cz/data/upload/2016/09/Adaptace_kniha_ISBN-978-80-87756-09-6.pdf
Adaptace zemědělství na změny klimatu v podmínkách ČR	2017	http://eagri.cz/public/web/file/552908/publikace_Adaptace_zemedelstvi_final.pdf
Aktualizace Komplexní studie dopadů, zranitelnosti a zdrojů rizik souvisejících se změnou klimatu v ČR z roku 2015	2019 (2015)	https://www.mzp.cz/C1257458002F0DC7/cz/studie_dopadu_zmena_klimatu/$FILE/OEOK-Aktualizovana_studie_2019-20200128.pdf
Český venkov a zemědělství v podmínkách měnícího se podnebí	2014	http://eagri.cz/public/web/file/352863/cesky_venkov_A5.pdf
Indikátory zranitelnosti regionů ČR vůči změně klimatu	2016	http://www.regio-adaptace.cz/download.php?Soubor=47_indikatory-zranitelnosti-regionu-cr-vuci-zmene-klimatu.pdf
Jaká adaptační opatření Češi upřednostňují?	2016	https://www.czp.cuni.cz/czp/images/2016/KLIMA.pdf
Katalog lesnických adaptačních opatření	2016	http://www.frameadapt.cz/coajdfadlf/uploads/2016/11/KATALOG_FINAL_po_strankach_web.pdf
Metodika tvorby adaptační strategie sídel na změnu klimatu	2016	http://adaptacesidel.cz/data/upload/2016/09/metodika_adaptace.pdf
Metodika tvorby místní adaptační strategie na změnu klimatu	2015	http://adaptace.ci2.co.cz/sites/default/files/souboryredakce/adaptace_metodika_nahled.pdf
Možnosti řešení vsaku dešťových vod v urbanizovaných územích v ČR	2015	http://www.povis.cz/mzp/132/vsak_destovych_vod.pdf

Národní akční plán adaptace na změnu klimatu	2021	https://www.mzp.cz/C1257458002F0DC7/cz/narodni_akcni_plan_zmena_klimatu/$FILE/OEOK_NAP_adaptace-aktualizace_2021.pdf
Očekávané klimatické podmínky v České republice	2019	https://www.klimatickazmena.cz/download/eb6693e9433c6f76162b9809e7713f8e/cliche_I_2019_v3_final_2b.pdf
Od zranitelnosti k resilienci Adaptace venkovských oblastí na klimatickou změnu	2014	https://www.veronica.cz/klima/resilience/Od_zranitelnosti_k_resilienci.pdf
Rozvoj obnovitelných zdrojů v ČR do roku 2030	2021	https://www.alies.cz/wp-content/uploads/2021/07/COZP-2021-Rozvoj-OZE-2030_final2.pdf
Strategie přizpůsobení se změně klimatu v podmínkách ČR	2021	https://www.mzp.cz/C1257458002F0DC7/cz/zmena_klimatu_adaptacni_strategie/$FILE/OEOK_Narodni_adaptacni_strategie-aktualizace_2021.pdf
Strategie resortu ministerstva zemědělství české republiky s výhledem do roku 2030	2021	http://eagri.cz/public/web/file/460683/_460659_683669_Strategie_resortu_ministerstva_zemedelstvi_s_vyhledem_do_2030.pdf
Stromy a změna klimatu	2018	https://www.sazimebudoucnost.cz/cs/prinosy-stromu
Zapojujeme města do klimatických řešení: Příručka pro Samosprávy a Aktivní Občan(k)y	2021	https://klimatickakoalice.cz/images/mesta_brozurafinalweb.pdf
Zavádění retenčních a infiltračních adaptačních opatření v povodí Moravy	2015	http://www.koaliceproreky.cz/wp-content/uploads/2016/01/technick%C3%A1-zpr%C3%a1va.pdf
ZEMĚDĚLSKÉ SUCHO V ČESKÉ REPUBLICE – vývoj, dopady a adaptace	2020	https://www.intersucho.cz/userfiles/file/ZemedelskeSucho.pdf
Milion stromů (Invetrreg)	yet	https://www.milionstromu.cz/
AdaptaN (Norské fondy)	2015-2016	https://www.adaptan.net/
Zavádění agrolesnických systémů na zemědělské půdě	yet	http://agrolesnictvi.cz/

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SHERPA has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No. 862448. The content of the document does not reflect the official opinion of the European Union. Responsibility for the information and views expressed therein lies entirely with the author(s).