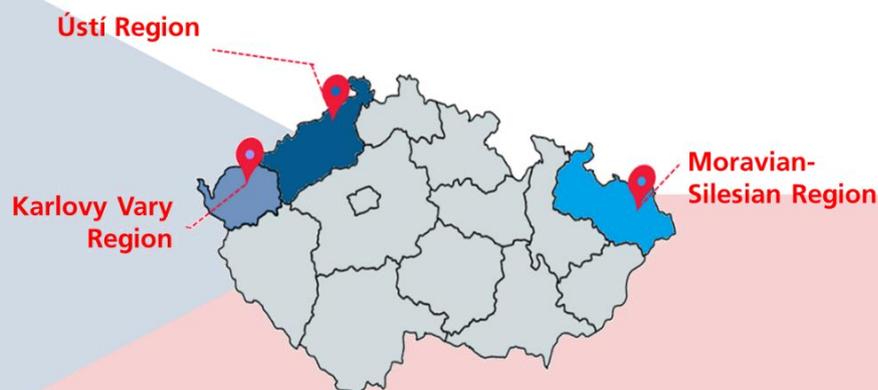


Framework ID: SRSS/2018/FWC/002

SPECIFIC CONTRACT: REFORM/SC2020/111

Support to the preparation of Territorial Just Transition Plan in the Czech Republic



D4. Report on the challenges, needs and action plans of the most affected territories (FINAL)

For Publication

30.09.2021

Disclaimer

This Report was prepared with funding by the European Union via the Structural Reform Support Programme and in cooperation with the Directorate General for Structural Reform Support (DG REFORM). The views expressed in this report are those of the consultants and do not necessarily reflect those of the European Union.



This project is implemented by Frankfurt School of Finance & Management (as part of the AARC Consortium) in cooperation with Trinomics, Czech Technical University and Cambridge Econometrics

ABBREVIATIONS

AI	Artificial Intelligence
ARC	Appalachian Regional Commission
CCI	Cultural and Creative Industries
CEF	Connecting Europe Facility
CINEA	European Climate, Infrastructure and Environment Executive Agency
CMZRB	Czech-Moravian Guarantee and Development Bank
CO _{2eq}	Carbon dioxide equivalent
COGEN	Association for combined heat and power generation
COSME	The EU programme for the Competitiveness of Small and Medium-Sized Enterprises (SMEs)
CPP	Climate Protection Policy
CSSA	Czech Social Security Administration
CVET	Continuing Vocational Education and Training
CZ	Czech Republic
CZGBC	Czech Council for Green Buildings
CZK	Czech Crown
CZSO	Czech Statistical Office
D	Deliverable
DEP	Digital Europe
DG	Directorate General
DNSH	Do No Significant Harm
DPO	Decarbonisation Pathways Optimizer
E3ME	Dynamic, computer-based, global macroeconomic model
EE	Energy Efficiency
EFEKT	State programme to support energy savings of the Ministry of Industry and Trade
EIB	European Investment Bank
ELENA	European Local Energy Assistance
ENERG	Improving Energy Efficiency and Reducing Greenhouse Gas Emissions in Industry in the EU ETS
ETS	EU ETS
ERDF	European Regional Development Fund
ERO	Energy Regulatory Office
ESF	European Social Fund
ESG	Environmental, Social and Governance Factors
ETS	Emissions Trading System
EU	European Union
EUR	Euro
EV	Electric Vehicles
FDIs	Foreign Direct Investments
FI	Financial Institution
FKI	Finger-Kreinin index
FN	Financial instruments
FP	Financing Partners
FTE	Full-Time Equivalent
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation

GHG	Greenhouse Gas
GJ	Gigajoule
GPN	Global Production Network
GVA	Gross Value Added
H2020	Horizon 2020
HEAT	Modernization of thermal energy supply systems
HKK	Hradec Kralove region
I4T	Industry 4.0 Technology
IB	Intermediate Body
ICF	Global advisory and digital services provider
ICT	Information and Communication Technology
IO	Input-Output
IROP	Integrated Regional Operational Program
ISCED	International Standard Classification of Education
ITI	Integrated Territorial Investments
JASPERS	Joint Assistance to Support Projects in European Regions
JHČ	South Bohemian Region
JHM	South-Moravia Region
JT	Just Transition
JTF	Just Transition Fund
JTM	Just Transition Mechanism
JTP	Just Transition Plan
KIBS	Knowledge-intensive Business Services
KV Region	Karlovy Vary Region or Karlovarský Region
LAG	Local Action Group
LBK	Liberec Region
LIFE	EU's financial instrument for environmental and climate change measures
MA	Managing Authority
MEYS	Ministry of Education, Youth and Sports
MF	Modernization Fund
MFF	Multiannual Financial Framework
MICE	Meeting, incentive, convention, and exhibition events
ML	Machine Learning
MoE	Ministry of the Environment
MoIT	Ministry of Industry and Trade
MoLSA	Ministry of Labour and Social Affairs
MoRD	Ministry of Regional Development
MoT	Ministry of Transport
MS Region	Moravian-Silesian Region
MSIC	Moravian-Silesian Innovation Centre
MW	Megawatt
NACE	Classification of Economic Activities
NDP	New Democratic Party
NDT	Non-Destructive Testing
NECP	National Energy and Climate Plans
NGO	Non-Governmental Organisation

NIP	National Investment Plan
NUTS	Nomenclature of Territorial Statistical Units
OLK	Olomouc Region
OP	Operational Program
OP E	Operational Programme Employment
OP EIC	Operational Programme Enterprise and innovations for Competitiveness
OP JAK	Operational Programme Jan Amos Komensky
OP JT	Operational Programme Just Transition
OP TAC	Operational Programme for Technologies and applications for Competitiveness
OP ŽP	Operational Programme Environment
OPD	Operational Programme Transport
PAK	Pardubice Region
PCF	Pan-Canadian Framework
PHA	Prague
PLK	Pilsen Region
PRV	Rural Development Program
R&D	Research and Development
RACER	Monitoring Indicator - Relevant, Accepted, Credible, Easy to monitor, Robust
RCA	Regional Policy Common Result Indicators
RCO	Recommended output indicator
RCR	Recommended result indicator
RE	Renewable Energy Strategies of economic restructuring of the Ústí, Moravian-Silesian and Karlovy Vary Regions
RE:START	
REACT-EU	The Recovery Assistance for Cohesion and the Territories of Europe
RES	Renewable Energy Sources
RES+	New Renewable Sources in Energy
RfS	Request for Service
RIS	Regional Innovation Strategy
RRF	Resilience Recovery Fund
RRP	Resilience Recovery Plan
RSK	Regional Standing Conference
RTP	Regional Transformation Plan
SC	Steering Committee
SE	Senior Expert
SEF	State Environmental Fund
SES	Secondary Energy Resource
SEZ	Old ecological burden
SKO	Mixed municipal waste
SME	Small and Medium Enterprises
SO	Specific Objective
SRSP	Structural Reform Support Programme
START	Secretariat's Technical Assistance to Regions in Transition
STČ	Central Bohemia Region
SWOT	Strengths, Weaknesses, Opportunities, and Threats analysis
TA	Technical Assistance

TACR	Technology Agency of Czech Republic
TAP	Sources burning solid alternative fuels
TEN-T	Trans - European transport networks
TJTP	Territorial Just Transition Plan
UJEP	University of J.E. Purkyne
U Region	Ustí Region or Ustecki Region
UNESCO	United Nations Educational, Scientific and Cultural Organization
URBIS	Urban investment advisory platform within the European Investment Advisory Hub
VYS	Highlands Region
ZEVO	Equipment for energy recovery of waste
ZLK	Zlin Region

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EXECUTIVE SUMMARY

To reach its climate targets, the Czech Republic needs to reduce mining, close and replace coal-based power plants, and tackle the carbon-intensity of its industries through modernisation, the introduction of new technologies and energy efficiency measures. The transition process to climate neutrality is expected to particularly affect communities with ongoing extraction and combustion of coal/lignite and carbon-intensive industries, as well as communities with a high risk of increasing unemployment, poverty and those with high regional disparities, such as those **in the Ústí, Moravian-Silesian and Karlovy Vary regions**. These are the eligible territories in the Czech Republic that will benefit from the measures of the European Commission's Just Transition Mechanism.

The objective of this report is **to discuss the challenges and corresponding actions required for a Just Transition in the most affected territories of the Czech Republic**. The report focusses on: (1) assessing the state of play of already implemented measures and their effectiveness; (2) analysing the political-administrative, economic, employment/labour market, environmental, socio-cultural, and digital/technological related challenges and opportunities for each of three transition regions; and (3) providing a detailed discussion of the priority operations and investment needs for each of the three regions.

Chapter 1 provides information to the project context that includes the analysis of existing transition efforts and results towards a climate-neutral economy, including an outlook of planned measures and the proposed governance mechanisms for the Just Transition, the potential of Artificial Intelligence (AI) in the transition and the good practice studies.

Existing transition efforts began in 2015, when the transformation process has been supported by a specific government resolution called the Strategic Framework for Economic Restructuring (RE:START Strategy), which outlines a variety of measures to prepare for the transition. To this end, the Czech Coal Commission, an advisory body of the Czech government, was established in 2019.

Key strategic documents have not yet fully reflected the transition to climate neutrality. The National Energy and Climate Plan (NECP) was prepared in 2018 and finalised in 2019, i.e., when the climate neutrality target was not yet established. Although the Climate Protection Policy (CPP) aims for an 80% CO₂ reduction by 2050, the CPP is an indicative, rather than binding, policy. The current State Energy Policy was adopted in 2015 and has been linked to 2020 energy efficiency targets, but it does not incorporate GHG emission reduction targets. These documents were developed in different periods and have not been clearly interconnected with respect to climate neutrality. It can be reasonably expected that climate neutrality will become the main point of reference in the revisions of these documents. The State Energy Policy is undergoing a revision at the time of writing of this report; the NECP will be revised in 2023.

Investment needs for the transition to climate neutrality remain to be fully assessed and tracked. The investment needs (reflecting pathways to decarbonisation) have not been fully quantified in the main strategic documents. The availability of funding to support the climate neutrality transition and the specific conditions of public support programmes are currently being negotiated. Importantly, a system that tracks both public and private sustainable investment in a systematic way should be established at the national level. The EU Taxonomy will be instrumental to develop such a system. Nevertheless, proper implementation in the analysis, evaluation, and decision-making processes will be key for its success at the national and regional levels.

The transition steps towards climate neutrality are still to be defined. In December 2020, the Czech Coal Commission recommended the phase-out of coal by 2038.

At the national level, CO₂ emissions are expected to decrease by 46% compared to baseline. Modelling at the national level suggests that full implementation of the NECP will reduce CO₂ emissions by 46% compared to the baseline (no NECP) by 2030. Total energy consumption is expected to be 13% lower than the baseline scenario by 2030. According to this scenario, coal is still expected to contribute roughly 10% of total energy production in 2030, although much of the coal supply will be substituted by nuclear and renewables. Thus, this outlook will require substantial development of renewables: up to 46% of the power generation mix in 2030 compared to roughly 13% in the baseline scenario. The NECP expects the share of renewables to reach 17% in 2030 (and 22% of total energy consumption).

The governance mechanism is to a large extent already in place for Pillar 1 of the Just Transition Mechanism (JTM) and the Just Transition Fund (JTF). In June 2021, the Cohesion policy legislative package 2021-2027 was adopted by the European Parliament, including JTF. This includes the preparation of the Territorial Just Transition Plan (TJTP) coordinated by MoRD. The Ministry of Environment (MoE) is the Managing Authority for the Operational Programme Just Transition (OPJT) and the State Environmental Fund is the intermediate body. The preparation of the OPJT, coordinated by MoE, is largely advanced. Different governance levels (national–regional) are currently represented through one body: the Transformation Platform. The MoE also works intensively with potential institutions that should act as intermediaries for OPJT (i.e., the Ministry of Labour and Social Affairs and the Ministry of Education, Youth and Sports). The MoE also began to cooperate intensively with the CzechInvest agency during the OPJT implementation to leverage their previous experience in supporting the business sphere. The coal regions and their respective working groups are also very active in the preparations for the TJTP, which continuously maps the absorption capacity. It is a matter of identifying suitable projects for the transformation of regions which, after meeting the set conditions, could have the opportunity to be financed (not the right) from the OPJT. During June 2021, the categorisation of suitable projects took place, dividing potential projects into strategic and thematic calls or simplified grant schemes.

The design of **Pillar 2** at the EU level progressed in March 2021, when appropriate Regulation (EU) 2021/523 establishing the InvestEU Programme was adopted. The governance of this pillar will follow in the coming months. For **Pillar 3** of the JTM, the situation is progressing, too, as the European Parliament also adopted the Public Sector Loan Facility that will effectively complete all proposals under the Just Transition Mechanism. This regulation is scheduled for adoption by the Council on 12 July 2021. The Technical Assistance (TA) team¹ compiled and further developed possible governance options for both pillars in the Deliverable 2 report.

The analysis of the potential of Artificial Intelligence (AI) states that it can have a positive impact on GHG, GDP and Employment in all three regions and in particular in Moravian Silesian Region.

The model shows the priority areas and the target impact in GHG, GDP and Employment. Moravian Silesian Region for its size and economic development has more potential to gain benefits from selected AI use cases. The other two regions, in their digitalisation plan, identified domains where AI use cases are relevant such as Autonomous vehicles, Smart monitoring and management of energy consumption. **The successful development of AI use cases** implies investments in the foundation digitalisation areas. It is recommended to address the critical aspect with particular focus to five domains (human capital, from lab to market, Infrastructure, networking, e-government service).

Finally, the overview chapter presents a series of good practices from other EU Member States (Germany, Hungary) in the areas of hydrogen buses, reconverting former coal mines and green industry clusters as well as long-term employment creation in regions of coal phase-out.

Chapter 2 of the report provides an overview on the methodology for the assessment. Chapter 3 (Ústí), Chapter 4 (Karlovy Vary) and Chapter 5 (Moravian-Silesian) include the assessment for each of the regions, by analysing various dimensions: political-administrative, economic, employment/labour market, environmental, socio-cultural, digital/technological, key economic operators and EU ETS, the (renewable) energy and heating sector. Thereafter follows the analysis of the impact of the climate transition and on jobs skills-mismatch assessment. The final part includes for each region a transition assessment, based on a SWOT analysis, the identification of the investment priorities and the strategic outlook.

From a methodological perspective, the TA team performed the analysis based on available data from the Czech Statistical Office or Eurostat, which has been supplemented by additional information provided in other strategic documents, such as Regional strategies, Regional innovation strategies, or RE:START, Strategy of regional development 21+, etc. Statistical data have been triangulated with the stakeholder interview results. A focus has been on the analysis of economic performance, sectoral composition on an inter-regional level, and firm size structure as an important precondition of economic and entrepreneurship performance. The transition process has been assessed from a holistic perspective, that is, not only in terms of a technological change but also in terms of a social change. To this end, a focus has been on social indicators, such as the development of unemployment rate and demographic development, including aging and migration. The analysis is enriched with some basic

¹ The Technical Assistance (TA) team is the consultant team implementing this Technical Assistance assignment, led by Frankfurt School of Finance & Management (as part of the AARC Consortium) in cooperation with Trinomics, Czech Technical University and Cambridge Econometrics)

spatial analysis of the energy sector, including renewable energy capacities and potential at the regional level. Moreover, an analysis of transformation plans of key economic operators with a focus on those under the EU ETS and analysis of the expected mismatch of skills on the labour market has been performed. The analysis is synthesized through a summary of main challenges and opportunities, SWOT analysis related to the transition process, and final strategic outlooks for all three coal regions.

Results from the analysis indicate that while the Moravian-Silesian Region has started its economic transformation towards an innovation-based economy with developed infrastructure for science and research, the Ústí and Karlovy Vary regions have not yet started such a positive development path, and for many indicators, are increasingly lagging behind other regions. Both regions have a regional economy that is predominantly based on the production and export of lower value-added products within global production chains. However, all three coal regions face challenges phasing-out coal and moving to a low-carbon economy due to the concentration of energy-intensive industries, the significant social impacts of the ongoing transformation, and the unfavourable images associated with the regions².

- The **Ústí Region** substantially lags behind other Czech regions in terms of investments in research and development activities. The region also faces unfavourable developments concerning other socio-economic indicators, such as unemployment, low education, household indebtedness, brain drain, etc. Combined, these factors create a negative image of the region. Ústí Region faces a further challenge – that is to reclaim large areas after surface lignite mining. However, if successful, land reclamation offers huge potential for new development areas and economic activities, e.g., recreation and related services, new industrial zones, energy production (RES) and storage, etc. Since the region has a strong tradition in the energy sector, the challenging energy transformation represents a great potential for further regional development. Besides land reclamation and development of modern energy systems, the region should further develop entrepreneurial ecosystem and invest into rather human and social capital, such as support of re-skilling and up-skilling for future oriented economic activities, systematic support of primary and secondary education and investments into quality of life of inhabitants.
- The **Karlovy Vary Region** has a high share of services geared towards tourism and spas. However, its economy is strongly oriented towards energy-intensive industries and is characterised by very low investment in research and development and low innovation potential. The region is also faced with several socio-economic challenges, such as continuing population decline, lack of university-educated professionals, and the emergence of socially excluded localities. Within the region, new development zones could be captured after mining land reclamation or re-use of brownfields, which could help diversify the region's economy. A key challenge is the social stabilisation of the population and increasing the qualifications of inhabitants. Thus, a corresponding opportunity is to invest in improving the quality of life of inhabitants at the municipal level, including the promotion of social cohesion and a high-quality education system (primary and secondary level). Besides that, the creation and development of the entrepreneurial ecosystem (public and private capacities) is seen among the key priorities.
- In recent decades, the **Moravian-Silesian Region** has significantly developed and improved in terms of education, transport, research and development. Based on economic indicators, the regional competitiveness is well-developed, although it is primarily based on a so-called low-road³ strategy. The region is facing the increasing decoupling of economic and demographic/social development. Indeed, processes such as out-migration (brain-drain), ageing, and social polarisation limit the region's ability to deal with future challenges. Negative regional image, poor quality of life, ecological burdens cannot be neglected either. The region should mainly focus on further support of entrepreneurial ecosystem, diversification and upgrading of the structure of economy, support of research and development, investments into the green economy and meaningful reuse of

² The unfavourable image has complex historical roots and continues to impact development perspectives. All three regions have experienced dramatic social changes after World War II and a significant part of the population (e.g. Ústí nad Labem lost the majority of its inhabitants) was lost when the German population was expelled. Subsequent settlement has rapidly changed the social structure. Industrialisation attracted the immigration of lower skilled population and resulted in negative environmental impacts. The de-industrialisation process at the end of 20th century changed the formerly prosperous regions – traditional industry closed down, young and qualified people moved away, and the regions are struggling with socially-excluded localities. The overall quality of life in the regions is perceived as low.

³ Low road strategy means that regional advantage is based on the low price of inputs such as low wages, provision of land, low taxes etc. For more details see: Cooke, P. (Ed.). (1995). Rise of the rustbelt: Revitalizing older industrial regions. Routledge or Rumpel, P., Slach, O., & Koutský, J. (2013). Shrinking cities and governance of economic regeneration: the case of Ostrava.

brownfields, support of re-skilling and up-skilling for future oriented economic activities, support of universities (all roles) and investments into quality of life of inhabitants.

The transition encompasses both unique regional opportunities and challenges. Nevertheless, it would be a mistake to perceive the JTF as a "catch-all" solution to stimulate regional transformation. The planned financial allocation will only cover a limited subset of regional challenges/opportunities. Therefore, it is necessary to understand the JTF related financial resources as a set of future-oriented stimuli to un-lock the region's recovery potential. All regional projects should be created, evaluated, selected, and implemented through this lens, irrespective of their size or thematic focus.

The climate transition will have different impacts on the three regions. There are existing differences in the socio-economic indicators of the three transition regions. For instance, there is a significant gap in terms of R&D institutions, technological readiness, education and healthcare between the Moravian-Silesian Region, Ústí Region and Karlovy Vary Region as well as the rest of the Czech Republic. However, some indicators in the Moravian-Silesian Region are closer to the Czech average than to the other two regions.

As for the skills mismatch the estimated impacts of a transition scenario are as follows:

- For Ústí Region, the transition scenario provides growth in construction and manufacturing employment, which offsets the potential negative labour impacts of the NECP scenario, concentrated in the energy & utilities sector. Consequently, these are largely lower-skilled jobs in the trades workers occupation group. Nevertheless, gains can also be seen in the operators, associate professionals and professionals.
- For Karlovy Vary Region, the transition scenario reduces overall employment losses. Gains are mainly realised in the construction and manufacturing sectors and consequently they are largely lower-skilled jobs in the trades workers occupation group. Nevertheless, gains can also be seen in the operators, associate professionals and professionals. From the occupational perspective, gains are the strongest in lower-skilled occupations, while in terms of losses this is not necessarily the case: skilled employees in certain occupations can lose their current jobs.
- For the Moravian-Silesian Region, the transition scenario could lead to gains mainly in manufacturing and construction sectors, other sectors through income and supply-chain effects. The energy & utilities sector is expected to see some losses. From the occupational perspective many of these new jobs are expected to be realised in lower-skilled occupations, concentrated for example in the group of trades workers; higher skilled occupation groups, such as professionals or associate professionals gain with a more diverse sectoral composition

Chapter 6 details the operations/investment needs and priorities for each of the three regions. It also includes an assessment of the draft transition plans of each region. Moreover, it analyses the contribution of JTF support based on absorption capacity and synergy/complementarity/consistency with other programmes.

Based on the assessment of the actual versions of the Regional Transition Plans the TA Team has identified substantial improvements in terms of analytical background and transformation story. All specific goals or expected supported activities listed in Regional Transformation Plans (RTPs) are in compliance with the JTF Regulation. However, a room for improvement remains in all Regional TPs and can be summarised as follows:

- **A clear intervention logic not yet included**, i.e., the expected change, results and impacts of the proposed measures. Similarly, the analytical background could be strengthened for some objectives.
- **Prioritisation** - the specific goals are not stratified according to the priority, i.e., all goals are given the same "weight". Karlovy Vary Region is an exception in providing a tentative allocation to the specific goals, which can be understood as a proxy for prioritisation.
- **Not integrated strategic projects** - the strategic projects must be made an integral part of the intervention logic and priority structure of the TPs. Currently, they are not directly mentioned in the priority structure of the plans in Ústí and Karlovy Vary regions. In Moravian-Silesian region, the strategic projects may need to be substantially scaled down.
- **Clarification of overlapping funding with other schemes** - most of the themes are obviously potentially overlapping with funding from other sources than JTF (for some objectives, the Karlovy

Vary Region even does not foresee funding from JTM at all). This is hard to be further specified at this stage.

Founded on the assessed strengths and weaknesses in the regions by the TA team, there remain the gaps against the themes and programmes prioritised by the regions themselves in their updated *draft* transition plans.

- In the **Ústí Region**, the main gaps are related to low economic performance and economic diversity, depopulation and low levels of education, social vulnerability, and a high share of environmental burdens. The operations needed in the region, therefore, rightly aim to build the social infrastructure and community development. Additional priorities include land-use and repurposing. Meaningful use of industrial monuments and brownfields is one of the region's opportunities in terms of diversifying the economy. With respect to demographics, the ageing of the population and an outflow of young, educated people should be clearly linked to transition objectives.
- Similarly, **in the Karlovy Vary Region**, the key identified gaps include low levels of innovations, labour mismatch, and depopulation. The analysis clearly shows the need to focus on social cohesion and improving the quality of life of inhabitants. These steps are necessary to stop out-migration and brain drain. Therefore, one of the key operations needed is social infrastructure and community building, combined with infrastructure and quality improvements on all levels of education. Education improvements should also be coordinated with encouraging the supply of skilled workers and immediate and intense work with employees from the energy and mining industry. Building support infrastructure for start-ups, support for new technologies and research activities can contribute to the diversification of the regional economy.
- For the **Moravian-Silesian Region**, identified gaps relate to the low level of entrepreneurship, unfavourable demographics, and lack of social infrastructure. The transition should therefore put more emphasis on building social infrastructure and community services (possibly financed from Pillar 2 and Pillar 3 of the JTM). Similarly, the region should clearly prioritise projects related to engagement of SMEs and economic/industry diversification. Brain drain and ageing are the main demographic processes in the region. Therefore, operations targeting these two aspects are highly relevant.

Generally, clean energy development is present as a priority in all three transition plans. The operations in all three regions should be prioritised with respect to the limited support from the JTF (and compared to the absorption capacity in the projects). Other instruments such as the Modernisation Fund (district heating, energy communities) and the RRF will be highly relevant. Sustainability of the projects, especially infrastructure projects, should be clearly addressed.

Concerning the stakeholder engagement, both MoRD and the regions are including stakeholder in the process of developing and updated the TJTP and RTPs. The Deliverable 5 (Final Report) will provide more details.

The JTF support is based on absorption capacity, including allocations for technical support to tackle capacity gaps during TJTP implementation. The first section of this chapter briefly summarises the situation regarding the input allocation and its distribution among coal regions. In summary, at the end of May 2021, the Government of the Czech Republic approved the division of the JTF into individual coal regions (Moravian-Silesian Region 46%, Ústí Region 39%, Karlovy Vary Region 15%). Technical assistance is not defined in the TJTP (version 1.7, June 2021). However, its financial scope can be estimated at CZK 1.7 billion, approximately 4% of the total OPJT allocation. This range will be more than twice as high as other OPs in the Czech Republic and will correspond to the complexity of the OPJT. In the next section, attention is paid to the readiness of the absorption capacity of the Czech coal regions for JTF financing (as of mid-June 2021), according to the first results of mapping potential projects for financing, which the working groups in individual coal regions evaluated and also categorised into: "strategic" projects, as well as projects suitable for thematic calls or simplified grant schemes. According to the process of project readiness, mapping for OPJT funding in particular regions, the total estimated budgets of these projects are higher in comparison with the total financial allocation. Mapping the absorption capacity and readiness of projects provides a good basis on how to prepare for the implementation of OPJT projects and on potential project reserves in the project pipeline. This will also be important for individual coal regions when finalizing the definition of the intervention logic of individual TJTP priorities (finalization is expected in the first half of July 2021).

Synergy/complementarity/consistency with other programmes. The TA team focussed on identifying the consistency, synergy and complementarity of the planned interventions with other

strategies such as the 2021-2027 operational programmes (i.e., ERDF and ESF+ programmes) and the EU's directly managed programmes.

- Many topics important for the transformation process of coal regions can be financed from programmes other than the OPJT. In terms of consistency and synergy, strong links exist with programmes that are outside the Multiannual Financial Framework (i.e., Recovery and Resilience Facility, Modernisation Fund, Innovation Fund). Other suitable programmes to finance the transition include the Multiannual Financial Framework (i.e., Connecting Europe Facility - CEF, Horizon Europe, LIFE, and Digital Europe - DEP).
- The TA team also evaluated synergies and complementarities of the proposed sub-priorities in the individual RTPs. In all these plans, complementarity and continuity with other operational programmes is laid out. However, the level of detail across descriptions is very different.
- At the same time, the individual regional transformation plans do not always have a clearly defined link to the supported activity in the JTF or other pillars of the JTM. The degree of processing and detail varies considerably.
- The MoE, in cooperation with MoRD, addressed possible overlaps and synergies with other operational programmes during April-May 2021 and will finalise the work during July 2021 (according to the information presented at the Transformation Platform in June 2021). However, in the frames of the Partnership Agreement, the closest links were with individual regional transformation plans such as OPE, OPTAC, OP Employment +, OPJAK and IROP.
- Finally, close links to the Modernisation Fund are often defined. Synergies with Pillar 2 and Pillar 3 of the JTM are also dedicated to all regional transformation plans, albeit to varying degrees of detail.

Chapter 7 presents a capital raising strategy.

The key actors in the capital raising strategy to finance to Just Transition will be small private and public investors. For these investors, several challenges that should be considered have been identified.

1. **Capacity and technical assistance.** Small players (SMEs and municipalities) tend to lack both personnel and knowledge capacity to prepare the project pipeline. Therefore, technical assistance to prepare the projects will be critical for success. One-stop-shops can be considered a good practice to help develop and implement projects for many applicants. Existing structures (e.g., CzechInvest offices) should be used to their full potential.
2. **Sensitivity to administrative burdens.** Subsidy programmes often have high administrative costs (with transaction costs reaching up to 25–30 % of the project (eligible) costs). Therefore, both the OPJT and the other mechanisms should strive to increase the flexibility of the grants where possible and lower the administrative burden, i.e., less text and easily navigable submissions.
3. The experience in the energy efficiency programmes has highlighted **the need to avoid competing with programmes that target similar activities.** In case of the JTM, the difference between Pillars 1, 2, and 3 should be made clear to potential applicants.
4. The same applies to the **potential overlaps (and complementarities) between OP JT and the other OPs, and other financial instruments** (Modernisation Fund, RRF). There will be a number of intermediaries to steer the capital raising. The exact settings of the financing environment are yet to be confirmed (for details revert to the D2 Report on Governance and Stakeholder Engagement).

Nevertheless, **commercial banks and other financial institutions are expected to play a significant role** in financing the Just Transition.

- To this end, the experience and expertise required to assess the risks and performance aspects of more novel types of undertakings, start-ups and projects of particular relevance for the Just Transition should be strengthened.
- This will include capacity building to incorporate ESG criteria in the investment assessment.
- Several financial instruments could be employed, including guarantees. The JTM provides a framework and trigger point, but other innovative instruments relevant to Just Transition, such as social bonds and green mortgages have been little explored to date in Czech Republic. However, these instruments can create the additional needed push to facilitate the Just Transition.

Chapter 8 of three subchapters, which include general comments on the monitoring background of the JTM particular pillars, as well as the necessary information on the possible use of a Smart Dashboard, and important issues to set up monitoring and evaluation systems for the TJTP and OPJT. The proposed list of indicators is part of this D4 report in the "*Annex 2: JTF activity Regulation (Article 8) and proposal of indicators for individual regional priorities*". The TA team updated this annex according to the available information and revised regional transformation plans. It is still not possible to determine the specific programme indicators yet as the strategies of individual coal regions are still not finalised, i.e., according to the state of elaboration of regional plans (as of mid-June 2021). After several meetings with representatives of the MoRD, it was agreed that the programme context indicators will be proposed in the D5 report, i.e., at a time when the regional transformation plans will be finalised (especially the intervention logic and transformation story). The TA team will emphasize the potential use of the Smart Dashboard for relevant program contextual monitoring indicators.

Chapter 9 follows with conclusions and recommendations. Based on findings in this report, the TA team has drawn the following conclusions and recommendations to strengthen the policy framework in the context of defined investment needs. However, what we have seen that the plans are progressing and more information is provided by the present report to overcome these observations.

- **The regional transformation plans differ in their approach, detail of elaboration, and consistency of intervention logic of the planned activities of the transformation process.**

Although individual regional transformation plans include a description of complementarity and continuity with other operational programmes, the level of detail varies considerably. At the same time, the individual regional transformation plans do not always have a clearly defined link to the supported activity in the JTF or other JTM pillars. The degree of processing and detail fluctuates.

Recommendation: Individual coal regions should clearly define a transformation story in their regional transformation plans, to which the intervention logics of individual groups of supported activities will be linked. The Ministry of Regional Development should give the regions clear formal guidelines for processing to synchronize the ideas of coal regions about their transformation also in terms of the TJTP. This is a prerequisite to establish criteria for project selection and the defining of indicators.

- **The prioritisation of measures in the regional transformation plans is sometimes not clear and fragmented.**

Due to the unclear or missing definition of the transformation story, the regions decided on fragmented support, including a wide range of operations. At the same time, it will be possible to finance some activities from other operational programmes or funds. Given the unclear definition of the transformation story and the lack of intervention logic of individual areas of activity at the time of writing this report, there is a high risk of fragmented support and limited transition results.

Recommendation: Following the definition of the transformation story and the intervention logic of individual areas of supported activities, the TA team recommends reducing the scope of supported activities. The measures in the transformation plan should consequently follow the philosophy of the JTF regulation (proposal) and underline the needs of the climate transition.

- **The transformation plans of the regions include information about complementary use of other operational programmes and funds.**

The complementarity and synergy with other programmes are considered, but often in a very general sense. The Czech Republic is still in the process of drafting the Partnership Agreement, particularly in terms of operational programmes of the cohesion policy and the Resilience and Recovery Plan.

Recommendation: The regions should carefully consider and evaluate the development of the programming of complementary funds and the pool of proposals for the Modernisation Fund from the coal regions. Regions should only include projects for JTF funding if they cannot be covered by other funding options (e.g., RRP and Modernisation Fund). The possibility of combining different funding sources for transition needs should be systematically analysed.

- **The regional transformation plans include a wide range of measures with respect to the climate transition and Just Transition. The strategic focus is in progress.**

The Just Transition is aimed at mitigating the socio-economic impacts of the transition, not at the climate neutrality transition itself. Having said that, the climate mitigation actions may and often do inherently have a just, social aspect. Therefore, the climate mitigation actions (energy efficiency, low carbon technologies and other) can be part of the JTM and the Transformation Plans. However, there must be a clear link to the “Just” component of the transition. An example for all three regions is the focus of the instruments to alleviate (energy) poverty and assist vulnerable households. Similarly, the development of energy communities and democratisation of energy could be another example enhancing the investment gap in community engagement and social infrastructure (even though the energy communities as such will also be supported by the Modernisation Fund).

Recommendation: The regions should identify investment needs and potential projects aiming at “win-wins” – i.e., climate transformation and social issues (related to the energy poverty). Concerning strategic planning, the municipalities should be more involved.

- **The strategic projects in coal regions will to a large extent determine the transformation path of regions. The readiness of strategic projects for the transformation process will be crucial.**

The strategic projects in all three regions should be submitted by the end of April 2021 for further review. They will indicate the strategic focus of key players (potential beneficiaries) and the absorption capacity in the regions.

Rough estimates of the absorption capacity of the JTF, according to the available version of the pool of project ideas (project fiches collected in December 2020), showed that the transformation story of the regions in relation to the Just Transition and climate agenda had not been clearly defined. Therefore, it was difficult to determine the transformation potential of project intentions and planned strategic projects.

Regarding the estimated total financial scope of the JTF, the contribution of JTF should be mostly directed towards climate agenda activities closely linked to social issues in the regions and make a significant contribution towards NECP objectives (i.e., a significant share of expected clean energy investments).

Recommendation: It is necessary to first complete the inventory of strategic projects and then comprehensively evaluate the readiness of each individual coal region for JTF financing. Thus, emphasis must be placed on the transformation story of regions and the transition to climate-neutrality. Strategic projects need to be evaluated on an on-going basis.

- **Timeframe of measures is not yet defined (which is of key importance for large economic operators).**

The review of regional transformation plans revealed that the analytical section does not include detailed specification and timeframe of measures for large economic operators. This might partly result from uncertainty about the development of the regulatory framework (the governmental decision about the date of the coal phase-out is still undecided). In turn, this causes uncertainty about the development of the regional job market and does not provide information for small players (municipalities, NGOs) about measures and project needs as of July 07, 2021.

Recommendation: The transformation plans need to be developed and complemented with the strategic plans and measures envisaged by large economic operators, especially the main emitters (EU ETS sources) in the region.

- **The transformation plans emphasise existing productive regional structures.**

Maintaining existing production via modernisation is partially justifiable (continuity). Nevertheless, the pitfalls of the region’s lock-in process cannot be neglected. The provided scenarios of regional diversification (change) and support of new activities are rather shallow in the RTPs.

Recommendation: The story or scenarios of economic diversification need to be better elaborated. In the current state, conservation of existing productive regional structure instead of regional change (conversion) is prevailing.

- **The transformation plans at times appear to be prepared according to opportunity-led planning.**

Consequently, for some formulated operations (e.g., support of hydrogen economy, cultural and creative industries, digitalisation), robust empirical evidence connected with regional specifics is missing and rough estimations of the future impact of the JTF on regional structures is hard to predict.

Recommendation: All transformation plans should be based on robust empirical evidence. Such evidence might allow juxtaposition between regional needs and planned operations and can help to avoid investment into unsustainable or wishful projects. To put it simply, more regional realism in transformation plans is needed.

Please note that most information contained in this report reflects the state of affairs as of July 7, 2021 unless otherwise stated. Based on comments from different stakeholders, additional information will be included in the Final Report (D5).

1 PROJECT CONTEXT

1.1 Overview on transition to climate neutrality⁴

The Czech Republic still has a long way to go to achieve climate neutrality. Overall, between 2008 and 2018 the Czech Republic managed to decrease its per capita greenhouse gas emissions (in tonnes of CO₂ equivalent) from 14.3 to 12.2 (a 15% decrease, with a largely stagnating total population). While this reduction is on par with the EU-27 average over the same period (15.5%), the 2018 figure is still much higher than the EU-27 average (8.7 tonnes of CO₂ equivalent) and is the fourth largest GHG emitter per capita in the EU-27.⁵

The European Commission's annual Country Report under the European Semester is a central document to set the priorities of development reforms and evaluate progress with country-specific recommendations. The 2020 report⁶ identifies environmental sustainability as one of five current priorities. Sustainability in the transport and energy sectors, which will soon be connected via electromobility, is a top priority. The common denominator of sustainable development is the shift away from fossil fuels, especially coal production. The Czech Republic is currently one of the highest greenhouse gas (GHG) emitters in the EU, in per capita terms, mostly due to reliance on coal. Phasing out coal production and combustion will mainly affect areas where coal mining is a significant economic activity. In Czechia, three regions are particularly reliant on coal mining and energy generation from coal (e.g., Karlovy Vary, Moravia Silesia and Ústí). The key GHG reduction targets outlined in the key strategic documents are presented in Table 1. While the documents have not yet reflected the climate neutrality pathway, it can be reasonably expected that it will become the main point of reference in the revisions of these documents.

Table 1: The Czech Republic's reduction targets of greenhouse gas emissions

Czech strategic document	NECP ⁷	SEP ⁸	Climate Protection Policy of the Czech Republic ⁹
Total greenhouse gas emissions by 2030 compared to 2005	30%	-	30% (Correlates with 44 million tonnes of CO ₂)
Total greenhouse gas emissions by 2030 compared to 1990	-	40%	40% (Correlates with 76 million tonnes of CO ₂)
Total greenhouse gas emissions by 2050 compared to 1990	-	-	80%

⁴ The report D3 Report on the transition process towards climate neutrality contains the details as to the key transition steps, investments needs and related public programmes, and impacts of climate neutrality transition on national and regional level. Additionally, it also discusses the impacts on key economic operators.

⁵ Eurostat (2020) Greenhouse gas emissions per capita. Available at: https://ec.europa.eu/eurostat/databrowser/view/t2020_rd300/default/table?lang=en

⁶ European Commission Staff Working Document. Country Report Czechia 2020. Accompanying the document Communication from the Commission to the European Parliament, the European Council, the Council, the European Central Bank and the Eurogroup 2020 European Semester: Assessment of progress on structural reforms, prevention and correction of macroeconomic imbalances, and results of in-depth reviews under Regulation (EU) No 1176/2011 SWD/2020/502 final: <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1584543810241&uri=CELEX%3A52020SC0502>

⁷ National Energy and Climate Plan of the Czech Republic, https://ec.europa.eu/energy/sites/ener/files/documents/cs_final_necp_main_en.pdf

⁸ Ministry of Environment. 2020. Státní politika životního prostředí České republiky 2030 [State Environmental Policy of the Czech Republic in 2030]: [https://www.mzp.cz/C1257458002F0DC7/cz/news_20200710_statni_politika_zivotniho_prostredi_2030\\$FILE/OPZPUR-SPZP_2030_pro_verejnou_konzultaci-20200710.pdf](https://www.mzp.cz/C1257458002F0DC7/cz/news_20200710_statni_politika_zivotniho_prostredi_2030$FILE/OPZPUR-SPZP_2030_pro_verejnou_konzultaci-20200710.pdf)

⁹ Ministry of Environment. 2017. Politika ochrany klimatu v ČR [Climate Protection Policy of the Czech Republic]: [https://www.mzp.cz/C1257458002F0DC7/cz/politika_ochrany_klimatu_2017\\$FILE/OEOK-POK-20170329.pdf](https://www.mzp.cz/C1257458002F0DC7/cz/politika_ochrany_klimatu_2017$FILE/OEOK-POK-20170329.pdf)

Czech strategic document	NECP ⁷	SEP ⁸	Climate Protection Policy of the Czech Republic ⁹
			(Correlates with 152 million tonnes of CO ₂)

The coal phase-out date recommended by the Czech Coal Commission is 2038, and the government took note of this recommendation. However, for the TJTP, the transition steps are to be determined from the bottom up based on key economic operators, e.g., the district heating sector phasing-out coal (85% by 2030) irrespective of the suggested government date. An earlier phase-out has been also highly recommended by civil society and environmental groups.

The key to achieving climate and energy objectives and creating a new growth model is to identify the necessary investments in green technologies and sustainable solutions and to facilitate such investments. For this purpose, it will be key to identify drivers and barriers of climate friendly investment, to provide for a green investment friendly regulatory framework and to understand the specific role of public finance, in terms of leveraging private finance or financing the necessary public investments. The European Commission proposals for the Just Transition Mechanism included in the next Multiannual Financial Framework 2021-2027 and REACT-EU includes the Just Transition Fund, the special Just Transition Scheme under the InvestEU programme and a new public sector loan facility in cooperation with the European Investment Bank. The mechanism is designed to facilitate the transition toward climate neutrality in the EU. Therefore, it will help the most affected regions of the Czech Republic mitigate the social and economic consequences of the climate transition. The Just Transition Fund's key priorities established under the Just Transition Mechanism are based on a more comprehensive analysis of the Czech Republic regions facing severe socio-economic challenges arising from the transition to a climate-neutrality by 2050.

The Czech Republic's high-carbon economy will have to deal with several challenges to achieve climate neutrality. As a transition country with a high share of industrial activities of GDP, the Czech Republic has one of the highest levels of greenhouse gas emissions per capita in the EU. High per capita greenhouse gas emissions are mainly due to dependence on coal and low energy efficiency. Coal mining is a significant economic activity in the three regions, which require a socially just and cost-effective transition.

According to the recently published National Investment Plan, the document indicates that it will be necessary to invest EUR 25 bn. (12% of GDP at 2018 prices) to achieve a complete transition from fossil fuels by 2050. Both the key strategic documents and expert organizations have estimated the investment needs connected with the climate and energy targets and/or climate neutrality transition. However, the calculations largely differ by sectors covered, costs included and underlying assumptions, therefore not allowing for direct comparison. Nevertheless, the overall conclusion is that the additional investment needed is high and will have to be covered mainly by private investors, which, however, will have to be triggered in many cases by public programmes and policies.

The availability of funding and support to the climate neutrality transition and the specific conditions of public support programmes are currently being negotiated. Importantly, a system that tracks both public and private sustainable investment in a systematic way should be established at the national level. The EU Taxonomy will be instrumental to develop such a system. Table 2 below shows the available public funds for climate transition for the next programming period.

Table 2: Available public funds for climate transition¹⁰

Name of the programme	Admin.	Allocation	Period
Programme Competitiveness	MoIT	3.1 bn EUR / 79.3 bn CZK	2021-2027
Operational Programme Environment	MoE	2.3 bn EUR / 61.1 bn CZK	2021-2027

¹⁰ The volume of private investment that the funds will raise remain to be defined depending on the specific conditions of each fund. Nevertheless, generally speaking, the investment grants, which have been widely used in Czechia in the last programming periods, have much lower leverage factor than other instruments, such as e.g., soft loans or guarantees. Thus, investment grants should be used for specific actors (e.g. vulnerable) and specific technologies (e.g. not mature).

Name of the programme	Admin.	Allocation	Period
Integrated Regional Operational Programme	MoRD	4.7 bn EUR / 122.7 bn CZK	2021-2027
Just Transition Fund	MoE	1.6 bn EUR / 42.7 bn CZK	2021-2027
Operational Programme Employment+	MLSA	1.4 bn EUR / 36.4 bn CZK	2021-2027
Operational Programme Transport	MoT	4.8 bn EUR / 125 bn CZK	2021-2027
Operational Programme Jan Amos Komensky	MEYS	2.5 bn EUR / 64.1 bn CZK	2021-2027
New Green Savings Programme	MoE	2.36 bn EUR* / 59 bn CZK*	2021-2030
Modernisation fund	MoE	5 bn EUR / 140 bn CZK	2021-2030
Resilience and Recovery Fund		7.1 bn EUR / 171.4 bn CZK	2021-2026

The modelling exercise¹¹ showed that **at the national level, CO₂ emissions are expected to decrease by 46% compared to baseline by 2030**. Modelling at the national level suggests that full implementation of the NECP will reduce CO₂ emissions by 46% compared to the baseline (no NECP) by 2030. Total energy consumption is expected to be 13% lower than the baseline scenario by 2030. According to this scenario, coal is still expected to contribute roughly 10% of total energy production in 2030, although much of the coal supply will be substituted by nuclear and renewables. However, this outlook will require substantial development of renewables—up to 46% of the power generation mix in 2030 compared to roughly 13% in the baseline scenario.

The transition will have different impacts on the three transition regions. There are existing differences in the socio-economic indicators of the three transition regions. For instance, there is a significant gap in R&D institutions, technological readiness, education and healthcare between the Moravian-Silesian, the Northwest, and the rest of the Czech Republic. However, some indicators in the Moravian-Silesian Region are closer to the Czech average than the Northwest.

Modelling the regional impacts of climate neutrality to 2030 illustrates the divergence between the regions even further. The Moravian-Silesian Region is expected to converge with other regions by 2030, though still among the lowest performing regions. By contrast, the modelling shows that without a (properly implemented) Just Transition Mechanism, the Northwest would remain substantially below the Czech average in employment and the gross value added (GVA) indicator. These trends are particularly visible for the energy sector where employment levels are expected to decrease in both regions. Employment rates are expected to grow the fastest in the information and communication sector.

Regional development strategies have mostly reflected the coal phase-out at the technical level. The regional development strategies reflect the coal phase-out commitment and climate transition in the energy sector. They also predominantly focus on technical aspects. Less attention is paid to the diversification of regional economies. There is limited attention paid to the social dimension of the Just Transition such as impacts on the job market (especially in older age cohorts and employees with lower qualifications) and the demand for different qualification job profiles.

1.2 Proposed governance mechanism

This chapter describes the key traits of the JTM governance mechanism in the Czech Republic according to the state and situation in the negotiations of key stakeholders as of June 2021. The main source for this chapter is the D2 report of this project, which was updated according to findings in semi-structured interviews with representatives of the MoRD and the MoE, also according to the state of preparations of the JTM at the level of coal regions, and finally in on-line consultation with representatives of the EIB Prague office in the first half of April 2021, with updates in June 2021. The following table presents the key governance traits of the JTM pillars, as revealed in a semi-structured interview with EIB representatives, conducted in February 2021, and is further slightly supplemented

¹¹ Fully detailed in D3 Report on the transition process towards climate neutrality

by findings from desk-research and interviews in April 2021. This table provides a link to the following sections of this chapter, which describe the current status quo of the three pillars. It is evident that the discussions are most advanced for Pillar 1. Legislation has already been approved for Pillar 1 and Pillar 2. The preparation of a specific implementation will follow in the coming months. The European Parliament also adopted the Public Sector Loan Facility that will effectively complete all proposals under the Just Transition Mechanism. This regulation is scheduled for adoption by the Council on 12 July 2021.

Table 3: An overview of the basic governance traits of the JTM pillars (update by mid-June 2021)

	Pillar 1 (JTF)	Pillar 2 (InvestEU)	Pillar 3 (Public sector loans)
EU budget	17.5 bn EUR <i>Note: Of which the allocation is EUR 1.49 billion for the Czech coal regions. Share of coal regions in JTF allocation:</i> <i>Karlovy Vary Region 15.3%</i> <i>Ústí nad Labem Region 38.6%</i> <i>Moravian-Silesian Region 46.1%</i>	<i>A portion of financing under InvestEU, corresponding to €1.8 billion, will be focused on just transition objectives.</i> <i>Note: Total volume of instrument in the form of guarantees – 26.2 bn EUR</i>	1.5 bn. EUR (EU grants) 10 bn (EIB loans)
Nature of instrument	For Czech JT territories will be 85 %. EU grant - 50 % - 85 % <i>The co-financing rate for the priority supported by the JTF shall not be higher than:</i> a. 85% for less developed regions; b. 70% for transition regions; c. 50% for more developed regions;	Guarantee (InvestEU rules)	Investment grant 15 % - 20 % of EIB loan
Delivery mechanism	Shared management <i>Governance model</i>	Central management <i>Business model</i>	Central management EC to approve grant <i>Business model</i>
Implementing/ Financing partners (FP)	MA (MoE in the Czech Republic) IB (SEF in in the Czech Republic)	EIB (75 %), others (CMZRB and other commercial banks in in the Czech Republic)	CINEA / similar (grant) EIB (Loan Facility) <i>Note: Potentially others later</i>
Location	JT territories (NUTS 3) in in the Czech Republic: <ul style="list-style-type: none"> • Karlovy Vary region • Ústí region • Moravian-Silesian region 	No restrictions but JT territories (NUTS 3) to benefit from investment. <i>Note: However, the regulation proposal assumes a dedicated scheme for Pillar 2 for transition regions.</i>	No restrictions but JT territories (NUTS 3) to benefit from investment
Sectors	SME, RDI, job creation, renewable energy, clean energy, ↓ emission, digitalisation, decontamination, land restoration, up-/reskilling, training, job search	<u>InvestEU Policy Windows:</u> Sustainable infrastructure, research; innovation and digitisation; availability of finance for SMEs and for small mid-cap companies; availability of microfinance and finance for social enterprises	No sectoral exclusions but demonstrable benefit for transition in most affected areas (JT territories)
Advisory in the JTM framework	JASPERS Support for the EC, MoRD and regions with the preparation of a project-pipeline financed mainly by grants from Pillar 1	InvestEU Advisory Hub - EIB consulting Counselling programs known today as ELENA and URBIS	EIB consultancy for identification, project support for Pillar 3 financing

Source: EIB presentation during a bi-lateral call held on 23 February 2021

Note: Table updated by the TA Team with minor amendments in April and June 2021 according to the working version of the TJTP.

The preparation of all three aforementioned pillars is covered by the Territorial Just Transition Plan (hereinafter TJTP). TJTP presents the basic document for the provision of support from the JTM, which means it applies not only to the JTF, but also to the remaining pillars (i.e., support of enterprises through InvestEU and the public sector loan facility). The TJTP describes the impacts of the transformation in the defined regions with coal mining and related industries in accordance with the current structure of the plan given by the JTF Regulation. Furthermore, in accordance with the regulation, it defines the individual type of activities that are associated with this transformation.

In terms of the TJTP governance, MoRD is preparing the final version of the TJTP in cooperation with relevant partners (especially the steering committee, Transformation platform, working groups). The TJTP preparatory team, led by MoRD, was nominated for the processing and coordination of TJTP preparation in the Czech Republic. The TJTP preparatory team involves representatives from regions,

ministries, and the Government of the Czech Republic and builds on the previous experience of the RE:START team. Details on the governance of the individual pillars are provided in the D2 report.

1.3 Impact of artificial intelligence

1.3.1 Overall impact of artificial intelligence

Over the past decade, we have seen an increasing digitalisation of nearly all aspects of our professional and personal life. From retail to healthcare to mobility, everything has been increasingly digitised.

The result of this progressive digitalisation is the amount of data that has been produced. Even now, during the pandemic, the volume of data produced is growing rapidly, from 33 zettabytes in 2018 to an expected 175 zettabytes in 2025

Increasingly connected objects will come to market, from home appliances to renewable energy plants to vehicles, and this will lead to an increasing wave of data generated and automation opportunities through the usage of artificial intelligence (AI) techniques.

Its usage will have a global estimated impact on GDP of USD 17.5 trillion in 2030 through a variety of sectors and use cases.

The EU has defined a common strategy towards the adoption of AI and recognised the potential benefits of an AI ecosystem to the European society and economy.

GPD Impact in 2030 of AI usage will be USD 17.5 trillion

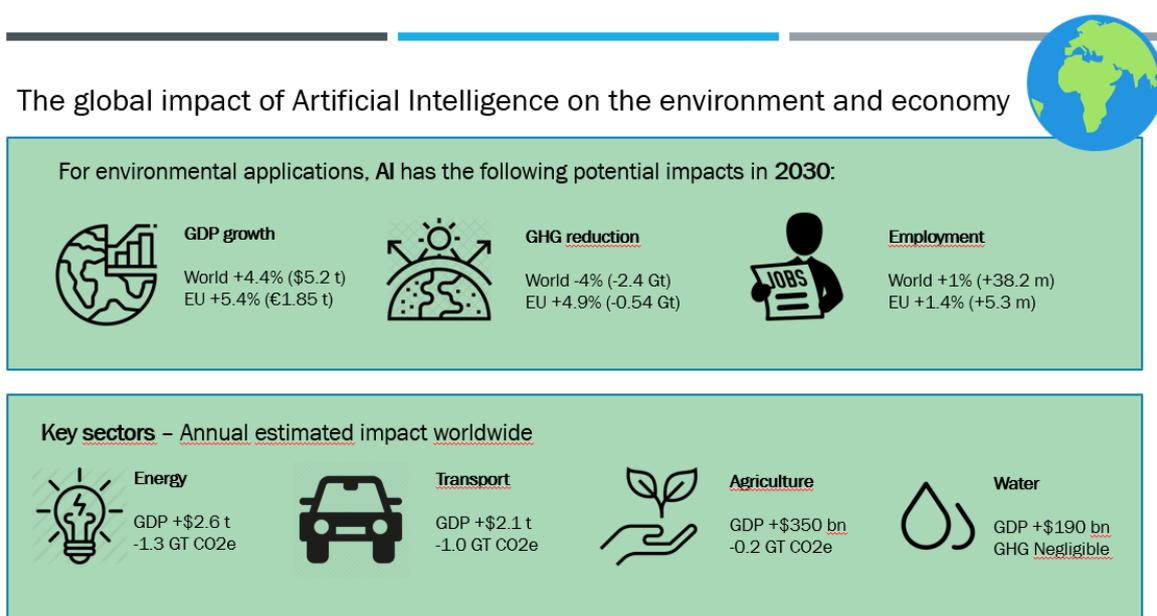
Artificial intelligence for the environment and for the society

Although the potential of AI is already recognised as significant, there are risks, perceived or real, in its massive adoption: from the potential negative impact on climate to the potential of creating job disruption.

For this reason, we need to evaluate the key sectors where AI could have a positive contribution in terms of GHG reduction, GDP increase and jobs preservation.

There are already a number of studies and data, publicly available, on the sectoral impact of AI adoption in terms GHG reduction and GDP increase. Using this data, we estimated the impact on the Czech Republic and on the three regions related to this assignment.

Figure 1: Global impact of artificial intelligence on environment and economy



Source: Microsoft and PWC study – modeling used: Computable General Equilibrium (CGE)

The results indicate that AI is likely to affect four main sectors (energy, transport, agriculture, and water) that contribute both to decarbonisation as well as have a positive increase in gross domestic product.

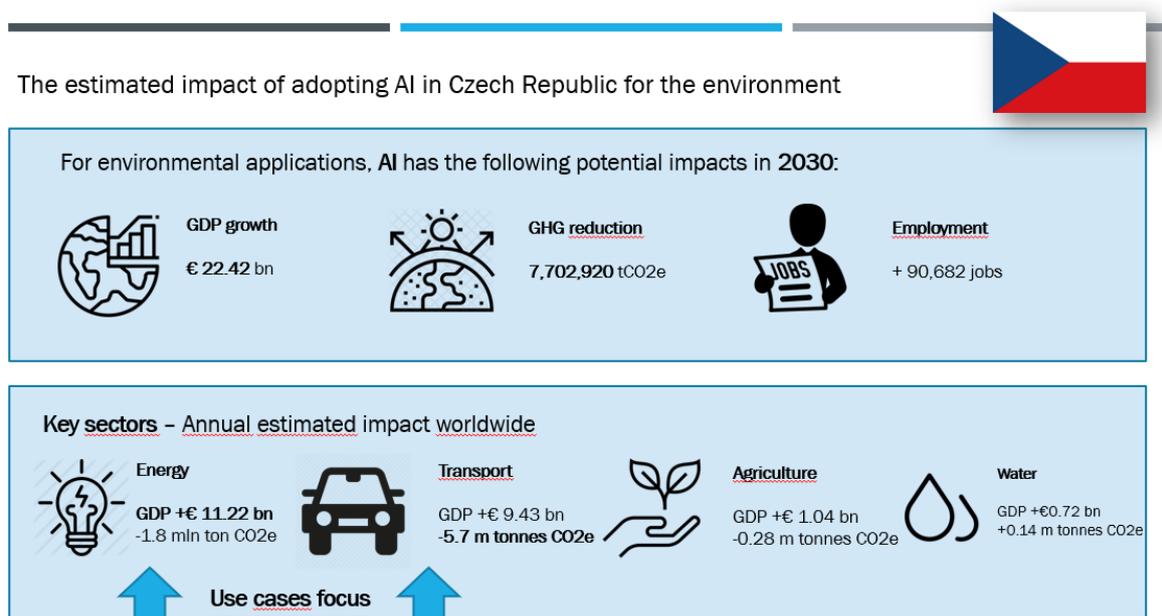
Adopting artificial intelligence in these four key sectors will generate a global GDP increase of USD 5.2 trillion (4.4% increase) and a European impact of USD 1.85 trillion (5.4% increase). Adoption of AI will also accelerate decarbonisation, reducing 2.4 Gt of CO₂e (-4%) globally and -0,54 Gt (-4,9%) in Europe.

Europe could benefit more, in relative terms, than the rest of the world in the AI transformation, which could create a net positive gain in employment if AI solutions are created, delivered and operated locally, rather than importing solutions created in other regions/countries.

In this proactive case, the positive contribution in employment will amount to 5.3 million jobs (+1.4%). Globally, AI adoption in these sectors will create 38.2 million jobs (+1%).

1.3.2 The impact on Czech Republic

Figure 2: Estimated impact for adopting AI in the environment in Czech Republic



Source: Own calculation on EU data for Microsoft and PWC study – modeling used: Computable General Equilibrium (CGE)

In the Czech Republic, the adoption of AI in these sectors could be very significant, with a potential contribution of EUR 22.42 billion of GDP growth, a GHG emission reduction of 7.7 million tonnes of CO₂ equivalent, and the creation of 90,682 related jobs.

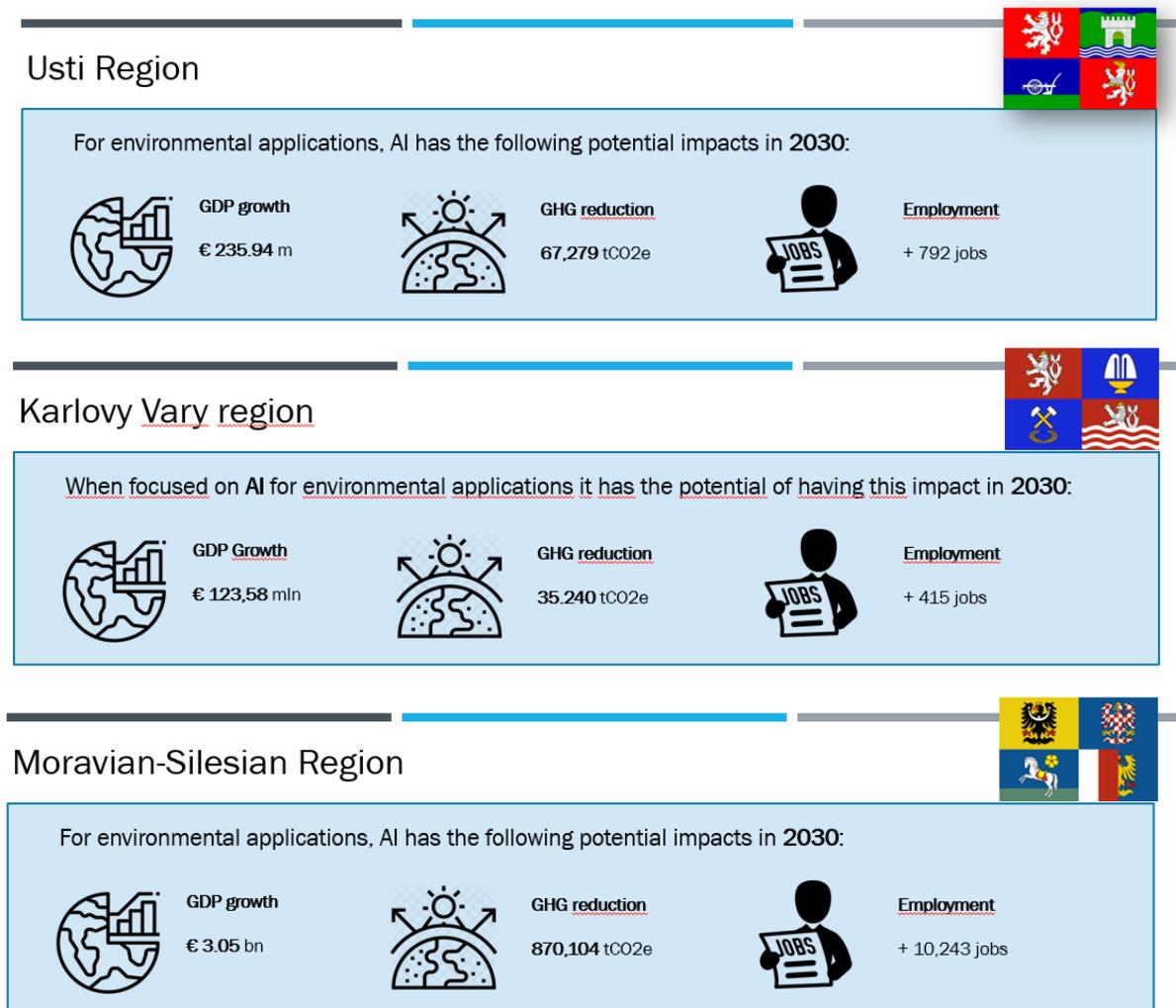
Moving to the sector specific impact, we find that there are two key sectors (energy and transport) that could generate 98.1% of the GHG reduction and 92.1% of the GDP impact. As a result, the use cases focus only on these two key sectors.

1.3.3 Regional Calculation

The estimated impact will be more relevant in the Moravian-Silesian region.

This does not mean that the accelerating the adoption of AI in these sectors in the two other target regions will not have an impact as it could contribute to create a common innovation pipeline, where solutions, projects or approaches realised in one region could be extended to others.

Figure 3: Estimated impact for adopting AI in the environment in the target regions



1.3.4 Key use cases

a) Area of impact for the selected AI use cases

To estimate the impact for a use case, there are three main channels to consider:

1. **Optimising use of inputs:** the use of AI tools enables more precise monitoring of production processes, which will help boost output and generate efficiency while reducing costs.
 - For example, AI could boost the usage of decentralised energy networks (micro-grids), making them more cost-effective and accelerating their diffusion.
2. **Higher output productivity:** with new and more efficient processes, there will be greater output produced for a given set of inputs.
 - In this case, AI enables smart grids to manage the distribution across multiple energy sources to maximize operational efficiency while limiting natural production variability.
3. **Automation of manual and routine tasks:** this will have several impacts; it could reduce errors, increase the efficiency of labour force, and facilitate the reduction of labour costs for operations. An example could be autonomous deliveries that free-up workers to do more value-added work

These direct channels also have secondary indirect effects through the links across sectors and regions.

The growth of new jobs, with higher average salaries, as well as the diffusion of more affordable goods and services will accelerate consumer demand and trade.

Knowledge spill overs will generate extended productivity and efficiency effects throughout the economy and will result in greater average household incomes and higher global output.

b) Energy

The figure below illustrates the impact of AI energy use cases in terms of GDP and GHG reduction. It provides an estimation of the adoption of specific AI use cases in the energy sector.

Figure 4: Estimated impact of AI in the energy sector in terms of GDP and GHG reduction



Energy	Mln € GDP in 2030	Var	Ton CO2e var 2030	Var
Smart monitoring and management of energy consumption	3.381,29	30,03%	- 911.199	49,85%
Predictive maintenance	13,62	0,12%	21.223	-1,16%
Job automation in energy	611,52	5,43%	390.408	-1,36%
Increased operational efficiency of renewable assets	1.512,99	13,44%	- 729.538	39,91%
Increased operational efficiency of fossil fuel assets	-	-	- 170.956	9,35%
Energy supply and demand prediction	228,03	2,03%	354.830	-9,41%
Decentralised energy networks	5.511,72	48,95%	- 782.537	42,81%
Total	11.259,17		- 1.827.768,74	

Source: Own calculation on EU data for Microsoft and PWC study – modeling used: Computable General Equilibrium (CGE)

Obtaining affordable and reliable energy while minimising the impact on Earth is one of the most important challenges of our times.

Applying AI could improve efficiencies in the energy sector across all fuel types, leading to the development of a cleaner and less fossil-fuel dependent sector.

While some AI use cases could have a potentially positive GDP impact (i.e., job automation in energy) they could also have a negative impact in terms of GHG reduction and, eventually, in job reductions.

Artificial intelligence, in this case, plays a key role in enabling smart, decentralised grids through the use of renewable energy sources. Microgrids, composed mainly of small wind farms, private solar panels and batteries add complexity to the existing grid structure.

AI could offer an effective way to handle this complexity since it could balance electricity supply and demand needs in real-time, optimise energy use and storage to reduce rates.

Technology governance and incentives will be needed to democratise access, encourage innovation, and ensure resilient electricity sources.

Over the next 10-15 years, we will see a growing adoption of electric vehicles (autonomous and otherwise), the progressive electrification of heating systems, and the proliferation of distributed energy resources (DERs) like wind turbines and solar panels. To make this transition sustainable, there is a need to balance supply and demand without risking a collapse of the electrical grid.

According to the World Economic Forum, approximately 36 million assets such as solar panels, electric vehicles and energy storage will be added to the grid in Europe by 2025, which will increase to 89 million by 2030.

Effective collection and use of data, artificial intelligence and automation will play a key role in this scenario, with some specific use cases that could be extremely impactful also in terms of GDP creation and GHG reduction.

c) Transport

Figure 5: Estimated impact of AI in the transport sector in terms of GDP and GHG reduction



Transport	Mln € GDP in 2030	Var	Ton CO2e var 2030	Var
Traffic optimization through monitoring and mgmt of conn. Vehicles	2.293,34	24,31%	- 455.691	8,08%
Predictive maintenance for vehicles	1.088,89	11,54%	782.723	-13,88%
Job automation in transport	611,52	5,48%	390.408	-6,92%
Demand prediction and better logistics planning	820,49	8,70%	- 123.244	2,19%
Autonomous vehicles	2.176,25	23,07%	- 4.755.749	84,32%
Autonomous deliveries	2.441,46	25,88%	- 1.478.755	26,22%
Total	9.431,96		- 5.640.308	

Source: Own calculation on EU data for Microsoft and PWC study – modeling used: Computable General Equilibrium (CGE)

The transport sector is in constant transformation and has also been impacted by the current pandemic. As the volume of e-commerce and home delivery has reached unprecedented levels, achieving an efficient and sustainable mobility of goods and people has become a prominent challenge in our increasingly urbanised and globalised world.

According to a recent study, transport accounts for 20-30% of global energy consumption and CO₂ emissions. AI could have a significant impact in this scenario, mainly for autonomous vehicles (AVs) and deliveries and through the adoption of technologies that enable traffic optimisation.

AVs will offer cost savings related to both labour and capital, while the introduction of industrial Internet of Things (IoT) alongside the automation and optimisation capabilities will help reduce queuing due to better traffic control and optimisation, in turn saving energy and reducing emissions.

To realise the benefits of AVs in GHG reduction, AVs will need to be predominantly electric (Autonomous Electric Vehicles AEVs) and encourage a progressive transformation to ridesharing, which needs to be incentivised.

The behavioural response of consumers to AV and AEV is still uncertain, while the benefits in terms of GDP impact and emission reduction could be extremely significant. In the next subsection, we focus on AEVs in more detail.

d) Autonomous vehicles focus

Autonomous vehicles (AVs) stand out compared to the other AI levers, with their future impact being more uncertain and dependent on the behaviour of users and the actions of policymakers.

The most relevant impact in terms of climate will be brought by autonomous electric vehicles (AEVs). They will be used more than standard vehicles and will contribute to lower emissions, even with a limited proportion of vehicles on the road.

They will be primarily used in ridesharing or mobility on demand, and this will lead, together with smart navigation systems, to reduced congestion.

However, these benefits are uncertain. It is plausible that, as AVs eliminate the ‘inconvenience factor’ of driving, overall passenger numbers and journeys will increase – along with emissions.

Beyond 2030, the impact of AVs has the potential to go either direction: they could enable an electric-powered revolution of shared mobility on demand, but poorly regulated and managed, they could lead to more cars on the road, which are driven more frequently and with fewer passengers per vehicle.

1.3.5 Key Use Cases (by impact)

- **Smart monitoring and management of energy consumption.**

AI and IoT technologies are used to monitor, actively manage and optimise energy use by automating price responsiveness to market signals. This could be done at several levels (system, grids, sectors or specific buildings).

- **Coordination of decentralised energy networks**

Integration of AI into increasingly localised energy grids can automate operations required to manage these systems, improving overall operational efficiency, and reducing energy waste.

- **Increased operational efficiency of renewable assets**

AI is used to enhance the efficiency and energy production of renewable assets. For example, hyperlocal weather modelling is used to monitor and adjust the positioning of solar panels and wind turbines to maximise power generation.

- **Autonomous vehicles**

AI tools are used to enable autonomous or semi-autonomous transport, offering eco-driving features, vehicle platooning, and vehicle sharing services.

- **Autonomous deliveries**

Driverless long-haul and last mile deliveries require AI. Examples include autonomous trucking and autonomous delivery robots

- **Traffic optimisation of connected vehicles**

AI is used to monitor and optimise traffic flows in real-time, reducing queuing and enforcing real-time smart pricing for vehicle tolls. Examples include variable rate congestion charges depending on time of day, level of congestion, number of passengers and vehicle efficiency.

On the basis of the analysis of the regional strategies for digitalisation, the table below summarises the perceived regional priorities in relation to the different use cases.

Figure 6: Perceived regional priorities for AI in the target regions

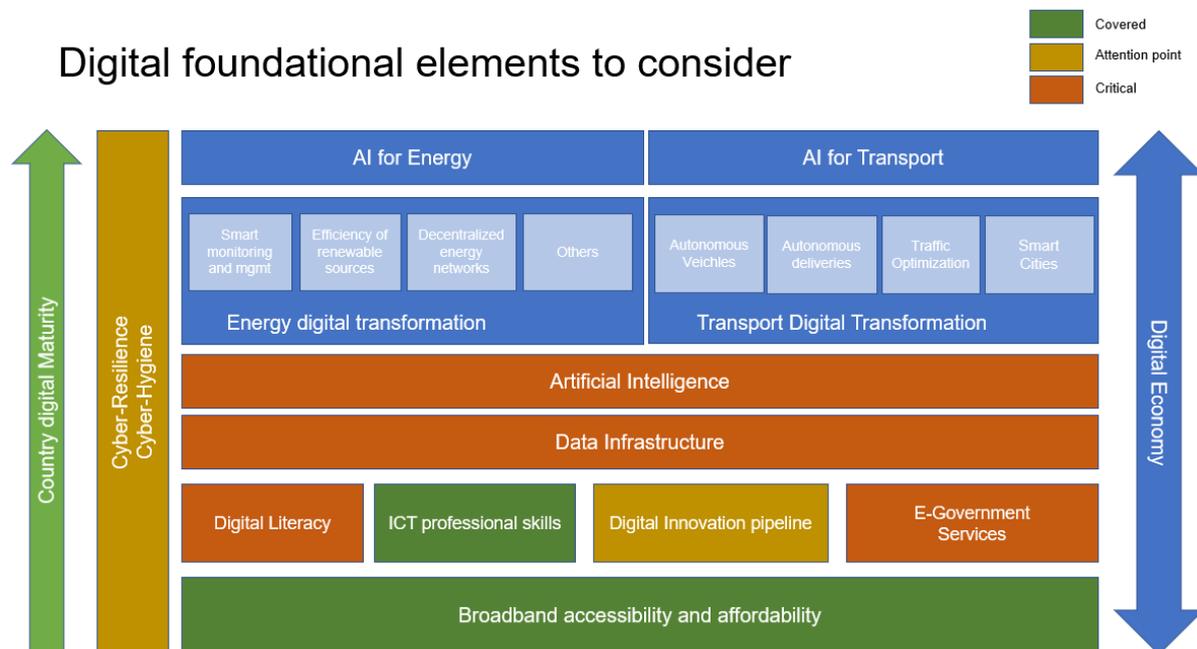
PERCEIVED PRIORITY DOMAINS FOR AI			
	Moravia-Silesia	Ústí	Karlovy Vary
Smart monitoring and management of energy consumption	Yes	Partly	Yes
Coordination of decentralised energy networks	Yes		
Increased operational efficiency of renewable assets	Yes		
Autonomous vehicles	Yes	Partly	Yes
Autonomous deliveries	Partly		
Traffic optimisation of connected vehicles	Yes		

1.3.6 Foundational elements to consider for adopting artificial intelligence use cases

The strategy for effective adoption of AI use cases, with a positive local impact in terms of GDP increase, GHG reductions and job creation, is to foster and incentivise several different elements of the digital transformation stack.

Several components need to be in place, available and of sufficient capacity to sustain the transformation. In the figure below, these elements are identified and complemented with the perceptions of national and regional strategies and priorities.

Figure 7: Foundational elements for AI use cases adoption



Accessible and affordable broadband is the main element to activate the digital scenario and make it pervasive. Nevertheless, other elements also need to be considered, such as:

- **Digital literacy:** increasing digital literacy accelerate positive adoption of new technologies and facilitate the dissemination of collateral technologies (i.e., digitally enabled renewable resources to autonomous vehicles in ridesharing).
- **ICT professional skills:** the transformation needs solutions to be realised, delivered, and maintained, and this requires professional skills, which are already in short supply in several European countries.
- **Digital innovation pipeline:** effectively moving solutions from the lab to market is a critical element to accelerate not only the local adoption of innovative solutions, but also to share locally the economic benefits that those solutions will generate (both directly and indirectly).
- **E-government services:** From open data to smart traffic monitoring to specific services to increase and deliver digitally enabled renewable sources, E-government services are not only enablers of the transformation but also lighthouses that encourage the development of more solutions and facilitate the creation of specific skills and competencies.

For these key elements, there is a need to create a data strategy to facilitate the creation of data assets with effective governance and stewardship.

The EU has released a European strategy for data, which aims at creating a single market for data that will ensure Europe's global competitiveness and data sovereignty. Common European data spaces will ensure that more data becomes available for use in the economy and society, while keeping companies and individuals who generate the data in control.

The approach of the National Strategy for Artificial Intelligence released in May 2019 is aligned with these concepts and expresses priorities for human capital, with a need to reform primary, secondary, and higher education and emphasise the importance of supporting the current and upcoming labour force with lifelong learning, vocational training and reskilling opportunities.

It also expresses the needs to support basic and applied research in the field of AI (from the lab to the market), with the creation of the Innovation Hub in AI (IHAI) and the establishment of start-up support programmes and accelerator instruments, among others. This is also strengthened by the introduction of the 2019-2030 innovation strategy to improve the entire innovation system.

These elements, among others, create a positive environment to adopt artificial intelligence regionally, with a specific focus on key sectors and use cases to exploit not only the benefits of a positive general trend of AI adoption, but also to seize benefits related to reduced emissions, GDP increases and job creation at a national and regional level.

The National AI Strategy of the Czech Republic is coordinated by the Ministry of Industry and Trade and an AI committee has been established to supervise its implementation; it will be positive to bring these themes to their agenda.

1.3.7 Areas for further exploration

AI is a general-purpose technology (GPT) that will likely play a role across the entire economy. While there are studies and use cases in heavy industry (like steel, cement or chemicals), effective adoption is still uncertain and limited. There are other areas, with effective use cases, that could complement the adoption of AI in a Just Transition. Facilitating the creation and dissemination of AI skills could spill over to the rest of the economy.

Air pollution monitoring and forecasting

Air pollution is one of the most critical environmental risks for human health. Air quality is often poor in areas with heavy industries like in the regions covered in this analysis.

To effectively monitor air quality, there is an opportunity to combine data generated by ground sensors with data coming from satellite-derived spectroscopy, which could be accessed from programmes like Copernicus from the European Space Agency.

Machine learning models could become an opportunity for low cost and hyper-local pollution monitoring and forecasting, generating a positive impact in term of quality of life and cost saving.

Prevention of illegal deforestation and forest damage

According to the World Bank, 34.63% (or about 2,657,000 ha) of Czech Republic is forested. Preventing illegal deforestation and forest damage and setting up early warning systems for priority investigation and pattern analysis will result in more effective forest preservation with reduced emissions.

In this scenario, AI could contribute by using ground-based sensors and satellite data that could enable the creation of cost-effective monitoring and response centres to provide benefits like generating water supplies, foster biodiversity, conserve species and provide valuable ecosystem services.

1.3.8 Conclusions and recommendations

- a) **Conclusion 1.** AI can have a positive impact on GHG, GDP and employment in all three regions. The model shows priority areas and the target impact in GHG, GDP and employment.

Recommendations:

- Development of AI use cases in the six priority domains has an impact on GHG emissions and can lead to an increase GDP. It is recommended that solutions are developed in the country. This creates new jobs and aids positive GDP growth. However, if AI solutions and technology are imported, there is a risk of job reductions.
- The successful development of AI use cases implies investments in foundational digitalisation areas. It is recommended to address critical aspects such as digital literacy, ICT professional skills, digital innovation pipeline, and E-government services.

- b) **Conclusion 2** - Although the Moravian Silesian Region has more potential to benefit from the selected AI use cases due to its size and economic development, all three regions will be able to accelerate their transition by adopting AI.

Recommendations:

- All regions share the following priority domains where AI use cases are relevant to the Just Transition (e.g., GDP growth, GHG reduction, job creation): autonomous vehicles, smart monitoring and management of energy consumption. It is recommended to develop AI skills in these areas as it can have a positive impact on job creation.
- For Moravian Silesian region, in addition to the domains above, it is recommended to support initiatives in the following areas: coordination of decentralised energy networks, increased operational efficiency of renewable assets, autonomous deliveries, traffic optimisation of connected vehicles.

1.4 Good practices from other countries

1.4.1 Deploying hydrogen fuel cell buses in regional transport – Cologne, Germany

1.4.1.1 Regional context

Cologne is a major city in the German state of North Rhine-Westphalia (NRW), which is also a major industry hub that has undergone a transition from fossil-fuel based energy. Recently, the government of NRW launched its own hydrogen roadmap, which includes targets to build up transport infrastructure as well as electrolyzers for hydrogen production and support to the end-use sectors. The roadmap also aims to develop the local hydrogen industry, focusing on innovative hydrogen production methods (such as using pyrolysis, but also focusing on hydrogen derivatives like ammonia or synthetic fuels)¹².

1.4.1.2 Hydrogen in the Cologne area

In the Cologne region, a network of hydrogen stakeholders and industries was formed in 2007, with the aim of using the hydrogen produced as a by-product of local industries to develop hydrogen applications that will pave the way for deploying green hydrogen in the future¹³.

¹² Ministry of Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia (2020). Hydrogen Roadmap North Rhine-Westphalia. Available at: https://www.wirtschaft.nrw/sites/default/files/asset/document/mwide_br_wasserstoff-roadmap-nrw_eng_web.pdf

¹³ HyCologne. About us. Available at: <https://www.hycologne.de/ueber-hycologne-wasserstoff-region-rheinland-e-v/>

The Cologne regional transport company (RVK) deployed two fuel cell hydrogen buses for regional public transport in 2011 and has increased this number to 38 to date and is planning to reach 50 buses by the end of 2021¹⁴.

The buses are used for regional transport and cover an average daily distance of 250–300 km. With such daily distances, the hydrogen fleet is replacing diesel fuelled buses that could not be replaced by battery electric buses, as they would require too long charging times (in contrast, refuelling the hydrogen bus takes only 10 minutes).

Hydrogen buses can be refuelled in the company headquarters, in two public refuelling stations and also importantly at the industrial sites that produce the excess hydrogen – there are approximately 10–20 tonnes of excess hydrogen available¹⁵. The partner is the Linde company also present in Czech Republic.

The first 30 hydrogen buses were co-funded by the Fuel-cell Hydrogen Joint Undertaking (EUR 5.6 million from the JIVE programme) and by the German federal government (EUR 5.2 million)¹⁶.

The project supported the development of a fleet of up to 50 fuel cell buses, currently the largest in EU, with a 3-years Project period.

1.4.1.3 Lessons learned

The main challenges of the project included:

- high upfront capital costs;
- lack of experience with implementing such innovative projects; and,
- lack of commitment to finalise the project.

The solutions to overcome these hurdles include:

- Seek additional funding, cooperate with the equipment (bus) manufacturers;
- Motivate and educate key decision makers (e.g., on climate commitments); and,
- Get in touch with successfully implemented projects.

1.4.2 Lusatian “Lake District”, Germany

1.4.2.1 Regional context

The Lusatian region is a peripheral area in the former GDR (eastern) part of Germany. While the region is heavily connected with coal mining, the local economy was also heavily influenced by the fall of communist regime and German reunification, after which the local coal industry disintegrated. The subsequent economic downturn has led to large unemployment, reaching the peak of 21% in 2004. Moreover, the region also faces significant emigration of younger and more educated population. Lusatia is also a fairly sparsely populated, with the largest city having a population of 100 000. It is also notable that the local infrastructure is fairly underdeveloped (for example in terms of access to public transport or telecommunication signal coverage), in particular when compared to the rest of Germany.¹⁷

1.4.2.2 The transition process

The transformation process was determined by the fact that the lignite in the Lusatian basin was extracted in large open pit mines, leaving substantial mark on the landscape and causing environmental degradation. After the closure of the mines, the land restoration process focused on flooding them and creating artificial lakes, a process that continues until today.

In 1994, the federal government decided that the land reclamation activities (in the whole area of former Eastern Germany) will be separated from mining activities. While the mining and power generation activities were privatized, the land remediation activities (for the former mining activities) remained in the competence of the government. 75% of the financing was borne by the federal government, while 25% by the states. Local authorities were asked to propose re-cultivation projects. These efforts have

¹⁴ Ballard. Fuel Cell Zero-Emission Buses for Cologne Region, Germany. Available at: <https://online.flippingbook.com/link/536059/>

¹⁵ EC (2019). Fuel Cell Buses: Clearing the Way for Zero Emission Transport. Available at: https://europa.eu/regions-and-cities/programme/sessions/492_en.

¹⁶ Conrad (2019). „Experience from Earliest Adopters: Deployment of Fuel Cell buses in the Cologne Region“. Available at: https://ec.europa.eu/regional_policy/rest/cms/upload/07102019_022110_2.%202019-10-08%20Presentation_RVK.pdf

¹⁷ Stognief et al (2019). Economic Resilience of German Lignite Regions in Transition. Available at: <https://core.ac.uk/download/pdf/287885359.pdf>.

provided visible results and since the early 2000s, large areas of nature, including lakes and forests, were available for tourism and recreation.¹⁸

1.4.2.3 Innovative vision for landscape transformation

To enhance the connection between changing landscape and the cultural heritage of mining in the region, an iteration of the International Building Exhibitions (Internationale Bauausstellung, IBA) was set up in Brandenburg between years 2000 and 2010. These projects focus on innovative development, initially of urban areas, but the project in Lusatia brought the attention to the changing landscape.¹⁹ The goal of this project was to imagine and develop new cultural identity for the revitalized regions.

The IBA itself is an association, bringing together network of stakeholders from concerned state, regional and municipal governments, people directly involved in the land re-cultivation activities and experts from academia. The three core topics of the IBA project in Lusatia were:

- Water landscapes;
- Utilization of post-industrial objects;
- Building new renewable energy sources.

The result was developing 30 illustrative projects of innovative landscape shaping, located in 9 “landscape islands”.

1.4.2.4 Lessons learned

The focus of the project was to shape the vision of new post-mining landscape that can bring an additional value to the region. While the implementation phase ended over 10 years ago, the projects itself and the vision continues to guide the development of the region, building on its cultural heritage.

The project also concluded with developing 10 core principles for the treatment of post-mining landscapes.²⁰ It is an example of the benefits of strategical long-term planning that focuses on sustainable development, engagement of local communities and utilizing the specific local assets.

1.4.3 Transitioning away from coal in Matra Power Plant – Hungary

1.4.3.1 Regional context

The Matra Power Plant (PP) is a brown coal fired thermal power plant located in Northern Hungary. The region has a rural character, with GDP below the national average and an above-average unemployment rate. The regional population is ageing and declining in total size²¹. Retaining energy industry jobs and supporting the development of sustainable businesses is therefore a high priority.

The Matra PP has 884 MW of coal-fired 60 MW of gas-fired power capacity. This is a significant capacity in the national context, as it accounts for 17% of Hungary’s electricity generation and is also responsible for 17% of the total national GHG emissions²².

1.4.3.2 Transitioning from coal electricity to sustainable industries

The process of transitioning away from coal in the Matra power plant started in 2004, when part of the coal feedstock was replaced by biomass. At the same time, an industrial park was created in the vicinity of the power plant with the aim to attract companies that could enter into a mutually beneficial relationship with the plant.

The industrial cluster currently consists of:

- Biomass preparation facility (using electricity from the PP, supplying the biomass feedstock);
- Chemical production facilities (using electricity, surplus heat from the PP);
- Biodiesel production facility (using surplus heat and electricity from the PP, supplying by-product biomass).

¹⁸ Deshaies (2020). Metamorphosis of Mining Landscapes in the Lower Lusatian Lignite Basin (Germany): New uses and new image of a mining region. Available at: <https://doi.org/10.4000/craup.4018>.

¹⁹ IBA (2017). History of the „Internationale Bauausstellung“. Available at: <http://www.iba-see2010.de/en/verstehen/ibameetsiba.html>

²⁰ IBA (2017). The “Lusatia Charter” of IBA. Available at: <http://www.iba-see2010.de/en/verstehen/charta.html>.

²¹ EC. Transforming the lignite-fired Matra Power Plant into part of a renewable energy cluster. Available at: https://ec.europa.eu/energy/sites/default/files/documents/transforming_the_lignite-fired_matra_power_-_platform_for_coal_regions_in_transition.pdf.

²² Balkan Green Energy News (2019). Transition away from coal by Matra Power Plant – Solar panels on ash deposits, biomass as fuel. Available at: <https://balkangreenenergynews.com/transition-away-from-coal-by-matra-power-plant-solar-panels-on-ash-deposits-biomass-as-fuel/>.

There have been also some efforts to recultivate the open-cast mine providing lignite for the power plant. Some of them are used as “energy forests”, supplying the feedstock for biomass used in the PP. Moreover, two solar power plants were installed (16 MW and 20 MW) and one more is planned²³.

In March 2021, the Hungarian government decided that power generation from coal will be phased out in 2025, with Matra PP planned to close even sooner. Because of the importance of the PP for domestic electricity supply, it was also announced that 500 MW gas and 200 MW solar power plants will be built on the site to replace the missing capacity.

1.4.3.3 Retaining local jobs in energy industry

The cluster strategy in the industrial park and the regional biomass use can be considered to have had (and will continue to have) a positive impact, securing long-term employment opportunities in the region. Specifically, regarding the solar PV plant, the company estimated before the installation of the first plant that the project could create 135-270 new jobs.

1.4.3.4 Lessons learned

The case shows that the use of renewable energy sources at a coal mining site can smoothen the transition away from coal; by diversifying resources the energy generation capacity was maintained and in doing so, jobs were created and kept in the region. Furthermore, extending the use of biomass and solar offered opportunities for low-cost mining area reclamation.

The case also shows that a long-term planning perspective is necessary. The step-wise approach to applying renewable energy projects helps to smoothen the shocks associated with transition and helps to prepare for the coal phase-out.

Finally, the role of state funding was imperative to the success of the transformation. The state funding came in the form of tax exemptions, as well as feed-in tariffs for the renewable energy projects.

²³ EC. Transforming the lignite-fired Matra Power Plant into part of a renewable energy cluster. Available at: https://ec.europa.eu/energy/sites/default/files/documents/transforming_the_lignite-fired_matra_power_-_platform_for_coal_regions_in_transition.pdf.

2 ASSESSMENT OF THE TRANSITION CHALLENGES – OVERVIEW AND METHODOLOGY

The main aim of this analysis is to provide robust empirical evidence on regional structures and create adequate analytical knowledge to better understand the challenges and opportunities emanating from the climate transition. Since it was already decided to prepare three specific regional transformation plans, this analysis follows the same logic. The analysis is divided into regional case studies, which have an identical structure. We start with a brief description of the regions. Then, main economic indicators such as GDP, firms size structure, sectoral development, and demographics will be presented. We use (mainly secondary) data provided from CSO, Eurostat, etc. We included all relevant strategic documents from the national and local levels such as regional strategies, regional innovation strategies or RE:START, strategy of regional development 21+, etc. To respect the place-based interventions logic, analysis across different spatial scales were elaborated (i.e., municipal, local, regional). Since we present three case studies, it is necessary to briefly describe the main methodological points, which are ordered in line with the structure of case studies.

Economic performance can be captured using different indicators. In our analysis, we employ GDP per capita in purchasing power parity for the years 2000–2018. NUTS 3 regions in the Czech Republic are compared to each other in terms of GDP (and against the Czech and EU averages) to provide a more complex picture of regional performance.

We used two indexes to analyse sectoral composition at the inter-regional level. We applied the Hirschman-Herfindahl index (hereafter HHI) to measure specialisation/diversification of regional economic base and the Finger-Kreinin index²⁴ (Finger and Kreinin 1979; hereafter FKI) to identify the intensity of sectoral change. Additionally, special focus is given to changes in energy intensive industries (NACE 17, 19, 20, 22, 23, 24, 25 and 27²⁵).

Firm size is an important precondition of economic performance²⁶ and entrepreneurship activity, which will both be analysed through a spatial-temporal lens. We use descriptive statistics to identify how these structural features have evolved. The analysis of firm size (NUTS 3 level) was performed for the years 2008 and 2020. Data were obtained from statistical yearbooks of the regions²⁷. For a clearer interpretation of the results, we chose to aggregate the size category of companies into four basic groups²⁸:

- micro-companies (number of employees: <10),
- small companies (number of employees: 10-49),
- medium-sized companies (number of employees: 50-249), and
- large companies (number of employees: >249).

The labour market (unemployment rate development) is primarily evaluated at a micro-regional level in Karlovy Vary, Moravia-Silesia and Ústí in 2010–2020. Emphasis is placed on both the long-term trajectory of unemployment in 2010–2019, as well as the impacts of the COVID-19 pandemic on employment during 2020. We applied a “proportion of unemployed persons” indicator since it is a basic socio-economic indicator expressing the share of available jobseekers aged 15–64 in the total population of the same age²⁹. We used data from the CSO.

The last economic analysis is devoted to sectoral employment change in 2008-2020 on the regional level. Additionally, the 15 largest industries are identified and analysed. Thanks to unique data, we were able to analyse the age structure of employees at the regional level.

The transition process must be interpreted holistically, that is, not only in terms of a technological change but also in terms of social change. Therefore, close attention is paid to **changes in demographic structures at different spatial levels**. Several key factors determining demographic development are assessed. The first factor, ageing, poses a major challenge to economically stagnant regions³⁰. The second factor relates to migration behaviour, which, in simple terms, reflects the spatial

²⁴ Finger and Kreinin, 1979

²⁵ Thollander and Ottosson, 2010; Paulus and Borggreve, 2011

²⁶ Chniniz, 1969; Hensdersen et al., 1995

²⁷ CSO, 2020

²⁸ The set number was simultaneously recalculated per 1,000 inhabitants.

²⁹ Czech Statistical Office, CSO 2021

³⁰ Rieniets, 2009

preferences of the population, i.e., a certain analogy to the popular phrase “vote with their feet”³¹. Especially in old industrial regions, migration is often associated with selective migration known as brain drain³². Given that “demography works as a ‘supertanker’ - once a trend has set in, it is difficult to steer away”³³ - demographic forecasts are added to our analysis. Analysis is carried out using data from the CSO and employs the following indicators:

- Gross rate of natural increase in population: expresses the difference between the number of births and deaths per 1,000 people. It is used to identify the intensity of the overall effect of natural population increase or decrease in the region.
- Gross rate of migration: difference between the number of immigrants and emigrants per 1,000 people. It is used to identify the intensity of the overall effect of migration in the region.
- The gross migration rate was subsequently supplemented by net migration³⁴ and analysis of migration flows³⁵.
- The aging index expresses how many people aged 65+ account for 100 children under 15 years of age.

We have included **a section on heating and renewable energy for each region**. The transition to different sources of energy away from coal is obviously at the centre of the low-carbon transition. In addition, various studies show that the development of RES has net benefits on employment, thus contributing both to low-carbon and the just components of the transition.³⁶ Additionally, both RES and affordable district heating have a significant “just” component, be it in terms of energy access and decentralisation in the case of renewable energy sources, or coal phase-out and potential impacts on energy prices and thus energy access and energy poverty in the case of district heating.

For RES, we present the spatial distribution of installed capacities for the main RES technologies (PV and wind) in all three regions, which is complemented with a discussion on RES potential in the three regions. Assumptions for the calculation of the potentials are detailed in Annex 3. For district heating, we show the current status of the district heating sector (as a main supplier of heat in residential and industrial sectors) and indicate the investment needs and pathways for low carbon transition in the sector. In Annex 3, we detail the current status, investment needs and funding opportunities for district heating, as well as stress further decarbonisation pathways in the sector, including sector coupling, decentralisation, and the use of RES. For all regions (and CZ for that matter) it must be highlighted that avoiding the lock-in of fossil fuel (natural gas) will be the main challenge. While natural gas will most likely be the short-term solution, district heating companies should seek to diversify their fuel base as much as possible, diversify their business (e.g., seek to provide energy services), and use modern technologies (e.g., PV, battery systems) to stay competitive and remain on the pathway to climate neutrality. The future of district heating will be a mix of highly efficient cogeneration and direct electrification using RES (heat pumps, solar collectors). CHP systems can also be used for energy storage (power-to-heat technology) to efficiently use surplus electricity from intermittent RES to generate and store heat using large heat pumps. Where possible these systems should be explored and piloted as soon as possible.

Moreover, the TA Team identified **two groups of key economic operators** (relevant for the climate transition process):

- mining companies: the number of employees was identified from the annual reports of companies; additional information was sourced from available analytical reports.
- installations based in the regions with the highest CO₂ emissions: - for every NUTS 3 coal region, 10 largest EU ETS installations were analyzed, covering more than 95% CO₂ emissions in the region in 2020. The installations were identified and relevant data collected from the European Union Transaction Log (<https://ec.europa.eu/clima/ets/>). The TA has received and used consolidated data set containing data about EU ETS sources in the Czech Republic (269 installations) provided by the Commission in November 2020.

³¹ Thiebaut, 1956

³² Rink et al., 2012

³³ Hospers, 2014, p. 1512

³⁴ The difference between the number of immigrants and emigrants in the selected territorial unit.

³⁵ CSO 2017

³⁶ <https://www.mdpi.com/1996-1073/14/11/3183/htm>

The analysis below is structured by each coal region, focusing on the main economic operators as defined above and the strategic outlook and plans of companies as well as the expected changes in the employment performance. Although it is assumed that the projects of key economic operators will be financed mainly from public or private sources, other than the JTF (e.g. Modernization Fund), the planned activities of these entities represent an important part of the transformation story of the Czech coal regions. The expected activities of key economic operators, belonging to the largest CO₂ emitters, may have major socio-economic impacts on the Czech coal regions and they can thus play an important role in the just transition, therefore specific attention has been paid to their strategic plans in the analysis.

The TA team exploited data from statistical sources (CSU, Eurostat), annual reports of companies (companies' websites), information provided by large companies, SMEs, NGOs and municipalities during stakeholder interviews and workshops (80 participants) and statements of business representatives in the media.

Regarding the envisaged strategic plans and measures, companies indicated rather general strategic considerations, highlighting the uncertainty regarding the future development of the market including the price of allowances and the potential funding sources. This implies that only general predictions about the total number of jobs and job market dynamics can be provided.

We also used a bottom-up modelling methodology to explain the **regionalised impacts** of changes in power generation capacity. In the bottom-up modelling, results from the E3ME national level modelling and capacity results from the FTT: Power submodule are used to estimate power sector employment and economic output at the regional level.

A summary of the process is provided below:

1. Determine 2017 national power plant capacity and plant age for different technologies.
2. Use E3ME national results to determine annual decommissions and new commissions.
3. Allocate national decommissions to each region.
4. Allocate national commission to each region
5. Estimate employment and economic output using the capacity of each region and combine with results from the shift-share model.

Outputs from the regional modelling exercise are GVA, employment on the regional level with sectoral disaggregation and CO₂ emissions by region and emitter.

Finally, analysis for each region ends with an overview of the main identified challenges and opportunities. We drew on the work of Schmidt et al. (2018) who, within the concept of "open region", recommend to "reframe regional problems as opportunities. A precise problem definition provides the basis of many innovations." In this sense, an existing challenge can be seen not as a problem but as a specific regional asset (opportunity) In separate chapter the SWOT analyses and strategic outlooks are presented for each region, with identified priorities.

We also present a separate analysis about the **potential "skills mismatch" and sectoral and occupational projections** based on the modelling delivered in Deliverable 3 and CEDEFOP's Skills Panorama database³⁷. The projections provide insights into projected sector and occupation structure transformations, and thus re-skilling and re-training needs, in the three target regions of the project.

"Skills mismatch" refers to a mismatch between the skills available on the labour market and the skills demanded in the labour market. As defined by the ILO, skills mismatch can occur in multiple, various situations³⁸. Here we focus on what ILO defines as "skill shortage" and "skill gap". We analyse changes in the sectoral and occupation composition of employment in the target regions.

In the analysis, we use projected changes in employment structures together with the observed occupational structure of the industries to project occupational changes and needs for re-skilling, re-training and remaining employment gaps (i.e., unemployment).

We categorise possible employment movements/mobility needs into four categories, which are illustrated in Table 4:

³⁷ CEDEFOP. 2020. 'Skills Panorama'. Skills Panorama. 2020. <https://skillspanorama.cedefop.europa.eu/en>.

³⁸ Palmer, R. 2018. 'Jobs and Skills Mismatch in the Informal Economy'. Publication. Geneva, Switzerland: International Labour Organization. http://www.ilo.org/skills/pubs/WCMS_629018/lang-en/index.htm.

Table 4: Illustrative categorisation of potential job change outcomes

		Occupation	
		Current	New
Sector	Current	No change	Not projected
	New	<i>Potential skill gap</i> Re-skilling within occupation	<i>Potential skill shortage</i> Re-training sector and occupation

To determine occupational mismatch, and therefore identify re-skilling and re-training needs based on projected trends, we develop a methodology to match regional level occupational changes to sector level projected employment changes.

We use regional and sectoral employment projections from the modelling carried out in D3 using the E3ME macroeconomic model³⁹ and its regional extension E3ME-TRE (which builds on the method described by Mayor, López, and Pérez⁴⁰ for regional estimation) to obtain regional-sectoral estimates. The projection methods are described in detail in D3 “Report on the Transition Process to Climate Neutrality in the Czech Republic”. Then we use data for the Czech Republic from the Skills Panorama database⁴¹ to match sectoral changes to occupation level changes. We do this by sharing our projected changes (from 2018 sectoral employment data) across occupational categories using the CEDEFOP reported national occupational structure of the relevant sectors.

To simplify assumptions, we assume that the overall occupational structure of the individual sectors does not change, and that the occupational composition of sectors is equal across regions. To illustrate this with an example: if the occupation composition of the retail sector is 50% sales workers and 50% managers in the Skills Panorama data, we assume that the ratio between the occupations will stay the same, e.g., if the sector gains 100 jobs it will be assumed that 50 of those jobs are for sales workers and 50 are managerial positions. The “equal composition across regions” assumption further posits that this occupational structure is constant across regions, i.e., if the national composition of the sector is the 50 sales staff to 50 managerial staff, then the same structure will apply to Galati or Mures or Prahova. Finally, when presenting the results, we do not make any assumptions on the openness of the regional labour market: we show differences in absolute employment from 2018. We do not assume how these jobs are lost or who will be employed in the newly created jobs. For example, if jobs are lost due to internal migration (which will not lead to unemployment on the national level), it is counted as a loss just the same as if a factory closes down (which will likely contribute to unemployment). Similarly gains can be realised both as ‘new’ people migrating to the region or current residents finding (new) jobs.

In the following, we have structured the analysis in three different chapters separately: Ústí Region, Karlovy Vary Region and Moravian-Silesian Region.

³⁹ Cambridge Econometrics. 2019. ‘E3ME Technical Manual v6.1’. <https://www.e3me.com/wp-content/uploads/2019/09/E3ME-Technical-Manual-v6.1-onlineSML.pdf>.

⁴⁰ Mayor, Matías, Ana Jesús López, and Rigoberto Pérez. 2007. ‘Forecasting Regional Employment with Shift–Share and ARIMA Modelling’. *Regional Studies* 41 (4): 543–51. <https://doi.org/10.1080/00343400601120205>.

⁴¹ CEDEFOP. 2020. ‘Skills Panorama’. Skills Panorama. 2020. <https://skillspanorama.cedefop.europa.eu/en>.

3 ÚSTÍ REGION

3.1 State of play

The Ústí Region is located in the northwest of the Czech Republic near the border with the federal state of Saxony in Germany. The region is characterised by a great diversity of natural and geographical conditions. The northern border is formed by the sparsely populated Ore Mountains and the Elbe Sandstones with the National Park of Bohemian-Saxon Switzerland. Below the Ústí lies the Bohemian Central Mountains. In the south, there are fertile plains around the rivers Elbe and Ohře with the main cities of Litoměřice and Louny (fruit, hops and vegetable growing). Below the Ore Mountains is a highly urbanised area with developed industrial production, including energy, lignite mining, engineering, and chemical and glass industries. The northernmost part of the region is formed by the peripheral Šluknov region. The environment in the region is gradually improving, especially in connection with the reduction of discharged emissions and the reclamation of the mining landscape (e.g., Lake Milada or Lake Most).

In March 2021, the Ústí Region had 815 209 inhabitants and is the fifth largest region by population in the Czech Republic⁴².

The economic importance of the region is historically given by the considerable mineral wealth, especially the large deposits of lignite deposited below the surface. The lignite basin is located below the Ore Mountains, stretching from Ústí to Kadaň (the North Bohemian basins). This belt contains large reserves of lignite, which is still one of the most important energy sources in the Czech Republic. Other important raw materials mined in the region include significant deposits of quality glass and foundry sands and building stone. Besides the lignite mining and energy sector, the Ústí Region has a long tradition in heavy and chemical industry and, as a result, the region was already hit by a strong wave of heavy industry transformation in the 1990s. While in 1989 almost 33,000 employees worked in the mining sector in the Ústí Region⁴³, today their numbers are around 9,000. As part of the transformation of the economy, a large part of employees moved to other sectors, where the largest employment is provided by the manufacturing industry. In 2010, the largest number of employees was registered in the manufacture of motor vehicles and in traditional and energy-intensive industries, such as the manufacture of other non-metallic mineral products (glass) and the manufacture of chemicals and chemical products. Many people are employed in the manufacture of machinery and equipment and in the manufacture of electrical equipment. In recent years, the number of inhabitants employed in industry has increased, mostly in the manufacture of motor vehicles (+3,838 employed persons, growth index: 1.70), where in 2020 the most employed persons were employed. The number of employees also grew in the manufacture of rubber and plastic products (NACE 22, +2,067 persons employed, growth index: 2.26) and in other energy-intensive industries, namely in:

- metallurgy (+1,131 persons employed, growth index: 1.68),
- manufacture of metal structures and products (+1,665 persons employed, growth index: 1.52),
- manufacture of electrical equipment (+982 persons employed, growth index: 1.24),
- manufacture of other non-metallic mineral products (+906 persons employed, index growth: 1.17), or in the
- manufacture of machinery and equipment (+871 persons employed, growth index: 1.18).

In 2020, the largest number of employees were registered in the manufacture of motor vehicles or in the manufacture of machinery and equipment. Furthermore, there was a very high number of persons employed in existing, traditional and energy-intensive industries, namely in the manufacture of other non-metallic mineral products and in the manufacture of chemicals and chemical products.

The Ústí Region is characterised by the localisation of the old industrial area, the advancing crisis of existing economic structures and the gradual transformation into new growth industries. It is a region with low growth dynamics, stagnation and negative development trajectories. The old Czech industrial regions survived the financial crisis in 2008/2009 and performed similarly to other types of Czech regions in socioeconomic terms⁴⁴. However, it is expected that the transition from coal to other sources of energy will most likely be especially challenging for the Ústí Region because of its employment

⁴² Czech Statistical Office, 2021

⁴³ Smolová, 2008

⁴⁴ Ženka and Slach, 2018

structure. In the Ústí Region, 9,400 people are employed in the mining industry and another 5,000 in the electricity, gas, steam and air conditioning supply⁴⁵.

The Ústí Region is facing many structural problems and it lags behind other Czech regions in many socioeconomic terms. The Ústí Region and Karlovy Vary Region have the lowest public and private research and development expenditures in the Czech Republic and their overall Regional Innovation Index is significantly lagging behind other Czech NUTS 2 regions⁴⁶. Comparing the Ústí region with other Czech regions the unemployment rate in the Ústí region has been one of the highest since 20 years. Even in recent years, when the unemployment rate in the Czech Republic was very low, the Ústí Region retained a “special position” in this aspect due to the structure of the labour force, which has been oriented towards traditional industrial areas. The dynamics of GDP growth per capita in Ústí have lagged significantly behind other Czech regions in recent years. This shows the diverging trend in the Czech Republic where the economic gap between peripheral (underdeveloped) and core (developed) regions is rising.⁴⁷ The region also has one of the highest crime rates, lowest percentages of university-educated people and the highest levels of indebted persons⁴⁸. The innovation intensity of the less developed regions (e.g., Ústí Region) is significantly lower than the innovation intensity of other Czech and European regions⁴⁹.

The Ústí Region also faces the challenge of low education. Ústí is characterised by a low rate of university students (second lowest in the Czech Republic). In addition to the Jan Evangelista Purkyně University in Ústí, the Faculty of the Czech Technical University in Děčín, the University of Finance and Administration in Most and the University of Chemical Technology also operate in the region.

In the case of the Ústí Region, weak regional capacities can be considered an issue. Although the region has regional institutions, these are characterised by a certain weakness, which limits the support of cooperation in the region⁵⁰. Weak leadership and low trust between actors in the region cannot be overlooked either.

The Ústí Region also has many historical cultural monuments, including industrial ones. The mining region of the *Erzgebirge/Krušnohoří* (Ore Mountains) is recognised on the UNESCO World Heritage list. However, due to the ongoing transformation of the region and ongoing structural changes, there are many old, unused areas in the region, i.e., brownfields. With further declines in mining and energy transformation, more brownfields will be added, including devastated areas after mining. So far, the region has not been able to find meaningful use for the large number of brownfields.

3.1.1 Development of the economic performance

In 2000, based on Eurostat data⁵¹, the Ústí Region recorded EUR 11,200 in GDP per capita (i.e., 61% of the EU average). The period 2000–2008 was characterised by economic growth, which was primarily due to Czech Republic’s accession to the EU in 2004. During this period, the GDP growth index of the Ústí Region was 1.49 and it reached 16,700 EUR in 2008 (i.e., 66% of the EU GDP). Despite the increase, Ústí dropped from the 10th to the 11th position among Czech regions.

During the 2008–2009 global economic crisis, a GDP decrease in Ústí was delayed and did not appear until 2010 (-600 EUR, a decrease of 3.57%), which indicates a slow response of the region to the destabilising phenomenon, manifested by a delayed economic shock affecting the fall of GDP. The slow response is characteristic of economically lagging regions, which show lower growth rates, even during the period of economic expansion but may be relatively more resilient in the first phase of the shock. In the following years, GDP per capita grew to EUR 19,500 by 2018 (i.e., 65% of the EU GDP average). However, this represents the lowest growth dynamics among Czech regions and Ústí fell to the 13th position among all Czech regions. In 2018, the average GDP in the EU was EUR 30,200, while in the Czech Republic it was EUR 27,900, i.e., 92% of the EU GDP (excluding Prague the average GDP in the Czech Republic was EUR 22,577, i.e., 75% of the EU average).

The analysis suggests that, despite ongoing structural changes in the economy of Ústí Region, it lags behind other regions (see Table 5 and Figure 8). The results reveal that the region’s economy is focused

⁴⁵ Czech Statistical Office, 2020

⁴⁶ EC. (2020). Regional Innovation Scoreboard 2019 – Czechia. Available at: <https://ec.europa.eu/docsroom/documents/35923>

⁴⁷ Šimon, 2017

⁴⁸ Czech Statistical Office, 2019

⁴⁹ European Commission, 2019

⁵⁰ In this text we draw on the capacity typology of (Borrás 2001), which distinguishes between analytical, administrative and organizational capacities. For more details see Borrás, S. (2011). Policy learning and organizational capacities in innovation policies. *Science and Public Policy*, 38(9), 725-734.

⁵¹ Eurostat 2021

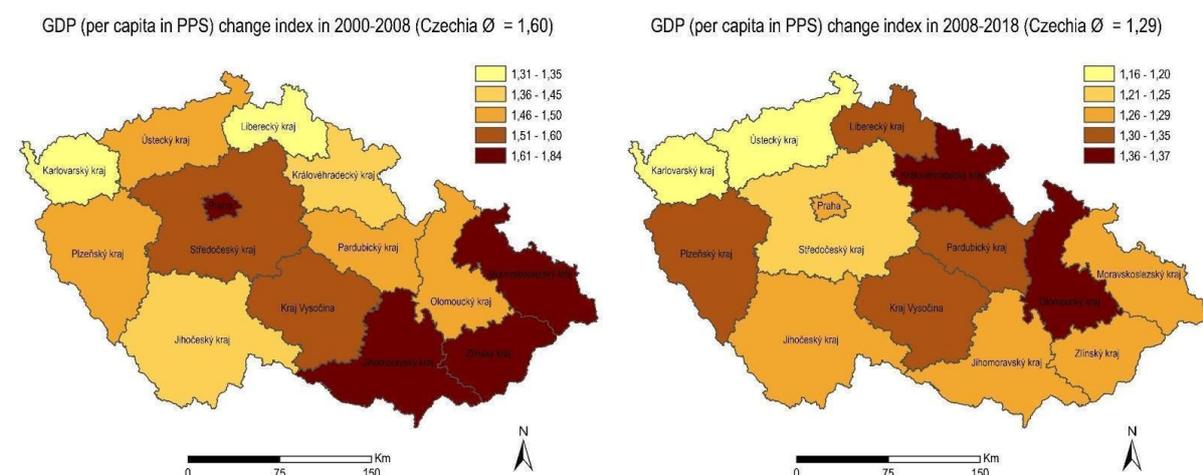
on economic activities with lower added value, which is reflected in GDP per capita. Despite the absolute growth of economic indicators, the relative status of Ústí continues to deteriorate within the country, and its share in the Czech GDP continues to decline. The low added value per capita reflects a complex situation. Factors such as the historical sectoral structure, the educational structure of the population, persistent social problems (population aging, above-average unemployment) and some of the lowest expenditures on research and development in the country all play a role.

Table 5: Development of GDP in purchasing power parity in the years 2000–2018

NUTS 3 region	Order 2000	Order 2008	Order 2018	GDP Growth index 2000-2008	Order in GDP Growth index 2000-2008	GDP Growth index 2008-2018	Order in GDP Growth index 2008-2018
Prague	1	1	1	1,83	1	1,28	10
Central Bohemian Region	2	3	4	1,51	6	1,22	12
South Bohemian Region	3	6	9	1,40	12	1,25	11
Pilsen Region	4	4	3	1,48	9	1,34	3
Karlovy Vary Region	8	14	14	1,31	14	1,18	13
Ústí Region	10	11	13	1,49	8	1,17	14
Liberec Region	6	12	12	1,33	13	1,30	5
Hradec Kralove region	5	7	5	1,42	11	1,38	2
Pardubice Region	9	9	8	1,50	7	1,30	4
Vysocina Region	11	10	10	1,53	5	1,30	6
South-Moravian region	7	2	2	1,69	3	1,29	7
Olomouc Region	13	13	11	1,46	10	1,38	1
Zlín Region	12	5	6	1,65	4	1,29	9
Moravian-Silesian Region	14	8	7	1,70	2	1,29	8
The Czech Republic	X	X	X	1,60	X	1,29	X
EU	X	X	X	1,38	X	1,19	X

Source: Eurostat2021, own elaboration

Figure 8: GDP change index in the Czech Republic in 2000–2018



Source: Eurostat2021, own elaboration

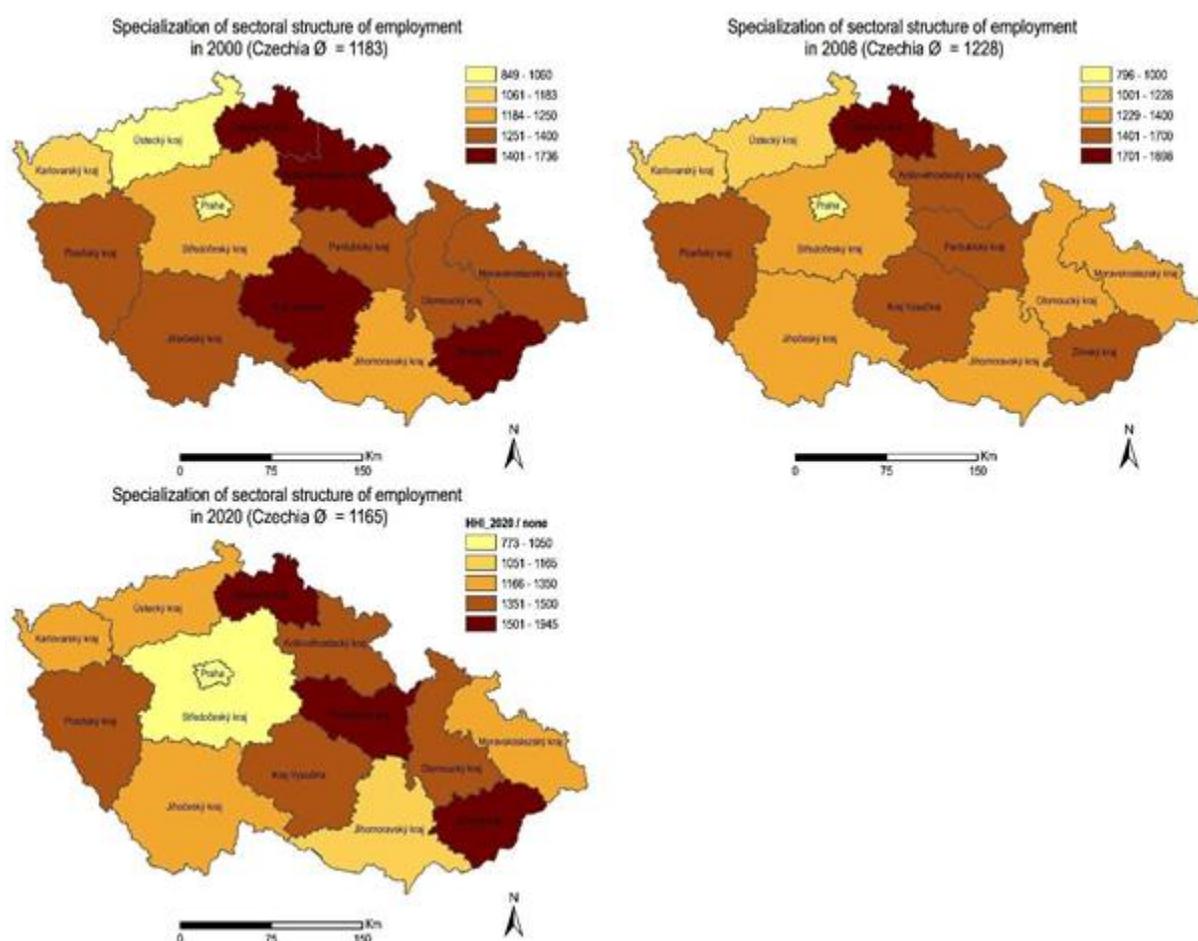
3.1.2 Development of the sectoral structure of employment in the manufacturing industry between 2010–2020 - HHI, FKI

We identified a relatively low specialisation of the manufacturing industry in the Ústí Region. In 2010, the Czech economy was already highly specialised in the manufacture of motor vehicles, and well

behind in the manufacture of machinery and equipment, the manufacture of electrical equipment, the manufacture of metal structures and products, and food production. The Ústí Region is also specialised in the manufacture of motor vehicles, the manufacture of machinery and equipment, the manufacture of other non-metallic mineral products, and the manufacture of chemicals and chemical agents. In general, the specialisation of automotive-related industries prevailed in the NUTS 3 transition regions. From 2010–2020, while the specialisation of industrial sectors increased, structural changes were relatively lower in the Ústí Region. Thus, in 2020, we observed a lower specialisation of the manufacturing industry in Ústí relative to other regions. The existing development trajectory has deepened and specialisation in traditional industries (typical of the region) and sectors related to the manufacture of means of transport have significantly strengthened.

Energy-intensive industries were significantly represented in the Ústí Region in 2010, mainly due to the presence of automotive related industries and the manufacture of other non-metallic mineral products and chemical substances and agents. From 2010–2020, the specialisation in energy-intensive industries in the Czech Republic significantly increased, but Ústí recorded a relatively minor change.

Figure 9: Specialisation of employment at the Czech regional level in 2000, 2008, and 2020



Source: Czech Statistical Office 2021, own elaboration

3.1.3 Corporate structure at the regional level

In 2008, the Ústí Region had one of the lowest business activities in the Czech Republic (209.98 economic entities per 1,000 inhabitants). Entrepreneurship rates were particularly low: self-employed (146.61) and entrepreneurs in agriculture (7.85). However, there was a relatively larger representation of commercial companies (24.86). During 2008–2020, only a slight increase in business activity was recorded (growth index: 1.03) and Ústí thus fell to the last place in business activity among all regions in the Czech Republic. Nevertheless, the share of commercial companies increased the most (growth index: 1.33) while there was only a slight increase in entrepreneurship and self-employed (growth index: 1.05). The results suggest low business activity in the region, which corresponds to the historically predominant employee-oriented structure of the economy.

3.1.3.1 Size structure of companies

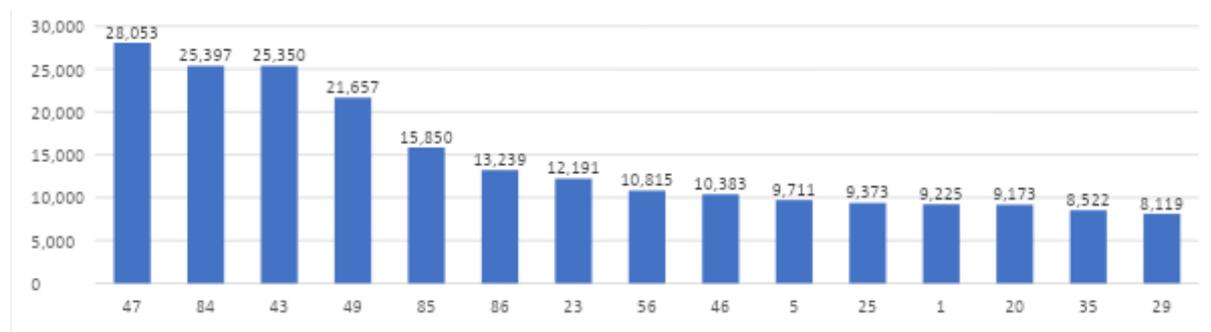
In 2008, only 76.16 micro-enterprises per 1,000 inhabitants were recorded in the Ústí Region, which is the second lowest value among Czech regions. Regarding small enterprises, Ústí recorded the lowest value among Czech regions (3.73) and reported the third lowest number of medium-sized companies (0.96). In terms of large companies with more than 250 employees, Ústí performed average (0.17). Detailed results indicate that several large companies employ much of the region.

Between 2008 and 2020, there was a slight increase in the number of micro-companies in Ústí (growth index: 1.02) while there was a decrease in other firm size categories. The number of small companies decreased the most over the period (growth index: 0.75), followed by medium-sized companies (growth index: 0.89) and large firms (growth index: 0.92). Compared to other regions, Ústí underperformed. This may be related to the low entrepreneurial activity of the population as well as the relatively lower attractiveness of the region for investors (e.g., lower qualification of the workforce).

3.1.3.2 Sectoral change in the Ústí Region 2008-2020

Services were the main sector in 2008 (Graph 1), especially B2C in the private sector (e.g., retail) and the public sector (e.g., healthcare, education). A high employment rate was observed in construction, consumer, and demand-oriented services (NACE 49, NACE 56). The primary (and traditional) sectors of the region were also relatively strongly represented (power engineering; lignite mining and processing, electricity generation and distribution, glassmaking). Finally, many residents found employment in capital-intensive and export-oriented industries (e.g., metalworking and automotive).

Graph 1: Sectoral structure of employment in 2008 – top 15 sectors by employment in Usti

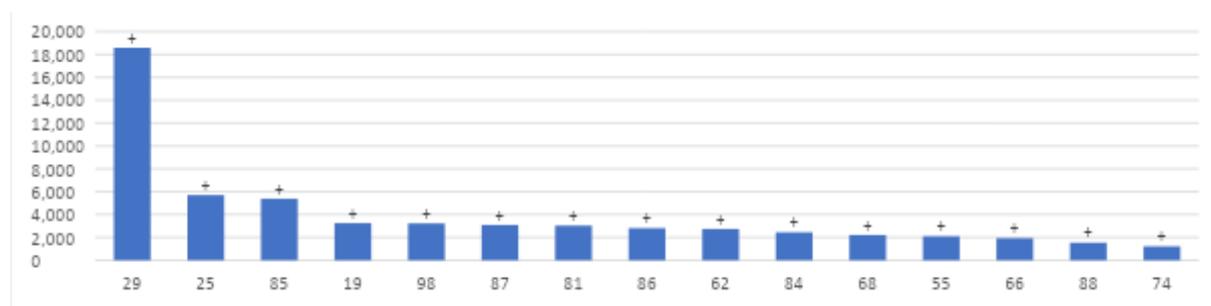


Source: Internal data of the Czech Statistical Office, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (47 - Retail trade, except of motor vehicles and motorcycles; 84 - Public administration and defence; compulsory social security; 43 - Specialised construction activities; 49 - Land transport and transport via pipelines; 85 - Education; 86 - Human health activities; 23 - Manufacture of other non-metallic mineral products; 56 - Food and beverage service activities; 46 - Wholesale trade, except of motor vehicles and motorcycles; 5 - Mining of coal and lignite, 25 - Manufacture of fabricated metal products, except machinery and equipment; 1 - Crop and animal production, hunting and related service activities; 20 - Manufacture of chemicals and chemical products; 35 - Electricity, gas, steam and air conditioning supply; 29 - Manufacture of motor vehicles, trailers and semi-trailers)

Between 2008 and 2020, the largest absolute increase in the number of employees was observed in the automotive industry (Graph 2). The manufacturing (capital-intensive), metalworking (NACE 25) and chemical (NACE 19) industries also achieved large increases in employment. Of the top 15 fastest growing sectors, only the services sector was represented. There were also employment increases in public, health and social services, as well as consumer and tourism-related services.

Graph 2: Sectoral structure of employment 2008-2020 – top 15 growth sectors by employment in Usti

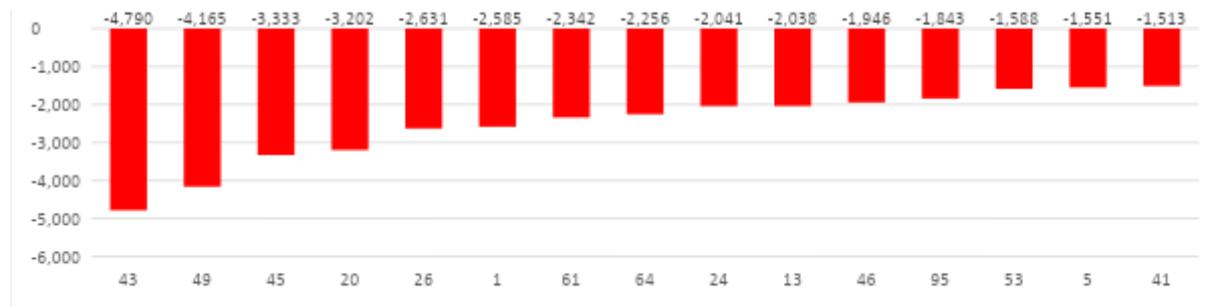


Source: Internal data of the Czech Statistical Office, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (29 - Manufacture of motor vehicles, trailers and semi-trailers; 25 - Manufacture of fabricated metal products, except machinery and equipment; 85 - Education; 19 - Manufacture of coke and refined petroleum products; 98 - Undifferentiated goods- and services-producing activities of private households for own use; 87 - Residential care activities; 81 - Services to buildings and landscape activities; 86 - Human health activities; 62 - Computer programming, consultancy and related activities; 84 - Public administration and defence; 68 - Real estate activities; 55 - Accommodation; 66 - Activities auxiliary to financial services and insurance activities; 88 - Social work activities without accommodation; 74 - Other professional, scientific and technical activities)

By contrast, transport and construction were among the sectors with the largest job losses (Graph 3). The high decline in employment also affected agriculture, mining, low-tech manufacturing and some medium-low tech manufacturing sectors (NACE 20, NACE 24, NACE 26).

Graph 3: Sectoral structure of employment, 2008-2020 – top 15 declining sectors by employment in Usti

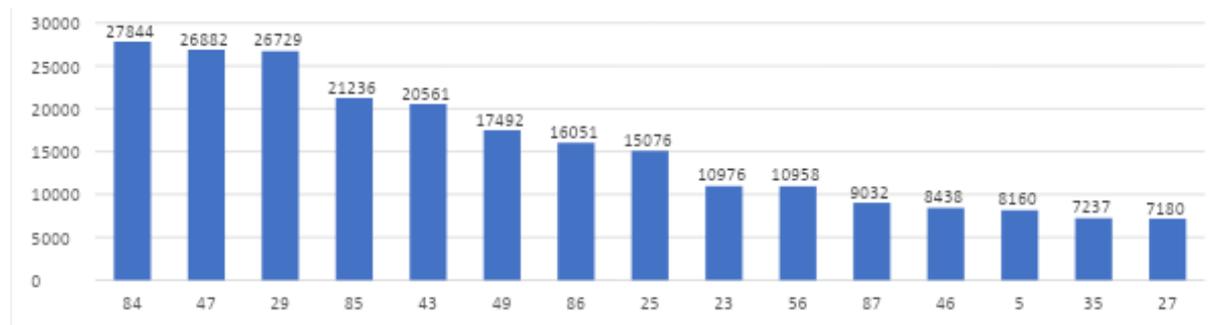


Source: Internal data of the Czech Statistical Office, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (43 - Specialised construction activities; 49 - Land transport and transport via pipelines; 45 - Wholesale and retail trade and repair of motor vehicles and motorcycles; 20 - Manufacture of chemicals and chemical products; 26 - Manufacture of computer, electronic and optical products; 1 - Crop and animal production, hunting and related service activities; 61 - Telecommunications; 64 - Financial service activities, except insurance and pension funding; 24 - Manufacture of basic metals; 13 - Manufacture of textiles; 46 - Wholesale trade, except of motor vehicles and motorcycles; 95 - Repair of computers and personal and household goods; 53 - Postal and courier activities; 5 - Mining of coal and lignite; 41 - Construction of buildings)

In 2020, a high number of people working in the public, health, social and public services sectors was recorded in Usti. At the same time, many inhabitants were employed in manufacturing industries, including the automotive, metalworking, glassmaking, and electrical equipment industries. A high employment rate was also observed in construction and basic commercial services with lower added value. Finally, the Usti Region, typical of an old industrial region, was characterised by a high number of people employed in power engineering, mining and processing of brown coal.

Graph 4: Sectoral structure of employment in 2020 – top 15 sectors by employment in Usti



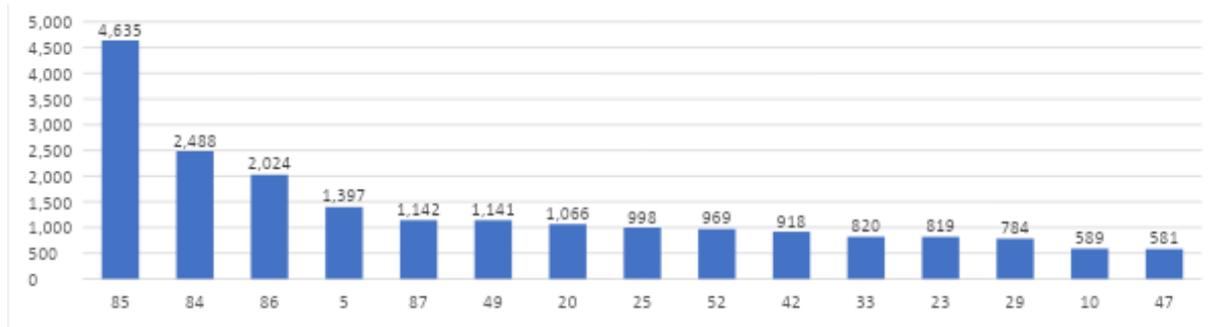
Source: Internal data of the Czech Statistical Office, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (84 - Public administration and defence; compulsory social security; 47 - Retail trade, except of motor vehicles and motorcycles; 29 - Manufacture of motor vehicles; 85 - Education; 43 - Specialised construction activities; 49 - Land transport and transport via pipelines; 86 - Human health activities; 25 - Manufacture of fabricated metal products; 23 - Manufacture of other non-metallic mineral products; 56 - Food and beverage service activities; 87 - Residential care activities; 46 - Wholesale trade, except of motor vehicles and motorcycles; 5 - Mining of coal and lignite; 35 - Electricity, gas, steam and air conditioning supply; 27 - Manufacture of electrical equipment)

Graph 5 presents regional characteristics in terms of age structure. The largest absolute number of people aged 55+ were employed in public, health and social services and in the traditional power engineering industry. Within the manufacturing industry, people aged 55+ were prevalent in capital-intensive and export-oriented industries. Many people aged 55+ were also recorded in routine consumer services with lower knowledge intensity and added value (e.g., transport and storage). At the

regional level, 22% of employed persons were aged 55+. A relatively large number of people aged 55+ were employed in power engineering and agriculture.

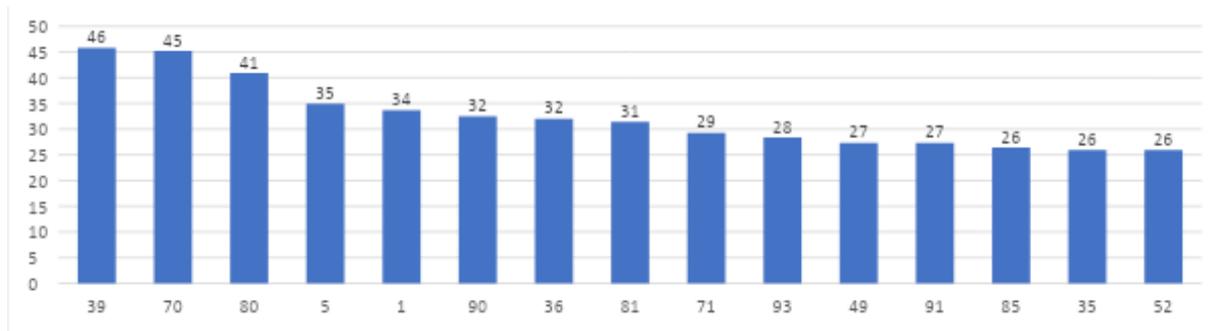
Graph 5: Number of employed persons aged 55+ in 2020 according to sectors in the Ústí Region



Source: Internal data of the UJEP, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (85 - Education; 84 - Public administration and defence; 86 - Human health activities; 5 - Mining of coal and lignite; 87 - Residential care activities; 49 - Land transport and transport via pipelines; 20 - Manufacture of chemicals and chemical products; 25 - Manufacture of fabricated metal products; 52 - Warehousing and support activities for transportation; 42 - Civil engineering; 33 - Repair and installation of machinery and equipment; 23 - Manufacture of other non-metallic mineral products; 29 - Manufacture of motor vehicles; 10 - Manufacture of food products; 47 - Retail trade, except of motor vehicles and motorcycles)

Graph 6: Percentage of employed persons aged 55+ in 2020 according to sectors in the Ústí Region



Source: Internal data of the UJEP, own elaboration

Note: Y-Axis = percentage and X-Axis = NACE Code (39 - Remediation activities and other waste management services; 70 - Activities of head offices; management consultancy activities; 80 - Security and investigation activities; 5 - Mining of coal and lignite; 1 - Crop and animal production, hunting and related service activities; 90 - Creative, arts and entertainment activities; 36 - Water collection, treatment and supply; 81 - Services to buildings and landscape activities; 71 - Architectural and engineering activities; technical testing and analysis; 93 - Sports activities and amusement and recreation activities; 49 - Land transport and transport via pipelines; 91 - Libraries, archives, museums and other cultural activities; 85 - Education; 35 - Electricity, gas, steam and air conditioning supply; 52 - Warehousing and support activities for transportation)

3.1.4 Unemployment

The region has been characterised by an above-average unemployment rate (see Table 6 and Figure 10). In 2010, unemployment reached 10.2% and was the highest in the Czech Republic. By 2019, it fell to 3.9%. In 2020, however, the unemployment rate again increased to 5.5% (growth index: 1.41).

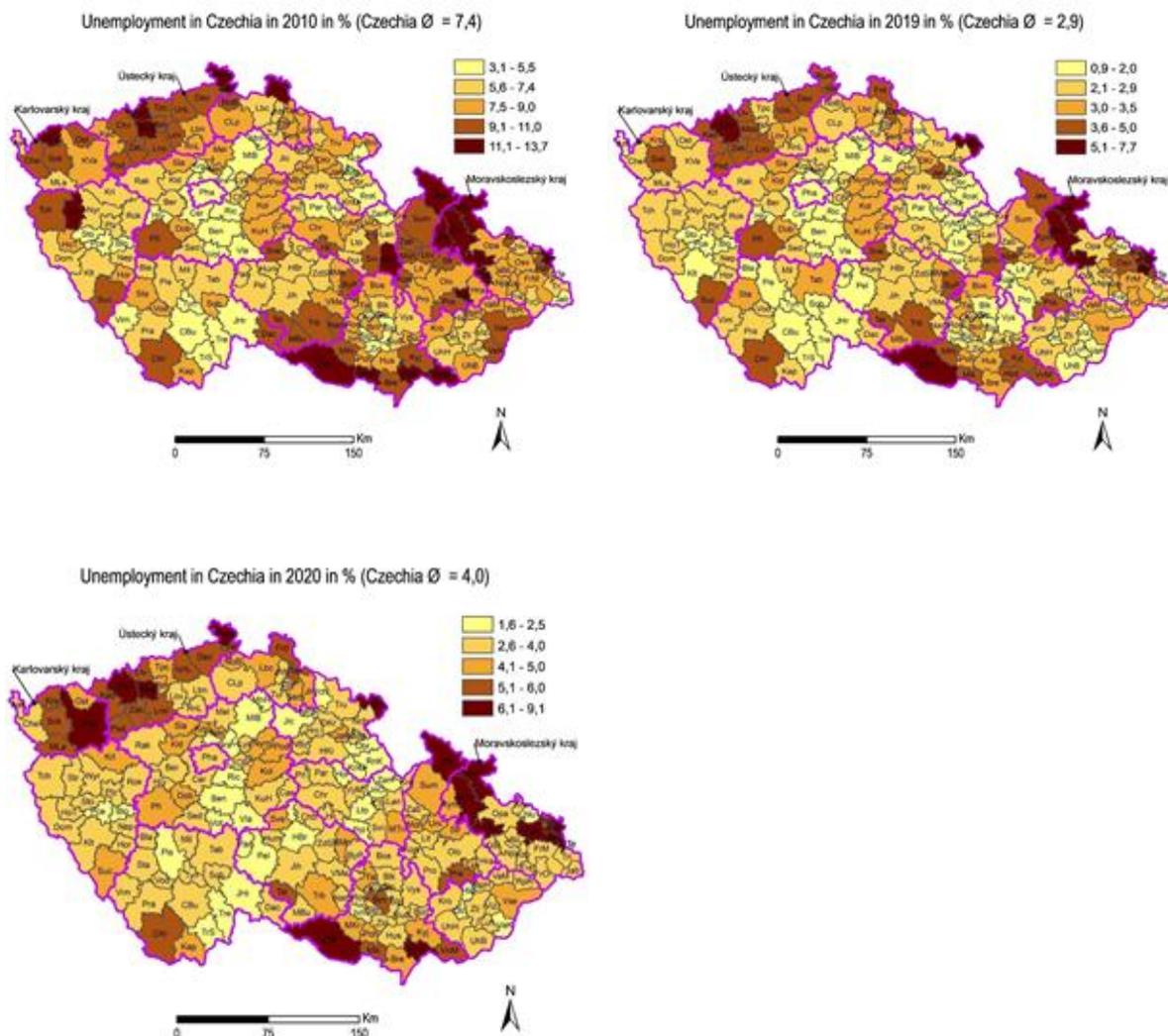
Table 6: Development of unemployment in the Czech Republic at the regional level in 2010–2020

NUTS3 region	Unemployment rate in 2010 in %	Unemployment rate in 2019 in %	Unemployment rate in 2020 in %	Unemployment change - index 2010-2019	Unemployment change - index 2019-2020
South Bohemian Region	6,4	2,3	3,2	0,36	1,38
South-Moravian region	8,5	3,5	4,5	0,41	1,31
Karlovy Vary Region	8,9	2,7	5,4	0,30	2,00
Vysočina Region	8,1	2,7	3,3	0,33	1,23
Hradec Kralove region	6,3	2,4	3,1	0,38	1,31
Liberec Region	8,1	2,9	4,1	0,37	1,38

NUTS3 region	Unemployment rate in 2010 in %	Unemployment rate in 2019 in %	Unemployment rate in 2020 in %	Unemployment change - index 2010-2019	Unemployment change - index 2019-2020
Moravian-Silesian Region	9,0	4,4	5,6	0,49	1,27
Olomouc Region	9,1	2,9	4,1	0,32	1,40
Pardubice Region	7,5	2,2	2,9	0,30	1,33
Pilsen Region	6,6	2,3	3,4	0,35	1,45
Prague	3,6	1,9	3,5	0,53	1,85
Central Bohemian Region	6,1	2,4	3,5	0,40	1,44
Ústí Region	10,2	3,9	5,5	0,38	1,41
Zlín Region	7,9	2,4	3,2	0,31	1,33
The Czech Republic	7,4	2,9	4,0	0,39	1,38

Source: Eurostat2021, own elaboration

Figure 10: Unemployment (%) in the Czech Republic at the micro-regional level in 2010, 2019, 2020

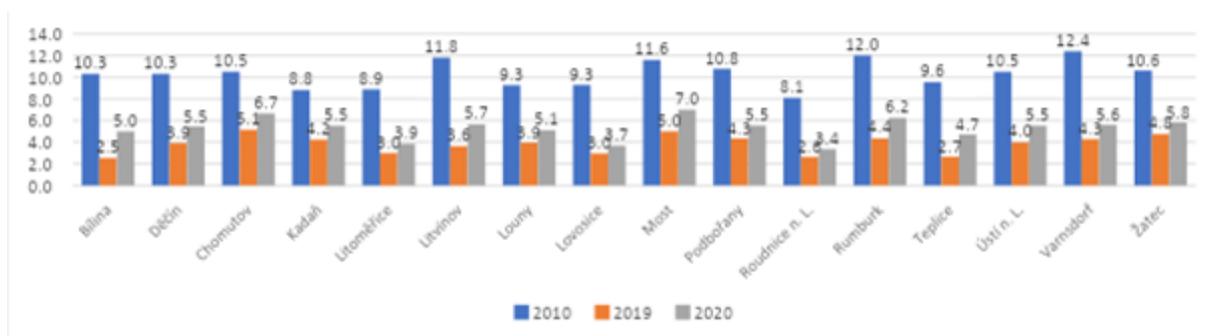


Source: Eurostat2021, own elaboration

In 2010, a relatively low unemployment rate was recorded in the southeastern part of the Ústí Region (rural micro-regions of Roudnice nad Labem and Litoměřice) and in the western periphery (Kadaň). By contrast, unemployment in the peripheral, rural micro-regions in the northern part of Ústí (Varnsdorf and

Rumburk) was comparatively high, followed by the industrial micro-regions Litvínov and Most. The regional unemployment at the micro-regional level in 2010 ranged from 8.1 to 12.4%. During 2010–2019, micro-regions experienced various dynamics in terms of unemployment. The smallest decline in unemployment was in the micro-regions of Chomutov and Kadaň, while the largest decrease in unemployment was recorded in the micro-region of Bílina. Spatial disparities also reveal interesting dynamics. The worst performing micro-regions were in the western part of the region, while better and above-average dynamics were achieved by micro-regions in the eastern and northern part of the region. The best performing micro-regions were in the central (north-southern) part of the region. In 2019, only the municipalities of Bílina, Roudnice nad Labem, and Teplice registered unemployment rates below the national average. Unemployment at the micro-regional level ranged from 2.5 to 5.1% in 2019. The impacts of the COVID-19 pandemic were reflected in an increase in unemployment in the industrial-dominant micro-regions of Bílina, Teplice, Litvínov, and Most. In terms of spatial differentiation, the unemployment rate in the Ústí Region did not change much during 2010–2020. The unemployment rate in micro-regional level ranged from 3.4 to 7.0% in 2020.

Graph 7: Development of unemployment (%) in the Ústí Region at the micro-regional level in 2010–2020



Source: Eurostat2021, own elaboration

General spatial patterns of unemployment at the level of micro-regions reflect structural characteristics. High unemployment is typical for micro-regions characterised by so called “bad specialisation”⁵² (although they more diversified today) such as Chomutov, Most, Kadaň or peripheral micro-regions. By contrast, relatively low unemployment characterises micro-regions with long-term “good specialisation” (Bílina, Teplice) or micro-regions near Prague with a dominant firm (Roudnice n. Labem, Litoměřice).

3.1.5 Demographic analysis

In 2020, the Ústí Region was the fifth most populous higher territorial self-governing unit in the Czech Republic. In 2008, the region had a total population of 835,891. The largest populations were in the Ústí micro-region and the industrial regions such as Most and Chomutov. Smaller populations were mostly in rural and peripheral regions. As a rule, micro-regions located in the Ore Mountains, the lowlands (agricultural) part of the region and peripheral rural micro-regions located in the Šluknov Hook foothills had lower populations. During 2008–2020, the Ústí Region population declined by 18,887 inhabitants, amounting to a loss of more than 22 inhabitants for every 1,000 inhabitants. High population declines were observed mainly in industrial (Litvínov, Teplice, Most) and urban (Ústí and Děčín) micro-regions. The population also decreased in peripheral micro-regions which is a result of a natural decline of the population as well as outmigration. In terms of both the absolute and relative numbers, the largest increase in population was recorded in the Bílina micro-region, as well as in rural micro-regions located on the main development axis along the D8 (Roudnice nad Labem and Lovosice) and D7 (Žatec) motorways.

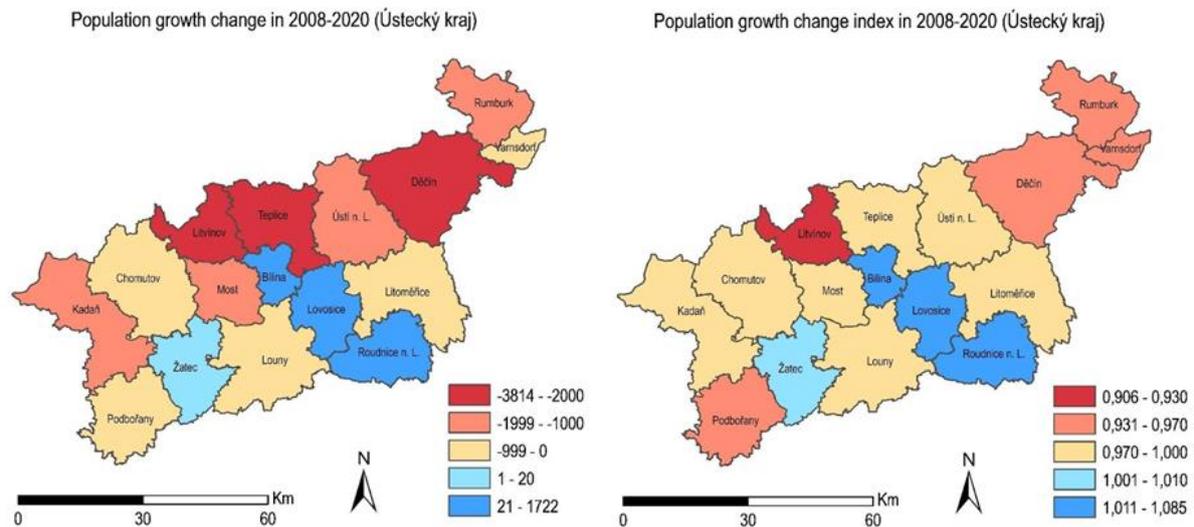
The cause for the negative trend in the change of the regional population is a natural decline in population which has been recorded in most micro-regions. The largest natural decrease was recorded in the industrial microregions of Litvínov and Teplice, followed by rural micro-regions (Podbořany, Rumburk). Some rural micro-regions (Lovosice, Roudnice nad Labem) that observed population growth were simultaneously not able to offset a decline in population due to a natural decline. Only three

⁵² Inspired by Kemeny and Storper 2015, Kemeny, T., & Storper, M. (2015). Is specialization good for regional economic development?. *Regional Studies*, 49(6), 1003-1018.

microregions achieved a natural population increase in 2008–2019, namely the urban micro-regions of Ústí, Chomutov and, quite surprisingly, also the peripheral rural Varnsdorf.

From 2008-2020, the Ústí Region saw a negative migration balance. Eight regions observed migration outflows during 2008–2019. The largest increase in migration could be seen in the Bílina micro-region (+90) and rural regions located in the Ore Mountains and lowlands (agricultural) of the region, as well as the development axes such as Roudnice nad Labem (+43), Lovosice (+42), Louny (+18).

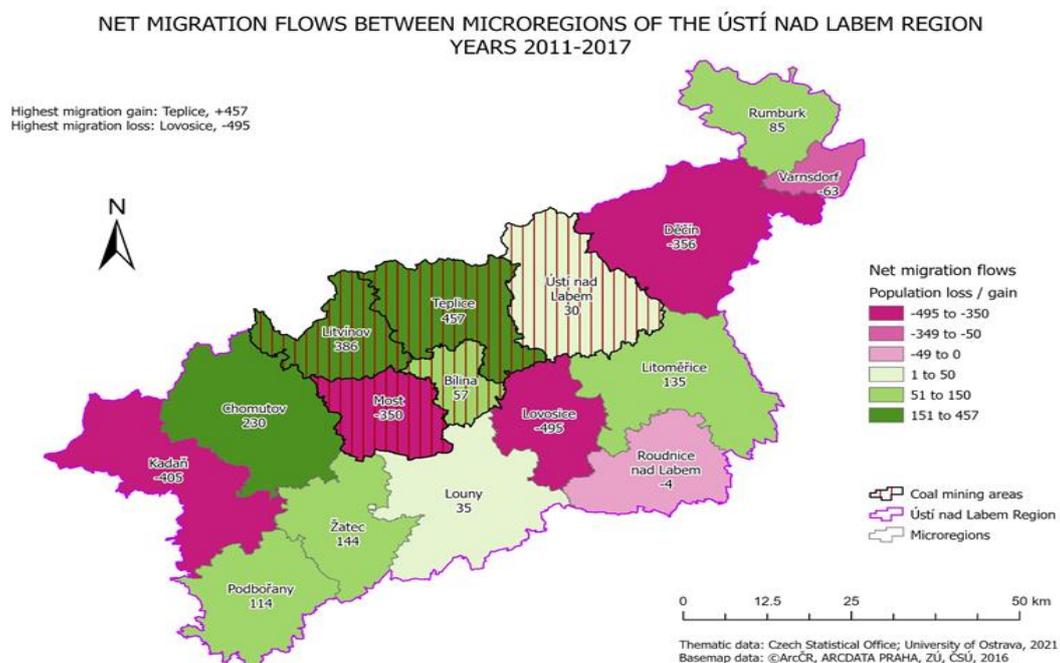
Figure 11: Population change, 2008–2020



Source: Czech Statistical Office (2021), own elaboration

Internal migration in the Ústí Region shows cities losing ground to rural micro-regions (due to suburbanisation) while also gaining from other, economically less successful (coal) micro-regions (Most, Kadaň, Litvínov, Chomutov).

Figure 12: Net migration flows between micro regions of the Ústí Region, 2011–2017



The Ústí Region is one of the youngest regions in the Czech Republic in terms of demographic composition. Although the population of 65+ accounted for only 15.7% in 2013, the population recorded an increasing aging process⁵³. Between 2011 and 2017, 88% of municipalities recorded an increase in

⁵³ CSO 2013

the aging index. However, the region has some demographic potential, at least in the context of similar regions. During 2011-2017, 45,101 inhabitants moved out of the region (CSO, Internal migration flows 2017), with more than 49% of all emigrants coming from the age groups 20-29 and 30-39. The relatively high proportion of age groups 0-9 and 10-19 suggests that larger multi-member households are moving out of the region. As is the case in most Czech regions, the main magnet for migrants was Prague and its surroundings (15.4%) or other economically successful cities such as Pilsen and Liberec. However, Ústí gained some population from Karlovy Vary and, somewhat surprisingly, from the Central Bohemian Region. In this case, the growth of living costs (especially real estate prices) seems to play a role, pushing the population from the vicinity of Prague to the Ústí Region. If this assumption is valid, there is a risk of an increase of so-called social filtering⁵⁴ to Ústí's disadvantage. The main push factors can be considered the low attractiveness of the labour market and the negative image of the region.

Figure 13: Net migration flows for the Ústí Region, 2011–2017

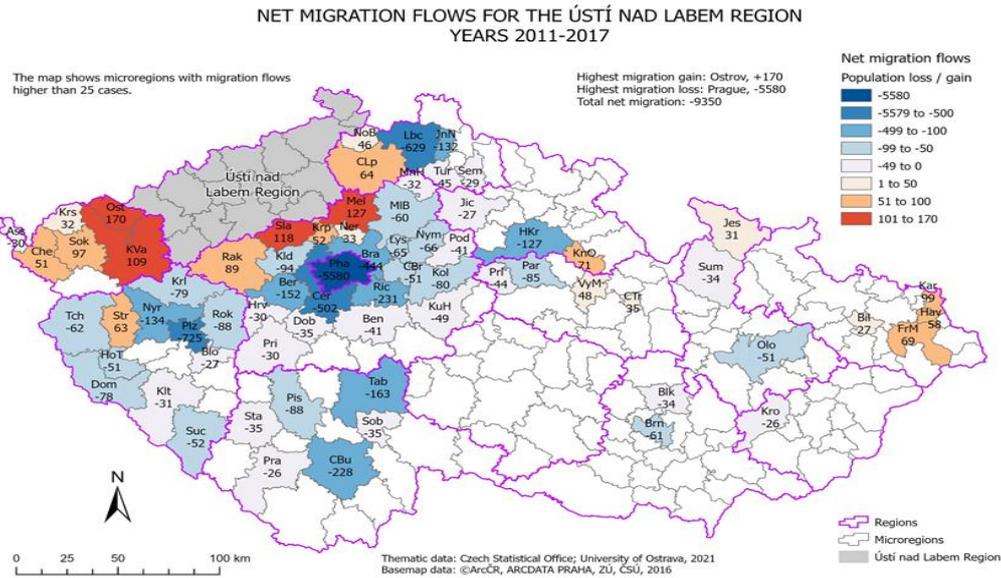
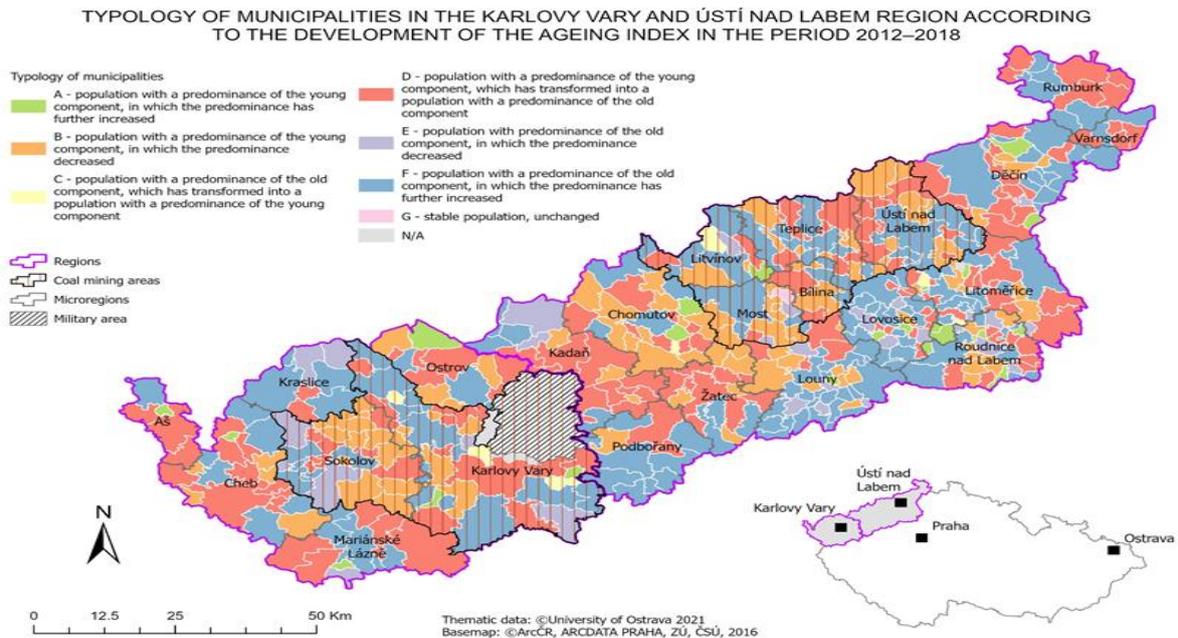


Figure 14: Typology of municipalities in the Ústí and Karlovy Regions, 2012–2018



⁵⁴ The “social filtering” was used in Hoyt, who has studied the process of social differentiation in U.S. cities. For more details see Hoyt, H. (1947). The effect of cyclical fluctuations upon real estate finance. The Journal of Finance, 2(1), 51-60.)

Despite the relatively promising demographic potential, the population is expected to decline from the current 815,209 (March 2021) to approximately 718,585 (11.9% decline) by 2051 according to forecasts. The 65+ population is also expected to increase to account for 31.7% of the region's population by 2051. This is, however, only 1% higher than the national average. The average age of the population is expected to increase from 40.6 years in 2013 to 42.2 years in 2019 and 48.8 years in 2050.

3.1.6 Energy and heating sector

3.1.6.1 Renewable energy

In 2019, the Ústí Region had a total installed capacity of 5,660.4 MW and a total of 25,5987.9 GWh of gross electricity was produced, which accounts for nearly 30% of energy electricity production in all of the Czech Republic and is clearly the most among the Czech regions (Czech Statistical Office, 2020). The main energy sources were 79.4% lignite, 15.0% natural gas and 5.3% from renewable sources (wind, photovoltaics, water, biogas, and biomass). The share of electricity consumption in the region is also relatively high: 10.2% of total consumption in the Czech Republic, i.e., the third highest value among Czech regions). A high number of employees also operate in the energy sector (around 6,000 in 2020).

The Ústí Region has the fifth highest installed capacity of renewable energy sources per capita (0.33 kW). The largest share of installed capacity consists of photovoltaics (177.24 MW) and wind power plants situated in the Ore Mountains (87.10 MW), which has the highest capacity from the Czech regions (Figures 15 and 16).

Figure 15: Total installed capacity of renewable energy (biogas, photovoltaics, and wind turbines) in the Czech Republic

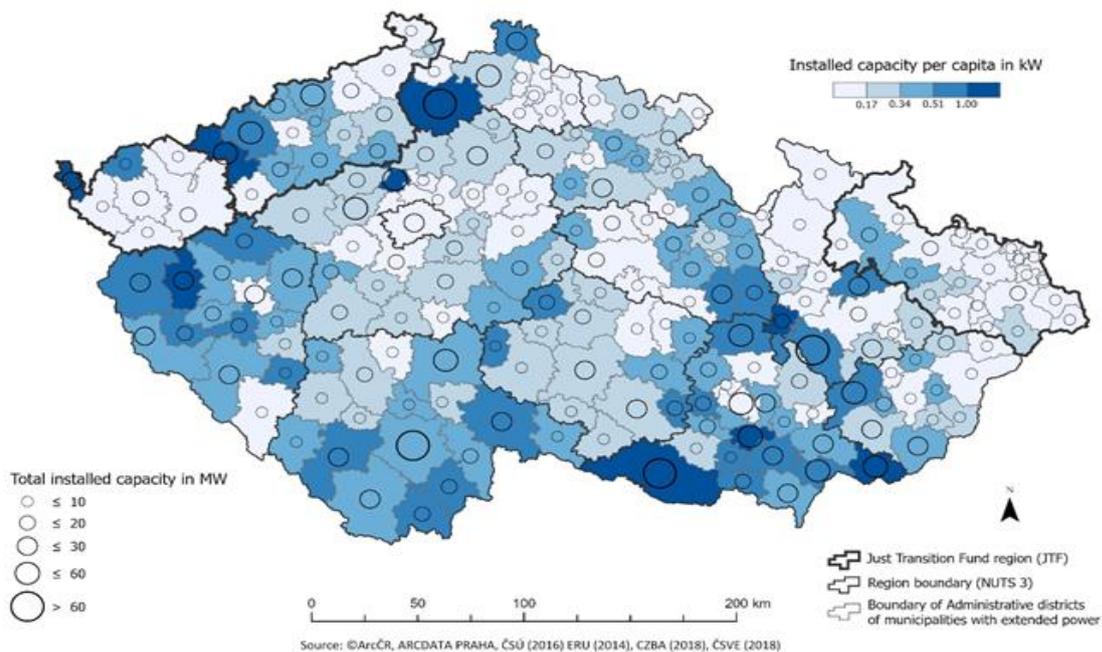
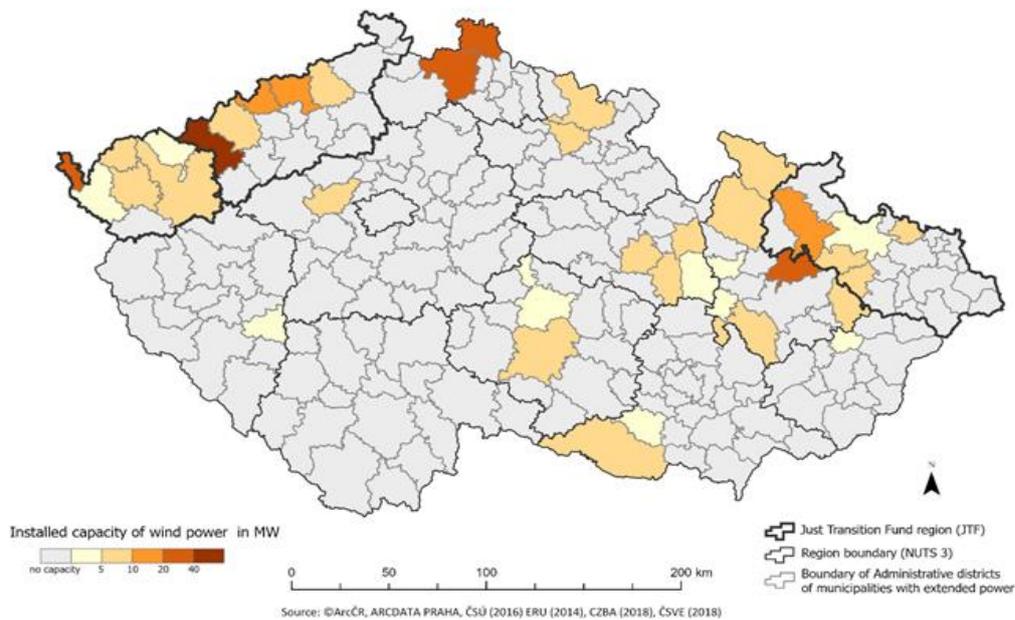


Figure 16: Total installed capacity of wind power in the Czech Republic



Below, the TA team assesses RES potential in Ústí Region; additional details on the modelling assumptions are in Annex 3. In Ústí Region, the potential for geothermal energy is considered to be higher compared to other regions. However, in absolute numbers, it is still relatively low compared to other RES technologies. The NECP assumes that 400 TJ of electricity and 1,600 TJ of heat will be produced in the Czech Republic by 2030. Even if we assumed this potential would be located in two regions (Ústí, Karlovy Vary), it would represent less than 1 % of installed (power) capacity in the region.

In the case of hydropower, there is some, but not substantial, potential to increase hydroelectric power generation in the case of 'repowering', i.e., where technology at existing sites is replaced by newer and more efficient technology. In the case of reclamation of closed opencast lignite mines, one of the methods of reclamation discussed is flooding them with water and possibly using them for pumped storage, which is currently discussed primarily in the Ústí Region⁵⁵.

More importantly, wind power has a lot of development potential in Ústí Region. According to a study by the Institute of Atmospheric Physics⁵⁶, the potential for wind is 314 MWe, which is nearly four times the current installed capacity.

As for PV, the NECP assumes that there should be roughly 2,000 MWe newly installed PV by 2030. When recalculated to the Ústí Region⁵⁷, the current installed capacity could roughly double to 162 MWe. Additionally, the floating photovoltaics has been one of the projects under preparation in one of the lakes that will be formed after flooding of the mines. On 600 ha, it could bring additional 500 MW, thus tripling the potential^{58, 59}.

3.1.6.2 Heating sector

The total installed capacity for district heating in the Ústí Region was 10.2 GWt in 2020, which was roughly 25% of the total installed capacity of Czechia. The table below lists the largest heating plants in the region (i.e., output above 20 MWt). Of the nine plants exceeding this threshold, the largest powerplant, Počerady, had a thermal output of 2.4 GWt. Additionally, there are about 30 other licensed heating plants with a heating capacity under 20 MWt (and therefore outside EU ETS).

⁵⁵ https://ustecky.denik.cz/zpravy_region/u-jezera-milady-muze-vyrust-nova-precerpavaci-vodni-elektrama-20191010.html

⁵⁶ https://www.ufa.cas.cz/DATA/vetma-energie/Potencial_vetrne_energie_2020.pdf

⁵⁷ See the Annex 3 for methods of recalculation.

⁵⁸ <https://www.seznamzpravy.cz/clanek/miliardar-a-jeho-mordor-tykac-chysta-prerod-uhelneho-lomu-v-obri-jezero-167961?amp=1>

⁵⁹ In addition, there is obviously biomass potential. However, this is highly dependent on the given location as well as regulatory framework and thus exceeds the scope of this work. For additional reading on biomass potential in Czechia, please refer to e.g. <https://doi.org/10.1016%2Fj.rser.2020.110319> or <https://doi.org/10.1016/j.egy.2020.11.146>

Table 7: Heating plants in the Ústí Region with total thermal output above 20 MWt MW ⁶⁰

Licensed company	Total thermal output [MWt]
Elektrárna Počerady, a.s.	2,435
ORLEN Unipetrol RPA s.r.o.	1,508
United Energy, a.s.	1,079
Lovochemie, a.s.	175
Žatecká teplárenská, a.s.	37
ENERGY Ústí nad Labem, a.s.	248
TERMO Děčín a.s.	74
Mondi Štětí a.s.	662
ACTHERM, spol. s r.o.	84

The Ústí Region has not yet developed its regional strategy for the coal phase-out like Moravia-Silesia Region. However, we can assume that the key findings would be similar to those of the MS region and are in the MoIT strategy, i.e, a major role of natural gas, then biomass and energy from waste.

In the short to mid-term, we expect that natural gas will indeed play a major role in the sector transformation, followed by biomass and energy from waste. In this respect, the investment needs in Ústí Region stem from the national investment needs for the district heating sector and can be estimated at CZK 22–24 billion by 2030 (EUR 0.9 billion)⁶¹. However, in line with the need to avoid carbon lock-in of such solutions, the JTM (and other initiatives) should be instrumental in supporting and piloting low-carbon, non-combustion technologies (heat pumps, electric boilers, solar collectors, waste heat recovery). Those will also be a crucial part of the heating sector’s broader transformation as part of the overall sector coupling and decarbonisation⁶².

The transformation of the heating sector forms a substantial part of the overall transition of the region and affordable heat and energy access are undoubtedly an inherent part of the “just” transition. In the mid to longer run, the transformation of the sector will be realised in a wider context of the decarbonisation of the whole economy, including first and foremost energy efficiency and energy savings. The future of DH will be a mix of highly efficient cogeneration and direct electrification using RES (solar collectors, heat pumps). CHP systems can also be used for energy storage (power-to-heat technology), where CHP systems can efficiently use surplus electricity from intermittent sources (wind and solar) to generate and store heat using large heat pumps⁶³. Where possible, these systems should be explored and piloted as soon as possible⁶⁴.

3.1.7 Digitalisation and technological level

Based on a comprehensive analysis of the possible impacts of digitisation on the labour market, the NUTS 2 Northwest Region (i.e., Karlovy Vary and Ústí) is the most at-risk region in terms of digitisation. Even in terms of potentially new job opportunities, this region lags other NUTS 2 Czech regions. Based on the study, it can be assumed that the negative impacts of digitisation will prevail within the region (job losses due to digitisation will exceed the creation of new jobs directly linked to the digitisation of the economy). This is clearly related to the structure of the economy of the Ústí Region, which is oriented

⁶⁰ Přehled údajů o licencích udělených ERÚ

<https://licence.ero.cz/index.php> (Overview of licenses granted by the ERO)

⁶¹ More details about the district heating transformation strategy, the connected investment needs and the link to just transition can be found in Annex 3.

⁶² Please see more in Annex 3, Section on District heating for further details on both the current state of DH in Ústí region and the pathways for decarbonisation.

⁶³ The DH systems generally have some capacity to store heat either in their own distribution systems or in specially designed heat storage tanks.

⁶⁴ For instance, the City of Prague will explore the option to use the clean water from its waste-water treatment plant for large heat pumps. Given the topography, similar could be explored e.g., in Ústí.

towards a less qualified workforce. The latest study also classifies the Ústí Region among the regions with low capacity to embrace Industry 4.0 technologies such as autonomous vehicles or cybersecurity.

3.1.8 Key economic operators

Although it is assumed that the projects of key economic operators will be financed mainly from public or private sources, other than the JTF, planned activities of these entities represent an important part of the transformation story of the Ústí region. Especially the reclamation of mining areas connected with new expected investments and transformation of the energy sector may have major socio-economic impacts on the region. They are thus strategically important for the regional development, therefore their strategic plans cannot be neglected in our analysis.

In the Ústí Region, a significant share of the population is dependent on the coal industry. Nearly 80% of the Czech Republic's lignite is mined in the Ústí Region (North Bohemian Coal Basin), where more than 9,000 jobs⁶⁵ are related to coal mining in four coal mines (some sources indicate even higher employment – more than 13,000 jobs⁶⁶). Lignite is then burned in the largest Czech coal-fired power plants (Prunéřov, Tušimice, Ledvice and Počerady), which provide about 20% of the total electricity produced in the Czech Republic. As most coal-based power generation capacity is located in Ústí, the region is responsible for about 25.5% of national CO₂ emissions. Ústí has the highest per capita emissions in the country⁶⁷. Ústí region is also specific to a large number of related industries with high energy intensity (steam, heat, and electricity), the production of chemicals and chemical products, the production of other non-metallic mineral products, and the production of paper and paper products.⁶⁸ Therefore, the region shows both tremendous potential to contribute to the low-carbon transition while at the same time, it faces a significant challenge because of the dominance of coal in its economic structure.

The following mining companies are located in the Ústí Region⁶⁹:

- Severočeské doly (mining site ČSA already in decline, Tušimice and Bílina): 4,776 employees
- Vršanská uhelná a.s. (Seven Energy, mining site Lom Vršany): 6,888 employees
- Severní energetická: 759 employees
- Coal services: 976 employees

The estimated number of jobs in suppliers for these companies is almost 18,000.

There are 35 EU ETS installations located directly in the Ústí Region. Companies from regional traditional industries are among the main CO₂ emitters. These companies include actors in the energy and heating sector, manufacturing of the non-metallic mineral products (such as glass and ceramics) and the manufacturing of chemicals and chemical products (see Table 8). These companies are also among the key employers in the region. In addition to the estimated 15,000 employees in the energy and mining sector in 2020, nearly another 11,000 jobs relate to manufacturing of non-metallic products, 5,500 jobs relate to manufacturing chemicals and chemical products and 15,000 jobs relate to the manufacturing of fabricated metal products, except machinery and equipment⁷⁰.

Table 8: Ústí Region - Distribution of EU ETS installations by sectors

CZ NACE classification of economic activities	Number of EU ETS installations
17 Manufacture of paper and paper products	2
20 Manufacture of chemicals and chemical products	6
23 Manufacture of other non-metallic mineral products	12
24 Manufacture of basic metals	2
25 Manufacture of fabricated metal products, except machinery and equipment	1

⁶⁵ ČSÚ (2021): Statistické ročenky krajů. [cit. 2021-03-30]. Retrieved from: <https://www.czso.cz/csu/czso/katalog-produktu>.

⁶⁶ annual reports of companies 2020, Asistenční centrum (2020) Podkladová analýza pro přípravu a implementaci Územního plánu spravedlivé transformace pro Ústecký kraj

⁶⁷ https://www.oecd-ilibrary.org/urban-rural-and-regional-development/oecd-regions-at-a-glance-2013_reg_glance-2013-en

⁶⁸ Investment Guidance on Just Transition Fund 2021-2027 for Czechia_ Annex D

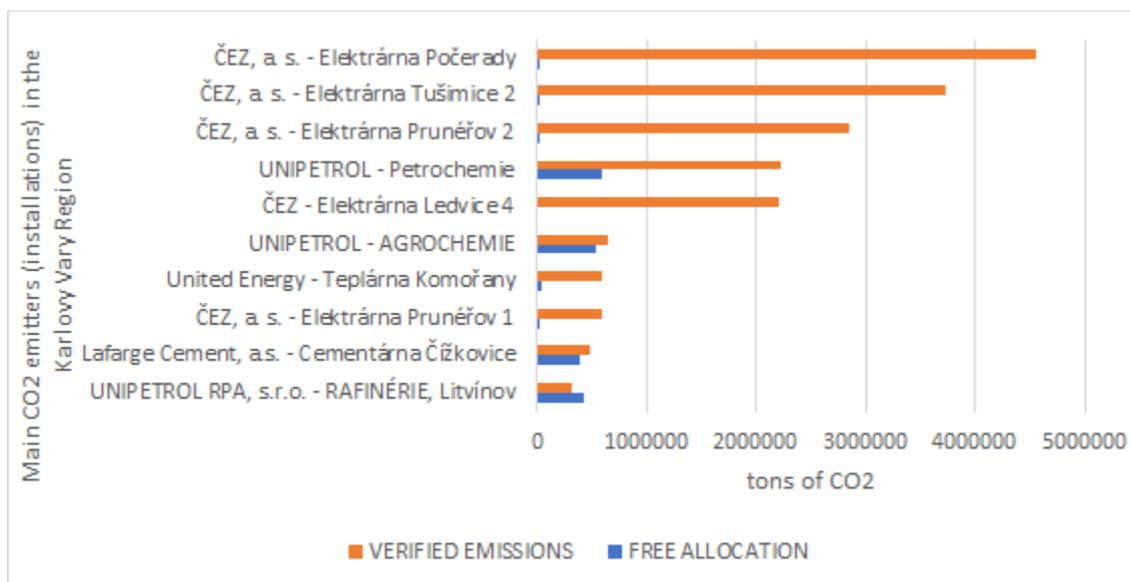
⁶⁹ annual reports of companies 2020, Asistenční centrum (2020) Podkladová analýza pro přípravu a implementaci Územního plánu spravedlivé transformace pro Ústecký kraj

⁷⁰ ČSÚ (2021): Statistické ročenky krajů. [cit. 2021-03-30]. Retrieved from: <https://www.czso.cz/csu/czso/katalog-produktu>.

CZ NACE classification of economic activities	Number of EU ETS installations
35 Electricity, gas, steam and air conditioning supply	12
Total EU ETS installations	35

The top 10 emitters (see Graph 8) are represented mainly by coal-burning power plants operated by ČEZ, Sev.en Energy and ORLEN Unipetrol RPA. ČEZ in particular operated coal-burning power plants that used large amounts of the transitional allowances dedicated for the modernisation and greening of the installations (from 2013-2019, these allowances covered 49,036,647 tonnes of CO₂ emissions). The largest allocation of these allowances went to the Tušimice Power Plant (14,262,910), the Počerady Power Plant (13,096,155), which was sold to Sev.en Energy in 2021, and Pruněřov 2 Power Plant (12,718,060). Transitional allowances were also obtained by heating plants operated by United Energy in Komořany and by Actherm in Chomutov.

Graph 8: Verified emissions 2020 – top 10 CO₂ emitters in the Ústí Region



Nearly all of the main corporate emitters in the Ústí Region are preparing their own strategies and plans for diversification and transformation of their businesses towards a low carbon economy.

Company CEZ has publicly declared that it wants to go “green” much earlier than it originally planned. According to a statement from the CEO, the company wants to reduce the share of electricity production from coal in its portfolio from the current 40% to 25%.⁷¹ In 2030, energy from coal should make up only 12% of the total energy produced and it aims to be climate neutral in 2050. Measured by the amount of CO₂ produced per amount of electricity produced, this is a decrease from today's 0.36 tonnes of CO₂ per megawatt-hour to 0.26 in 2025 and 0.16 in 2030. It is expected that only lignite burning power plants Ledvice and maybe Tušimice will operate after 2030. One of the factors for acceleration of the plans is possible availability of private funding by banks and insurance companies, which demand such a commitment as well as increasing prices of CO₂ allowances.

Company ČEZ also expects large investments in its heating division, which will be reoriented to natural gas or biomass as well as investments in RES on reclaimed land after mining (in total, for the Czech Republic, there are plans for 1,500 MW of new photovoltaics)⁷². The investments to green the company are calculated to be about EUR 3.6 billion this decade. The company also envisages the use of public financing from the Modernisation Fund, the Just Transition Fund and other operational programmes. The company is also preparing other development projects for lithium mining or related battery production in a gigafactory on its land.

Sev.en Energy has also announced its transition plans. Main measures include the modernisation of the power plant Počerady (which was bought from ČEZ in 2021 and is the main stationary polluting installation in the Czech Republic) to meet new emission regulations. The company is also preparing

⁷¹ HN, 2021. Available at: <https://archiv.ihned.cz/c1-66928100-cez-chce-rychleji-zelenat-na-firmy-ktete-nejsou-odpovedne-neni-spolecnost-zvedava-rika-benes>

⁷² dtto

alternative projects for the future at the place of the current lignite burning power plant, such as natural gas power plant, a small modular reactor or power plant based on green hydrogen⁷³. At the ČSA quarry, they are preparing a pilot project of a floating solar power plant with the production of so-called green hydrogen. It is also possible to build a pumped storage plant on the planned lake. These projects will take time and are also subject to the allocation of subsidies, where the company plans to use sources from the Modernisation Fund for its projects.

Companies operating in other sectors are preparing projects especially in the areas of new technologies to reduce emissions and they typically improve their existing products, since the diversification of fuel source is not usually part of their core business. They are preparing investment in RES. Particularly in the manufacture of chemicals and chemical products, the focus is on the creating new, more environmentally friendly products and, in specific cases, introducing new recycling technologies to reduce dependence on fossil fuels. However, most companies do not expect projects that focus on regeneration and decontamination of sites, land restoration and repurposing projects (with exception of the mining sector).

Businesses in the energy sector will be affected the most, which we also demonstrate through separate modelling results. All companies across the coal regions participating in interviews to date have expressed their continuous need for qualified and/or requalified employees to implement the new strategies, diversify and upscale the business. The lack of such employees is expected to be amplified by the climate neutrality transition, which is expected to increase high value-added business in the regions and possibly amplify this need even further.

3.1.9 Challenges in the Ústí Region

The results provided in this chapter are mainly derived from the analysis of the current situation in the Ústí Region. However, we also analysed other relevant strategic documents, such as:

- Regional innovation strategy of the Ústí Region⁷⁴;
- Development strategy of the Ústí Region until 2027⁷⁵;
- The update of the Strategic Framework for Economic Restructuring of the Ústí, the Moravian - Silesian and the Karlovy Vary regions⁷⁶

The challenges/opportunities related to the transition process in the Ústí Region are interconnected, so we have identified the following set of challenges. The challenges/opportunities are ranked according to their importance and the intensity of their link to the transition process

- Low economic performance (divergence from the national level). The regional economy is dominated by a limited number of large firms (low diversity), some micro-regions are strongly dependent on a single company (Lovosice, Litoměřice, Litvínov).
- High unemployment and increasing regional economic polarisation (scattered spatial development creates a “Swiss cheese” structure) accompanied by a below-average level of entrepreneurship.
- Low level of primary, secondary, and university (mid-range regional university) education. More precisely, together with the Karlovy Vary, Ústí Region has the lowest share of tertiary educated inhabitants. According to the Czech School Inspectorate (2020), the region generally has a below-average share of pupils with the best results, on the contrary, it has a higher share of pupils who do not even reach the low level (valid for 1st level of primary school). The same holds true for secondary education. The university also achieves rather below-average results, for example in the field of science and research.
- Low regional capacities/funding absorption capacity. In the case of the Ústí Region, weak regional capacities can be considered an issue. Although the region has regional institutions, these are characterised by a certain weakness, which limits the support of cooperation in the region. Weak leadership and low trust between actors in the region cannot be overlooked either.

⁷³ HN, 2020. <https://archiv.ihned.cz/c1-66852970-odchod-od-uhli-je-nezodpovedny-nikdo-nevi-kolik-to-bude-stat-a-jen-na-zelene-elektrarny-se-spolehat-nelze-rika-sef-sev-en-energy>

⁷⁴ https://www.kr-ustecky.cz/assets/File.ashx?id_org=450018&id_dokumenty=1749678

⁷⁵ https://www.kr-ustecky.cz/flipbook/strategie_rozvoje_usteckeho_kraje/mobile/index.html#p=1

⁷⁶ <https://restartregionu.cz/content/uploads/2021/03/Aktualizace-Strategick%C3%A9ho-r%C3%A1mce.pdf>

- Depopulation – a combination of selective out-migration (brain-drain) and ageing. Increasing social polarisation/exclusion is accelerated through a process of social filtering (e.g., internal migration from Central Bohemia).
- Environmental burdens (especially landscape degradation). More specifically, the area affected by mining in the region is approximately 21,000 ha (4% of the region's area, CENIA 2018).
- Poor image and low quality of life in cities (Most, Litvínov), strong push factor for out-migration.
- Economic growth in recent years was driven predominantly by the inflow of foreign direct investments (FDI) with a rather low value-added FDIs (low-road strategy); additionally, the inflow of FDIs was spatially concentrated (Žatec, Louny).
- Fragmented (weak engagement of large firms in R&D cooperation on a regional level) and weak regional innovation system, more generally low innovation performance (weak R&D investments).
- Energy transition may increase the social vulnerability (energy poverty) of a large number of inhabitants.

3.1.10 Opportunities in the Ústí Region

- Innovation of education infrastructure (on all levels) and investments into human capital (education at all levels).
- Create critical mass in the regional research domain (e.g., chemical research, land recycling).
- Post-mining landscape as a new opportunity and laboratory for the use of new approaches (e.g., Internationale *Bauausstellung Fürst-Pückler-Land*) such as renewable energies, culture and creative industries.
- Well-developed knowledge capacity for brownfield regeneration ⁷⁷.
- New skills development for a more adaptable and future-oriented labour market.
- Development of green economy (e.g., recycling of land, materials), start-ups, SMEs. More intensive integration of foreign firms into regional innovation system (e.g., automotive).
- Potential to branch out from the chemical industry into the (new) related industries. New technologies (digitalisation, energy efficiency) can serve as drivers of regional restructuring.
- Amenity migration and region with a good transport connection (borrow the performance from Prague metropolitan region).
- The university as a regional leader (research, third mission).
- The region has hidden potential for cultural and creative industries (key actor Faculty of Art, UJEP).
- Unique opportunity for housing development such as waterfront (rivers, lakes).
- Support of new grassroots activities, mobilisation of social capital as a source for the bottom-up organic growth in the form of new use of (neglected) places left over after planning.
- Natural landscape (Krušné hory, Česko-Saské Švýcarsko) and industrial culture (tangible – mining past, intangible – mining identity) go hand-in-hand. The new combination as a driver of sustainable tourism development.
- Strengthening of cross-border cooperation with Saxony (difference in attractiveness, e.g., renewable energies, knowledge sharing).
- The region has the potential to further develop as a transport hub (good accessibility) using the potential of its good geographical location.
- Low prices (general low prices of inputs) and high availability of land for infrastructure projects (transport, housing).
- Renewable energies (above-average share of RES) and potential for grow.

⁷⁷ Klusáček et al. 2018

- Development on the metropolitan scale (integrated planning) and exploitations of polycentric regional structure (rebalancing of regional growth).

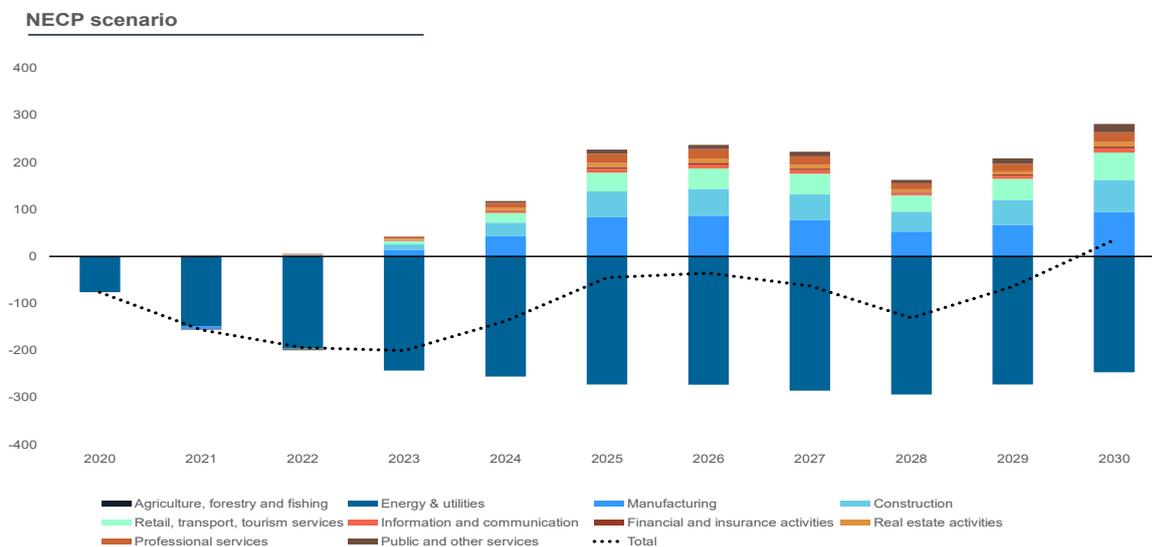
3.2 Impacts from climate transition

3.2.1 NECP impacts

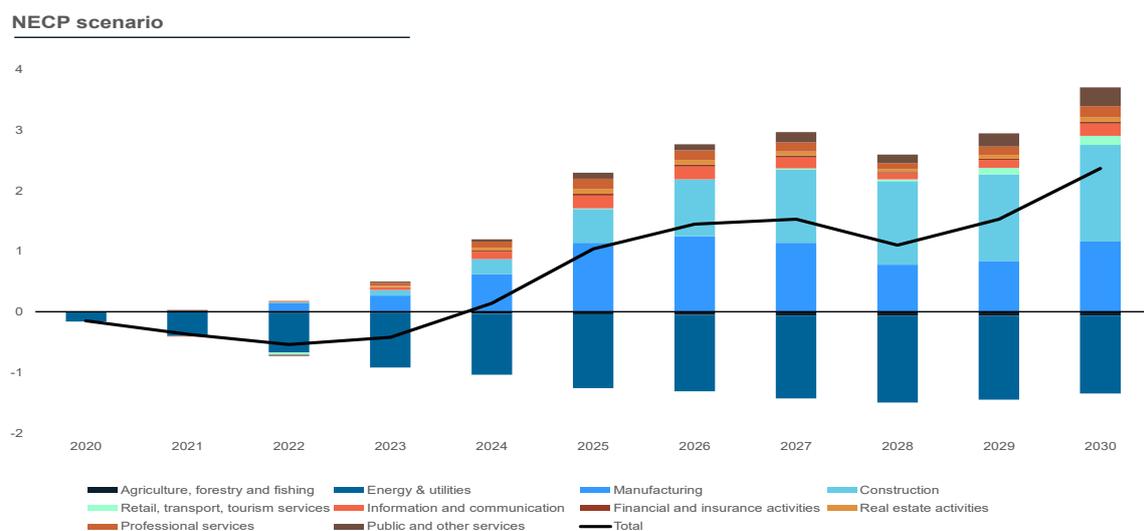
3.2.1.1 Regional impacts from modelling: Ústí Region

Modelling results underscore this phenomenon. Graph 9 shows declining GVA due to losses in the energy and utilities sector compared to the baseline. The net impact is negative throughout the period (with the exception of a small positive effect in 2030) as gains in sectors such as construction, retail and manufacturing (EUR 240 million at its peak, 2.1% of 2030 baseline GVA total) fail to offset the high losses (EUR 150-300 million, 1.3-2.7% of 2030 baseline GVA total) in the energy sector. Employment, as illustrated by Graph 10, paints a similar picture. However, the net effect is positive as the manufacturing and construction sectors create a higher number of jobs. This echoes the case of Karlovy Vary: new jobs gains are expected to be lower value-added, and therefore a lower GVA increase can lead to higher gains in employment.

Graph 9: Ústí Region - GVA in the NECP scenario, by sector, million EUR (2010) difference from baseline⁷⁸



Graph 10: Ústí Region - Employment in the NECP scenario, by sector, '000 jobs difference from baseline⁷⁹



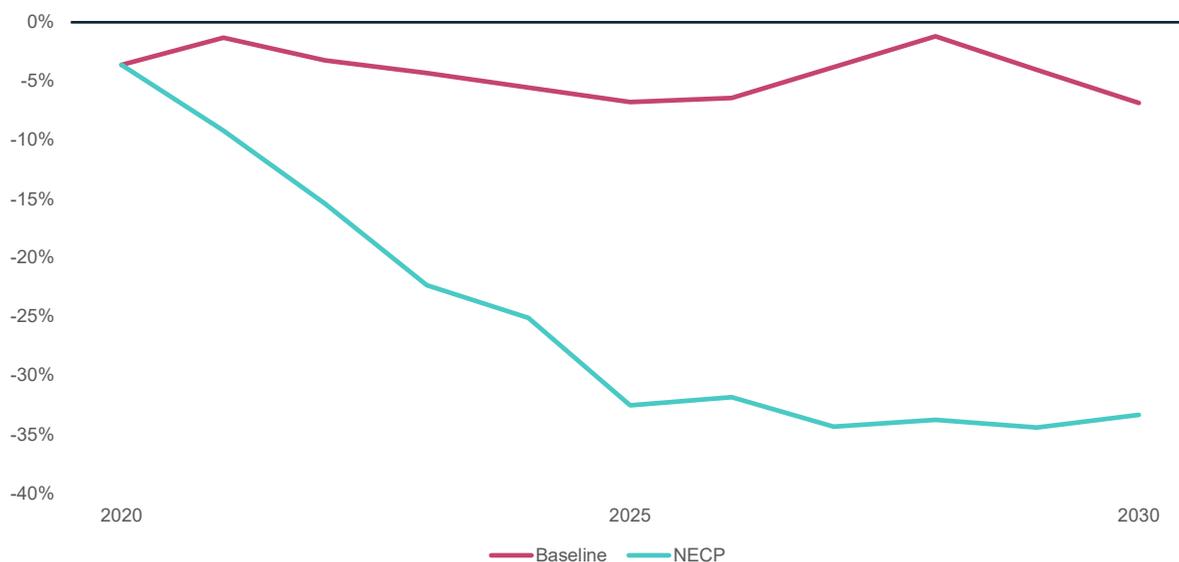
⁷⁸ E3ME modelling results

⁷⁹ Ibid.

The absolute employment impact – in line with the size of the region and total employment figures – is greater than in Karlovy Vary. The modelling shows that up to 1,500 jobs could be lost in the energy sector as an outcome of the transition, while other sectors, such as the construction sector, could show comparable gains. Nevertheless, these employment impacts are taken as net impacts, and while E3ME calculations consider some labour market-rigidity, to actually make this transition (i.e., employees transitioning from the energy sector to manufacturing), further support such as reskilling and retraining might be needed.

Finally, Ústí is responsible for a large share of national CO₂ emissions. In the baseline scenario, emissions from the region are largely unchanged compared to 2018. Nevertheless, in the NECP scenario, the reduction is substantial. By 2025, the reduction is 32.5%, which continues at a slower pace to 33.3% by 2030. In the NECP scenario, the reduction of coal-based PG mostly happens from 2020-2025, while it is fairly stagnant between 2025 and 2030 (see Graph 11). Given that the decarbonisation is more muted in Ústí compared to the national average (-43%) this means that under the NECP scenario, other regions have higher than average emission reduction rates. Nevertheless, it should be also noted that the level of reduction compared to the baseline is the highest among the target regions (27% by 2030).

Graph 11: Ústí Region: CO₂ emissions in the NECP scenario, % difference from est. 2018 values⁸⁰



3.2.2 Occupational mismatch analysis

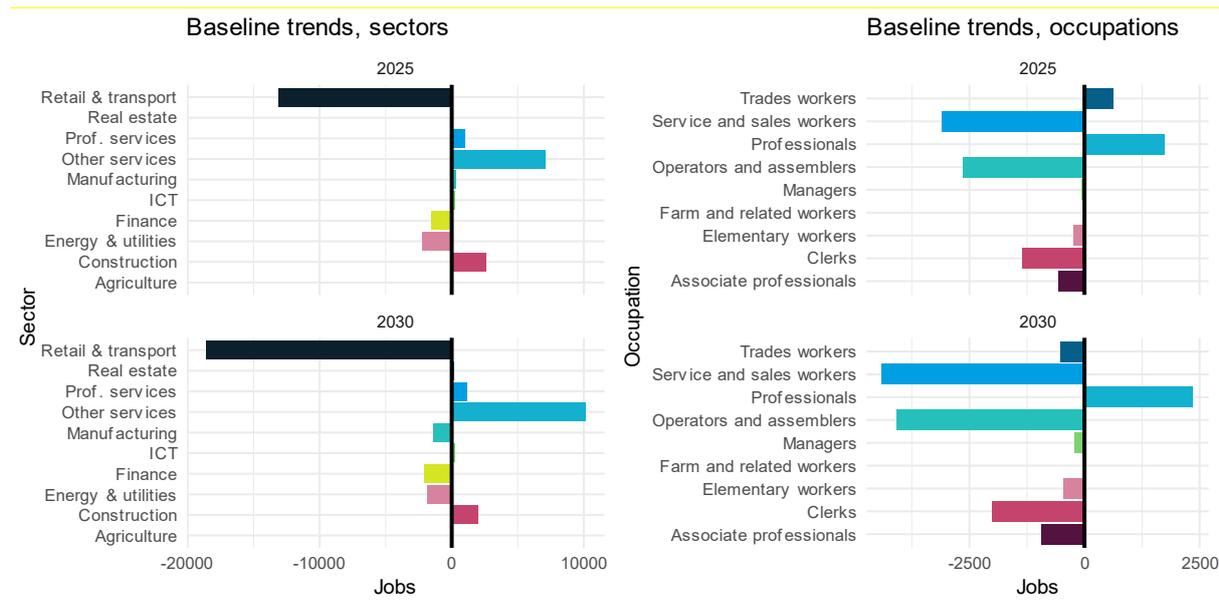
Baseline projections

Graph 12 shows the changes in the baseline from 2018 values in Ústí Region. Trends differ from the other two target regions quite substantially. Most importantly, employment in the baseline scenario grows in the public and other services sector (contrary to Moravian-Silesian and Karlovy Vary) and retail and transport shows a sharper decrease than the other regions. Both sectors are shown in cross-region comparison at the end of this note. These patterns are produced by the historical performance of these sectors in the region. The retail and transport sector in Ústí produced worse employment growth than the national average over the last decade, while the services sector produced much stronger growth. As in the projection method, this is understood as regional competitiveness (see the description of the regional modelling methodology in D3 “Report on the Transition Process to Climate Neutrality in the Czech Republic”).

In occupational terms, the baseline projection shows potential growth for higher-skilled professional occupations, while it shows negative outcomes for all other occupational groups (by 2030).

⁸⁰ E3ME modelling results

Graph 12: Changes in employment from 2018 in baseline projections in Ústí Region

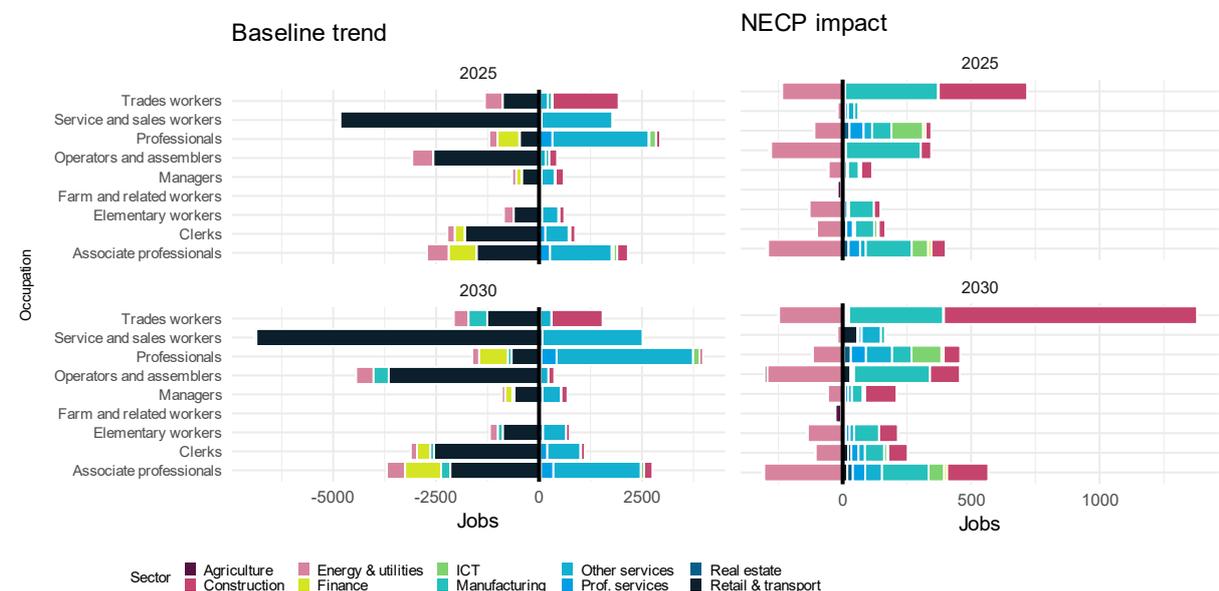


Note: left panel - changes by sector; right panel – changes by occupation

The detailed results (Graph 13) show that while the projected decline of the retail and transport dominates the results, gains are realised in occupational groups overlapping with where losses occur. Thus, although the employment loss from 2018 exceeds 18,000 jobs in the retail sector, gains in the services sector provides a within occupation transition opportunity for a substantial number of people.

NECP Impact

Graph 13: Changes in employment from 2018 in the Ústí Region (baseline and Green Deal scenarios)



Note: left panel – changes by sector and occupation in baseline; right panel – changes by sector and occupation in the Green Deal scenario compared to the baseline

The right panel of Graph 13 shows employment impacts of the NECP scenario compared to the baseline. As in other regions, we see a growth in construction and manufacturing employment, which offsets the potential negative labour impacts of the NECP scenario, concentrated in the energy and utilities sector. Further *net* gains, i.e., new jobs, are expected to draw upon a large base of potential employees (due to baseline trends). Baseline trends dominate the projected labour market transformation, and while the transition in general can contribute to the mitigation of the baseline losses (by creating new opportunities), it comes with its own challenges. Despite the net positive effects, occupation transitioning for current employees of the energy and utilities sector needs to be ensured.

3.3 Transition assessment

3.3.1 SWOT analysis

The aim of the analysis is not to provide an exhaustive list of factors influencing the development of the region, but to present the most pressing aspects of the region that relate to its current and future transformation into a low-carbon economy (Table 9).

Table 9: SWOT analysis for the Ústí Region

Strengths	Weaknesses
<p>Economy</p> <ul style="list-style-type: none"> - Location of the region on important development and transport axes (Prague - Ústí nad Labem - Dresden) - Location of University of J. E. Purkyne in the region - Development of traditional industries in the region (chemical and glass industry and energy) 	<p>Economy</p> <ul style="list-style-type: none"> - Reliance on sectors with lower added value in the global supply chains - Relatively lower entrepreneurial activity in the population - Low innovation performance and low R&D expenditure
<p>Society</p> <ul style="list-style-type: none"> - Still relatively favourable age structure of the population compared to other Czech regions 	<p>Society</p> <ul style="list-style-type: none"> - Socially excluded localities across the whole region - Low attractiveness of the region due to unfavourable regional image - Lack of qualified people in the labour market - Unfavourable educational structure of the population
<p>Environment</p> <ul style="list-style-type: none"> - Recovery of forest stands in the Ore Mountains after desulphurisation of power plants in the 1990s - Presence of attractive natural sites (e.g., National Park Czech-Saxon Switzerland) 	<p>Environment</p> <ul style="list-style-type: none"> - Devastated landscape after mining - Air pollution due to high share of coal-based heating systems and power plants
Opportunities	Threats
<p>Economy</p> <ul style="list-style-type: none"> - Land reclamation after mining as new development zones - Geographical proximity of Saxony and the possibility of cross-border cooperation - Possibility to establish a long tradition in energy and the development of new trends (renewable sources, hydrogen) - Cooperation of research and educational institutions with business and public sector 	<p>Economy</p> <ul style="list-style-type: none"> - Inability of energy-intensive industry to adjust to stricter environmental regulation

Strengths	Weaknesses
<ul style="list-style-type: none"> - Lithium deposits in the Ore Mountains - Decarbonisation sets free capital otherwise required for emission allowances under the ETS (and rising carbon prices) 	
<p>Society</p> <ul style="list-style-type: none"> - Proactive approach in employment policy (lifelong learning, retraining) - Active working with excluded communities - Improving the quality of the region's education system 	<p>Society</p> <ul style="list-style-type: none"> - Deepening of social inequalities and social problems in excluded localities - Rising unemployment and related social problems - Deepening the mismatch between supply and demand in the labour market
<p>Environment</p> <ul style="list-style-type: none"> - Until now, the untapped development potential of the Ore Mountains - Land reclamation after mining 	<p>Environment</p> <ul style="list-style-type: none"> - Old ecological burdens in abandoned industrial areas - Impacts of climate change (drought, bark beetle calamity, etc.)

3.3.2 Investment priorities

3.3.2.1 Pillar 1: Economy, business and innovation

Table 10: Overview of investment priorities in economy, business and Innovation in the Ústí Region

Investment priority	Prioritisation
Entrepreneurial ecosystem	Very High
Upgrading/Diversification of traditional industries/firm structure (SMEs)	Medium
IT technologies/digital economy/artificial intelligence	Medium
Research and development (public and private)	High
Regional capacity building	High

Entrepreneurial ecosystem – Very high importance

There have been efforts to build an entrepreneurial ecosystem in the region for some time, but there is room for improvement. Instead of investing in hard infrastructure, it is recommended to focus efforts on developing human capital in the form of talent; network density; support services; engagement, and leadership.

Upgrading/Diversification of traditional industries/firm structure (SMEs) – Medium importance

The potential for upgrading existing industries relates primarily to the chemical industry, which is historically embedded in the region. At the same time, it should be noted that there is a rather relative, than the absolute type of specialisation. Therefore, a medium priority has been set for this area, as well as for diversification. Given the low share of SMEs and their position within the GPN, support for these actors should be seen as a high priority.

IT technologies/digital economy/artificial intelligence – Medium importance

Rationale for priority identification: the region has a relatively weak potential for digitalisation and AI, which needs to be considered when identifying the relevance in the context of the JTF. Therefore, it is also recommended to support digitalisation in the public sector and to assist in the implementation of digitalisation in the private sector, especially for SMEs. In the case of artificial intelligence, attention should be paid to the transfer of innovation from the external environment.

Research and development (public and private) – Medium importance

The Ústí Region had one of the lowest indicators in research and development. The share of expenditures on research and development is below 1% of the region's gross value added. The private sector dominates R&D expenditure (~70%) and government expenditure for R&D is extremely weak. Support for R&D in the region should not be left out of the JTF, but it is a higher priority. Similar to MSR, JTF resources should be allocated in line with the newest Regional Innovation System strategy.

Regional capacity building – High importance

Weak regional capacities were identified in the Ústí Region. Investments in this field should support analytical, administrative and organisational capacities of regional (public) institutions. Strong regional institutions with strong leadership should lead to support of cooperation in the region and trust building, especially in the key field for the transition (e.g., energy, entrepreneurial ecosystem, human capital and land reclamation).

3.3.2.2 Pillar 2: Sustainable environment

Table 11: Overview of investment priorities in sustainable environment in the Ústí Region

Investment priority	Prioritisation
Green economy (e.g., land recycling, materials)	High
Modern energy systems - decentralised, diversified, environmentally friendly	Very High
Circular economy	Medium
Landscape reclamation, new development zones	Very High
Brownfields (industrial heritage utilisation/exploitation)	High

Green economy – High importance

A main goal of the transformation is to transform an economy from an unsustainable one based on fossil fuels to an economy that is sustainable and emission-free. The aim should be to focus on green technologies (supported by research), which can bring new green jobs to the economy, help with its diversification and bring higher value-added production. The priority should be not only be on eco-innovations in existing companies but also on the attraction of new technology companies.

Modern energy systems - decentralised, diversified, environmentally friendly – Very high importance

Rationale for priority identification:

The right mix of centralised and decentralised energy systems with a diverse portfolio of clean energy sources will be at the heart of the low carbon transition. While not at the core of the JTM priorities, energy efficiency as a first principle together with clean, affordable energy bring about clear non-energy “Just Transition” related benefits, such as the reduction of energy poverty, the enhancement of energy access and last, but not least, job creation. Therefore, these aspects should be an inherent part of the wider transformation of the region and energy efficiency, RES and energy communities can be widely promoted.

Regarding energy efficiency, the deep renovation of buildings needs to be substantially scaled up, with a special focus on vulnerable households. On the supply side, in Ústí Region, the potential for development of RES is very high. To reach the 2030 RES goals, the installed PV capacity should double

in the region. There is also potential for geothermal and wind power (which could increase by a factor of four). The district heating sector in the region is still largely dependent on coal and will have to undergo a major transformation. While natural gas is the main short-term solution, innovative options heading towards full decarbonisation of the sector and sector coupling should be explored (lowering temperatures in the systems, heat pumps, thermal storage, among others).

Circular economy – Moderate importance

The circular economy is certainly relevant in relation to the Just Transition. Based on the modelling of hypothetical scenarios used to estimate regional impacts of different policies, support of the circular economy could bring lower benefits in efforts to grow GVA and employment relative to other possibilities. Therefore, the priority has moderate importance and investments in research support and focus on specific sectors (e.g., chemistry) are emphasized in particular.

Landscape reclamation, new development zones – Very high importance

The development of large areas after coal mining are potentially a huge asset for the region. New reclaimed areas should be used multifunctionally. They offer not only space for recreational use with great development potential, including housing, but also for the development of new industrial zones and new energy in the region. These territories should always be approached comprehensively, and the "resocialisation" of these territories is an essential part. Their location is in the centres of localities, where the greatest socio-economic impacts of the transformation can be expected, so they represent a great development potential. As such, they have high importance for the future development of the region.

Brownfields – High importance

Due to the long specialisation in mining and heavy industry, there is a high number of brownfields (industrial buildings), which can be regenerated for a wider set of new activities, especially in relation to new business opportunities as well as improving quality of life of inhabitants.

3.3.2.3 Pillar 3: Inclusiveness, prosperity and diversity in the Ústí Region

Table 12: Overview of investment priorities in Inclusiveness, prosperity and diversity in the Ústí Region

Investment priority	Prioritisation
Re- and up-skilling for future oriented economic activities	Very High
Support of universities (all roles)	High
Primary and secondary education	Very High
Investments into quality of life of inhabitants – affordable housing, social, health and community-building, quality of the public space, leisure activities, etc.	Very High
Support of youth and disadvantaged groups (grassroots activities)	High

Re- and up-skilling for future oriented economic activities – Very high importance

The industries sensitive to the energy transition process (NACE 5, 17, 19, 20, 22, 23, 24, 25, 27, and 35) create around 45,000 jobs in the Ústí Region. The mining sector (approx. 6,500 jobs) and the energy sector (approx. 7,000 jobs) are the most represented sectors, where an intensive decline in the number of jobs can be expected. At the same time, the region appears to have a low level of education, a weak potential for digitalisation and a poorly developed green economy sector. This combination will put upward pressure on the labour market mismatch. Intervention is therefore necessary.

Support of universities (all roles) – High importance

The regional universities are partially locked-in mid-range status. To un-lock their potential for a regional transition, it is recommended to support all three roles of universities. More specifically, the projects related to universities should encourage their flexibility and autonomy to develop a regional mission. The JTF can be a vital and unique source of so-called "patient capital". Since universities are perceived as one of the key agents in research and development, special awareness is given to the second and

“third mission”. We are aware of the regional context, nevertheless, and the justification of this priority is almost identical with the Moravian-Silesian Region. Nevertheless, since the position of universities in the region is slightly less important, we assess this priority as a high.

Primary and secondary education – Very high importance

Since the region belongs, together with the Karlovarský Region, to the worst-performing education region in Czechia, support of primary and secondary education appears to be necessary. Additionally, if the region has the ambitions to improve the entrepreneurial ecosystem and the quality of labour, without good basic education, such activities can easily fail.

Investments into quality of life of inhabitants – Very high importance

As shown in our analysis, out-migration represents a key regional challenge. The region is coping with a low quality of life, which is perceived as an important push factor considering migration, especially for selected groups of the population. At the same time, the low quality of life hinders social upscaling in socially vulnerable groups. In short, the transition cannot be successful when the quality of life will be neglected. Therefore, high priority is given.

Support of youth and disadvantaged groups (grassroots activities) – High importance

Brain drain is a serious regional problem. Support of youth groups can help to tackle this problem. Additionally, the formulation of specific activities and projects should be designed in the sense of organising opportunities or providing vacant spaces rather than defining projects in a top-down sense. In other words, sources from JTF can help to create an enabling environment for new combinations stemming from the energy/enthusiasm of the youth and old regional structures (e.g., brownfields). Further, the inclusion of disadvantaged groups is an obligatory precondition to achieve Just Transition.

3.3.3 Strategic outlook for the Ústí Region

In the Ústí Region, despite partial successes, the transformation process towards sectors with higher added value in global value chains and based on knowledge and innovation has not yet been fully started. In recent decades, the specialisation of the economy has deepened but it lags behind other Czech regions in economic performance. The region is particularly lagging behind in terms of expenditures on research and development activities; however, it maintains a strong position of research in chemistry and could see to its further development. The region also faces unfavourable developments in other socio-economic indicators, such as unemployment, low education of the population, household indebtedness, brain drain, etc. Together, these factors create a negative image of the region. The social transformation with respect to social cohesion will be one of the region's greatest challenges.

The region faces a challenge in the form of reclamation of large areas after surface lignite mining, which, if successful, offers a huge potential of new development areas for further economic activities, whether in the form of recreation and related services, new industrial zones, energy use, etc. During its transformation, it can also benefit from the hitherto untapped potential of the natural beauties of the Ore Mountains and a number of industrial cultural monuments. The Ústí Region can also use its strategic position between the growing metropolitan areas of Prague and Dresden. Finally, the region has a strong tradition in the energy sector, which it already has used to spark a partial positive transition in the development of renewable energy sources and where it is already a leader in the Czech Republic. Given the energy intensity of key sectors, the energy transformation is both one of the main challenges, but also thanks to the new development areas, it also represents great potential for the region's development.

The Just Transition Fund is a great opportunity to start the economic and social transformation of the region, but it cannot cover all the transformation needs of the region. In this regard, it is necessary to prioritise critical activities that will bring the greatest development benefits to the Ústí region.

4 KARLOVY VARY REGION

4.1 State of play

The Karlovy Vary Region is located in the west of the Czech Republic on the border with the German federal states of Saxony in the northwest and Bavaria in the southwest. The region is characterised by a great diversity of natural and geographical conditions. The northern border with Saxony is created by Ore Mountains; the southern part contains the natural protected area of the Slavkovský Forest. The main river in the region is the Ohře, which flows through the three largest cities in the region: Cheb, Sokolov and Karlovy Vary. The region is characterised by a large number of cultural monuments.

The Karlovy Vary Region has 293,311 inhabitants and is the smallest region by population in the Czech Republic⁸¹.

The region has a diverse economy. While the districts of Cheb and Karlovy Vary focus on tourism and spas, the district of Sokolov concentrates in industrial production. Nearby Sokolov, there are also lignite deposits (the Sokolov basins) and related energy, chemical and engineering production. The mining of lignite and the Tisová lignite-fired power plant and gas-fired power plant Vřesová are operated by Sokolovská Uhelňá, a.s., which, with its 2,500 employees, is one of the largest employers in the region. Since 2020, Sokolovská has started to experience a more significant decline in mining and redundancies. However, the structural restructuring of the region began in the 1990s. In 1989, 12,000 people were employed in mining in the Sokolovská region (Smolová, 2008) while the number today is around 2,000. The people from declining industries were absorbed by the labour market. At the same time, spa and tourism services sector was developing significantly and nowadays this sector is very important for the region's economy. In 2010, most employees worked in the manufacturing industry, and particularly in the glass and ceramic industry, which is the primary traditional sector of the region. Other prominent sectors include the manufacture of motor vehicles, metal structures and products, electrical equipment and textiles. For the most part, these are energy-intensive industries. As part of the ongoing transformation, the number of employees in the production of metal structures and products increased from 2010 to 2020 (+939 persons employed, growth index: 1.44) and the production of rubber and plastic products recorded employment gains of 814 (growth index: 2.16). By contrast, employment in the manufacture of motor vehicles surprisingly decreased by 634 (growth index: 0.75). The number of employees also decreased in traditional industries. From the point of view of the region's transition to a low-carbon economy, it is essential, however, that the focus on energy-intensive industries has deepened, which further complicates the current starting position of the region.

One of the key problems in the Karlovy Vary Region is considered to be weak regional capacity, which limits the region's ability to cope with decline. Indeed, so-called "institutional thinness"⁸² indicates that the region lacks robust intermediary institutions as an important actor of successful regional development.

The region also benefits from its strategic location and proximity to Germany, which facilitates the export of many products and where a larger number of the region's population commute to work. Despite its strategic location, however, the region lags behind other Czech regions in terms of economic indicators. This points to the more significant structural problems of the region, which are both economic (e.g., production and export products with lower value added, low incomes) and social (e.g., population aging, low education, migration). Moreover, the Karlovy Vary Region (together with the Ústí Region) has the lowest public and private research and development expenditures in the Czech Republic and their overall Regional Innovation Index is significantly lagging behind other Czech NUTS 2 regions⁸³. Additionally, these disparities are likely to deepen in the coming years with the continuing transformation of the economy. The region is characterised by low growth dynamics, stagnation and negative development trajectories.

The Karlovy Vary Region is the worst performing Czech region in terms of education. Despite partial improvements in recent years, the region has the highest share of people with completed basic or no education. It also has below-average values for the university-educated population (second lowest after the Ústí Region) and the lowest number of university students. Moreover, the region is the only Czech

⁸¹ Czech Statistical Office, 2021

⁸² Amin, A., & Thrift, N. J. (1994). Globalization, institutional thickness and local prospects. *Revue d'Economie régionale et Urbaine*, 3, 405-427.

⁸³ EC. (2020). Regional Innovation Scoreboard 2019 – Czechia. Available at: <https://ec.europa.eu/docsroom/documents/35923>

region that does not have its own university, but there are open studying programmes through the University of West Bohemia in Pilsen on campus in Cheb.

4.1.1 Development of the economic performance

In 2000, GDP per capita in the Karlovy Vary Region amounted to EUR 11,500 (i.e., 63% of the EU average), eighth highest among Czech regions. From 2000–2008, the region was characterised by economic growth mainly due to the Czech Republic’s accession to the EU in 2004. During this period, the Karlovy Vary Region had the lowest GDP growth per capita (growth index: 1.31) of all Czech regions, thus falling to the last place in terms of GDP per capita (EUR 15,100 or 60% of the EU average).

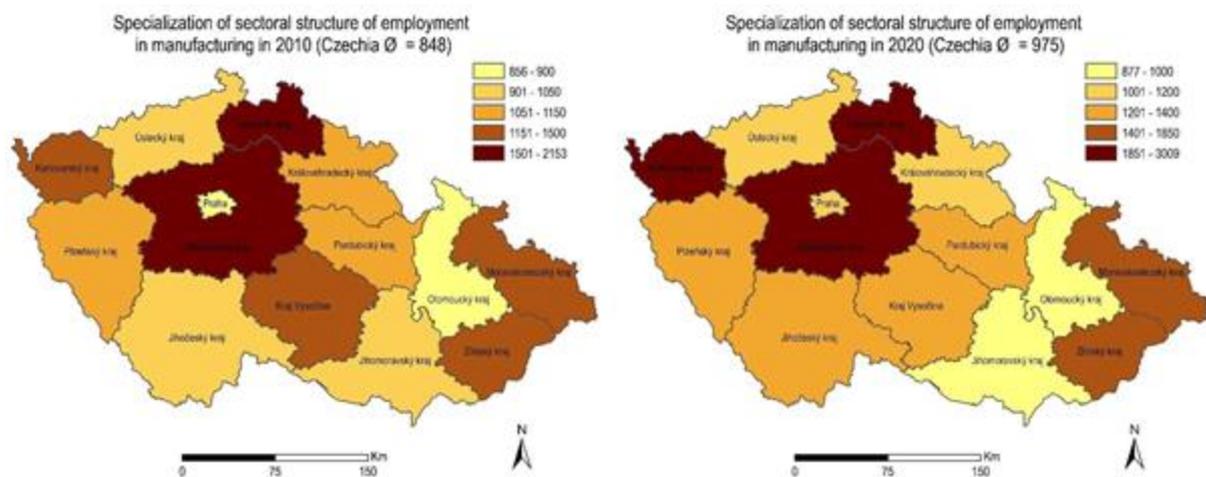
The 2008–2010 period was marked by the global economic crisis. The adverse, immediate impact of the economic downturn (2008–2009) manifested in the Karlovy Vary Region first by stagnation and then by a decrease in GDP per capita of EUR 400 from 2009–2010 (i.e., a decrease of 2.64%). The declining GDP per capita indicates the region’s slow response to a destabilisation phenomenon, which was manifested by a delayed effect of the economic shock on the decline in GDP. The slow response is particularly characteristic of economically lagging regions, which may be relatively more resilient in the first phase of the shock. There was also a decline in GDP per capita in the Karlovy Vary Region in 2011 and 2012. In the following years, there was a gradual increase in GDP and, since 2015, the growth of the GDP per capita indicator has accelerated. In 2008–2020, the Karlovy Vary Region was the second lowest among Czech regions (growth index: 1.18), with only the Ústí Region scoring worse. In 2020, the Karlovy Vary Region reported GDP per capita of EUR 17,800 (i.e., 59% of the EU average). In the (sole) case of the Karlovy Vary Region, there was a decrease in GDP compared to the average value of GDP per capita at the EU level (by 4 percentage points compared to 2000).

The analysed data suggest that disparities are deepening between Karlovy Vary and other Czech regions. In particular, the economic position of the Karlovy Vary Region has significantly deteriorated in 2008-2020 both nationally (from 8th to 13th among the 14 Czech regions), and in relation to other EU regions.

4.1.2 Development of the sectoral structure of employment in the manufacturing industry between 2010–2020 – HHI, FKI

In 2010, the manufacturing industry was highly specialised in the Karlovy Vary Region. Notable sectors included the manufacture of non-metallic mineral products, motor vehicles, metal structures and textiles. In general, the region was dominated by the specialisation of automotive (and related) industries. In 2010–2020, the specialisation of industrial sectors increased when there was a significant structural change in industry. In 2020, the region was among the NUTS 3 regions with the largest specialisation of the manufacturing industry. In the Karlovy Vary Region, the current development trajectory has deepened and the specialisation in traditional industries and industries related to transport have significantly strengthened. The declining specialisation of automobile manufacturing in the region has enabled a significant increase in specialisation in the manufacture of metal structures.

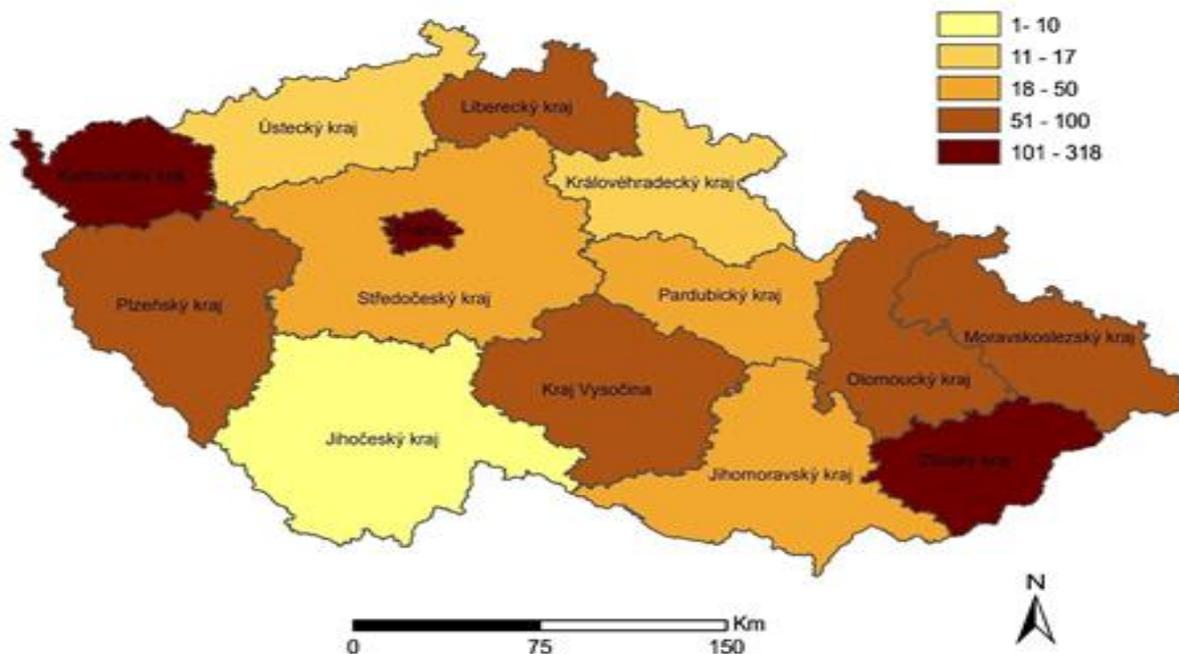
Figure 17: Specialisation of employment in the manufacturing industry at regional level in the Czech Republic in 2010–2020



Source: Czech Statistical Office 2021, own elaboration

In the Karlovy Vary Region, energy-intensive industries are significantly represented, mainly due to the presence of automotive related industries, and due to the manufacture of other non-metallic mineral products. From 2010 to 2020, specialisation in energy-intensive industries also significantly increased, with the Karlovy Vary Region recording the highest increase in this specialisation and simultaneously one of the largest structural changes [S61] compared to other Czech regions.

Figure 18: Change in the specialisation of employment (FKI) in energy-intensive industries at regional level in the Czech Republic in 2010–2020



Source: Czech Statistical Office 2021, own elaboration

4.1.3 Corporate structure at the regional level

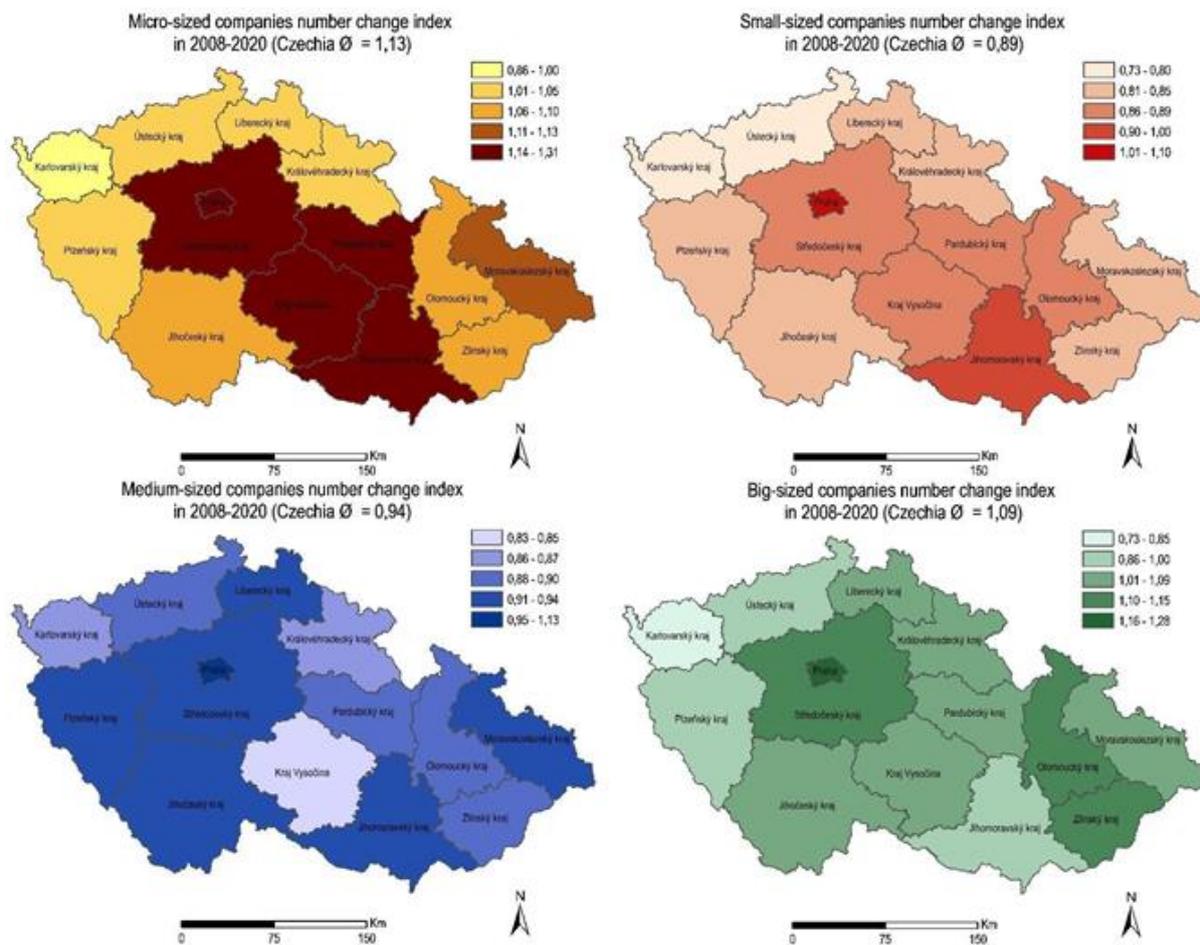
In 2008, economic activity exceeded the Czech average in the Karlovy Vary Region (262 economic entities per 1,000 inhabitants). The region thus ranked second after Prague by this metric. The largest share of economic agents were entrepreneurs/self-employed persons (178.92, third among Czech regions). The number of commercial companies was below average (13.59), as was the number of agricultural entities (6.16). Between 2008–2020, the Karlovy Vary Region was the only Czech region to record a decrease in the number of economic entities (change index: 0.96) and the region thus fell to sixth place out of the Czech regions. In the same period, there was a minimal increase in companies (growth index 1.30), while there was a decrease in entrepreneurship (growth index 0.94) and agricultural entities (0.42).

4.1.3.1 Size structure of companies

By firm structure, micro-companies (up to 10 employees) were predominant in the Karlovy Vary Region in 2008, although the number of 94.16 micro-companies per 1,000 inhabitants was still below the Czech average. The region had a relatively low representation of small companies (4.25), a slightly below-average representation of medium-sized companies (1.09) and the fourth lowest number of large companies (0.16).

Between 2008 and 2020, the Karlovy Vary Region was the only Czech region to record a negative growth dynamic in the category of micro-enterprises (growth index 0.86). The region also recorded the largest decline in small companies among Czech regions (growth index: 0.74). There was also a decrease in the category of medium-sized companies (growth index: 0.85) and the largest relative decrease was recorded for large companies (growth index: 0.73). The results are illustrative of deteriorating business activity in the region and point to the widespread cross-border commuting of workers to Germany.

Figure 19: Evolution of economic entities (aggregated units to 1,000) in the Czech Republic in 2008–2020

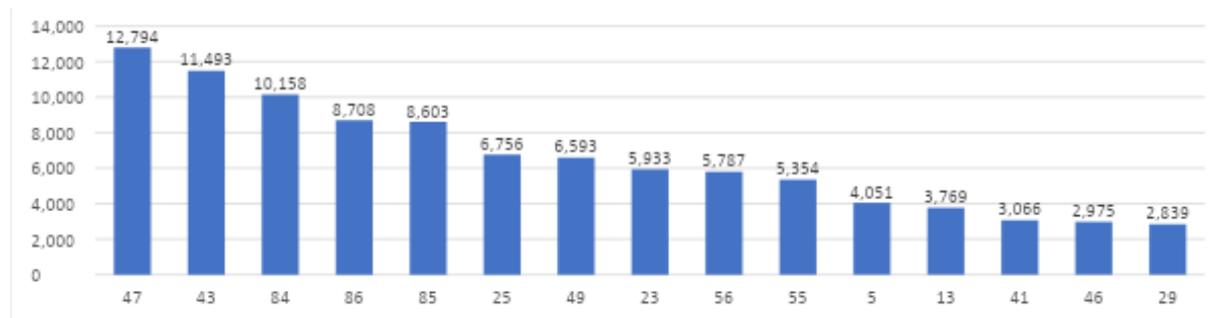


Source: Czech Statistical Office 2021b, own elaboration

4.1.3.2 Sectoral change in the Karlovy Vary Region 2008-2020

In 2008, the sectoral structure of employment in the Karlovy Vary Region was largely analogous to the Ústí Region. Employment was high in the retail and social/public services sectors. High employment in the health care sector (NACE 86) confirms the region's high specialisation in this segment. Export-oriented manufacturing industries (NACE 13, NACE 23, NACE 25 and NACE 29) and traditional mining and power engineering industries were also highly represented (Graph 14).

Graph 14: Sectoral structure of employment in 2008 – top 15 sectors by employment in the Karlovy Vary Region



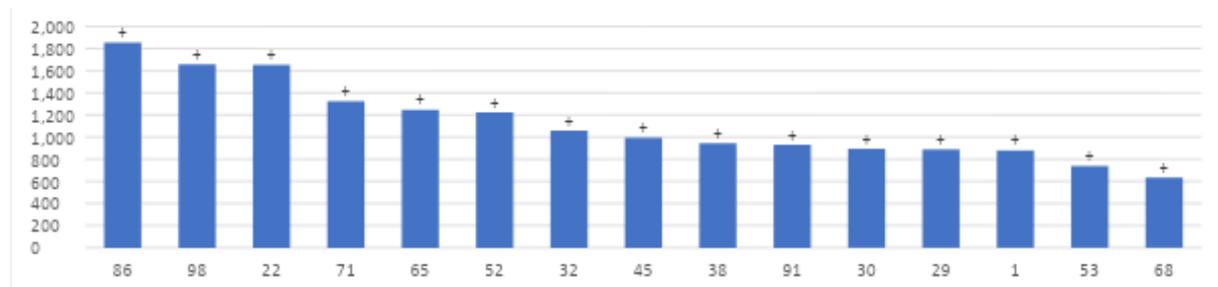
Source: Internal data of the Czech Statistical Office, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (47 - Retail trade, except of motor vehicles and motorcycles, 43 - Specialised construction activities, 84 - Public administration and defence; compulsory social security, 86- Human health

activities, 85 - Education, 25 - Manufacture of fabricated metal products, except machinery and equipment, 49 - Land transport and transport via pipelines, 23 - Manufacture of other non-metallic mineral products; 56 - Food and beverage service activities; 55 - Accommodation; 5 - Mining of coal and lignite; 13 - Manufacture of textiles; 41 - Construction of buildings; 46 - Wholesale trade, except of motor vehicles and motorcycles; 29 - Manufacture of motor vehicles, trailers and semi-trailers)

Between 2008–2020, employment in the services sector recorded a large increase; the largest rise was in health care (NACE 86). There was a significant increase in employment in basic consumer and other services. Employment increases in commercial services were driven by demand from industrial firms (NACE 52). From the perspective of industry, employment increases were achieved in recycling (NACE 38) and the manufacturing industries, primarily in the automotive sector and the production/processing of plastics. Employment stagnation affected the construction, retail, and other routine service sectors. In the manufacturing industry, the largest decline in employment concerned the low-tech sector as well as mining and power engineering.

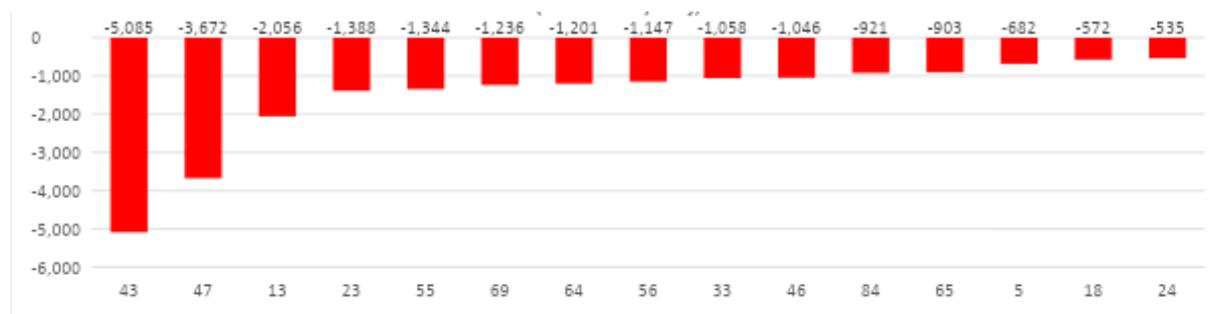
Graph 15: Sectoral structure of employment in years 2008-2020 – top 15 growing sectors by employment in the Karlovy Vary Region



Source: Internal data of the Czech Statistical Office, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (86 - Human health activities; 98 - Undifferentiated goods- and services-producing activities of private households for own use; 22 - Manufacture of rubber and plastic products; 71 - Architectural and engineering activities; technical testing and analysis; 65 - Insurance, reinsurance and pension funding, except compulsory social security; 52 - Warehousing and support activities for transportation; 32 - Other manufacturing; 45 - Wholesale and retail trade and repair of motor vehicles and motorcycles; 38 - Waste collection, treatment and disposal activities; materials recovery; 91 - Libraries, archives, museums and other cultural activities; 30 - Manufacture of other transport equipment; 29 - Manufacture of motor vehicles, trailers and semi-trailers; 1 - Crop and animal production, hunting and related service activities; 53 - Postal and courier activities; 68 - Real estate activities)

Graph 16: Sectoral structure of employment in years 2008-2020 – top 15 declining sectors by employment in the Karlovy Vary Region

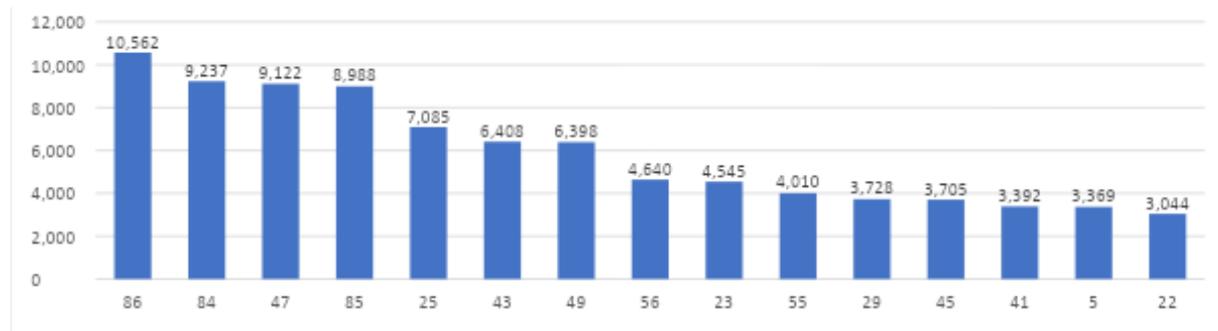


Source: Internal data of the Czech Statistical Office, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (43 - Specialised construction activities; 47 - Retail trade, except of motor vehicles and motorcycles; 13 - Manufacture of textiles; 23 - Manufacture of other non-metallic mineral products; 55 - Accommodation; 69 - Legal and accounting activities; 64 - Financial service activities, except insurance and pension funding; 56 - Food and beverage service activities; 33 - Repair and installation of machinery and equipment; 46 - Wholesale trade, except of motor vehicles and motorcycles; 84 - Public administration and defence; compulsory social security; 65 - Insurance, reinsurance and pension funding, except compulsory social security; 5 - Mining of coal and lignite; 18 - Printing and reproduction of recorded media; 24 - Manufacture of basic metals)

The sectoral structure between 2008 and 2020 is characterised by a decrease in the importance of mining and power engineering and, conversely, the strengthening of the metalworking and automotive industries. The services sector has maintained a high specialisation in health services.

Graph 17: Sectoral structure of employment in 2020 – top 15 sectors by employment in the Karlovy Vary Region

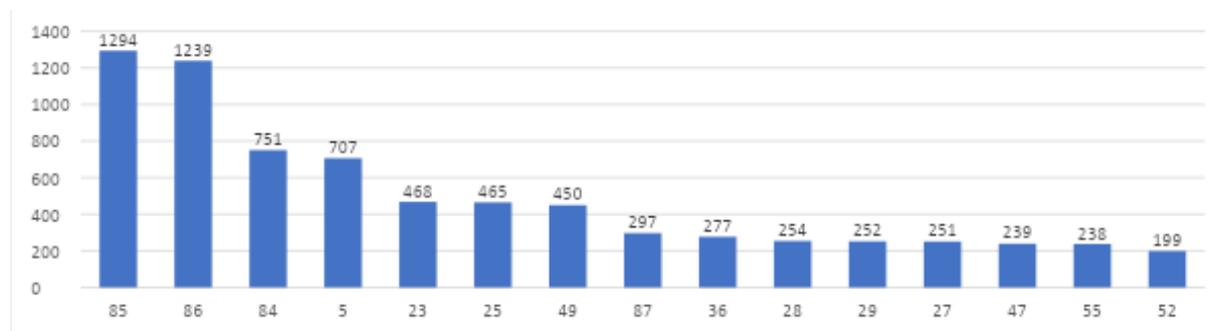


Source: Internal data of the Czech Statistical Office, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (86 - Human health activities; 84 - Public administration and defence; compulsory social security; 47 - Retail trade, except of motor vehicles and motorcycles; 85 - Education; 25 - Manufacture of fabricated metal products, except machinery and equipment; 43 - Specialised construction activities; 49 - Land transport and transport via pipelines; 56 - Food and beverage service activities; 23 - Manufacture of other non-metallic mineral products; 55 - Accommodation; 29 - Manufacture of motor vehicles, trailers and semi-trailers; 45 - Wholesale and retail trade and repair of motor vehicles and motorcycles; 41 - Construction of buildings; 5 - Mining of coal and lignite; 22 - Manufacture of rubber and plastic products)

In terms of age structure of employment, the Karlovy Vary Region was characterised by the largest number of persons aged 55+ working in public, health and social services, traditional power engineering and capital-intensive manufacturing industries, as well as in routine consumer and tourism related services. At the regional level, 25% of employed persons were aged 55+ in total employment. A high percentage of people aged 55+ were also employed in the construction and services sectors, where they worked in less knowledge-intensive commercial services with lower added value. A relatively high share of the 55+ group worked in primary sectors and industries, especially in the power engineering and manufacturing industries (NACE 33).

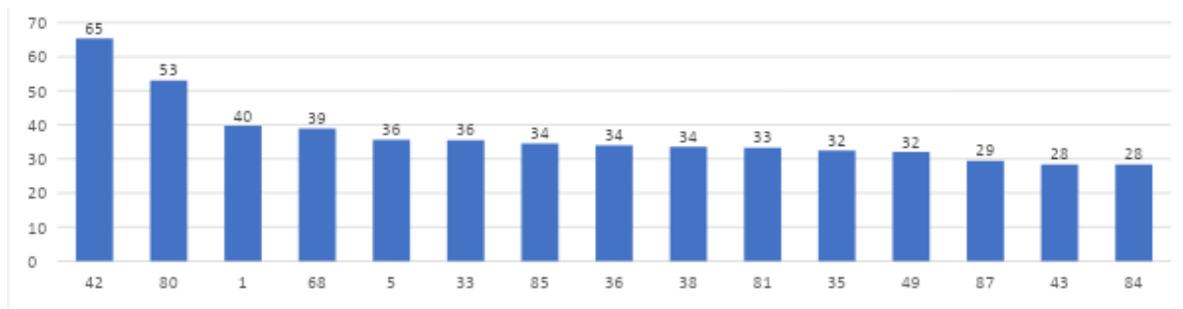
Graph 18: Number of employed persons aged 55+ in 2020 according to sectors in the Karlovy Vary Region



Source: Internal data of the UJEP, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (85 - Education; 86 - Human health activities; 84 - Public administration and defence; compulsory social security; 5 - Mining of coal and lignite; 23 - Manufacture of other non-metallic mineral products; 25 - Manufacture of fabricated metal products, except machinery and equipment; 49 - Land transport and transport via pipelines; 87 - Residential care activities; 36 - Water collection, treatment and supply; 28 - Manufacture of machinery and equipment n.e.c.; 29 - Manufacture of motor vehicles, trailers and semi-trailers; 27 - Manufacture of electrical equipment; 47 - Retail trade, except of motor vehicles and motorcycles; 55 - Accommodation; 52 - Warehousing and support activities for transportation)

Graph 19: Percentage of employed persons aged 55+ in 2020 according to sectors in the Karlovy Vary Region



Source: Internal data of the UJEP, own elaboration

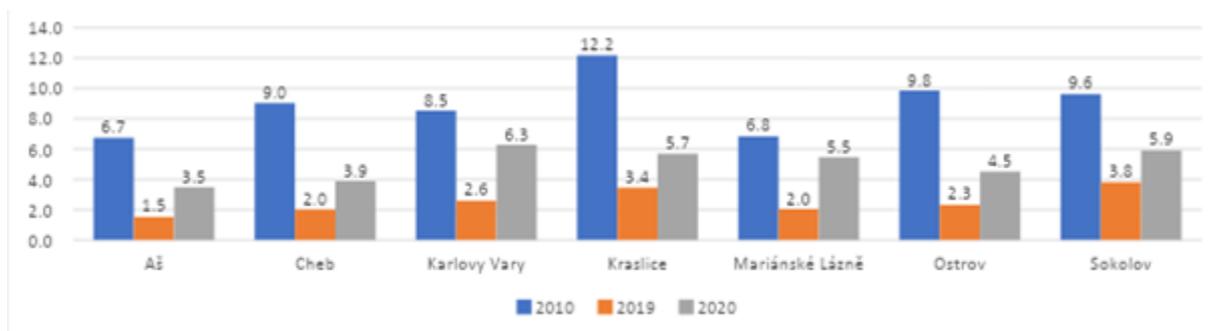
Note: Y-Axis = percentage and X-Axis = NACE Code (42 - Civil engineering; 80 - Security and investigation activities; 1 - Crop and animal production, hunting and related service activities; 68 - Real estate activities; 5 - Mining of coal and lignite; 33 - Repair and installation of machinery and equipment; 85 - Education; 36 - Water collection, treatment and supply; 38 - Waste collection, treatment and disposal activities; materials recovery; 81 - Services to buildings and landscape activities; 35 - Electricity, gas, steam and air conditioning supply; 49 - Land transport and transport via pipelines; 87 - Residential care activities; 43 - Specialised construction activities; 84 - Public administration and defence; compulsory social security)

4.1.4 Unemployment

In 2010, unemployment in the Karlovy Vary Region (8.9%) was lower than Ústí. The region managed to successfully lower the unemployment until 2019 (growth index: 0.30). However, COVID-19 (reduction of cross-border work, specialization in tourism) had a negative impact on the region, which resulted in an increase in unemployment to 5.4% (growth index: 2.00).

At micro-regional level, high spatial variability of unemployment was recorded in 2010. All micro-regions were characterised by an above-average unemployment rate, with two exceptions (Aš and Mariánské Lázně). The highest unemployment was documented in the Kraslice micro-region. In 2010, the regional unemployment of micro-regions ranged from 6.7 to 12.2%.

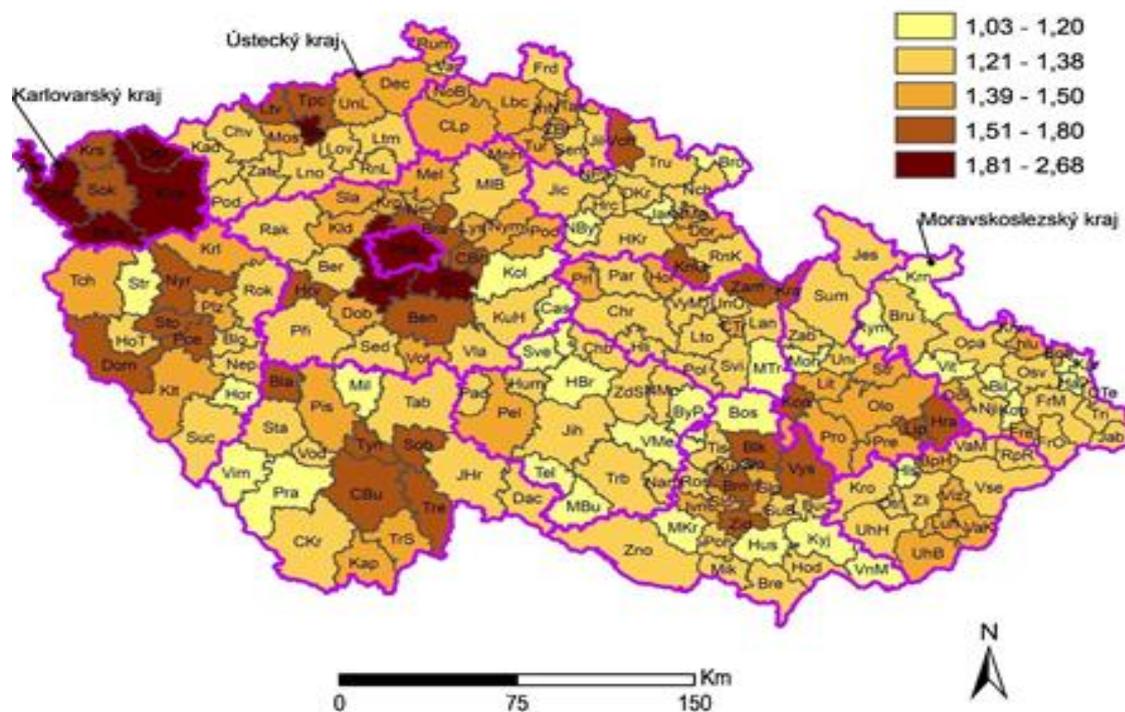
Graph 20: Development of unemployment (%) in the Karlovy Vary Region at the micro-regional level from 2010–2020



Source: Eurostat2021, own elaboration

Figure 20: Unemployment change in the Czech Republic at the micro-regional level from 2019–2020

Unemployment change index in Czechia in 2019-2020 (Czechia \bar{x} = 1,38)



Source: Eurostat2021, own elaboration

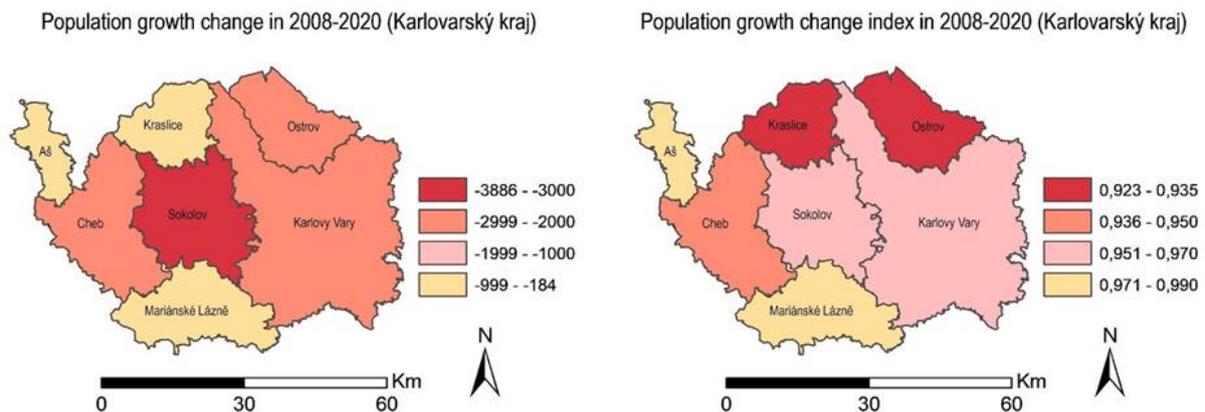
From 2010–2019, unemployment declined substantially in the Karlovy Vary region. Above-average declines in unemployment, compared to the Czech average, were recorded by all micro-regions except for the Sokolov coal micro-region. In 2019, the unemployment rate at the micro-regional level ranged from 1.5 to 3.8%. During 2019–2020, the Karlovy Vary Region was significantly affected by the COVID-19 pandemic, not due to government measures, restrictions on cross-border migration and mobility, but especially by the weakening of traditional tourism, recreation and spa treatment related services. In this respect, the Karlovy Vary region was one of the most affected regions in the Czech Republic (Figure 20). An extremely high increase in unemployment was recorded in nearly all micro-regions (except for the industrial micro-region of Sokolov and the peripheral micro-region Kraslice), which already had above-average unemployment rates. The highest unemployment rate was identified in the city of Karlovy Vary. The regional unemployment at the level of micro-regions ranged from 3.5 to 6.3% in 2020.

In terms of the spatial distribution of unemployment, relatively higher unemployment rates are characteristic of coal micro-regions (Sokolov), while peripheral regions (Kraslice) have a relatively low unemployment rate (which is strongly influenced by cross-border work in neighbouring Germany).

4.1.5 Demographic analysis

The Karlovy Vary region recorded a negative change in natural population from 2008 to 2020, which amounted to 10 people for every 1,000 inhabitants. At the micro-regional level, the worst dynamics were found in the Mariánské Lázně (-32) and Karlovy Vary (-20). In contrast, only the micro-regions Aš (+6) and Cheb (+3) recorded a natural increase in population.

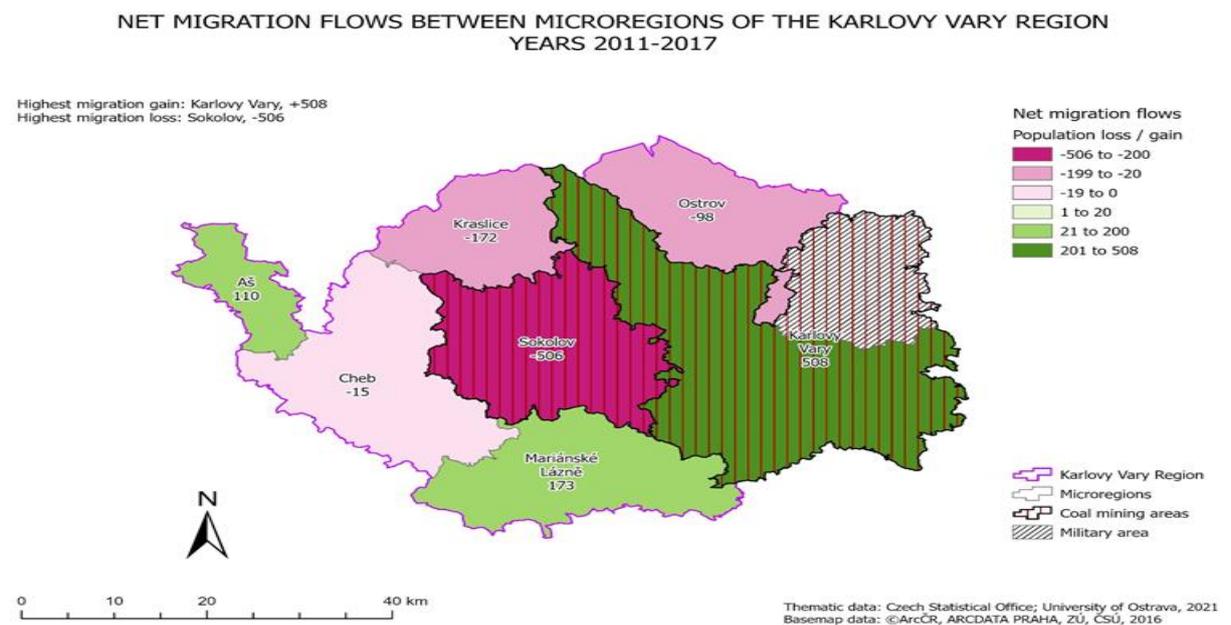
Figure 21: Population growth changes in Karlovy Vary in the period 2008-2020



The negative migration balance was 21 people for every 1,000 inhabitants. At the micro-regional level, the largest outflows of inhabitants were identified in Ostrov (-72), followed by Kraslice (-40) and Sokolov. The Aš (+15) and Mariánské Lázně (+11) micro-regions had positive figures, while the Karlovy Vary micro-region (+2) also recorded an increase.

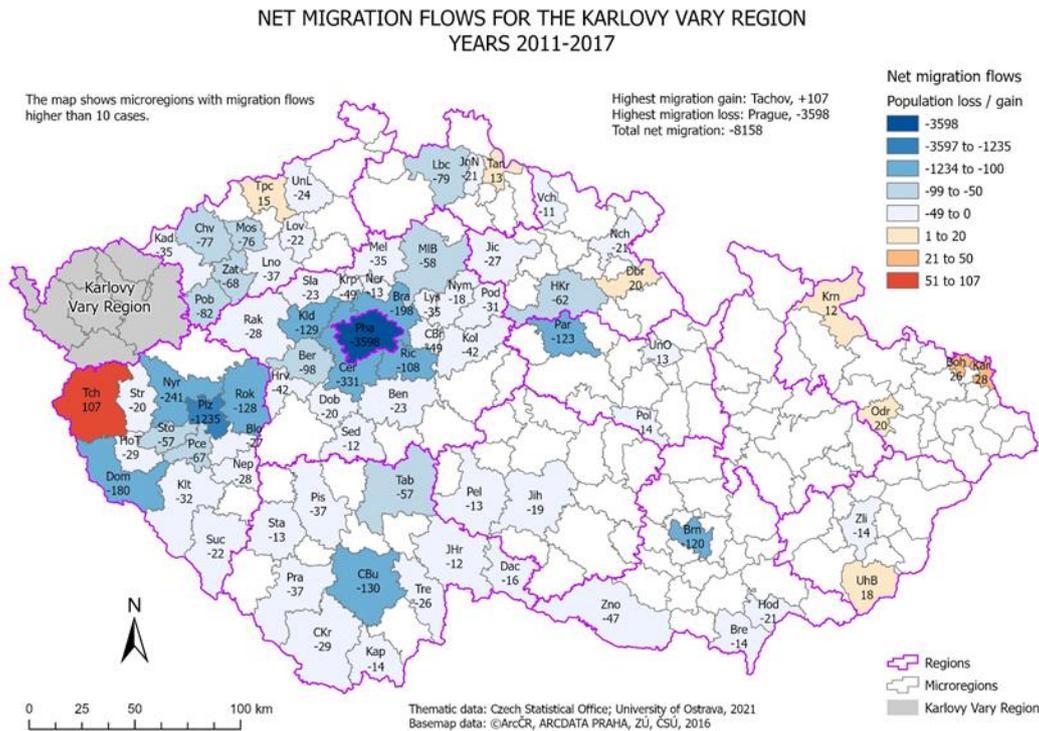
Similar to the situation in the Ústí region, the Karlovy Vary micro-regions gained some population from the Sokolov and Cheb coal micro-regions, which were the two micro-regions with the highest outmigration.

Figure 22: Net migration flows between micro regions of the Karlovy Vary Region for the period 2011-2017



Similar to the Ústí region, the Karlovy Vary region is characterised by a relatively low intensity of population aging, although there is a trend towards older average population age. In a total of 85% of municipalities, the aging index increased between 2011 and 2017, even for relatively young municipalities (e.g., the Sokolov micro-region). The acceleration of the already intensive aging process is evident in (internal and external) peripheral communities. From 2011 to 2017, 20,333 inhabitants emigrated from the region, with the 20-29 age group accounting for more than a quarter (26.2%) of all emigrants; the second most populous group emigrating from the region was the age group 30-39 (22%). The main migration destination was Prague and its immediate surroundings (22%). Another popular destination was the Pilsen agglomeration (8.5%).

Figure 23: Net migration flows for the Karlovy Vary Region for the period 2011-2017



If there is no fundamental change, according to the CSO forecast⁸⁴, there will be 250,217 inhabitants in the region (-14.7%) by 2051, of which residents aged 65+ will exceed 82,000.

4.1.6 Energy and heating sectors

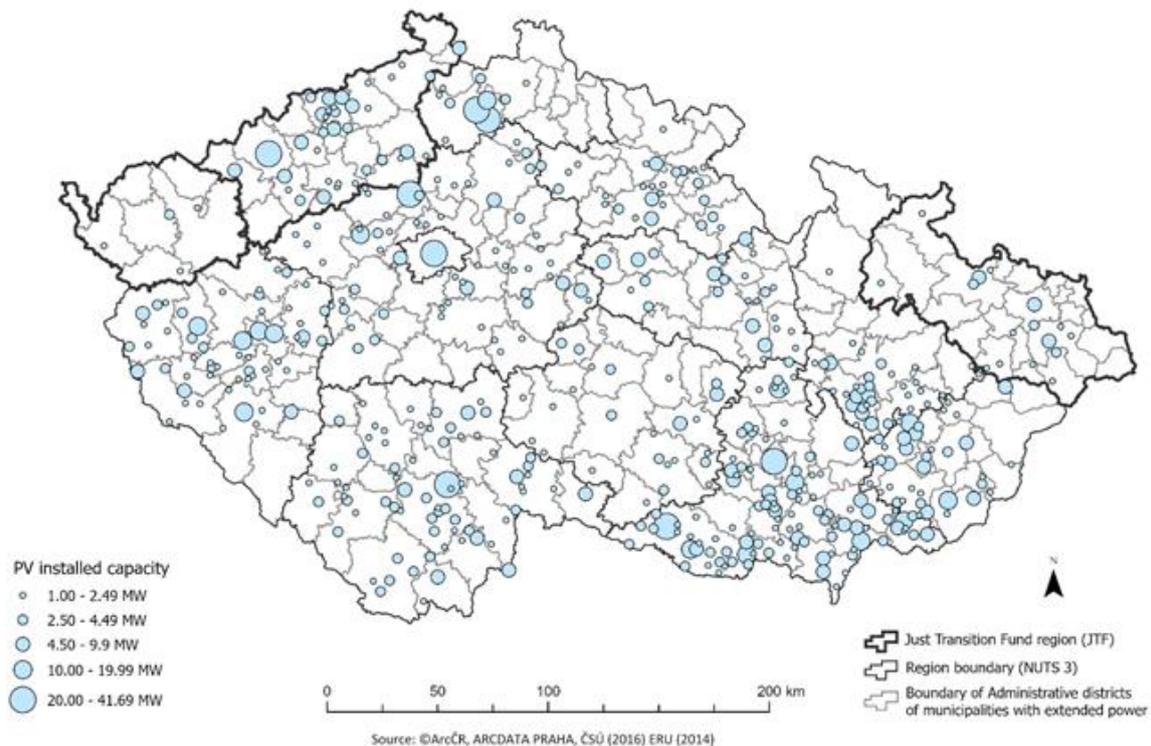
4.1.6.1 Renewable energy

The total installed capacity in the electricity grid in the region is 1.1 GWe, or 4.8 % of the total installed capacity of Czechia. This is proportionally higher than the share of population of the KV Region (roughly 3%).

The Karlovy Vary Region has the lowest installed capacity of renewable energy sources of all regions and the fourth lowest per capita (0.24 kW). This is mainly due to the low installed capacity of PV (13 MW compared to e.g., 162 MW in Ústí and 60.6 MW in Moravian-Silesian Regions) (Figure 244). By contrast, the region has the second highest capacity in wind power plants (68 MW), which are distributed across the whole region.

⁸⁴ CSO, 2013

Figure 24: Photovoltaic plants with 1 MW Installed capacity and more in the Czech Republic



Below, the TA team assesses the RES potential in Karlovy Vary Region; more details on the assumptions are in Annex 3.

In Karlovy Vary Region, the potential for geothermal energy can be considered higher compared to other regions⁸⁵. Nevertheless, in absolute numbers, it is still relatively low compared to other RES technologies. The NECP assumes that 400 TJ of electricity and 1,600 TJ of heat will be produced in whole Czech Republic by 2030. Even if we assumed this potential would be located in two regions (Ústí, Karlovy Vary), it would represent about 2% of installed (power) capacity in the Karlovy Vary Region.

In the case of hydropower, there is some modest potential to increase hydroelectric power generation for 'repowering', i.e., where technology at existing sites is replaced by newer, more efficient technology.

In Karlovy Vary, the wind power potential according to the study of the Institute of Atmospheric Physics⁸⁶ is 151 MWe, which is about 6% of total Czech potential and about two times more than the current installed capacity.

As for PV, the NECP assumes that there should be roughly 2,000 MWe of newly installed PV by 2030. When recalculated to the Karlovy Vary Region⁸⁷, the current installed capacity could be more than seven times from the current 13 MWe (to roughly 96 MWe). This is the most from all three regions, and clearly, PV has the highest potential for growth that could potentially contribute to better energy access and decentralisation⁸⁸.

⁸⁵ The geothermal potential is currently being mapped and refined. The outputs of the project are expected in June 2022, <https://www.energie21.cz/pruzkum-potencialu-geotermalni-energie-2/>

⁸⁶ https://www.ufa.cas.cz/DATA/vetma-energie/Potencial_vetrne_energie_2020.pdf

⁸⁷ See the Annex 3 for methods of recalculation.

⁸⁸ In addition, there is obviously biomass potential. However, this is highly dependent on the given location as well as regulatory framework and thus exceeds the scope of this work. For additional reading on biomass potential in Czechia, please refer to e.g. <https://doi.org/10.1016/j.egyr.2020.110319> or <https://doi.org/10.1016/j.egyr.2020.11.146>

4.1.6.2 Heating sector

The total installed thermal capacity of district heating plants in Karlovy Vary Region is 2.9 GWt, which represents 7% of total installed thermal capacity in Czechia. Table 13 shows the largest heating plants in the region (over 20 MWt), of which Sokolovská uhelná, právní nástupce is the major source with 2.1 GWt. In addition, there are 18 heating plants with a thermal capacity below 20 MWt.

Table 13 Heating plants in the Karlovy Vary region with total thermal output above 20 MWt⁸⁹

License company	Total thermal output [MWt]
Elektrárna Tisová, a.s.	540
Sokolovská uhelná, právní nástupce, a.s.	2,090
Synthomer a.s.	80
Ostrovská teplárenská, a.s.	24
Veolia Energie Mariánské Lázně, s.r.o.	65

Similar to Ústí Region, Karlovy Vary does not have a specific strategy for coal phase-out in the district heating sector. However, similar conclusions can be drawn for both regions, i.e., the major role of natural gas, followed by biomass and energy from waste.

In the short to mid-term, we expect that natural gas will play a major role in the sector transformation, followed by biomass and energy from waste. Investment needs in Karlovy Vary Region stemming from the national investment needs for the district heating sector would therefore be estimated at CZK 15 - 16 billion (EUR 0.6 billion) by 2030⁹⁰. However, in line with the need to avoid carbon lock-in of such solutions, the JTM (and other sources) should be used to support and pilot low-carbon, non-combustion technologies (heat pumps, electric boilers, solar collectors, waste heat recovery) which have to be an inherent part of the heating sector's broader transformation in the overall sector coupling and decarbonisation⁹¹.

These activities form a substantial part of the overall transition of the region and affordable heat and energy access are undoubtedly an inherent part of the "just" transition. In the mid and longer run, the transformation of the sector will be realised in a wider context of the decarbonisation of the whole economy, including first and foremost energy efficiency and energy savings. The future of DH will be a mix of highly efficient cogeneration and direct electrification using RES (solar collectors, heat pumps). CHP systems can also be used for energy storage (power-to-heat technology), where CHP systems can efficiently use surplus electricity from intermittent sources (wind and solar) to generate and store heat using large heat pumps. Where possible, these systems should be explored and piloted as soon as possible⁹².

4.1.7 Digitalisation and technological level

Based on a comprehensive analysis of the possible impacts of digitisation on the labour market, the NUTS 2 Northwest Region (i.e., the Karlovy Vary and Ústí regions) is clearly the most endangered region in terms of digitisation. Even in terms potential new job opportunities, this region is unfavourable relative to other NUTS 2 regions in the Czech Republic. Based on the study, it can be assumed that the negative impacts of digitisation will prevail within the region (job losses due to digitisation will exceed the creation of new jobs directly linked to the digitisation of the economy). This is clearly related to the structure of the economy of the Karlovy Vary Region, which is oriented towards a less qualified manufacturing workforce. The latest study also classifies the Karlovy Vary Region among the regions with low prospects to integrate Industry 4.0 technologies such as autonomous vehicles or cybersecurity.

⁸⁹ Ibid.

⁹⁰ More details about the district heating transformation strategy, the connected investment needs and the link to just transition can be found in Annex 3.

⁹¹ Please see additional information in Annex 3, Section on District heating for further details on both the current state of DH in Karlovy Vary region and the pathways for decarbonisation.

⁹² For instance, the City of Prague will explore the option to use the clean water from its waste-water treatment plant for large heat pumps. Given the topography, similar could be explored e.g., in Ústí.

4.1.8 Key economic operators

Although it is assumed that the projects of key economic operators will be financed mainly from public or private sources, other than the JTF, their planned activities represent an important part of the transformation story of the Karlovy Vary region. Especially the reclamation of the mining areas connected to new expected investments and the energy sector transformation may have major socio-economic impacts in the region. They are thus strategically important for the region's development, therefore strategic plans of key economic operators cannot be neglected in the analysis.

In the Karlovy Vary Region, there are two lignite mines in Sokolov district operated by the largest regional employer, Sokolovská uhelná. The company had 3,000 employees in 2020. The lignite from the Sokolov area is mainly used for power production and heating. Sokolovská uhelná operates two power plants (Vřesová and Tisová). Based on CSO⁹³ data, in 2020, about 4,000 jobs were in the coal and lignite mining sector and another 1,000 employees worked in the electricity, gas, steam and air conditioning supplies.

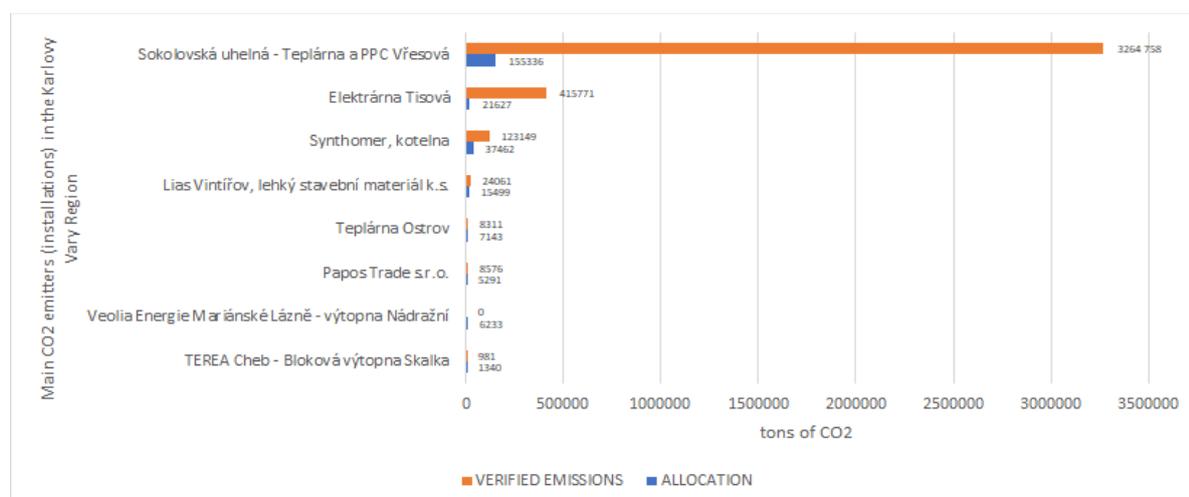
In the Karlovy Vary Region, there are only seven installations under EU ETS (see Table 14). Most are related to the electricity, gas, steam and air conditioning supplies, which is also connected to lignite mining. Two other installations are operated by companies manufacturing chemicals and chemical products (Synthomer) or paper and paper products (Papos Trade).

Table 14: Karlovy Vary Region - Distribution of EU ETS installations by sectors

CZ NACE classification of economic activities	Number of EU ETS installations
05 Mining of coal and lignite	1
17 Manufacture of paper and paper products	1
20 Manufacture of chemicals and chemical products	1
35 Electricity, gas, steam and air conditioning supply	4
EU ETS installations in total	7

Among the largest emitters in the Karlovy Vary Region, steam-gas power plant, Vřesová, had the highest emissions in 2020. This was due to the lignite gasification plant for energy gas, which was closed in 2020 due to rising emission allowance prices. The power plant thus switched to natural gas. Relatedly, about 1,000 employees were terminated. Another large powerplant is Tisová, which burns lignite. Both installations are operated by Sokolovská uhelná and have obtained transitional allowances for greening. In total, transitional allowances for both installations for 2013-2019 covered 9,571,940 tonnes of CO₂ emissions. Another installation using transitional allowances was the heating plant Ostrov (33,280).

Graph 21: Verified emissions 2020 – 7 CO₂ emitters in the Karlovy Vary Region



Key economic operators in Karlovy Vary are preparing their businesses for the post-coal period and closely monitoring current developments. They are often backed by active players who communicate

⁹³ ČSÚ (2021): Statistické ročenky krajů. [cit. 2021-03-30]. Retrieved from: <https://www.czso.cz/csu/czso/employment-and-unemployment-as-measured-by-the-labour-force-survey-quarterly-data-4-quarter-of-2020>

the situation with representatives of the region. The interviews show that they are preparing a number of projects that are not only focused on reduction of emissions in current operations, but they are also preparing a number of development projects that should ensure the diversification of their business and the transition to business activities that are not directly linked to coal.

One such example is Sokolovská uhelná, which, according to the public statements of its representatives, is preparing a number of projects that are intended to economically compensate for outages from a declining coal business. In addition to investments in reducing emissions from existing energy sources by changing from lignite to natural gas, biomass or waste, RES projects are also planned in the former mining areas, where the company has a total area of 87 square kilometres at its disposal. There are plans for investments in solar and wind power plants. Moreover, the company is preparing projects for the construction of large greenhouses to grow vegetables and fruits, in the field of tourism in connection with the development of the area around the already existing or planned lakes Medard (500 ha) and Jiří (expected 1,200 ha).⁹⁴ The company also plans to provide its land for possible industrial zones or the construction of a gigafactory for the production of car batteries in connection with the planned Lithia plant in the Ore Mountains.

Representatives of Sokolovská uhelná admit problems with financing these activities, since some banks want to distance themselves from the coal business. They also envisage the use of the Modernisation Fund and a Just Transition Fund. It is clear from the presented plans that the company will need new employees or retrain existing ones. As in other regions, there is a shortage of skilled workers, which is likely to be exacerbated by transition. The sufficiency of qualified people should be a prerequisite for the planned transition to higher value-added production and services.

4.1.9 Challenges in the Karlovy Vary Region

The results provided in this section and Section 2.1.6 are mainly derived from the analysis of the current situation in the Karlovy Vary Region. However, we also analysed other relevant strategic documents, such as:

- Regional innovation strategy of the Karlovy Vary Region⁹⁵;
- Development Programme of the Karlovy Vary Region for the period 2021 - 2027⁹⁶;
- The update of the Strategic Framework for Economic Restructuring of the Ústí, the Moravian - Silesian and the Karlovy Vary regions⁹⁷

The challenges/opportunities related to the transition process in the Karlovy Vary Region are interconnected, and we have identified set of following challenges. The challenges/opportunities are ranked according to their importance and the intensity of their link to the transition process

- One of the key challenges is a desired change in the position of the region from the lower levels in global supply chains towards production with higher value added. The current structure of economy is oriented to production with low added value, which is characterized by low level of product innovations. The region has one of the lowest expenditures of private and public sector on the research and development⁹⁸. The low level of entrepreneurship and actually missing key elements of the entrepreneurial ecosystem. To put it simply, comprehensive regional economic repositioning will be probably highly needed.
- Relative specialisation in energy-intensive industries. Obviously, the energy transition will increase the pressure on upgrading or diversification of existing industries in order to maintain or even to improve regional competitiveness. Such substantial change will be very demanding on all types of resources (financial, human, knowledge). Another environmental challenge for the region will be necessary comprehensive changes in the waste management system towards recycling and circular economy.
- Education. As the region has long been characterised by the worst indicators in primary and secondary education (Czech School Inspectorate 2020), massive investment in this segment will be needed.

⁹⁴ HN, 2021. Available at: <https://archiv.ihned.cz/c1-66939300-sen-sokolovske-uhelne-misto-tezby-rajcata-gigafactory-a-nove-zell-am-see>

⁹⁵ https://www.ris3kvk.cz/download/documents/RIS3_KVK_final.pdf

⁹⁶ <http://www.kr-karlovarsky.cz/region/Stranky/EU2014-2020/PRKKaSRKK.aspx>

⁹⁷ <https://restartregionu.cz/content/uploads/2021/03/Aktualizace-Strategick%C3%A9ho-r%C3%A1mce.pdf>

⁹⁸ EC. (2020). Regional Innovation Scoreboard 2019 – Czechia. Available at: <https://ec.europa.eu/docsroom/documents/35923>

- Digitalisation. Existing regional structures effectively create a constraining environment regarding digitalisation. Therefore, in the current situation, digitalisation might have a destructive rather than creative impact on regional development.
- The combination of mismatch between supply and demand on the labour market and the lack of qualified and well-paid job positions in the region causes an intensive brain-drain which is further weakening of human potential in the region.
- Aging population. The combination of mismatch between supply and demand on the labour market and the lack of qualified and social services.
- One of the main challenges is a stabilisation of the population by increasing conditions for quality of life (for whole families) and offering suitable job opportunities. In this direction, the improvement in education system towards long-life programmes to increase the qualification of employees seems essential as the region has the lowest share of the university educated people in the Czech Republic.
- One of the key problems in the Karlovy Vary Region is considered to be weak regional capacity, which limits the region's ability to cope with decline. Indeed, so-called "institutional thinness" indicates that the region lacks robust intermediary institutions as an important actor of successful regional development.
- Depopulation of the region caused by out-migration and the trend of prolonging life expectancy results in aging population and its increasing demand on health and social services. With further decline in mining, the social problems of the region may deepen, especially in excluded localities. A key challenge is to improve social cohesion.
- The region is facing the revitalisation of the landscape after mining, which is connected with a disposal of old environmental burdens. But other old environmental burdens are located in abandoned industrial areas.
- A challenge for the whole region is an adaptation to climate change in cities and the countryside.

4.1.10 *Opportunities in the Karlovy Vary Region*

- One of the main opportunities is to improve educational infrastructure in the region, especially at the university level, including life-long learning. Investment into human capital can increase the attractiveness of the region for young people and improve the current low level of education.
- Increase entrepreneurial activity, diversification of the regional economy and new industries. As the basic elements of an innovation ecosystem are virtually absent in the region, its support can create jobs in new sectors (green economy). Potential for diversification can be found, for example, in traditional sectors such as the manufacture of other non-metallic mineral products.
- Development of research and development. The opportunity lies primarily in strengthening applied research and development (technology transfer) linked to the external environment. Intensified collaboration within traditional sectors and support for the creation of new combinations between traditional (e.g., ceramics) and new industries (cultural and creative industries).
- Searching for meaningful and sustainable use of brownfields, especially in relation to the infrastructural support of new companies or/and improving services and quality of life of inhabitants mainly at municipal level.
- Energy transformation, increase the use of renewable energy sources (wind, biomass, etc.) and energy decentralisation (community energy), including improving the environmental situation in the region (reduction of air pollution, revitalisation of the post mining landscapes).
- Further development of the knowledge in spa and balneology and diversification of the services related to tourism and spas (with higher value added).
- Reclamation of post-mining landscape as a new development zone for attracting new investors and new technology companies directly in the micro-regions directly affected by the coal-phase out. A cross-border cooperation with Germany in relation to the knowledge transfer could represent opportunity as well.

4.2 Impacts from climate transition

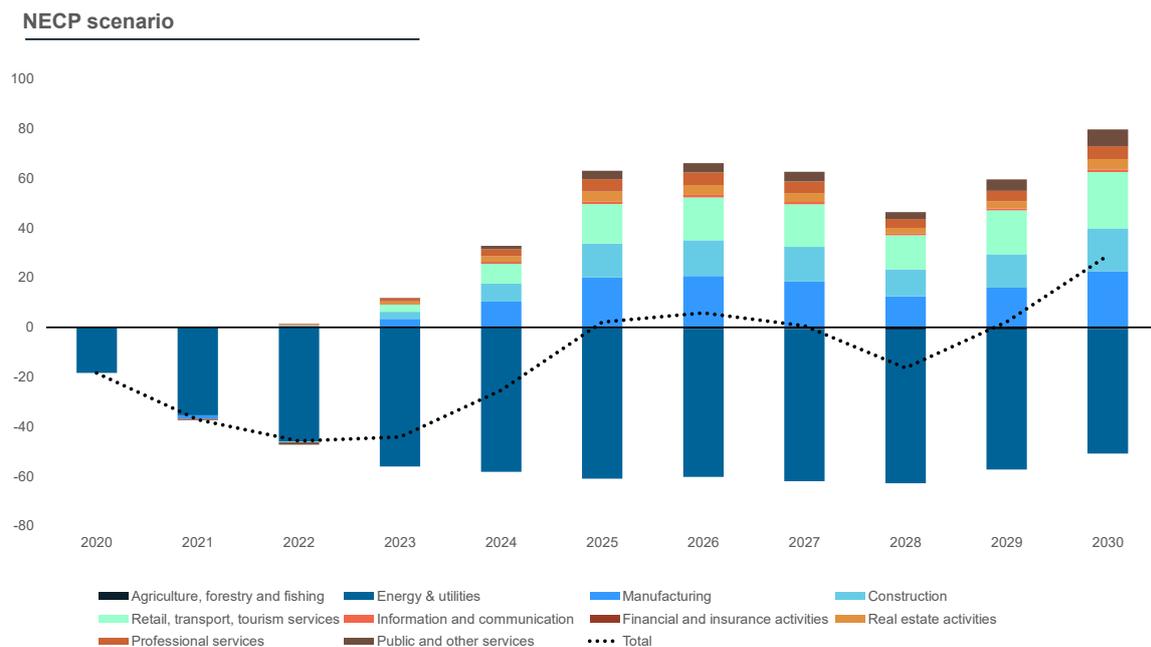
4.2.1 NECP impacts

4.2.1.1 Regional impacts from modelling: Karlovy Vary Region

The modelling shows that the transition, especially in the first half of the modelling period, can depress local GVA (Graph 22) and employment (Graph 23). The transition in the energy and utilities sector, which contains both coal mining and processing and coal-based power generation, suffers substantial losses (compared to the baseline). Other sectors, similar to national trends, gain from the impacts of the transition (e.g., manufacturing, construction). However, as discussed earlier, since the coal industry is a major employer in the region, these gains are unable to offset the losses through much of the decade. GVA effects in energy are fairly stagnant from 2023 onwards, resulting in a EUR 50-60 million (1.4-1.7% of projected 2030 baseline total) decrease compared to the baseline, while positive effects gradually increase over time and lead to an EUR 80 million increase (2.3% of projected 2030 baseline total) by 2030.

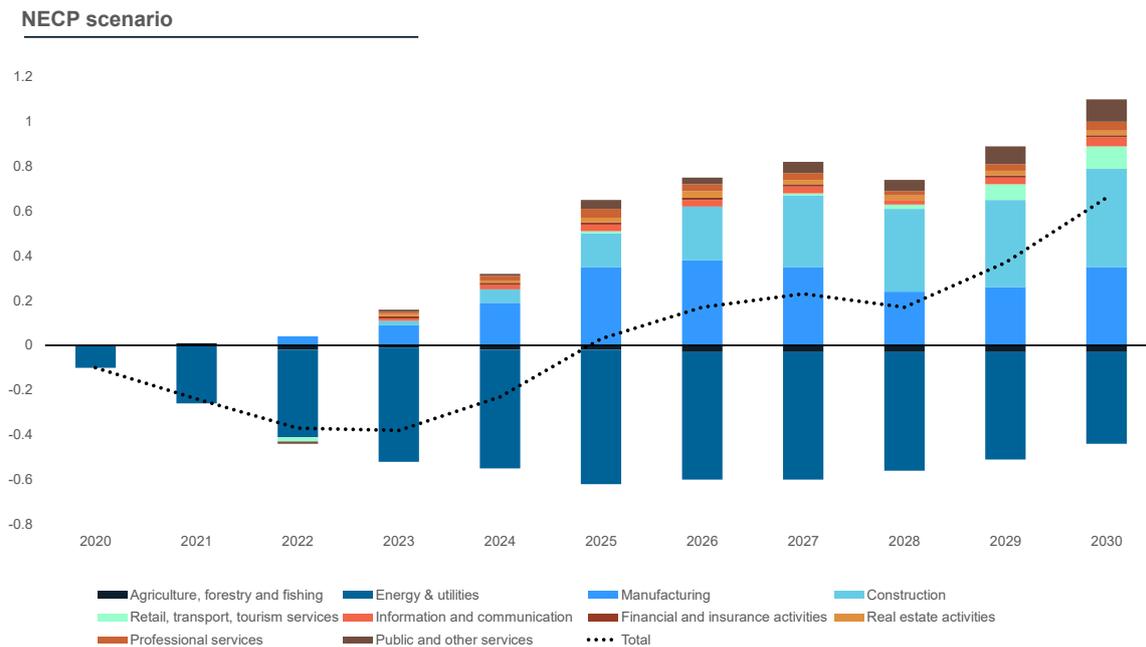
Comparing these estimates with the employment results (Graph 23), further insights can be derived. Employment impacts turn positive (compared to baseline) faster than GVA, largely due to the labour-intensive nature of the construction sector. However, this highlights an important aspect of the transition effects. Both the construction and the manufacturing (to a lesser extent) sectors create jobs that have, on average, lower value-added than the lost energy sector jobs. Meanwhile, the retail and tourism sectors create jobs that have a higher GVA impact, but a smaller employment impact.

Graph 22: Karlovy Vary Region - GVA in the NECP scenario, by sector, million EUR (2010) difference from baseline⁹⁹



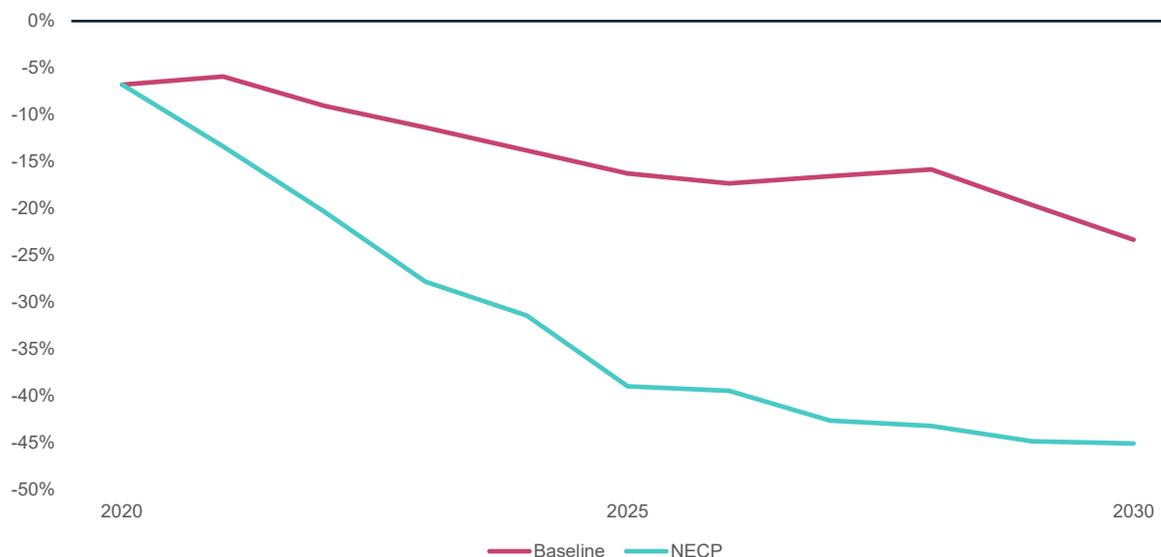
⁹⁹ E3ME modelling results

Graph 23: Karlovy Vary Region - Employment in the NECP scenario, by sector, '000 jobs difference from baseline¹⁰⁰



Graph 24 presents the decrease of CO₂ emissions in the region from 2018 values. In 2015, Karlovy Vary was responsible for about 5% of total CO₂ emissions in Czechia. Emissions in the baseline decrease by 23%. In the NECP scenario, emissions decrease by 39% by 2025 and then decrease an additional 6% to 45% by 2030, which is largely in line with the national trends (the national figure for the same time frame is a 43% reduction compared to 2018).

Graph 24: Karlovy Vary Region - CO₂ emissions in the NECP scenario, % difference from baseline (2018 values)¹⁰¹



4.2.2 Occupational mismatch analysis

Graph 25 shows the changes in the baseline from 2018 values. There are some patterns that are mostly national and therefore shared with the results of the Moravian-Silesian Region, e.g., a decline of

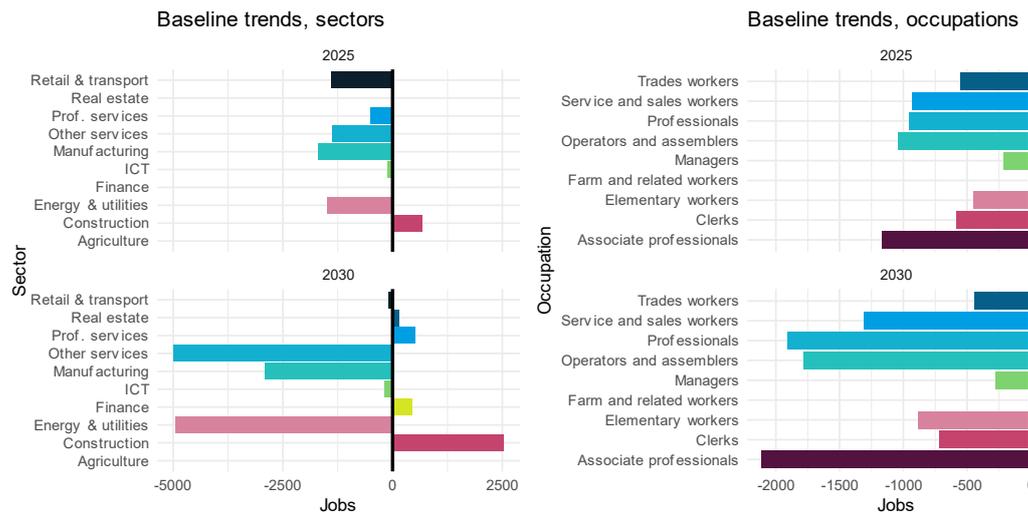
¹⁰⁰ Ibid.

¹⁰¹ E3ME modelling results

employment in the other services sector and growth in construction are driven by national effects. However, while this is somewhat offset by growth in other sectors in the Moravian-Silesian Region, this is not the case in Karlovy Vary. Overall employment has a negative trend in the baseline. By 2030, overall employment is about 9% lower than in 2018. An important contextual factor about this figure is that overall population decrease in the region is projected to be 7% between 2015 and 2030. The region also shows a unique pattern in the energy and utilities sector. While the sector's overall employment is relatively small to start with (about 8,000 people in 2018), this shrinks to about 3,000 employees in the baseline.

The right panel of Graph 25 illustrates trends by occupation, where nearly all occupations suffer *net* losses in the baseline scenario (compared to 2018).

Graph 25: Changes in employment from 2018 in baseline projections in Karlovy Vary Region



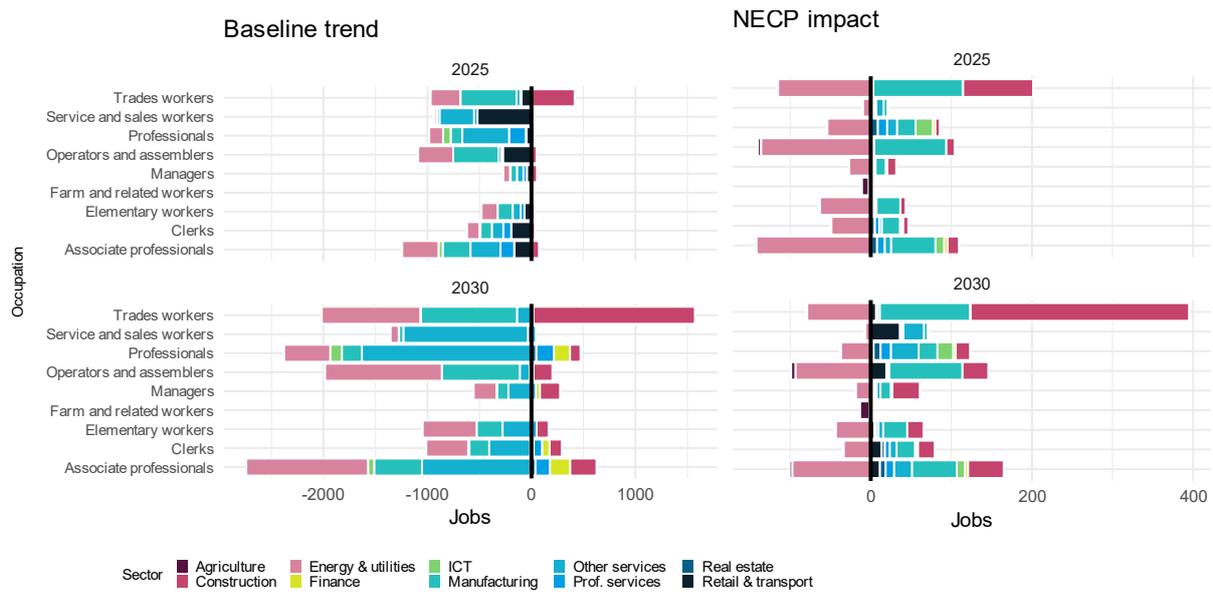
Note: left panel - changes by sector; right panel – changes by occupation

NECP Impact

The right panel of Graph 26 shows the estimated impacts of the NECP scenario. By 2030, the NECP scenario reduces overall employment losses. Gains are mainly realised in the construction and manufacturing sectors, and consequently, they are largely for lower-skilled jobs in the trade workers occupation group. Nevertheless, similar to Moravian-Silesian, gains can also be seen in the operators, associate professionals and professionals groups. Within occupation transition seems possible in all of these occupational groups, as both the baseline trends and the impacts of the NECP show that skilled employees in these occupations can lose their current jobs.

One of the important positive impacts of the transition can be that it partially offset the impacts of the negative baseline trend in manufacturing sector employment. Nevertheless, like Moravian-Silesian, positive employment effects can be expected where job gains can draw upon a skilled employee pool. However, gains are the strongest for lower-skilled occupations, while in terms of losses this is not necessarily the case. Therefore, it is important to consider the “quality” of the employment the transition can offer compared to the current status quo.

Graph 26: Changes in employment from 2018 in Karlovy Vary Region (baseline and Green Deal scenarios)



Note: left panel – changes by sector and occupation in baseline; right panel – changes by sector and occupation in the Green Deal scenario compared to the baseline

4.3 Transition assessment

4.3.1 SWOT analysis

The aim of the analysis is not to provide an exhaustive list of factors influencing the development of the region, but to present the most pressing aspects of the region.

Table 15: SWOT analysis for the Karlovy Vary Region

Strengths	Weaknesses
<p>Economy</p> <ul style="list-style-type: none"> - Strong knowledge base of traditional industries (ceramics, porcelain and glass) - Relatively high business activity level with focus on services (tourism and spa) - Convenient location and the possibility of direct cross-border cooperation with Germany 	<p>Economy</p> <ul style="list-style-type: none"> - Deepening of specialisation in the energy-intensive industries, including traditional industries - Reliance on industry and production with low added value in global supply chains - Reliance of the economy to the export of low-value products to the German market - Low attractiveness for investors (limited inflow of foreign investment into the region) - Absence of research and development base in the region (universities and research centres) - Poor transport accessibility of the region from the Czech Republic and Germany

Strengths	Weaknesses
<p>Social</p> <p>-----</p>	<p>Social</p> <ul style="list-style-type: none"> - Long-term population decline due to migration - Relatively large number of socially excluded localities - Low level of education and qualification and a small share of university-educated people - High share of long-term unemployed
<p>Environment</p> <ul style="list-style-type: none"> - Relatively large share of protected areas 	<p>Environment</p> <ul style="list-style-type: none"> - Landfilling of municipal waste - Polluted air - emissions of harmful substances into the air
Opportunities	Threats
<p>Economy</p> <ul style="list-style-type: none"> - Increasing importance and public support of SMEs - Further development of balneology, including accompanying services and research - The post coal landscape as a source of new activities, including innovative usage of industrial heritage and brownfields - Decarbonisation sets free capital otherwise required for emission allowances under the ETS (and rising carbon prices) 	<p>Economy</p> <ul style="list-style-type: none"> - Strict environmental regulations and their impact on the main employers in the energy-intensive industries - Ongoing brain drain (loss of working age population, weakening of human capital) - Potential shortage of skilled labour
<p>Social</p> <ul style="list-style-type: none"> - Further education of adults (life-long learning) or establishment (expansion) of university studies in the region - The social inclusion of excluded communities 	<p>Social</p> <ul style="list-style-type: none"> - Rapid population ageing - Further deepening of the region's social problems, including socially excluded communities and emergence of new ones - Rising unemployment, including its other social consequences associated with the cessation of coal mining
<p>Environment</p> <ul style="list-style-type: none"> - Land and landscape reclamation after mining - Energy transformation – development of renewable energy sources and reduction of the air pollution 	<p>Environment</p> <ul style="list-style-type: none"> - Old ecological burdens in the region - Consequences of climate change

4.3.2 Investment priorities

4.3.2.1 Pillar 1: Economy, business and innovation

Table 16: Overview of investment priorities in economy, business and Innovation in the Karlovy Vary Region

Investment priority	Prioritisation
Entrepreneurial ecosystem	Very High
Upgrading/Diversification of traditional industries/firm structure (SMEs)	High
IT technologies/digital economy/artificial intelligence	Medium
Research and development (public and private)	Medium
Regional capacity building	High

Entrepreneurial ecosystem – Very high importance

As the elements of the entrepreneurial ecosystem in this region are very weakly developed, there is a need to develop virtually all elements. The development of each element must be strictly based on regional needs, which need to be clearly and comprehensively described, evaluated and identified. Otherwise, there is a risk that building the entrepreneurial ecosystem will fail.

Upgrading/Diversification of traditional industries/firm structure (SMEs) – High importance

Considering the regional sectoral structure and the size structure of firms, upgrading traditional industries is assessed as a priority (niche upgrading via integration of symbolic knowledge)¹⁰². However, diversification and support of existing and emerging SMEs seem to be more important.

IT technologies/digital economy/artificial intelligence – Medium importance

The Karlovy Vary Region has a low existing potential for AI and digital technologies. Therefore, we recommend to implement analogical approaches such as those suggested in the Ústí Region. More emphasis should be given to technology transfer from the external environment. The potential in this area can be strengthened via cross-border cooperation with Germany.

Research and development (public and private) – Medium importance

The Karlovy Vary Region has the lowest indicators in science and research in the Czech Republic. Government and university expenditures are practically zero. Even private spending is deeply below average. However, it would be a mistake to completely neglect the support of R&D. As such, it is a medium priority. Support for science and research should be highly targeted to a limited number of specific areas. It is recommended to focus activities on the transfer of R&D results from outside.

Regional capacity building – High importance

The Karlovy Vary Region has weak regional capacity, which limits the region's ability to cope with ongoing decline. The region lacks robust intermediary institutions as an important actor of successful regional development. Investments in this field should support analytical, administrative and organisational capacities of regional (public) institutions, especially in the key field for the transition (energy, entrepreneurial and innovation ecosystem, human capital and land reclamations). Moreover, in the case of the Karlovy Vary Region, capacities from another key players, such as universities, are missing.

¹⁰² Grillitsch, M., & Asheim, B. (2018). Place-based innovation policy for industrial diversification in regions. *European Planning Studies*, 26(8), 1638-1662.

4.3.2.2 Pillar 2: Sustainable environment

Table 17: Overview of investment priorities in sustainable environment in the Karlovy Vary Region

Investment priority	Prioritisation
Green economy (e.g., land recycling, materials)	High
Modern energy systems - decentralised, diversified, environmentally friendly	High
Circular economy	High
Landscape reclamation, new development zones	Very High
Brownfields (industrial heritage utilisation/exploitation)	High

Green economy – High importance

A main goal of the transformation is to transform an economy from an unsustainable one based on fossil fuels to an economy that is sustainable and emission-free. The aim should be to focus on green technologies (supported by research), which can bring new green jobs to the economy, help with its diversification and bring higher value-added production. The priority should be not only be on eco-innovations in existing companies but also on the attraction of new technology companies.

Modern energy systems - decentralised, diversified, environmentally friendly –High importance

Rationale for priority identification:

The right mix of centralised and decentralised energy systems with a diverse portfolio of clean energy sources will be at the heart of the low carbon transition. While not at the core of the JTM priorities, energy efficiency as a first principle together with clean, affordable energy bring about clear non-energy “Just Transition” related benefits, such as the reduction of energy poverty, the enhancement of energy access and last, but not least, job creation. Therefore, these aspects should be an inherent part of the wider transformation of the region and energy efficiency, RES and energy communities can be widely promoted.

Regarding energy efficiency, the deep renovation of buildings needs to be substantially scaled up, with a special focus on vulnerable households. On the supply side, in Ústí Region, the potential for development of RES is high. To reach the 2030 RES goals, the installed PV capacity should double in the region. There is also potential for geothermal and wind power (which could increase by a factor of four). The district heating sector in the region is still largely dependent on coal and will have to undergo a major transformation. While natural gas is the main short-term solution, innovative options heading towards full decarbonisation of the sector and sector coupling should be explored (lowering temperatures in the systems, heat pumps, thermal storage, among others).

Circular economy – High importance

The circular economy is certainly relevant in relation to the Just Transition. Based on the modelling of hypothetical scenarios used to estimate regional impacts of different policies, support of the circular economy could bring lower benefits in efforts to grow GVA and employment relative to other possibilities. Therefore, the priority has moderate importance and investments in research support and focus on specific sectors (e.g., chemistry) are emphasized in particular.

Landscape reclamation, new development zones – Very high importance

The development of large areas after coal mining are potentially a huge asset for the region. New reclaimed areas should be used multifunctionally. They offer not only space for recreational use with great development potential, including housing, but also for the development of new industrial zones and new energy in the region. These territories should always be approached comprehensively, and the “resocialisation” of these territories is an essential part. Their location is in the centres of localities, where the greatest socio-economic impacts of the transformation can be expected, so they represent a great development potential. As such, they have high importance for the future development of the region.

Brownfields – High importance

Due to the long specialisation in mining and heavy industry, there is a high number of brownfields (industrial buildings), which can be regenerated for a wider set of new activities, especially in relation to new business opportunities as well as improving quality of life of inhabitants.

4.3.2.3 Pillar 3: Inclusiveness, prosperity and diversity

Table 18: Overview of investment priorities in Inclusiveness, prosperity and diversity in the Karlovy Vary Region

Investment priority	Prioritisation
Re- and up-skilling for future oriented economic activities	Very High
Support of universities (all roles)	Medium
Primary and secondary education	Very High
Investments into quality of life of inhabitants – affordable housing, social, health and community-building, quality of the public space, leisure activities, etc.	Very High
Support of youth and disadvantaged groups (grassroots activities)	High

Re- and up-skilling for future oriented economic activities – Very high importance

Employment in energy-intensive industries accounts for the relatively highest share of all coal regions. Mining alone employed around 4,000 people, around 3% of total employment. Employment was also relatively high in steel and metal fabrication (7,000 jobs). Similar to the Ústí region, the low level of education, the low level of development of digitalisation, and the green economy create a potentially risky mix for the future development of the region.

Support of universities (all roles) – Medium importance

There are long-term efforts to establish the regional university in Karlovarský region, since as the only region in the Czech Republic does not have its own university. There are branches of other universities, but they are rather small. The absence of university does not exclude this priority automatically, on contrary. The main difference compared to the other region is, that support should focus on mobilisation and circulation of knowledge to the regional actors from the external environment. In the long-term perspective, the new university may emerge, nevertheless, it must be organically embedded in the regional context.

Primary and secondary education – Very high importance

Considering primary and secondary education, for Karlovarský region can be said the same as for Ústí region. Primary and secondary education must be seen as a high priority, regardless of the overlapping with OP Jan Amos Komenský.

Investments into quality of life of inhabitants – Very high importance

As was shown in our analysis, the out-migration represents one of the key regional challenges. The region is coping with a low quality of life, which is perceived as an important push factor considering migration, especially for selected groups of the population. At the same time, the low quality of life hinders social upscaling in socially vulnerable groups. To sum up, the transition cannot be successful, when the quality of life will be neglected. Therefore, high priority is given

Support of youth and disadvantaged groups (grassroots activities) – High importance

Brain drain is a serious regional problem. Support of youth groups can help to weaken this problem. Besides, the formulation of specific activities and projects should be designed in the sense of organising opportunities or providing vacant spaces rather than in the clear definition of projects in a top-down sense. In other words, sources from JTF can help to create an enabling environment for new combinations stemming from the energy/enthusiasm of the youth and old regional structures (e.g.,

brownfields). Further, the inclusion of disadvantaged groups is an obligatory precondition to achieve just transition in the full sense of the word.

4.3.3 Strategic outlook for the Karlovy Vary Region

The Karlovy Vary Region started the transformation process successfully when some of the redundant workers from the mining industry found employment in the rapidly growing service sector and the manufacturing industry, but even so, the region started to lag behind the other Czech regions economically. This fact points to the low position of the regional economy within the global value chains, which is characterised by very low expenditure on research and development and low innovation potential. As a result, the region suffers from several socio-economic problems, such as continuing population decline, lack of university-educated professionals, the emergence of socially excluded localities, etc. In recent decades, the region has also significantly deepened specialisation in energy-intensive industries, which represents a challenge given the need for energy transformation in the upcoming years.

A key part of the economy is built on the tourism and spa sectors, which offers potential for further development, even in the direction of specialisation in research activities. Within the region, new development zones can also be captured after mining land reclamation or the re-use of brownfields and thus, these zones can contribute to the diversification of the region's economy. A key challenge is the social stabilisation of the population and increasing the qualifications of inhabitants. By the same token, there is opportunity to invest in improving the quality of life for inhabitants at the municipal level, including the promotion of social cohesion and a quality education system. The region has an advantageous location on the border with Germany, which it can use in its development (e.g., in the form of technology transfer of technologies, direct foreign investments, or knowledge exchange). Although the region is currently lagging in terms of installed capacity of renewable energy sources, decentralised energy based on renewable sources offers further growth potential in the future built on the base of this traditional energy industry.

5 MORAVIAN-SILESIA REGION

5.1 State of play

The region has historically been one of the most important industrial regions in the Czech Republic with the centre in the Ostrava-Karviná mining basin. This part of the region is highly industrialised and urbanised, and its development has been linked to the extraction of high-quality coking black coal and its use in subsequent metal and steel production, as well as the chemical or automotive industries. In addition to these traditional industries, the region is also engaged in the production and distribution of electricity, gas and water, as well as the transport, chemical and pharmaceutical industries. The strong industrial specialisation confirms the regional share, 9% of national consumption of electricity, where industry makes up 46% of regional energy consumption¹⁰³.

The region has been undergoing a gradual restructuring of the economy since the 1990s, with a decline in heavy industry and hard coal mining. The mining sector itself employed over 90,000 people by the end of the centrally planned economy era. Today, the number of jobs has fallen to 5,000 and will shrink further in the coming years. Since the 1990s, three decades of economic restructuring might be considered as an example of successful transformation for an old industrial region in Central Europe¹⁰⁴. Indeed, the GDP development, relatively low unemployment figures, growth of the automotive industry, or promising development of regional universities and R&D (third strongest region in the Czech Republic) serve as proof of a successful transformation¹⁰⁵. To support this success, previous development efforts can be highlighted. Deindustrialisation and loss of economic attractiveness induced regional unemployment, which peaked in 2003 when the regional unemployment rate reached more than 16%. Nevertheless, in regions with high specialisation on steel and coal production unemployment was almost 20%. During this period, the region had one of the worst performances among old industrial regions in Central and Eastern Europe¹⁰⁶. Since then, and with the exception of the economic crisis, the unemployment rate fell to 3.7% by 2019. With the arrival of Covid-19, the current unemployment rate is 5.6%¹⁰⁷.

To avoid a skewed picture, it is necessary to look beyond this successful transformation. Starting with economic development, the most severely declining sector was hard coal mining and related industries. Steel and metal production were also hit by deindustrialisation, but remain two of the largest industries in the region (approximately 50,000 jobs). The automotive industry has developed into one of the most important industrial sectors (approximately 31,000 jobs). From 2010 to 2020, the highest employment growth was recorded in the automotive industry (and related industries) and in machinery. By contrast, employment declines were recorded in traditional industries such as the repair and installation of machinery and equipment, metallurgy, and routine industrial production like the manufacture of computers, electronic and optical products. In services, the fastest growing industries include IT, health care and education. However, less knowledge-intensive services are still dominating the regional landscape. In other words, the region retains its specialisation in heavy industry but has also added new industries such as the export-oriented automotive industry¹⁰⁸.

As noted by Ženka et al.¹⁰⁹, “growth of the automotive industry and export-oriented business services compensated for job losses resulting from the contraction of traditional industries such as mining and metallurgy. The most typical path development was upgrading of existing industries, path extension, and path modernisation occurred. On the other hand, more radical changes (conversion, recombination) were of minor importance”. The absence of more radical changes explains the lower importance of the green economy or lower share of knowledge-intensive services or creative and cultural industries, although the creative sector experienced significant growth after 2010. Moreover, especially in the automotive industry, some negative effects of FDIs¹¹⁰ such as “branch plant syndrome” (i.e., lack of stable jobs, lack of research and development activities, limited backward linkages,

¹⁰³ CSO, 2018

¹⁰⁴ Blažek a Bečicová, 2014

¹⁰⁵ Ženka et al., 2019

¹⁰⁶ Birch and Mykhnenko, 2009

¹⁰⁷ CSO, 2021

¹⁰⁸ Slach et al., 2018

¹⁰⁹ Ženka et al. 2019, p. 2035

¹¹⁰ Pavlínek, 2004

appropriation of government incentives and lack of spillover effects, Sonn and Lee 2012, p. 243¹¹¹). have emerged¹¹². This may negatively affect the regional ability to introduce product innovations. Another explanation for the lower share of new activities can be found in below average entrepreneurship rates, which are the worst in the Czech Republic, and low share of SMEs. Finally, the economic restructuring was highly uneven at the regional level. The winners of the transformation process belong to micro-regions with a high share of automotive industry ties (Nový Jičín, Kopřivnice, Frýdek-Místek) or with successfully transformed large companies (Třinec, Bohumín). By contrast, the losers belong to coal micro-regions (Karviná, Havířov) or peripheral regions (Bruntál, Vítkov), which are struggling with labour mismatches and high unemployment rates. To sum up, the restructuring of the regional economic base was predominantly positive, nevertheless, some issues need to be considered.

Unfortunately, the relatively successful transformation was not accompanied by social and demographic improvements. Indeed, there is an obvious decoupling of social and demographic trends with economic development. The region is characterised by above-average poverty rates and a high share of socially vulnerable groups, to a lower extent in the Ústí and Karlovy Vary regions. The region has one of the highest numbers of personal bankruptcies of individuals, one of the highest alcohol consumption rates, obesity, and low life expectancy¹¹³. More generally, several municipalities have a very poor quality of life and some (Orlová, Karviná) are the worst ranked in the Czech Republic.

The Moravian-Silesian Region has a relatively good educational structure. On one hand, it has one of the highest shares of inhabitants with primary or lower education and it has the third highest share of university-educated inhabitants among Czech regions. Educational infrastructure is well developed. However, the quality of education lags (even in technical education) the best economically performing regions in the Czech Republic. In the region, there are four universities (VSB - Technical University of Ostrava, The University of Ostrava, The Silesian University in Opava and The PRIGO University). Even though all universities progressed over the last two decades and transformed into regional knowledge “gatekeepers”¹¹⁴, they are still struggling (to a different extent) with challenges typical for regional mid-range universities such as lack of critical mass, lower scientific performance and low levels of human resources¹¹⁵. Moreover, the number of university students in recent years has dropped 39,788 students in 2011 to 23,340 students in 2019¹¹⁶. With a low regional image, youths from the region prefer to study in other Czech regions (cities). However, it partially explains why regional universities are not attractive for youth out of the region. Culture is closely related to education. A good example of culture-led development can serve the regeneration of Lowe Areas of Vítkovice in Ostrava (former large inner-city brownfield). However, some critical infrastructure of metropolitan importance is still missing, which hampers the exploitation of regional potential and improvement of regional image.

The region also faces challenges related to the environment. The region continues to be one of the most polluted in terms of environment, especially air pollution, soil, and groundwater contamination because of industrial and mining activity. However, the region has managed to make significant progress in recent decades, both due to the decline in industrial production and mining and the use of more environmentally friendly technologies and significant investments in environmental measures. Due to the decline of industry, there are many abandoned industrial monuments and brownfields in the region. Some have already managed to reclaim the sites and find a new use.

Finally, regional capacities are one precondition to help cope with the energy transition, namely absorption capacities¹¹⁷. Regional capacities are important “for devising efficient ways to deal with the problems, let alone be successful in bidding for external funding”¹¹⁸. In the case of the Moravian-Silesian Region, so-called institutional thickness plays an important role since the region has established and developed specific intermediary organisations such as Moravian-Silesian Innovation Centre, Moravian-Silesian Investment, Moravian-Silesian Employment Pact and Development or MSID Moravian-Silesian Energy Centre to support regional development. Sufficient capacities can also be found in universities

¹¹¹ Sonn, J. W., & Lee, D. (2012). Revisiting the branch plant syndrome: Review of literature on foreign direct investment and regional development in Western advanced economies. *International Journal of Urban Sciences*, 16(3), 243-259.

¹¹² Ženka et al., 2017

¹¹³ Džurová et al., 2010; ÚZIS 2014

¹¹⁴ Bennenworth and Hospers, 2007

¹¹⁵ Gál and Ptáček, 2012

¹¹⁶ MEYS, 2019

¹¹⁷ Campbell and Coenen, 2017

¹¹⁸ Healey, 1998

and the private sector¹¹⁹. Some more general problems such as a pragmatic view of planning (“strategical planning or plans are perceived as an irksome “formality” required to get EU funds”¹²⁰) still exist. Nevertheless, capacity seems to be a regional strength.

5.1.1 *Development of the economic performance*

The 2000–2008 period was characterised by economic growth, which is also reflected in the economy of the Moravian-Silesian Region (growth index of GDP between 2000 and 2008: 1.70). The period saw significant improvement, moving from the last position in 2000 in the national ranking to eighth by 2008, when it generated GDP per capita of EUR 17,700, i.e., 70% of the EU average. Similar to the rest of the Czech Republic, GDP decreased between 2008 and 2009 (EUR -1,100, i.e., 6.21%). The last decrease in GDP was recorded in 2012–2013. Since 2014, the region has maintained a positive GDP growth rate and is slightly below average (EUR 22,800). However, the region still has not converged with the EU average.

5.1.2 *Development of the sectoral structure of employment between 2000–2020*

In 2000, the Moravian-Silesian Region showed a high proportion of employment in the mining sector, but relatively less in the manufacturing industry. Employment specialisation in the retail, transport and storage or education sectors was also identified. While the specialisation of most regions increased until 2008, this was not the case in the Moravian-Silesian Region. It is therefore not surprising that the structural change was rather shallow. This is one of the reasons why the MSR was among the regions with only a slightly above-average specialisation in employment in 2020. Overall, specialisation in manufacturing, health and social services, professional, scientific and technical activities in the MSR increased significantly between 2000 and 2020, whereas specialisation decreased in other sectors such as mining, wholesale and retail trade, transport and storage, construction and the primary sector. In summary, the MSR has increased the specialisation of its production base.

The Moravian-Silesian Region was historically dominated by the production of basic metals, the metallurgical processing of metals, manufacture of motor vehicles, machinery and equipment and metal structures. In the monitored period (2000-2020), two trends can be observed in the region. The first trend was the strengthening of specialisation (also due to the decline in employment at the national level) in traditional metal and steel industries. The second trend was the strengthening of the automotive segment. On the contrary, specialisation in energy-intensive industries has declined.

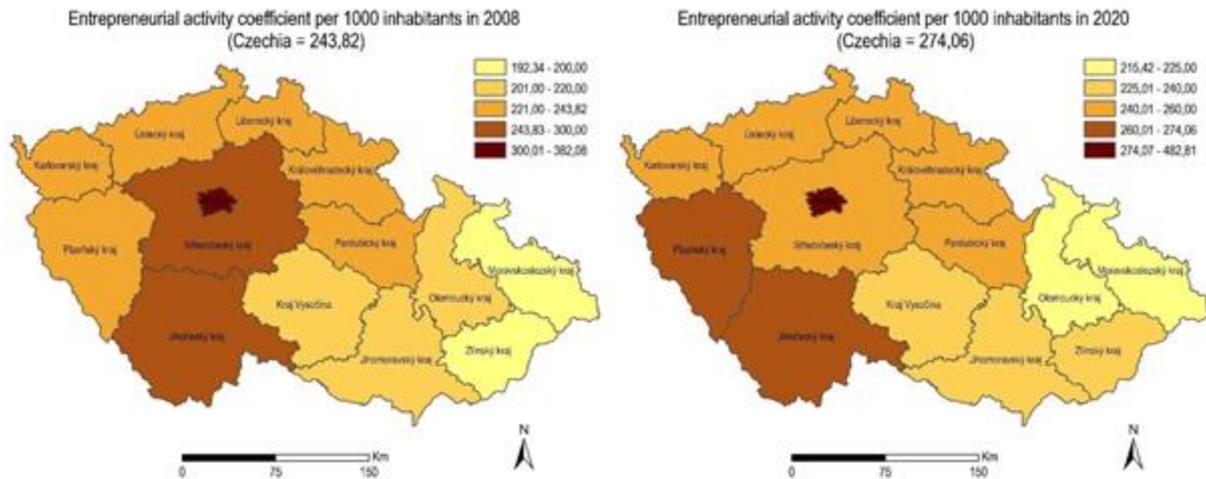
5.1.3 *Corporate structure at the regional level*

In 2008, the Moravian-Silesian Region was characterised by the lowest business activity (192.35 per 1,000 inhabitants) among all regions, while it also ranked among the regions with the lowest number of entrepreneurs (141.24). Regarding trade companies, the region also scored below average (17.61) with a similar situation in agricultural self-employed. Despite an increase business activity between 2008 and 2020 (growth index: 1.13), the region continues to have the lowest business activity (216.54). By contrast, a high growth rate (the second highest) was achieved in the segment of trade companies (growth index: 1.71).

¹¹⁹ Hána and Hellebrantová 2018

¹²⁰ Dabrowski 2014, p. 390

Figure 25: Entrepreneurial activity coefficient per 1,000 inhabitants in the Czech Republic in 2008 and 2020

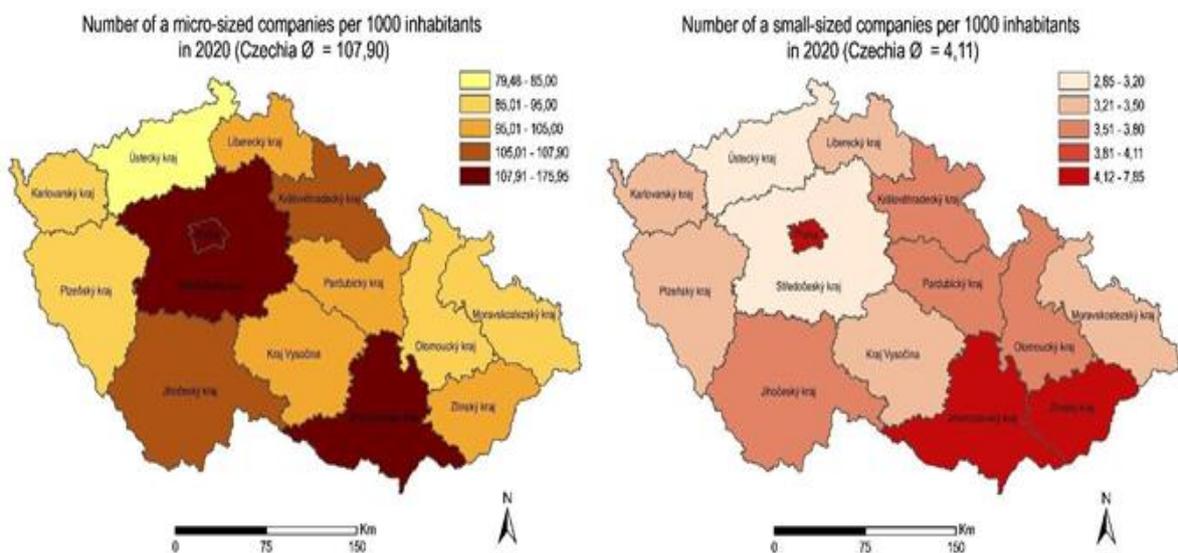


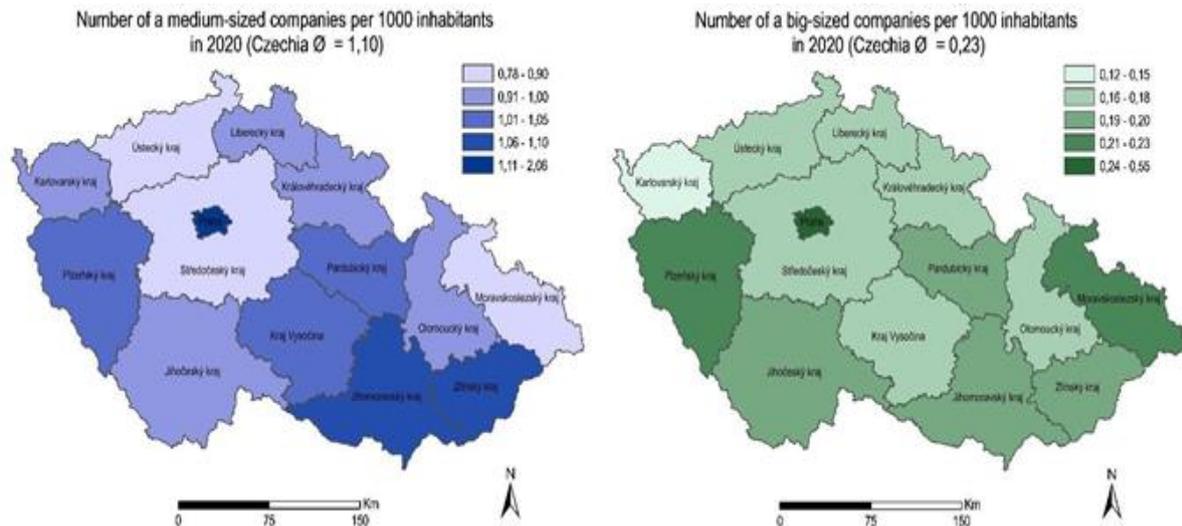
Source: Czech Statistical Office 2021a, own elaboration

5.1.3.1 Size structure of the companies

In 2008, the region was characterised by the lowest number of microenterprises (73.98). It was also relatively underrepresented in terms of small enterprises (3.86) and medium-sized companies (0.93). The number of large companies per 1,000 inhabitants (0.18) was also significantly below average (e.g., Prague had a rate of 0.46). At the same time, however, it should be noted that concerns were strongly represented in the region, forming the backbone of employment. Between 2008 and 2020, the growth of microenterprises in the region (growth index 1.10) was slightly above average compared to the national average (1.13). However, the overall share of microenterprises remained deeply below average (85.63). The trend was similar for small firms. A slight decrease was recorded in the number of medium-sized enterprises (growth index: 0.81). Large enterprises (250+) developed the most dynamically in relative terms (growth index: 1.09) and the region ranks third after Prague and the Pilsen Region in terms of large firms.

Figure 26: Number of companies (aggregated units per 1,000) in the Czech Republic in 2020



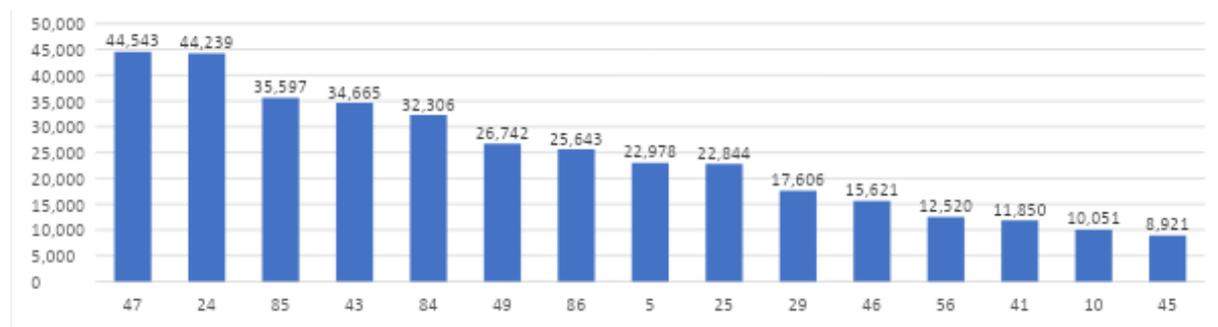


Source: Czech Statistical Office 2021b, own elaboration

5.1.3.2 Sectoral change in the Moravian-Silesian Region 2008-2020

Although the Moravian-Silesian Region is perceived as industrial, the most employment was generated by the tertiary services sector in 2008. The most important sectors included retail, public and health services, transport and food services. At the same time, many people were engaged in capital-intensive (steel and metal processing), export-oriented (automotive) and low-tech (food production) sectors of the manufacturing industry. The Moravian-Silesian Region, typical of an old industrial region, was characterised by many people employed in energy, namely in the mining and processing of hard coal.

Graph 27: Sectoral structure of employment in 2008 – top 15 sectors by employment in the Moravian-Silesian Region

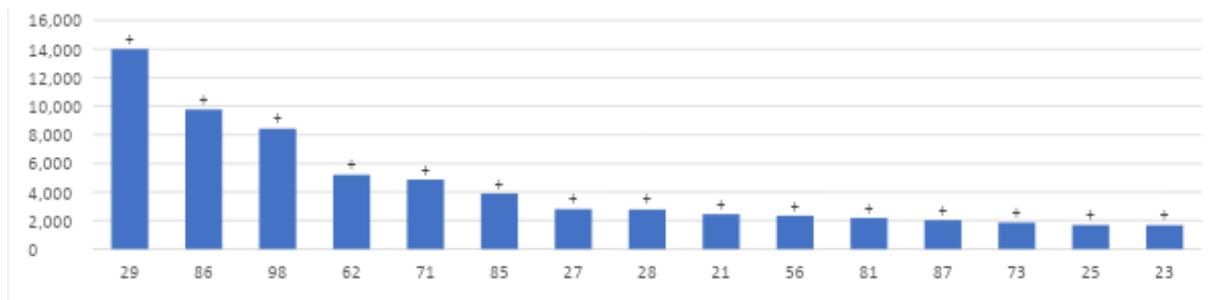


Source: Internal data of the Czech Statistical Office, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (47 - Retail trade, except of motor vehicles and motorcycles, 24 - Manufacture of basic metals; 85 – Education; 43 - Specialised construction activities; 84 - Public administration and defence; compulsory social security; 49 - Land transport and transport via pipelines, 86 - Human health activities; 5 - Mining of coal and lignite, 25 - Manufacture of fabricated metal products, except machinery and equipment, 29 - Manufacture of motor vehicles, trailers and semi-trailers; 46 - Wholesale trade, except of motor vehicles and motorcycles; 56 - Food and beverage service activities; 41 - Construction of buildings; 10 - Manufacture of food products; 45 - Wholesale and retail trade and repair of motor vehicles and motorcycles)

Comparing the sectoral structure between 2008 and 2020, the largest absolute increase in terms of number of employees was in the automotive industry. Other sectors also recorded large increases in terms of employment such as the manufacturing (capital-intensive) industry, the export-oriented manufacture of electrical equipment, manufacture of machinery and equipment, manufacture of basic pharmaceutical products and pharmaceutical preparations, and steel processing. Within the top 15 fastest growing sectors, only the services sector was represented. First and foremost, there were high increases in employment in public, health and social services. A positive finding was the increase in knowledge-intensive business services employment known as KIBS (NACE 62, NACE 71) or in creative industries (advertising and NACE 73). In addition, there has also been a large increase in the workforce in routine services such as the restaurant and overall hospitality industry.

Graph 28: Sectoral structure of employment in years 2008-2020 – top 15 growing sectors by employment in the Moravian-Silesian Region



Source: Internal data of the Czech Statistical Office, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (29 - Manufacture of motor vehicles, trailers and semi-trailers; 86 - Human health activities; 98 - Undifferentiated goods- and services-producing activities of private households for own use; 62 - Computer programming, consultancy and related activities; 71 - Architectural and engineering activities; technical testing and analysis; 85 – Education; 27 - Manufacture of electrical equipment; 28 - Manufacture of machinery and equipment n.e.c.; 21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations; 56 - Food and beverage service activities; 81 - Services to buildings and landscape activities; 87 - Residential care activities; 73 - Advertising and market research; 25 - Manufacture of fabricated metal products, except machinery and equipment; 23 - Manufacture of other non-metallic mineral products)

By contrast, the absolute largest loss of employees was in metallurgy (NACE 24) and power engineering and mining. Further employment declines were found in construction and some public and social sectors, low-tech manufacturing sectors, routine and consumer services, and the primary sector.

Graph 29: Sectoral structure of employment in years 2008-2020 – top 15 declining sectors by employment in the Moravian-Silesian Region

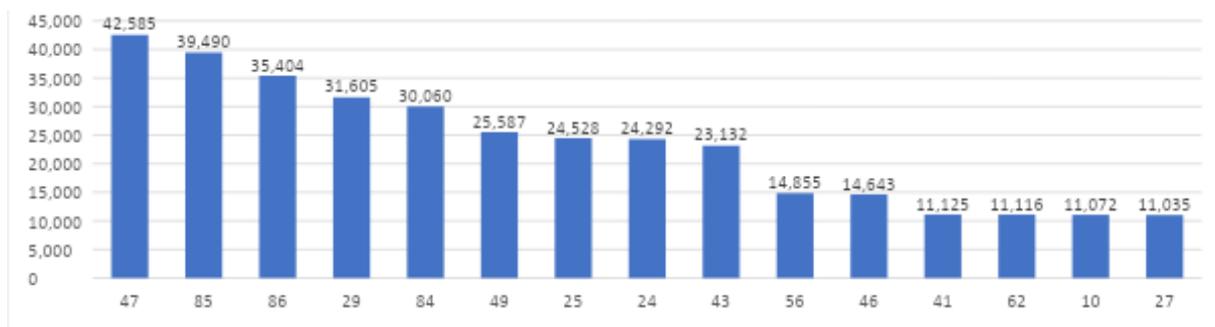


Source: Internal data of the Czech Statistical Office, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (24 - Manufacture of basic metals; 5 - Mining of coal and lignite; 43 - Specialised construction activities; 64 - Financial service activities, except insurance and pension funding; 13 - Manufacture of textiles; 42 - Civil engineering; 84 - Public administration and defence; compulsory social security; 47 - Retail trade, except of motor vehicles and motorcycles; 14 - Manufacture of wearing apparel; 88 - Social work activities without accommodation; 1 - Crop and animal production, hunting and related service activities; 53 - Postal and courier activities; 80 - Security and investigation activities; 95 - Repair of computers and personal and household goods; 68 - Real estate activities)

Compared to 2008, the sectoral structure has undergone some changes, especially regarding a growing importance of the automotive and IT industry. However, the traditional manufacturing industry has been maintained, although its importance has fallen on a relative basis.

Graph 30: Sectoral structure of employment in 2020 – top 15 sectors by employment in the Moravian-Silesian Region

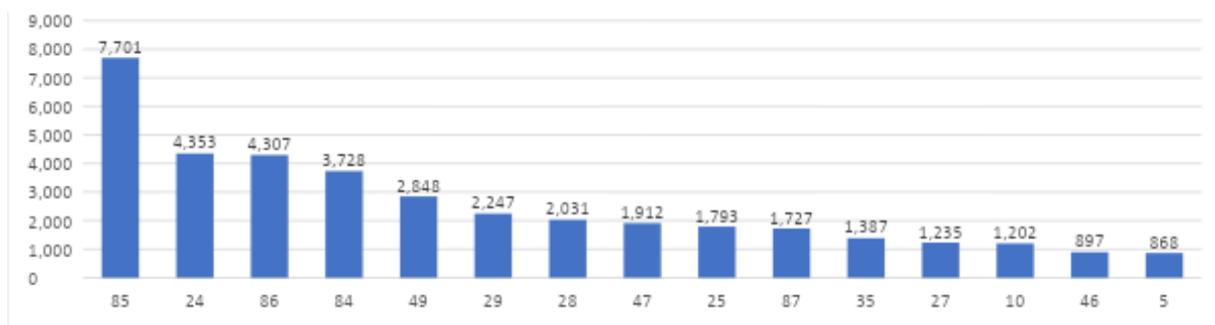


Source: Internal data of the Czech Statistical Office, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (47 - Retail trade, except of motor vehicles and motorcycles; 85 – Education; 86 - Human health activities; 29 - Manufacture of motor vehicles, trailers and semi-trailers; 84 - Public administration and defence; compulsory social security; 49 - Land transport and transport via pipelines; 25 -Manufacture of fabricated metal products, except machinery and equipment; 24 - Manufacture of basic metals; 43 - Specialised construction activities; 56 - Food and beverage service activities; 46 - Wholesale trade, except of motor vehicles and motorcycles; 41 - Construction of buildings; 62 - Computer programming, consultancy and related activities; 10 - Manufacture of food products; 27 - Manufacture of electrical equipment)

The age structure of employees cannot be neglected either. In absolute terms, the largest number of workers aged 55+ were employed in public, health and social services, as well as in the traditional sectors of power engineering and metallurgy. In general, many people aged 55+ were employed in the export sectors of the manufacturing industry and in low-tech sectors. Finally, many people aged 55+ were employed in routine and consumer services with lower added value and lower knowledge intensity.

Graph 31: Number of employed persons aged 55+ in 2020 according to sectors in the Moravian-Silesian Region



Source: Internal data of the UJEP, own elaboration

Note: Y-Axis = number of employees and X-Axis = NACE Code (85 - Education; 24 - Manufacture of basic metals; 86 - Human health activities; 84 - Public administration and defence; compulsory social security; 49 - Land transport and transport via pipelines; 29 - Manufacture of motor vehicles, trailers and semi-trailers; 28 - Manufacture of machinery and equipment n.e.c.; 47 - Retail trade, except of motor vehicles and motorcycles; 25 -Manufacture of fabricated metal products, except machinery and equipment; 87 - Residential care activities; 35 - Electricity, gas, steam and air conditioning supply; 27 - Manufacture of electrical equipment; 10 - Manufacture of food products; 46 - Wholesale trade, except of motor vehicles and motorcycles; 5 -Mining of coal and lignite)

Another view offers a relative representation of people aged 55+ in employment by industry. At the regional level, employed persons aged 55+ accounted for 20% of the total employment rate. A high percentage of people aged 55+ were found in traditional industries, the primary sector, some service sectors (e.g., NACE 70, NACE 93, NACE 82), and other consumer services.

Graph 32: Percentage of employed persons aged 55+ in 2020 according to sectors in the Moravian-Silesian Region



Source: Internal data of the UJEP, own elaboration

Note: Y-Axis = percentage and X-Axis = NACE Code (7 - Mining of metal ores; 80 - Security and investigation activities; 19 - Manufacture of coke and refined petroleum products; 81 - Services to buildings and landscape activities; 93 - Sports activities and amusement and recreation activities; 1 - Crop and animal production, hunting and related service activities; 36 - Water collection, treatment and supply; 8 - Other mining and quarrying; 35 - Electricity, gas, steam and air conditioning supply; 70 - Activities of head offices; management consultancy activities; 2 - Forestry and logging; 85 - Education; 49 - Land transport and transport via pipelines; 91 - Libraries, archives, museums and other cultural activities; 68 - Real estate activities)

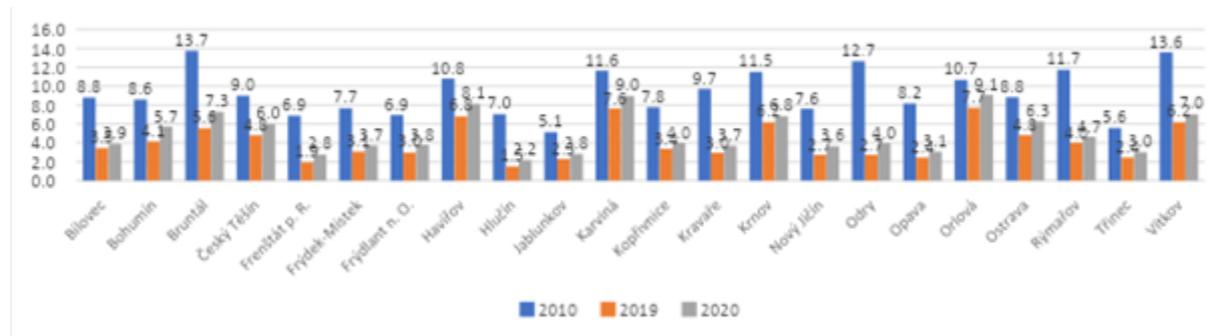
5.1.4 Unemployment

In 2010, the average unemployment rate in the Czech Republic was 7.4% while in the Moravian-Silesian Region unemployment was 9.0%. Between 2010–2019, the region showed relatively low dynamics in the decline in unemployment (growth index: 0.49), and therefore it is not surprising that at the end of the monitored period it was the region with the highest unemployment rate (4.4%) across the Czech Republic. During 2020, the unemployment rate increased to 5.6% (growth index: 1.27). However, this was a relatively minor increase that correlated to the national level.

Spatial patterns of unemployment at the intra-regional level are characterised by a certain north-south gradient, ranging from above-average to extremely high. In 2010, the highest rates in the Czech Republic were recorded in peripheral rural micro-regions in the northern part (e.g., Bruntál, Rýmařov and Vítkov). Another example of a highly above-average unemployment rate is coal micro-regions (Karviná, Havířov). By contrast, regions with a below-average unemployment rate were located on the southern periphery, such as the micro-regions of Jablunkov, Frenštát pod Radhoštěm, Třinec or Hlučín, which is located in the metropolitan hinterland of Ostrava. Of the 22 autonomous districts and municipalities with extended powers, only seven micro-regions achieved an above-average decrease in unemployment from 2010 to 2019. Specifically, unemployment decreased the least in coal regions (Orlová, Karviná, Havířov) and the regions of metropolitan Ostrava and peripheral Krnov. From a spatial perspective, above-average metrics of the decline in unemployment were achieved by micro-regions located in the hinterland of urban areas (e.g., Hlučín, Odry, Frenštát pod Radhoštěm, Kravaře) and by the town of Opava (its urban region). In contrast, the low dynamics of the decline in unemployment were characteristic of peripheral rural regions, coal regions, and regions located in the central and southern part of the region. In 2019, spatial disparities in regional unemployment were comparable to 2000.

In 2019, the unemployment ranged from 3.4 to 7.0% at the micro-regional level. The micro regions were relatively resilient to the impacts of the Covid-19 pandemic, which is mainly due to the sectoral composition in the region. In this sense, the MSR micro-regions were among the most stable in the Czech Republic. Nevertheless, most were still characterised by above-average unemployment. High unemployment also plagued the micro-regions in the northern peripheral part of the region and in the coal regions. High unemployment is also prevalent in Ostrava. The spatial distribution of unemployment mimicked the trend from 2010. In 2020, unemployment rates ranged from 2.2 to 9.1% in the micro-regions.

Graph 33: Development of unemployment (%) in the Moravian-Silesian Region at the micro-regional level in 2010–2020



Source: Eurostat2021, own elaboration

The spatial patterns of unemployment are persistently high and can be divided into various groups. Above-average unemployment rates affect the peripheral regions (Vítkov, Krnov, Bruntál, Rýmařov) and micro-regions traditionally specialised in hard coal mining. Lower unemployment rates can be divided into three spatial groups. The first group is urban micro-regions with a strong industrial base, either specialised (Třinec, a single-company town) or diversified (Opava). The second group has benefited from an intensive inflow of foreign direct investment and is dominated by the automotive industry (Frýdek-Místek, Frenštát pod Radhoštěm, Nový Jičín). Finally, the third group benefit from proximity to urban micro-regions (Hlučín, Jablunkov). Between these two extremes is Ostrava, which, despite its positive economic development, shows an above-average unemployment rate.

5.1.5 Demographic analysis

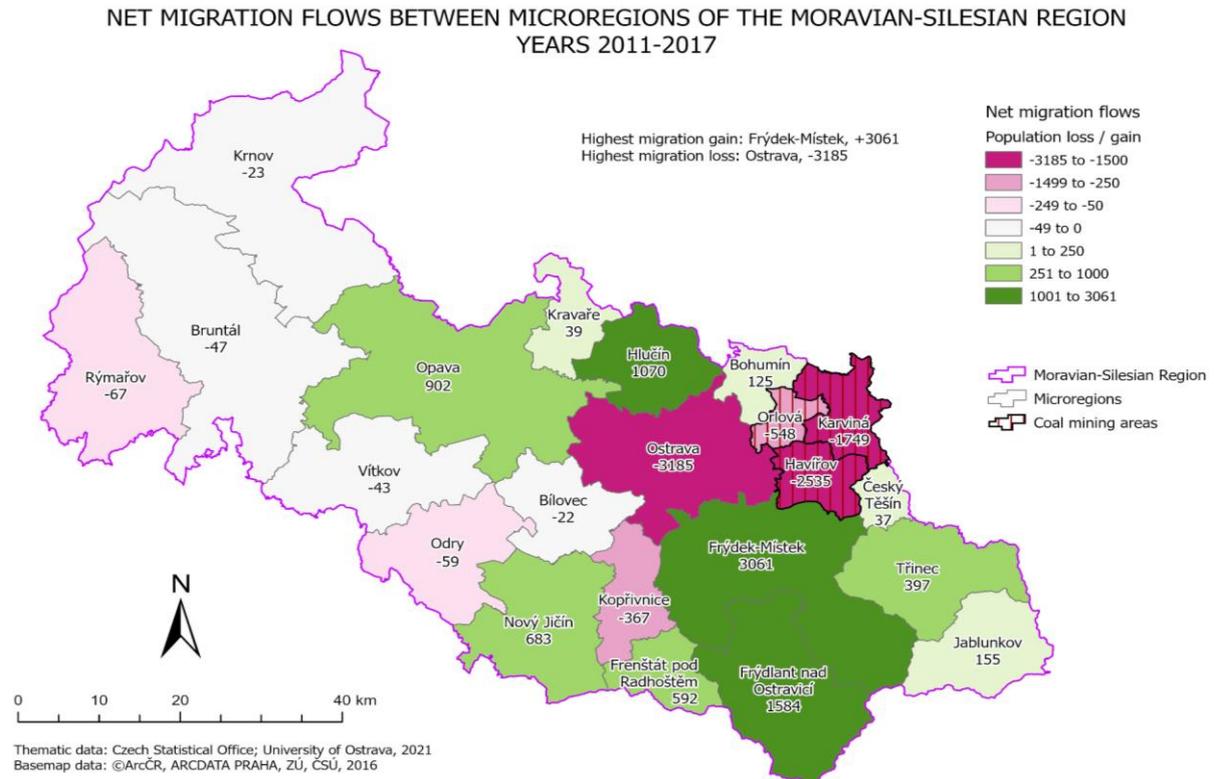
In 2020, the Moravian-Silesian Region was the fourth most populous region in the Czech Republic and is characterised by a high degree of urbanisation, which is the result of long-term industrialisation. However, it is a highly differentiated region, including rural and peripheral regions. In 2008, there was a total population of 1,250,255. By 2020, the number of inhabitants fell to 1,192,834 (-4.6%). The largest absolute decline occurred in the old industrial micro-regions (e.g., Ostrava, Havířov, Karviná, and Orlová) and peripheral regions located in the northern part of the region. Population trends were positive in only a few micro-regions, with the largest increase in the periphery of urban regions. Spatially, significant differences persisted between urban and rural regions. Improvement has been seen in the Frýdek-Místek micro-region and other micro-regions located in the hinterland of urban micro-regions, which achieved positive population growth between 2008 and 2020.

With respect to the gross rate of natural population increase, the Moravian-Silesian Region recorded a negative natural population change from 2008 to 2020, which amounted to -10 inhabitants for every 1,000 inhabitants. The natural decline in population has been recorded in seventeen micro-regions. At the same time, however, a negative natural increase was also measured in growing micro-regions, while a natural increase was achieved in only six micro-regions. Simply put, all major cities in the region have declined in population, while their periphery has grown. This indicates the intensity of the suburbanisation process. In addition, this process is highly uncoordinated and unsustainable since low-density and highly energy demanding urban structure of single detached houses is prevailing¹²¹. In the monitored period, the Moravian-Silesian Region achieved a negative migration balance, which amounted to -23 inhabitants for every 1,000 inhabitants. The population decline through migration was also recorded in most micro-regions. High migration gains per 1,000 inhabitants were achieved mainly by micro-regions fulfilling residential functions in the southern part of the region while industrial and peripheral regions recorded a high migration loss.

Intra-regional analysis provides a more precise perspective of migration flows. For example, Ostrava has been gaining population mainly from coal micro-regions. From those areas, Ostrava gained over 1,800 people between 2011 and 2017 while losing 1,900 to the Frýdek-Místek micro-region.

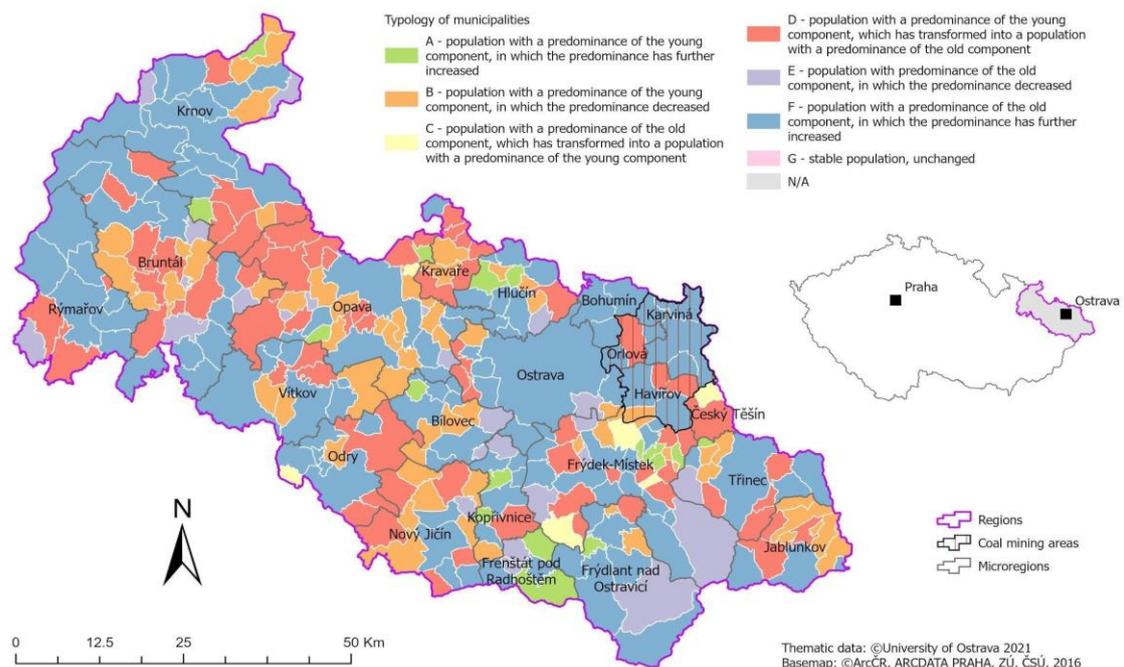
¹²¹ Slach et al. 2019

Figure 27: Net migration flows between micro regions of the Moravian-Silesian Region for the period 2011-2017



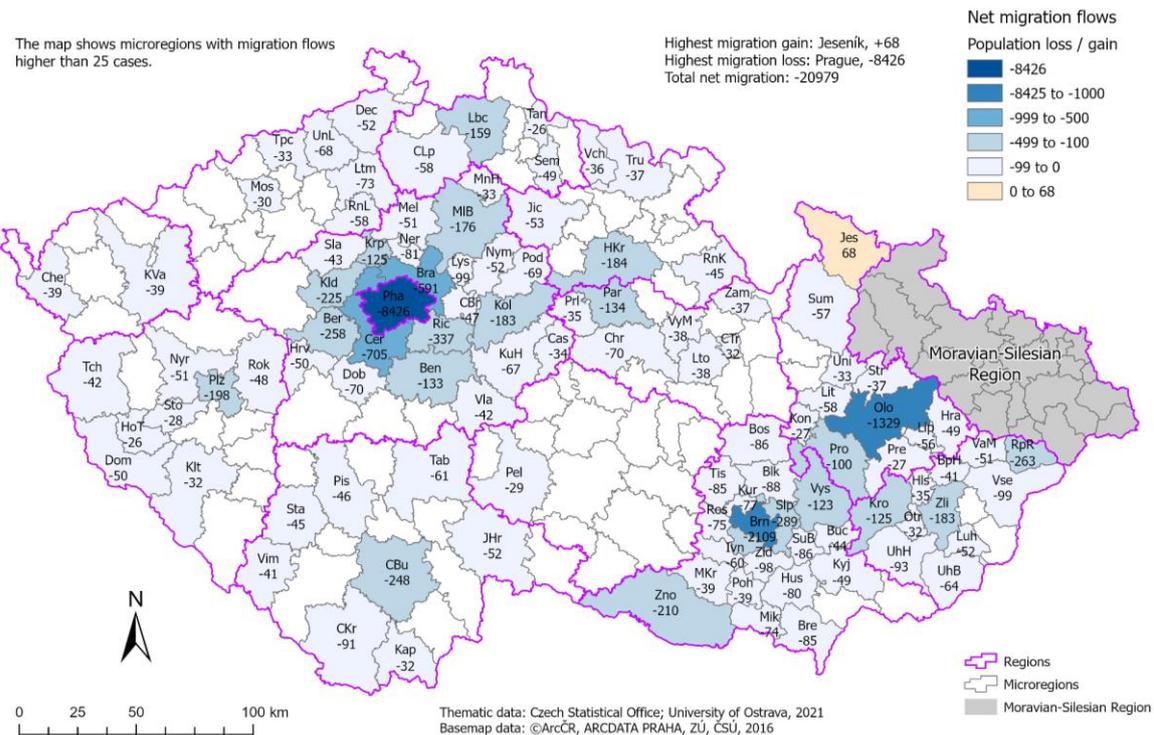
As mentioned earlier, the main causes of the population decline can be considered in two processes: negative natural balance (low birth rates and prevailing deaths) and migration. The intensity of ageing is highly variable, so it is analysed by using a change in the ageing index at the municipal level. Figure 28 illustrates an intensification of the ageing process and the resulting low demographic potential, as the ageing index increased in 84% of municipalities between 2012 and 2018. The process of demographic rejuvenation is rather an exception to the rule.

Figure 28: Typology of municipalities in the Moravian-Silesian Region according to the development of the ageing index in the period 2012-2018



In the period between 2011 and 2017, 43,859 people moved out of the region. The intensity of the brain-drain process is illustrated by the age distribution: more than 27% of out-migration was from the age group 20-29 years old, and more than 25.5% came from the age group 30-39 years old. The clear direction of migration was to Prague and its surroundings (24.1%) as well as to larger Moravian cities (Brno, Olomouc). The only micro-region with a population gain was Jeseník, which has long been one of the economically weakest regions. From the spatial patterns of migration, it can be deduced that the main push factors include mainly low wages, lack of skilled jobs, and quality of life, especially the environment¹²². To explain this phenomenon, research points to a) the growing importance of non-economic factors among highly educated population¹²³, b) the low attractiveness of Ostrava as the Region's hub for university and grammar school students¹²⁴.

Figure 29: Net migration flows for the Moravian-Silesian Region for the period 2011-2017



The demographic outlook is not very favourable for the region. According to the CSO forecast, the population of could fall to 978,513 by 2051, an 18% decline compared to the 1,192,834 inhabitants in 2020¹²⁵. The ageing index would reach 278, i.e., 323,459 people aged 65+. It is reasonable to expect this trend to affect large cities in particular since the process of suburbanisation is still prevailing over reurbanisation. One of the demographic forecasts assumes that the city of Ostrava could lose 50,000 inhabitants by 2050 (from 283,320 in 2021 to 230,000 in 2050)¹²⁶.

¹²² Khomenko et al., 2021

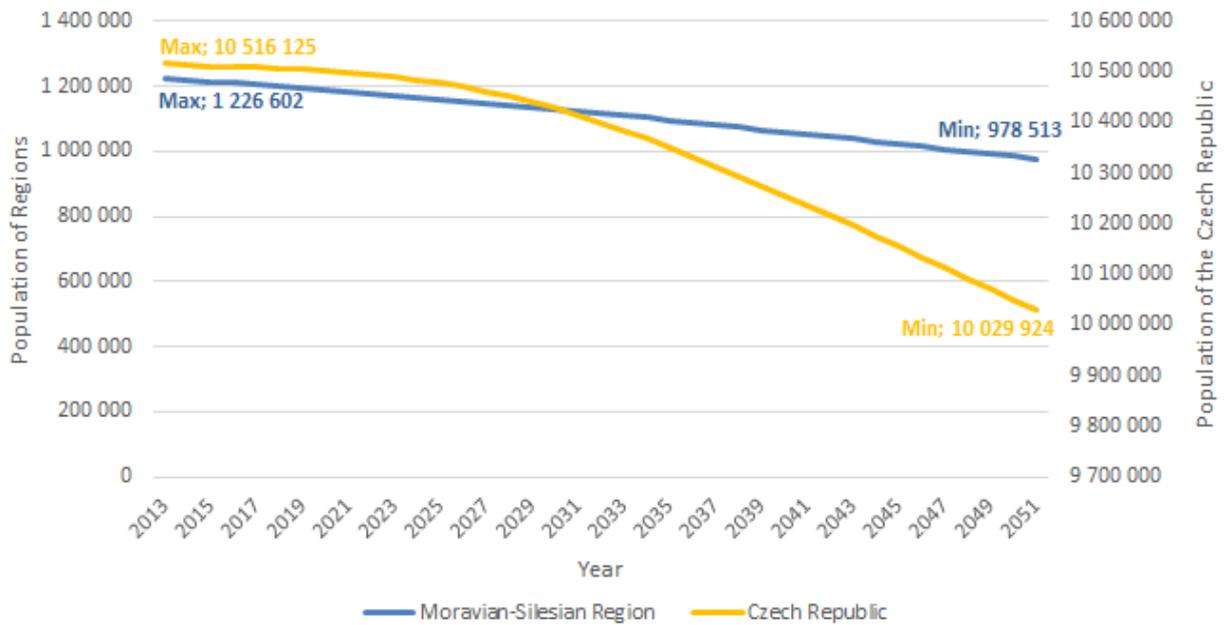
¹²³ Nováček et al., 2018

¹²⁴ Slach et al., 2021

¹²⁵ CSO, 2013

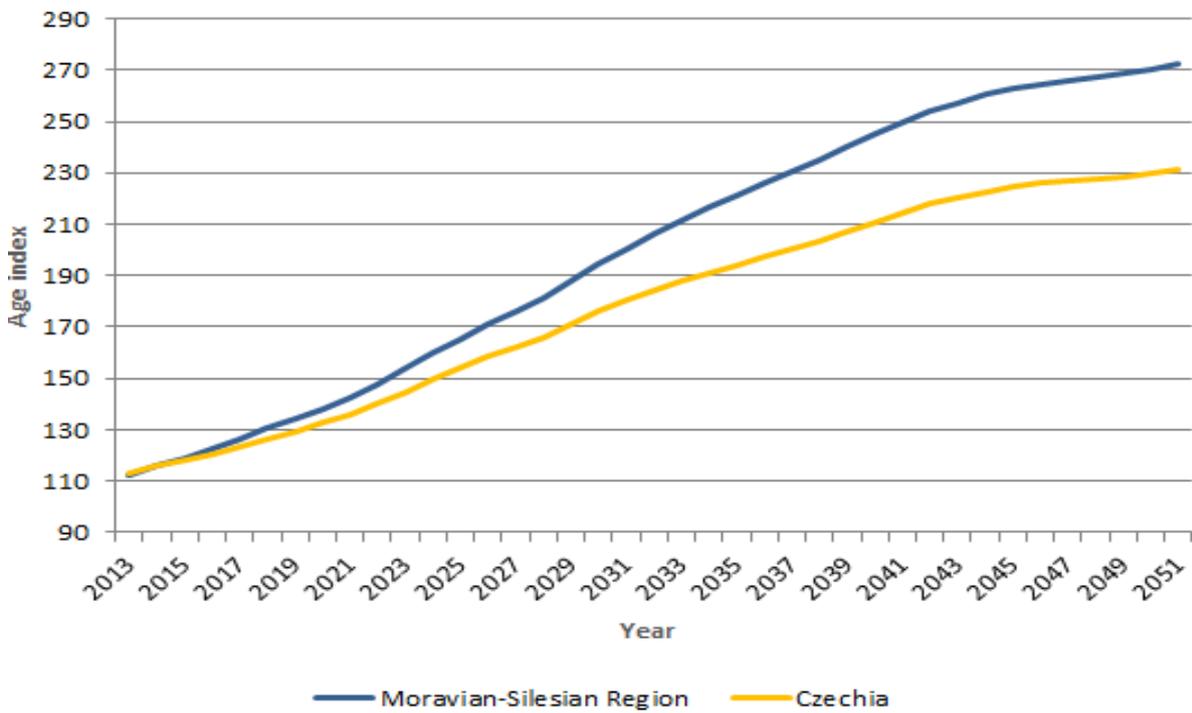
¹²⁶ Šotkovský 2010

Graph 34: Population projection up to 2051 for the Moravian-Silesian Region



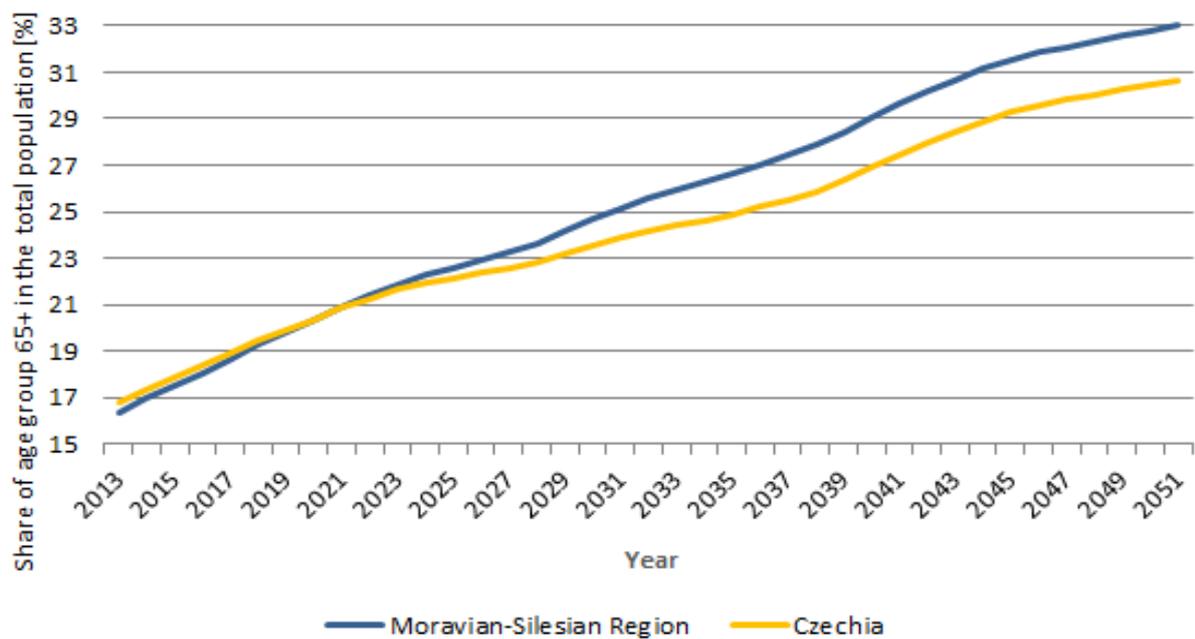
Source: CSO 2013

Graph 35: Age index projection up to 2051 from the Moravian-Silesian Region



Source CSO 2013

Graph 36: Share of age group 65+ in the total population (%) for the Moravian-Silesian Region



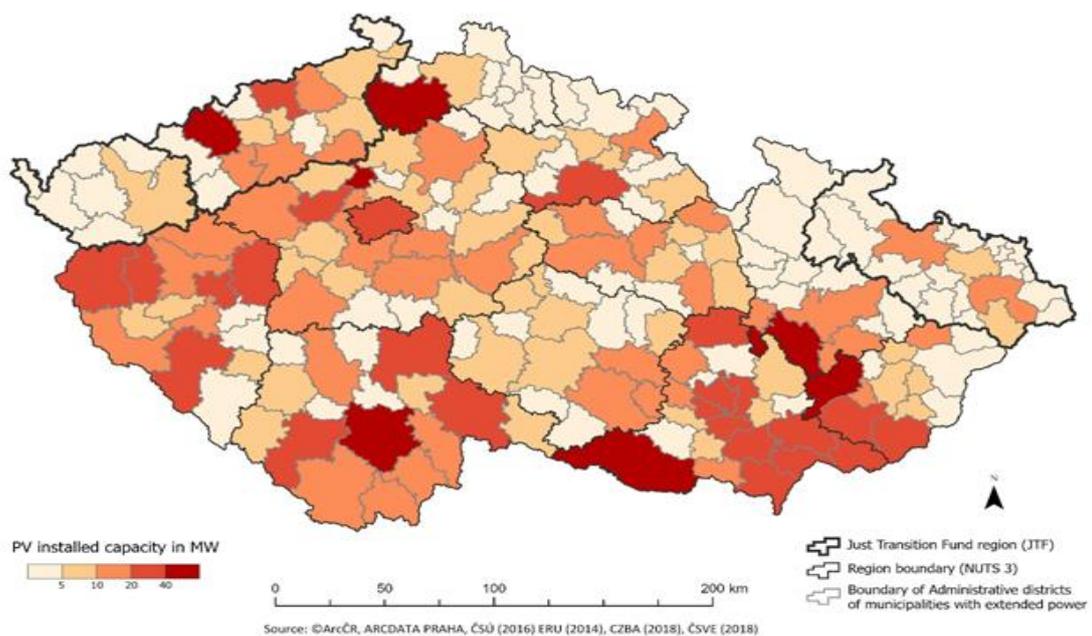
Source: CSO 2013

5.1.6 Energy and heating sector

5.1.6.1 Renewable energy

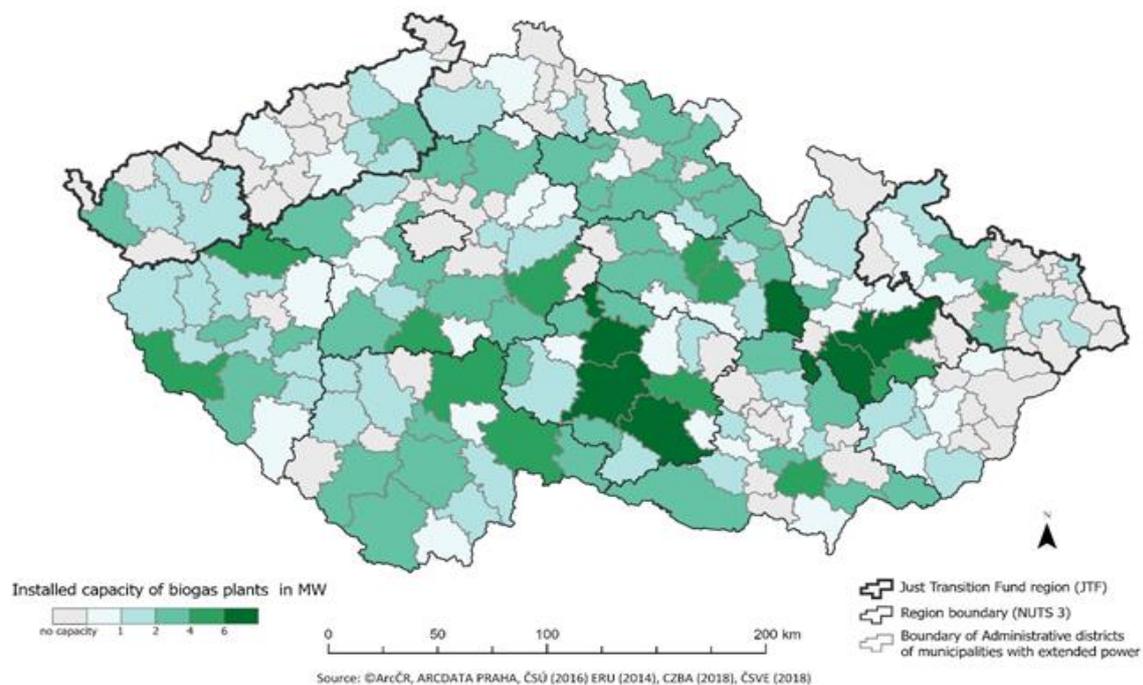
The Moravian-Silesian Region has the third lowest installed capacity of renewable energy in absolute numbers and the second lowest per capita (0.09 kW) among Czech regions. It is below average in the installed capacity of wind turbines, as well as photovoltaics (Figure 30) and biogas plants (Figure 31). This seems to be a challenging initial situation due to the ongoing energy transformation and the second highest energy consumption among the Czech regions (8,087.6 GWh in 2019)¹²⁷.

Figure 30: Installed capacity of photovoltaics



¹²⁷ CSO, 2020

Figure 31: Total installed capacity of biogas plants



Hereafter, the TA team assesses the RES potential in Moravia-Silesia region; more details on the assumptions behind are in the Annex 3.

By contrast to the other two regions, the potential for geothermal energy is lower in Moravia-Silesia region and, therefore, can be disregarded in this scope¹²⁸. Similarly, hydropower represents one of the lowest shares in the regional installed power capacity.

Conversely, the potential for wind is rather high, third highest (in terms of generation) of all three regions. However, it would mean increasingly the currently installed capacity more than ten fold (from 28 MW to 330 MW)¹²⁹. The brownfields and the plans of some of the key economic operators to develop RES on their premises could help to enhance the development of this type of RES¹³⁰.

As to PV, the NECP assumes that there should be roughly 2000 MWe newly installed PV by 2030. When recalculated to the Moravia-Silesia region¹³¹, the current installed capacity (60 MWe) could be nearly 5 times increased to roughly 285 MWe. This is the highest expected installed capacity from all three regions and clearly, the PV has the highest potential for growth, potentially contributing to better energy access and decentralisation¹³².

5.1.6.2 Heating sector

There are a total of 12 heat sources in this region with an installed capacity of more than 20 MWt. Another thirty-eight licenses are allocated for heating plants whose installed thermal output does not exceed the limit of 20 MW¹³³.

¹²⁸ The geothermal potential is currently being mapped and refined. The outputs of the project are expected in June 2022, <https://www.energie21.cz/pruzkum-potencialu-geotermalni-energie-2/>

¹²⁹ https://www.ufa.cas.cz/DATA/vetma-energie/Potencial_vetrne_energie_2020.pdf and <https://www.czso.cz/csu/czso/14-energetika-6y4izfqv/>

¹³⁰ E.g. <https://libertysteelgroup.com/cz/news/realizaci-programu-uhlikove-neutrality-v-gfg-alliance-povede-nove-roland-junck/>

¹³¹ See the Annex 3 for methods of recalculation.

¹³² In addition, there is obviously biomass potential. However, this is highly dependent on the given location as well as regulatory framework and thus exceeds the scope of this work. For additional reading on biomass potential in Czechia, please refer to e.g. <https://doi.org/10.1016%2Fj.rser.2020.110319> or <https://doi.org/10.1016/j.egy.2020.11.146>

¹³³ Přehled údajů o licencích udělených ERÚ <https://licence.eru.cz/index.php> (Overview of licenses granted by the ERO)

Table 19: Heating plants in the Moravian-Silesian regions with total thermal output above 20 MWt ¹³⁴

License company	Total thermal output [MWt]
ENERGETIKA TŘINEC, a.s.	613
TEPLO BRUNTÁL a. s.	35
Veolia Energie ČR, a.s.	2,393
BorsodChem MCHZ, s.r.o.	74
OPATHERM a.s.	92
Semperflex Optimit s.r.o.	44
ČEZ Energetické služby, s.r.o.	114
Mayr-Melnhof Holz Paskov s.r.o.	20
Veolia Průmyslové služby ČR, a.s.	131
TAMEH Czech s.r.o.	1,359
MS UTILITIES & SERVICES a.s.	34
Elektrárna Dětmorovice, a.s.	1,573

Based on the information from the "Impact study of coal combustion phase out in the Moravian-Silesian region"¹³⁵, it was found that in this region, there are six distributing heating systems connected to heat sources, which use 90% of coal or secondary products for heat production.

These six distributing heating systems cover heat supply in the cities of Ostrava, Třinec, Havířov, Karviná, Orlová and Bohumín. These heating systems ensure heat supplied for both the housing sector, non - manufacturing sector, and the industry sector in these cities (see Table 20).

In the towns Frýdek-Místek, Kopřivnice and Bruntál, the distributing heating systems are connected to heat sources that use coal in the range of 52% to 80% for production. On the contrary, the distributing heating system in Krnov is connected to a heat source, which uses 81% biomass for production. The other distributing heating systems mentioned below in Table 20, which ensure the supply of heat in the cities of the Moravian-Silesian Region with a population level of more than 10,000, are connected to a heat source that uses natural gas for heat production.

¹³⁴ Ibid.

¹³⁵ Dopadová studie odchodu od energetického spalování uhlí v Moravskoslezském kraji (Impact study of coal combustion phase out in the Moravian-Silesian region)
<https://www.mskec.cz/data/storage/files/dopadova-studie-moravskoslezske-energeticke-centrum-web.pdf>

Table 20: Heat supplied to the district heating system in MSR - municipalities with more than ten thousand inhabitants in 2017¹³⁶

District heating system	Number of flats connected to the district heating system [qnty.]	Distribution of annual heat supply		Total heat supply [GJ]	Brutto - heat production		
		Housing sector / Non - manufacturing sector [GJ]	Industry sector [GJ]		Coal [%]	Biomass [%]	Natural gas [%]
Ostrava	100,360	6,765,531	2,899,513	9,665,044	99.9	0	0.1
Třinec	9,229	525,905	1,224,260	1,750,165	98.5	0	1.5
Havířov	29,000	-	-	1,418,734	99.7	0.1	0.3
Karviná	21,778	-	-	1 027 359			
Frýdek-Místek	18,342	-	-	763,485	52.5	47.5	0
Krnov	4,370	-	-	488,110	19	81	0
Kopřivnice	6,644	195,435	188,306	383,741	73.2	22.5	4.3
Orlová	8,602	-	-	361,768	91.8	0	8.2
Bohumín	5,700	-	-	194,798			
Opava	8,936	-	-	187,855	0	0	100
Bruntál	4,515	174,173	0	174,173	80.5	0	19.5
Nový Jičín	3,542	-	-	157,097	0	26.1	83.9
Český Těšín	4,705	129,150	0	129,150	0	0	100
Hlučín	2,205	55,284	0	55,284	0	0	100
Frenštát pod Radhoštěm	1,269	-	-	-	-	-	100
Total annual heat supply [GJ]				16,756,763			

The above study further concludes that apart from coal, natural gas and RES, secondary energy resource (SES) and, in the future, possibly small nuclear reactors can be considered suitable primary energy sources for the Moravian-Silesian Region. However, according to the TA team, the latter goes far beyond the horizon of 2030 and should be taken with this respect.

Secondly, related to district heating, the study concludes that replacing coal in district heating sources and its low carbon transition presents an excellent potential for the Moravian-Silesian Region's energy, which together with the infrastructure and systems, create a compact energy system.

The study evaluates three possible scenarios: 1) natural gas scenario, 2) nuclear scenario, 3) renewable energy scenario. However, the study also clearly states that the third, renewable energy scenario has only been elaborated as „supplementary“. The nuclear scenario then mainly relies on

¹³⁶ Dopadová studie odchodu od energetického spalování uhlí v Moravskoslezském kraji (Impact study of coal combustion phase out in the Moravian-Silesian region), November 2020. <https://www.mskec.cz/data/storage/files/dopadova-studie-moravskoslezske-energeticke-centrum-web.pdf>

small modular reactors. The study does not consider the contribution of the scenarios to the overall climate neutrality transition.

The study concludes the gas scenario to be “feasible” to lead the transition from coal in all the district heating systems in the Moravian-Silesian region. For the “nuclear” scenario, it recommends mainly two localities for further development (Třebovice and Dětmárovice) to be “technologically feasible” by 2035 with the need for further economic considerations (e.g., discounting, financial feasibility and bankability, etc.). The renewable energy scenario is the least developed of the three and is based on the regional target of 11 % of RES in primary energy in the region from the current 9 % (by 2044?)¹³⁷. It concludes that a suitable mix of RES, as an additional energy source in the district heating sector will be complemented with the potential of closed coal mines, brownfields and building facades.

The study concludes that the gas scenario confirmed by capacity calculations and natural gas availability that the technical feasibility of replacing coal-fired sources with natural gas-fired sources is possible. The most important aspects of the transition from coal-fired to natural gas combustion are the production costs of heat and electricity, which affect the competitiveness of gas sources in energy markets and the availability of natural gas at an economically acceptable distance source.

The TA team recommends a focus should be on the follow-up of this study to low-carbon (non-combustion) technologies and their role in the decarbonisation of the heating sector, as (sketchily) suggested in the RES scenario of the above study. To avoid carbon lock-in of the natural gas-based solutions, the JTM (and other sources) should be used to support and pilot low-carbon, non-combustion technologies (heat pumps, electric boilers, solar collectors, waste heat recovery) which have to be an inherent part of the heating sector’s broader transformation in the overall sector coupling and decarbonisation¹³⁸.

In the short-term, investment needs in the Moravia-Silesia Region stem from the national investment needs for the district heating sector and can be estimated at CZK 17-18 billion (EUR 0.7 billion) by 2030¹³⁹.

The heating sector forms a substantial part of the overall transition of the region and affordable heat and energy access are undoubtedly an inherent part of the “just” transition. In the mid and longer run, the transformation of the sector will be realised in a wider context of the decarbonisation of the whole economy, including first and foremost energy efficiency and energy savings. The future of DH will be a mix of highly efficient cogeneration and direct electrification using RES (solar collectors, heat pumps). CHP systems can also be used for energy storage (power-to-heat technology), where CHP systems can efficiently use surplus electricity from intermittent sources (wind and solar) to generate and store heat using large heat pumps. Where possible, these systems should be explored and piloted as soon as possible¹⁴⁰.

5.1.7 Digitalisation and technological level

To date, the most comprehensive study on the impact of digitalisation on the labour market is the work of Chmelář et al. (2015). Their analysis builds on the seminal work of Frey and Osborne (2013) and applies it to the context of the Czech Republic. The authors studied the destruction/creation potential of digitalisation on the NUTS 2 level. They found that the Moravian-Silesian Region has a low potential in digitalisation, which would result in aggregate job loss. The low regional potential in digitalisation was confirmed by Ciffolilli and Muscio (2018). In the newest study, Balland and Boschma (2021) map the potential of regions (NUTS 2) to apply and benefit from industry 4.0 technologies (I4T) such as artificial intelligence, augmented reality, autonomous robots, cloud computing, and cybersecurity, which suggest that the MSR has weak I4T potential.

5.1.8 Key economic operators

Although the projects of key economic operators are expected to be financed mainly from public or private sources, other than the JTF, planned activities of these entities represent an important part of

¹³⁷ Regional Energy Policy of the Moravian-Silesian Region (2021 – 2044). March 2020.

¹³⁸ Please see more in Annex 3, Section on District heating for further details on both the current state of DH in Moravian-Silesian region and the pathways for decarbonisation.

¹³⁹ More details about the district heating transformation strategy, the connected investment needs and the link to just transition can be found in Annex 3.

¹⁴⁰ For instance, the City of Prague will explore the option to use the clean water from its waste-water treatment plant for large heat pumps. Given the topography, similar could be explored e.g., in Ústí.

the transformation story of the Moravian Silesian Region as these operators are the main regional employers. Thus, their strategic plans cannot be neglected in the analysis.

Moravian Silesian Region is the largest region of hard coal mining in the Czech Republic (28% of the total area of the region is part of the Ostrava-Karviná Coal Basin and half of the regional inhabitants - around 600,000 people live there). Hard coal is mined by only one company in the Czech Republic, OKD Nástupnická, a.s. Since 2010, there has been a sharp decline of coal mining, which is also due to the economic problems of the mining company. According to CSO¹⁴¹ data, in 2020, about 11,000 jobs were dedicated to the mining sector in the region. The end of hard coal mining has already begun, and as of 1 March 2021, mining at the Darkov and ČSA mines has ceased. A decision on the termination of mining at the remaining ČSM - North and ČSM - South mines has not yet been taken. However, a rapid cessation of activities is expected (2022 at the latest). In Moravian-Silesian Region, traditional production of steel is located in Ostrava (Liberty Ostrava) and Třinec (Třinecké železářny). Whereas coal mining is significantly declining in last years, producers of the steel are preparing for the post-coal period and plan to develop their businesses after the coal phas-out. The largest hard coal burning power plant in the Czech Republic is also in the region, Dětmarovice operated by ČEZ, and other heating and power plants operated by Veolia Energie or TAMEH CEZCH.

There are 41 installations operating under the EU ETS in Moravian-Silesian Region (see Table 21). The distribution across sectors is diversified, and installations under EU ETS are mainly located in the manufacturing industry with local energy or heating installations. A higher concentration of installations can be found for firms in the electricity, gas, steam and air conditioning supplies sector and in the manufacturing of basic metals. In 2020, firms in electricity, gas, steam and air conditioning supplies had about 9,000 employees and there were another 24,000 jobs in manufacturing of basic metals¹⁴².

Table 21: Moravian-Silesian Region - Distribution of EU ETS installations by sectors

CZ NACE classification of economic activities	Number of EU ETS installations
10 Manufacture of food products	1
11 Manufacture of beverages	1
17 Manufacture of paper and paper products	2
19 Manufacture of coke and refined petroleum products	1
20 Manufacture of chemicals and chemical products	2
21 Manufacture of basic pharmaceutical products and pharmaceutical preparations	1
22 Manufacture of rubber and plastic products	1
23 Manufacture of other non-metallic mineral products	3
24 Manufacture of basic metals	7
25 Manufacture of fabricated metal products, except machinery and equipment	1
27 Manufacture of electrical equipment	1
28 Manufacture of machinery and equipment	1
29 Manufacture of motor vehicles, trailers and semi-trailers	1
30 Manufacture of other transport equipment	1
33 Repair and installation of machinery and equipment	1
35 Electricity, gas, steam and air conditioning supply	14
46 Wholesale trade, except of motor vehicles and motorcycles	1
52 Warehousing and support activities for transportation	1
EU ETS installations in total	41

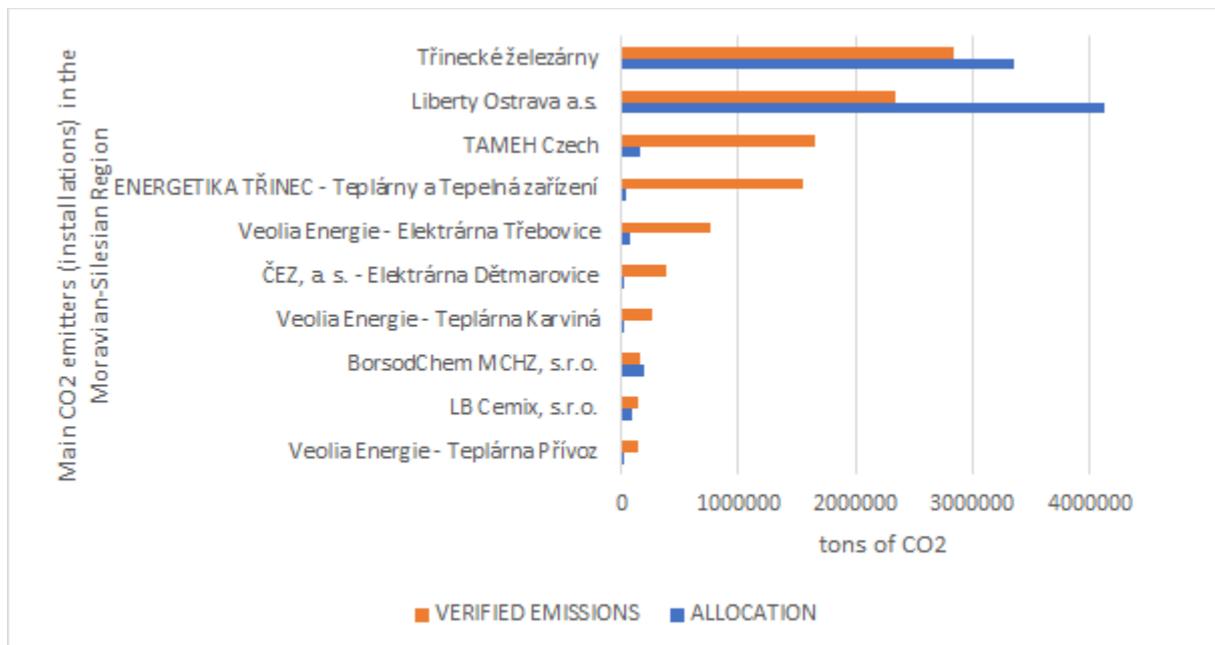
The main CO₂ emitters in the region with installations under EU ETS include the firms already mentioned, such as Třinecké železářny (and its energy division), Liberty Ostrava, Veolia Energie or ČEZ. These companies also gained in size during recent years, and a significant portion of transitional CO₂ allowances for investments into modernisation and ecology were acquired. ČEZ used the majority of these allowances between 2013-2019 for its power plant, Dětmarovice, as well as for its heating

¹⁴¹ ČSÚ (2021): Statistické ročenky krajů. [cit. 2021-03-30]. Retrieved from: <https://www.czso.cz/csu/czso/employment-and-unemployment-as-measured-by-the-labour-force-survey-quarterly-data-4-quarter-of-2020>

¹⁴² dtto

plant, Vítkovice (7,533,588 transitional allowances), followed by TAMEH CZECH which provides energy supplies to Liberty (4,632,723), Veolia Energie gained 1,901,026 of transitional allowances mainly for its power plant, Třebovice, and for its heating plants across the region and Energetika Třinec, which provides energy supplies to Třinecké železárny (1,640,608).

Graph 37: Verified emissions 2020 – Top 10 CO₂ emitters in the Moravian-Silesian Region



Key economic operators in the region are preparing their own strategies for the transition to a low carbon economy. Based on interviews and publicly available data, they are actively mapping the opportunities and are also able to finance an external professional consultancy. Some key operators are communicating and coordinating their plans together. For example, seven industrial companies operating in MSR have joined forces to support the region's transition to a low-carbon economy through a joint initiative. The joint declaration was signed in 2020 by AI Invest Břidličná (MTX Group), Bonatrans Group, Brose CZ, Liberty Ostrava, Ostroj, Třinecké železárny - Moravia Steel and Vítkovice Steel.

The largest CO₂ emitter in the region is Třinecké železárny, which expects significant impacts of the transition to a climate neutral economy. The firm is intensively preparing several interconnected innovative projects, which it plans to implement over the next ten years. Projects include investment into RES, investments into the greening of primary production, operations and processes as well as change in the portfolio towards ecological segments. Rising costs for emission allowances also play a role in deciding on green investments. The company set up a goal to gradually reduce emissions by 55% by 2030¹⁴³. The company plans to apply for financial support of their projects from the Modernisation Fund and the Just Transition Fund. Another part of the strategy is a massive planting of trees and care for greenery, which is ongoing. The company does not explicitly mention any reductions in the labour force. However, there are also concerns about the sufficient security of European steel producers against competitors from third countries.

Another key employer in the region, Liberty Ostrava, publicly presents its plans for transition to a climate neutral economy. Liberty Ostrava is a part of the international Liberty Steel, which set up a global goal to be climate neutral by 2030. The company is preparing plans for an extensive modernisation of the current operation of the steel plant in Ostrava. The basis of the modernisation is the introduction of hybrid technology for steel production, where Liberty Ostrava wants to replace current technologies by the end of 2022. Less impact on the environment is expected - for example, it will reduce emissions of solid pollutants by 66% and CO₂ emissions by more than half.¹⁴⁴ One of the goals is also to increase the volume of scrap that will be used in production and thus contribute to the development of the circular economy, where the recycling of scrap is also significantly less emission-intensive. The plan contains

¹⁴³ Třinecké železárny – Moravia Steel (2021): <https://trz.cz/clanky/156/dok415/zelezarny-smeruji-ke-snizeni-emisi-sklenikovyh-plynu-o-polovinu-do-roku-2030>

¹⁴⁴ LIBERTY Ostrava (2020): <https://libertysteelgroup.com/cz/news/liberty-ostrava-ziskala-kladne-stanovisko-k-modemizaci-ocelarny-muze-zahajit-svou-cestu-k-uhlikove-neutralite/>

the use of low-carbon and renewable resources in industrial processes and the replacement of coking coal with hydrogen for the direct reduction of iron ore to eliminate CO₂ emissions from steel production. Other investments relate to the reduction of the dust emissions in steel production.

All companies participating in interviews to date, both large companies and SMEs, have expressed their continuous need for qualified and/or requalified employees to implement the new strategies, diversify and upscale the business. They usually mention that the current educational system and labour market do not cover their needs for qualified and skilled workers, and it is expected that the transition will deepen this shortage as installations of new technologies are expected in the following decade.

5.1.9 Challenges in the Moravian-Silesian Region

The results provided in this section and section 2.1.9 are mainly derived from the provided analysis of the current situation in the Moravian-Silesian Region, however we also analysed other relevant strategic documents, such as:

- Regional Annex to National RIS 3 for Moravian-Silesian Region¹⁴⁵;
- Development Strategy of the Moravian-Silesian Region 2019–2027¹⁴⁶; and,
- The update of the Strategic Framework for Economic Restructuring of the Ústí, the Moravian - Silesian and the Karlovy Vary regions¹⁴⁷.

The challenges/opportunities related to the transition process in the Moravian-Silesian Region are interconnected, and we have identified set of following challenges. The challenges/opportunities are ranked according to their importance and the intensity of their link to the transition process.

- Labour market mismatch. More specifically, the mismatch between demanded labour force (e.g., knowledge-intensive jobs) and the available labour force in the region. The existing mismatch is negatively affected by brain drain and long term (structural) unemployment. The transition process can increase the mismatch since it is expected that there will be lay off from energy-intensive sectors and new skills will be demanding on regional labour market.
- Decoupling of economic and demographic/social development. Relatively good economic performance is not accompanied by social and demographical upgrading. If the transition will be perceived and implemented only from a technological perspective, there is a real risk that this negative development will be accelerated in the future.
- The lowest level of entrepreneurship in the Czech Republic (a typical feature for the majority of old industrial regions). The low share of micro-firms and SMEs compared to the above-average share of large companies on regional economic structure/employment. Most large companies are externally controlled (branch plant syndrome) and we observe the lower position of regional firms in global production network (tier 2 and 3 suppliers). This limits the implementation of product innovations and the creation of products with higher added value (functional and product upgrading)
- Despite the relatively high regional demand (specialisation on brown technologies), the region is characterised by a low representation of firms in the green economy. A certain role in the low share of the green economy is also played by the absence of headquarters in energy and mining sectors, which are, besides the state, perceived as a key actor in the creation of green technologies in old industrial regions, e.g., the Ruhr area.
- The low share of knowledge intensive business services in the regional economy, especially compared to other metropolitan regions in the Czech Republic (Ženka et al. 2015). These services are perceived as key to regional competitiveness (Storper 2013). At the same time, the weak representation of KIBS limits the capacity for green knowledge provision. Moreover, firms operating in KIBS have an above-average share of 55+ employees, which may limit their contribution not only to the transition region but to regional growth overall.
- Depopulation (regionally highly uneven) caused by out-migration, in the near future multiplied by the growing importance of natural change (aging). Among the key push factors can be listed as the poor quality of life (especially in larger cities).

¹⁴⁵ https://www.rismk.cz/upload/files/RIS3_MSK_krajaska_priloha_CZ_FINAL_aktualizace%2030052018%281%29.pdf

¹⁴⁶ <https://hrajemskrajem.cz/wp-content/uploads/2019/11/Upraven%C3%BD-n%C3%A1vrh-Strategie-rozvoje-MSK-2019-2027.pdf>

¹⁴⁷ <https://restartregionu.cz/content/uploads/2021/03/Aktualizace-Strategick%C3%A9ho-r%C3%A1mce.pdf>

- The region is still coping with a negative image that "can negatively affect not only potential investors, but also the highly skilled workforce that is needed in the region." (Blažek and Bečicová 2014, p. 16).
- Deindustrialisation and implementation of new environmental technologies massively reduced air pollution. Nevertheless, the region is still one of the most polluted areas in the whole EU (Khomeenko et al. 2021).
- Despite intensive progress, regional universities are still considered so-called mid-range universities status. In past decade, there has been a significant drop of university students.
- Unsustainable land development. The predominance of land grabbing and low dense urban development.
- A large number of brownfields (e.g., Ostrava – 8.4% of city area), some of which can be classified as a black field. Due to the high reclamation costs, they are actually creating a certain form of inherited barrier.

5.1.10 *Opportunities in the Moravian-Silesian Region*

- High regional adaptability and well-built regional capacities (government, companies, universities) enabling the use of "moments of opportunity" such as the JTF.
- Digitalisation, green technologies as "windows of opportunity" for regional sectoral re-orientation. Diversification of the local economy into the new (related) industries with the mobilisation of the knowledge base of traditionally industrial sectors. Unrelated diversification through the support of the regional entrepreneurial ecosystem. Firm size diversification (start-ups, micro firms, SMEs). Potential to upgrade existing industries.
- Strengthening of already well-developed research and development (third strongest in the Czech Republic), creating a critical mass (excellence) in environmental (e.g., hydrogen), medicine, technical IT and social research. Simultaneously, a better integration of foreign companies into regional innovation system.
- Creation of new skill reducing labour market mismatch/unemployment.
- Improvement of the environmental situation in the region. Valorisation of the hidden potential of neglected spaces via better interconnection of the region through blue and green infrastructure.
- Stabilisation of population/improving quality of life. Social upgrading.
- Valorisation of post-mining landscape/build environment as a laboratory for new activities and pillars of regional identity. Industrial culture as an asset for regional identity and image (tourism).
- More compact and sustainable land development.
- Cross-border cooperation (Poland, Slovakia). Especially in transport, tourism and culture. Such cooperation might transform the region into a transport hub (logistics hub).
- Metropolitan governance and flagship projects (integrated territorial investments), general support of strategic regional/local alliances.
- Better exploitation of urbanisation economies (metropolitan core Ostrava), more favourable conditions for Knowledge intensive business services (KIBS) development such as IT or technical testing, and analysis services statistics or creative industries.

5.2 **Impacts from climate transition**

5.2.1 *NECP impacts*

5.2.1.1 *Regional impacts from modelling: Moravian-Silesian Region*

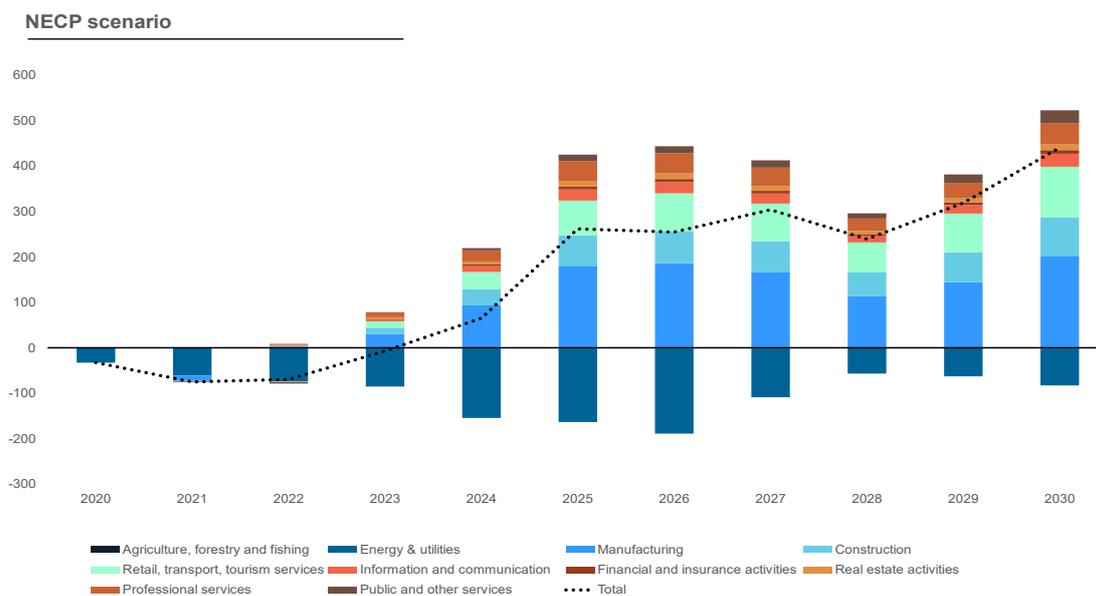
The Moravian-Silesian Region is the largest transition region in terms of population (1.2 million people). While the region is below the national average in terms of GDP per capita (PPS terms), 73% of the EU average in MSR compared to 89% of EU average nationally, it is the most active economically across the target regions. The growth of regional economic activity is comparable to that of the national growth, and GDP per capita (market prices) is only slightly below the national average (EUR 16,700 nationally compared to EUR 13,900 in MSR in 2016). There has been continued growth in the last decade. While

both the natural change and net migration have been negative since 2010, there is a projected employment growth in the region¹⁴⁸.

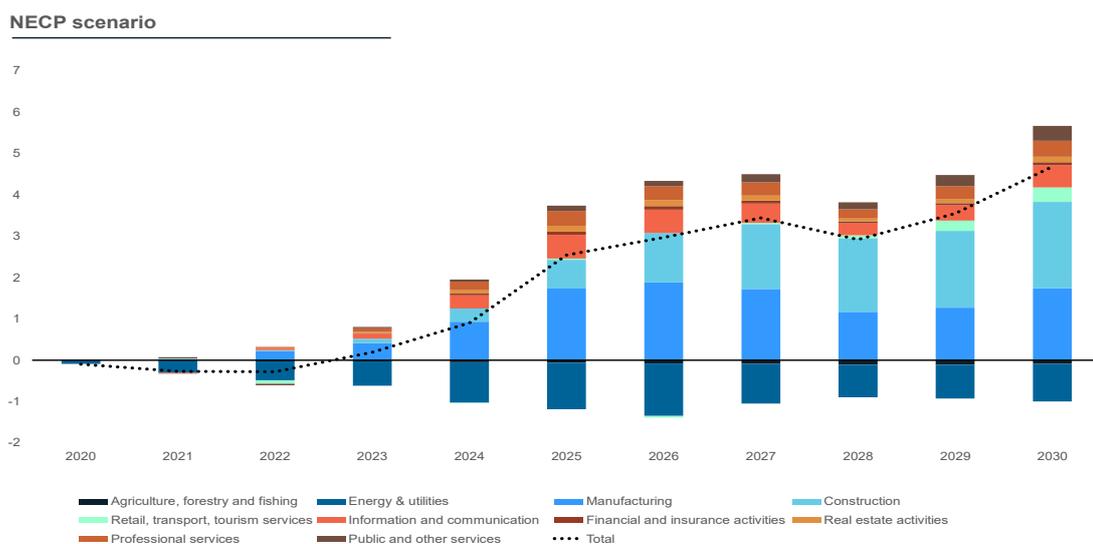
The region is home to both coal-based heat and power generation, primarily used by heavy industry and coal mining in the Ostrava-Karviná Basin. Industry use, such as steel production in Třinec or Ostrava, alongside the power it uses, is therefore responsible for a substantial part of CO₂ emissions in the region. Nevertheless, due to its larger overall economy, positive trends (economic and employment growth) and its lower direct reliance on coal-based power generation, MS is relatively (compared to other target regions) resilient to the impacts of the transition.

The results of the modelling, shown in Graph 38 and Graph 39 present a similar picture. While the overall pattern in both GVA and employment follows the national trends, the net effect is positive in both cases. Contrasting results from Karlovy Vary and Ústí, results in MSR turn positive as early as 2023.

Graph 38: Moravian-Silesian Region - GVA in the NECP scenario, by sector, million EUR from baseline¹⁴⁹



Graph 39: Moravian-Silesian Region - Employment in the NECP scenario, by sector, '000 jobs from baseline¹⁵⁰



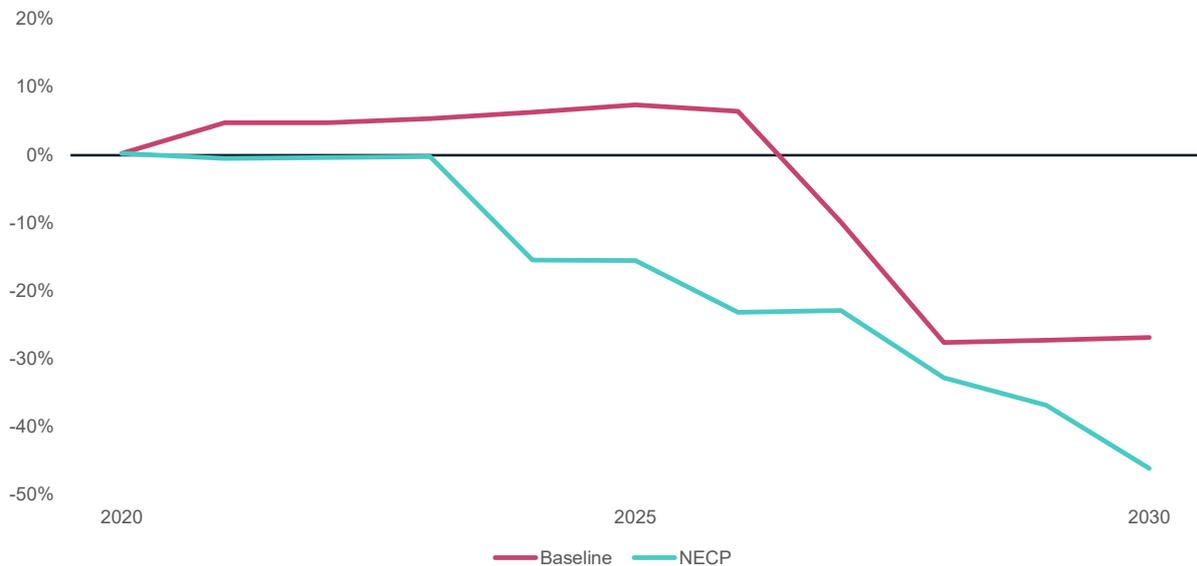
¹⁴⁸ <https://urban.jrc.ec.europa.eu/#/en/my-place?context=Default&territorialscope=EU28&level=NUTS3&nutsid=CZ042>

¹⁴⁹ E3ME modelling results

¹⁵⁰ Ibid.

A strong decrease (comparable to Ústí in absolute terms) of the energy sector (up to EUR 190 million lower GVA; up to 1,300 less jobs) is offset by an even stronger positive response in the manufacturing and construction sectors, coupled with supply-chain effects. Positive impacts range between EUR 80 to 520 million (0.3% to 2.6% of 2030 baseline total GVA) or 200 to 5,700 jobs (0.04% to 1% of 2030 baseline employment). These gains offset losses from the energy and utilities sector.

Graph 40: Moravian-Silesian Region - CO₂ emissions in the NECP scenario, % difference from baseline¹⁵¹



Meanwhile, emissions are substantially reduced by 2030 under both the baseline and the NECP scenarios. Overall, CO₂ emissions end up 46% lower than 2018 in the NECP scenario. However, even though E3ME, coupled with the FTT:Steel submodule, can simulate technology switching impacts and trajectories within the steel sector, this module is not yet adapted for use in regional level modelling. Therefore, the results presented here do not take advantage of the bottom-up modelling in FTT:Steel. It also should be noted that the baseline scenario already has a noticeable decrease in emissions from 2025 to 2028, which is caused the baseline itself including the reduction of coal-based power generation and, as the regionalisation simulates decommissioning based on estimated plant lifetime and age, coal-based capacities in MS are decommissioned in the simulation.

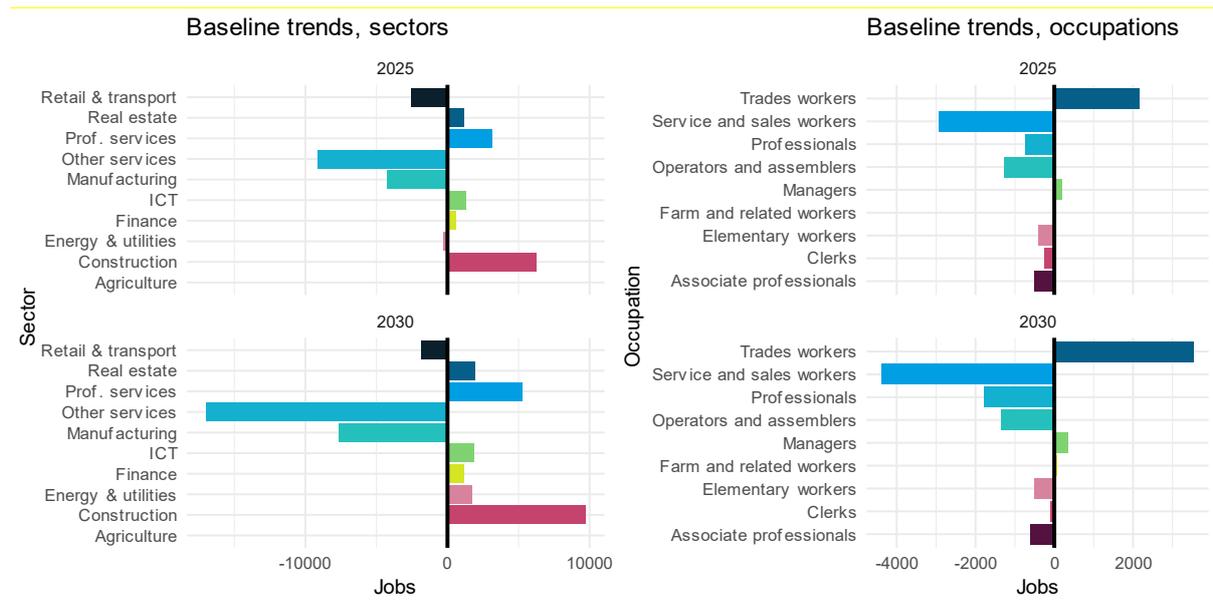
5.2.2 Occupational mismatch analysis

Baseline projections

Graph 41 shows the changes in the baseline projection from 2018 values. The left panel shows changes across sectors, while the right panel shows changes across occupations. While the overall employment decline in the region is about 4,000 jobs compared to 2018, there are sectors with projected higher losses. For example, the services sector (consumer and public) shows a substantial decrease (over 15,000 jobs) in the region by 2030. However, this is largely offset by gains in other sectors, such as professional services and construction. In terms of occupations (right panel), this suggests an important shift within the region from services and sales workers and professionals towards lower skilled, manual work classified in the trade workers occupational group. Overall employment trends in the baseline regarding the services sector (excluding professional services) is discussed at the end of this note.

¹⁵¹ E3ME modelling results

Graph 41: Changes in employment from 2018 in baseline projections in the Moravian-Silesian Region



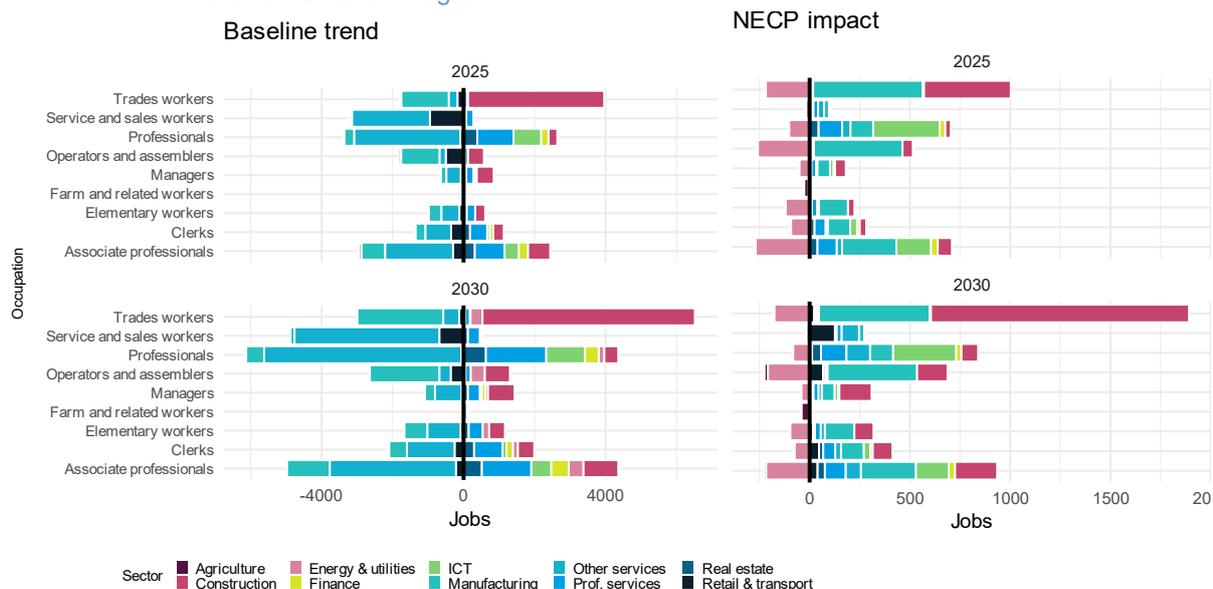
Note: left panel - changes by sector; right panel – changes by occupation

These figures uncover between-sector and between-occupation differences, but do not show how sectoral employment can change *within* an occupation. The left panel of Graph 42 highlights this aspect. This view is important, because while across sector trends can show where re-training is needed, within occupation changes show where there are possibilities for a less “intensive” re-skilling (i.e., learning to apply the same or similar occupational skills in a different sector).

In this regard, there is substantial transformation potential within the region in several occupational groups. These include occupations such as trade workers, professionals or associate professionals. Sectors where employment of these occupational groups decline include manufacturing and public and other services, while gaining sectors include professional services, ICT, finance, construction and utilities. According to the baseline projections, cross-sectoral mobility might be needed.

NECP Impact

Graph 42: Changes in employment from 2018 in baseline projections and in the Green Deal scenario in Moravian-Silesian Region



Note: left panel – changes by sector and occupation in baseline; right panel – changes by sector and occupation in the Green Deal scenario compared to the baseline

The right panel of Graph 42 shows effects between the baseline scenario and the NECP scenario. The NECP scenario can provide substantial gains to multiple sectors and occupational groups. The overall employment impact is largely positive, resulting in about 5,000 net additional jobs by 2030. Most of these jobs are to be realised in the manufacturing and construction sectors. However, other sectors, through income and supply-chain effects, could also realise gains. At the same time, the energy and utilities sector is expected to see some losses due to the transition effects. From an occupational perspective, many of these new jobs are expected to be realised in lower-skilled occupations, concentrated for example in the group of trade workers (close to 2,000 new jobs). Nevertheless, higher skilled occupation groups, such as professionals (over 700 jobs) or associate professionals (close to 1,000 jobs), could also see gains with a more diverse sectoral composition by 2030 in the region.

5.3 Transition assessment

5.3.1 SWOT analysis

The aim of the analysis is not to provide an exhaustive list of factors influencing the development of the region, but the purpose is to present the most pressing aspects of the region that relate to its current and future transformation into a low-carbon economy.

Table 22: SWOT analysis for the Moravian-Silesian region

Strengths	Weaknesses
Economy <ul style="list-style-type: none"> - Strong base of traditional industries (metallurgy and metal production as well as engineering) - Development of new industries in the region – automotive and IT - High level of foreign direct investment 	Economy <ul style="list-style-type: none"> - Reliance on energy-intensive industries - Very low entrepreneurship activities in the population
Society <ul style="list-style-type: none"> - Relatively high proportion of university educated inhabitants - Developed health services 	Society <ul style="list-style-type: none"> - Localities with concentrated social problems - Low attractiveness of the region due to unfavourable regional image - Significantly high out-migration of inhabitants (ongoing brain-drain) - High share of long-term unemployed
Environment <ul style="list-style-type: none"> - Improving quality of the environment - Presence of attractive natural sites (e.g., Jeseníky or Beskydy) 	Environment <ul style="list-style-type: none"> - Landfilling of municipal waste - Polluted air and land (brownfields)

Opportunities	Threats
<p>Economy</p> <ul style="list-style-type: none"> - The post coal landscape could represent new development zones - Cooperation of research and educational institutions with business and public sector - Innovative usage of industrial heritage and brownfields - Potential of creative industries - Decarbonisation sets free capital otherwise required for emission allowances under the ETS (and rising carbon prices) 	<p>Economy</p> <ul style="list-style-type: none"> - Strict environmental regulations and their impact on the main employers in the energy-intensive industries - Potential shortage of skilled labour - High spending on new emission-free technologies in current key sectors
<p>Society</p> <ul style="list-style-type: none"> - Proactive approach towards cohesive communities - Support for the development of public space in municipalities and improving the quality of life of the population 	<p>Society</p> <ul style="list-style-type: none"> - Ageing population and increasing demands on relevant social services - Expected growth of unemployment in connection with the planned coal phase out
<p>Environment</p> <ul style="list-style-type: none"> - Land and landscape reclamation after mining - Reducing coal-related pollution, increasing quality of life, attractiveness for tourism and immigration and enhancing labour productivity 	<p>Environment</p> <ul style="list-style-type: none"> - Extensive environmental burdens in former and current industrial areas - Impacts of climate change (drought, bark beetle calamity, etc.)

5.3.2 Investment priorities

5.3.2.1 Pillar 1: Economy, business and innovation

Table 23: Overview of investment priorities in economy, business and innovation in the Moravian-Silesian Region

Investment priority	Prioritisation
Entrepreneurial ecosystem	Very High
Upgrading/Diversification of traditional industries/firm structure (SMEs)	Very High
IT technologies/digital economy/artificial intelligence	High
Research and development (public and private)	Very High
Regional capacity building	Moderate

Entrepreneurial ecosystem – Very high importance

Long-term very low level of entrepreneurship. Jobs in traditional industries can be expected to disappear due to technological change and regulation. Entrepreneurship can be one source of job creation, especially in the green economy, digitalisation or cultural and creative industries, while support for less knowledge-intensive industries also seems desirable. As the basic infrastructure of the entrepreneurial

ecosystem already exists in the region, priority should be given to strengthening the following elements of the entrepreneurial ecosystem¹⁵²: Network density; Support services; Engagement

Upgrading/Diversification of traditional industries/firm structure (SMEs) – Very high importance

Traditional industries such as the steel sector (NACE 24, 25) still generate around 50,000 jobs. Employment in energy-intensive industries cannot be neglected either. This is also why various forms of upgrading (climbing, renewal or niche development)¹⁵³ of existing industries can be considered relevant. At the same time, it must be stressed that any support directed towards upgrading must be based on robust evidence of need and impact on employment. The second area is diversification, which is twofold in nature. The first refers to diversification of the sectoral structure on the basis of related diversification (for example, diversification of new activities from existing sectors such as the development of materials engineering based on steel production), but also unrelated diversification (new sectors such as cultural and creative industries) where these are sectors without a historical link to the region. For the latter, however, the need for and impact of the planned support must again be clearly described. As diversification of production can be considered high-risk and complicated as it is not primarily based on existing accumulated knowledge or contacts¹⁵⁴, JTF support is desirable here. The second dimension is primarily the diversification of the size structure of firms in the region. In the context of this whole priority, then, support for SMEs can be seen as crucial.

IT technologies/digital economy/artificial intelligence – High importance

According to available data and related predictions, this area appears to be a high priority. At present, the most developed capacities are mainly in the IT sector, although even here a relatively high share of less knowledge-intensive business services can be found. A major challenge is the development of digitalisation and artificial intelligence. Here it is recommended to focus on supporting basic/applied R&D. Intensifying cooperation with universities and the private sector is highly desirable.

Research and development (public and private) – Very high importance

The MSR belongs to the best-performed regions in research and development in the Czech Republic. Especially in private research and development, we can observe in the last five years an increase in expenditure. Simultaneously, the region is still significantly lagging behind Prague and Brno metropolitan regions. The projects in research and development should be linked to the newest version of the Regional innovation system strategy, if not, they have to be reasonably justified. This might be the case of social research, which is in the region underdeveloped. From our analysis can be derived, that planned activities have to aim to create an environment for excellent research. To sum up, research and development have a high priority.

Regional capacity building – Moderate importance

The regional capacities are already well developed in the Moravian-Silesian and the region has established and developed specific intermediary organisations and centres to support regional development. Sufficient capacities can also be found in universities and the private sector. The aim should be to further strengthen already built and established capacities. This area thus has moderate priority.

5.3.2.2 Pillar 2: Sustainable environment

Table 24: Overview of investment priorities in economy, business and Innovation in the Moravian-Silesian Region

Investment priority	Prioritisation
Green economy (e.g., land recycling, materials)	Very High
Modern energy systems - decentralised, diversified, environmentally friendly	High

¹⁵² Stam, E. (2015). Entrepreneurial ecosystems and regional policy: a sympathetic critique. *European Planning Studies*, 23(9), 1759-1769.

Stam, E., & Van de Ven, A. (2021). Entrepreneurial ecosystem elements. *Small Business Economics*, 56(2), 809-832.

¹⁵³ Grillitsch, M., & Asheim, B. (2018). Place-based innovation policy for industrial diversification in regions. *European Planning Studies*, 26(8), 1638-1662.

¹⁵⁴ Chapman, K., MacKinnon, D., & Cumbers, A. (2004). Adjustment or renewal in regional clusters? A study of diversification amongst SMEs in the Aberdeen oil complex. *Transactions of the Institute of British Geographers*, 29(3), 382-396.

Investment priority	Prioritisation
Circular economy	Medium
Landscape reclamation, new development zones	Medium
Brownfields (industrial heritage utilisation/exploitation)	Very High

Green economy – very high importance

A main goal of the transformation is to transform an economy from an unsustainable one based on fossil fuels to an economy that is sustainable and emission-free. The aim should be to focus on green technologies (supported by research), which can bring new green jobs to the economy, help with its diversification and bring higher value-added production. The priority should be not only be on eco-innovations in existing companies but also on the attraction of new technology companies.

Modern energy systems - decentralised, diversified, environmentally friendly – Very high importance

Rationale for priority identification:

The right mix of centralised and decentralised energy systems with a diverse portfolio of clean energy sources will be at the heart of the low carbon transition. While not at the core of the JTM priorities, energy efficiency as a first principle together with clean, affordable energy bring about clear non-energy “Just Transition” related benefits, such as the reduction of energy poverty, the enhancement of energy access and last, but not least, job creation. Therefore, these aspects should be an inherent part of the wider transformation of the region and energy efficiency, RES and energy communities can be widely promoted.

Regarding energy efficiency, the deep renovation of buildings needs to be substantially scaled up, with a special focus on vulnerable households. On the supply side, in Ústí Region, the potential for development of RES is very high. To reach the 2030 RES goals, the installed PV capacity should double in the region. There is also potential for geothermal and wind power (which could increase by a factor of four). The district heating sector in the region is still largely dependent on coal and will have to undergo a major transformation. While natural gas is the main short-term solution, innovative options heading towards full decarbonisation of the sector and sector coupling should be explored (lowering temperatures in the systems, heat pumps, thermal storage, among others).

Circular economy – Moderate importance

The circular economy is certainly relevant in relation to the Just Transition. Based on the modelling of hypothetical scenarios used to estimate regional impacts of different policies, support of the circular economy could bring lower benefits in efforts to grow GVA and employment relative to other possibilities. Therefore, the priority has moderate importance and investments in research support and focus on specific sectors (e.g., chemistry) are emphasized in particular.

Landscape reclamation, new development zones – Very high importance

The development of large areas after coal mining are potentially a huge asset for the region. New reclaimed areas should be used multifunctionally. They offer not only space for recreational use with great development potential, including housing, but also for the development of new industrial zones and new energy in the region. These territories should always be approached comprehensively, and the "resocialisation" of these territories is an essential part. Their location is in the centres of localities, where the greatest socio-economic impacts of the transformation can be expected, so they represent a great development potential. As such, they have high importance for the future development of the region.

Brownfields – very high importance

Due to the long specialisation in mining and heavy industry, there is a high number of brownfields (industrial buildings), which can be regenerated for a wider set of new activities, especially in relation to new business opportunities as well as improving quality of life of inhabitants.

5.3.2.3 Pillar 3: Inclusion, prosperity and diversity

Table 25: Overview of investment priorities in Inclusion, prosperity and diversity in the Moravian-Silesian Region

Investment priority	Prioritization
Re- and up-skilling for future oriented economic activities	Very High
Support of universities (all roles)	Very High
Primary and secondary education	High
Investments into quality of life of inhabitants – affordable housing, social, health and community-building, quality of the public space, leisure activities, etc.	Very High
Support of youth and disadvantaged groups (grassroots activities)	High

Re- and up-skilling for future oriented economic activities – Very high importance

The transition process will affect the labour market in two ways. On the one hand, many jobs can be expected to become effectively obsolete. Job losses can be expected mainly in mining, energy-intensive industries, and energy (NACE 5, 17, 19, 20, 22, 23, 24, 25, 27, and 35), which generated around 71 000 jobs (CSO 2020). On the other hand, there will be requirements for new skills needed for the green economy, digitalisation, or the service sector. Therefore, re- and up-skilling represent a priority for the transition.

Support of universities (all roles) – Very high importance

As was mentioned above, the regional universities are partially locked-in mid-range status. In order to un-lock their potential for regional transition, it is recommended to support all three roles of universities. More specifically, the projects related to universities should encourage their flexibility and autonomy to develop their regional mission. The JTF can be a vital and unique source of so-called “patient investment capital”.¹⁵⁵ Since universities are perceived as one of the key agents in research and development, in this priority, the special awareness is given to the second and especially to their so-called “third mission”.¹⁵⁶ Therefore, a very high priority was identified.

Primary and secondary education – Medium importance

The level of primary and secondary education in the region is rather average. Therefore, investments in this segment are recommended, however, a large part can be financed from OP Jan Amos Komensky. The projects financed from JTF should be unique and reasonably justified.

Investments into quality of life of inhabitants – Very high importance

As was shown in our analysis, the out-migration represents one of the key regional challenges. The region is coping with a low quality of life, which is perceived as an important push factor considering migration, especially for selected groups of the population. At the same time, the low quality of life hinders social upscaling in socially vulnerable groups. To sum up, the transition cannot be successful, when the quality of life will be neglected. Therefore, high priority is given.

Support of youth and disadvantaged groups (grassroots activities) – High importance

Brain drain is a serious regional problem. Support of youth groups can help to weaken this problem. Besides, the formulation of specific activities and projects should be designed in the sense of organising opportunities or providing vacant spaces rather than in the clear definition of projects in a top-down sense. In other words, sources from JTF can help to create an enabling environment for new combinations stemming from the energy/enthusiasm of the youth and old regional structures (e.g.

¹⁵⁵ Bennenworth, P., & Hospers, G. J. (2007). The new economic geography of old industrial regions: Universities as global—local pipelines. *Environment and Planning C: Government and Policy*, 25(6), 779-802.

¹⁵⁶ Tripl, M., Sinozic, T., & Lawton Smith, H. (2015). The role of universities in regional development: conceptual models and policy institutions in the UK, Sweden and Austria. *European Planning Studies*, 23(9), 1722-1740.

brownfields). Further, the inclusion of disadvantaged groups is an obligatory precondition to achieve just transition in the full sense of the word.

5.3.3 Strategic outlook for the Moravian-Silesian Region

The transformation of the Moravian-Silesian Region can be perceived as a success. The initial monolithic economic structure has been diversified and transformed. The most pronounced development paths were upgrading existing industries, path extension, and path modernisation. By contrast, more radical changes (conversion, recombination) were an exception rather than the rule. During the last three decades, education, transport, research, and development have been significantly developed. The same applies to the environment. The economic figures (GDP, unemployment) signals the existence of well-developed regional competitiveness, which is based more on the so-called low-road strategy. Additionally, the region has demonstrated high adaptability to cope with economic ruptures in the past. Simultaneously, the region is facing the increasing decoupling of economic and demographic/social development. Indeed, the processes such as out-migration (brain -drain), aging, social polarisation limits the region's ability to deal with future challenges. Negative regional image, poor quality of life, and ecological burdens cannot be neglected as well. To sum up, the successful transformation story needs to understand to a certain degree as ambiguous.

The JTF represents a unique regional opportunity and challenge. Nevertheless, it would be a mistake, to perceive JTF as a "catch-all" solution to accomplish the regional transformation. On the contrary, the planned financial allocation will cover only a limited part of regional challenges/opportunities. Therefore, it is more than necessary to understand the JTF related financial resources as a set of future-oriented impulses to un-lock the region's potential for the energy transition. This lens should be used to identify the regional projects that should be created, evaluated, selected, and implemented. All regional projects, irrespectively of their size or thematic focus.

6 JUST TRANSITION ACTION PLAN FOR TRANSITION REGION

6.1 Type of operations needed and consistency with other operations, regulatory framework, and innovation policy

This section is based on the assessment from Chapter 2, the most recent versions of the Regional Transition Plans (RTP) of the three regions (refer to Annex 1), and the priority investment needs as listed in Annex D of the Country Report of the Czech Republic 2020. It is divided according to the three regions. For each region, we assess the identified goals in the (most recent) Regional TPs against the priorities as identified in the analytical part of Chapters 3 to 5. Generally, the main findings across the three regions can be summarised as follows:

- All of the Regional TPs have substantially improved in terms of analytical background and transformation story.
- There is room for improvement for all TPs to express a clear intervention logic, i.e., the expected change, results and impacts of the proposed measures. Similarly, the analytical background could be strengthened for some objectives¹⁵⁷
- With this respect, all plans should be more assertive in prioritisation. The specific goals are not stratified according to the priority, i.e., all goals are given the same “weight”. Karlovy Vary Region is an exception as it provides a tentative allocation to specific goals, which can be understood as a proxy for prioritisation.
- The strategic projects must be made an integral part of the intervention logic and priority structure of the TPs. Currently, they are not directly mentioned in the priority structure of the plans in Ústí and Karlovy Vary regions. In Moravian-Silesian Region, the strategic projects may need to be substantially scaled down.
- Most of the themes are obviously potentially overlapping with funding from other sources than JTM (for some objectives, the KV region even does not foresee funding from JTM at all). This is hard to further specify at this stage.

The following subsections provide details and further granularity to the assessment and thus contribute to identifying the operations needed in each region.

6.1.1 Ústí Region

The following subsection examines the operations identified in the regional Just Transition Plan against the gaps, challenges, opportunities and priorities as identified in Chapter 3. Through this lens, we assess the priority themes proposed by the Ústí Region in their regional transformation plan (RTP)¹⁵⁸.

The measures are structured in four priority areas: I. Entrepreneurship, research, innovation, II. Competent people and smart region, III. New energy systems and effective use of resources, IV. Revitalised land for 21st century.

The RTP includes a detailed description of the current situation in the region, supported by additional references. The priority areas are justified by specific facts, with reference to the RE-START analysis and the strategy of the regional development of the Czech Republic.

The RTP seems balanced regarding the measures focused on innovation and economic development relative to social issues. However, detailed information about the time frame of repurposing/transformation of main economic operators/CO₂ emitters and its potential impacts on the regional labour market is still missing (Mid-June 2021).

In mid-June 2021, progress was reported in creating a regional transformation plan for the Ustecky Region. Compared to the first version of the D4 report/analysis (April 2021), the argumentation in the analytical part for the transformation story was strengthened (i.e., the basic starting points - the main problems and challenges related to the transformation of the region). There is also a generally formulated goal of transformation in the Ustecky Region, which is vague and still unmeasurable, because the individual specific goals are not quantified and/or prioritised, which should be available during July 2021 (according to information provided on the Transformation Platform in June 2021). This also results, among other things, from the still open evaluation, classification and selection of projects according to the implemented call (strategic projects vs. project pipeline for thematic calls).

The Regional Transition Plan of the Ústí Region identifies the four priority areas and 14 strategic goals. The plan itself does not prioritise or give weights to the individual areas of interest. The following table

¹⁵⁷ The TA team hopes that their analytical work could be used in this sense.

¹⁵⁸ The TA team assessed the latest available plan in the time of writing and reviewing the report, i.e. version 7.0.

summarises the identified priority programmes and the identified examples of supported activities, compares them with the identified gaps and shows complementarities with the JTM priorities and other planned programmes and funds. The list of operations is not exhaustive but represents the key types of operations that are expected to be promoted in the region.

Table 26: Types of operations for the Ústí Region, as identified in the draft Regional Transition Plan

Types of operations for the Ústí Region, as identified in the draft Regional Transition Plan				
Theme	Specific goals	In scope of JTF Regulation	Compliance with the identified priorities	Potential overlaps with other programmes and funds
Enterprise, research, innovation	Increasing the innovation performance of the region, strengthening research and innovation capacity with an emphasis on the areas of regional specialisation (including R&D and innovation application, thematic regional innovation vouchers, transfer of knowledge, infrastructure for pilot and experimental projects).	Yes	Research and development (public and private) (High) Entrepreneurial ecosystem (Very High)	OP Jan Amos Komensky OP Technology and Application for Competitiveness Modernisation Fund
	Increasing the competitiveness of SMEs through digitalisation, productive investment, transfer of expertise and learning, supporting microenterprise, support to proof-of-concept projects, etc.	Yes	Entrepreneurial ecosystem (Very High) IT technologies/digital economy/artificial intelligence	
	Stabilisation and development of key sectors for economic transformation	Yes	Upgrading/Diversification of traditional industries/firm structure (SMEs) (medium)	
	Development of cultural and creative sectors and their involvement in the overall development of the region (including technical equipment, marketing, re-use of brownfields, historical sites, film vouchers).	Yes	Brownfields (industrial heritage utilisation/exploitation) (High) Entrepreneurial ecosystem (Very High)	

Types of operations for the Ustí Region, as identified in the draft Regional Transition Plan				
Theme	Specific goals	In scope of JTF Regulation	Compliance with the identified priorities	Potential overlaps with other programmes and funds
Competent people, Smart Region	Improving access to quality services and infrastructure of formal and further education in the areas of regional specialisation (including construction of education facilities and equipment, new study programmes, life-long learning).	Yes	Primary and secondary education (Very High)	Integrated Regional OP OP Jan Amos Komensky OP Employment Plus Active labour market policy
	Increasing the employment and usability of workers in the labour market (umbrella projects of Employment Pact and follow-up projects).	Yes	Re- and up-skilling for future oriented economic activities (Very High)	
	Increased use of digitalisation for efficient and understandable public services for citizens (including data centres, digital platforms, and cybersecurity).	Yes	IT technologies/digital economy/artificial intelligence (medium) Investments into quality of life of inhabitants (Very High) Regional capacity building (High)	
	Increasing social cohesion and community development in municipalities (including community and social services).	Yes	Investments into quality of life of inhabitants (Very High)	
New energy and efficient use of resources	Development of knowledge, technologies, systems and infrastructures for clean energy (focus on complex and pilot projects).	Yes	Modern energy systems - decentralised, diversified, environmentally friendly (Very High) Green economy (e.g., land recycling, materials) (High)	Modernisation Fund OP Environment New Green Savings TA CR (Theta)

Types of operations for the Ustí Region, as identified in the draft Regional Transition Plan				
Theme	Specific goals	In scope of JTF Regulation	Compliance with the identified priorities	Potential overlaps with other programmes and funds
	Development of new energy industries largely focused on hydrogen economy (green hydrogen facilities, R&D and innovation applications, mobility, upskilling/reskilling).	Yes	Green economy (e.g., land recycling, materials) (High)	Integrated Regional OP OP Transport New Green Savings OP Technology and Application for Competitiveness RRF
	Community energy development and capacity building for the energy transition.	Yes	Modern energy systems - decentralised, diversified, environmentally friendly (Very High)	
	More efficient use of resources, transition to a circular economy (feasibility studies, pilot projects, education, R&D).	Yes	Circular economy (medium)	
Revitalized areas of 21st century	Improving the usability of areas with discontinued coal mining for new activities (complex projects incl. preparatory studies, concepts, strategies, feasibility studies, remediation, etc).	Yes	Landscape reclamation, new development zones (Very High)	OP Technology and Application for Competitiveness Integrated Regional OP RRF
	Greater exploitation of the region's industrial heritage.	Yes	Brownfields (industrial heritage utilisation/exploitation) (High)	

In general, the prepared goals in the RTP are in the scope of the JTF Regulation and in line with identified priorities by the TA team in the analysis in Chapter 2. In spite of the progress in the development of the plan, some major elements are still missing:

- 1) the prioritisation of programmes is missing. It is not clear which type of operations have a higher or lower priority. The prioritisation is an obligatory part of good regional plans in general.
- 2) the stronger and more explicit intervention logic of plan is missing - how the proposed areas of intervention will contribute to the change, what are the expected results and impacts for the just transition of the region. This part could be introduced for each goal, as well as a story of the whole transformation.
- 3) specific goals (e.g., digitalisation, hydrogen economy, creative industries) need to be supported by the analysis of specific expected benefits for the region; a better description of the pros and cons of this technology/approach is unclear or is missing.
- 4) The plan does not explain the role of the strategic projects and their connections to individual strategic goals (they are not calculated in the overall allocation for these goals)
- 5) The overlap of some priorities from other financial instruments must be clearly explained.

The specific themes are assessed below:

Enterprise, research, and innovation

The need to increase innovation performance and support research and development activities in both the private and public sector clearly follows from the analysis and there is a clear link to increasing the competitiveness of the region. However, there is no clear identification of the key research specialisations (e.g., chemistry, energy, eco-innovations, etc.) that seem necessary given the current limited capacities (personnel, financial, infrastructural) in R&D in the region.

Increasing the competitiveness of companies is needed, but from the RTP it is not clear how this goal is linked to the Just Transition and transition to a low-carbon economy. The intervention logic needs to be added. From the provided analyses, employment in the region is endangered by digitalisation. However, the analysis in the Chapter 2 shows a relatively small number of economic entities and thus there is a need to support start-ups to avoid social-economic consequences of the transition. There is a space for support of the infrastructural or net projects.

Support for the activities of current business entities towards new technologies, including the reduction of energy intensity, clearly corresponds to the needs of the region and is in line with the starting points of the transformation process. Here, however, it is necessary to monitor very intensively the social benefits of specific projects, also with regard to the possibilities of using other resources, especially the Modernisation Fund. In some aspects there is no clear line between interventions under this and other goals (New Revitalised areas).

The development of the Entrepreneurial ecosystem should have a very high priority in the RTP. In the plan, this priority is also connected with the reuse of the brownfields. One of the expected ways for development are cultural and creative industries which can bring a new value added to the region. Although the expected benefits of the development of creative industries for the region are well described (based on the good practice from abroad), it is not entirely clear how they are to be achieved in the region under its specific conditions. Enhancing the creative industry does not seem to stem from a clear trend in the region so far. Support should be oriented on the conditions for emergence of the industry, innovative use of the cultural heritage, support of entrepreneurship or regeneration of brownfields. Intervention logic should be clearly stated with concrete expected impacts for the region. The link to the revitalisation of brownfields as well as change of the regional image is very well received and cover the identified investment gaps.

Competent people, Smart Region

Focus on social and educational infrastructure in the region is aligned with the identified investment gaps and needs and explanation of an expected contribution to the just transition is clear. The same is valid for the re-skilling an up-skilling. However, improving the quality of life for the population through social services, an ageing population, and outflow of young, educated people (brain-drain) is not sufficiently reflected in the plan (mentioned in the introduction, not reflected in the proposed objectives). Development of services for excluded locations (support for social cohesion, community and counselling centres on the corner, etc.) are explicitly mentioned in the plan and investments into this field should be among key priorities, but expected outcomes and impacts based intervention areas should be developed. Focus on municipalities and communities is highly relevant.

The goal focused on the digitalisation of public administration is clearly aimed at improving the quality of life, but the expected benefits are not clear from the provided description. The intervention logic and how the digitalisation of public services (especially the data centres, cybersecurity) need to be linked to Just Transition. One explanation probably could be to use this to support decision making capacities for municipalities, etc.

New energy and efficient use of resources

The goals are in line with conclusions from the analyses where important projects for climate transitions are expected, including ensuring the availability of energy resources for citizens and businesses. On the one hand, the support of R&D is expected. On the other hand, it is not clear how this priority will be targeted and the area of support defined. The region has an energy tradition, and it can be assumed that there will be a dynamic development of renewable energy sources thanks to newly cultivated areas and the existing energy infrastructure/knowledge in the region. While many of the energy related projects will be covered from other sources, the link could be further stressed in the plan. The plan mentions the need for delimitation of other financial sources (especially Modernisation Fund) and the assumption of support for complex and integrated projects.

In particular, the RTP assumes the focus on the hydrogen economy that has potential in the region for the current identified structure of the economy (energy and chemistry). However, this direction is not yet supported by an analysis of specific benefits for the development of the region and the expected / intended impacts of the intervention. The hydrogen economy is a promising, yet less developed sector with unclear technical and economic viability. This potential for hydrogen use is (and should be) highly specific for just selected end-uses¹⁵⁹. The goal should aim at R&D activities, and should be complemented with other clean energy options, which are more viable in the short and mid-term.

The need to increase recycling and the circular economy is certainly appropriate, even if it has not the highest priority based on the TA team analysis. However, priority targeting is not described in sufficient detail. The intervention logic of the supported activities needs to be supplemented.

Revitalised areas of 21st century

Land reclamation for mining is one of the main priorities for the transformation of the region. A comprehensive concept of versatile land use (e.g., environment, recreation, new industry) is necessary, including resocialisation and re-use of existing industrial areas. Particularly in the Ústí Region, extensive reclaimed land represents new development areas for multifunctional use. The same is valid for meaningful use of industrial monuments and brownfields is one of the region's opportunities in terms of diversifying the economy.

6.1.2 Karlovy Vary region

The following subchapter examines the operations needed as identified in the regional transition plan against the gaps, challenges, opportunities and thus priorities as identified in Chapter 4. Through this lens, we examine the priority themes proposed by the Karlovy Vary Region in their regional transformation plan - RTP¹⁶⁰.

The RTP includes three priority programmes with six priority areas. The available plan document has a clear structure focused on specific measures derived from strategic goals. However, the proposed goals are listed rather than justified. However, the TA team greatly appreciates the addition of a baseline analysis for each specific objective compared to the previous version of the plan, which was evaluated in April 2021. The TA team notes that this addition will make it possible to establish the intervention logic planned by the representatives of the region until the beginning of July 2021. Even in this context, it will be appropriate to reflect the recommendations of the TA team regarding the appropriate distribution of specific objectives in terms of their prioritisation.

The RTP seems balanced regarding the measures on innovation and economic development compared to social issues. The RTP update (version June 2021) now contains a link to other strategic national and regional documents (especially RIS, strategic development plan, territorial energy concept), which significantly helped to understand the context of the planned JTF interventions in the Karlovy Vary Region. In the RTP version of April 2021, which the TA team evaluated in the first version of the D4

¹⁵⁹ See e.g., <https://www.nature.com/articles/s41558-021-01032-7> for a detailed analysis of where hydrogen makes sense and where definitely not.

¹⁶⁰ The TA team assessed the latest available plan in the time of writing and reviewing the report, i.e. version 4.0 from 6 June 2021.

report, this was completely missing. In this sense, significant progress is evident in the preparation and improvement of the content of the regional strategic plan. According to the information provided at the Transformation Platform meeting in June 2021, this region, in line with other coal regions, will complete the evaluation and selection of suitable projects (pre-selection without funding) to show project pipeline readiness and absorption capacity.

The following table summarises the identified priority programmes and the identified examples of supported activities, compares them with the identified gaps and shows complementarities with the JTM priorities and other planned programmes and funds. The list of operations is not exhaustive but represents the key types of operations that are expected to be promoted in the region.

Table 27: Types of operations for the Karlovy Vary Region, as identified in the Regional Transition Plan

Types of operations for the Karlovy Vary Region, as identified in the draft Regional Transition Plan				
Theme/programme	Specific goals ¹⁶¹	Compliance with the JTF Regulation	Compliance with the identified priorities ¹⁶²	Potential overlaps with other programmes and funds
Tradition	New enterprises (creating production opportunities that include SMEs to global value chains).	Yes	Entrepreneurial ecosystem (Very High) Upgrading/Diversification of traditional industries/firm structure (SMEs) (High)	OP Technology and Application for Competitiveness Integrated Regional OP Modernisation Fund
	Transformation of firms (Restructuring and support to export oriented firms)	Yes	Upgrading/Diversification of traditional industries/firm structure (SMEs) (High)	
Innovation	Research and innovation (innovation infrastructure)	Yes	Research and development (public and private) (Moderate)	OP Technology and Application for Competitiveness Integrated Regional OP OP Jan Amos Komensky OP Environment OP Employment Plus (OP Transport)
	Creativity and design (infrastructure for creative industries)	Yes	Upgrading/Diversification of traditional industries/firm structure (SMEs) (High)	
	Digitalisation and new products (digital infrastructure, new products and services)	Yes	IT technologies/digital economy/artificial intelligence (Moderate) Investments into quality of life of inhabitants (Very High) Regional capacity building (High)	

¹⁶¹ The Regional Transition Plan of Karlovy Vary Region as of 9 April 2021.

¹⁶² Based on assessment in Chapter 2

Types of operations for the Karlovy Vary Region, as identified in the draft Regional Transition Plan				
Theme/programme	Specific goals ¹⁶¹	Compliance with the JTF Regulation	Compliance with the identified priorities ¹⁶²	Potential overlaps with other programmes and funds
Knowledge	Quality of education (development of the institute of balneology, infrastructure for technical education, education in creative fields)	Yes	Primary and secondary education (Very High) Regional capacity building (High)	OP Technology and Application for Competitiveness Integrated Regional OP OP Jan Amos Komensky OP Employment Plus,
	Reskilling (support to reskilling to redundant workers related to climate transition, social innovation to silver economy services)	Yes	Re- and up-skilling for future oriented economic activities (Very High)	Interreg OP Environment, Modernisation fund RRF
Cooperation	Cultural and environmental heritage (e-culture, public areas development, infrastructure for MICE events).	Yes	Investments into quality of life of inhabitants (Very High)	OP Technology and Application for Competitiveness Integrated Regional OP OP Environment
	“Nobody is left behind” (avoidance of digitally excluded locations, inclusive environment for all socially vulnerable groups, social entrepreneurship, attractiveness of the region).	Yes	Support of youth and disadvantaged groups (High)	RRP OP Employment Plus Interreg
Regeneration	Regeneration of brownfields and old environmental burdens	Yes	Brownfields (industrial heritage utilisation/exploitation) (High)	OP Technology and Application for Competitiveness

Types of operations for the Karlovy Vary Region, as identified in the draft Regional Transition Plan				
Theme/programme	Specific goals ¹⁶¹	Compliance with the JTF Regulation	Compliance with the identified priorities ¹⁶²	Potential overlaps with other programmes and funds
	Landscape regeneration and new agriculture.	Yes	Landscape reclamation, new development zones (Very High)	Integrated Regional OP OP Environment OP Jan Amos Komensky Rural Development Programme
	Green cities and municipalities.	Yes	Investments into quality of life of inhabitants (Very High)	OP Transport RRP
Energy	New energy (agro-energy, community energy).	Yes	Modern energy systems - decentralised, diversified, environmentally friendly (High)	OP Technology and Application for Competitiveness
	Energy savings (regional energy management).	Yes	Modern energy systems - decentralised, diversified, environmentally friendly (High)	Integrated Regional OP OP Environment OP Jan Amos Komensky
	Mass flows and recycling.	Yes	Green economy (e.g., land recycling, materials) (High)	Modernisation fond OP Transport RRP
	Transition to circular economy.	Yes	Circular economy (High)	

In general, the analytical part and transition story, including identification of key opportunities and challenges for the region, is well developed and there is a significant improvement in comparison to the previous version of the RTP. Based on the text of the RTP in centre of the transformation process are inhabitants of the region and the transition process aims towards sustainable development of the region, integrating economic, social and environmental and climate transitions.

The RTP already indicates basic prioritisation among themes/programmes based on the expected allocation of resources. However, this does not include strategic projects. Some of specific goals were already indicated for funding from sources other than JTF, including the transformation of firms; regeneration of brownfields and old environmental burdens; landscape regeneration and new agriculture; energy savings and transition to circular economy.

In spite of the overall high quality of the latest version of the plan, some major elements are still missing:

- 1) the prioritisation of programmes is missing. It is not clear which type of operations have a higher or lower priority. The prioritisation is an obligatory part of good regional plans in general. Similarly, the number of strategic projects should be reduced.
- 2) In some specific goals the intervention logic is not clear and should be supported by the empirical evidence.
- 3) The plan does not explain the role of the strategic projects and their connections to individual strategic goals (they are not calculated in the overall allocation for these goals).
- 4) A large part of the financial allocation is planned for different types of hard infrastructure. By contrast, development of social and human capital plays a less important role in the Regional TP. The potential risk of such investment patterns needs to be carefully considered, especially in relation to the sustainability.

The specific themes are assessed in detail below:

Tradition (expected allocation: 11%)

Since the analysis suggests there is a decline in entrepreneurial activity, it seems appropriate to support the creation of new companies and support the transformation of existing ones linked to coal supply-customer chains. In particular, support infrastructure for start-ups, support for new technologies and research activities can contribute to the diversification of the regional economy. In case of Karlovy Vary, the infrastructure of the entrepreneurial ecosystem is not developed, so this seems to be a key priority.

With the support of transforming companies, it is not yet clear how the support will be provided and how it contributes to the change towards the production with higher value added to the regional economy. It is expected to use other financial schemes than JTF to finance activities under this goal.

Innovation (expected allocation: 19%)

In the field of research and development, the region has long lagged behind other regions, so the systematic support of research in companies meets the needs of the region. Similar to support of the entrepreneurial ecosystem, the research infrastructure and support of innovation is not developed in the region, so focus should be on the development of the basic infrastructure in the key fields (e.g., energy, balneology). At the same time, questions of project sustainability arise if starting from scratch.

The area of creative industries can contribute to greater diversification of the region's economy and move up within global value chains and creation of the KIBS¹⁶³ jobs, but it is not clearly supported (with respect to the potential of the region). Our analyses identified the insignificant importance of digitisation for the region, where according to other studies, it represents a risk for labour market due to the current structure of the economy oriented on services and manufacturing with lower added value. The benefits of digitisation can thus be seen in particular with regard to improving services for citizens and public administration. Especially, in these two specific goals the intervention logic should be stated based on the regional analyses and clearly linked to the Just Transition.

Knowledge (expected allocation: 18%)

A low-educated population structure was identified in the analysis, including interviews with the key economic operators, as a main challenge for the region. There is a need to increase the proportion of

¹⁶³ knowledge intensive business services

university-educated people, improve the educational system and focus on reskilling and upskilling of employees. However, this has to be closely coordinated by encouraging the supply of skilled jobs and quality of life to stop the brain drain. Fulfilling these specific goals is clearly one of the key conditions for the Just Transition of the Karlovy Vary Region.

Cooperation (expected allocation: 16%)

The analysis clearly shows the need to focus on social cohesion and improving the quality of life of the inhabitants of the Karlovy Vary Region, which is necessary to stop out-migration and the associated brain drain. Based on the analysis, this should be a high-priority measure.

Regeneration (expected allocation: 8%)

The regeneration of brownfields, the promotion of social inclusion and the improvement of the quality of life (including public spaces, SMART cities, and blue-green infrastructure) of the inhabitants are in line with the identified needs of the region.

Energy and materials (expected allocation: 28%)

In recent years, the region has deepened its specialisation in energy-intensive industries so a focus on comprehensive energy transformation is necessary. Support of recycling and green economy and circular economy are in line in transition, but it is not clearly distinguished between these two specific goals in the document and supported activities seem to be complementary to the priorities in other programmes. In this case, it is important to monitor especially the possibilities of financing from various public programs, especially the Modernisation Fund.

6.1.3 *Moravian-Silesian Region*

The following subsection assesses the operations needed as identified in the Regional Just Transition Plan against the gaps, challenges, opportunities and priorities as identified in Chapter 5. Through this lens, we assess the priority themes proposed by the Moravian-Silesian Region in their regional transformation plan -RTP¹⁶⁴.

The RTP includes eight thematic programmes. The vision of MSR is, “With new energy, we change the life in the region”. The RTP has the ambition to promote innovations, new economic activities and sectors, as well as knowledge development. The philosophy “nobody will be left behind” is not on the agenda.

The RTP is focused on priorities and measures that are not covered by standard operational programmes and funds; exploiting these extraordinary resources could lead to a competitive advantage. Detailed information about the time frame and regional labour market impacts related to the repurposing/ restructuring of main economic operators/CO₂ emitters is missing.

The plan itself does not prioritise or give weights to the individual programmes/operations. They all have the same level of priority in the plan.

In mid-June 2021, progress was reported in creating a regional transformation plan for the Moravian-Silesian Region. Compared to the first version of the D4 report/analysis (April 2021), the link to the Regional Development Strategy 2019-2027 and RIS3 was added, the planned types of operations, specific strategic projects and brownfields according to the output of project mapping were added. According to representatives of the region, at the turn of June and July 2021, the intervention logic and prioritisation of topics and the transformation story will be supplemented, as well as recommended strategic projects and brownfields by the Regional Standing Conference (their evaluation and selection is still ongoing).

The following table summarises the identified priority programmes and the identified examples of supported activities, compares them with the identified gaps, and shows potential overlaps with other planned programmes and funds. The list of operations is not exhaustive but represents the key types of operations that are expected to be promoted in the region.

¹⁶⁴ The TA team assessed the latest available plan in the time of writing and reviewing the report, i.e. from June 2021 (the plan does not contain any more specific identification of version).

Table 28: Types of operations for Moravian-Silesian Region, as identified in the Regional Transition Plan

Types of operations for Moravian-Silesian Region, as identified in the draft Regional Transition Plan				
Theme	Examples of supported activities	Compliance with the JTF Regulation	Compliance with the identified priorities ¹⁶⁵	Potential overlap with other programmes and funds
New Energy	Support for energy research activities, including pilot and testing projects.	Yes	Research and development (public and private) (Very High)	TA CR (Theta) Programme EFEKT OP Transport OP Technology and Application for Competitiveness RRF
	Expert advice on the preparation and implementation of projects increasing the energy efficiency of buildings, the deployment of renewable energy sources and smart solutions.	Yes	Modern energy systems - decentralised, diversified, environmentally friendly (High)	
	Use of hydrogen in public transport.	Yes	Modern energy systems - decentralised, diversified, environmentally friendly (High)	
	Energy storage	Yes	Modern energy systems - decentralised, diversified, environmentally friendly (High)	
	Community energy supporting energy communities to meet their energy needs	Yes	Modern energy systems - decentralised, diversified, environmentally friendly (High)	
	Ensuring high-capacity connection to a very high voltage network, the delivery of the transmission and distribution network.	Yes	Modern energy systems - decentralised, diversified, environmentally friendly (High)	

¹⁶⁵ Based on assessment in Chapter 2

Types of operations for Moravian-Silesian Region, as identified in the draft Regional Transition Plan				
Theme	Examples of supported activities	Compliance with the JTF Regulation	Compliance with the identified priorities ¹⁶⁵	Potential overlap with other programmes and funds
New Land Use	Active cooperation with land owners in the search for solutions and use of brownfields, including a database of areas suitable for transformation – this database will be complementary to the brownfields database maintained by the MoIT.	Yes	Brownfields (industrial heritage utilisation/exploitation) (Very High) Upgrading/Diversification of traditional industries/firm structure (SMEs) (Very High)	Integrated Regional OP OP Technology and Application for Competitiveness RRF OP Environment
	Expansion of functional, cultivated and clean public space for civic and business use, removal of barriers, thickening of urban space with architecturally valuable development.	Yes	Investments into quality of life of inhabitants (High)	
	Reviving settlement centres and increasing the attractiveness of public space through the cultural and creative industry.	Yes	Investments into quality of life of inhabitants (High)	
	Increasing the attractiveness and resilience of public space through greenery.	Yes	Investments into quality of life of inhabitants (High)	
	Revitalisation of monuments related to mining and industrial identity.	Yes	Brownfields (industrial heritage utilisation/exploitation) (Very High)	
	Investing to increase the efficient and sustainable use of monuments related to the region's mining tradition, including museums and other cultural infrastructure.	Yes	Investments into quality of life of inhabitants (High)	

Types of operations for Moravian-Silesian Region, as identified in the draft Regional Transition Plan				
Theme	Examples of supported activities	Compliance with the JTF Regulation	Compliance with the identified priorities ¹⁶⁵	Potential overlap with other programmes and funds
	Use of temporary or long-term unused buildings and space for cultural, social, educational and leisure events (e.g., mobile/shared cultural facilities for the use of temporarily unused premises).	Yes	Brownfields (industrial heritage utilisation/exploitation) (Very High)	
	Regeneration of areas unsuitable for investment and their introduction into a nature-related state, considering measures responding to climate change.	Yes	Landscape reclamation, new development zones (Moderate)	
	“Disassembly” heaps, use their useful content, reclamation of their areas, including the necessary green infrastructure.	Yes	Green economy (e.g., land recycling, materials) (Very High)	
Green Industry	Production of “green steel” ¹⁶⁶ and investment in downstream production processes.	Yes	Green economy (e.g., land recycling, materials) (Very High)	Modernisation Fund OP Technology and Application for Competitiveness
	Production of aluminium from recycled raw materials and investment in downstream production processes.	Yes	Green economy (e.g., land recycling, materials) (Very High)	
	Change of product portfolio due to the cessation of coal mining and the closure of downstream carbon-intensive operations.	Yes	Upgrading/Diversification of traditional industries/firm structure (SMEs) (Very High)	

¹⁶⁶ This is a commonly used term, also used in the regional TP, which basically refers to replacing coal (coke) used for steel making with hydrogen produced from renewable energy sources. More generally it can be defined as “a steel-making process designed to lower GHG emissions, as well as potentially cutting costs and improving the quality of steel, in comparison to conventional methods” Griffin, P. W., & Hammond, G. P. (2021). The prospects for ‘green steel’ making in a net-zero economy: A UK perspective. *Global Transitions*, 3, 72-86. However, it was noticed that this term is considered by some regional stakeholders as inappropriate.

Types of operations for Moravian-Silesian Region, as identified in the draft Regional Transition Plan				
Theme	Examples of supported activities	Compliance with the JTF Regulation	Compliance with the identified priorities ¹⁶⁵	Potential overlap with other programmes and funds
	Production, storage and distribution of hydrogen.	Yes	Upgrading/Diversification of traditional industries/firm structure (SMEs) (Very High)	
	Use of land and real estate after mining, defunct production or productive investment services generating new jobs.	Yes	Upgrading/Diversification of traditional industries/firm structure (SMEs) (Very High)	
New Enterprise	Development of business competences and willingness to do independent business in the form of integration into teaching in schools, counselling, coaching, acceleration programmes, networking events, competition and inspirational events.	Yes	Upgrading/Diversification of traditional industries/firm structure (SMEs) (Very High)	OP Jan Amos Komensky OP Technology and Application for Competitiveness
	Consulting, acceleration and incubation services, shared workshops, laboratories, coaching programmes, networking and development for sharing experience and cooperation of experts, developing shared services and expanding the offer of attractive business properties.	Yes	Upgrading/Diversification of traditional industries/firm structure (SMEs) (Very High)	

Types of operations for Moravian-Silesian Region, as identified in the draft Regional Transition Plan				
Theme	Examples of supported activities	Compliance with the JTF Regulation	Compliance with the identified priorities ¹⁶⁵	Potential overlap with other programmes and funds
Competent People	Support for employee re/upskilling, support for employers in identifying new competences needed and creating new jobs, , support for educational institutions in the creation of new / adapted educational programs and modules.	Yes	Re- and up-skilling for future oriented economic activities (Very High) Primary and secondary education (High)	OP Employment plus OP Jan Amos Komensky Active labour market policy
	Overall support for improving the quality of vocational education and training in a lifelong perspective, support for cooperation between employers and schools, support for polytechnic education of all ages, support for teaching foreign languages, especially English, support for digital and mathematical skills, development of skills of all ages, reducing the administrative burden on schools and teachers, increasing the capacity for development activities in education	Yes	Primary and secondary education (High) Re- and up-skilling for future oriented economic activities (Very High)	
	Improving the study offer of universities and strengthening their internationalisation, supporting talent, strengthening marketing and involving regional partners, improving cooperation between schools and companies, attractiveness of the student environment	Yes	Support of universities (all roles) (Very High)	
	Available career and professional counselling services for all target groups, career and professional counselling support system linked to existing activities.	Yes	Re- and up-skilling for future oriented economic activities (Very High)	
	Promoting greater job flexibility and the integration of foreign workers.	Yes	Re- and up-skilling for future oriented economic activities (Very High)	

Types of operations for Moravian-Silesian Region, as identified in the draft Regional Transition Plan				
Theme	Examples of supported activities	Compliance with the JTF Regulation	Compliance with the identified priorities ¹⁶⁵	Potential overlap with other programmes and funds
	Upskilling and strengthening labour mobility, creating and implementing education standards for application in higher value-added fields and new fields in line with the Smart Specialisation Strategy, cooperation with labour offices in targeting active employment policy, promoting corporate social responsibility	Yes	Re- and up-skilling for future oriented economic activities (Very High)	
Innovation Ecosystem	Strengthening the capacities of excellent research in the key priorities of the MSK smart specialisation.	Yes	Research and development (public and private) (Very High)	TA CR OP Jan Amos Komensky Technology and Application for Competitiveness
	Strengthening the shared capacities of support organisations and platforms (MS Innovation Centre, cluster organisations, research and technology centres and platforms, hubs, co-working centres, etc.)..	Yes	Entrepreneurial ecosystem (Very High)	
	Preparation and expansion of the capacity of new interdisciplinary subjects and fields of university.	Yes	Support of universities (all roles) (Very High)	
	Promoting knowledge transfer, commercialisation, verification and marketing of research and innovation results.	Yes	Entrepreneurial ecosystem (Very High) Research and development (public and private) (Very High)	
	Financial support for investments in development and innovation, including support for research and innovation infrastructure.	Yes	Entrepreneurial ecosystem (Very High) Research and development (public and private) (Very High)	

Types of operations for Moravian-Silesian Region, as identified in the draft Regional Transition Plan				
Theme	Examples of supported activities	Compliance with the JTF Regulation	Compliance with the identified priorities ¹⁶⁵	Potential overlap with other programmes and funds
	Incentive tools to strengthen cooperation between private and research organisations and universities (e.g., innovation vouchers).	Yes	Research and development (public and private) (Very High)	
	Support for the provision of risk finance.	Yes	Entrepreneurial ecosystem (Very High)	
	Digital infrastructure for research, development and cooperation in the field of innovation	Yes	Entrepreneurial ecosystem (Very High)	
Digital and creative region	Creation and digitisation of data collections and agency information systems, including completion of the necessary infrastructure	Yes	IT technologies/digital economy/artificial intelligence (High)	OP Technology and Application for Competitiveness Integrated Regional OP OP Transport RRF
	Automation and robotisation of agendas and digital data	Yes	IT technologies/digital economy/artificial intelligence (High)	
	Adaptive traffic management, provision of real-time traffic information, development of information and navigation systems	Yes	IT technologies/digital economy/artificial intelligence (High)	
	Development of digital competences	Yes	IT technologies/digital economy/artificial intelligence (High)	
	Creation of a sustainable infrastructure (ecosystem) for the development of the cultural and creative industries	Yes	Entrepreneurial ecosystem (Very High)	

Types of operations for Moravian-Silesian Region, as identified in the draft Regional Transition Plan				
Theme	Examples of supported activities	Compliance with the JTF Regulation	Compliance with the identified priorities ¹⁶⁵	Potential overlap with other programmes and funds
			Upgrading/Diversification of traditional industries/firm structure (SMEs) (Very High)	
	Promoting creative education and entrepreneurship	Yes	Upgrading/Diversification of traditional industries/firm structure (SMEs) (Very High)	
	Revitalising settlement centres and enhancing the attractiveness of public spaces through the cultural and creative industries	Yes	Investments into quality of life of inhabitants (Very High) Brownfields (industrial heritage utilisation/exploitation) (Very High)	
Circular economy	Building research and development centres for circular economy in enterprises and research centres.	Yes	Research and development (public and private) (Very High)	TA CR (Eta) TA CR OP Environment OP Technology and Application for Competitiveness
	Financing of research and development in the field of prevention of industrial waste and material recovery of waste.	Yes	Research and development (public and private) (Very High)	
	Investment in demonstration and small-scale projects implementing the results of R&D in preparation for the creation of industrial capacities.	Yes	Research and development (public and private) (Very High) Circular economy (Moderate)	
	Recycling and removal of industrial heaps and decals.	Yes	Circular economy (Moderate)	

Types of operations for Moravian-Silesian Region, as identified in the draft Regional Transition Plan				
Theme	Examples of supported activities	Compliance with the JTF Regulation	Compliance with the identified priorities ¹⁶⁵	Potential overlap with other programmes and funds
	Ecological transformation of municipal and similar waste into usable products.	Yes	Circular economy (Moderate)	
	Building competence and education centres.	Yes	Circular economy (Moderate)	
	Circular scans in businesses and municipalities.	Yes	Circular economy (Moderate)	

In comparison to previous versions, clear progress can be identified in the current MSR Transformation Plan. The plan is characterised by its overall clarity and internal coherence. Eight types of programmes represent the basic pillars. Each individual programme is complemented by an overview of strategic projects, a description of simplified schemes, and thematic calls. Network projects, territorial solutions, and financial instruments are identified as a specific type of operations. These types of operations seem to be highly appropriate. The inclusion of Chapter 2, which presents the architecture of the transformation plan, is also positive. This is still a draft, but it is recommended that this chapter is thoroughly revised and expanded. More specifically, it should better summarise in a clear form the main logic of the preparation and potential impact of the JTF. Further, it is recommended Chapters 3 and 4 be incorporated into Chapter 2 for a better clarity and overall coherence.

In spite of the overall high quality of the latest version of the plan, some major elements are still missing. They are as follows:

- 1) the prioritisation of programmes is missing. It is not clear which type of operations have a higher or lower priority. The prioritisation is an obligatory part of good regional plans in general. Similarly, the number of strategic projects should be reduced.
- 2) the stronger and more explicit intervention logic plan is missing. It can be incorporated into Chapter 2.
- 3) according to the results of our analysis, the region is facing increasing decoupling of economic and social development. In the plan, the technological and mainly pure economical perspective is still prevailing (e.g., “JTF mechanism has the ambition to help especially in the economic transformation of the region, which will be affected by the decline of mining and related industries.” p. 22). The social dimension needs to be more integrated into the plan, in order to be really comprehensive.
- 4) the spatial distributions of listed strategical projects seem to be highly uneven. The potential risk of increasing spatial polarisation cannot be neglected.
- 5) certain programmes or operations (Hydrogen Valley) are very bold, since the technological readiness of hydrogen is still questionable and must be directed towards very specific sectors and uses¹⁶⁷, a better description of the pros and cons of this technology is expected.
- 6) a large part of the financial allocation is planned for different types of hard infrastructure. By contrast, development of human and social capital plays a less important role in the Regional TP. The potential risk of such investment patterns needs to be carefully considered. In the line with the latter, planned financial allocation for re- and upskilling activities seems to be underestimated. Nevertheless, opportunities from other OPs should also be considered.

Last but not least, for some planned activities/projects, empirical evidence is missing.

As for the specific priority themes:

New Energy

The theme rightly identifies the clean energy as one of the priorities of the Just Transition. The section, however, presents a nearly direct overlap with the existing support schemes. Therefore, the JTF projects will need to clearly demonstrate the intervention logic and additionality to other “clean energy” projects.

The hydrogen economy is a promising, yet less developed sector with unclear technical and economic viability in selected sectors and end-uses. Therefore, potential projects should aim at R&D activities and specific sectors with high potential (such as industrial processes, heavy transport)¹⁶⁸, and should be complemented with other clean energy options, which are more viable in the short and mid-term.

A clear link to the sustainability of the projects, especially for the infrastructure projects should be established.

New Land Use

These operations relate to the reuse of brownfields and land reclamations and often relate to investments to quality of life or support of new business activities which are in line with identified priorities. However, they must be clearly linked with the climate neutrality transition and its impacts.

¹⁶⁷ Refer to <https://www.nature.com/articles/s41558-021-01032-7> for potential and risks as to sectors and uses.

¹⁶⁸ Ibid.

Moreover, operations/projects should consider including building social infrastructure and community services.

Some of operations can be primarily supported through Pillars 2 and 3 but should be clearly highlighted in the RTP as priorities.

Green Industry

Investments into the green economy have high priority as the region has an above-average specialisation (although decreasing) in energy-intensive industries. Ongoing coal mine closure creates spaces for new productive investments. The RTP focuses only on the green transformation of existing companies dependent on conventional production processes and restructuring them in line with climate neutrality. Scenarios of diversification to the new (related) industries are not developed. There is a danger of conserving existing production instead of conversion/recombination. Additionally, large firms are expected among beneficiaries. However, the absence of SMEs is not really possible. In this case some of operations can be primarily supported through Pillars 2 and additionality to other programmes focused on the greening of production (e.g., Modernisation Fund).

Hydrogen energy is a key priority within RIS. Nevertheless, the exploitation subsystem is weakly developed.

New Enterprise

The region has the lowest long-term entrepreneurial activity in the Czech Republic and the share of micro-firms and SMEs is also below average, so modernisation and diversification of its economy by support of new enterprises has very high priority. The proposed activities do not differ significantly from previous strategies/activities, which had been implemented in the past. More novelty of financial schemes and new models of entrepreneurship should be strengthened.

There is a lack of regional firms operating in the low-carbon economy. Attracting FDIs to this segment seems appropriate, however, attractive regional assets need to be developed. The strategy and instruments to attract such types of firms are not clear. Providing basic infrastructure is not a sufficient precondition.

Competent People

The focus on the people in the region and investments into human capital should be very high priority for the just transition. Especially the brain drain is a serious regional problem. Nevertheless, it is often mentioned but not really connected to the proposed operations. The decline of university students cannot be solved solely with improvement in education supply. The plan fails to mention investments in solving current and future social problems and creating quality living conditions (not only economically oriented).

Due to the existing specialisation in energy-intensive industries, coal mining, and the energy sector, intensive layoffs are expected. Further, the region is facing an increasing labour market mismatch that will result in above-average unemployment, with some hot spots (peripheral and coal micro regions).

The universities in the region, despite progress in recent decades, are still locked-in into mid-range status. In regional cooperation, involvement is still much needed for improvements.

More integration of foreign workers is needed and can act as an instrument to solve the lack of human resources in some sectors (e.g., IT, health care). Again, the integration into the labour market is one of many necessary success factors.

Innovation Ecosystem

Due to the existing economic structure, supporting activities working towards a low-carbon economy is needed. In relation to the R&D, a critical mass is missing, RIS is fragmented, and the embeddedness of foreign companies into RIS is rather weak. The role of universities is rather weak either. The support of R&D is highly appropriate and surely is one of key aspects for development of the innovation ecosystem in the region.

Research on ageing meets regional needs. Ageing is one of the most intensive demographic processes in the region. Nevertheless, it is rarely mentioned in the proposed types of action. Also, some proposed measures should be carefully prepared as their success depends on the quality of their design. Similarly, the lack of venture capital is an existing barrier and needs to be further prioritised.

Moreover, a clear link to the sustainability of the projects, especially for the infrastructure projects should be established.

Digital and creative region

Digitalisation represents a greater opportunity for the Moravian-Silesian Region than the other two coal regions, but is still rather low. Therefore, such operations meet the regional need. However, starting “from scratch” is difficult due to the low absorption capacity, weak infrastructure, or low regional demand. Similarly, the creative industries can be used as a “tool” to diversify the economy, especially if it is connected to the revitalisation of brownfields. The creative industries have been developed and could play an integral part in the transformation of the region, but empirical evidence and clear strategy of cultural and creative industries is not available.

The additionality and contribution of these activities to Just Transition should be clearly stated. The Just Transition intervention logic for some of the priority topics beyond the scope of existing OPs should be clarified.

Circular economy

The circular economy represents operations that meet regional needs. Land degradation/contamination creates a kind of “inherited barrier”. Therefore, operations aiming to mitigate this barrier are highly needed. Basic competencies on recycling on the municipal level are already developed. Simultaneously, the private sector has evolved rather poorly. The lower importance of this activity is supported by the findings of the impact (please see Section 6.4). Nevertheless, as was mentioned above, circular economy has potential for jobs creation.

6.1.4 Action plans

The action plans will be included in the Final Report (D5) as there is already a lot of information on potential and strategic projects, but not all detailed information has been made available.

6.2 Contribution of the JTF support based on absorption capacity including allocations for technical assistance to tackle capacity gaps for the implementation of the JTF

In the Czech Republic, the JTF focuses on mitigating the effects of the transformation process towards a carbon-neutral economy in three coal regions, i.e., the Moravian-Silesian, Karlovy Vary and Ústí regions, where the transition process will have the most serious consequences. For this reason, the JTF will focus on supporting projects aimed at creating new jobs, restoring the area after coal mining or related industries, regionally specific projects within the business environment, science and research or active employment policy. These projects may be complex as they could for example support different areas from training to modernisation of production in one project.

In this section, we assess the absorption capacity for JTF in the Czech coal regions. The first subsection briefly summarises **the situation regarding the input allocation** and its distribution among coal regions, including a table of criteria according to which regional allocations were determined. This is important to understand the potential financial scope that will be implemented in individual coal regions. In the subsequent subsection, attention is dedicated **to the absorption capacity readiness** of the Czech coal regions for JTF financing (as of mid-June 2021) according to the first results of mapping potential projects for financing, which the working groups in the coal regions evaluated and categorised into: “strategic” projects and projects suitable for thematic calls or simplified grant schemes. However, this process has not yet been fully completed at the time of processing the update of this D4 report. Nevertheless, TA team provides the first framework results of this assessment in relation to the absorption capacity of JTF (i.e., the availability and readiness of meaningful projects). Individual coal regions will continue to work on fine-tuning the evaluation of these projects and, in this context, will finalise the intervention logic of individual measures in regional transformation plans, especially the prioritisation of specific objectives, which the TA team has already proposed in the D4 report. In any case, the content delivered by the TA team in the first version of the D4 report remains relevant. That is, **although the absorption capacity (i.e., the number and scope of potential projects) clearly exceeds the available financial allocation, it will be crucial to assess their relevance to the transformation story of the regions and the degree of readiness for their implementation.**

Distribution of input JTF allocation between regions

The main information concerning the absorption capacity in the coal regions is represented by partial analysis, which is created in the coal regions and follows the mapping of project readiness in specific topics. In connection with this process, the TJTP will also be finalised at the national level by the Ministry of Regional Development. The distribution of funds will be ensured through the OPJT, while the first calls for proposals are expected in 2022. According to the draft Partnership Agreement in the programming period 2021-2027 (p. 43, version April 2021), the total allocation of the OPJT is:

- EUR 718,766,159 (JTF - allocation, Article 3 of the draft JTF Regulation, i.e., the multiannual financial framework),
- EUR 922,725,849 (JTF - allocation, Article 3a of the draft JTF Regulation, i.e., resources from the European Union Recovery Instrument).

A total of EUR 1,641,492,008 (i.e., approx. CZK 42 billion) of funding is available; after deducting the allocation intended for technical assistance, the amount will be CZK 41.0 billion. The programme will contain three priorities by region (i.e., priority 1: Karlovy Vary Region; priority 2: Ústí Region; priority 3: Moravian-Silesian Region). Each region has its own allocation, which should allow for better planning of the regional transformation plan and strategic projects. This distribution of funds was approved by the Government of the Czech Republic on 24 May 2021¹⁶⁹. The basic criterion for the distribution of funds is the number of inhabitants in individual regions, and other criteria such as gross domestic product per capita, unemployment, areas affected by mining, the number of workers in research and development.

Table 29: Distribution of the Just Transition Fund allocation by coal region (priorities of the OPJT)

Region	Population		Coefficients				Allocation		
	ths. persons	%	GDP per capita	Unempl.	Area affected by mining	Number of R&D workers	Total (in billions of CZK)	%	Per person (in CZK)
Karlovarský	295	12.7	1.15	0.97	0.98	1.07	6.3	15.3	21 221
Ústecký	821	35.4	1.06	0.93	1.04	1.04	15.8	38.6	19 271
Moravian-Silesian	1 204	51.9	0.93	1.04	0.94	0.95	18.9	46.1	15 682
Total	2 320	100.0					41.0	100.0	17 657

Source: MoE (2021). Rozdělení prostředků Fondu pro spravedlivou transformaci (Distribution of the Just Transition Fund). Available at: [https://www.mzp.cz/C1257458002F0DC7/cz/opst_2021_2027/\\$FILE/OPTNE-rozdeleni_alokace-20210526.pdf](https://www.mzp.cz/C1257458002F0DC7/cz/opst_2021_2027/$FILE/OPTNE-rozdeleni_alokace-20210526.pdf)

Technical assistance is not defined in the TJTP (version 1.7, June 2021). However, its potential financial scope can be estimated at CZK 1.7 billion, which amounts to approximately 4% of the total OPJT allocation. In the opinion of the TA team, this allocation is fully in line with the expected complexity of the programme and the multi-layered implementation and involvement of key actors within the partnership principle. For comparison, the planned scope of technical assistance for a similar multi-fund IROP (Integrated Regional Operational Programme) is less than half of the technical assistance amount, i.e., 1.6% of the total programme allocation. The OP Environment, for example, which will have the same managing authority as the OPJT (i.e., the Ministry of Environment), will have 1.8% of the total allocation in the form of technical assistance. To not jeopardize the approach to tackle the capacity gaps, it will be necessary to emphasise the following aspects in the technical assistance settings:

- to prepare conditions for high-quality and efficient management and for proper utilisation of financial allocations according to the rules established by European and national legislation;
- to plan (very carefully) for financial support from relevant supporting institutions in the implementation structure, which have more experience with the administration of projects related to business and social agenda. Therefore, it will be necessary to improve competencies, human resource skills within management structures, and thus ensure a low rate of employee turnover and personnel stability in the implementation structure. This recommendation applies to both the central and regional levels of OPJT implementation;
- to support effective monitoring and readiness of evaluation capacity in the administrative structures of the OPJT within the framework of technical assistance;
- to ensure a quality communication strategy of the OPJT in relation to target groups and general public (as a standard part of technical assistance).

¹⁶⁹ See: Resolution of the Government of the Czech Republic of 24 May 2021 No. 483 (only in the Czech language). Available at: <https://apps.odok.cz/attachment/-/down/HOAC3DB9WXT>

Readiness of absorption capacity of Czech coal regions for JTF financing (as of mid-June 2021)

This section summarises and analyses the main results of the mapping of project readiness for OPJT funding, i.e., the absorption capacity of coal regions to spend the funding available on meaningful projects. Coal regions have announced calls for proposals for potentially strategic projects with a significant transformation impact on their territory, which will be included in the TJTP after the evaluation and fulfilment of the conditions for the strategic project. Thus, after fulfilling other conditions, they will receive the opportunity (not the right) to be financed from the OPJT (to access finance from OPJT, projects will need to comply with other requirements in the final call for strategic projects). Projects in this call were considered strategic if the project was significant for the given territory and further that the project:

- contributes to the specific strategic objectives of the region;
- has a direct or indirect economic impact on the region;
- has a direct impact on the transformation of the region;
- has an impact on a significant part of the territory;
- can combine investment and non-investment activities;
- has a clear organisational and institutional framework;
- is financially and institutionally sustainable;
- has a defined implementation schedule; and,
- is unique.

The aim of the call was to collect, evaluate and recommend these potential strategic projects to PSÚT. The submission window for proposals was from 31 March to 30 April 2021. Applicants could include all entities in the regions that have prepared investment projects for more than CZK 200 million and non-investment projects in the amount of more than CZK 50 million.

In addition to mapping the absorption capacity potential in major strategic projects of coal regions (it is necessary to emphasise again that this was a mapping of potential projects, not the selection of final projects for funding), particular regions could also structure the absorption capacity potential of other "Just Transition" activities, which will be supported in thematic calls or simplified grant schemes. The next subsection summarises the key findings by individual coal regions, which provides an information base on the readiness of the project pipeline.

According to information from the representatives of the regions on the transformation platform held on 25 June 2021, the estimated budgets of the projects were generally higher compared to the financial allocation for a given region. However, this indicates that the regions are ready in the absorption capacity to implement OPJT funds with a meaningful approach, and that they have prepared projects for the selection process for their final implementation.

Mapping the absorption capacity and readiness of projects provides a good basis on how to prepare for the implementation of OPJT projects and potential project reserves in the project pipeline until the implementation of OPJT starts. Then, projects in the biggest phase of readiness for their implementation will be definitively selected.

Ústí Region

A total of 49 projects were submitted in the Ústí Region (CZK 57 billion). Of these, 7 strategic projects were recommended (CZK 65.6 billion) and 35 projects were identified as non-strategic for thematic calls (CZK 124 billion). As part of the meetings of working groups in the Ústí Region, they will recommend the Regional Standing Conference to cap the maximum amount of support per strategic project in the amount of EUR 50 million. Additionally, a minimum of 1 project is to be recommended for each pillar of the regional transformation plan, while the maximum financial allocation for strategic projects should not exceed 50% of the OPJT financial allocation in the region. According to these conclusions, the mapping will recommend to the Regional Standing Conference of the Ústí Region the following scope of JTF funding (specific projects are not listed, because the evaluation is still ongoing).

Table 30: Strategic projects and thematic calls projects with high transformation potential

Thematic areas of support according to strategic projects and thematic calls	Total project expenditures (recommended projects) (in CZK)	Allocation of the support, max. 50 mil. EUR for strategic projects (in CZK)	Number of projects
Strategic projects	65 687 530 540	6 394 809 000	7
I. Entrepreneurship, research, innovation	3 111 540 000	2 644 809 000	4
II. Competent people and Smart Region	1 487 892 031	1 250 000 000	1
III. New energy and effective use of resources	1 650 420 038	1 250 000 000	1
IV. Revitalised territories of the 21 st century	59 437 678 471	1 250 000 000	1

Thematic areas of support according to strategic projects and thematic calls	Total project expenditures (recommended projects) (in CZK)	Allocation of the support, max. 50 mil. EUR for strategic projects (in CZK)	Number of projects
Thematic calls	59 150 893 270	21 639 137 469	35
I. Entrepreneurship, research, innovation	26 988 521 460	9 748 767 081	13
II. Competent people and Smart Region	3 294 435 810	2 186 132 938	8
III. New energy and effective use of resources	24 813 936 000	8 017 467 450	10
IV. Revitalised territories of the 21 st century	4 054 000 000	1 686 800 000	4
Total	124 838 423 810	28 033 976 469	42

Source: Ustecky region Strategic projects selection (May 2021) and summary table of Strategic projects according to the Ustecky region presentation at the Transformation Platform in June 2021

Karlovy Vary Region

A total of 46 projects were submitted in the Karlovy Vary Region (CZK 167 billion), of which 20 met the eligibility criteria for the transformation process. Of acceptable projects, a total of 13 projects achieved more than 50 points in the evaluation and 11 strategic projects were prioritised. Nevertheless, the evaluation process is still ongoing. The evaluation also applied criteria related to the transformation potential, readiness and feasibility of projects, which are now evaluated in three categories, of which the first and second categories represent projects with the best conditions for implementation. In the first category, there are projects in the amount of CZK 1.5 billion (e.g., Karlovy Vary Innovation Center, Creative and Cultural Office, Transformation Agency, etc.). In the second category, projects amount to CZK 1.2 billion (e.g., Business Park Sokolov, Sokolovská investiční green development, Spa Research Center). According to these conclusions, the mapping will recommend to the Regional Standing Conference of the Karlovarsky Region the scope of JTF funding.

Moravian-Silesian Region

A total of 65 projects were submitted in the Moravian-Silesian Region (CZK 75.3 billion). Of these, 23 strategic projects were recommended (CZK 26.5 billion) and 42 projects were identified as non-strategic. From these non-strategic projects, the working groups of the region identified 35 suitable projects for thematic calls in the amount of CZK 28.5 billion (subsidies from OPST in the amount of CZK 14.7 billion).

By contrast, 23 strategic projects were further classified by MSK staff and will be further discussed within the Regional Standing Conference:

- 13 priority strategic projects were subsequently identified (CZK 18.2 billion),
- 6 strategic projects for SMEs (CZK 5.7 billion)
- 4 strategic brownfields (CZK 2.6 billion)

It is evident that the readiness of the absorption capacity in the Moravian-Silesian Region is at a very high level. Preliminary distribution of JTF funds among individual types of operations in the Moravian-Silesian Region will be approved by the MSK Regional Standing Conference and it is assumed that 51% of the allocation will be drawn for strategic projects with high transformation potential, 12% for strategic brownfields (i.e., funding through a thematic call or using another financial instrument), and 37% for other types of operations (e.g., thematic calls, simplified schemes, network solutions).

Table 31: Strategic projects – CATEGORY 1 – 13 projects with high transformation potential

Program of the Regional Transformation Plan	Title of the project	Title of the entity	Total expenditures in mil. CZK	Financial requirements for the OPJT in mil. CZK
Nová energie (New Energy)	Centrum veřejných energetiků	Moravskoslezské energetické centrum, p.o.	200	170
Nové využití území (New land use)	POHO Park	Sdružení pro POHO Park	503	427
	MUSEum+	MUSEum+, s.p.o.	2 000	1 999
	PODOLUPARK Karviná	PDI a. s.	7 400	1 350
	EDEN Karviná – výzkumný a vzdělávací park	Slezská univerzita v Opavě	2 980	2 431
Kompetentní lidé (Competent people)	Technologická a podnikatelská akademie a digitální, inovační a mediální laboratoř	Moravskoslezský kraj	1 220	1 037
	Education District	Dolní oblast Vítkovice, z.s.	496	421
	CEPIS – „Centrum podnikání, profesních a mezinárodních studií“	Slezská univerzita v Opavě	620	588
	TRAUTOM – KOMPETENCE PRO 21. STOLETÍ	Moravskoslezský pakt	1 000	500
Inovační ekosystém (Innovation ecosystem)	Life & Environment Research Center Ostrava	Ostravská univerzita	1 847	1 754
	REFRESH	Vysoká škola báňská, TUO	3 994	3 794
Církulární ekonomika (Circular economy)	CirkArena – Circular Economy R&D Centre	Materiálový a metalurgický výzkum, s. r. o.	2 199	2 089

Digitální a kreativní region Digital and creative region	Černá kostka – Centrum digitalizace, vědy a inovací	Moravskoslezský kraj	1 946	1 654
IN TOTAL			26 405	18 214

Source: MSK Strategic projects (May 2021) and summary table of Strategic projects according to the MSK presentation at the Transformation Platform in June 2021

Delineation of intervention logic for absorption capacity – state of readiness of regional transformation plans by mid-June 2021

In April and June 2021, a review of individual regional transformation plans by the TA team experts revealed that the intervention logic is either completely missing or only partially explained without a deeper reflection of the intervention and absorption capacity. The TA team appreciates the progress made by individual coal regions in the preparation and planning of interventions from the JTF according to the situation, which was presented on the Transformation Platform on 25 June 2021. Partial details are given below, however, it can be stated that they fully understand the need to define the intervention logic of individual priorities and the overall transformation story. During May and June, the description in establishing individual priorities in the context of the ongoing evaluation of strategic projects and other projects suitable for thematic challenges was further addressed. At the turn of June and July, the intervention logic, prioritisation of topics, and transformation story will be added to all regional transformation plans, including the distribution of funds according to individual thematic areas.

In the context of absorption capacity, the TA team focused on a general assessment of the expected contribution of the prepared absorption capacity of the regions to the JTF and to the defined TJTP capacity gaps. This process is still ongoing. Nevertheless, the TA team summarised the main elements and pitfalls of the prepared regional transformation plans, which are absolutely essential for understanding the extent of the assumed absorption capacity of all three coal regions. In this context, the TA team emphasizes the need to not only reflect on the regional investment needs, which are higher than the OPJT allocation, but also the degree of project readiness. Additional comments from the TA team are summarised in the following textbox for individual coal regions.

In the first version of the D4 report (April 2021), the TA team prepared a summary and overview table regarding the potential range of estimates related to financial absorption capacity according to the submitted projects, which were defined in the TJTP as of the version from 15 March 2021. Of course, this was a first (rough) estimate, which did not correspond to the overall situation in the coal regions, because (at that time) information on potential projects was still being collected, and a call for potential projects was announced at the regional level. However, the added value of the overview table was a clear structuring of the expected activities and the extent of the mapped absorption capacity according to individual JTF-type activities in relation to Article 8 of the Regulation. **The TA team recommends that the Ministry of Regional Development, when finalising the TJTP during the summer of 2021, perform a similar summarisation and classification of mapped projects according to individual JTF-type activities in relation to Article 8 of the Regulation and insert this overview table as a special appendix to the TJTP.** It should not be anything demanding, because from the excel tables of mapped projects in individual regions, this link to JTF-type activities is monitored. However, the TA team does not have the final classification of these mapped projects (as of June 2021), so it is not possible to update this table in the D4 report. Such an overview table can be considered as a good initial basis for comparing the potential of the absorption capacity of individual JTF activities against defined problematic development gaps.

6.3 Synergies/complementarity/consistency with other programmes (EU, country context (national, regional, territorial; see above including pillars 2 and 3 as well as banking sector)

6.3.1 General introduction

The estimated absorption capacity related to the project intentions (fiches) of particular Czech coal regions is significantly higher than the expected JTF allocation (OPJT). As a result, it is absolutely necessary to identify the consistency, synergy and complementarity of the planned interventions with other strategies such as the 2021-2027 operational programmes and the EU's directly managed programmes. Many topics related to the transformation process of coal regions will be eligible to access finance from programmes other than the OPJT. For this reason, it will be necessary to precisely target priorities and measures that will not be included in standard operational programmes or that can benefit from additional (although perhaps lower) national allocations. The OPJT should finance activities/projects that will not meet the conditions of other operational programmes (e.g., in terms of

the absolute amount of support, complexity and scope of supported activities, etc.). According to a semi-structured interview with a representative of the MoE in April 2021, it was confirmed that inter-ministerial negotiations on potential overlaps between operational programmes were conducted during May, however, it is an ongoing process that will continue in during July 2021 (according to the discussion at the Transformation Platform meeting in June 2021).

This issue stems from the JTF Regulation - Article 11, point 2, (e), (j), (k), that a territorial just transition plan shall contain the following elements:

- (e) an assessment of its consistency with other **relevant national, regional or territorial strategies and plans;**
- (j) synergies and complementarities with other **relevant** EU programmes to address identified development needs; and,
- (k) synergies and complementarities with planned support from **other JTM pillars**, i.e., Pillar 2 (dedicated scheme under InvestEU) and Pillar 3 (public sector loan facility).

This chapter is divided into two sub-sections, to identify the consistency, synergy and complementarity of the planned priorities:

1. The EU programmes and national/regional/territorial strategies; and,
2. Czech operational programmes, Pillar 2 and Pillar 3 of the JTM.

6.3.2 Consistency, synergies and complementarity in directly managed EU programmes and national/regional/territorial strategies

Programmes outside the Multiannual Financial Framework

1. Recovery and Resilience Facility

On 11 February 2021, the Council adopted a regulation establishing an Instrument for Recovery and Resilience. According to current estimates, the total allocation for the Czech Republic will amount to approximately EUR 35.7 billion (EUR 39.9 billion at current prices), i.e., approximately CZK 964 billion. These funds will help the Czech Republic address the economic and social impacts of COVID-19, while ensuring that its economy undergoes an ecological and digital transformation and becomes more sustainable and resilient. The RRF is part of the Czech Recovery Plan, which will be submitted by the end of April 2021. In this plan, the Czech Republic defines a comprehensive set of projects, reforms and investments in six policy areas, i.e., ecological transformation, digital transformation, smart and sustainable growth supporting inclusion and job creation, social and territorial cohesion, health and resilience, policies for the next generation, including education and skills. As for the RRF and JTF settings, they can complement each other. Double funding is not allowed but different funding for the same project is possible. RRF commitment is 3 years - maturity of the project and timeline for spending money in time. Coordination with other sources of funding is therefore needed, especially for longer projects.

2. Modernisation fund

The Modernisation Fund is part of the European Emissions Trading Scheme (EU ETS) and aims to modernise energy. In addition to operational programmes, the modernisation fund supports installations in the EU ETS, thermal energy supply systems, energy savings in public lighting and community energy. In other areas, it supplements OPJT territorially, materially and financially within the framework of Policy Objective 2. The modernisation fund favours applicants from coal regions and together with OPJT forms an interconnected support system - the Modernisation Fund supports energy transformation, OPJT mitigates its impacts. In this context, it can be emphasized that a number of issues regarding climate neutrality could be "solved" with the help of the Modernisation Fund that is more focused on this topic.

In February 2021, the Ministry of the Environment prepared an internal analysis entitled "*Evaluation and analysis of project plans submitted under the first pre-registration calls from the HEAT / RES + / ENERGETS programmes for the implementation of the Modernisation Fund in the Czech Republic*". This analysis showed that the Moravian-Silesian Region and the Ústí Region have the largest absorption capacity in the Czech Republic in programme No. 3 "Improving Energy Efficiency and Reducing Greenhouse Gas Emissions in Industry in the EU ETS - ENERGETS". They also have a significant absorption capacity for programme No. 2 "New renewable sources in energy RES+" and programme No. 1 "Modernisation of thermal energy supply systems - HEAT".

3. Innovation fund

The Innovation Fund supports innovative projects demonstrating low-carbon technologies and practices in energy-intensive industries. It is established for the EU as a whole, i.e., there is no direct allocation for a Member State as in the case of the Modernisation Fund. From 2020-2030, it provides around EUR 10 billion of support for the commercial demonstration of innovative low-carbon technologies, aiming to bring to the market industrial solutions to decarbonise Europe and support its transition to climate neutrality. In particular, innovative, low-carbon technologies and processes in energy-intensive industries, including products substituting carbon-intensive ones, carbon capture and utilisation, construction and operation of carbon capture and storage, innovative renewable energy generation, energy storage.

Programmes financed by the Multiannual Financial Framework

4. Connecting Europe Facility (CEF)

CEF represents another possibility to finance projects in the field of transport, infrastructure for alternative fuels, energy and electronic communications (high-speed internet). It is primarily focused on projects with a European dimension. Its largest part is the financing of the railway and marginal road network TEN-T. CEF thus finances the same activities as CF in OP Transport. However, due to the huge financial needs for the development of the TEN-T network, this overlap has no negative effects.

5. Horizon Europe

Horizon Europe (i.e., the 9th Framework Programme for Research and Innovation) builds on the previous Horizon 2020 programme (H2020) and is set to be the most ambitious instrument to fund research and innovation to date. The greatest potential for cities and municipalities is offered under the second pillar and cluster focused on climate, energy and transport. In this area, projects of European cities are envisaged with the aim of creating neutral carbon areas, systematic spatial planning, and urban innovation, advanced use of data, sustainable transport or energy. Pillar 2 of this programme, i.e., "Global Challenges and Industrial Competitiveness", "Digital and Industry" and "Climate, Energy and Mobility" will be very important.

Czech operational programmes (i.e., OPJAK and OPTAK) can contribute, among other things, to increasing the readiness of domestic organisations to compete for these funds with more complex international projects and to the complementary financing of investment costs.

6. LIFE

LIFE is the EU's financial instrument for environmental and climate change measures. Through its activities, it contributes to the implementation, updating and development of EU environmental policy and legislation through the co-financing of projects with European added value. The focus of LIFE is historically very broad, and it is constantly growing. This corresponds to the degree of usability of the programme for the plans of cities and municipalities, which in many cases can be a direct project beneficiary, but also indirectly through their for-profit and non-profit organizations. Compared to operational programmes that focus on Objective 2, LIFE makes it possible to finance more measures to support the development and exchange of good practice and knowledge and the implementation of demonstration projects. The LIFE 2021-27 programme is currently being defined, for which the European Commission proposes to raise the budget of the LIFE programme to EUR 5.45 billion between 2021 and 2027. The new LIFE programme would have four sub-programmes: nature and biodiversity; circular economy and quality of life; climate change mitigation and adaptation; and clean energy transition. Concerning the synergy of the TJPT with a new LIFE instrument, it is possible to mention into more details the following sub-programmes:

- **The LIFE Clean Energy Transition sub-programme** has a budget of nearly EUR 1 billion over the period of 2021-2027 and aims at facilitating the transition towards an energy-efficient, renewable energy-based, climate-neutral and -resilient economy by funding coordination and support actions (Other Action Grants) across Europe. These are actions of high EU added-value, which are targeted at breaking market barriers that hamper the socio-economic transition to sustainable energy, and typically engage multiple small and medium-sized stakeholders, multiple actors including local and regional public authorities and non-profit organisations, as well as consumers.¹⁷⁰

¹⁷⁰ See also: https://cinea.ec.europa.eu/life/clean-energy-transition_en

- **The Climate Change Mitigation and Adaptation sub-programme** will contribute to the shift towards a sustainable, energy-efficient, renewable energy-based, climate-neutral and resilient economy, thereby contributing to sustainable development.¹⁷¹
- **The Circular economy and quality of life sub-programme** aims at facilitating the transition toward a sustainable, circular, toxic-free, energy-efficient and climate-resilient economy and at protecting, restoring and improving the quality of the environment, either through direct interventions or by supporting the integration of those objectives in other policies.¹⁷²

7. Digital Europe (DEP)

This programme builds the EU's strategic digital capacity and facilitate the widespread deployment of digital technologies. The programme should play a central role in the issue of European digital transformation. The main goal of the programme is to support the digital transformation of the European economy and society and bring its benefits to European citizens and businesses. The programme will strengthen Europe's capacity in key areas of digital technologies through their widespread deployment and increase the diffusion and use of digital technologies in areas of public interest and in the private sector. This programme should contribute to the further introduction of eGovernment elements into the Czech environment, as well as to the introduction of modern technologies into various spheres of city life (transport, energy, environment, etc.).

National/regional/territorial strategies

Coherence with other national, regional or territorial strategies and plans is described in detail in the current version 1.7 of the TJTP (June 2021) in Chapter 2.3. Therefore, the TA team does not consider it essential to create this analysis in duplicate, this section will simply provide a brief summary of key issues in the following text.

It is necessary to emphasize that TJTP (version 1.7) is still a working version, and therefore there are also minor formulation shortcomings in the text of this plan. For example, at the beginning of Chapter 2.3, a list of the main relevant national strategies is given, however, in the other subchapters, the NECP is listed first, which is missing in the given list of strategies. This can be added. In terms of content, however, the problem is that the text only describes the content of the national strategies and does not specify the specific relevance to the TJTP in the relevant priorities and the process of transition of Czech coal regions, which is defined in the overview table in Chapter 2.3.4 Link to national documents. level. The TA recommends that the relevant chapters be supplemented by descriptive text of relevant relevance and synergies, in particular:

- Chapter 2.3.1 - Link to NECP
- Chapter 2.3.2 - Link to the national RIS3 strategy

The link to regional and territorial strategies is developed according to the different types of supported activities defined in the JTF Regulation (Article 8). For each of these activities, its link to the relevant regional and territorial strategies is described.

In the case of the Karlovy Vary Region, there are two additional sub-activities in accordance with the relevant regional strategy:

- (e) JTF, i.e., investment in digitisation, digital innovation and digital connectivity.
- (i) Job search assistance to jobseekers.

The TA team therefore recommends that the Karlovy Vary Region update its relevant strategies on these two topics, since according to the previous chapter, it is clear that the region is planning financial support for these types of JTF activities.

6.3.3 Consistency, synergy and complementarity of TJTP priorities with Czech operational programmes and Pillar 2 and Pillar 3 of the JTM

The TA team evaluated the identification of synergies and complementarities of the proposed sub-priorities in the individual regional transformation plans. In these plans, complementarity and continuity with other operational programmes is established. It is evident that the level of detail varied significantly between regional transformation plans in April 2021, and since then significant progress has been made in complementing the context and coherence of the planned specific objectives with other relevant

¹⁷¹ See also: https://cinea.ec.europa.eu/life/climate-change-mitigation-and-adaptation_en

¹⁷² See also: https://cinea.ec.europa.eu/life/circular-economy-and-quality-life_en

programs. The individual regional transformation plans do not always have a clearly defined link to the supported activity in the JTF or other pillars of the JTM.

As mentioned above, the Ministry of the Environment, in cooperation with the Ministry of Regional Development, addressed possible overlaps and synergies with other operational programmes during April/May 2021 and will finalise these issues during July 2021 (according to the information presented at the Transformation Platform in June 2021). However, in the framework of the Partnership Agreement, the closest links are to:

- Operational Programme Environment (OPE)
- Operational Programme Technology and Applications for Competitiveness (OP TAC)
- Operational Programme Employment Plus (OP Employment +)
- to the Operational Programme Jan Amos Komenský (OPJAK)
- Integrated Regional Operational Programme (IROP)

Furthermore, close links to the Modernisation Fund are often defined. Synergies with Pillar 2 and Pillar 3 of the JTM are also dedicated to all regional transformation plans, albeit to varying degrees of detail.

Ústí Region

The transformation plan of the Ustecky region (version 7.0, 3rd May 2021) is divided into four areas, which are further divided into 14 sub-specific objectives. This structure is too fragmented, and some topics would be more appropriate to combine. Additionally, some specific objectives are not well argued in relation to the transition process or are weakly linked to the climate agenda or not directly linked to the transformation process and can be included in the mainstream of Cohesion Fund funding in other operational programmes – e.g., specific objective II.4: Increasing social cohesion and community development in municipalities; or specific objective IV.2: Increased use and transformation of the region's industrial heritage potential, which could be merged with IV.1. These sub-specific objectives therefore need to be better argued. In view of the information provided at the Transformation Platform meeting in June 2021, it can be assumed that this comment will be fully addressed in finalizing the intervention logic of the individual areas of support and sub-specific objectives in the first half of July 2021.

The following section briefly describes the synergy of the planned activities according to the thematic priorities of the regional transformation plan of the Ustecky region. Thematic priority I. "Entrepreneurship, research, innovation" focuses on innovation performance (specific objective I.1) and activities related to the support of SMEs (specific objectives I.2, I.3 and I.4). The innovative and research part of this thematic priority has synergy with support from the OP TAC and OP JAK, while the definition of overlaps with these programmes is assumed. SME support is also linked to the OP TAC and some sub-programmes of the CzechInvest agency, and in the field of energy there is synergy with the Modernisation Fund and synergy with InvestEU (Pillar 2 of the JTM) is also expected.

Thematic priority II. "Competent people and Smart Region" has four specific objectives, of which only the first three are well argued in relation to the transformation potential of the respective projects. The first specific objective is focused on complementary activities related to infrastructure for further education and specialisation (synergy with IROP and OPJAK), the second specific objective focuses on employability and skills (synergy with OP Employment +). The third objective is focused on digitisation and public services (synergy with IROP). The last specific goal "Increasing social cohesion and community development in municipalities" is not well argued in connection with the transformation story of the region and it is a standard subsidy agenda that does not need to be included in the JTM. None of these four topics is expected to use financial instruments in Pillar 2 and Pillar 3 of the JTM.

Thematic priority III. "New energy and efficiently used resources" has four specific objectives. However, the first three objectives focus on various forms of clean energy, which is expected to have strong synergy and complementarity with projects supported by OP TAC, OPE, IROP, OPT, Modernisation Fund. There is also synergy with projects in financial instruments in both pillars of the JTM (InvestEU and Public sector loan facility). The last specific objective in this priority focuses on the circular economy and therefore has synergy with the OPE and OPTAC.

Thematic priority IV. "The revitalized areas of the 21st century" is divided into two specific objectives and relates to improvements in the use of areas affected by coal mining and the potential of the industrial

heritage. Synergies are expected for Pillar 3 financial instruments (improving the usability of the area affected by coal mining for new activities) and in the case of industrial heritage, synergies are expected only with support in the IROP. However, the TA team considers that it would be appropriate to combine the two specific objectives and consider using synergies for both specific objectives.

Table 32: Complementarities with other programmes - Transformation plan of the Ustecky Region (version 7.0, 3rd May 2021)

Thematic priority of the regional transformation plan	Article 8	Synergies and complementarity with other OPs and JTM Pillars
I. Entrepreneurship, research, innovation Specific objective I.1: Increasing the innovation performance of the region, strengthening research and innovation capacity with emphasis on the areas of specialisation of the region	(c)	OPTAC (SO 1.1). OP JAK (SO 1.1, SO 1.2). Measures/projects in the Ústí Region will be financed from the OPJT funds in addition to the support provided in the OP TAC and OP JAK. Border areas will be defined at the level of conditions of support programmes and calls (e.g., amount of support, eligible beneficiaries, complexity and scope of supported activities, eligible expenditure, etc.).
Specific objective I.2: Increasing the competitiveness of SMEs	(a)	OPTAC (SO 1.3, SO 2.1). MIT/Czech Invest - Technological Incubation programme. Measures/projects in the Ustecky Region will be financed from the OPJT in addition to the support provided in the OP TAC. Border areas will be defined at the level of conditions of support programmes and calls (e.g., amount of support, eligible beneficiaries, complexity and scope of supported activities, eligible expenditure, etc.). Planned use of financial instruments - It is possible to consider the use of FN, or Pillar 2 of the JTM. Details should be set out in a separate preliminary assessment of the FN.
Specific objective I.3: Stabilisation and development of key sectors for economic transformation	(a)	OPTAC (SO 1.1, SO 4.1, SO 5.2), Modernisation Fund. OPJT will support both large companies as well as companies (especially SMEs) established in customer-supply chains and employees in companies. Among the types of beneficiaries will be business entities in traditional branches of the regional economy (especially energy-intensive industries). Planned use of financial instruments - It is possible to consider the use of two pillars of MST. Details should be set out in a separate preliminary assessment.
Specific objective I.4: Development of cultural and creative industries and their involvement in the overall development of the region	(a)	OPTAC (SO 2.1).
II. Competent people and Smart Region Specific objective II.1: Improving access to quality services and infrastructures for formal and further education in the areas of specialisation of the region	(l)	IROP (SO 4.1). OP JAK (SO 2.1, SO 2.2, SO 2.3, SO 2.4).
Specific objective II.2: Increasing the employment and employability of workers	(h) (i) (j)	Synergies and complementarities - OP Employment+.
Specific objective II.3: Increase the use of digitization for efficient and comprehensible public services to citizens	(e)	Synergies and complementarities IROP (SO 1.1).
Specific objective II.4: Increasing social cohesion and community development in municipalities	(l)	Synergies and complementarities - IROP (SO 4.2), OP Z +.
III. New energy and efficiently used resources	(d)	OP Environment (SO 1.1). OP TAC (SO 4.1, SO 4.2). New green savings. Modernisation fund.

Thematic priority of the regional transformation plan	Article 8	Synergies and complementarity with other OPs and JTM Pillars
Specific objective III.1: Development of knowledge, technologies, systems and infrastructures for clean energy		Planned use of financial instruments: It is possible to consider the use of Pillars 2 and 3 of the JTM. Details should be set out in a separate preliminary assessment.
Specific objective III.2: Development of new energy sectors	(d)	OPTAC (SO 1.1, SC 4.1). IROP (SO 2.1). OPT (SO 3.1). Modernisation fund. Planned use of financial instruments: It is possible to consider the use of Pillars 2 and 3 of the JTM. Details should be set out in a separate preliminary assessment.
Specific objective III.3: Development of community energy	(d)	OP Environment (SO 1.1). Modernisation fund Planned use of financial instruments: It is possible to consider the use of Pillars 2 and 3 of the JTM. Details should be set out in a separate preliminary assessment.
Specific objective III.4: More efficient use of resources, transition to a circular economy	(g)	OP Environment (SO 1.4). OPTAC (SO 5.2).
IV. Revitalised areas of the 21st century Specific objective IV.1: Improving the usability of the area affected by coal mining for new activities	(f)	OPTAC (SO 2.1). OP Environment (SO 1.5). Planned use of financial instruments: It is possible to consider the use of Pillars 2 and 3 of the JTM. Details should be set out in a separate preliminary assessment.
Specific objective IV.2: Increased use and transformation of the region's industrial heritage potential	(f)	IROP (SO 5.1, SO 5.2). Planned use of financial instruments: The use of financial instruments is not envisaged.

Karlovy Vary Region

The transformation plan of the Karlovy Vary Region was one of the least detailed plans in its content elaboration (as of April 2021), however, this region also presented more significant progress in the level of detail and argumentation of the overall focus of the strategy (plan version 4.0, June 6, 2021). The expected support is fragmented across six thematic areas: (1) Tradition, (2) Innovation, (3) Knowledge, (4) Cooperation, (5) Regeneration, and (6) Energy and materials.

As identified in the table below, some specific objectives cannot be clearly assigned to supported activities under the JTF or other pillars of the JTM. In this context, the TA team must emphasize that strengthening the economic diversification of areas affected by transformation can apply to a wide range of investments, provided that these investments contribute to meeting the development needs of the climate-neutral economy described in the territorial transformation plans. Supported investments may cover energy and transport infrastructure, district heating networks, green mobility, intelligent waste management, clean energy and energy efficiency measures, including renovations and conversions of buildings, support for the transition to a circular economy, land reclamation and decontamination, as well as skills upgrading, skills change, training and social infrastructure, including social housing. As it emerged from the Transformation Platform meeting in June 2021, the TA team recommends that representatives of the Karlovy Vary Region pay increased attention when designing and finalizing the intervention logic and overall transformation story to the following specific objectives, which are still not well argued. These are the SO 4.1 - cultural and natural heritage; SO 4.2 - no one is excluded; SO 5.2 - landscape regeneration and new agriculture; SO 6.3 - mass flows and recycling. The TA team considers these SOs to be potentially relevant, however in the current version of the regional transformation plan they are not quite well explained in their connection to the transformation need. This is particularly important in a situation where other sources of funding will be available in the 2021-2027 programming period. Other thematic priorities are already described in an acceptable form and

can also be assessed in terms of potential synergies with other operational programmes, JTM pillars and other sources (e.g., the Modernisation Fund).

Table 33: Complementarities with other programmes - Transformation plan of the Karlovy Vary Region

Thematic priority of the regional transformation plan	Article 8	Synergies and complementarity with other OPs and JTM Pillars
SC 1.1 new businesses	(b)	Pillar 2 OPTAC, IROP
SC 1.2 transformation of companies	(a)	Pillar 2 OPTAC, Modernisation fund, IROP
SC 2.1 research and innovation	(c)	Pillar 2 + Pillar 3 OP JAK, OP TAC, OPŽP, IROP, maybe OPZ +, possibly OPD
SC 2.2 creativity and design	(c)	Pillar 2 + Pillar 3 OP JAK, OP TAC, IROP, OPD
SC 2.3 digitization and new products	(e)	Pillar 2 + Pillar 3 OPTAC, IROP
SC 3.1 quality education	(l)	OP JAK, OP TAC, IROP, OPZ +, Interreg
SC 3.2 retraining- a new beginning	(h)	OP JAK, OPŽP, OP TAC, IROP, OPZ +, Interreg, Modernisation Fund, National Recovery Plan
SC 4.1 cultural and natural heritage	n.a.	Pillar 2 + Pillar 3 OPTAC, OPŽP, IROP, National Recovery Plan
SC 4.2 no one is excluded	n.a.	IROP, OPZ +, Interreg
SC 5.1 regeneration of brownfields and old ecological burdens	(f)	Pillar 2 + Pillar 3 IROP, OP ŽP, OP TAC
SC 5.2 landscape regeneration and new agriculture	n.a.	Pillar 2 + Pillar 3 OP JAK, OP TAC, OPŽP, IROP, PRV
SC 5.3 green towns and villages	(d)	Pillar 2 + Pillar 3 OPTAC, OPŽP, IROP, OPD
SC 6.1 new energy	(d)	Pillar 2 + Pillar 3 OPŽP, IROP, Modernisation Fund, OPTAC, OPD
SC 6.2 energy savings	(d)	Pillar 2 + Pillar 3 OPŽP, IROP, OPTAC
SC 6.3 mass flows and recycling	n.a.	Pillar 2 + Pillar 3 OP JAK, OP TAC, OPŽP, IROP
SC 6.4 transition to a circular economy	(g)	Pillar 2 + Pillar 3 OPTAC, OPŽP, IROP

Moravian-Silesian region

The transformation plan of the Moravian-Silesian Region (version of June 2021) consists of a total of eight sub-programmes, which are well thematically linked to the defined supported activities of the JTF Regulation. For the eight programmes, the continuity and complementarity with other operational programmes, the Modernisation Fund, is described in great detail. Their objectives in context with Pillar 2 and Pillar 3 of the JTM are also described in detail. In mid-June 2021, progress was reported in creating a regional transformation plan for the Moravian-Silesian Region. Compared to the first version of the D4 report (April 2021), the link to the Regional Development Strategy 2019-2027 and RIS3 was added, the planned types of operations, specific strategic projects and brownfields according to the output of project mapping were added. According to the region's representatives, the intervention logic and prioritization of topics and the transformation story will be added at the turn of June and July 2021, as well as recommended strategic projects and brownfields by the Regional Standing Conference (their evaluation and selection is still ongoing).

Programme 1 “New Energy” synergistically follows up on supported projects in the Modernisation Fund (especially RES), as well as on OPE in the topics of energy intensity in public buildings or RES in households. Synergies are also expected in Pillar 2 and Pillar 3 in the case of actions that address market failures or sub-optimal investment situations.

Programme 2 “New Use of the Territory” presents standard transition activities that focus on brownfields. Under this programme, activities will be implemented in Pillar 3 of the JTM, which will use loan instruments for the public sector (leverage effect), and synergies with OPE support are also expected. In the case of Pillar 2 of JTM, complementarity with business models of brownfields solutions is assumed. For this program, the TA team strongly recommends to the representatives of the Moravian-Silesian Region (i.e. the authors of the regional transformation plan) to specify and explain the reflection on the "polluter pays" principle, which is assumed for these activities according to the JTF regulations. The above principle is explicitly stated in the regional transformation plan only in the next program No. 8 Circular Economy.

Programme 3 “Green Industry” focuses on the corporate sector and activities related to green steel production and investment in downstream production processes, recycled raw materials, change of product portfolio due to the cessation of coal mining, etc. In the case of loan instruments, there is also synergy with Programme 2 (especially the environment, science and research) and with the Innovation Fund (low carbon technology).

Programme 4 “New Business” aims to support the creation of new companies and a new generation of entrepreneurs who will have the motivation, desire and conditions to do business in promising fields for the regional economy. It is therefore synergistically complemented significantly by the support of the OP TAC and Pillar 2 of the JTM, where the support of progressive start-ups can be expected.

Programme 5 “Competent People” focuses on helping people adapt to change in a transforming economy through re/upskilling and supporting new jobs with higher added value in promising sectors. Synergistically, support is complemented by the IROP (educational infrastructure), OP Employment+ (access to the labour market), and links to actions under Pillar 2 and Pillar 3 of the JTM.

Programme 6 “Innovative Ecosystem” represents an important link to support new, and strengthen existing, cooperation networks in the field of research, development and innovation. It is synergistically complemented by R&D support in the corporate sector and cooperation with public research organisations in the OP TAC, as well as with projects in credit facilities (Pillar 2 and Pillar 3 of the JTM).

Programme 7 “Digital and Creative Region” focuses on both public and private sectors, with an emphasis on investment in digitisation, digital innovation and digital connectivity. Special attention is paid to public administration and increasing the use of ICT infrastructure, modern technologies for applications, etc. These activities synergise with support from OP TAC and IROP. Pillar 2 of the JTM also assumes complementarity with actions related to high-capacity digital networks, 5G connectivity, including the inclusion of peripheral regions.

Programme 8 “Circular Economy” focuses on activities leading to the transition to the principles of circular economy and improving the application of the waste hierarchy in industry, strengthening regional competitiveness. Synergies are identified with the OPE (themes of waste prevention and material and energy utilisation of non-industrial waste) and the OP TAC (innovative technologies). Program No. 8 Circular Economics will address the remnants of industrial activities in the form of dumps and tailings ponds, while paying attention to the “polluter pays principle.” Innovative ecological technologies for municipal waste management can be supported in order to reduce the share of landfills.

Table 34: Complementarities with other programmes - Transformation plan of the Moravian-Silesian Region

Thematic priority of the regional transformation plan	Article 8	Synergy and complementarity with other OPs and JTM Pillars <i>(Note: For each planned activity of a given program, the relevant synergy program or fund is indicated in brackets)</i>
Programme 1 NEW ENERGY	(d) (db)	<ul style="list-style-type: none"> - Modernisation of thermal energy supply systems (fuel change, distribution, accumulation), (MF) - New renewable energy sources, (MF) - Improving energy efficiency and reducing greenhouse gas emissions in industry (optimisation of consumption, technology, energy production, accumulation, H2 applications), (MF)

Thematic priority of the regional transformation plan	Article 8	Synergy and complementarity with other OPs and JTM Pillars <i>(Note: For each planned activity of a given program, the relevant synergy program or fund is indicated in brackets)</i>
		<ul style="list-style-type: none"> - Energy efficiency in public buildings and infrastructure, (MF) - Community Energy, (MF) - Insulation, construction and energy sources for housing (family and apartment houses), (OPE) - Energy savings and renewable energy sources - support for reducing the energy intensity of public buildings and public infrastructure, (OPE) - Increasing the use of renewable energy sources in the public sector and in households, (OPE) - Support for measures in the field of energy efficiency, (OP TAC) <p>Compliance with Pillar 2 of the JTM:</p> <p style="padding-left: 20px;">a) the development of the energy sector in line with the priorities of the Energy Union, including security of energy supply and the transition to clean energy, and with the commitments made in the 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change</p> <p>Compliance with Pillar 3 of the JTM:</p> <p style="padding-left: 20px;">Public Sector Loan Facility - (a) investments in renewable energy sources; (b) investments in green and sustainable mobility, including the promotion of green hydrogen; (g) clean energy and energy efficiency measures, including renovation and refurbishment of buildings</p>
Programme 2 NEW USE OF THE TERRITORY	(f)	<ul style="list-style-type: none"> - Inventory of contaminated areas, surveys and removal of old burdens, (OPE) - Demolition of buildings, regeneration and resocialisation of brownfields, support of industrial zones, (NDT) <p>Compliance with Pillar 2 of the JTM:</p> <p style="padding-left: 20px;">c) Environment and Resources; h) Cultural and creative industries, cultural heritage, media, audio-visual, journalism and press, inter alia in particular through the development of new technologies, the use of digital technologies and technological management of intellectual property rights; i) tourism; j) reclamation of industrial zones (including contaminated sites) and restoration of their sustainable use</p> <p>Compliance with Pillar 3 of the JTM:</p> <p style="padding-left: 20px;">(h) investment in urban renewal and regeneration; j) reclamation and decontamination of soil and ecosystem in compliance with the polluter pays principle; (k) promoting biodiversity; (m) support for social infrastructure, including care facilities and social housing; (n) promoting solutions to make infrastructure more resilient to environmental disasters, in particular those caused by climate change</p>
Programme 3 GREEN INDUSTRY	(a)	<ul style="list-style-type: none"> - Projects which are implemented primarily to achieve the reduction of greenhouse gas emissions from activities listed in Annex I to Directive 2003/87 / EC of the European Parliament and of the Council - Support for major innovative projects demonstrating low-carbon technologies and practices in energy-intensive industries, in renewable energy, energy storage, carbon capture and storage or industrial carbon capture and use, (Innovation Fund) - Projects without a direct link to the decline of mining and related traditional industries will not be supported. <p>Compliance with Pillar 2 of the JTM:</p> <p style="padding-left: 20px;">c) environment and resources; e) research, development and innovation; j) reclamation of industrial zones (including contaminated sites) and restoration of their sustainable use</p>
Programme 4 NEW BUSINESS	(a) (b)	<ul style="list-style-type: none"> - Strengthening the performance of enterprises in the field of research, development and innovation and their digital transformation, (OP TAC) - Strengthening the growth and competitiveness of SMEs, (OP TAC)

Thematic priority of the regional transformation plan	Article 8	Synergy and complementarity with other OPs and JTM Pillars <i>(Note: For each planned activity of a given program, the relevant synergy program or fund is indicated in brackets)</i>
		<ul style="list-style-type: none"> - Support for adaptation to climate change, risk prevention and disaster resilience, (OPTAC) - Support for the transition to a circular economy, (OPTAC) Compliance with Pillar 2 of the JTM: <ul style="list-style-type: none"> g) financial support for entities with up to 499 employees, with a special focus on small and medium-sized enterprises and small mid-cap companies
Programme 5 COMPETENT PEOPLE	(h) (i) (j) (l) + social infrastructure.	<ul style="list-style-type: none"> - Improving access to inclusive and quality education, training and lifelong learning services through infrastructure development (IROP). - Improve access to employment for all jobseekers, especially young people and the long-term unemployed and disadvantaged groups in the labour market and the inactive, promote self-employment and the social economy, (OP Employment +) Compliance with Pillar 2 of the JTM: <ul style="list-style-type: none"> k) social investment, including investment to support the implementation of the European Pillar of Social Rights Compliance with Pillar 3 of the JTM: <ul style="list-style-type: none"> l) support for deepening skills, changes in qualifications, training
Programme 6 INNOVATIVE ECOSYSTEM	(c) (e)	<ul style="list-style-type: none"> - Strengthening research and innovation capacities and introduction of advanced technologies, (OPTAC) - Exploiting the benefits of digitization for citizens, businesses and governments, (OPTAC) - Support for the transition to a circular economy, (OPTAC) Compliance with Pillar 2 of the JTM: <ul style="list-style-type: none"> e) research, development and innovation; f) development, deployment and diffusion of digital technologies and services, in particular digital technologies and services, which contribute mainly to the objectives of the Digital Europe programme; m) strategic autonomy of the Union Compliance with Pillar 3 of the JTM: <ul style="list-style-type: none"> (d) investment in public research; e) investment in digitization; (g) clean energy and energy efficiency measures, including renovation and refurbishment of buildings; (o) the possibility of promoting investment in other sectors, provided that they are in line with the adopted plans for equitable territorial transformation
Programme 7 DIGITAL REGION	(e)	<ul style="list-style-type: none"> - Reaping the benefits of digitisation for citizens, businesses and governments, (IROP) - Exploiting the benefits of digitisation for citizens, businesses and governments, (OPTAC) - Increasing the digital interconnection, (OPTAC) Compliance with Pillar 2 of the JTM: <ul style="list-style-type: none"> d) development of infrastructure for digital connectivity, in particular through projects to support the deployment of very high capacity digital networks, 5G connectivity and the improvement of digital connectivity and access, in particular for rural areas and peripheral regions Compliance with Pillar 3 of the JTM: <ul style="list-style-type: none"> e) investment in digitization; (h) investment in urban renewal and regeneration; l) support for deepening skills, changes in qualifications, training
Programme 8 CIRCULAR ECONOMY	(g)	<ul style="list-style-type: none"> - Prevention of waste generation and material and energy utilisation of non-industrial waste (SKO, sewage sludge, etc.), (OP ŽP) - Isolated investments and support of innovative technologies (without link to R&D), (OPTAC)

Thematic priority of the regional transformation plan	Article 8	Synergy and complementarity with other OPs and JTM Pillars <i>(Note: For each planned activity of a given program, the relevant synergy program or fund is indicated in brackets)</i>
		Compliance with Pillar 2 of the JTM: c) environment and resources Compliance with Pillar 3 of the JTM: (f) investments in intelligent waste and water management infrastructure; (i) supporting the transition to a circular economy

6.4 Expected impact on measures/needs using the E3ME model and above-mentioned multiple criteria mix

This section details the methodology and setup of the D4 deliverable where we aim to estimate the potential effects of different “illustrative actions” on the targeted counties’ economies and labour markets.

The section presents the methodology of the modelling exercise and the assumptions in the illustrative scenarios. This is followed by a discussion of the results comparing across regions and illustrative actions, finally the regional level disaggregated results are also presented.

The modelling of the illustrative cases was carried out in April 2021, with the proposed methodology approved by the Commission. The modelling of the illustrative cases was limited since the concrete allocation of the JTP/JTF funds were not yet available, and action plans were in their preliminary stages. Therefore, the modelling aimed to select and assess the most common potential action types by the information available at the time.

The modelling of illustrative cases, although limited in some ways, calculates expected GVA multipliers and employment costs that can be understood as expected returns of the stimulus. These multipliers are specific to the analysed regions, as they are based on region specific inputs (i.e., share of SMEs in targeted sectors) and use region specific interactions across the economic sectors (regional input-output tables). Therefore, the modelling can highlight how certain types of action can contribute to economic and employment outcomes in the regions (based on available statistical information and simulated E3ME scenario).

6.4.1 Description of the “illustrative actions”

The illustrative cases are comparable hypothetical scenarios that are used to estimate regional impacts and resulting multipliers of different policy actions. Three action types were selected as most common / relevant from the potential JTF activities: support for SMEs, R&D investments and promoting the circular economy.

We model the impacts of these action types individually for all cases and for all regions (i.e., $3 \times 6 = 18$ modelling tasks were set up and run). In each case, we assume EUR 100 million to be spent over the programming period (2021-2027) in equally distributed amounts. This helps us to make the outcomes and the multipliers comparable across action types and across regions. The “illustrative actions” and their assumptions are described in detail below, while the methodology used for the assessment is described in the next section.

6.4.1.1 Support for SMEs (“SME”)

The SME illustrative action case assumes that financial subsidies for productive investments are provided to SMEs in the region. It is further assumed that the targeted SMEs spend a 100% of these subsidies on investments (capital goods) and that these capital goods are bought within the region (e.g., if the firm decides to buy machinery to increase its productivity the machinery will be bought in the same region). When compared to reality this is a highly simplifying assumption. We also assume that the sectoral distribution of SMEs getting support is equal to the current structure of SMEs in the regions, which we quantify by employment (in SMEs) distributions across sectors. These investments trigger two types of response in the economic structure of the respective regions. First, a direct consumption effect boosts demand (and output) as firms spend the subsidies on capital goods and second, a productivity impact kicks-in once the new capital goods are integrated (we assume a one-year delay in the process) boosting the targeted firms’ productivity. It is assumed that productivity gains in this case lead to GVA gains, as we assume that the firms are price-takers and an increase in production will be

met by demand nationally. Finally, due to the integration of the input-output impacts with E3ME-TRE (described in D3) we calculate with an indirect effect through increased regional competitiveness in the long-term.

6.4.1.2 Investment to promote circular economy across the economic sectors ('Circular')

The illustrative action is a highly stylized scenario that considers some aspects of a shift towards circular economy activities. The case builds on assumptions and findings of the study on the impacts of circular economy policies on the labour market by Cambridge Econometrics, Trinomics and ICF, conducted for DG Environment (European Commission et al. 2018). Investments are assumed to be made in the recycling and waste management sectors, boosting the sectors' productivity (on average about 15% total increase in the sectors output by 2030 years is assumed). The sector buys capital goods from manufacturing, professional services and itself. Employment intensity of the sector is also assumed to increase substantially. At the same time, we assume a decreasing demand for products, due to longer product lifecycles, sharing and repairing activities. This amounts to a decrease of about 2% (by 2030) in the retail and manufacturing sectors. An important limitation of the case is that in the sectoral classification used the aggregated BDE sector include both recycling, waste management activities as well as energy and extraction sectors.

6.4.1.3 R&D investment to enhance long-run growth and productivity increase in various sectors of the economy ('R&D')

In this case, we assume that R&D grants or subsidies are provided to enterprises, promoting knowledge intensive growth and knowledge accumulation. The R&D investment is distributed across sectors following national level R&D intensity patterns. We assume that firms engage in external R&D activities, therefore boosting demand for R&D type capital goods (concentrated in the ICT and professional services sectors). Just as in the case of the SME illustrative action, there is a direct consumption boost and an important productivity effect. It is important to note that the ICT and professional services are usually both the more R&D intensive sectors and get the most (capital good type) additional demand from this setup, therefore significantly boosting the sectors' capabilities. A limitation of the case is that we assume that capital goods are bought locally, which might be less realistic in this case.

6.4.2 Brief description of the methodology used

To estimate the potential effects of the actions in the "illustrative cases" we employ E3ME modelling results from D3, regional input-output tables, representing supply-chain structures in the target regions, elasticity coefficients estimated in the E3ME framework and the E3ME-TRE regional modelling tool.

We start with the calculation of the GVA impacts. First, we build the assumptions about how financial resources are allocated across sectors in each region and each case. The method for this is described in the description of the illustrative cases. This gives us annual assumptions for the magnitude of capital goods bought by buying sector (and supplying sector with gross fixed capital formation statistics). Second, we use methods of input-output (IO) analysis, namely the calculation of the Leontief inverse¹⁷³ on regional input-output tables¹⁷⁴, to derive the effect of demand shock (positive, firms buying capital goods) on the regional economy. Third, we use the calculated increase in capital goods / knowledge stock (compared to existing capital stock / knowledge stock in the region), together with sectoral coefficients calculated in the E3ME framework, to calculate productivity effects induced by the increasing level of production factors. Finally, we integrate both type of impacts (consumption and productivity) into the E3ME-TRE framework, to account for arising competitiveness effects and to estimate long-run outcomes. It is important to note, that neither the IO method, nor the E3ME-TRE framework is able to capture constraints on sectoral growth at the moment and sectors are estimated independent of each other (i.e., no competition effects across sectors), which is an evident limitation of the methodology.

Employment impacts are estimated following the estimation of GVA impacts. Employment increase is assumed to be a direct consequence of the increase in GVA (i.e., a GVA increase will lead to employment increase in most cases). Employment impacts by sector are estimated multiplying the annual new GVA impacts (in percentage terms) with sectoral coefficients estimated in the E3ME

¹⁷³ ten Raa 2006

¹⁷⁴ Sixta and Vltavská 2016

framework. This is done within the E3ME-TRE framework, integrating estimated region competitiveness effects in the process and providing long-run estimates.

6.4.3 Results of the “illustrative actions” in the regions

6.4.3.1 Employment and GVA multipliers by region and by illustrative action

This section summarises the short-term and long-term multipliers observed based on the derived GVA- and employment impacts in the three focal regions, under the three illustrative actions.

Short-term multipliers capture the employment- and GVA-generating potential in 2025; long-term multipliers capture the employment- and GVA-creation potential in 2030. Long-term multipliers yield more advantageous results (indicate higher value-creation potential of the same level of investment), which is primarily due to positive impacts of an investment / grant made in year t spreading across several years following the investment / grant year t .

In other words, the associated positive GVA impacts of an investment made in a specific year spread across several years by increasing the regional value added (e.g. through new, innovative manufacturing processes) in the subsequent years as well, while in the case of employment, FTE jobs derived as a result of a specific investment are not necessarily generated in the same year when the investment is made, but to a certain extent are assumed to be created over the years following the investment. Therefore, the long-run multipliers are considered to show a more accurate picture in that they are better able to capture the total GVA- and employment generation potential of the investments made under the selected illustrative actions.

The GVA multiplier is calculated as the cumulated GVA impact induced by the selected action (i.e., difference from baseline trends), divided by the total amount of financing the action (e.g., EUR 100 million vs. EUR 50 million by 2025 yields a multiplier of 2). Higher GVA multipliers indicate higher value-added creation potential.

The employment multiplier captures the cost of creating one FTE job, i.e., the cost of creating a year's worth of employment for a person. In this case, lower employment multipliers indicate an overall better generation potential, i.e., results show under which action is the creation of one FTE job ‘cheaper’.

In sum, short-term and long-term multipliers show similar trends across the illustrative actions both with regards to GVA and in employment terms.

In both GVA- and employment multipliers, the action yielding the highest positive results is R&D grants to businesses. By 2030, the overall GVA multiplier of this type of action is above five, indicating that 1 million EUR spent under this type of action may result in more than 5 EUR million GVA impact across the economy (including both direct and indirect GVA impacts, resulting from supply chain linkages, too). The long-term employment generation potential is also highest for this type of action: in case of R&D grants to businesses, the cost of creating a full-time equivalent (year) job is slightly below 10 thousand EUR.

6.4.3.2 GVA multipliers

Table 35 presents GVA multipliers under the different illustrative action types. R&D yields the highest multipliers in all regions, with values in the range of 5.3-5.9 by 2030. These impacts are driven by growth primarily in ICT sector and professional services sectors. This is expected because these sectors are both the most R&D intensive and the most important suppliers for R&D type capital goods; therefore, in this case they gain both from the productivity effects and from the growth of final consumption of capital goods. The long-term multiplier for the R&D case is somewhat lower in Karlovy Vary than in the other regions, this happens despite strong productivity gains in the region. Nevertheless, there are two aspects working against a strong impact in the region: (1) the current economic size (GVA) of the most impacted sectors (ICT and professional services) in Karlovy Vary is smaller than in other regions, (2) based on the regional IO method the “leakage”, i.e., the level of indirect GVA effects realised outside of the region, is the highest in Karlovy Vary.

SME investments follow closely, with multipliers between 4.0-4.3. A primary reason behind the difference between the SME and the R&D case is the magnitude of the sectoral productivity coefficients, which are estimated in the E3ME framework on the national level. The productivity coefficient (the percentage growth in possible output given a percent increase in capital and knowledge stock) for the ICT sector is much higher than for other sectors (such as construction) which receive a higher share of financial resources in the SME case. However, SME investment drives growth in a more diversified way, in a higher number of sectors than the R&D case. In the SME case, GVA growth appears in

construction, manufacturing, retail, ICT and the professional services sectors as well. This is caused by the mixture of the impacts – productivity impacts dominate in the retail or professional sectors, while growth of demand for capital goods drives increases in other sectors (such as construction). The manufacturing sector importantly gains from both effects.

Table 35: Summary of the GVA multipliers by region under the three selected illustrative actions

	Short-term GVA multiplier (2025)	Long-term GVA multiplier (2030)
CZ041 - Karlovy Vary		
R&D grants to business	2.34	5.25
SME investments	1.74	3.98
Circular economy	1.66	3.41
CZ042 – Ústí		
R&D grants to business	2.31	5.67
SME investments	1.70	4.16
Circular economy	0.67	1.80
CZ080 - Moravian-Silesian		
R&D grants to business	2.41	5.88
SME investments	1.75	4.28
Circular economy	-0.37	-0.77

Finally, the Circular economy case yields lower or even negative GVA outcomes (in the case of the Moravian-Silesian region). Nevertheless, it is important to note that the Circular case is the only one that has an explicit negative consumption assumption, reducing final consumption of the manufacturing and the retail sectors. The estimated impacts are varying: a multiplier, close to that of the SME case, is produced in Karlovy Vary; a lower multiplier is produced in Ústí, while in the Moravian-Silesian (MS) region the multiplier is negative. In both Ústí and the Moravian-Silesian regions, this is caused by a higher direct negative impact stemming from the consumption reduction in retail and manufacturing. In Karlovy Vary, not only this impact is weaker, but the productivity effects influence the outcome strongly as well. However, this result should be treated with caution, because as we discussed earlier the BDE sector (which includes recycling, utilities) also includes power generation, therefore positive impacts are potentially inflated. We also do not take the potential environmental benefits of circular economy activities into account, which can be substantial.

6.3.4 Employment multipliers

In line with the GVA results the long-term employment generation potential (per million EUR invested) is the higher in the R&D case. Table 36 summarizes results.

The range for the cost of creating a full-time equivalent (year) job is between 9.1-9.4 thousand EUR investment. Employment gains in this case are realized largely in the ICT and professional services sectors. Given that these sectors usually include many high-skilled jobs, the feasibility of transitioning workforce to these sectors can come into question, this absorption capacity cannot be taken into account in the current modelling setup.

The SME case has a generally higher per job cost in the long-term, between 11.1-12.8 thousand EUR per job (year). This is largely in line with the somewhat smaller GVA growth potential of this action type compared to the R&D action. However, as we have discussed it related to the GVA impact of the sectors, the SME case has a more diverse effect. This is true in the case of employment as well; employment is boosted in construction, manufacturing, retail, ICT and professional services sectors. However, the distribution of GVA and employment effects differ somewhat, indicating the value-added differences of the jobs across the sectors.

In the case of the Circular economy case, again in line with the GVA results, we see higher costs (due to lower economic impacts). In the case of Karlovy Vary, the employment costs come close to those of SMEs driven by the economic impacts (see discussion on GVA) and in the case of Ústí, the cost is still within 20 EUR thousand per FTE-year. Nevertheless, in the case of the Moravian-Silesian region, the

cost is much higher, both in the short- and long-term. However, despite the *net* negative economic outcomes, we observe employment increases. Nevertheless, this is explained by lower value-added employment gains (i.e., employment is gained in sectors where the GVA-to-employment ratio will be lower). In this case, employment losses are occurring in mostly retail, while gains are realised in recycling, waste management and professional services. Losses in the retail sector are the highest in the Moravian-Silesian region, which also explains the outcomes.

Table 36: Summary of the employment multipliers by region under the three selected illustrative actions

	Total job creation cost per FTE ('000 EUR) short-term (2025)	Total job creation cost per FTE ('000 EUR) long-term (2030)
CZ041 - Karlovy Vary		
R&D grants to business	18.87	9.39
SME investments	24.91	12.84
Circular economy	25.63	13.33
CZ042 - Ústí		
R&D grants to business	22.27	9.11
SME investments	26.48	11.06
Circular economy	42.81	16.23
CZ080 - Moravian-Silesian		
R&D grants to business	22.41	9.35
SME investments	28.60	11.85
Circular economy	86.14	30.03

6.4.4 Employment and GVA impact by region and by illustrative action

In the following section, the estimated GVA and employment impacts are presented for each of the target regions and for each of the selected illustrative actions. With respect to sectoral disaggregation, our modelling yields results for ten economic sectors (Agriculture; Forestry and fishing; Energy & utilities; Manufacturing; Construction; Retail, transport, tourism services; Information and communication; Financial and insurance activities; Real estate activities; Professional services; Public and other services). Wherever the GVA or employment impact equals zero, the respective sector is not presented on the chart.

In general, the results show that the sectoral distribution of impacts (both in terms of GVA and employment) is considerably different across the selected illustrative actions. R&D grants to businesses is expected to have the largest positive impact on the Information and communication sector (both in GVA- and employment-terms), as the nature of most R&D projects are such that IT inputs, computers and software solutions, are required.

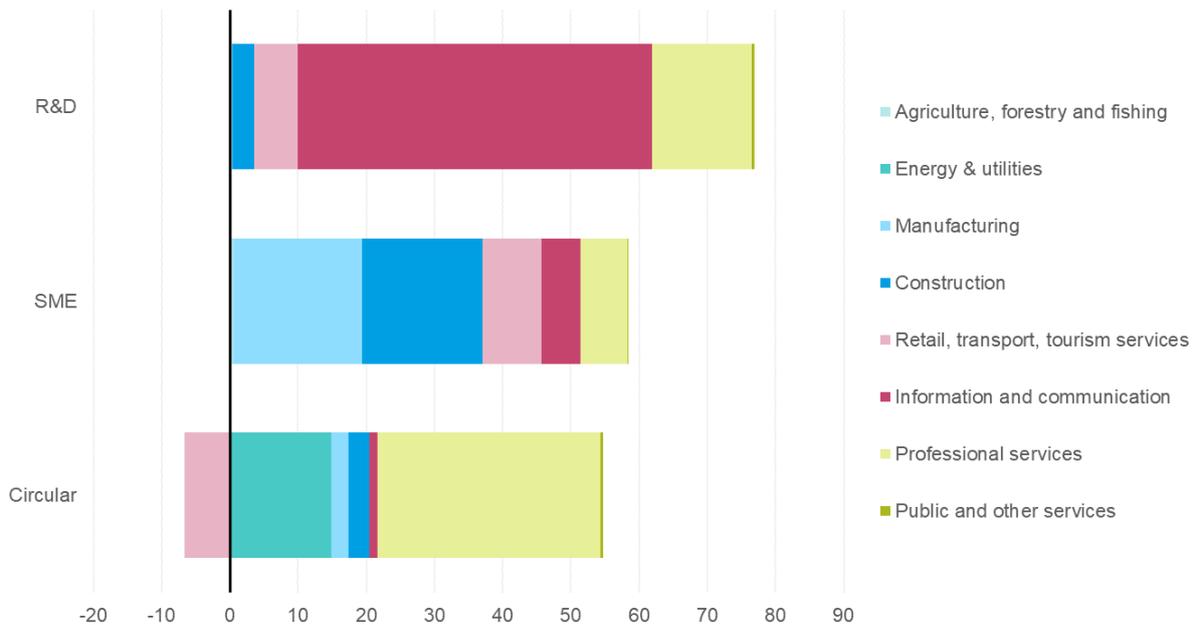
SME investment is expected to yield to the highest positive impacts in Manufacturing and Construction, not only because a large share of SMEs are active in these sectors, but also because investments from other sectors usually mean consumption increase for these sectors (e.g., buying machinery or real estate investments).

Finally, investment in circular economy services and activities is anticipated to result the largest GVA impact in the Professional services sector, while with regards to employment, the employment generation resulting from circular economy investment is larger in the Energy & Utilities sector (due to Waste management activities, in which the most circular economy-driven jobs are expected to be created, also belonging to the Energy & Utilities sector) than in the Professional services – indicating that such investment would likely yield relatively higher number of jobs in relatively lower value-added job categories within Energy & Utilities, which is expected to – at least partly - compensate for the job losses that are expected to occur (primarily in Manufacturing). However, it needs to be noted, that these results are of course heavily dependent on the type of assumptions we make about the direct impacts of circular economy activities.

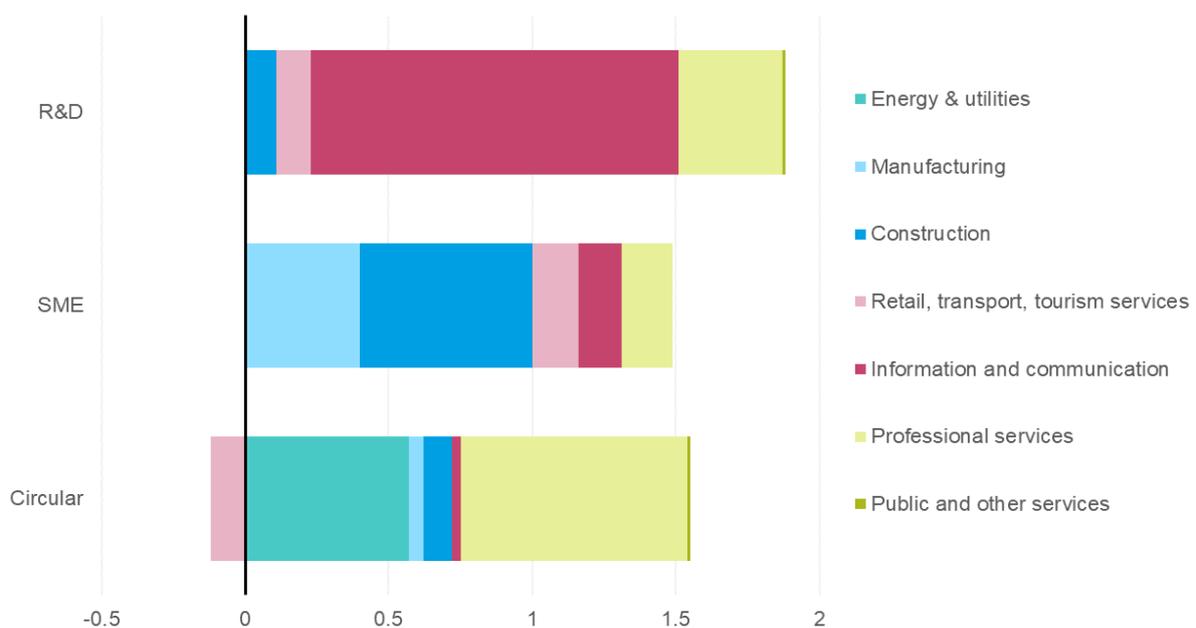
6.4.4.1 Karlovy Vary

R&D investments / grants to businesses is expected to have the largest positive impact on the Information and communication sector (both in GVA- and employment-terms). SME investment is expected to yield to the highest positive impacts in Manufacturing and Construction. Importantly, investment in circular economy services and activities is estimates to have weaker, but overall *net* positive impacts, with potential important environmental benefits. As it was noted, in the R&D case, the ICT sector drives growth, but absorption capacity (skilled labour force) of the region needs to be taken into account to understand the potential outcomes better.

Graph 43: GVA impact in Karlovy Vary in 2030 by sectors, resulting from a total of EUR 100 million investment over the years 2021-2027 under the three illustrative action categories, EUR million (current prices)



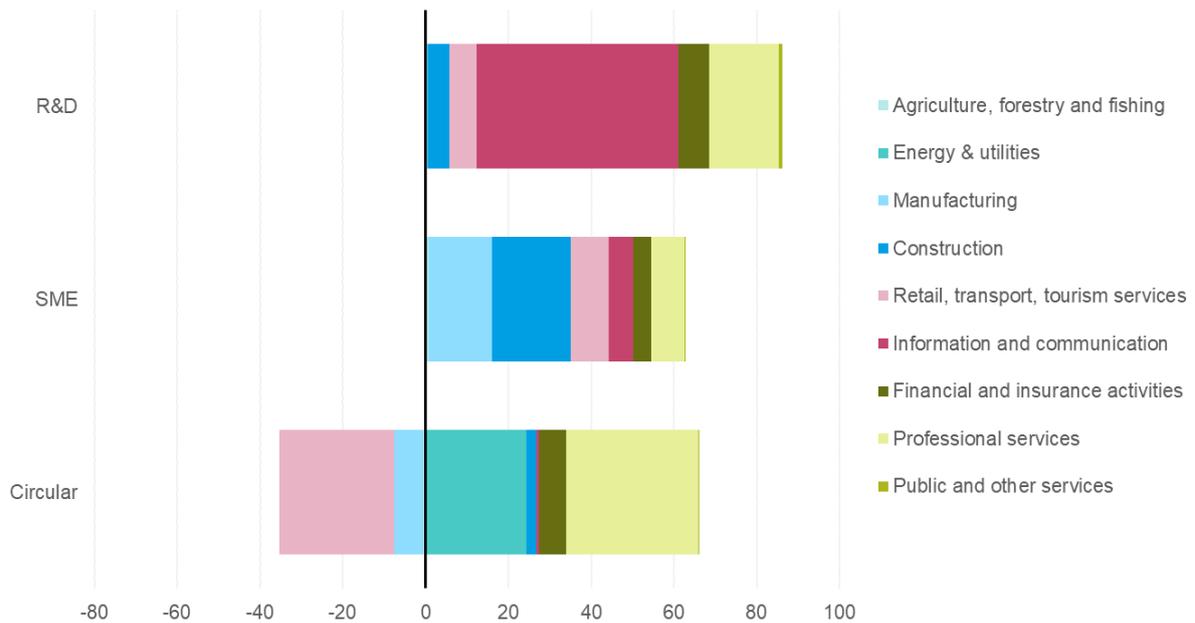
Graph 44: Employment impact in Karlovy Vary in 2030 by sectors, resulting from a total of EUR 100 million investment over the years 2021-2027 under the three illustrative action categories, '000 jobs



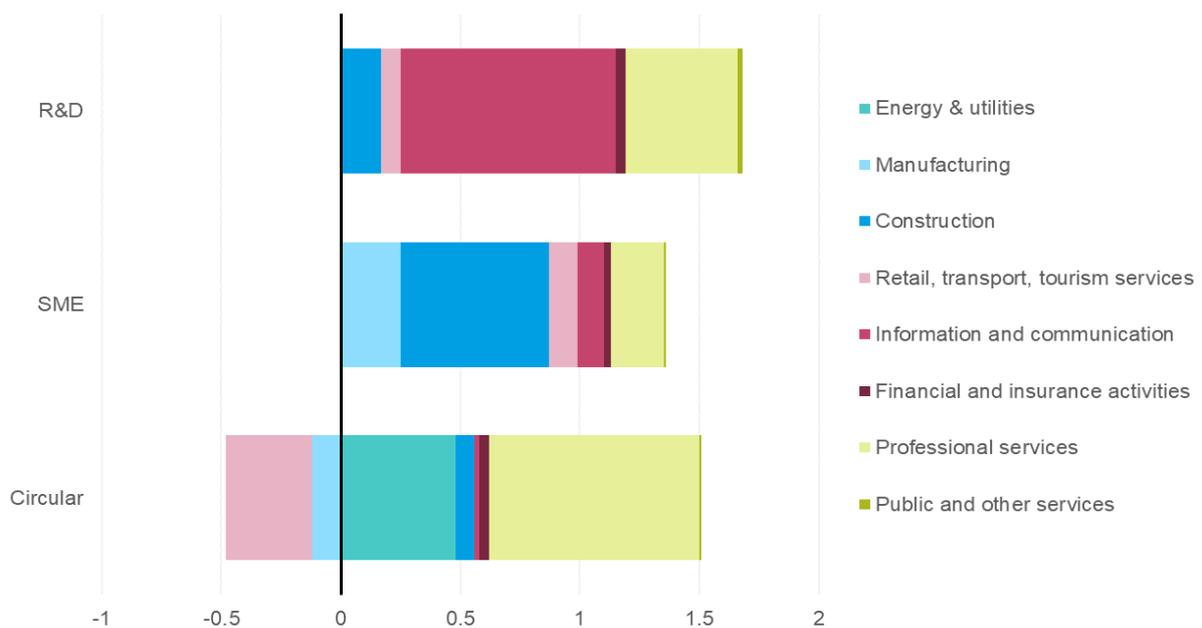
6.4.4.2 Ústí

Similarly, to the other regions, sectoral distribution of impacts (both in terms of GVA and employment) is considerably different across the selected illustrative actions. Sectoral distribution of the effects is generally similar to Karlovy Vary, nevertheless, there are differences. Importantly, due to regional competitiveness effects and IO linkages, the financial sector gains in all scenarios in Ústí, while in Karlovy Vary, the result for the sector is negligible. Distribution of the outcomes across sectors in the SME case is also more equally divided in GVA terms in Ústí, but not in employment terms – indicating gains in lower value-added jobs in construction and manufacturing.

Graph 45: GVA impact in Ústí in 2030 by sectors, resulting from a total of EUR 100 million investment over the years 2021-2027 under the three illustrative action categories, EUR million (current prices)



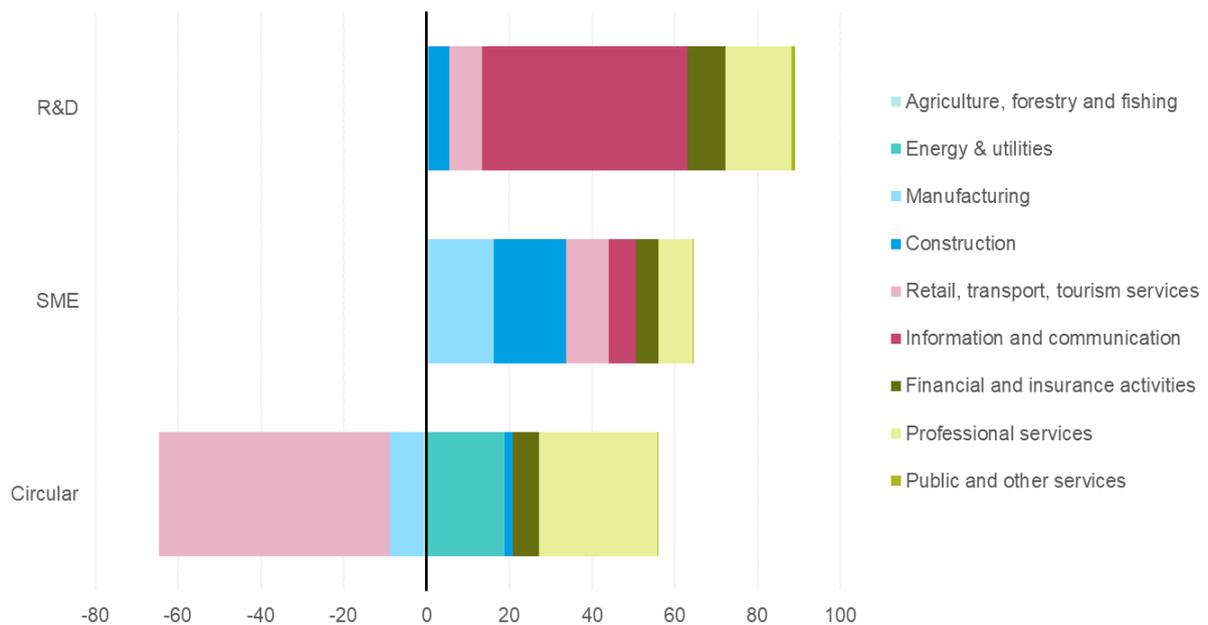
Graph 46: Employment impact in Ústí in 2030 by sectors, resulting from a total of EUR 100 million investment over the years 2021-2027 under the three illustrative action categories, '000 jobs



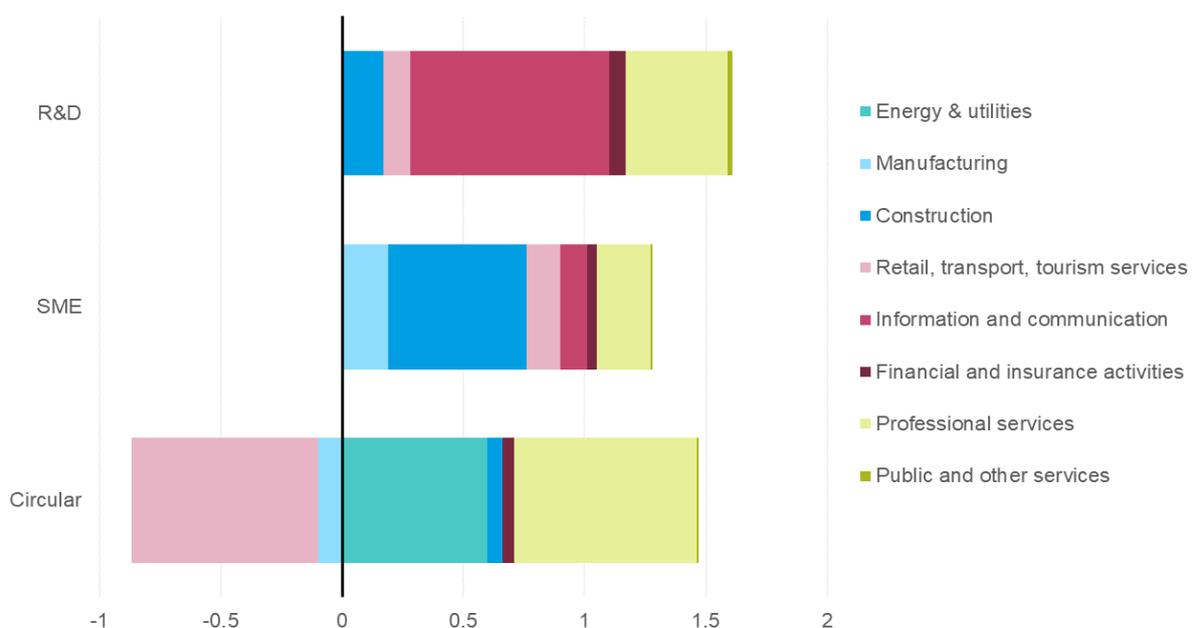
6.4.4.3 Moravian-Silesian

Distribution of the effects across action types is similar in MS than in the other regions. In terms of the overall impact of the cases, R&D induces the highest growth both in GVA and in employment terms, largely concentrated on the ICT sector. In the SME case, similarly to Ústí, there is a slight disconnect between GVA increase and employment increases, due to gains in lower value-added jobs. Importantly, the Circular economy case brings *net* negative GVA outcomes in MS, while it brings *net* positive employment outcomes. This can be interpreted as transitioning to lower value-added jobs.

Graph 47: GVA impact in Moravia-Silesia in 2030 by sectors, resulting from a total of EUR 100 million investment over the years 2021-2027 under the three illustrative action categories, EUR million (current prices)



Graph 48: Employment impact in Moravia-Silesia in 2030 by sectors, resulting from a total of EUR 100 million investment over the years 2021-2027 under the three illustrative action categories, '000 jobs



Overall, the results highlight the substantial differences across the expected impacts of JTF funds, depending on how and where they are used. They also highlight how different types of actions can provide gains with differing sectoral structures (e.g., R&D in ICT, SME in a more distributed manner for

lower-skilled jobs). Something that should be considered in the action plans as creating job opportunities in economic sectors where there is lack of trained workforce available either needs further training efforts or could lead to price increases due to the lack of labour market supply, while leaving lower-skilled people without jobs. It should be noted that while the modelling signals that the R&D and SME cases could have stronger outcomes, the environmental benefits of the circular economy action are not quantified. The circular economy case is the only one among these three with direct environmental benefits and the modelling demonstrates that it can have multipliers that are comparable to the other action types, while simultaneously providing environmental gains.

7 CAPITAL RAISING STRATEGY

Key messages

- **Private investors** are key to the Just Transition but have to be supported by the right mix of well-chosen public programmes and instruments.
- To be most effective, the instruments should be marked by **flexibility and low administrative burdens** for all stakeholders. The programmes should be **complementary, distinctive, and clear**. **Technical assistance and capacity building** are fundamental to build a good quality project pipeline, especially for small players.
- While investment grants have been pervasive in the Czech system, **financial instruments** including **innovative schemes** should be preferred where possible.
- Commercial financial institutions and investors are a key part of the Just Transition process. They are expected to increasingly commit to the sustainable goals and align their **portfolios to ESG criteria**.
- To enhance this process, **capacity building** should be strengthened on the opportunities (and inevitabilities) of compliance with ESG criteria (with a specific focus on the social component “S” with respect to just transition) in the decision making and incorporation in products.

The Just Transition will require mobilising substantial amounts of private and public investment, which will be triggered by both the pillars of the Just Transition Mechanism and other public policy programmes. In a first estimation, the regions gathered projects exceeding CZK 400 billion (EUR 16 billion), while the JTF allocation alone is roughly ten times lower. Additional funds through the Multiannual Financial Framework will be used in line with the Just Transition. However, it is clear that other innovative sustainable financial instruments should be continuously explored and developed to raise additional funding and attract responsible investors to the regions.

This chapter examines the main features of the capital raising strategy, including the key actors and intermediaries, timeframe, and financial instruments and programmes. It therefore follows the logic of the investment landscape analysis¹⁷⁵, which has been so far successfully used in mapping the climate and energy investments and can also be equally used to assess the Just Transition landscape.

7.1 Actors and intermediaries in the capital raising strategy

Investors: private (key economic operators, SMEs, NGOs, individuals), public (municipalities, regional authorities, universities).

Currently, the Just Transition Plans are mainly targeted towards SMEs and key economic operators. Key challenges related to capital raising pertain mainly to the small players, rather than key operators, who tend to have substantial personal capacity, knowledge and good access to financing^{176, 177}.

For *small players*, several challenges to capital raising have been identified:

- **Capacity and technical assistance (Invest EU Advisory Hub).** Small players (SMEs and municipalities) tend to lack both the personnel and knowledge capacity to prepare a project pipeline¹⁷⁸. Therefore, technical assistance to prepare the projects will be crucial for the success of the programmes. One-stop-shops can be considered as a good practice to help develop and implement projects for many applicants. The existing structures (e.g., CzechInvest offices) should be used to their full potential. In November 2020, the EIB and the CMZRB signed a memorandum expressing the will to cooperate in advisory support and to help promoters in the Czech Republic

¹⁷⁵ <https://www.climatepolicyinitiative.org/the-topics/climate-finance-landscapes/>

¹⁷⁶ See also stakeholder interviews in D3.

¹⁷⁷ However, e.g. the LSE study on investors' roadmap to just transition presented the level of “preparedness” to just transition in the energy utility sector in the UK and concludes a limited level of preparedness especially in terms of socioeconomic and just transition factors, such as human capital investments and governance.

¹⁷⁸ <https://ekonom.feld.cvut.cz/cs/katedra/ide/valenmi7/cic2030/reports/czechia-capital-raising-strategy-2021-02-19.pdf>

to prepare, finance and implement such projects. The specific contours of the cooperation will be further specified (going beyond the timeframe of the TA)¹⁷⁹.

- *Sensitivity to administrative burden.* Small projects tend to be overburdened with administrative procedures, especially investment grant schemes where transaction costs often reach up to 25–30% of the project (eligible) costs¹⁸⁰. Therefore, both the OP JT and the other mechanisms should strive to increase the flexibility of the grants where possible and lower the administrative burden (more in the next section).
- *Competing resources and programmes.* - The experience in the energy efficiency programmes has highlighted the need to avoid competing programmes that target similar activities. In the case of energy efficiency, the financial instrument (soft loans and guarantees) for energy savings administered by the CMZRB “competed” with the investment grant to energy efficiency under OP Enterprise and Innovation for Competitiveness, which may have negatively influenced the take up of the CMZRB. In the case of JTM, the differences between Pillars 1, 2, and 3 should be made clear to the potential applicants. This also applies to the potential overlaps (and complementarities) between OP JT and the other OPs.

Institutional and corporate investors can be further engaged through activities such as finance forums to identify the needs of workers and communities related to achieving regional climate and economic development goals and identify ways in which these investors could support the Just Transition activities and programmes. Investors could be also further encouraged to disclose not only on environmental performance, but also on the activities related to Just Transition¹⁸¹.

Municipalities are expected to be mainly financed through Pillar 3 - Public Sector Loan Facility (see next section), which would be a combination of loans and grant components. The technical assistance to prepare such projects will be crucial to successfully engage these actors.

Intermediaries:

EIB is the key supporting and facilitation actor in Pillars 2 and 3 of the Just Transition Mechanism. In Pillar 2, its mandate is to implement 75% of total investment under InvestEU and, the EIB Group will provide support to projects benefiting the territories most affected by the transition to climate neutrality under all four policy windows of InvestEU: Sustainable infrastructure; Research, Innovation and Digitisation; SMEs; and Social infrastructure and skills. It will be the main financing partner in Pillar 3.

CMZRB is becoming the Implementing Partner for InvestEU. The role of CMZRB (and potentially commercially banks) in the JTM (Pillar 2) has not been fully clarified at the time of writing this report. The suggested roles of CMZRB in Pillar 2 have been summarised in D2: Report on governance mechanism and stakeholder engagement¹⁸². A summary of these roles is provided in the Textbox below.

Textbox 1: Suggested roles of CMZRB in Pillar 2 from the D2 report

1. **The EIB or ČMZRБ will directly finance the Czech private sector** and large enterprise projects contributing to a Just Transition in the concerned regions. However, this should be done solely in cases that commercial financing is not available (i.e., market test showing that this is the case should be a condition). In this case, the EIB or ČMZRБ may directly select projects to provide guarantees, low-interest loans and similar financing favoured by the InvestEU funding scheme guarantee.
2. **The EIB will finance the Czech private sector indirectly, through facilitated financing.** In this case, it will choose financial intermediaries in the concerned regions, such as ČMZRБ or commercial banks. These institutions will create a portfolio of new loans for SMEs that will contribute to a Just Transition.
3. **The EIB or ČMZRБ (after granting the pillar assessment) will enable risk -sharing** (through the provided guarantee by InvestEU) to increase the capacity of the national support programme managed by an entity other than commercial banks. It can be an existing or newly created programme. The relevant national programme must be financed from national resources. The

¹⁷⁹ Recently, the CMZRB has launched the technical assistance to preparation of Energy Performance Contracting projects, financed through programme ELENA. It is aimed at both public authorities (municipalities) and SMEs.

(<https://www.cmzrb.cz/mesta/poradenstvi-elena/>)

¹⁸⁰ <https://www.sciencedirect.com/science/article/pii/S0301421520305875>

¹⁸¹ <https://www.unpri.org/download?ac=9452>

¹⁸² See the D2 report for full details and chapter 1.4 in this report

guarantee from InvestEU will mobilise additional private and public resources and increase the available amount of funds in the national support programme.

4. **Governance option of widespread application of InvestEU conditions in the Czech Republic**

The CMZRB may also be considered as the national partner for the loan component under Pillar 3. However, it has not been yet decided in the time of writing of this report (May 2021).

The State Environmental Fund (SEF) is a focused institution that was incorporated by Act No. 388/1991 Coll. It provides direct financial support through subsidies and indirect financial support through loans or contributions towards interest on loans. SEF will be the intermediate body for the implementation of Pillar 1 – JTF through the OP JT. The SEF could also potentially be engaged as a national partner to distribute the loans in Pillar 3. However, at the time of writing this report (April 2021), it was one of many potential governance options in the loan part of Pillar 3 (along with the Ministry of Finance, CMZRB, and other actors). Therefore, its precise role must be perceived in the context of existing knowledge and ambiguities, which will only be resolved after the approval of the necessary legislation (tentatively in the second half of 2021).

The concrete role of *commercial banks* in the Just Transition Mechanism is yet to be clarified. Based on the current knowledge of the TA team, the options for financial intermediaries are still open, especially in Pillar 2. Commercial banks could be part of the guarantee mechanism, e.g., for the SMEs window. However, the specifics are yet to be defined, and are expected to be finalised in the second part of 2021.

Commercial banks and other financial institutions

Financial institutions (especially commercial banks) play a key role in financing a just transition in various ways. E.g., the largest share of investment for the renewable energy supply and infrastructure sector was assisted by the capital market. In particular, commercial banks played a major role, providing up to 80 % of total project costs in the form of loans.

To support the Czech just transition commercial banks will play a fundamental role. First of all, they act as intermediaries for EIB (and CMZRB) programmes, facilitating lending to public and private entities locally. Asset managers/owners, institutional investors and investment banks play an important role in sustainable finance by investing directly in green assets and especially institutional investors such as pension funds, have a higher propensity than others to consider ESG factors in general or climate change in particular in their investment strategy. In a recent study published by the Czech Technical University in Prague¹⁸³ financial institutions (like the State Environmental Fund, CMZRB, and commercial banks) are the main stakeholders involved in the climate and energy measures.

Considering the tectonic shifts toward stakeholder value and ESG investing and disclosure going on in global financial markets and the rapid evolution of sustainable finance regulation at EU level, the entire sector is increasingly realising its role in financing the sustainability transformation. And with FIs falling both under the scope of the SFDR (Sustainable Finance Disclosure Regulation) and the newly proposed corporate sustainability reporting directive (replacing the non-financial reporting directive), pressure will increase also on CZ FI to green their portfolios.

Despite promising overall framework, there are still barriers (not only) in Czech Republic that prevent more engagement of commercial banks in sustainable finance.

SMEs are the backbone of the Czech economy (especially in terms of employment effects) and are therefore crucial player for a Just Transition. However, their investment volume is often small, their credit rating poorer than large listed and audited companies. By contrast, as regards SME financing commercial banks have been building for a long-term sufficiently deep know how in this area, and therefore there is quite a tough competition in the Czech SME financing market. What should help especially to more indebted SMEs and / or those that lack sufficient collateral, to get a new financing if needed, is well structured and administratively simple guarantee scheme. Administrative simplicity is the most especially for the smallest companies that often lack capacity to deal with bureaucratically demanding requirements that often condition the access to subsidies or even financial instruments currently provided by public programmes. The guarantee programs of the European Investment Fund

¹⁸³ Valentová, M., Dunovskí, D., Knápek, J., 2020. Capital Raising Strategy for Czechia: Buildings and renewable energy supply. Prague: Czech Technical University in Prague.

that have been long actively and successfully used by commercial banks could serve as a good practice example.

Finding innovative ways to reduce transaction costs for SMEs is important, e.g., more standardized loan programmes dedicated at SMEs, public guarantee schemes and /or support to creating investment pools for a bundle of projects etc. As mentioned in the study above, the CTU concludes that guarantees may be especially relevant for energy efficiency projects, as the enterprises may face financial difficulties and given the long-term nature of energy efficiency projects (typically 8-10 years), for which the credit risk for commercial banks may be too high.

The capacity building challenge discussed above could also hold for the financial sector and needs to be tackled to unleash its potentially catalytic and central role in raising capital for the just transition. The Study of the CTU¹⁸⁴ confirms that financial institutions in the Czech Republic need capacity building and assistance in financing sustainability projects. According to the respondents in the study, commercial banks are in some cases still behind on sustainable finance issues, i.e., being able to identify and evaluate sustainable (especially energy efficiency) projects¹⁸⁵. Additionally, the banks need to learn how to “deliver” these kinds of projects: learn about the incorporation of the EU taxonomy of climate mitigation projects in their decision making and widening the portfolio of their instruments.

Hereafter, we will further explore the current structure and state of play regarding sustainable finance in the Czech financial sector.

Generally, the activity of the Czech banking sector in sustainable finance so far can be characterised as moderately active. The commercial banks are at different level of progress in their sustainable finance portfolio and progress. However, 16 members of the Czech Banking Association have recently signed the Sustainable Finance Memorandum (see text box)¹⁸⁶.

Part of the commitment of banks described in the Memorandum is the readiness of banks to cooperate with the public administration in co-financing projects implemented with the help of EU funds. The banks have also expressed their readiness to help co-finance strategic projects in cooperation with the state “in the most efficient way possible so that their implementation contributes as much as possible to the sustainable development of our country”.

At the same time, CBA Member Banks have set up a Commission on Sustainable Finance, which will look at how banks can make a concrete contribution to creating the conditions for sustainable development of the Czech Republic in the long term.

Czech banking association¹⁸⁷

Founded in 1990, the Czech Banking Association is a voluntary association of banks and building societies operating on the Czech market. It has 37 members representing more than 99 % of the Czech banking sector.

Its activities are broad including legislation and regulatory procedures, public relations and financial literacy or digitalisation. Sustainable finance is now seen as one of the key banking trends, but so far somewhat limited in the Czech environment to “greening” its own operations (paperless services, etc) and offering sustainable products (credit and investment portfolios) to clients. The biggest step so far has been the signing of the Memorandum for Sustainable Finance and the creation of the Sustainability Commission in early 2021, which will also deal with how banks can make a concrete contribution to creating conditions for the sustainable development of the Czech Republic.

Sustainable Finance Memorandum¹⁸⁸

The Memorandum for Sustainable Finance was published in March 2021 originally signed by 10 banks. By the time of writing this report, total of 16 commercial banks operating on the Czech market have signed the Memorandum. The list includes all the major commercial financial institutions.

¹⁸⁴ Ibid.

¹⁸⁵ <https://www.tandfonline.com/doi/abs/10.1080/15567249.2018.1494763?journalCode=uesb20>

¹⁸⁶ <https://cbaonline.cz/ceske-banky-podepsaly-memorandum>

¹⁸⁷ <https://cbaonline.cz/en>

¹⁸⁸ <https://cbaonline.cz/upload/1537-memorandum-cba-pro-udrzitelne-finance-fin-en.pdf>

In the memorandum, the banks commit to, among other, aligning their activities with the “UN global agreements, EU programmes and policies, [...] and national sustainable policy frameworks” and applying sustainability principles in relation to clients, suppliers and other stakeholders, and to review (and report where applicable) on the compliance with the ESG criteria. The memorandum supports the offer of sustainable finance products, incl. green mortgages and loans, and assess their portfolio against sustainability objectives, disclosure. The banks also commit to “monitoring the possibility to manage their portfolio in accordance with the [...] Paris agreement, exit loan portfolios associated with production [...] excessively harmful to the environment and human health.” They also express the readiness to cooperate with public authorities in implementing, among others, the Just Transition Fund.

The Czech Republic is marked by a large share of banks which are Czech entities but are part of international groups. This largely shapes their attitude and positions towards sustainability and ESG. The five biggest commercial banks, representing roughly 65 % of the deposits, are all part of international groups and have all, to larger or lesser extent, set up their paths towards sustainability. Some of them have (top-down) driven sustainability, climate targets, such as reducing own carbon footprint, lowering GHG emissions, but also greening the portfolio of products, gradually ceasing to finance unsustainable activities¹⁸⁹. Overall, the financial market has been marked by large uncertainty due to the impacts of Covid pandemic. According to CBA, the investment recovery is under way and (hopefully) expected to gain strength in the second half of 2021.

So far, it has been hard to evaluate the volume and structure of sustainable finance market as there has not been a common ground for tracking these financial flows as well as reporting obligations and standards in this area. The EU Taxonomy and the requirements for sustainability-related disclosures in the financial services sector will be instrumental. In the Czech framework, the financial institutions may especially closely follow the final decision on the transition activities. The CBA Commission on Sustainable Finance will work on guiding the discussions and providing a proposal for best practice sustainable finance reporting.

It is evident that the volume of sustainable finance (in its broadest term) will continue growing. To unlock the potential, the standardization (taxonomy) needs to be complemented with capacity building to resolve the asymmetric information and allow for proper assessment and monitoring of “green” projects and their contribution to low-carbon transition. The same applies to “social” projects contributing to just transition¹⁹⁰. This also comes with transparency of reporting and ultimately clear and stable regulatory framework¹⁹¹.

The engagement of commercial banks in the JTM is yet to be defined, according to CBA, the discussions have so far been rather scarce. Depending on the final decision, commercial banks could be significantly involved in Pillar 2 (through guarantee mechanisms), as well as in Pillar 3, depending on the final EIB framework. The discussions among the stakeholders (EIB, CMZRB, commercial banks) should now be directed towards specifics to smooth the role out of JTM and other climate and transition related programmes, such as Modernisation Fund, RRP.

We can expect further commitments and strengthening of the targets by individual financial institutions in the coming years, also due to the fact that the risks associated with climate change (or potentially the disorderly transition) are evident (see also section below on sustainability). In addition, banks are ready to increase its role as the partner in the whole project process, i.e., guiding the client through the whole life-cycle of the project, from the idea to the end, instead of “mere” financing/loan¹⁹².

7.2 Financial instruments and programmes

7.2.1 General considerations

Diversity in instruments

In general, the Czech Republic should consider abandoning the prevailing model of investment grants financing for suitable areas in EU funds and to involve other financial instruments with higher leverage

¹⁸⁹ As we also point out further, this approach is just underlying the proper risk management and due diligence as assets aligned with ESG criteria are generally less risky.

¹⁹⁰ More on the ESG criteria in chapter 7.3.

¹⁹¹ <https://fb.watch/5JK1j-zm1b/>

¹⁹² Ibid.

and return. Where appropriate, subsidies can be appropriately combined with support from financial instruments of both generations, i.e., 2021-2027 operational programmes and the InvestEU Fund.

Flexibility and low administrative intensity

Tailor the administrative processes to supported projects. While adhering to the monitoring requirements, the programmes should strive for simple administration for both the recipients and the administration body. The forms of vouchers or simple grant schemes are good examples of such procedures. The more intensive administrative procedures and requirements should be mainly reserved for large and strategic projects. Sustainability of the projects must be demonstrated.

Consistency and complementarity with other programmes

Initial, preparatory stages of the programmes, including an ex-ante evaluation of the programmes may improve the subsequent effectiveness and administrative intensity of the programme¹⁹³. Conversely, a late start tends to result in the insecurity among applicants, which in turn lowers the absorption capacity and increases the administrative burden.

In operational programmes, the conditions of the programmes tended to change during the process, sometimes small nuances or between individual calls, which further increased uncertainty and administrative burden, and largely prevented economies of scale from learning-by-doing¹⁹⁴. Therefore, continuity and consistency within the programmes are crucial for a successful uptake of the policy. Creating a safe and stable framework increases the absorption capacity.

Additionally, as mentioned above, the complementarity (and non-rivalry) of programmes will influence their successful take-up. The design of the programmes with clear guideposts for applicants will be instrumental.

Monitoring and evaluation

Once there are clear supported topics in coal regions, which will be defined in the TJTP and subsequent OPJT, we propose that the MoRD conducts its own internal analysis of these topics in terms of capability to monitor the specific progress of the coal regions. Social and governance criteria should be included in the assessment. Although the JTF Regulation defines specific output and result monitoring indicators that the Managing Authority will utilise other internal indicators should also be considered which would enable the MA to monitor the transformation of Czech coal regions in more detail. These internal indicators will then help to interpret the achievement of results in specific matters concerning individual coal regions. Specific attention should also be paid to defining long-term impact monitoring indicators.

The planning process to establish the governance of monitoring and evaluation also includes the topic of setting milestones for monitoring indicators. The financial allocation and calculation of the expected scope of the output indicators (e.g., number of enterprises, tonnes per year) will be followed, and complemented with result indicators. However, it will be necessary to prepare additional input analyses for the result indicators.

7.2.2 Specifics of the main features of the JTM

Pillar 1 Just Transition Fund

To be implemented through the OPJT which will have three priorities for three regions, allocation to be based on objective indicators (more intensive support is expected in Ústí and Karlovy Vary). Depending on the TJTP, the key forms of support are expected to include:

- Thematic continuous calls
- Grant schemes
- Financial instruments

In addition, there may be **special measures** focused on:

- Territorial solutions (territorial support based on a local territorial strategy, example brownfields repurposing projects)
- Integrated network solutions (complex networks such as digitalization, production)
- Strategic projects explicitly stated in the OP/ Just Transition Plan (JTP)

¹⁹³ <https://www.sciencedirect.com/science/article/pii/S0301421520305875?via%3Dihub>

¹⁹⁴ <https://ekonom.feld.cvut.cz/cs/katedra/lide/valenmi7/cic2030/reports/czechia-capital-raising-strategy-2021-02-19.pdf>

The core of the OPJT is expected to be based in the thematic continuous calls (suitable, among others but not exclusively, for large enterprises or larger projects), grant schemes (generally suitable for smaller, unified projects for e.g. reskilling), vouchers (stimulating innovation and cooperation of business and knowledge providers)¹⁹⁵, and financial instruments (combination of grant and loan support etc. suitable f. e. for SMEs). However, the text of the programme, and thus the concrete types of instruments, is yet to be finalised¹⁹⁶.

The debate so far has mainly turned around the so-called **strategic projects**, which would be projects, indicatively mentioned in the JTP. There will be financial limits for strategic projects – at least EUR 7.5 million for investments or EUR 2 million for projects focused on investments into the human and social capital. Strategic projects must have clear management and a pre-feasibility study.

Based on the exchange between the MoE and the EC, the **inclusion** of the Strategic Projects into the future OP has been endorsed by the European Commission. The pre-feasibility studies should lead to higher certainty that the projects will be implemented. The specific governance mechanisms to implement the strategic projects is yet to be discussed, especially the involvement of other ministries, apart from the core managing bodies (MoRD and MoE), based on the themes of the strategic projects. The strategic projects should, however, not represent the core part of the JTM.

Pillar 2 Dedicated Scheme under Invest EU

In the second half of 2021, the TA team recommends intensifying the use of EIB technical assistance in the preparation of Pillar 2 projects. Interviews with EIB representatives have shown that comprehensive preparation of suitable projects is crucial.

It is therefore desirable for the Ministry of Regional Development, the Ministry of the Environment and the regions concerned to finalize a set of suitable projects for Pillar 2 within the Transformation Platform and relevant working groups and to use technical assistance for their further preparation. According to EIB representatives, preference will be given to mature projects and not to weakly prepared and argued projects.

The CBA and commercial banks have not yet been fully part of the discussion processes. As stated above, the governance mechanism is yet to be finalised. Various options have been on the table, which also differ according to the policy window. In 2019, the CMZRB and commercial banks successfully implemented the first portfolio guarantee mechanism, Expanze¹⁹⁷, which could serve as “template” for some of the Pillar 2 mechanisms¹⁹⁸.

With respect to the policy windows, the CMZRB does not expect to get involved in the R&D mechanism per se, as this is “sufficiently covered” by the Technology Agency of the Czech Republic, and the activities are not financed with a “recoverable” form of support.

Pillar 3 Public Sector Loan facility

The grant element of Pillar 3 will be provided by the European Commission under a directly managed programme, probably managed by the *CINEA - European Climate, Infrastructure and Environment Executive Agency* (CINEA – see [web link](#)). We assume that although it is not necessary to involve any governmental body at the level of the Czech Republic, there is a possibility of involving the Ministry of Finance and CMZRB within the EFSI. However, at this stage, it is only a hypothetical option of governance.

The loan element of Pillar 3 will be provided by EIB (including advice). This was also discussed by the TA team with representatives of EIB and SEF, in terms of what formal steps could be launched and implemented. According to these discussions, it can be generally stated that to the loan part of Pillar 3, EIB lending policies and procedures will apply to projects and operations. It is not yet clear what the role of commercial banks would be in this process.

¹⁹⁵ <https://www.innovationpolicyplatform.org/www.innovationpolicyplatform.org/content/innovation-vouchers/index.html>

¹⁹⁶ The draft OPJT to be finalised 2Q 2021 and approved by the Government in 3Q 2021 to enter the negotiations with the EC. Detailed conditions of support for applicants and publication of indicative schedule of calls for applications for support is expected by the end of 2021. https://www.mzp.cz/cz/opst_2021_2027

¹⁹⁷ For each loan defaulting, a certain % (guarantee rate) of the covered loss is paid to the bank until a certain % (cap rate) of the portfolio is covered. https://www.fi-compass.eu/sites/default/files/publications/Bruno_Robino_How_does_a_Guarantee_scheme_work_0.pdf

¹⁹⁸ Similarly, a good example and case study of portfolio guarantee mechanism are the recently introduced programmes COVID III for financing working capital (2020) and even Investment (2021), albeit under the rules of the EU Temporary Framework. Banks broadly use and appreciate it as a prime example of low administrative burden portfolio guarantee products of the European Investment Fund.

Given that SEF may become part of the implementation structure of Pillar 3, precisely because it has significant experience in providing not only grants but also loans for the public sector. The CMZRB has been providing loans to municipalities and has recently launched an ELENA technical assistance programme for Energy Performance Contracting¹⁹⁹.

Pillar 3 will support projects by public entities. Projects that do not generate a sufficient stream of own revenues are to be mainly supported by this Pillar. The subject of support is yet to be defined and will have to be primarily consistent with the sectors and thematic areas in the TJTPs. As of June 2021, the related legislation was expected to be adopted in the second half of 2021, with a first call in early 2022 and first projects approved in late 2022/early 2023.

7.2.3 Other instruments

In order to use up the full potential of just transition activities and scale up the capital raising in the Just Transition, new financial instruments should also be explored and potentially further enhanced. These entail for instance the green and social bonds, and green mortgages, which also have a social component in them.

Green and social bonds²⁰⁰: Local issuance by municipalities, businesses, and public bodies, as well as national issuance by large corporations and the government itself, is a highly promising field in the bond sector²⁰¹. The Czech Republic has not been particularly active in issuing climate and social bonds so far (Climate bonds initiative overview²⁰²), therefore there is a high potential for development. Poland could be used as a good practice example – as one of the biggest government issuers in Europe to help finance the low carbon transition.

The social bonds then particularly bring in the social dimension to the capital raising strategy and have grown intensely especially in 2020²⁰³.

In both cases, the underlying criteria to label green, climate, sustainable or social bonds must be clearly defined, monitored and verified. The EU Taxonomy and the EU Green Bond Standard proposes a credible set of recommendations in this regard and can serve as the initial guidance. The social and governance dimensions have not been fully incorporated in the EU Taxonomy, and the criteria has been less developed so far.

Green mortgages: Green Mortgages can offer a strong supporting tool not only for the climate-neutrality targets, but also compatible with the Just Transition goals through directly aiming at energy poverty²⁰⁴. Green mortgage can be offered by the commercial banks rewarding the purchase of a “green” energy efficient home with a lower interest rate. The idea is that the energy efficient home generates extra disposable income through lower energy bills and thus decreases the risk of non-repayment of the mortgage by the customer²⁰⁵. There is a clear link between the development of green mortgages and the just transition. By making them available and attainable to vulnerable customers, they can largely contribute to reducing fuel and energy poverty and thus attenuating the impacts of the transition.²⁰⁶

The stakeholders interviewed by the EEAMap project stated several perceived barriers, which entail low interest and priority, operational considerations (e.g., building separate cover pools to build a 100% green bond) and technical issues (translating energy efficiency into green value)²⁰⁷. Standardising procedures, including standard labels, baseline setting, and clarity in the financing and repayment mechanisms were among the key considerations for a successful take up of this instrument, together with a clear complementarity to other subsidy instruments²⁰⁸.

¹⁹⁹ Nevertheless, municipalities are often financed by banks on a purely commercial basis. Therefore, as members of CBA highlight, a caution should be taken when intervening by on-lending or even granting public funds to areas which run smoothly on a market basis.

²⁰⁰ Green bonds are issued in order to raise finance for climate change solutions. The key is for the proceeds to go to green assets. They can be issued by central and local government, banks or corporations. (Climate Bonds Initiative). Social bonds are any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance in part or in full new and/or existing eligible Social Projects (Social Bonds Principles).

²⁰¹ https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2019/09/Financing-inclusive-climate-action-in-the-UK_An-investor-roadmap-for-the-just-transition_POLICY-REPORT_56PP.pdf

²⁰² <https://www.climatebonds.net/resources/reports/green-bonds-state-market-2018>

²⁰³ <https://www.bloomberg.com/news/articles/2021-01-11/social-bonds-propel-esg-issuance-to-record-732-billion-in-2020>

²⁰⁴ https://ec.europa.eu/commission/presscorner/detail/en/IP_20_1835

²⁰⁵ https://www.czgbc.org/download/CZGBC_Green_Homes_pro_banky.pdf

²⁰⁶ <https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2019/10/Banking-the-just-transition-in-the-UK-2.pdf>

²⁰⁷ <http://eemap.energyefficientmortgages.eu/wp-content/uploads/2018/04/EeMAP-Technical-Report-on-Green-Finance.pdf>

²⁰⁸ Ibid.

7.3 Sustainability in operations

As a starting point, the implementing Ministries should apply the EU Taxonomy as it is a proven climate tracking tool for selection and evaluation of projects as well as the Do No Significant Harm (DNSH) principle, a cornerstone of the EU Green Deal²⁰⁹.

The EU Taxonomy so far defines one part of broader Environmental, Social, and Governance (ESG) standards and considerations. The EU Taxonomy is instrumental regarding the environmental dimensions and tagging of the investment. The Just Transition will require the inclusion of social dimensions in the investment analytics to include the risks and opportunities around the Just Transition, including impacts on workers and communities in the assessment.²¹⁰

ESG²¹¹

Environmental considerations include climate change mitigation and adaptation, but also environment more broadly, including preservation of biodiversity, pollution prevention and the circular economy.

Social considerations could refer to issues of societal aspects, such as inclusiveness, diversity, inequality, labour relations, investment in human capital and communities, as well as human rights issues.

The **governance** of public and private institutions includes the system of practices, controls and procedures, management structures, employee relations and executive remuneration. It interconnects the “S” and “E” and makes sure to include it in the decision-making process.

Sustainable finance is therefore defined as compliant with the above ESG criteria. Furthermore, it has been widely proven that incorporating ESG into decision making and aligning with ESG criteria brings about economic benefits to stakeholders (businesses, etc.) through lower credit risk, lower loan and credit and higher credit ratings²¹². By contrast, Klusak et al.²¹³ show that without stringent policies, climate change impacts will significantly increase the interest payments on sovereign and corporate debt, therefore lowering the credit ratings for most countries, including Czechia, as soon as 2030.

Similarly, the ECB is currently running a climate stress test to assess the resilience of the banking system to the transition to a low-carbon economy.²¹⁴ The preliminary results of the exercise strongly advocate for early action as opposed to a costly and disorderly transition at a later stage. It further states that climate change may pose a systemic risk for banks with portfolios in “certain economic sectors and geographical areas”. As mentioned at the CEE Sustainable Finance Summit, “the combined exposure of financial investors’ equity portfolio to climate-policy relevant sectors are large (36% – 48% across investor types) and intertwined (...), thus, impacting broader financial stability”²¹⁵.

Therefore, it is clear that risks related to climate change are real, need to be understood, and need to be accounted for in the financial institutions/investors’ portfolios. Furthermore, apart from the regulatory pressure coming with the Corporate Sustainability Reporting Directive (CSRD)²¹⁶, the societal pressure is also gaining momentum and should not be underestimated²¹⁷.

There is a diverse level of development among the various “letters” of the ESG. While the “E”, i.e., environmental considerations have been widely developed in metrics, methods, and guides and have been incorporated in the EU Taxonomy, the “S” (and “G”) indicators have been less developed and used in practice. However, a report by the ESG Working Group²¹⁸ stresses that “there are still significant data gaps due to the lack of standardised reporting requirements - in particular, for global supply chains - many quantifiable social indicators are available for investors to include as part of their investment analysis”. The same applies for tools to monitor these indicators. Robins et al. come to similar findings, concluding that the low profile of social dimension of the transition among investors would not be “a sign that the Just Transition is unimportant for investors. Rather, it signals that investor approaches to

²⁰⁹ <https://www.isfc.org/just-transition-mechanism> <https://www.isfc.org/just-transition-mechanism>

²¹⁰ <https://www.unpri.org/download?ac=9452>

²¹¹ https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/overview-sustainable-finance_en, <https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/five-ways-that-esg-creates-value#>

²¹² <https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/five-ways-that-esg-creates-value#>

²¹³ https://www.bennettinstitute.cam.ac.uk/media/uploads/files/Rising_Climate_Falling_Ratings_Working_Paper.pdf

²¹⁴ https://www.ecb.europa.eu/pub/financial-stability/fsr/special/html/ecb.fsrart202105_02~d05518fc6b.en.html

²¹⁵ <https://fb.watch/5JK1j-zm1b/>

²¹⁶ https://ec.europa.eu/info/publications/210421-sustainable-finance-communication_en#csrd

²¹⁷ <https://fb.watch/5JK1j-zm1b/>

²¹⁸ <https://www.isfc.org/amplifying-the-s-in-esg>

climate change have yet to connect the environmental, social and governance dimensions of responsible investment”²¹⁹.

Social indicators have been denounced as immaterial (unlike environmental risks). However, growing evidence suggests that social indicators are material²²⁰. Investing in companies with low scores on “S” indicators, or no available data, brings about tangible risks. Firms performing well on social dimensions are associated with higher returns, less volatility and lower downside risk – ergo higher resilience.

In other words, as Robins et al further state: “Climate change is already a clear systemic risk – and the just transition offers a way for investors to deliver a similarly systemic response. [Disregarding just transition and the potential reaction of affected sectors, communities and countries] would result in severe economic, social and financial costs (...) and would fundamentally harm long-term investors”. Understanding ESG factors can help us understand the transformation

To this end, the platform on Sustainable Finance, which is the main expert body behind the EC work on sustainable finance and taxonomy, has launched work to extend the EU taxonomy with the “social” component. The main rationale follows the findings described above: social objectives are acknowledged as a key element of sustainable investing and socially inclusive measures (i.e., the Just Transition) must accompany the green transition. Investors themselves are increasingly searching for social investment opportunities²²¹. It is likely that the “social taxonomy” and subsequent new regulation are on the way.

²¹⁹ https://www.cccep.ac.uk/wp-content/uploads/2018/06/Robins-et-al_Investing-in-a-Just-Transition.pdf

²²⁰ <https://www.isfc.org/amplifying-the-s-in-esg>

²²¹ https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/finance-events-210226-presentation-social-taxonomy_en.pdf

8 MONITORING AND EVALUATION

8.1 Specific output & results indicators (Regional Policy Common Output / Common Result)

Although the preparation of the TJTP and partial regional transformation plans of particulate coal regions is still ongoing, in the first half of June the TA team worked mainly with working versions of individual documents. In these plans, progress is evident in the extent to which they have been developed compared to the situation in mid-April 2021, when the first version of the D4 report was created. Nevertheless, some important attributes for monitoring indicators (i.e., intervention logic and transformation story) are still missing. For this reason, attention is paid in this chapter to the following three topics, which form the following sections:

- General comments to the monitoring setting background of the JTM particular pillars
- SMART DASHBOARD for TJTP
- Monitoring and evaluation setting issues
- Summary tables - JTF activity Regulation (Article 8) and proposal of indicators for individual regional priorities (placed in the Annex 2 of this report)

Note: The tables are arranged according to the priorities or sub-programs that have been submitted by the individual coal regions in their transformation plans. However, the order of priorities is not in the order set out in the Regulation, so it is not entirely clear. With regard to EU planning procedures, it is appropriate to unify this not only between individual regions, but also at the level of the TJTP, so that it can be evaluated in relation to the objectives set in the relevant legislation. This issue should be resolved during the finalisation of the TJTP during July and August 2021.

The proposed list of indicators is part of report D4 in "*Annex 2: JTF activity Regulation (Article 8) and proposal of indicators for individual regional priorities*". The TA team updated this annex according to the available information and the revised regional transformation plans. It is still not possible to determine the specific programme indicators since the strategies of the individual coal regions are still not finalised, i.e., according to the state of elaboration of regional plans as of mid-June 2021. Once the individual regional transformation plans are finalised, the TA team will emphasize the potential use of the Dashboard for the relevant program monitoring indicators.

8.1.1 General comment to the monitoring setting background of the JTM particular pillars

As part of the monitoring and evaluation settings of the JTM's **Pillar 1 (JTF)**, the Managing Authority will be strictly based on the JTF Regulation and its Annex 3, which include the relevant indicators. According to the findings in the structured interviews, it turned out that the Managing Authority (i.e., MoE) will not have the ambition to expand the defined list of output and result indicators. However, during June 2021, the MoRD initiated negotiations with members of the TA team regarding broader contextual programme indicators. At these meetings, it was agreed that these indicators will be identified in the D5 report in connection with the completed regional transformation plans and the need for a more detailed discussion of data sources for these indicators and their potential processing through the Dashboard. The impact indicators are not addressed in any way by the JTF regulation. Output indicators will be calculated according to financial allocation. If similar measures were implemented in previous programming periods, it is easy to calculate the expected scope of the output indicator (e.g., number of enterprises, tonnes per year, etc.). A similar approach can be applied to result indicators. To facilitate further work, the TA team created a proposal for specific indicators for individual JTF activities, which are planned by coal regions in their regional transformation plans. At this stage, the TA team considers this approach to be pragmatic and adequate with regard to the state and level of development of the TJTP, however, partial attention is paid to this topic in the next section "Monitoring and evaluation setting issues". This concerns the need to finalize the intervention logic of individual supporting JTF activities and, in connection with this, the need to consider adding other indicators to strengthen the argumentation of transformation stories.

The design of **Pillar 2 (InvestEU)** at the EU level progressed in March 2021, when Regulation (EU) 2021/523 of the European Parliament and of the Council of 24 March 2021 establishing the InvestEU Programme and amending Regulation (EU) 2015/1017 was approved. The governance of this pillar will follow in the coming months, including a specification of the setting and arrangement for monitoring and evaluation of the planned measures. The monitoring of InvestEU programme performance will be measured against indicators laid out in the regulation's Annex 3 (Key performance and monitoring

indicators). In addition to these core indicators, more detailed indicators will be included in the investment guidelines or in the guarantee agreements on the basis of the specific financial products to be deployed. Moreover, specific indicators will be developed for the InvestEU Advisory Hub and the InvestEU Portal. Harmonised reporting will be requested from the implementing partners in line with the Financial Regulation. The impact of the InvestEU Programme will be assessed through evaluations. Evaluations will be carried out according to paragraphs 22 and 23 of the Interinstitutional Agreement of 13 April 2016,²²² where the three institutions (European Parliament, Council of the European Union and European Commission) confirmed that evaluations of existing legislation and policy should provide the basis for impact assessments of options for further action. The evaluations will assess the InvestEU Programme's effects on the ground based on the InvestEU Programme indicators/targets and a detailed analysis of the degree to which the InvestEU Programme can be deemed relevant, effective, efficient, provides enough EU added value and is coherent with other EU policies. They will include lessons learnt to identify any lacks/problems or any potential to further improve the actions or their results and to help maximise their exploitation/impact.

The design of **Pillar 3 (Public Sector Loan Facility)** at the EU and national levels is still ongoing and is less advanced than Pillars 1 (JTF) and 2 (InvestEU). Key performance indicators to monitor the implementation and progress of the Facility towards the objectives established in Article 3 are provided in Annex II of the draft regulation on the public sector loan facility under the JTM. Under this regulation, it is assumed that the performance reporting system will ensure that data regarding the aforementioned indicators are collected efficiently, effectively and in a timely fashion. Beneficiaries in cooperation with finance partners shall provide data regarding the indicators to the EC. Proportionate reporting requirements will be imposed on the beneficiaries of the grant component of the Facility. The Facility will be subject to a mid-term evaluation, by 30 June 2025, to assess its efficiency, effectiveness, relevance and coherence. The evaluation will also demonstrate how EU support will have contributed to addressing the development needs of the Just Transition territories. At the end of the implementation period and no later than 31 December 2031, a final evaluation report on the results and long-term impact of the Facility shall be established.

The TA team does not address Pillar 2 and Pillar 3 issues in this report, as the EIB monitors and evaluates the relevant supported actions itself²²³. In the case of assessing the entire JTM in the Czech Republic, the MoRD will proceed in such a way that it directly requests from the EIB the relevant documents, data sets and evaluations in order to comprehensively evaluate the achieved results within the JTM.

8.1.2 Smart Dashboard for TJTP

Part of the expert TA team created the smart dashboard for the needs of effective monitoring of projects and their results in the regions. Its description is given in Annex 5 of this report, and for representatives of the TJTP implementation, this tool was also presented in the form of an online discussion on 13 April 2021. The advantage of the Dashboard is that tracking data from specific impact indicators, their progression and their consolidation, it will be possible to highlight critical situation, predict programme results, and understand the relative estimated impact of selected projects for the just transition.

A Smart Dashboard includes 3 types of information:

- Descriptive - telling you what happened in the past;
- Predictive - predicting what is most likely to happen in the future;
- Prescriptive - recommending actions to take to affect the outcomes.

Specific examples of its use and operation are described in the Annex to this report, however, it should be emphasized that its use is directly dependent on a clear definition of individual indicators in terms of existing data sources / stock, data usage maturity and effective collaboration between the various stakeholders involved in the dashboard construction process. Institutions, associations, cooperatives, economic operators, and users are the main players involved in the collection of data from the territory and, consequently, in the definition of the development policies, in line with a sustainable strategic vision of the territory and the local communities' needs.

²²² Interinstitutional Agreement between the European Parliament, the Council of the European Union and the European Commission on Better Law-Making of 13 April 2016 (OJ L 123, 12.5.2016, p. 1).

²²³ The whole system of Pillar 2 and Pillar 3 is still being established (see the discussion on the Transformation Platform in June 2021) and greater progress in this area can be expected in terms of monitoring and evaluation only during the second half of 2021. At this stage, specific financial products are not finalised under Pillar 2 and Pillar 3.

As part of the above-mentioned consultations of TA team experts (smart dashboard authors) and TJTP representatives, it turned out that the preparation of monitoring indicators and their target values must be further discussed. Representatives of the Ministry of Regional Development expressed interest in using this tool to monitor JTF interventions. However, it should be emphasized that the monitoring system alone is not able to reflect changing socio-economic and political circumstances (e.g., the impact of the Covid-19 pandemic on socio-economic development). The broader context of the implemented interventions is part of the impact evaluations at the end of the programming period. However, the setting of monitoring indicators must follow the logic of the intervention, which must be in line with the transformation story, which will be completed in early July 2021. Therefore, MoRD representatives agreed with TA team representatives that further consultations will take place to set program programming indicators in the D5 report (in July 2021). Emphasis will be placed on their possible application in the Smart Dashboard.

Specific issues concerning the setting up of monitoring and the evaluation of the JTF intervention are given below.

8.1.3 *Monitoring and evaluation setting issues*

In this section, the TA team focuses on several issues that will be important for the correct setting of monitoring indicators and subsequently also evaluation. Although the first two issues are of a general nature, the TA team considers them essential for the correct setting and final success of JTF interventions in the Czech Republic. Other issues are more specific in relation to JTF.

1. **Intervention logic at the level of supported JTF activities and stakeholder involvement**

By the end of June 2021, the individual coal regions submitted their partial regional transformation plans, which, however, are not sufficiently elaborated to the necessary degree of detail in terms of a clear intervention logic. It is not only the absence of a clearly defined overall transformation story of the coal region, but also the lack of a detailed description and schematic representation of the intervention logic at the level of planned supporting activities, which are defined in the JTF Regulation (Article 8). An essential part of the intervention logic (resp. the theory of change) are correctly set indicators that ensure the measurability of outputs and related results in direct relation to the specific objectives of the given coal region priority in the OPJT. The correct setting can be ensured through multi-round validation of the intervention logic of individual supporting activities, both in terms of content and methodology, but only provided that the relevant thematic or regional working groups are adequately involved. According to the available data in the creation of TJTP, the smaller active involvement of small innovative actors (SMEs, NGOs, innovative start-ups, etc.) is evident, who can significantly contribute to the diversification of the regional economy and the formation of a transformation story. It is therefore necessary to pay attention to the agenda of stakeholder involvement also in the case of building a monitoring system and planning the evaluation of JTF support (on-going and ex-post view is desirable).

2. **Range of indicators beyond the Annex 3 of the JTF regulation and RACER monitoring principles**

As mentioned above, the MA of the OPJT plans to use in the preparation of monitoring indicators only those that are recommended in Annex 3 of the JTF Regulation proposal. This is a pragmatic approach in terms of the preparation of the operational programme and the effort to avoid the complex setting of the indicator system, and the TA team considers this possible. However, in connection with the previous recommendation, it is not possible to forget that **in order to strengthen the argumentation of the intervention logic** of individual OPJT priorities and individual specific supporting activities, **it will be necessary to include other indicators** from the national code list of indicators administered by the MoRD. From this point of view, it seems appropriate to add more and qualitative indicators based on the expected goals of the transformation story. It is appropriate to focus on indicators with a qualitative assessment of progress in sustainable development, quality of life of the population, the potential to achieve climate neutrality, the development of quality jobs, etc.

Regarding the setting of the indicator system, in general, it is possible to recommend a reflection "Better regulation toolbox, no. 41"²²⁴ of the European Commission, which is focused on monitoring and evaluation. In addition to the various recommendations and specific proposed

²²⁴ See: https://ec.europa.eu/info/files/better-regulation-toolbox-41_en

procedures, it is appropriate to emphasize the general **RACER principles** that must be followed when setting and validating the proposed indicators:

- **R - Relevant** - the indicator must be closely linked to the objectives to be reached. They should not be overambitious and should measure the right thing.
- **A - Acceptable** - the indicator must be easy to understand and must be perceived as acceptable (e.g. by staff, stakeholders).
- **C - Credible** - the indicator must be accessible to lay people, unambiguous and easy to interpret. If necessary, composite indicators might need to be used instead - such as country ratings, well-being indicators. As they may be difficult to interpret, they should be used to assess broad context only
- **E - Easy to monitor** - it should be possible to collect data with available sources in the appropriate range and depth.
- **R - Robust** - the indicator must be clearly defined so that it is not manipulated and misinterpreted, but at the same time so that it is sufficiently sensitive and changes can be monitored.

3. **Effective monitoring of OPJT (MoE) and strong hierarchical evaluation background (OPJT at MoE and TJTP at MMR)**

Effective monitoring should focus on determining the number and scope of supported projects in the JTF, monitoring the progress of their implementation and identifying potential risks in meeting the set objectives, estimating relevant results that supported projects should bring, etc. Based on the monitoring system of programme and project implementation it will be necessary to establish an analytically strong on-going and ex-post evaluation scheme focused on the factors and effects of the transition in three coal regions. With regard to the scope and breadth focus of the TJTP, which presents the basic document for the provision of support from the JTM, which means it applies not only to the JTF, but also to the remaining pillars (i.e. support of enterprises through InvestEU and soft loans for the public sector), it will be necessary to create three levels of strong evaluation as part of this agenda, the TA team recommends setting up a separate evaluation unit at the level of the Ministry of the Environment only for OPJT and separate evaluation units at the level of coal regions, which should be interconnected to share experiences in applied monitoring and evaluation approaches. This is therefore the regional and programme level of evaluation.

The third level of evaluation background (unit) should operate at the Ministry of Regional Development and focus on the synthesis and comprehensive evaluation of the overall operation of TJTP, i.e., use information and data from the implementation of Pillar 2 (InvestEU) and Pillar 3 (Public sector loan facility).

Experience in the Czech Republic shows that functional strong evaluation units within individual operational programs can significantly contribute internally to the success of the implementation of a given operational programme or strategy planning. However, in order to build an evaluation unit, it is necessary to employ evaluation specialists who have experience with qualitative and quantitative evaluation methods, as well as impact evaluations. Such specialists will then be able to competently prepare the content and focus of quality OPJT evaluations, they will also be able to adequately manage and evaluate the findings, results and recommendations of larger evaluation projects.

4. **Set up monitoring so that it is possible to effectively collect valid data at regular intervals at minimal cost and with long-term time reflection - case of social impacts evaluation and data sharing in public administration**

As mentioned above, in the case of the recommended use of SMART Dashboard, it is important to prepare the settings of relevant indicators and especially the method of their collection, which requires strong involvement of key stakeholders. An example is the case of social impact assessment, for which the indicator *RCR 203 - participants employed after the end of their participation, including the self-employed*, can be chosen. For such indicators, it is necessary to ensure the possibility of measuring the indicator over time.

The social impacts of public interventions are among the more complex evaluation agenda, as their quantification is possible through common labour market and employment indicators. However, proving the causality of the implemented intervention with impacts has so far been almost impossible in the Czech Republic. The main reason was the inappropriate setting up of

the monitoring system in relation to the results and impacts of ESF programs on the labour market, which did not provide the basis for adequate evaluation. The TA team recommends setting up a monitoring system so that it is possible to retrospectively verify the situation of supported persons from disadvantaged target groups on the labour market. To do this, it will be necessary to set up the collection of necessary data (i.e., not only the name and surname of the person, but also other personal data, such as personal identification number). During the implementation of the OPJT, it will be possible to verify the level of representation of these persons among the unemployed, employed or self-employed. For such a monitoring model, it will be necessary to ensure the conditions of monitoring according to the GDPR, and to prepare an evaluation system so that it is possible to verify the current situation of supported persons on the labour market in an anonymized form in the central database of the Czech Social Security Administration (CSSA). For example, it may be a verification according to milestones in 2024 and 2029. It is not important for OPJT what state on the labour market a particular supported person has, relevant is only aggregated information on the percentage of people among employees, unemployed or self-employed.

This verification model has already been piloted several times by the Ministry of Labour and Social Affairs of the Czech Republic in previous programming periods. However, the problem arose in the degree of willingness and readiness of the CSSA to cooperate on this agenda, because they themselves are overwhelmed by their own work agenda.

8.2 Risks, prevention & mitigation (likelihood and impact of risks rated as high, medium and low)

Distinguishing between the risks and potential prevention and mitigation measures during the TJTP elaboration process and the implementation of the OPJT is also of key importance.

Table 37: Risk management concerning the TJTP elaboration and OPJT implementation process

Risk	Prevention measure proposed	Mitigation measure proposed
Low maturity of project pipeline	Education and explanation on JTF possibilities by the consultants and MoRD in stakeholder dialogues undertaken to inspire the generation of project ideas. Sharing of Just Transition good practices from other countries in all project deliverables.	MoRD to explore with JASPERS (Joint Assistance to Support Projects in European Regions) for supporting local authorities and promoters free of charge.
Lack of data/unreliable data (e.g., no definitive plans for the restructuring of coal-fired power plants)	Soliciting data from multiple sources	Using proxy data/modelling from Cambridge Econometrics Working with statistical trends at company level to make assessment of impact trajectories
Lack of clarity on eligibility of certain areas of investment	Permanent dialogue with MoRD, MoE and the European Commission	Comprehensively identifying the investment needs at the regional level
Missing participation/motivation of regional and local authorities to progress regions, other regional stakeholders including companies, academia and NGOs to become active and experienced owners of project	We will rely on the dedication of the Ministries (MoRD and MoE) and the regional authorities of the three coal regions to drive participation via: <ul style="list-style-type: none"> Informing early, equally and openly all parties about the JTF instrument and other funding sources available 	Deliverable 2 sets out the strategies and provides a detailed roadmap for the preparation and the implementation of the plans (Annex 12 of D2), outlining how various stakeholders are connected and how they should be engaged at the national, regional, and local levels.

Risk	Prevention measure proposed	Mitigation measure proposed
	<ul style="list-style-type: none"> Reducing the complexity of procedures and the regulatory burden (for SMEs) Improving support for potential project applicants Creating a single point of contact for all funds applications. 	
Risk that projects for small players are considered less important than strategic projects for the regions	Establish an allocation share reserved for strategic projects with less than 50% so that small players' project and others can have a significant share.	Create a system for monitoring and evaluation of the support for small innovative actors (SMEs, NGOs, innovative start-ups, etc.) in the sense that they contribute to the process of diversification of the regional economy and the formation of transformation story.
Lack of policy planning and monitoring capacity at the level of regional authorities	Ensure that the right people, adequate systems, and budget are assigned for these tasks	Seek technical assistance to support regional authorities related to policy preparation, policy tracking, implementation support and implementation review.

We would like to emphasize the approach for unreliable data more in detail as follows:

Textbox 2: Risk mitigation measures for unreliable data

When dealing with statistical data for the purpose of modelling future impacts a common issue is that statistical indicators are usually published a few months or a few years later than the period that they describe. While we generally aim to use the most up-to-date historical data as a basis of our simulation exercises processing and verifying new data adds to the length of the overall process. This means that historical data used in the simulations might lag behind reality by some periods. In E3ME and in E3ME-TRE modelling, this phenomena is treated by simulating the data for those periods which can be considered historical, but data is not available for them. E.g., if the latest data published for a given indicator with the required granularity is missing, we might use observed behaviour in the historical period to predict the missing value.

Issue: statistical data lagging behind actuals, due to publishing and processing timing

Prevention: update modelling with latest data available

Mitigation: use simulated data points, "nowcasting" latest indicators

Nevertheless, in the current context of COVID-19 this method would have misrepresented the economic, environmental and energy trends in 2020. Therefore, we have used a different method, taking projections (economic and energy; available at the time of modelling) into consideration to account for extraordinary shocks to the system. For the year 2020, therefore we calculated with these projections (EC, IMF) instead of simulating data points based on historical relationships.

Issue: simulating based on observed relationships for 2020 might not be realistic because of COVID-19

Mitigation: COVID-19 impact included exogenously in the model data, using projections from authoritative sources

In other cases, historical data might be missing or the data might be incomplete. This is known to be the case in terms of how the bottom-up energy modelling of E3ME-TRE is built up. While the JRC-PPDB-OPEN database covers much of the existing power plant fleet in the Czech Republic, there are cases where we had to use different sources (JRC Geothermal PP database, Global Power Plant database and other sources) to complement the data. Even then some data might be missing

(such as commissioning date) which we imputed based on regional or national age averages. (See D3 deliverable for details.)

Issue: incomplete or missing energy generation (power plant) data

Prevention: multiple sources used to complement initial dataset

Mitigation: imputation, where based on regional or national averages where data is not available

Another important area where data is rather scarce is granular data on CO₂ emissions across sectors or emitters. While NUTS-3 level CO₂ emissions were estimated by JRC (LUISA) these projections do not have a sectoral breakdown, nor it is easy to calculate / estimate regional level emissions. For example, the treatment of road transport is highly ambiguous. National level emissions are often calculated based on characteristics of the domestic fleet and mileage travelled, nevertheless when we consider the regional level we would have to account for cross-region usage and other factors, which are less relevant on the national level. To cope with this issue, we have used sectoral GVA differences across regions, as proxy, to share out CO₂ emissions from the national level, with special treatment for the energy sector.

Issue: data is not collected, unavailable at granularity level

Prevention: higher level of aggregation

Mitigation: using proxy variables that are available at the level of granularity and their relationship with the goal variable is known at a higher level of aggregation

9 CONCLUSIONS AND RECOMMENDATIONS FOR IDENTIFIED INVESTMENT NEEDS FOR THE JUST TRANSITION FUND

Based on findings in this report, the TA Team has the following preliminary conclusions and recommendations to strengthen the policy framework in the context of defined investment needs.

- **The regional transformation plans differ in their approach, detail of elaboration, and consistency of intervention logic of the planned activities of the transformation process.**

During April 2021, the individual coal regions submitted their partial regional transformation plans. However, the plans are not sufficiently elaborated to present a clear intervention logic. Based on findings in this report, the TA team has drawn the following conclusions and recommendations to strengthen the policy framework in the context of defined investment needs. However, what we have seen that the plans are progressing and more information is provided by the present report to overcome these observations.

- **The regional transformation plans differ in their approach, detail of elaboration, and consistency of intervention logic of the planned activities of the transformation process.**

Although individual regional transformation plans include a description of complementarity and continuity with other operational programmes, the level of detail varies considerably. At the same time, the individual regional transformation plans do not always have a clearly defined link to the supported activity in the JTF or other JTM pillars. The degree of processing and detail fluctuates.

Recommendation: Individual coal regions should clearly define a transformation story in their regional transformation plans, to which the intervention logics of individual groups of supported activities will be linked. The Ministry of Regional Development should give the regions clear formal guidelines for processing to synchronize the ideas of coal regions about their transformation also in terms of the TJTP. This is a prerequisite to establish criteria for project selection and the defining of indicators.

- **The prioritisation of measures in the regional transformation plans is sometimes not clear and fragmented.**

Due to an unclear or missing definition of the transformation story and collection of ideas from different stakeholders based on a bottom-up approach, the regions decided on fragmented support, including a wide range of operations. At the same time, it will be possible to finance some activities from other operational programmes or funds. Given the unclear definition of the transformation story, involvement of different stakeholders and the lack of intervention logic of individual areas of activity, there is a high risk of fragmented support and limited transition results.

Recommendation: Following the definition of the transformation story and the intervention logic of individual areas of supported activities, the TA team recommends reducing the scope of supported activities. The measures in the transformation plan should consequently follow the philosophy of the JTF regulation (proposal) and underline the needs of the climate transition.

- **The transformation plans of the regions include information about complementary use of other operational programmes and funds.**

The complementarity and synergy with other programmes is considered, but often in a very general sense. The Czech Republic is still in the process of drafting the Partnership Agreement, particularly in terms of operational programmes of the cohesion policy and the Resilience and Recovery Plan.

Recommendation: The regions should carefully consider and evaluate the development of the programming of complementary funds and the pool of proposals for the Modernisation Fund from the coal regions. Regions should only include projects for JTF funding if they cannot be covered by other funding options (e.g., RRP and Modernisation Fund). The possibility of combining different funding sources for transition needs should be systematically analysed.

- **The regional transformation plans include a wide range of measures with respect to the climate transition and Just Transition. The strategic focus is in progress.**

The Just Transition is aimed at mitigating the socio-economic impacts of the transition, not at the climate neutrality transition itself. Having said that, the climate mitigation actions may and often do inherently have a just, social aspect. Therefore, the climate mitigation actions (energy efficiency, low carbon technologies and other) can be part of the JTM and the Transformation Plans. However, there must be a clear link to the “Just” component of the transition. An example for all three regions is the focus of the instruments to alleviate (energy) poverty and assist vulnerable households. Similarly, the development of energy communities and democratisation of energy could be another example enhancing the investment gap in community engagement and social infrastructure (even though the energy communities as such will also be supported by the Modernisation Fund).

Recommendation: The regions should identify investment needs and potential projects aiming at “win-wins” – i.e., climate transformation and social issues (related to the energy poverty). Concerning strategic planning, the municipalities should be more involved.

- **The strategic projects in coal regions will to a large extent determine the transformation path of regions. The readiness of strategic projects for the transformation process will be crucial.**

The strategic projects in all three regions should be submitted by the end of April 2021. They will indicate the strategic focus of key players (potential beneficiaries) and the absorption capacity in the regions.

Rough estimates of the absorption capacity of the JTF, according to the available version of the pool of project ideas (project fiches collected in December 2020), showed that the transformation story of the regions in relation to the Just Transition and climate agenda is not clearly defined. Therefore, it is difficult to determine the transformation potential of project intentions and planned strategic projects.

Regarding the estimated total financial scope of the JTF, the contribution of JTF should be mostly directed towards climate agenda activities closely linked to social issues in the regions and make a significant contribution towards NECP objectives (i.e., a significant share of expected clean energy investments).

Recommendation: It is necessary to first complete the inventory of strategic projects and then comprehensively evaluate the readiness of each individual coal region for JTF financing. Thus, emphasis must be placed on the transformation story of regions and the transition to climate-neutrality. Strategic projects need to be evaluated on an on-going basis.

- **Timeframe of measures is not yet defined (which is of key importance for large economic operators).**

The review of regional transformation plans revealed that the analytical section does not include detailed specification and timeframe of measures for large economic operators. This might partly result from uncertainty about the development of the regulatory framework (the governmental decision about the date of the coal phase-out is still undecided). In turn, this causes uncertainty about the development of the regional job market and does not provide information for small players (municipalities, NGOs) about measures and project needs.

Recommendation: The transformation plans need to be developed and complemented with the strategic plans and measures envisaged by large economic operators, especially the main emitters (EU ETS sources) in the region.

- **The transformation plans emphasise existing productive regional structures.**

Maintaining existing production via modernisation is partially justifiable (continuity). Nevertheless, the pitfalls of the region’s lock-in process cannot be neglected. The provided scenarios of regional diversification (change) and support of new activities are rather shallow in the RTPs.

Recommendation: The story or scenarios of economic diversification need to be better elaborated. In the current state, conservation of existing productive regional structure instead of regional change (conversion) is prevailing.

- **The transformation plans at times appear to be prepared according to opportunity-led planning.**

Consequently, for some formulated operations (e.g., support of hydrogen economy, cultural and creative industries, digitalisation), robust empirical evidence connected with regional specifics is missing and rough estimations of the future impact of the JTF on regional structures is hard to predict.

Recommendation: All transformation plans should be based on robust empirical evidence. Such evidence might allow juxtaposition between regional needs and planned operations and can help to avoid investment into unsustainable or wishful projects. To put it simply, more regional realism in transformation plans is needed.

10 ANNEXES

Annex 1: Assessment of the Transformation Plans of coal regions Czech Republic

Annex 2: JTF activity Regulation (Article 8) and proposal of indicators for individual regional priorities

Annex 3: Energy and heating sector in the Just Transition

Annex 4: Reference List

Annex 5: Smart Dashboard design

Annex 6: Statistical data and further outputs from analyses of the Czech coal region, including the regional data for the climate transition and skills mis-match analysis (separate file in a link)

Annex 1

Assessment of the Transformation Plans of coal regions in the Czech Republic (attributed to 6.1 section) – status June 2021

All three coal regions in the Czech Republic are currently working on their regional transformation plans. The plans are still in the draft version, therefore the review below should be considered as preliminary picture of regional strategic plans. For the assessment the technical assistance team used the following versions of the regional transformation plans available in June 2021: Moravian-Silesian Region - version from June 2021; Ústí Region - version 7 from May 3, 2021; Karlovy Vary Region - version 4 from June 6, 2021.

For the review of the regional transformation plans, the assessment of the strategic projects of the regions is essential. All three regions have already collected and assessed the strategic project proposals. Although there was still some uncertainty about the final list of these projects at the time of the evaluation, the Technical Assistance Team has worked with the preliminary list.

The checklist for the review of regional transition plans is derived from Recitals and Articles of the Regulation establishing the Just Transition Fund (version provisional common agreement reached by the co-legislators on 09-12-2020)

Criteria	Moravian Silesian region	Ústí region	Karlovy Vary region
(1) Is the RTP aiming to contribute to limiting global temperature?	YES However, rather in the implicit way. In general, the ambition was identified.	YES However, the issue is addressed very generally.	YES, but rather in the implicit way. In general, the ambition was identified.
(2) Does the RTP consider wider social, economic and environmental impacts of the transition on the region?	Partially Economic and environmental impacts are considered sufficiently, nevertheless, social impact is rather neglected.	YES Impacts related to all three pillars are considered, although there are differences in the depth of their elaboration.	YES Impacts related to all three pillars are considered in the RTP.
(3) Does the RTP indicate the deployment of all possible instruments to mitigate adverse consequences of the transition?	NO as was mentioned above, the social dimension of transition is neglected.	NO	NO The use of all 3 pillars of the JTM is indicated; the deployment of other possible instruments was announced
(4) Does the RTP address social, economic and environmental consequences for citizens of the region, in particular for workers affected in the process of transitioning?	Partially More detailed (especially social) consequences of transition are rather missing.	YES One of the specific objectives is increasing social cohesion and community development in municipalities including a support of social	YES Specific objectives cover all three pillars, but the focus of the RTP is more on targets and measures rather than on the impacts.

Criteria	Moravian Silesian region	Ústí region	Karlovy Vary region
	The impact on most vulnerable communities is limited or unclear. Miner communities are mentioned only with regard to the utilization of industrial culture or re-employment.	services for vulnerable groups. On the other hand, the specific objective for the increase in employment and employability of workers in the labour market is insufficiently developed. In addition, the environmental dimension is lagging behind in relation to cities and citizens.	The need to reduce disparities among micro-regions is mentioned in the RTP.
(5) Does the RTP promote balanced socio-economic transition via diversification and modernisation of the local economy and by mitigating the negative repercussions on employment?	YES This dimension is presented, nevertheless, some complexity is missing	YES This dimension is elaborated in detail.	YES This ambition is implicit resulting from the overall concept of the RTP.
(6) Does the RTP support activities that respect the climate and environmental standards and do no significant harm to the environmental objectives?	YES The environmental dimension is considered.	YES This dimension is considered especially in relation to a support for low carbon technologies, new energy and reclamations of post-mining landscapes.	YES but in a very general format, resulting from 3 strategic goals and priority programmes: economic transformation, social transformation, environmental and climate transformation Every priority programme has 2 priority areas with more specific goals.
(7) Do the resources from the JTF complement resources available under cohesion policy?	YES, the complementarity is presented.	YES The complementarity is presented.	YES The complementarity is presented.
(8) Does the RTP focus on the territories that are the most affected by the climate transition process?	YES The spatial dimension is presented. The special awareness will be given to the triangle spread between Havířov, Orlová, Karviná. Simultaneously, in the light of spatial justice, neglect of (peripheral) rural areas and	NO The plan does not specifically identify the most affected areas within the Ústí region.	NO The RTP does not specifically deal with any small-scale territories of Karlovy Vary region.

Criteria	Moravian Silesian region	Ústí region	Karlovy Vary region
	some inner cities (Ostrava) would be a mistake		
<i>Note: ORP level</i>			
(9) Are municipalities and cities involved in the implementation of the JTF resources and their needs in that context are taken into account?	Partly The integration of municipalities is rather limited up to now. Especially the needs of small municipalities seem to be neglected.	Partly. Municipalities are addressed by the digitalization (concept of Smart cities), support of social services or new energetic management. Municipalities are also listed as potential beneficiaries for most specific objectives.	The Karlovy Vary region aims to implement participatory principle for JTM. The preparation of the RTP is being discussed at the meetings of the Platform, which is still open for new members, and where some representatives of cities are involved. No more detailed information about the involvement of municipalities and cities in the implementation is available. However, e.g., the potential of the 3 rd pillar of JTM has been discussed in meetings of the Platform and is mentioned in the RTP, including the assessment of current financial situation of cities.
(9a) Are the recovery and resilience measures to address the COVID-19 crisis carried out?	NO COVID-19 measures are not carried out.	NO	Partially Rather indirectly.
(9b) Does the RTP deal with the identity and future of mining communities?	YES The RTP deals with the mining communities, nevertheless, it is not based on regional/local needs. This needs have be further developed.	Partly. Although the unfavourable image of the region and need for building a new identity is mentioned many times, the plan does not directly address the support of the new identity of the region.	NO The RTP does not cover the new identity or image of the region.
(10) Does the RTP include support of broader range of activities?	NO	YES	YES
(10a) Does the RTP include support for activities in the	Partially	YES	YES,

Criteria	Moravian Silesian region	Ústí region	Karlovy Vary region
area of education, social inclusion and social infrastructure	Education is covered relatively sufficiently; social inclusion is covered just partially and social infrastructure is rather neglected.	The strengthening of existing social services or support for the emergence of new ones is expected, as well as changes in education.	in some specific areas: The priority area KNOWLEDGE has two specific goals: Quality of education (establishment of balneology institute, infrastructure for technical education, education in creative industries) and Reskilling
(11) Does the RTP cover up upskilling and reskilling, including training, of the affected workers?	YES However, the description of this target group and future impact is not elaborated.	YES However, the issue of employment and retraining is very vaguely described in the plan, as well as identification of the target groups is rather general (not explicitly mentioned affected workers).	YES The specific goal Reskilling includes reskilling of the unemployed staff of former mining sites and social innovations for the deployment of services in the "silver economy"
(11a) Does the RTP promote specific situation and role of women in the transitions?	NO	NO Gender issues are not covered.	NO
(11b) Does the RTP pay special attention to vulnerable groups?	NO	Partially. However, any detailed identification of particular vulnerable groups is missing, generally referred to as "employees" or "citizens".	YES Specific goal 4.2 – Nobody is left behind – includes 12 measure, most of them targeted at vulnerable groups
(11c) Does the RTP pay special attention to youth?	Partially, There is a short mention about the mitigating of brain-drain, but in a very limited manner. The education of youth is stressed, nevertheless more traditional approaches is prevailing.	Partially. They are specifically mentioned as target groups in specific objectives related to development of cultural and creative industries and education in areas of specialization of the region.	NO This group mentioned only in relation to brain drain and expected changes in education
(12) Does the RTP envisage support to enterprises and economic	YES	YES	YES

Criteria	Moravian Silesian region	Ústí region	Karlovy Vary region
stakeholders including through support to productive investment to SMEs?			The priority area INNOVATION has 3 strategic goals: Research and innovation, Creativity and design, Digitalization and new products. All three strategic goals include specific measures supporting SMEs
(13) Are ERDF or ESF+ complementing JTF resources envisaged in the RTP?	YES it is presented. Nevertheless, more information is needed.	YES Needs to be clearly specified once the details about programmes are ready.	YES, Needs to be clearly specified once the details on programmes are ready.
(14) Is the RTP consistent with the National Energy and Climate Plan?	Partially The NECP is not explicitly reflected. However, the measures proposed may be in accordance with NECP.	NO The NECP is not reflected. However, the measures proposed are in accordance with NECP.	YES NECP is mentioned in the analysis of the context frameworks.
(15) Does the RTP take into account the depopulation risks and identify operations needed to contribute to job creation?	NO There are some mentions, however in a very limited way. Need to be better addressed.	NO The issue of migration is not explicitly mentioned, however, measures for job creation are mentioned.	Partially The analysis of the current situation is included in minimal extent (negative demographic development mentioned), the issue of depopulation was repeatedly mentioned at the Platform meetings.
<i>Article 4</i>			
(16) Scope of support - Does the RTP support following activities:			
(a) productive investment in SMEs	YES, Programme 3 GREEN INDUSTRY	YES Priority area I: Enterprise, research, innovation	YES Priority areas TRADITION, strategic goal 1.1 New firms and 1.2 Transformation of firms
(b) investment in the creation of new firms, leading to job creation	YES 3 programmes	YES Priority area I: Enterprise, research, innovation	YES Priority area TRADITION, strategic goal 1.1 New firms and 1.2 Transformation of firms

Criteria	Moravian Silesian region	Ústí region	Karlovy Vary region
(c) investment in research and innovation activities	YES Programmes COMPETENT PEOPLE and INNOVATION ECOSYSTEMS	YES Priority area I: Enterprise, research, innovation	YES Priority area INNOVATION, strategic goals 2.1 Research and innovation, 2.2 Creativity and design, 2.3 Digitalization and new products
(d) investment in the deployment of technology as well as in systems and infrastructures for affordable clean energy	YES	YES	YES
(da) investment in renewable energy	YES	YES Priority area III: New energy and efficient use of resources	YES Priority area ENERGY, strategic goal 6.1 New energy
(db) investments in smart and sustainable local mobility	YES, Programme INNOVATION ECOSYSTEMS	YES Priority area III, New energy and efficient use of resources (part of Hydrogen economy)	YES Priority area REGENERATION Specific goal 5.3 Green cities and municipalities, measure Smart solutions
(dc) rehabilitation and upgrade of district heating networks	YES, Programme NEW ENERGY	YES Priority area III: New energy and efficient use of resources	YES in the priority area ENERGY, strategic goal 6.1 New energy
(e) investment in digitalisation, digital innovation and digital connectivity	YES, Programme DIGITAL REGION	YES Priority area II: Competent people, Smart Region	YES Priority area INNOVATION, in the specific goal 2.3. – Digitalization and new products
(f) investments in regeneration and decontamination of brownfield sites	YES, Programme NEW USE OF THE LAND	YES Priority area IV: Revitalized areas of 21st century	YES, in the priority area REGENERATION, strategic goal 5.1 Regeneration of brownfields and old contaminated sites

Criteria	Moravian Silesian region	Ústí region	Karlovy Vary region
(g) investments enhancing the circular economy	YES, Programme CIRCULAR ECONOMY	YES Priority area III: New energy and efficient use of resources	YES, Priority area ENERGY, specific goal 6.4 Transition to circular economy
(h) upskilling and reskilling of workers and jobseekers	YES, Programme COMPETENT PEOPLE	YES Priority area II: Competent people, Smart Region	YES Priority area KNOWLEDGE, strategic goal 3.2. Reskilling – new start
(i) job-search assistance to jobseekers	YES, Programme COMPETENT PEOPLE	YES Priority area II: Competent people, Smart Region	YES Only some aspects mentioned in the RTP. However, the Czech Republic has a complex system for jobseekers assistance established, coordinated by the Ministry of Labour and Social Affairs, which is supported by ESF programmes.
(j) active inclusion of job seekers	YES, Programme COMPETENT PEOPLE	YES Priority area II: Competent people, Smart Region	YES Priority area KNOWLEDGE, strategic goal 3.2. Reskilling – new start, measure support of reskilling
(k) technical assistance	NO	NO	NO
(l) other activities in the areas of education and social inclusion	NO	YES Priority area II: Competent people, Smart Region The specific goals address:	YES Priority area KNOWLEDGE, strategic goal 3.2. Reskilling – new start, measures Support of social innovations aiming to deliver services for elderly and handicapped people, socially and digitally excluded localities,

Criteria	Moravian Silesian region	Ústí region	Karlovy Vary region
		<p>Increasing social cohesion and community development in municipalities (including community and social services).</p> <p>Improving access to quality services and infrastructure of formal and further education in the areas of regional specialisation (including construction of education facilities and equipment, new study programmes, life-long learning).</p>	<p>Support of digital literacy and online reskilling programmes, Jobs for unemployed in municipal public services, mainly in the blue-green infrastructure, Support for micro- and small enterprises employing reskilled or unemployed workers, Involvement of local action groups in the support of small entrepreneurial activities of reskilled and 50+ citizens</p>
<i>Article 5</i>			
(17) Does the RTP support any excluded activities?	NO	NO	NO
(18) Does the RTP follow clear intervention logic?	Intervention logic needs to be further improved.	<p>Partly.</p> <p>For some expected activities and specific objectives, the interconnections and causality are not clear.</p>	<p>YES</p> <p>For some specific goals the intervention logic is not clear and should be supported by empirical evidence. For some expected activities and specific objectives, the interconnections and causes are not clear.</p>
(19) Expert comments, issues not covered by the previous questions	<p>The vision of MS region is “With the new energy we change the life in the region”. The RTP has the ambition to promote innovations, new economic activities and sectors, knowledge development. The philosophy “nobody will be left behind” is not on the agenda. The complementarity and synergy with other programmes (cohesion policy, Modernisation fund, Innovation fund are mentioned (p. 22):</p>	<p>The RTP includes quite detailed description of the current situation in the region, supported by additional references. The priority areas (called areas of interest are justified by specific facts, with reference to the RE-START analysis and the Strategy of the regional development of the Czech Republic.)</p> <p>The measures are structured in 4 priority areas: I. Entrepreneurship, research, innovation, II. Competent people and Smart region, III. New energy systems and effective use of resources, IV. Revitalised land for 21. century.</p> <p>The RTP seems balanced regarding the measures focused on innovation and economic development versus social issues. However, detailed information about the time frame of repurposing/transformation of main economic</p>	<p>The RTP document available has clear structure, focused on the specific measures derived from defined strategic goal, the measures proposed are listed.</p> <p>The RTP seems balanced regarding the measures focused on innovation and economic development versus social issues. The RTP does explicitly relate to other strategic documents of the region (RIS, strategic development plan) and it seems it might have the ambition to replace them as a document elaborated in more participative modus, implementing the evidence-based approach.</p> <p>The RTP includes 3 priority programmes with 6 priority areas</p>

Criteria	Moravian Silesian region	Ústí region	Karlovy Vary region
	<p>- many issues important for MS region will be covered by other programmes than OP Just Transition,</p> <p>- the RTP is focused on priorities and measures, which are not covered by standard operational programmes and funds; exploiting these extraordinary resources a competitive advantage should be created.</p> <p>The RTP includes 8 thematic programmes.</p> <p>Detailed information about the time frame and regional job market impacts related to the repurposing/restructuring of main economic operators/CO2 emitters is missing</p>	<p>operators/CO2 emitters and its potential impacts on the regional job market is missing and goals have also not been prioritized.</p>	

Annex 2

JTF activity Regulation (Article 8) and proposal of indicators for individual regional priorities

The tables are arranged according to the priorities or sub-programs that have been submitted by the individual coal regions in their transformation plans. However, the order of priorities is not in the order set out in the Regulation, so it is not entirely clear. With regard to EU planning procedures, it is appropriate to unify this not only between individual regions, but also at the level of the TJTP, so that it can be evaluated in relation to the objectives set in the relevant legislation.

Table 1: Recommended monitoring indicators for the regional transformation plan of the Moravian-Silesian Region (June 2021 version)

Note: The monitoring indicators in the Moravian-Silesian Region of the transformation plan were not determined in the April 2021 version. In the updated June 2021 version of the regional transformation plan, only a few indicators were added (and only result indicators in some thematic priorities). Therefore the TA team created a proposal of indicators for the individual objectives of the regional transformation plan and updated it according to regional specific indicators proposed in June 2021.

Thematic priority of the regional transformation plan	JTF Article 8	Recommended output indicators (RCO)	Recommended result indicators (RCR)
Programme No. 1 NEW ENERGY	(d) (db)	RCO 20 - District heating network lines newly constructed or improved (ERDF/CF indicator) RCO 22 - Additional production capacity for renewable energy (of which: electricity, thermal) RCO 97 – Number of energy communities and renewable energy communities supported* (ERDF/CF indicator)	RCR 30 - Enterprises with improved energy performance (ERDF/CF indicator) RCR 31 - Total renewable energy produced (of which: electricity, thermal) RCR 32 – Renewable energy: Capacity connected to the grid (operational)* Fuel and energy consumption - total energy balance (specific indicator in connection with the Development Strategy of the Moravian-Silesian Region)
Programme No. 2 NEW USE OF THE TERRITORY	(f)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments RCO 04 - Enterprises with non-financial support RCO 05 - Start-ups supported RCO 10 - Enterprises cooperating with research institutions	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments)
		RCO 38 - Surface area of rehabilitated land supported	RCR 52 - Rehabilitated land used for green areas, social housing, economic or community activities Number of regenerated brownfields (specific indicator in connection with the Development Strategy of the Moravian-Silesian Region)
Programme No. 3 GREEN INDUSTRY	(a)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 10 - Enterprises cooperating with research institutions RCO 120 – Enterprises supported to achieve the reduction of greenhouse-gas emissions from activities listed in Annex I to Directive 2003/87/EC	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments) RCR 06 - Patent applications submitted to European Patent Office RCR 29 – Estimated greenhouse-gas emissions from activities listed in Annex I to Directive 2003/87/EC in supported enterprises

Thematic priority of the regional transformation plan	JTF Article 8	Recommended output indicators (RCO)	Recommended result indicators (RCR)
			Number of employees in research and development (specific indicator in connection with the Development Strategy of the Moravian-Silesian Region)
Programme No. 4 NEW BUSINESS	(a) (b)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments RCO 04 - Enterprises with non-financial support RCO 05 - Start-ups supported	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments) RCR 03 – SMEs introducing product or process innovation RCR 17 - 3-year-old enterprises surviving in the market Number of small and medium-sized enterprises (specific indicator in connection with the Development Strategy of the Moravian-Silesian Region)
		RCO 101 – SMEs investing in skills development	RCR 97 – Apprenticeships supported in SMEs RCR 98 – SMEs staff completing Continuing Vocational Education and Training (CVET) (by type of skill: technical, management, entrepreneurship, green, other)
Programme No. 5 COMPETENT PEOPLE	(h) (i) (j) (l) + social infrastr.	for participants: RCO 200- un employed, including long-term un employed, RCO 201 - long-term un employed, RCO 202 - inactive, RCO 203 - employed, including self-employed, RCO 204 - below 30 years of age, RCO 205 - above 54 years of age, RCO 206 - with lower secondary education or less (ISCED 0-2), RCO 207 - with upper secondary (ISCED 3) or post-secondary education (ISCED 4), RCO 208 - with tertiary education (ISCED 5 to 8), RCO 209 - total number of participants	for participants: RCR 200 - participants engaged in job searching upon leaving, RCR 201 - participants in education or training upon leaving, RCR 202 - participants gaining a qualification upon leaving, RCR 203 - participants in employment, including self-employment, upon leaving. Share of long-term un employed (longer than 1 year) as a percentage of the total number of un employed (specific indicator in connection with the Development Strategy of the Moravian-Silesian Region)
		RCO 101 – SMEs investing in skills development	RCR 97 – Apprenticeships supported in SMEs RCR 98 – SMEs staff completing Continuing Vocational Education and Training (CVET) (by type of skill: technical, management, entrepreneurship, green, other)
Programme No. 6 INNOVATIVE ECOSYSTEM	(c) (e)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments RCO 04 - Enterprises with non-financial support RCO 05 - Start-ups supported RCO 07 - Research institutions participating in joint research projects (ERDF/CF indicator) RCO 10 - Enterprises cooperating with research institutions	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments) RCR 03 – SMEs introducing product or process innovation RCR 04 - SMEs introducing marketing or organisational innovation RCR 05 - SMEs innovating in-house RCR 06 - Patent applications submitted to European Patent Office Share of employment in high-tech fields (specific indicator in connection with the Development Strategy of the Moravian-Silesian Region)
		RCO 15 - Capacity of incubation created	RCR 17 - 3-year-old enterprises surviving in the market RCR 18 - SMEs using incubator services one year after the incubator creation
Programme No. 7 DIGITAL REGION	(e)	RCO 01 - Enterprises supported (of which: micro, small, medium, large)	RCR 02 - Private investments matching public support (of which: grants, financial instruments)

Thematic priority of the regional transformation plan	JTF Article 8	Recommended output indicators (RCO)	Recommended result indicators (RCR)
		RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments	Number of jobs in cultural and creative industries (specific indicator in connection with the Development Strategy of the Moravian-Silesian Region)
		RCO 13 - Digital services and products developed for enterprises RCO 14 - Public institutions supported to develop digital services and applications (ERDF/CF indicator)	RCR 11 - Users of new public digital services and applications RCR 12 - Users of new digital products, services and applications developed by enterprises
Programme No. 8 CIRCULAR ECONOMY	(g)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments RCO 04 - Enterprises with non-financial support RCO 05 - Start-ups supported RCO 07 - Research institutions participating in joint research projects (ERDF/CF indicator) RCO 10 - Enterprises cooperating with research institutions	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments) RCR 03 - SMEs introducing product or process innovation RCR 04 - SMEs introducing marketing or organisational innovation RCR 05 - SMEs innovating in-house
		RCO 34 - Additional capacity for waste recycling	RCR 46 - Population served by waste recycling facilities and small waste management systems RCR 47 - Waste recycled RCR 48 - Recycled waste used as raw materials RCR 49 - Waste recovered Production, utilisation and disposal of individual types of waste (specific indicator in connection with the Development Strategy of the Moravian-Silesian Region)

Table 2: Recommended monitoring indicators for the regional transformation plan of the Ústecký region (version 7.0, 3 May 2021)

Note: Monitoring indicators in the Ústí region were compiled by the staff of the regional authority (regional transformation plan). The TA team summarized these indicators in this overview table and added notes **highlighted in red** for unclear indicators (or indicators that are not specified by the JTF regulation and are part of the ERDF / CF regulation). This is a working version of the list of indicators, because the final proposal of supported topics will still be approved within the entire TJTP.

Thematic priority of the regional transformation plan	JTF Article 8	Recommended output indicators (RCO)	Recommended result indicators (RCR)
I. Entrepreneurship, research, innovation Specific objective I.1: Increasing the innovation performance of the region, strengthening research and innovation capacity with emphasis on the areas of specialization of the region	(c)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments RCO 04 - Enterprises with non-financial support RCO 05 - Start-ups supported RCO 07 - Research institutions participating in joint research projects (ERDF/CF indicator) RCO 10 - Enterprises cooperating with research institutions	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments) RCR 03 - SMEs introducing product or process innovation RCR 04 - SMEs introducing marketing or organisational innovation RCR 05 - SMEs innovating in-house RCR 06 - Patent applications submitted to European Patent Office Note of the TA team: In version 7.0, other indicators related to participants, digital services and other indicators are newly included in this thematic priority, which, according to the TA team's discretion, are not clearly argued for the focus of the planned activities of the thematic priority. In addition, the TA team considers the extension of other

Thematic priority of the regional transformation plan	JTF Article 8	Recommended output indicators (RCO)	Recommended result indicators (RCR)
			indicators, which are not listed in Annex 3 of the JTF Regulation, to be a very extensive approach lacking rationality in setting indicators. Therefore, we do not include these new indicators in the recommended indicators by the TA team.
		RCO 15 - Capacity of incubation created	RCR 17 - 3-year-old enterprises surviving in the market RCR 18 - SMEs using incubator services one year after the incubator creation
Specific objective 1.2: Increasing the competitiveness of SMEs	(a)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments RCO 04 - Enterprises with non-financial support RCO 05 - Start-ups supported RCO 10 - Enterprises cooperating with research institutions	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments) Note of the TA team: In version 7.0, other indicators related to participants, digital services and other indicators are newly included in this thematic priority, which, according to the TA team's discretion, are not clearly argued for the focus of the planned activities of the thematic priority. In addition, the TA team considers the extension of other indicators, which are not listed in Annex 3 of the JTF Regulation, to be a very extensive approach lacking rationality in setting indicators. Therefore, we do not include these new indicators in the recommended indicators by the TA team.
		RCO 15 - Capacity of incubation created	RCR 17 - 3-year-old enterprises surviving in the market RCR 18 - SMEs using incubator services one year after the incubator creation
		RCO 101 – SMEs investing in skills development	RCR 98 – SMEs staff completing Continuing Vocational Education and Training (CVET) (by type of skill: technical, management, entrepreneurship, green, other)
Specific objective 1.3: Stabilization and development of key sectors for economic transformation	(a)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 10 - Enterprises cooperating with research institutions RCO 120 – Enterprises supported to achieve the reduction of greenhouse-gas emissions from activities listed in Annex I to Directive 2003/87/EC	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments) RCR 29 – Estimated greenhouse-gas emissions from activities listed in Annex I to Directive 2003/87/EC in supported enterprises
Specific objective 1.4: Development of cultural and creative industries and their involvement in the overall development of the region	(a)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments RCO 04 - Enterprises with non-financial support RCO 05 - Start-ups supported	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments)
II. Competent people and Smart Region Specific objective II.1: Improving access to quality services and infrastructures for formal and further education in	(I)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments)
		RCO 67 - Classroom capacity of supported education infrastructure (new or upgraded) (ERDF/CF indicator)	RCR 71 - Annual number of students using education infrastructure supported (ERDF/CF indicator)
		RCO 101 – SMEs investing in skills development	RCR 97 – Apprenticeships supported in SMEs

Thematic priority of the regional transformation plan	JTF Article 8	Recommended output indicators (RCO)	Recommended result indicators (RCR)
the areas of specialization of the region			RCR 98 – SMEs staff completing Continuing Vocational Education and Training (CVET) (by type of skill: technical, management, entrepreneurship, green, other) Note of the TA Team: In version 7.0, other indicators are newly included in this thematic priority, for example in relation to the number of employees in research organizations and other indicators which, according to the TA team, are not clearly argued for the focus of planned thematic priority activities. In addition, the TA team considers the extension of other indicators, which are not listed in Annex 3 of the JTF Regulation, to be a very extensive approach lacking rationality in setting indicators. Therefore, we do not include these new indicators in the recommended indicators by the TA team.
Specific objective II.2: Increasing the employment and employability of workers	(h) (i) (j)	RCO 61 – plocha nových nebo modernizovaných zařízení pro služby zaměstnanosti	RCR 65 – počet uživatelů nových nebo modernizovaných zařízení pro služby zaměstnanosti za rok.
		for participants: RCO 200- unemployed, including long-term unemployed, RCO 201 - long-term unemployed, RCO 202 - inactive, RCO 203 - employed, including self-employed, RCO 204 - below 30 years of age, RCO 205 - above 54 years of age, RCO 206 - with lower secondary education or less (ISCED 0-2), RCO 207 - with upper secondary (ISCED 3) or post-secondary education (ISCED 4), RCO 208 - with tertiary education (ISCED 5 to 8), RCO 209 - total number of participants	for participants: RCR 200 - participants engaged in job searching upon leaving, RCR 201 - participants in education or training upon leaving, RCR 202 - participants gaining a qualification upon leaving, RCR 203 - participants in employment, including self-employment, upon leaving.
Specific objective II.3: Increase the use of digitization for efficient and comprehensible public services to citizens	(e)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments	RCR 02 - Private investments matching public support (of which: grants, financial instruments)
		RCO 13 - Digital services and products developed for enterprises RCO 14 - Public institutions supported to develop digital services and applications (ERDF/CF indicator)	RCR 11 - Users of new public digital services and applications RCR 12 - Users of new digital products, services and applications developed by enterprises Note of the TA Team: In version 7.0, other indicators are newly included in this thematic priority, for example in relation to the number of employees in research organizations or community-led local development strategies for local development and other indicators which, according to the TA team, are not clearly argued for the focus of planned thematic priority activities. In addition, the TA team considers the extension of other indicators, which are not listed in Annex 3 of the JTF Regulation, to be a very extensive approach lacking rationality in

Thematic priority of the regional transformation plan	JTF Article 8	Recommended output indicators (RCO)	Recommended result indicators (RCR)
			setting indicators. Therefore, we do not include these new indicators in the recommended indicators by the TA team.
Specific objective II.4: Increasing social cohesion and community development in municipalities	(l)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments)
		RCO 113 – počet obyvatel zahrnutých do projektu v rámci integrovaných opatření pro sociálně-ekonomické začlenění marginalizovaných komunit, domácností s nízkými příjmy a znevýhodněných skupin Note of TA team: Aforementioned indicator was not identified in the list of indicators.	
		RCO 70 - Capacity of supported social infrastructure (other than housing) (ERDF/CF indicator)	RCR 74 - Annual number of persons using the social care facilities supported (ERDF/CF indicator)
III. New energy and efficiently used resources Specific objective III.1: Development of knowledge, technologies, systems and infrastructures for clean energy	(d)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 10 - Enterprises cooperating with research institutions	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments)
		RCO 18 – Dwellings with improved energy performance RCO 19 - Public buildings with improved energy performance	RCR 26 - Annual primary energy consumption (of which: dwellings, public buildings, enterprises, other) RCR 29 – Estimated greenhouse gas emissions
		RCO 22 - Additional production capacity for renewable energy (of which: electricity, thermal)	RCR 31 - Total renewable energy produced (of which: electricity, thermal) RCR 32 – Renewable energy: Capacity connected to the grid (operational)
Specific objective III.2: Development of new energy sectors	(d)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 10 - Enterprises cooperating with research institutions	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments)
		RCO 18 – Dwellings with improved energy performance RCO 19 - Public buildings with improved energy performance	RCR 26 - Annual primary energy consumption (of which: dwellings, public buildings, enterprises, other) RCR 29 – Estimated greenhouse gas emissions
		RCO 22 - Additional production capacity for renewable energy (of which: electricity, thermal)	RCR 31 - Total renewable energy produced (of which: electricity, thermal) RCR 32 – Renewable energy: Capacity connected to the grid (operational)
Specific objective III.3: Development of community energy	(d)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments RCO 04 - Enterprises with non-financial support RCO 05 - Start-ups supported	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments)

Thematic priority of the regional transformation plan	JTF Article 8	Recommended output indicators (RCO)	Recommended result indicators (RCR)
		RCO 18 – Dwellings with improved energy performance RCO 19 - Public buildings with improved energy performance	RCR 26 - Annual primary energy consumption (of which: dwellings, public buildings, enterprises, other) RCR 29 – Estimated greenhouse gas emissions
		RCO 22 - Additional production capacity for renewable energy (of which: electricity, thermal) RCO 97 – podpořené komunitní energie z obnovitelných zdrojů Note of TA team: Aforementioned indicator was not identified in the list of indicators.	RCR 31 - Total renewable energy produced (of which: electricity, thermal) RCR 32 – Renewable energy: Capacity connected to the grid (operational)
Specific objective III.4: More efficient use of resources, transition to a circular economy	(g)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments RCO 04 - Enterprises with non-financial support RCO 05 - Start-ups supported RCO 10 - Enterprises cooperating with research institutions	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments) RCR 03 – SMEs introducing product or process innovation RCR 04 - SMEs introducing marketing or organisational innovation RCR 05 - SMEs innovating in-house
		RCO 34 - Additional capacity for waste recycling RCO 107 – investice do zařízení pro tříděný sběr odpadu Note of TA team: Aforementioned indicator was not identified in the list of indicators. RCO 119 – odpad připravený k opětovnému použití Note of TA team: Aforementioned indicator was not identified in the list of indicators.	RCR 46 - Population served by waste recycling facilities and small waste management systems RCR 47 - Waste recycled RCR 48 - Recycled waste used as raw materials RCR 49 - Waste recovered
IV. Revitalized areas of the 21st century Specific objective IV.1: Improving the usability of the area affected by coal mining for new activities	(f)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments RCO 04 - Enterprises with non-financial support RCO 05 - Start-ups supported RCO 10 - Enterprises cooperating with research institutions	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments)
		RCO 38 - Surface area of rehabilitated land supported	RCR 52 - Rehabilitated land used for green areas, social housing, economic or community activities Note: In version 7.0, other indicators are also included in this thematic priority, for example in relation to participants in the structure of the unemployed, inactive, etc. This is possible, but according to the description of the specific objective is not clear, which should solve the intervention logic, which will be available in July 2021. The TA team considers the newly added indicators to be very extensive and insufficiently argued in relation to the main activities of this specific goal. Therefore, we do not include these new indicators in the recommended indicators by the TA team.
Specific objective IV.2: Increased use and transformation of the region's industrial heritage potential	(f)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 05 - Start-ups supported RCO 10 - Enterprises cooperating with research institutions	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments)

Thematic priority of the regional transformation plan	JTF Article 8	Recommended output indicators (RCO)	Recommended result indicators (RCR)
		RCO 77 - Capacity of cultural and tourism infrastructure supported (ERDF/CF indicator)	RCR 77 - Tourists/ visits to supported sites* (ERDF/CF indicator) Note: In version 7.0, other indicators are also included in this thematic priority, for example in relation to participants in the structure of the unemployed, inactive, etc. This is possible, but according to the description of the specific objective is not clear, which should solve the intervention logic, which will be available in July 2021. The TA team considers the newly added indicators to be very extensive and insufficiently argued in relation to the main activities of this specific goal. Therefore, we do not include these new indicators in the recommended indicators by the TA team.

Table 3: Recommended monitoring indicators for the regional transformation plan of the Karlovy Vary Region (version 4.0, 6 June 2021)

Note: The monitoring indicators in the Karlovy Vary Region of the transformation plan were newly determined in the Annex of this plan, and therefore the TA team compared and updated its original proposal of indicators for the individual objectives of the regional transformation plan, which was presented in the first version of the D4 report. The TA team appreciates that most of the recommended indicators were accepted by the region's representatives.

Thematic priority of the regional transformation plan	JTF Article 8	Recommended output indicators (RCO)	Recommended result indicators (RCR)
SC 1.1 new businesses	(b)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments RCO 04 - Enterprises with non-financial support RCO 05 - Start-ups supported	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments) RCR 03 – SMEs introducing product or process innovation RCR 04 - SMEs introducing marketing or organisational innovation RCR 05 - SMEs innovating in-house RCR 17 - 3-year-old enterprises surviving in the market
SC 1.2 transformation of companies Note: version 4.0 of the plan is missing a list of possible indicators. The TA team recommends using the following monitoring indicators.	(a)	RCO 01 - Enterprises supported (of which: micro, small, medium, large) RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments RCO 04 - Enterprises with non-financial support RCO 05 - Start-ups supported	RCR 01 - Jobs created in supported entities RCR 02 - Private investments matching public support (of which: grants, financial instruments)
SC 2.1 Research, development and innovation	(c)	RCO 01 - Enterprises supported (: micro, small, medium, large) RCO 04 - Enterprises with non-financial support RCO 07 - Research organisations participating in joint research projects RCO 10 - Enterprises cooperating with research institutions RCO 17 - Investments in regional/ local ecosystems for skills development (ERDF/CF indicator)	RCR 01 - Jobs created in supported entities RCR 03 – SMEs introducing product or process innovation RCR 04 - SMEs introducing marketing or organisational innovation RCR 05 - SMEs innovating in-house RCR 06 - Patent applications submitted to European Patent Office RCR 24 - SMEs benefiting from activities for skills development delivered by a local/ regional ecosystem (ERDF/CF indicator)
SC 2.2 creativity and design	(c)	RCO 01 - Enterprises supported (of which: micro, small, medium, large)	RCR 01 - Jobs created in supported entities

Thematic priority of the regional transformation plan	JTF Article 8	Recommended output indicators (RCO)	Recommended result indicators (RCR)
<i>Note: The content of this SC is not fully in line with the JTF supporting activities and needs to be better argued according to the transformation story and intervention logic</i>		RCO 02 - Enterprises supported by grants RCO 03 - Enterprises supported by financial instruments RCO 04 - Enterprises with non-financial support RCO 05 - Start-ups supported	RCR 02 - Private investments matching public support (of which: grants, financial instruments)
SC 2.3 digitisation and new products	(e)	RCO 13 - Digital services and products developed for enterprises RCO 14 - Public institutions supported to develop digital services and applications (ERDF/CF indicator)	RCR 11 - Users of new public digital services and applications RCR 12 - Users of new digital products, services and applications developed by enterprises
SC 3.1 quality education	(l)	RCO 67 - Classroom capacity of new or modernised education facilities for participants: RCO 200- unemployed, including long-term unemployed, RCO 201 - long-term unemployed, RCO 202 - inactive, RCO 203 - employed, including self-employed, RCO 204 - below 30 years of age, RCO 205 - above 54 years of age, RCO 206 - with lower secondary education or less (ISCED 0-2), RCO 207 - with upper secondary (ISCED 3) or post-secondary education (ISCED 4), RCO 208 - with tertiary education (ISCED 5 to 8), RCO 209 - total number of participants	RCR 71 - Annual users of new or modernised education facilities for participants: RCR 200 - participants engaged in job searching upon leaving, RCR 201 - participants in education or training upon leaving, RCR 202 - participants gaining a qualification upon leaving, RCR 203 - participants in employment, including self-employment, upon leaving.
SC 3.2 retraining- a new beginning	(h)	RCO 01 - Enterprises supported (micro, small, medium, large) RCO 61 - Annual unemployed persons served by enhanced facilities for employment services (capacity) (ERDF/CF indicator) RCO 101 – SMEs investing in skills development for participants: RCO 200- unemployed, including long-term unemployed, RCO 201 - long-term unemployed, RCO 202 - inactive, RCO 203 - employed, including self-employed, RCO 204 - below 30 years of age, RCO 205 - above 54 years of age, RCO 206 - with lower secondary education or less (ISCED 0-2), RCO 207 - with upper secondary (ISCED 3) or post-secondary education (ISCED 4), RCO 208 - with tertiary education (ISCED 5 to 8), RCO 209 - total number of participants	RCR 01 - Jobs created in supported entities RCR 65 - Job seekers using annually the services of the employment services supported (ERDF/CF indicator) RCR 97 – Apprenticeships supported in SMEs RCR 98 – SMEs staff completing Continuing Vocational Education and Training (CVET) (by type of skill: technical, management, entrepreneurship, green, other) for participants: RCR 200 - participants engaged in job searching upon leaving, RCR 201 - participants in education or training upon leaving, RCR 202 - participants gaining a qualification upon leaving, RCR 203 - participants in employment, including self-employment, upon leaving.
SC 4.1 cultural and natural heritage <i>Note: The content of this SC is not fully in line with the JTF</i>	n.a.	RCO 36 - Green infrastructure supported for other purposes than adaptation to climate change (ERDF/CF indicator) RCO 77 - Capacity of cultural and tourism infrastructure supported (ERDF/CF indicator) (ERDF/CF indicator)	RCR 77 - Tourists/ visits to supported sites (ERDF/CF indicator) RCR 78 - Users benefiting from cultural infrastructure supported (ERDF/CF indicator)

Thematic priority of the regional transformation plan	JTF Article 8	Recommended output indicators (RCO)	Recommended result indicators (RCR)
<i>supporting activities and needs to be better argued according to the transformation story and intervention logic</i>			RCR 95 - Population having access to new or upgraded green infrastructure in urban areas (ERDF/CF indicator)
SC 4.2 no one is excluded <i>Note: The content of this SC is not fully in line with the JTF supporting activities and needs to be better argued according to the transformation story and intervention logic</i>	n.a.	RCO 61 - Annual unemployed persons served by enhanced facilities for employment services (capacity) (ERDF/CF indicator) RCO 70 - Capacity of new or modernised social care facilities (other than housing)	RCR 74 - Annual users of new or modernised social care facilities RCR 65 – Annual users of new or modernised facilities for employment services
SC 5.1 regeneration of brownfields and old ecological burdens Note: version 4.0 of the plan is missing a list of possible indicators. The TA team recommends to use the following monitoring indicators.	(f)	RCO 38 - Surface area of rehabilitated land supported RCO 39 - Systems for monitoring air pollution installed	RCR 50 - Population benefiting from measures for air quality RCR 52 - Rehabilitated land used for green areas, social housing, economic or community activities
SC 5.2 landscape regeneration and new agriculture	n.a.	Note: In the version 4.0 of the plan is missing a list of possible indicators. TA Team recommends to use the following monitoring indicators. <i>Note: The content of this SC is not fully in line with the JTF supporting activities and needs to be better argued according to the transformation story and intervention logic.</i>	Note: In the version 4.0 of the plan is missing a list of possible indicators. TA Team recommends to use the following monitoring indicators. <i>Note: The content of this SC is not fully in line with the JTF supporting activities and needs to be better argued according to the transformation story and intervention logic.</i>
SC 5.3 green towns and villages	(d)	RCO 18 – Dwellings with improved energy performance RCO 19 - Public buildings with improved energy performance RCO 36 - Green infrastructure supported for other purposes than adaptation to climate change RCO 60 - Cities and towns with new or modernised digitised urban transport systems RCO 74 - Population covered by strategies for integrated urban development (ERDF/CF indicator)	RCR 26 - Annual primary energy consumption (of which: dwellings, public buildings, enterprises, other) RCR 29 – Estimated greenhouse gas emissions RCR 62 - Annual users of new or modernised public transport RCR 76 - Stakeholders involved in the preparation and implementation of strategies of urban development (ERDF/CF indicator) RCR 95 - Population having access to new or upgraded green infrastructure in urban areas (ERDF/CF indicator)
SC 6.1 new energy	(d)	RCO 22 - Additional production capacity for renewable energy (of which: electricity, thermal) RCO 97 – Number of energy communities and renewable energy communities supported (ERDF/CF indicator)	RCR 31 - Total renewable energy produced (of which: electricity, thermal) RCR 32 – Renewable energy: Capacity connected to the grid (operational) RCR 34 - Roll-out of projects for smart grids (ERDF/CF indicator)
SC 6.2 energy savings Note: version 4.0 of the plan is missing a list of possible indicators. The TA team	(d)	RCO 18 – Dwellings with improved energy performance RCO 19 - Public buildings with improved energy performance	RCR 26 - Annual primary energy consumption (of which: dwellings, public buildings, enterprises, other) RCR 29 – Estimated greenhouse gas emissions

Thematic priority of the regional transformation plan	JTF Article 8	Recommended output indicators (RCO)	Recommended result indicators (RCR)
recommends to use the following monitoring indicators.			
SC 6.3 mass flows and recycling	n.a.	<p><i>The TA team recommend to argue this SC more in relation to the set goals of the JTF or the other two pillars of the JTM. It is possible to use following indicators:</i></p> RCO 34 - Additional capacity for waste recycling RCO 74 - Population covered by strategies for integrated urban development (ERDF/CF indicator)	RCR 46 - Population served by waste recycling facilities and small waste management systems RCR 47 - Waste recycled RCR 48 - Recycled waste used as raw materials RCR 49 - Waste recovered
SC 6.4 transition to a circular economy Note: version 4.0 of the plan is missing a list of possible indicators. The TA team recommends to use the following monitoring indicators.	(g)	RCO 34 - Additional capacity for waste recycling	RCR 46 - Population served by waste recycling facilities and small waste management systems RCR 47 - Waste recycled RCR 48 - Recycled waste used as raw materials RCR 49 - Waste recovered

Annex 3

Energy and heating sector in the Just Transition

Key messages

- The regional potential for renewables largely depends on the technology, which can be site specific (biomass, wind, geothermal), or universal in the Czech conditions (e.g., solar). In case of wind, Ústí and Moravia-Silesia Regions have the highest, so far untapped, potential. In the case of solar, the unused potential remains high in all three regions.
- District heating represents a large part of the overall heating in Czech households and overall economy. It has been largely dependent on coal. In individual heating, around 300,000 households still use coal.
- The coal phase-out for DH will be marked by decarbonisation as well as decentralisation and market coupling. Energy efficiency as a first principle should be applied. It has a large “just” component since it has potential to reduce energy poverty.
- In the short term, and given the speed of the transformation, natural gas is the main component of the transition. However, the future of DH will be a mix of highly efficient cogeneration and direct electrification using RES (solar collectors, heat pumps). District heating is expected to play a significant role in sector coupling. Where feasible the new RES systems should be explored and piloted as soon as possible.

We develop in more detail the renewable energy sources and decarbonisation of district heating, as these two fields are at the core of the low carbon energy transition. At the same time, both have a significant “just” component, be it in terms of energy access and decentralisation in the case of renewable energy sources or coal phase-out and potential impacts on energy prices and thus energy poverty in the case of district heating.

Regional potential of renewable energy sources

While support for renewable energy sources is not at the core of the JTM, the transition to energy sources away from coal is obviously at the centre of the low-carbon transition. In addition, various studies show that the development of RES has net benefits on employment, thus contributing to both low-carbon and the Just Transition.²²⁵ Hence, developing RES sources on the three regions will also enhance the Just Transition.

As for the potential of renewable energy sources and their linkage to regional structure, RES can be structured as follows:

RES, where the potential for future development is limited or not significant.

These include **hydropower and geothermal energy**. In Czechia, there are basically no conditions for the implementation of hydropower plants with a capacity exceeding 10 MW. The potential of small hydropower plants has also been substantially exploited (thanks to the construction of small hydropower plants since the end of the 19th century and also thanks to the support for the renewal of the original plants and the construction of new plants of this type since the mid-1990s). There is modest potential for increasing hydroelectric power generation in the case of 'repowering', i.e., where technology at existing sites is replaced by newer and more efficient technology.

In the case of reclamation of closed opencast lignite mines, one of the methods of reclamation discussed is flooding them with water and possibly using them for pumped storage. These options are discussed mainly in the Ústí Region²²⁶.

In case of geothermal power plants, the primary limiting factor is the low potential given by the geological conditions in Czechia. There is some potential in geothermal energy especially in the Ústí and Karlovy Vary regions. The geothermal potential is currently being mapped and refined. The outputs of the project are expected in June 2022²²⁷. In the case of geothermal energy, a primary use for heat production is expected, including the use of geothermal energy as input for large heat pumps in district heating systems. In addition to high investment costs, the use of this energy is challenging by the often-complicated geological conditions and the potential threat to water resources for spa operations.

²²⁵ <https://www.mdpi.com/1996-1073/14/11/3183/htm>

²²⁶ https://ustecky.denik.cz/zpravy_region/u-jezera-milady-muze-vyrust-nova-precerpavaci-vodni-elektrama-20191010.html

²²⁷ <https://www.energie21.cz/pruzkum-potencialu-geotermalni-energie-2/>

RES, where the potential for future development is significant but regionally differentiated.

This includes **wind energy** in particular. According to an updated study of the potential of wind energy prepared by the Institute of Atmospheric Physics of the CAS in 2040²²⁸, the potential for electricity production from wind energy is between 6 and 19 TWh. The best conditions are found mainly in the border mountains, the Bohemian-Moravian Highlands, the Low Jeseník Mountains and the Beskydy Mountains. Very often, these are areas where the construction of wind power plants is excluded for reasons of nature protection (e.g., national parks). Suitable locations for the development of wind power plants are found, for example, in the Ore Mountains (mainly in the Ústí nad Labem Region), and in the Moravian-Silesian Region. This is also reflected by the installed capacity of the regions. According to the updated wind potential study, the share of coal regions in the conservative scenario is as follows: Moravian-Silesian Region (14%), Karlovy Vary Region (6%), Ústí Region (12%). Similar shares are also observed in the optimistic scenario.

RES, where the potential for future development is significant and available throughout Czechia.

This is mainly the case for **solar energy** and its use for electricity production using photovoltaic panels. Here, we can expect not only an orientation towards the installation of small and medium PV applications on the roofs of buildings (both single-family houses, residential buildings and buildings of business subjects, where the primary electricity consumption on site is assumed), but also large PV applications. These large PV applications have currently been included in the auction systems in the draft Law on Supported Energy Sources (which is expected to be finalised in early July 2021). The plans to date (see NECP) have envisaged the implementation of PV plants without the acquisition of (agricultural) land. Suitable areas for large-scale PV plants can be provided by brownfields, including areas after reclamation of coal mines. Plans for massive investments are also announced by large energy companies, including CEZ, which at the presentation of its updated strategy in May 2021 announced the construction of RES-based power plants with a total installed capacity of 6,000 MW until 2030 (mostly in PV)²²⁹. Investors from the agricultural sector are also becoming interested in the field of photovoltaics - the so-called agrovoltaics, where electricity production in photovoltaics is linked to conventional agriculture (e.g., in the RES+ call from the Modernisation Fund announced in spring 2021, about 700 projects of this type were considered). While solar conditions vary slightly by geographical location, the difference between the best and worst locations in terms of annual global solar radiation differs only by about 10-15%²³⁰.

For small PV, we expect an even spread of the potential across regions, roughly corresponding to the number of inhabitants in each of the regions. For commercial installations (industrial buildings and other commercial and public buildings), the potential could be spread evenly as well, we have linked it to regional GDP, which can be a rough proxy for commercial and industry buildings. For large scale PV, we expect that the existence of brownfields, tips, and lakes over flooded mines will contribute to disproportionately higher potential in the three regions, with higher share in Ústí (+50%) and lower shares in Karlovy Vary and Moravia Silesia (+ 25%).

Conversely, other factors such as lower motivation due to lower income of inhabitants could drive against these assumptions. However, we disregard this in the current exercise given the overall level of granularity of the estimate.

RES, where the potential for future development is significant but regionally differentiated and potentially dependent on future land use rules and the application of sustainability criteria.

This category covers **biomass** used for combustion (electricity and heat production) or solid biofuel production (pellets and briquettes to replace coal in local and small-scale sources) and biomass used for biogas or biomethane production in the future. Future biomass potential depends, among other things, on the state and recovery of forest stands after the 2015-2019 bark beetle calamity (use of residues from logging, these residues are about 15% of the total biomass mass), or on changes in farming methods on agricultural land. Agricultural land is currently threatened by a number of factors, where the consequences of the former pre-1989 farming practices, which still persist to a significant extent today (deficit of organic material in the soil, large monoculture paddocks, soil compaction, etc.), are manifested. These are mainly risks of water and wind erosion, biodiversity reduction, and threats

²²⁸ https://www.ufa.cas.cz/DATA/vetma-energie/Potencial_vetne_energie_2020.pdf

²²⁹ <https://www.cez.cz/cs/pro-media/tiskove-zpravy/cez-predstavuje-cistou-energi-zitrka-do-roku-2030-prebduje-vyrobní-portfolio-na-nizkoemisni-144350>

²³⁰ <http://www.isofenenergy.cz/slunecni-zareni-v-cr.aspx>

to animal migration corridors and landscape connectivity. One of the options discussed to address this problem is the implementation of perennial energy crop plantations, which would help to address these problems and at the same time provide additional biomass for energy purposes. However, sources of relatively affordable (both logistically and economically) biomass are already being exploited. Further development of biomass use for energy purposes (if it were to occur) would require the allocation of a portion of land (generally the least suitable for conventional agriculture) for these purposes. For these reasons, we disregard this potential in our regional analysis as it exceeds the scope of the TA work.

Other sources based on RES and secondary sources. These include, in particular, the efficient use of waste (e.g., the use of sewage sludge) or waste heat (from industrial processes, wastewater treatment plants, etc.). These sources are generally very local and site-specific, this again, exceeding the scope of this work.

District heating

District heating represents a major portion in the overall heating of Czech households. Roughly 40% of Czech households are heated by district heating systems²³¹. In addition, about 10% of households have still use coal for individual heating, roughly 300,000 households.

The shift away from coal has had asymmetric impacts in the heating sector, with the three coal regions significantly dependent on coal use for both central heating and local/individual heating (see following figures). The transformation of these systems away from coal has a strong socio-economic dimension of providing reliable and affordable heating in a situation where in many (or most) cases these systems have no real technical alternative in urban agglomerations. The generation of electricity in CHP systems is also an important aspect of the heating sector, with heat sources contributing significantly to the resource balance (but also to the dynamic services) in the system.

The maintenance of integral district heating systems creates the conditions for the application of the sector coupling concept, i.e., direct and indirect electrification of the consumption sector using electricity from intermittent RES. CHP systems will allow the integration of technologies such as large electric boilers (for the use of surplus electricity from RES), large heat pumps (for the use of e.g., waste heat), and smaller RES-based heat generators (e.g., solar thermal collectors). CHP systems make it possible to combine all these technologies into an integral unit together with heat sources using "green" natural gas (synthetic natural gas produced from green hydrogen) or other synthetic fuels. Large systems also have the advantage of heat storage capability and efficient use of CHP units.

Effective transformation of district heating systems requires technical solutions that will enable the gradual implementation of the sector coupling concept and the integration of RES-based heat sources. This includes a gradual lowering of system temperatures to enable the effective integration of heat pumps and small RES-based sources. A well-designed transformation of the current coal-based systems, where central coal-fired CHP sources are replaced in the first step by appropriately sized natural gas-fired CHP sources, together with the preparation of the system for the integration of heat pumps and other RES-based sources, creates the preconditions for a gradual reduction of the role of natural gas and its use as a backup/peak source (together with the transition to "green" gaseous fuels). Such a transition will both enable a realistic and rapid shift away from coal and avoid the risk of fossil fuel-based heating structure and the risk of stranded assets.

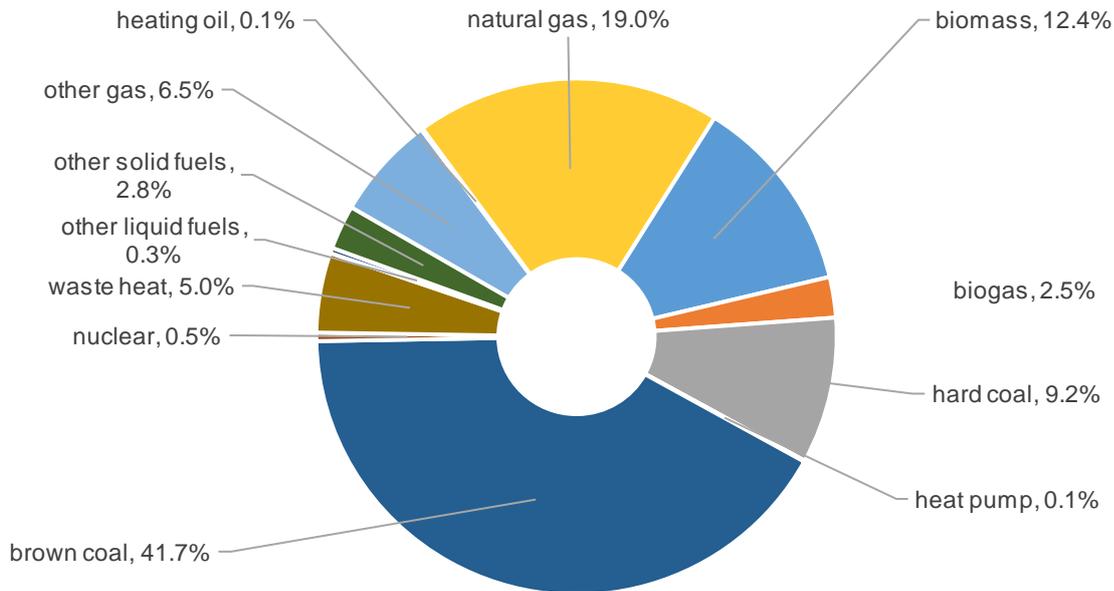
Coal, and especially brown coal, currently plays a significant role in the (district) heating sector of the Czech Republic. A significant part of heat production and supply is provided through coal combustion. According to ERO statistics²³², total gross heat production was 161.7 PJ in 2019. The share of brown coal in total gross heat production was 42%, and the share of hard coal was 9%. Natural gas accounted for 19% and biomass accounted for 12% (see Graph 1)²³³.

²³¹ Energo 2015.

²³² Annual Report on the Operation of Heating Systems in the Czech Republic, ERO 2019, http://www.ero.cz/documents/10540/5391332/Rocni_zprava_provoz_TS_2019.pdf/a4d8e72d-4f7b-4d02-b464-201bf1648479

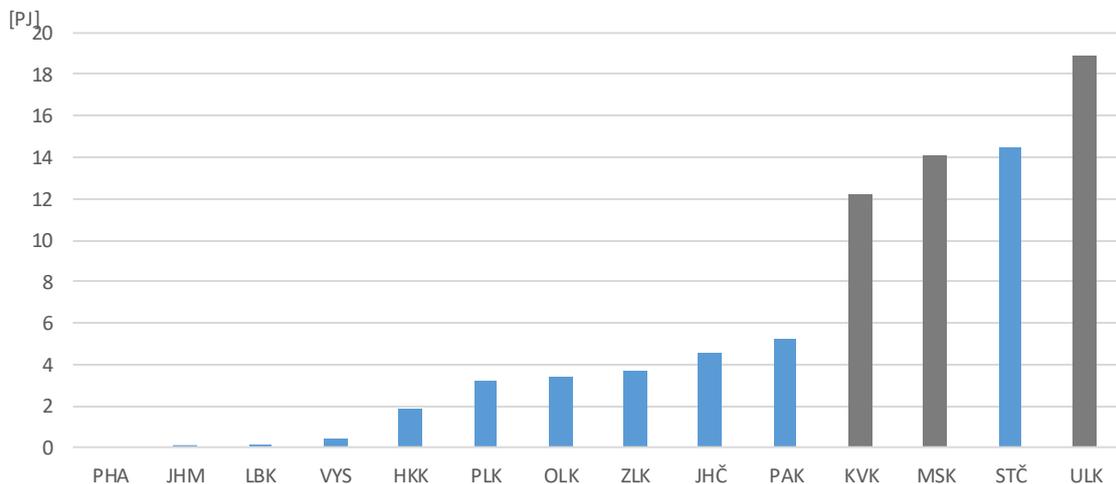
²³³ More also in the D3 Report on the transition process to wards climate neutrality.

Graph 1: Share of fuel types in gross heat production, Czech Republic, 2019²³⁴



The share of coal in gross heat production by region is shown in Graph 2. Roughly 32% of the heat produced by coal was consumed directly in the heating plant itself, which supplied heat for technological production purposes. Heat supplies to final consumers amounted to approximately 87.5 PJ. The structure of heat production by fuel type to final customers is similar to the structure of fuel type in gross heat production with a slightly higher share of coal - brown coal 46%, hard coal 11% and a significantly higher share of natural gas (25%). The share of biomass in the heat supply was 7%. The share therefore clearly shows the high dependence on coal in gross heat production in the three regions of Karlovy Vary, Moravian-Silesian, and Ústí.

Graph 2: Volume of coal in gross heat production (PJ) by region²³⁵



Note: Regions are denoted as: PHA:Prague, JHM: South-Moravian region, LBK: Liberec region, VYS: Highlands region, HKK: Hradec Kralove region, PLK: Pilsen Region, OLK: Olomouc region, ZLK: Zlín Region, JHČ: South Bohemian Region, PAK: Pardubice Region, KVK: Karlovy Vary region, MSK: Moravian-Silesian region, STČ: Central Bohemian region, ULK: Ústí region

The heating sector is currently facing a transformation caused by economic pressure, mainly from the rising prices of emission allowances, but also potential unavailability of coal for district heating

²³⁴ www.eru.cz

²³⁵ Ibid.

purposes²³⁶. The transformation of the heating sector (diversion from coal) is addressed by the Strategy for district heating of the Ministry of Industry and Trade (in preparation in the time of writing of this report). Coal will be replaced by natural gas and biomass, and waste (ZEVO) and sources burning solid alternative fuels (TAP). Natural gas is expected to represent 66% share in the district heating energy mix in 2030, biomass 20%, and ZEVO and TAP make up the remaining 14%.²³⁷

Until April 2021, the ERO in the Czech Republic issued a total of 659 licenses for heat production and 649 licences for heat distribution to entities supplying heat to third parties. There are 101 companies licensed for total thermal output above 20 MWt and 526 with above 1 MWt.²³⁸

i. Low carbon transition of the district heating sector

The challenge of coal phase-out in the heat and cold supply sector can be divided into three categories according to the size of heat sources for which different transformation and decarbonisation pathways will be relevant: 1) large heat supply systems with sources above 20 MWt, which are in the EU ETS, 2) medium heat supply systems (with heat sources up to 20 MWt), and 3) local systems (e.g., block boilers) and individual heating. For local and individual sources, a direct transition to RES - e.g., using heat pumps or sustainably sourced biomass - is the logical solution. On the other hand, for large systems, there is a great absorption potential for heat sources based on intermittent RES and waste heat recovery. At the same time, a direct transition from coal to the exclusive use of RES is technically and economically unrealistic in the Czech conditions. The generation curve of RES-based energy production throughout the year (solar energy) and the relatively limited potential of wind energy, together with the significant heat needs for heating in winter must be respected. Natural gas can thus play a role in large systems as first a base source at first, and over time a semi-peak to peak source.

The study on climate-energy investments in the heating sector 2014-2030²³⁹ by the Czech Technical University in Prague found that in the case of the Czech Republic, the transformation of heating plants to burn natural gas is identified as a bridge technology and transitional solution. Although the use of natural gas brings a primary reduction in greenhouse gas emissions compared to coal, this transformation of heating plants into natural gas must not be taken as a permanent solution that would otherwise hinder the achievement of the EU's long-term climate neutrality goals.

It must be mentioned that natural gas and energy from waste are not eligible to be financed under the Just Transition Mechanism. However, with this in mind, due to the urgency of the coal phase-out in the district heating sector, the short to mid-term transformation will be reliant on natural gas, as one of the only readily available solutions.

The aforementioned study²⁴⁰ develops two scenarios of the low carbon transition by 2030, based on the Ministry of Industry and Trade draft study on district heating sector transformation. For these purposes, it divides the plants according to their heating output into three main categories: installations below 50 MWt, installations of 50–300 MWt, and installations over 300 MWt.

The study shows that in the category of heating plants above 300 MWt, it is practically possible to consider only their reconstruction to firing natural gas. At present, the experts do not see an alternative to reconstructing these plants so that they would emit less GHG emissions. For these reasons, heating companies do not plan to build new installations in this size category. The same applies to using other fuels (such as energy recovery of municipal waste or biomass).

In the category of heating plants between 50 MWt and 300 MWt, it is currently technologically and economically feasible to consider the re/construction of installations based on firing natural gas or hybrid solutions with (smaller) different boilers firing natural gas and biomass. To reconstruct or construct new installations fully on biomass is not possible for the same reasons as discussed in the category of heating plants above 300 MWt. The study also analysed the possibility to introduce

²³⁶ The main consumers of domestic lignite are large coal-fired power plants and second, in terms of consumption, are heating plants. Due to the installed technology, thermal power plants need higher quality coal than power plants. This coal is limited in terms of reserves. In addition, with a possible relatively rapid decline in coal consumption in power plants, coal mining in some locations may be shut down due to the scale of mining falling below a certain minimum level (from an economic point of view). Given the relatively high transport costs (per GJ of heat in the fuel), but also the characteristics of domestic coal, it is unrealistic to consider imports from other countries.

²³⁷ Klimaticko-energetické investice v teplárenství 2014-2030 („Climate-energy investments in the heating sector 2014-2030“)

²³⁸ Přehled údajů o licencích udělených ERÚ

<https://licence.ero.cz/index.php> (Overview of licenses granted by the ERO)

²³⁹ Klimaticko-energetické investice v teplárenství 2014-2030 („Climate-energy investments in the heating sector 2014-2030“)

²⁴⁰ Ibid.

installations in this size category based on energy recovery from municipal waste and alternative solid fuels. These installations will unlikely achieve higher output than 50 MWt due to the fuel's nature, limited availability, and large collection distances. Therefore, they cannot be an alternative in this category.

For the installations below 50 MWt, fuel choice is more flexible but still somewhat constrained. This category currently mainly includes installations up to 20 MWt, therefore not under the EU ETS. The installations below 20 MWt often had to undergo some form of reconstruction or modernisation, realising to some extent their decarbonisation potential. For new installations in this category, next to natural gas and/or biomass, it is possible to consider reconstructions based on energy recovery from municipal waste and alternative solid fuels. However, the latter two installations may not be always feasible because they need a respective reliable supply of waste or alternative fuels that is site-specific. It is also not possible to reconstruct existing facilities to allow them to utilize these fuels. Therefore, these installations could only be new.

The strategy outlined above can be considered the key strategy until 2030. However, clearly, firing natural gas can only be perceived as the transition technology. The other technologies, especially biomass, only have limited potential, and sustainability of this source can be challenging. The challenge (and opportunity) of the transformation has to be tackled within the context of the decarbonisation of the whole economy (especially energy efficiency, energy conservation and decarbonisation of the energy demand in industry, households and commerce). In the short run, the coal phase-out is the major driver for transformation and the short-term solution in most cases is natural gas²⁴¹. However, the future of DH will be a mix of highly efficient cogeneration and direct electrification using RES (solar collectors, heat pumps). CHP systems can also be used for energy storage (power-to-heat technology), where CHP systems can efficiently use surplus electricity from intermittent sources (wind and solar) to generate and store heat using large heat pumps²⁴². Where possible these systems should be explored and piloted as soon as possible²⁴³.

ii. Overview of the district heating sector in the Moravian-Silesian Region

There are a total of 12 heat sources in this region with an installed capacity of more than 20 MWt. Another 38 licenses are allocated for heating plants whose installed thermal output does not exceed the limit of 20 MW²⁴⁴.

Table 1: Heating plants in the Moravian-Silesian regions with total thermal output above 20 MWt²⁴⁵

License company	Total thermal output [MWt]
ENERGETIKA TŘINEC, a.s.	613
TEPLO BRUNTÁL a. s.	35
Veolia Energie ČR, a.s.	2,393
BorsodChem MCHZ, s.r.o.	74
OPATHERM a.s.	92
Semperflex Optimit s.r.o.	44
ČEZ Energetické služby, s.r.o.	114
Mayr-Melnhof Holz Paskov s.r.o.	20

²⁴¹ <https://ekonom.feld.cvut.cz/cs/katedra/ide/valenmi7/cic2030/reports/ipp-report-final-en.pdf>

²⁴² The DH systems generally have some capacity to store heat either in their own distribution systems or in specially designed heat storage tanks.

²⁴³ For instance, the City of Prague will explore the option to use the clean water from its waste-water treatment plant for large heat pumps. Given the topography, similar could be explore e.g., in Ústí.

²⁴⁴ Přehled údajů o licencích udělených ERÚ

<https://licence.ero.cz/index.php> (Overview of licenses granted by the ERO)

²⁴⁵ Ibid.

License company	Total thermal output [MWt]
Veolia Průmyslové služby ČR, a.s.	131
TAMEH Czech s.r.o.	1 359
MS UTILITIES & SERVICES a.s.	34
Elektrárna Dětmárovice, a.s.	1 573

Based on the information from the "Impact study of coal combustion phase out in the Moravian-Silesian Region"²⁴⁶, it was found there are six distributing heating systems connected to heat sources, which use 90% of coal or secondary products for heat production.

These six distributing heating systems cover heat supply in the cities of Ostrava, Třinec, Havířov, Karviná, Orlová and Bohumín. These heating systems ensure heat supplied for both the housing sector, non-manufacturing sector, and the industry sector in these cities (see Table 2).

In the towns Frýdek-Místek, Kopřivnice and Bruntál, the distributing heating systems are connected to heat sources that use coal in the range of 52% to 80% for production. By contrast, the distributing heating system in Krnov is connected to a heat source, which uses 81% biomass for production. The other distributing heating systems mentioned below in Table 2 which ensure the supply of heat in the cities of the Moravian-Silesian Region with a population level of more than 10,000 are connected to a heat source that uses natural gas for heat production.

Table 2: Heat supplied to the district heating system in MSR - municipalities with more than ten thousand inhabitants in 2017²⁴⁷

District heating system	Number of flats connected to the district heating system [qnty.]	Distribution of annual heat supply		Total heat supply [GJ]	Brutto - heat production		
		Housing sector / Non manufacturing sector [GJ]	Industry sector [GJ]		Coal [%]	Biomass [%]	Natural gas [%]
Ostrava	100,360	6,765,531	2,899,513	9,665,044	99.9	0	0.1
Třinec	9,229	525,905	1,224,260	1,750,165	98.5	0	1.5
Havířov	29,000	-	-	1,418,734	99.7	0.1	0.3
Karviná	21,778	-	-	1 027 359			
Frýdek-Místek	18,342	-	-	763,485	52.5	47.5	0
Krnov	4,370	-	-	488,110	19	81	0
Kopřivnice	6,644	195,435	188,306	383,741	73.2	22.5	4.3
Orlová	8,602	-	-	361,768	91.8	0	8.2

²⁴⁶ Dopadová studie odchodu od energetického spalování uhlí v Moravskoslezském kraji (Impact study of coal combustion phase out in the Moravian-Silesian region)

<https://www.mskec.cz/data/storage/files/dopadova-studie-moravskoslezske-energeticke-centrum-web.pdf>

²⁴⁷ Dopadová studie odchodu od energetického spalování uhlí v Moravskoslezském kraji (Impact study of coal combustion phase out in the Moravian-Silesian region)), November 2020. <https://www.mskec.cz/data/storage/files/dopadova-studie-moravskoslezske-energeticke-centrum-web.pdf>

District heating system	Number of flats connected to the district heating system [qnty.]	Distribution of annual heat supply		Total heat supply [GJ]	Brutto - heat production		
		Housing sector / Non manufacturing sector [GJ]	Industry sector [GJ]		Coal [%]	Biomass [%]	Natural gas [%]
Bohumín	5,700	-	-	194,798			
Opava	8,936	-	-	187,855	0	0	100
Bruntál	4,515	174,173	0	174,173	80.5	0	19.5
Nový Jičín	3,542	-	-	157,097	0	26.1	83.9
Český Těšín	4,705	129,150	0	129,150	0	0	100
Hlučín	2,205	55,284	0	55,284	0	0	100
Frenštát pod Radhoštěm	1,269	-	-	-	-	-	100
Total annual heat supply [GJ]				16,756,763			

The study described above further concludes that apart from coal, natural gas and RES, secondary energy sources (SES) and, in the future, small nuclear reactors can be considered suitable primary energy sources for the Moravian-Silesian Region. However, according to the TA team, the latter goes far beyond the horizon of 2030.

Second, related to district heating, the study concludes that replacing coal in district heating sources and its low carbon transition presents an excellent potential for the Moravian-Silesian Region's energy supply, which together with the infrastructure and systems, create a compact energy system.

The study evaluates three possible scenarios: 1) natural gas scenario, 2) nuclear scenario, 3) renewable energy scenario. However, the study also clearly states that the renewable energy scenario has only been elaborated as "supplementary". The nuclear scenario then relies on small modular reactors. The study does not consider the contribution of the scenarios to the overall climate neutrality transition.

The study concludes the gas scenario to be "feasible" to lead the transition from coal in all the district heating systems in the Moravian-Silesian Region. For the "nuclear" scenario, it recommends mainly two localities for further development (Třebovice and Dětmárovice) to be "technologically feasible" by 2035 with the need for further economic considerations (e.g., discounting, financial feasibility and bankability, etc.). The renewable energy scenario is the least developed of the three and is based on the regional target of 11% of RES in primary energy in the region from the current 9% (by 2044?)²⁴⁸. It concludes that a suitable mix of RES, as an additional energy source in the district heating sector will be complemented with the potential of closed coal mines, brownfields and building facades.

The gas scenario confirmed by capacity calculations and natural gas availability that the technical feasibility of replacing coal-fired sources with natural gas-fired sources is possible. The most important aspects of the transition from coal-fired to natural gas combustion are the production costs of heat and electricity, which affect the competitiveness of gas sources in energy markets and the availability of natural gas at an economically acceptable distance source.

²⁴⁸ Regional Energy Policy of the Moravian-Silesian Region (2021 – 2044). March 2020.

iii. Overview of the heating sector in the Ústí region

The total installed capacity for district heating in the Ústí Region was 10.2 GWt in 2020, which was roughly 25% of the total installed capacity of Czechia. The table below presents the nine largest heating plants in the region (i.e., with output above 20 MWt). There are an additional 30 licensed heating plants with heating capacity under 20 MWt (and therefore outside of the EU ETS).

Table 3: Heating plants in the Ústí region with total thermal output above 20 MWt²⁴⁹

Licensed company	Total thermal output [MWt]
Elektrárna Počeradý, a.s.	2 435
ORLEN Unipetrol RPA s.r.o.	1 508
United Energy, a.s.	1 079
Lovochemie, a.s.	175
Žatecká teplárenská, a.s.	37
ENERGY Ústí nad Labem, a.s.	248
TERMO Děčín a.s.	74
Mondi Štětí a.s.	662
ACTHERM, spol. s r.o.	84

The Ústí Region has not yet developed its regional strategy for coal phase-out like Moravia-Silesia. However, we can assume that the key findings would be in a similar direction to the ones of MSR and the MoIT strategy.

iv. Overview of the heating sector in the Karlovy Vary Region

The total installed thermal capacity of district heating plants in Karlovy Vary region is 2.9 GWt, which represents 7% of total installed thermal capacity in Czechia. Table 4 shows the largest heating plants in the region (over 20 MWt), of which Sokolovská uhelná, právní nástupce, is the major source with 2.1 GWt. In addition, there are 18 heating plants with the thermal capacity below 20 MWt.

Table 4: Heating plants in the Karlovy Vary region with total thermal output above 20 MWt²⁵⁰

License company	Total thermal output [MWt]
Elektrárna Tisová, a.s.	540
Sokolovská uhelná, právní nástupce, a.s.	2 090
Synthomer a.s.	80
Ostrovská teplárenská, a.s.	24
Veolia Energie Mariánské Lázně, s.r.o.	65

Similar to Ústí, Karlovy Vary Region does not have a specific strategy for coal phase-out in the district heating sector. However, similar conclusions apply.

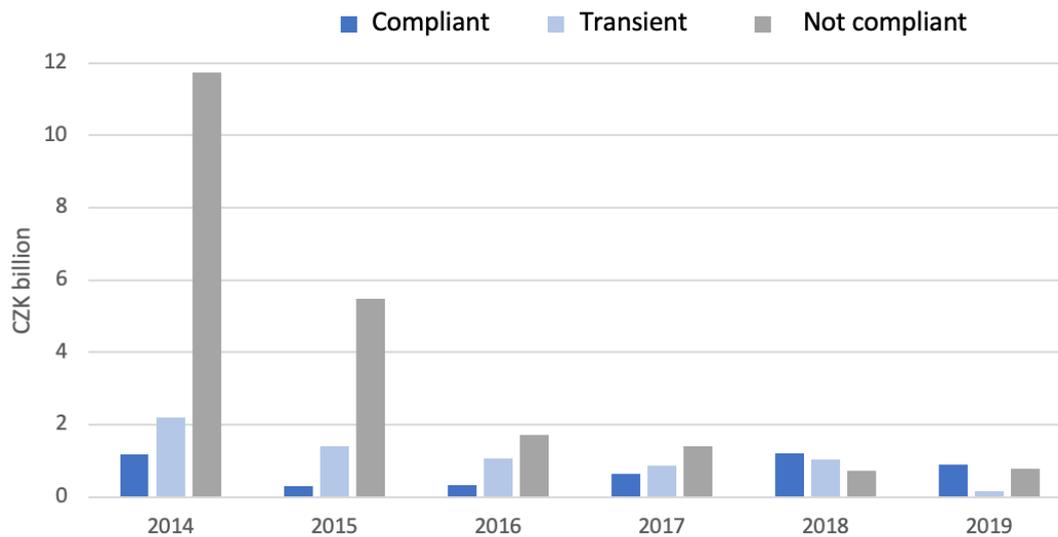
²⁴⁹ Přehled údajů o licencích udělených ERÚ
<https://licence.ero.cz/index.php> (Overview of licenses granted by the ERO)

²⁵⁰ Ibid.

v. *Investing in low carbon transition*

In Czechia, between 2014–2019, total investments in measures to reduce greenhouse gas emissions in the district heating sector amounted to the total of CZK 33.1 billion²⁵¹. The largest investments were implemented in 2014, which is mainly due to the National Investment Plan, which made up almost half the total investments in that year and was linked to the free allocation of emission allowances to the district heating sector. Between 2016-2018 (when the NIP no longer played such a significant role), the annual amount of investments stabilised around CZK 3 billion (Graph 3).

Graph 3: Climate and energy investments in heating sector, 2014–2019 (billion CZK), breakdown by compliance with EU taxonomy²⁵²



From the perspective of future development of the heating sector, it is important to emphasize that the overwhelming majority of these investments (CZK 21.9 billion, i.e., two thirds of investment between 2014-2019) is not in accordance with the current requirements of the EU Taxonomy. That is, they were investments in greenhouse gas emission reduction in coal plants, without a fuel switch. However, Graph 3 also shows that the proportion of the two types of investment became equal during 2016-2019. Thus, 75% of the investments in 2018 were either in accordance with the taxonomy (investments in reducing losses in distribution networks and renewables) or possibly of transitional nature (compared to 66% in 2019). Clearly, the conditions of the support programmes for 2014-2020 were established so that they essentially do not match the current typology of sustainable investment. Therefore, they may thus have an impact on settling these investments in the coming years.

vi. *Further investment needs for the low-carbon transformation*

In this section, we assess the potential investment needs to realise low carbon transition in the district heating sector for the three regions. The analysis is based on the statistical data from the Energy Regulatory Office and the scenarios as presented in the study on climate and energy investment in district heating sector in the Czech Republic²⁵³.

While we are aware that the district heating transformation, and particularly investment in natural gas and energy from waste, are not eligible for support from the JTM, the low carbon transition in the district heating sector (as well as individual heating) has potentially high implications for heat prices (which are already above EU average²⁵⁴). Therefore, there is a potential threat of energy poverty to households connected to DH (currently about 1.6 million), which is closely interlinked with the Just Transition²⁵⁵.

In the district heating sector, this mainly concerns the combustion of natural gas. Thus, it is necessary to analyse which sources do not meet the taxonomy of low-carbon heating and how these sources

²⁵¹ Klimaticko-energetické investice v teplárenství 2014-2030 („Climate-energy investments in the heating sector 2014-2030“).

²⁵² Ibid.

²⁵³ Klimaticko-energetické investice v teplárenství 2014-2030 („Climate-energy investments in the heating sector 2014-2030“)

²⁵⁴ <https://www.euroheat.org/publications/reports-and-studies/european-district-heating-price-series/>

²⁵⁵ For instance, the price of EUA of 30 EUR/t is translated into roughly 90 CZK in the production price of heat, i.e. 36 % of the total price. Increasing of the EUA to 40 EUR/t increases this share to 50 % of the total heat price.

contribute to the entire heating industry to estimate the investment needs for transforming the heating industry. The latest annual final report of the Energy Regulatory Office (ERO) was used—Table 5 lists gross heat production in the regions of the Czech Republic according to fuels. The three regions of Karlovy Vary, Moravian-Silesian and Ústí are highlighted in the table.

Table 5: Main fuels used for central heating in the region in 2019

[PJ]	PHA	JHČ	JHM	KVK	VYS	HKK	LBK	MSK	OLK	PAK	PLK	STČ	ULK	ZLK
Biomass		1 373	491	378	1 135	663	12	6 214	154	45	959	813	7 447	348
Coal	151	361	285	70	673	407	37	329	342	381	378	442	117	133
Other	-	4 526	59	12 198	433	1 895	107	14 105	3 379	5 281	3 189	14 453	18 911	13 646
Natural gas	-	-	80	11	33	3	3	1 762	637	208	-	3 974	1 171	199

Note: Regions are denoted as: PHA: Prague, JHM: South-Moravian region, LBK: Liberec region, VYS: Highlands region, HKK: Hradec Kralove region, PLK: Pilsen Region, OLK: Olomouc region, ZLK: Zlín Region, JHČ: South Bohemian Region, PAK: Pardubice Region, KVK: Karlovy Vary region, MSK: Moravian-Silesian region, STČ: Central Bohemian region, ULK: Ústí region

As discussed above, the following calculation assumes the transformation into three alternative fuels: natural gas, biomass, and energy from waste²⁵⁶. The share of transformation to these fuels is approximated as follows:

1. Two-thirds of the current heat production based on coal will be substituted with heating plants using natural gas (either reconstructed original heating/cogeneration plants or new heating/cogeneration plants)²⁵⁷.
2. About one-fifth of coal used for heat production will be replaced by biomass.
3. About 13% of heat sources using coal will be replaced by new sources based on municipal waste and alternative solid fuels.

The main idea of allocating investment needs for the transformation of the heating industry is the amount of heat produced from coal in the given regions. Therefore, the total investment needs defined by the study (its optimistic and conservative scenarios based on expected technology prices) are divided into a portion of heat production in the regions. Table 6 shows investment needs until 2030. Scenarios consider only the sources with heat installed capacity over 20 MWt (as general reconstruction has been assumed for most installations under 20 MWt). The optimistic scenario identifies an estimate of the lowest costs, while the conservative scenario assumes a higher level of costs. It shows that the investment needs estimate ranges from CZK 14.6 billion (EUR 0.6 billion) in Karlovy Vary Region to CZK 22.6 billion (EUR 0.9 billion) in the Ústí Region by 2030.

Table 6: Investment needs necessary to transform the heating industry in individual regions by 2030 (in million CZK)

Abbr.	NUTS-3	Scenario	
		CONSERVATIVE	OPTIMISTIC
PHA	CZ010	-	-
JHČ	CZ031	5,904	5,414
JHM	CZ064	77	71

²⁵⁶ Ibid.

²⁵⁷ The Ta team is aware of the challenging position of natural gas in the low-carbon transition. There is a risk that investment in firing natural gas could become stranded assets the same way the relatively recent investment in coal firing has become now. However, given the speed of the transformation and the size of the projects, we assess the major options, while acknowledging that the long-term transformation of the sector will have to be marked by further decarbonisation – we also develop on this in other parts of this section,

Abbr.	NUTS-3	Scenario	
		CONSERVATIVE	OPTIMISTIC
KVK	CZ041	15,911	14,590
VYS	CZ063	565	518
HKK	CZ052	2,472	2,266
LBK	CZ051	140	128
MSK	CZ080	18,399	16,871
OLK	CZ071	4,408	4,042
PAK	CZ053	6,888	6,317
PLK	CZ032	4,160	3,815
STČ	CZ020	18,853	17,288
ULK	CZ042	24,668	22,620
ZLK	CZ072	4,756	4,361
Sum in mil. CZK		107,200	98,300

Note: Regions are denoted as: PHA: Prague, JHM: South-Moravian region, LBK: Liberec region, VYS: Highlands region, HKK: Hradec Kralove region, PLK: Pilsen Region, OLK: Olomouc region, ZLK: Zlin Region, JHČ: South Bohemian Region, PAK: Pardubice Region, KVK: Karlovy Vary region, MSK: Moravian-Silesian region, STČ: Central Bohemian region, ULK: Ústí region

vii. Source of funding

We expect that about 80% of all the low carbon operations and measures in the installations have been co-financed or triggered by a public programme or policy (mainly the National Investment Plans under EU ETS, and operational programmes, and operating RES support). It can be expected that in the future low carbon transition, public programmes will continue to play a major role.

The main upcoming instrument to support the transformation of the heating industry is the Modernisation Fund. It is expected that about CZK 40 billion (EUR 1.6 billion) will be earmarked to support the district heating industry. Another source of funding should be the Recovery and Resilience Facility to support the modernisation of heat distribution and, last but not least, the operational support scheme for cogeneration will be instrumental to reduce the expected investment gap between existing climate-energy investments and investment needs. In view of the investments already made, which as we showed, were primarily implemented in coal fuelled operations, the level of aid will be important so that the transformation of the heating industry is reflected as little as possible in the heat price for final customers.

viii. Further considerations of the low carbon transition in district heating

Fuel diversification and flexibility is a key to optimise heating plant operations and reduce its costs. Diversification also makes it possible to reduce the sensitivity of heating plants to external shocks such as fuel price fluctuations, prices of emission allowances, and changes in the regulatory environment. For these reasons, financial intermediaries also prefer financing low carbon technologies instead of fossil fuels, and especially coal.

Fuel switch to natural gas is a short-term technological alternative, which may allow reducing emissions in a relatively cost-efficient and time-wise affordable way. However, the emissions reduction is only 40-50%, and in the future, the installations may either be further upgraded to allow “greening gas” or other

energy carriers with lower carbon content. In the short term, it may help achieve greater flexibility and ability to provide power balancing.

Biomass can only fully replace coal in small installations, for large installations long-term supply of sustainable biomass must be secured, which is highly challenging²⁵⁸. Addressing heat demand in large urban areas would require a large amount of biomass that is rarely possible to produce in a sustainable manner nearby or that is rarely possible to deliver in a low carbon manner. Other renewable sources, such as heat from biogas, also have limited potential.

Energy recovery from waste is a win-win and small-scale installation which may deliver sustainable and reliable energy supply and simultaneously address the needs of sustainable waste management. The realisation of this approach could only be realised in an agreement and cooperation with the nearby municipalities, for whom this concept shall be an element of their waste management strategy. The latter is not always possible due to other, conflicting interests.

Gas turbines and battery energy storage systems can significantly improve the flexibility of energy systems. Technologies that allow regulating electric power supply in a short time significantly contribute to the reliability of production and supply of electricity and heat.

The other way to make the system flexible is to provide energy services to customers. Whenever a retrofit of a heating plant takes place, it is useful to consider the future development of heat demand and supply. It is further useful to work on the reduction of peak demands and thus energy management of customers to avoid the need to address it through additional supply and/or storage.

The reconstruction of heat distribution is an important measure requiring significant investment, especially for the repair and reconstruction of steam distribution systems. Switching to heat distribution at lower temperatures may significantly reduce heat losses, as well as switching to hot water supply instead of steam. This in turn will allow to use further, RES technologies, such as heat pumps (and solar collectors) to further decarbonise the sector and also contribute to market coupling.

²⁵⁸ Biomass is expected to play role in middle sized cogeneration and heating stations and for local sources. In the former case, the fluid boilers have cleaning technologies installed, thereby the emissions of conventional pollution are not significant. In the later case, the biomass, typically pellets, substitute coal, which leads to a substantial improvement of local air quality otherwise still rather typical problem in many rural areas in Czechia.

Annex 4

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