Case study 5

Severozápad

AMO.CZ

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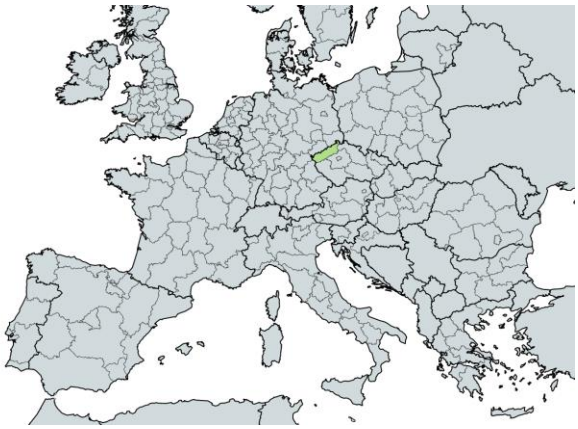
Northwestern Czech Republic (Severozápad), Czech Republic



GDP per capita	€19,200 (2018)
Population	1,115,629 (2020)
Population density	128/km^2
Unemployment rate	4%
People at risk of poverty or social exclusion	21.5%
Share of renewable energy (% of gross final energy consumption)	N/A
Total installed RES capacity	1,549 (GWh) out of 29,522 (GWh) (2019)
Employment in RES	0.1-0.7% (est)

1. NATIONAL CONTEXT

1.1 Overview of key socio-economic indicators

In 2019, the annual GDP per capita (PPP) in the Czech Republic was 29 510 EUR, nearing the EU-28 average of 32 020 EUR and exceeding even Spain.[1] Notably, Czechia was able to ensure unprecedentedly low unemployment in the past years with its 2.0% rate in 2019 being the lowest of EU-28[2], and overall employment rate of 75.1% among people aged 15-64 being one of the highest in Europe.[3]

[1] Czech Statistical Office, https://www.czso.cz/documents/10180/123503161/370002200801.pdf/ab2797f1-254c-40c4-9440-cb8d02f47a77?version=1.1

[2] Czech Statistical Office, https://www.czso.cz/documents/10180/123503161/370002200326.pdf/f19c21a0-06b1-4709-a92e-bc670d478214?version=1.1

[3] Czech Statistical Office, https://www.czso.cz/documents/10180/123503161/370002200313.pdf/96079e48-2a28-45ec-adee-4184bd9c1c83?version=1.1

According to the OECD, Czechia ranked among member countries with the lowest income inequality (GINI coefficient of 0.249 for 2019) with a trend of slightly decreasing inequality in the past decade.[4] Nevertheless, in other key indicators, Czechia is trailing behind. These include public expenditures on education as a percentage of GDP, which are among the lowest in the EU[5], as well as the percentage of 25-34 year olds with tertiary education (33% as compared to OECD average of 45%).[6]

1.2 RES deployment in Czechia

In the Czech energy mix, RES accounts for 16% of gross final energy consumption, surpassing the Czech national target of 13% RES share by 2020. Specifically, RES covers 8% of gross final energy consumption in transport and 23% of gross energy consumption in the heating and cooling sector, the latter dominated by biomass (84% of RES share) followed by heat pumps (8%).

RES generated 10 TWh of electricity in 2019,[7] which corresponds to 14% of gross electricity consumption.[8] Between 2010 and 2019, the electricity generation from RES rose by 59%: most of the change happened between 2010 and 2014, then varied insignificantly. The major boom of solar photovoltaics occured between 2009 and 2011, while the rise of biogas share continued until 2014. The share of wind energy more than doubled by 2019, but still accounts for only 7% of electricity generation from RES.[9]

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[4] OECD, https://data.oecd.org/inequality/income-inequality.htm

[5] Czech Statistical Office, https://www.czso.cz/documents/10180/123503161/370002200701.pdf/07a89be0-117e-414d-a4f5-189c24094d5c?version=1.1

[6] OECD, https://gpseducation.oecd.org/CountryProfile?primaryCountry=CZE&treshold=10&topic=EO

[7] Energy Regulatory Office, https://www.eru.cz/documents/10540/5381883/Rocni_zprava_provoz_ES_2019.pdf/debe8a88-e780-4c44-8336-a0b7bbd189bc

[8] Under the SHARES methodology used by Eurostat, the RES share is 14% in the gross electricity consumption. Ministry of Industry and Trade, https://www.mpo.cz/assets/cz/energetika/statistika/obnovitelne-zdroje-energie/2020/12/Podil-OZE-na-hrube-konecne-spotrebe-energie-2010-2019.pdf;
In gross electricity generation, the RES share stands at 12% due to the high electricity export. Energy Regulatory Office, https://www.eru.cz/documents/10540/5381883/Rocni_zprava_provoz_ES_2019.pdf/debe8a88-e780-4c44-8336-a0b7bbd189bc

[9] Ministry of Industry and Trade, https://www.mpo.cz/assets/cz/energetika/statistika/obnovitelne-zdroje-energie/2020/9/Obnovitelne-zdroje-energie-2019_2.pdf

The boom of solar photovoltaics was caused by the falling prices of solar panels[10] combined with a feed-in tariff regulation for RES set very favourably for the investors with 15-year guaranteed support.[11] Consequently, the 2010 target of 8% RES share in electricity consumption[12] had been met at the cost of considerable state support (tens of billions CZK every year) that shall be paid annually up until 2030. In order to downscale the support, an additional tax on profits from solar electricity was introduced and the regulation was changed in 2010 and 2012.[13] The unfortunate rules for RES support led to a pejorative term 'solar baron' and is the cause of persistent negative public sentiments towards solar energy.

Between 2010 and 2020, the targeted RES share in gross final consumption of energy was set at 13% by Directive 2009/28/EC on renewable energy, accompanied by the binding target of 10% RES share in the transport sector.[14] In response, Czechia published the National Renewable Energy Action Plan for 2020[15]; a stricter version of the original feed-in tariff regulation remains the main support scheme for RES and the fast growth of RES share ceased.[16] The last version of the national plan for RES was approved in 2016 and will be replaced by the NECP after 2021.[17] Moreover, the Czech Government approved the National Action Plan for Clean Mobility (NAP CM) in 2015 and updated it in 2019, based on Directive 2014/94/EU on the deployment of alternative fuels infrastructure.

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[10] Fraunhofer ISE,

[11] Producers had to choose between a fixed feed-in tariff or a premium tariff (green bonus). For biomass cogeneration, only the green bonus applied. Source: Act No. 180/2005 Coll. on the promotion of electricity produced from RES, https://www.zakonyprolidi.cz/cs/2005-180

[12] Directive 2001/77/EC (RES Directive), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02001L0077-20100401

[13] Czech Radio, https://www.irozhlas.cz/zpravy-domov/fotovoltaika-energetika-obnovitelne-zdroje_1912040600_jab; Act No. 165/2012 Coll. on promoted energy sources https://www.zakonyprolidi.cz/cs/2012-165#cast5

[14] Directive 2009/28/EC (RED II), https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009L0028

[15] National Renewable Energy Action Plans 2020, https://ec.europa.eu/energy/topics/renewable-energy/national-renewable-energy-action-plans-2020_en

[16] Act No. 165/2012 Coll. on promoted energy sources, https://www.zakonyprolidi.cz/cs/2012-165

[17] Czech National Renewable Energy Action Plan, Ministry of Industry and Trade, https://www.mpo.cz/cz/energetika/elektroenergetika/obnovitelne-zdroje/narodni-akcni-plan-pro-obnovitelne-zdroje-energie--169894/

In the key strategic document for energy policy, the State Energy Policy (SEP), published in 2015, the optimized scenario (not a target)[18] anticipates a 14% RES share among primary energy sources by 2030, 18% in gross electricity generation and a 13% share of biofuels and electricity in final energy consumption in the transport sector.[19]

The most ambitious policy document to date concerning future RES development is the National Energy and Climate Plan of the Czech Republic (NECP), published in 2020 on the basis of the requirements of Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action.[20] The Czech Republic proposes a 22% contribution to the European target of 30% RES share in gross final energy consumption by 2030, increasing its national target set for the year 2020 by 9%. It was increased after the assessment by European Commission, though failing to reach the suggested level of 23%.[21] The increase of ambition from 22 to 23% would equal to a significant increase of ambition in the area of electricity production: the NECP goal corresponds to a 33% increase in RES final electricity consumption; the ambition of 23% RES share requires a 87% increase.[22] Altogether, the climate ambition stated in the Czech NECP is assessed as insufficient in a report by Ember.[23] However, it is likely that further development will occur in reaction to the enhanced EU GHG emissions reduction target of at least 55% by 2030.[24]

Broken down into sectors, NECP targets are 17% RES share in electricity consumption, 14% RES share in the transport sector (binding target that has been

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[18] Prognosis under specific assumptions (policy on the EU and national level, electricity consumption, GDP, energy prices and accessibility, ETS prices etc.). SEP, Ministry of Industry and Trade, https://www.mpo.cz/assets/cz/energetika/statni-energeticka-politika/2016/12/Statni-energeticka-koncepce-_2015_.pdf

[19] SEP, Ministry of Industry and Trade, https://www.mpo.cz/assets/cz/energetika/statni-energeticka-politika/2016/12/Statni-energeticka-koncepce-_2015_.pdf

[20] NECP, Ministry of Industry and Trade, https://www.mpo.cz/en/energy/strategic-and-conceptual-documents/the-national-energy-and-climate-plan-of-the-czech-republic--252018/

[21] Assessment of the final national energy and climate plan of Czechia, European Commission, https://ec.europa.eu/energy/sites/ener/files/documents/staff_working_document_assessment_necp_czechia.pdf

[22] Analysis of the Czech NECP (actualized), Chamber of RES, https://www.komoraoze.cz/download/pdf/153.pdf

[23] Vision or division? What do National Energy and Climate Plans tell us about the EU power sector in 2030?, Ember, https://ember-climate.org/wp-content/uploads/2020/10/Vision-or-Division-Ember-analysis-of-NECPs.pdf

[24] 2030 climate & energy framework, European Commission, https://ec.europa.eu/clima/policies/strategies/2030_en

assigned for all Member States), and 31% RES share in heating and cooling.[25] Among the electricity sources, photovoltaics leads the way with additional 2 TWh of electricity consumption by 2030 compared with 2020 anticipated consumption, followed by wind (additional 1,1 TWh).[26]

[25] Czech NECP

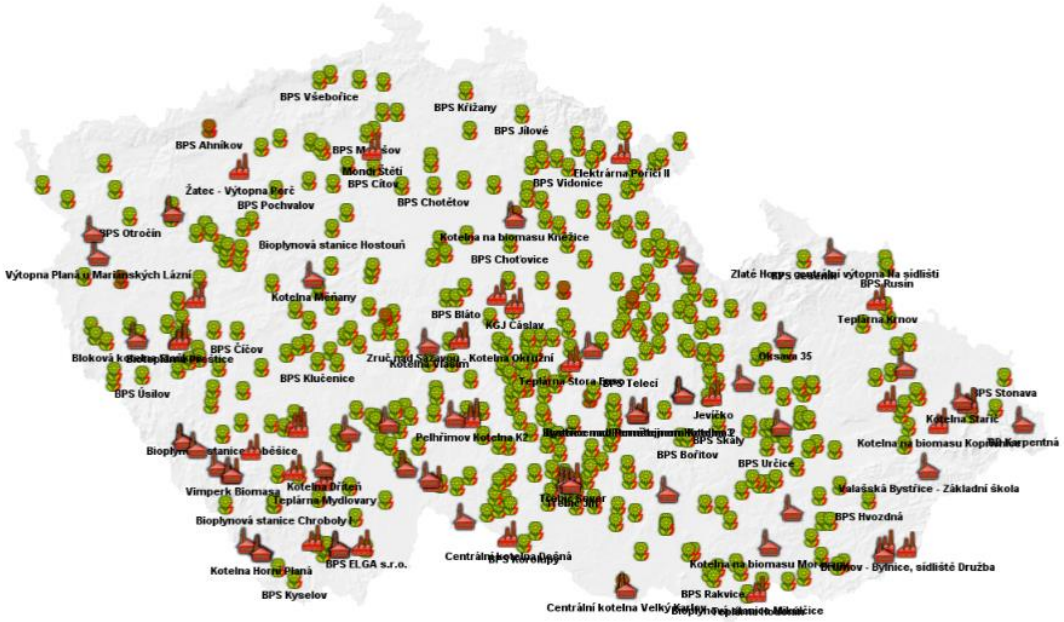
[26] Czech NECP, converted from TJ to TWh

Table 1: CZ electricity generation from renewable energy sources

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Electricity												
Hydro	175.9	181.6	186.4	184.2	187.6	196.1	196.8	197.0	196.0	191.6	192.3	191.5
Wind	18.5	24.7	29.4	31.9	35.6	39.6	41.4	44.8	44.6	47.9	51.3	56.0
Solar	1.1	7.6	52.9	187.6	184.7	174.8	182.5	194.7	183.3	188.6	202.8	198.8
Solid biofuels	100.6	120.1	128.3	144.8	156.3	144.7	171.3	179.8	177.8	190.3	182.4	206.3
All other renew-ables	24.0	38.9	57.6	87.6	133.7	204.4	229.7	232.0	231.1	236.8	232.8	226.4
Total (RES-E numerator)	320.0	372.9	454.7	636.2	697.9	759.6	821.7	848.2	832.7	855.2	861.5	878.9

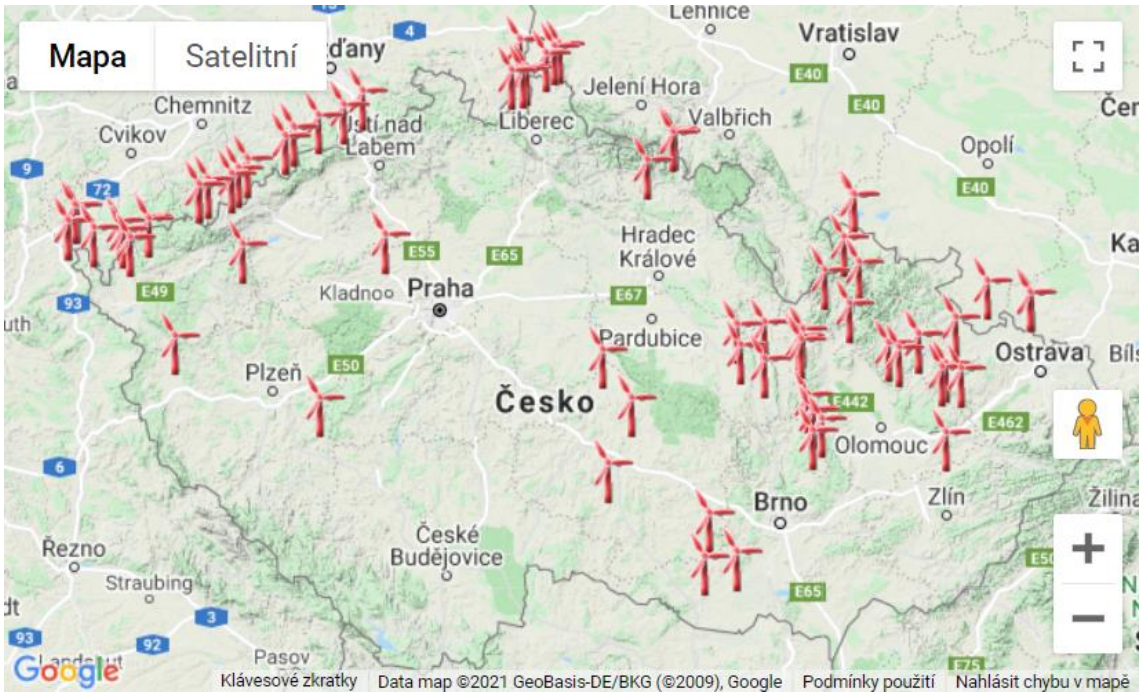
Source: Eurostat SHARES https://ec.europa.eu/eurostat/web/energy/data/shares

Figure 1: Biogas plants (green) and biomass heat plans (red) in Czechia (2021)



Source: Regional Sustainable Energy Policy, https://restep.vumop.cz/

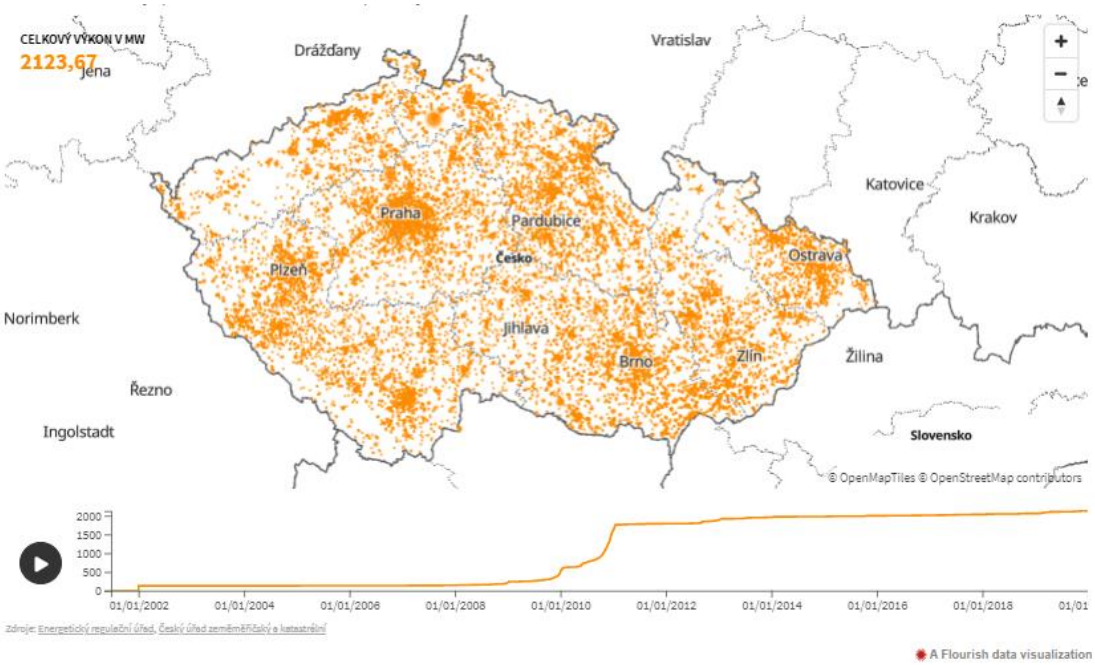
Figure 2: Wind power plants in Czechia



Source: Czech Wind Energy Association, https://csve.cz/cz/aktualni-instalace

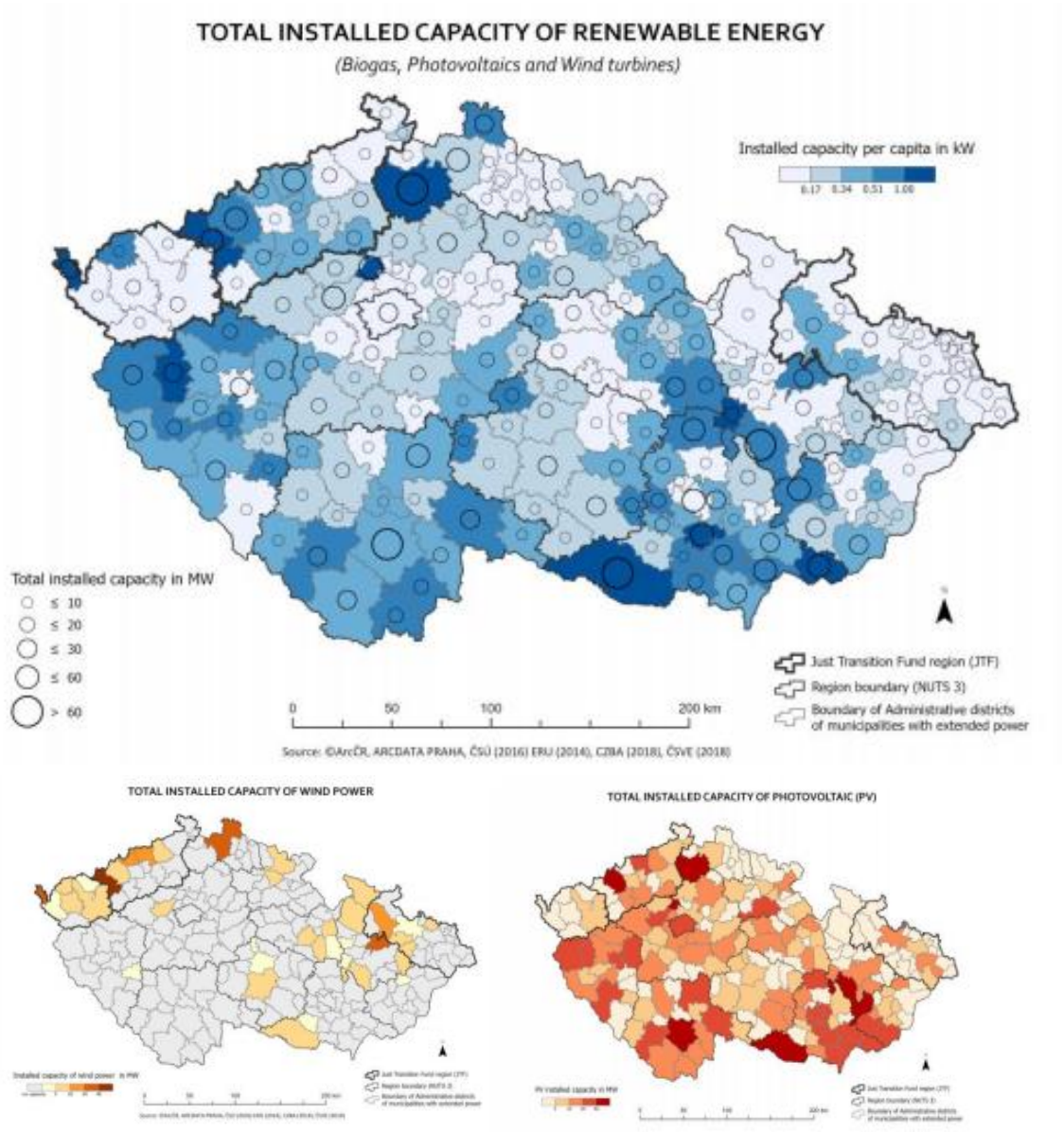
Figure 3: Photovoltaic power plants in Czechia (2019)

(spot size illustrates installed capacity)



Source: Interactive map by the Czech Radio https://www.irozhlas.cz/zpravy-domov/fotovoltaika-energetika-obnovitelne-zdroje_1912040600_jab

Figure 4: Microregional perspective on RES installed capacity (2019)



Source: Frankfurt School of Finance & Management (Support to the preparation of a Territorial Just Transition Plan in Czech Republic)

1.3 Overview of relevant political governance structures

At the level of the central government, energy-related matters are dealt with primarily within the Ministry of Industry and Trade with multiple dedicated departments, comparably large budgets and strong political power. Nevertheless, with the increased prominence of the climate agenda in the EU, the Ministry of the Environment's initially limited role in the topic has also been of a growing importance, which has increased further with the decision assigning it

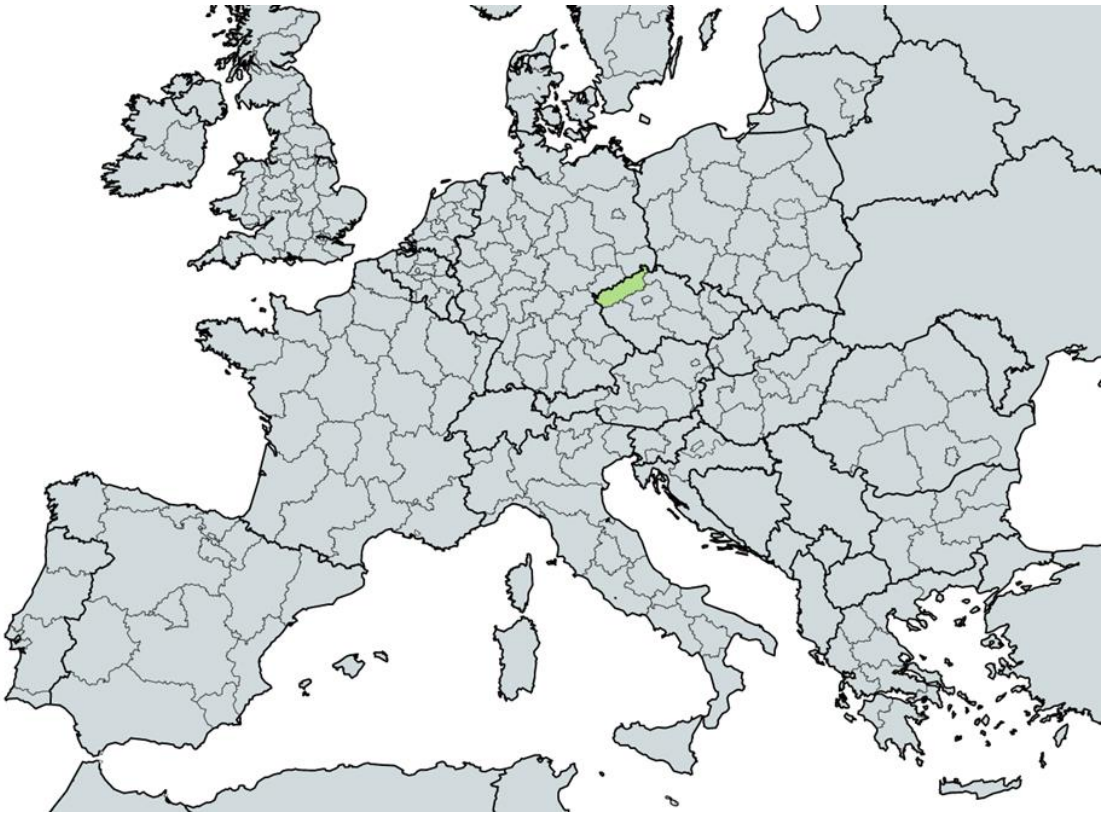
responsibility for setting up and disbursement of the Modernisation Fund, a key financing instrument for the energy transition, as well as the Just Transition Fund.

Historically, the energy sector in Czechia has been a highly centralized one with a prominence of large producers and distributors of power and/or heat. This legacy is still palpable both in terms of governance structures and in mindsets of both stakeholders and the general public. The only real legal obligation that regional governments and administrations (equalling to NUTS III, as NUTS II is just a statistical unit in Czechia) have in the context of energy is the adoption of "Territorial Energy Policies", strategic documents that shall reflect the State Energy Policy and provide an outlook of 25 years with a 5-year evaluation and actualization period.[27] There are no energy departments in the standard administrative setup of regional administrative bodies and the (for the most part, marginal) agenda is dealt with by departments of property and investment. The situation differs somewhat in coal regions in transition which had been setting up advisory bodies dealing with just transition-related matters (see further).

[27] Defined by Act No. 406/2000 Coll., on energy management and specified by government regulation No. 195/2001 Coll, https://www.zakonyprolidi.cz/cs/2000-406

2. DETAILED ASSESSMENT

2.1 Regional economy, geography, demographics and political context



Location of Severozápad in Europe

As noted above, the NUTS II Severozápad region is composed of two distinct administrative NUTS III units, Ústecký kraj and Karlovarský kraj. Alongside Moravskoslezský kraj, both Ústecký and Karlovarský kraj are considered coal regions in transition, and are eligible for support from the Just Transition Fund.

Both of these are regions historically strongly affected by the mining of lignite in open pits and its combustion in power plants and heat plants, with devastating impacts on the natural environment, public health, and diversification of the local economy. It should be further noted that these regions had been strongly depopulated and uprooted with the mass expulsion of Germans from Czechoslovakia following WWII, leaving behind a negative and lasting legacy.

In 2020 Severozápad had 1 115 629 inhabitants, making it the least populated NUTS II region in Czechia and a population density of 128 people per square kilometer. Out of that, over 820 000 people lived in Ústecký kraj and less than 300 000 people in Karlovarský kraj. Over the past decade, the region had lost over 30

000 inhabitants while in sum, Czechia's population had increased by nearly 200 000. The average age in Severozápad was 42,5 years, equalling the national average.[28]

In most key socio-economic indicators, Ústecký and Karlovarský kraj consistently rank at the very bottom of the Czech Republic (out of the 13 regions + Prague). These include, notably, GDP per capita (with a relative drop post-1989), highest attained level of education of the local population, investments in research and innovation, life expectancy and other health-related indicators (see the graphs below). The region recorded an unemployment rate of 4% in 2020.[29]

Geographically, Karlovarský and Ústecký kraj are characterized particularly by the Ore Mountains range (tallest peak of 1244 m) spanning some 150 km over the northern border with Germany (Saxony). Their foothills host a concentration of cities and towns mostly built around coal mining/energy production/heavy industry (Sokolov, Kadaň, Chomutov, Most, Litvínov, Bílina etc.), with the largest lignite reserves being located and for the most part mined in this region. The local geographic conditions have significant potential for wind energy deployment (along the range) and photovoltaics (on the territory of the former lignite open pits). There are also ongoing discussions about possible pump-up storage use, utilizing the flooded pits left behind by lignite mining.[30]

As for the regional political context, historically, extremist and populist parties have scored well among voters in the region, exploiting among others issues around social exclusion, targeting the Roma population and other minorities. For instance, Ústecký kraj had been presided over by a Communist Party representative between 2012 and 2020 when a new center-right coalition was formed. Similarly, the post-Communists had fared well in Karlovarský kraj, alongside Andrej Babiš's ANO party. A new regional government was formed after difficult negotiations in December 2020, composed of 6 parties so as to put ANO in opposition. The hard-left and populist parties have also traditionally voiced their support for continued lignite mining and fossil-based energy, pointing to the socio-economic realities and presenting themselves as guardians of the working class.

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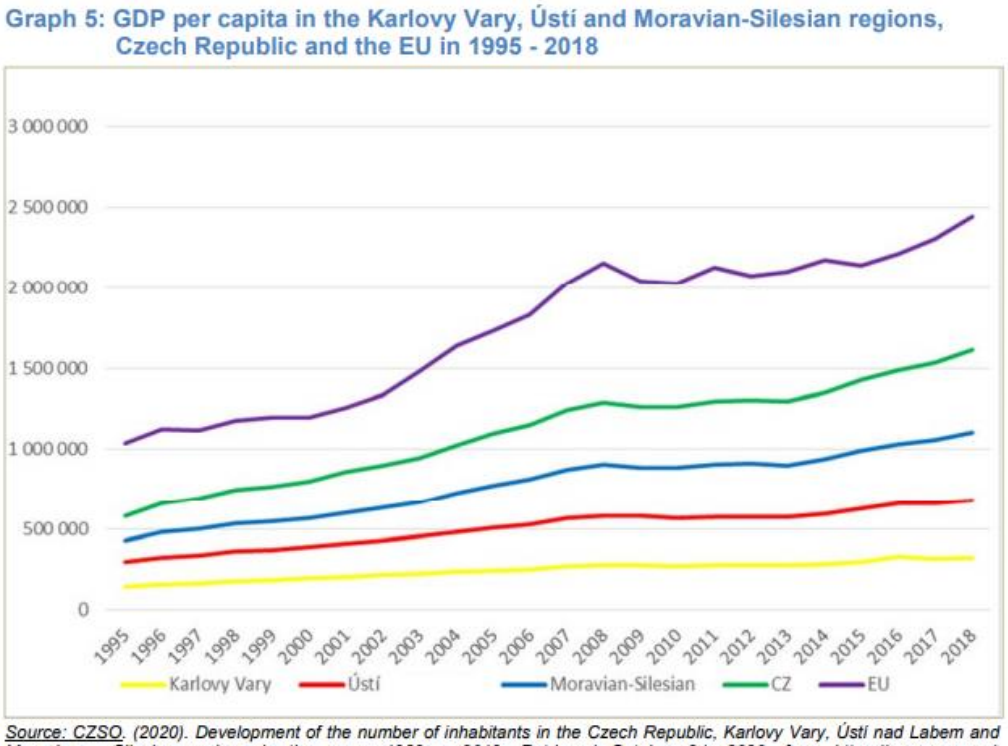
[28] Czech Statistical Office, https://www.czso.cz/documents/10180/20556267/13011001.pdf/fd1f44ef-d931-4ba1-9b59-cf44b82518f5?version=1.0; https://www.czso.cz/documents/10180/121739326/1300722001.pdf/3554a4b2-118f-46ae-9105-8764faa1d6eb?version=1.1

[29] https://ec.europa.eu/eurostat/databrowser/view/tgs00010/default/table?lang=en

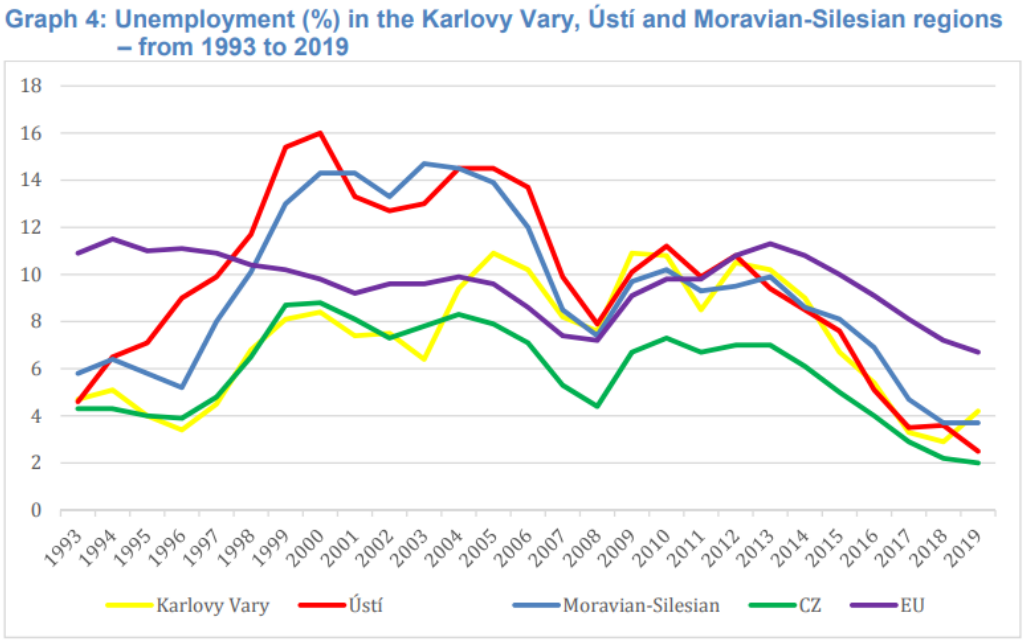
[30] Czech Television, https://ct24.ceskatelevize.cz/domaci/2898578-misto-uhli-jezera-voda-mohla-na-severu-cech-vyrobit-podle-havlicka-energii-jako-dva

Figure 5: GDP per capita in selected CZ regions as compared to national and EU average



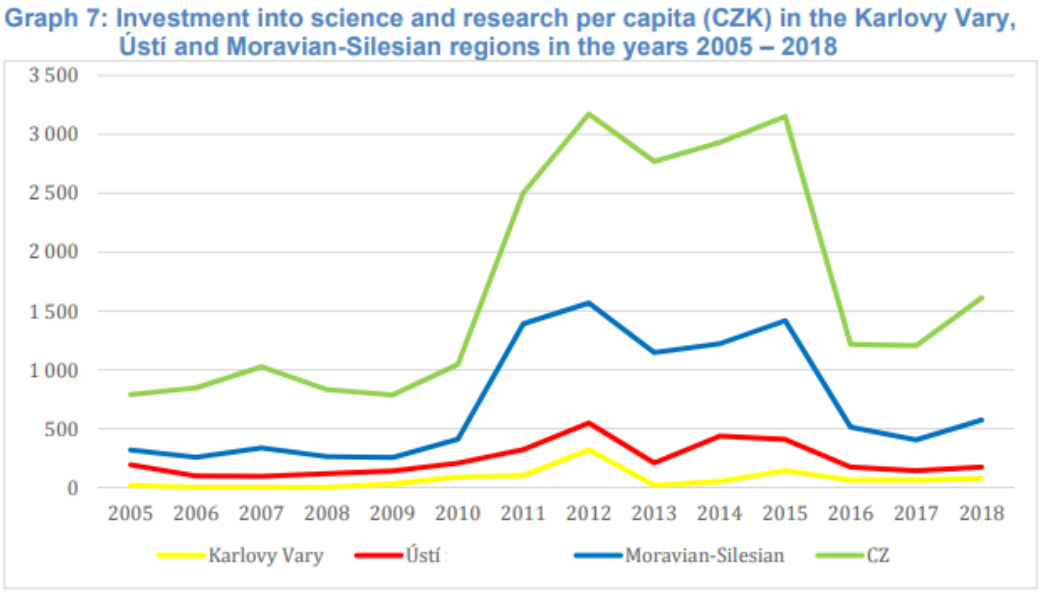
Source: CZSO. (2020). Development of the number of inhabitants in the Czech Republic, Karlovy Vary, Ústí nad Labem and Moravian - Silesian regions in the years 1989 – 2019. Retrieved October 24, 2020, from https://www.czso.cz/, https://data.worldbank.org/, Gross domestic product in Karlovy Vary, Ústí nad Labem and Moravian - Silesian regions in the years 1989 – 2018. Retrieved October 24, 2020, from https://www.czso.cz/

Figure 6: Unemployment in selected CZ regions as compared to national and EU average



Source: CZSO. (2020). Development of unemployment in the Czech Republic, Karlovy Vary, Ústí nad Labem and Moravian-Silesian regions in 1993–2019. Retrieved October 24, 2020, from https://www.czso.cz/, https://data.worldbank.org/indicator/SL.UEM.TOTL.NE.ZS?locations=EU

Figure 7: Investment into science and research per capita in selected CZ regions as compared to national and EU average



Source: https://vdb.czso.cz/vdbvo2/faces/cs/index.jsf?page=vystup%20-objekt&f=TABULKA&pvo=VAV02&z=T&katalog=30851&str=v183

Figure 8: Regional Competitiveness Index per indicator: Severozápad/CZ/EU (2019)

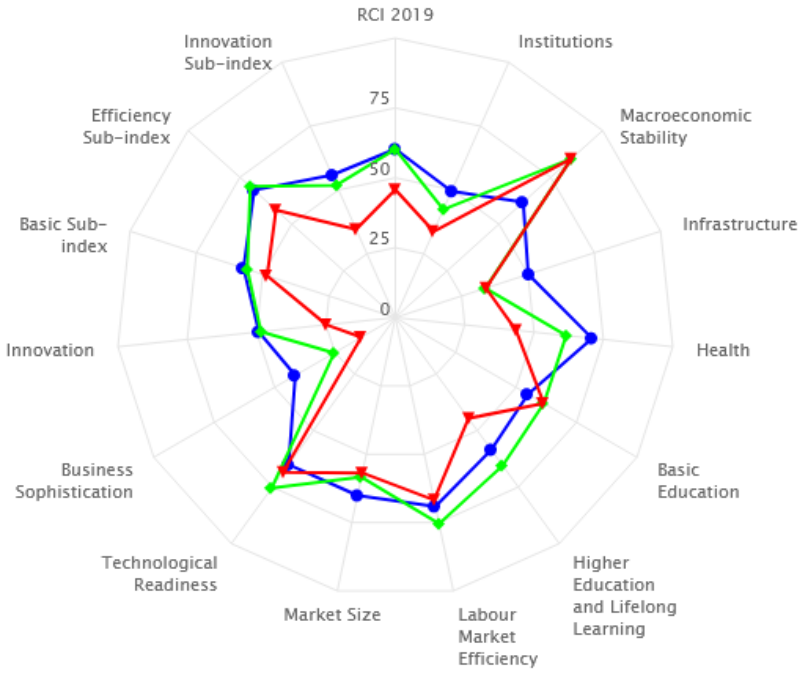


Figure 9: Selected Transition Challenges facing Czech coal regions

Table 2: Situational snapshot of the in the Karlovy Vary, Ústí and Moravian-Silesian regions

CRITERIA	ÚSTÍ	KARLOVY VARY	MORAVIAN-SILESIAN
Economy, entrepreneurship and innovation			
Aging population	Yes	Yes	Yes
Lack of diversification	Yes	Yes	Partially
Innovation	Partially	Partially	Yes
Employment			
Increase of unemployment	No	No	No
Unskilled workers	Yes	Yes	Partially
Sustainable environment			
Air pollution	Partially	Partially	Yes
Contaminated production sites	Partially	Partially	Yes
Negative impact on health	Partially	Partially	Yes
Lack of GHG free energy	Yes	Yes	Yes
Mobility and interconnection			
Lack of Infrastructure and accessibility	Partially	Partially	Partially

→ **Transition Challenges need to be tackled, but also depend on the absorption capacity of the regions**

Note: without impact of COVID-19

Source: Frankfurt School of Finance & Management (Support to the preparation of a Territorial Just Transition Plan in Czech Republic)

2.2 RES in the Severozápad region

2.2.1 Regional GHG emissions

In the Northwest region, industrial GHG emissions reported under EU ETS in 2016 amounted to 30.4 million tonnes of CO2e, reaching 44% of total Czech ETS emissions in 2016. This equals a decrease of 7.4% between 2010 and 2016.[1] 10 out of 29 biggest Czech emitters under EU ETS are located in this region, producing nearly 29 million tonnes of CO2 equivalent in 2018, indicating that the majority of emissions are produced by a small number of large facilities.[2] This corresponds to a high production of electricity from coal and presence of heavy industry including the chemical industry, an oil refinery, a cement plant and more.

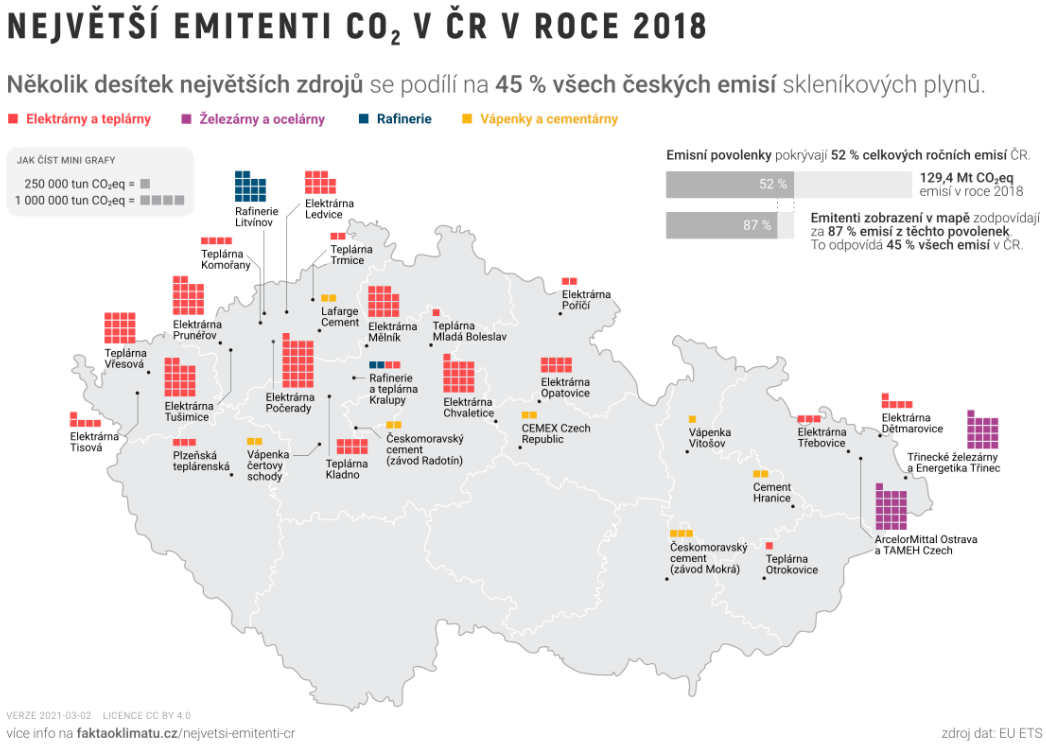
[1] Climate-KIC, https://re-industrialise.climate-kic.org/maps/co2-map/; Mura M et al., Industrial Carbon Emissions Intensity, Ecological Economics, https://www.sciencedirect.com/science/article/pii/S2352340921003309

[2] Apart from that, there are a number of smaller facilities whose emissions have not been included into the figure. Facts on climate change, https://faktaoklimatu.cz/infografiky/nejvetsi-emitenti-cr

Figure 10: Largest industrial GHG emitters in Czechia (2018)

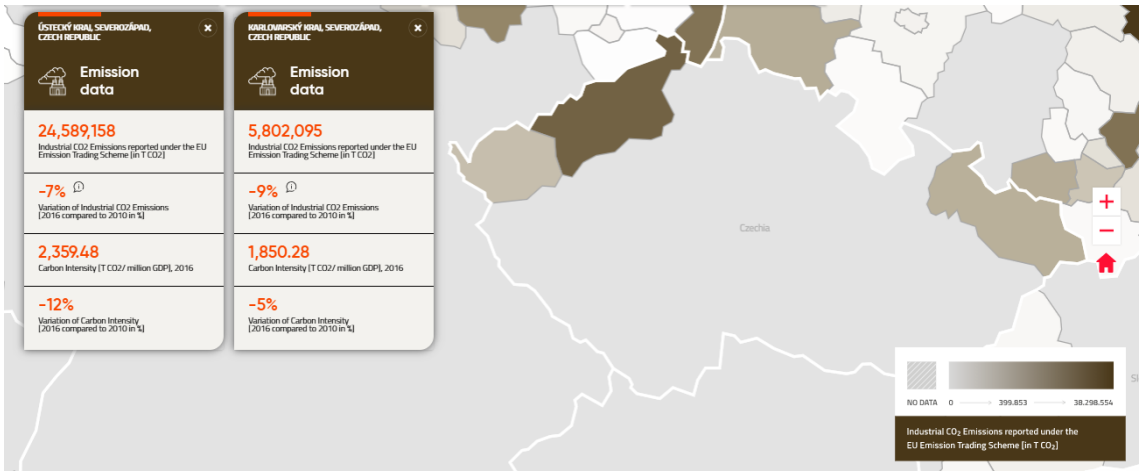
Red: power plants and heat plants; Purple: iron and steel plants; Blue: refineries; Yellow: lime and cement plants. Each square indicates 250 000 tonnes of CO2eq produced by the facility.

(EU ETS covers 52% of total yearly Czech emissions. Facilities captured on the map produce 87% of emissions reported under EU ETS, equalling 45% of total Czech emissions)



Source: Fakta o klimatu/Facts on climate change, https://faktaoklimatu.cz/infografiky/nejvetsi-emitenti-cr

Figure 11: Emission data for Ústecký and Karlovarský kraj (2016)



Source: Climate-KIC, https://re-industrialise.climate-kic.org/maps/co2-map/

2.2.2 RES installations and potential

The Northwest region produces 34% of total Czech electricity (30 TWh in 2019) which illustrates its key position in the Czech energy industry. Its highest share is produced by lignite power plants, and RES sources produce 5.2% of electricity in the region.[3] RES only seems to play a minor role in the Northwest energy mix with an extensive coal energy production, however, in comparison to other regions, the Northwest does not fall behind, producing 14% of total electricity generated from RES.

In 2019, 46% of the Czech installed capacity of wind energy was installed in the Northwest region, while this region accounted for 9% of the total installed capacity of photovoltaics. The level of installed capacity has not changed considerably since 2010. In the case of photovoltaics it even decreased, according to the Czech Energy Regulatory Office.[4]

As for biomass, the data for the installed capacity are not available due to the missing differentiation of combustion sources.[5] The gross electricity production from biomass (solid biomass, biogas and decomposable waste) is 740 GWh of electricity in the Northwest region, that is 15% (2019) of the Czech electricity

[3] Energy Regulatory Office, https://www.eru.cz/documents/10540/5381883/Rocni_zprava_provoz_ES_2019.pdf/debe8a88-e780-4c44-8336-a0b7bbd189bc

[4] Ibid.

[5] TZB-info, https://vytapeni.tzb-info.cz/vytapime-elektrinou/305-rozdeleni-elektricke-energie

produced from biomass. Solid biomass dominates with 84% of the bioelectricity production.[6]

District heating plays an important role in the heating sector, with 10% of its energy supplied by RES, dominated by biomass (9%). Although the heat pumps and solar heating have a negligible share in the Northwest heating system supplied mainly by coal, compared with other regions, there are 96% of Czech heat pumps and 40% of solar thermal heating in the region, both referring to the district heating.[7]

With regard to individual heating, RES have their role, mainly represented by biomass. As for the deployment of heat pumps, the Northwest region has lower deployment of heat pumps, but in the newly built houses, the installation occurs more frequently than in other Czech regions - while the Czech average is 11% of new houses with heat pump installation, it is 18% in the Northwest.[8]

As for the sub-regional differences, wind energy dominates the RES electricity production in the Northwest region and is relatively evenly deployed on the ridge of the Ore Mountains located on the border with Germany.

Karlovarský region has a low deployment of photovoltaics with a 1% share of local installed capacity (compared with 3% in the Ústecký region) and the highest deployment of wind energy per capita. In the Ústecký region solid biomass dominates with 87% of local bioelectricity production, while in Karlovarský region 86% of electricity production from biomass is produced by biogas.

The potential of RES is assessed by multiple studies differing in ambition and methodology. The Institute of Atmospheric Physics at the Czech Academy of Sciences estimated the wind feasible potential (not to be mistaken with the technical potential) in the Northwest to be 470 MW of installed capacity according to the conservative scenario and 2530 MW in the optimistic scenario,

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[6] Energy Regulatory Office, https://www.eru.cz/documents/10540/5381883/Rocni_zprava_provoz_ES_2019.pdf/debe8a88-e780-4c44-8336-a0b7bbd189bc

[7] Energy Regulatory Office, https://www.eru.cz/documents/10540/5391332/Rocni_zprava_provoz_TS_2019.pdf/a4d8e72d-4f7b-4d02-b464-201bf1648479

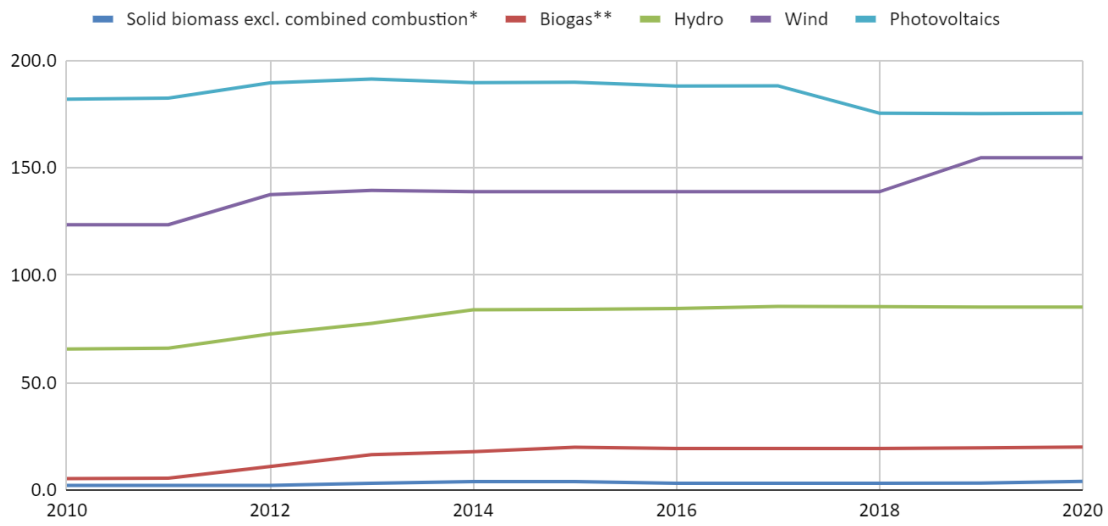
[8] The average is largely reduced by the regions with big cities. Ministry of Industry and Trade, https://www.mpo.cz/assets/cz/energetika/statistika/obnovitelne-zdroje-energie/2019/5/Tepelna-cerpadla-1981-2018-final-verze.pdf

that is between 18%, or 15% respectively of the czech potential wind capacity.[9] The regional potential of solar installations has not yet been assessed.

The potential of RES deployment, its investment needs and job creation in the Northwest region are also analysed in the publication „Clean energy technologies in coal regions" by JRC. The technical potential of installations in the areas of open pit mines is 180 MW of wind energy and 330 MW of solar PV. In total, the technical potential of RES in the Northwest region reaches 40 TWh/year.[10]

[9] The Institute of Atmospheric Physics at the Czech Academy of Sciences, https://www.ufa.cas.cz/DATA/vetrna-energie/Potencial_vetrne_energie_2020.pdf
[10] JRC, https://publications.jrc.ec.europa.eu/repository/handle/JRC117938

Figure 12: RES installed capacity in the Northwest region CR (2010-2020)



Source: Energy Regulatory Office - personal communication

* facilities using biomass only, the biomass used in the facilities burning other solid fuels as well are not included - these are facilities Mondi Štětí, CHP Komořany and CHP Trmice in Ústecký region and CHP Ostrov, Power plant Tisová I. and Heating plant KG Energo s.r.o.

** biogas includes: sewer gas, landfill gas, other biogas

Table 2: RES electricity production in the Northwest region & Czechia

Brutto electricity production (GWh)	Northwest	CZ
	2019	2019
Biomass	741.3	5030.6
...Solid biomass	626.0	2398.7
...Biogas	115.3	2527.1
...Biologically degradable municipal waste	0.0	104.8
Photovoltaic power plants	180.1	2285.9
Hydro including pumped storage plants	315.6	3174.7
Wind power plants	312.0	700.0
RES Total	**1549.0**	**11191.2**
Brutto electricity production from all sources	**29,522.4**	**86,988.7**

Source: Energy Regulatory Office

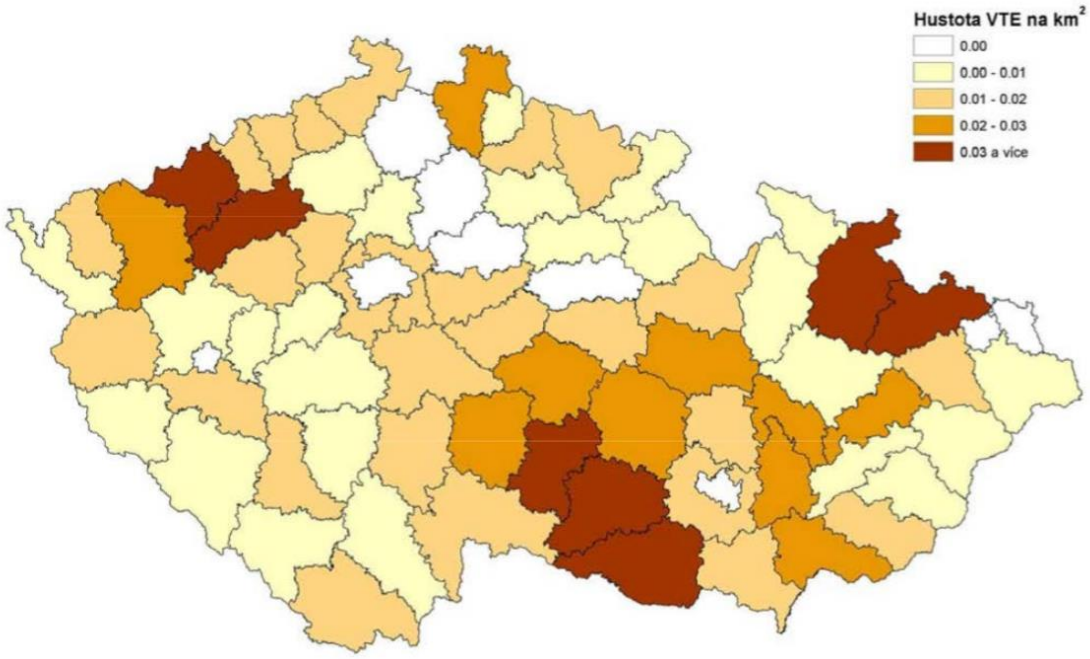
Table 3: Heat supply in district heating

Note that the column „Share of HS in the CR" indicates the regional supply share in the Czech total heat supply (by source), for example, Northwest heat supply accounts for 18% of total Czech heat supply. The column „Share of HS in the NW region" represents the share of different sources in the Northwest heat supply.

Heat supply in district heating (TJ)	2019	2019		Share of HS in the CR (%)	2019		Share of HS in the NW region (%)	2019
	NW	CZ			NW			NW
Total	15752.5	87543.5		Total	18%		Total	(100%)
Biomass (Total)	1442.2	7028.8		Biomass (Total)	21%		Biomass (Total)	9.2%
...Solid biomass	1411	6491		...Solid biomass	22%		...Solid biomass	9.0%
...Biogas	31.2	537.8		...Biogas	6%		...Biogas	0.2%
Electricity	0	13.4		Electricity	0%		Electricity	0%
Heat pump	83.2	86.7		Heat pump	96%		Heat pump	0.5%
Solar heating	0.2	0.5		Solar heating	40%		Solar heating	0%

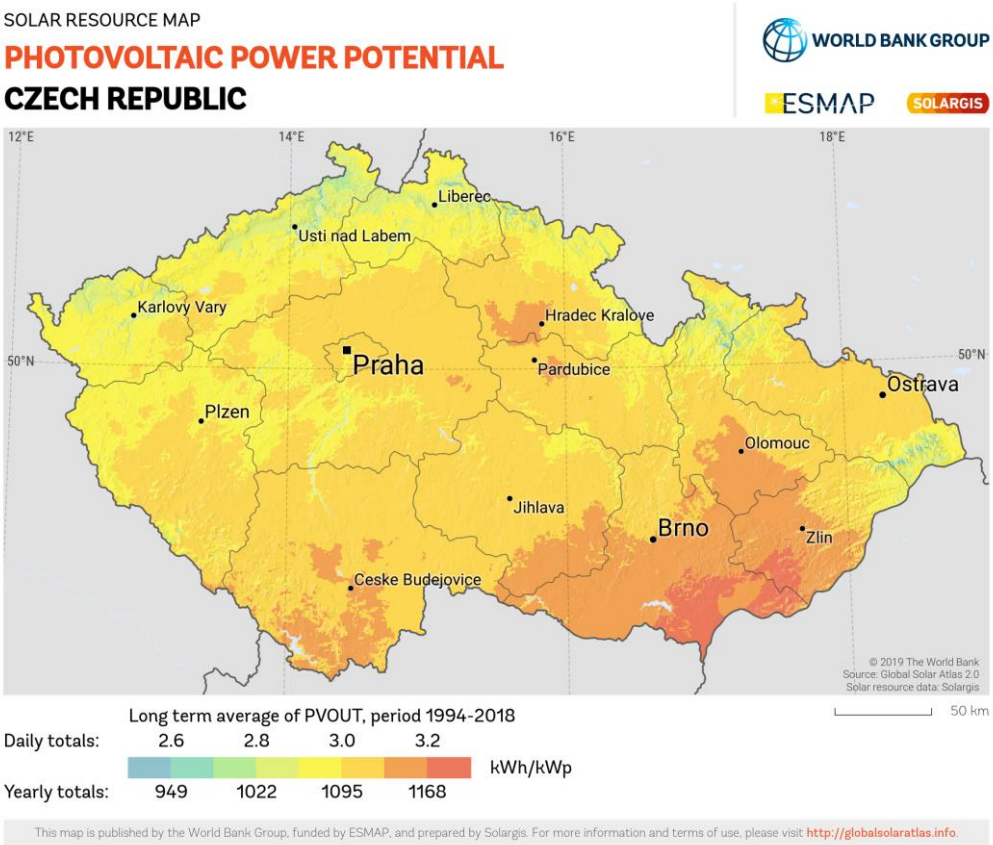
Source: Energy Regulatory Office

Figure 13: Technical potential of wind energy per district (density per km2)



Source: UFA, CZ Academy of Sciences (2012)

Figure 14: Technical potential of photovoltaics in Czechia



2.2.3 Economic impact of RES deployment and ownership structure

The benefits arising from the RES deployment are dependent on the structure of ownership. As for photovoltaics,analysis of the legal structure of operators shows that other entities (such as physical persons etc.) installed the biggest number of photovoltaic facilities, but with regards to the installed capacity, the classical enterprise models (private or public limited company) still own the biggest share of installed capacity in the Czech Republic (around 90%).[11] While the analysis for wind energy is non-existent, it is likely that private ownership dominates here as well.

The character of the biggest Czech wind farm, located in the Ústecký region, illustrates the economics of wind energy: the wind farm Kryštofovy Hamry with 42 MWe capacity is owned by the German company ecoenerg Windkraft GmbH & Co. KG, and uses Enercon's (company also situated in Germany) wind turbines E-82.[12] The wind farm provides a contribution to the municipality where it is located on the order of millions CZK per year, or around a third of the municipality's yearly budget. The plans to expand the wind farm were canceled because of an unstable legal environment that hinders the long-term planning for new RES.[13]

The municipality Jindřichovice in the Karlovarský region, where one of the newest wind farms was built in 2019 (one of 8 facilities built in the Czech Republic after 2014) also receives a similar benefit: the wind farm of 15.4 MW installed capacity provides around 1 million CZK yearly to the local budget.[14]

No factory located in the Northwest is involved in the wind energy value chain; there are 3 in the neighbouring regions (gearbox, nacelle assembly, blades).[15] The major providers of wind energy technology are foreign companies (Enercon, Vestas, etc.). One of the wind farms in Karlovarský region built in 2006 used the technology provided by Czech manufacturer Vítkovice, located in the

[11] Sklenář, Fotovoltaika v České republice v roce 2014, TZB-info, https://oze.tzb-info.cz/fotovoltaika/12162-fotovoltaika-v-ceske-republice-v-roce-2014
[12] Energy Regulatory Office, https://www.eru.cz/legacyerustaticdata/RZ2008/rz/subjekty/21.htm
[13] Czech News Agency, TZB-info, https://oze.tzb-info.cz/124786-nejvetsi-ceska-vetrna-farma-v-krusnych-horach-se-nerozsiri
[14] Czech News Agency, Czech Radio, https://vary.rozhlas.cz/u-jindrichovic-vyrostl-novy-vetrny-park-prvni-po-mnoha-letech-7960829
[15] Clean energy technologies in coal regions, JRC, https://publications.jrc.ec.europa.eu/repository/handle/JRC117938

Moravskoslezský kraj (the other Czech coal region with a concentration of heavy industry, incl. steel).[16]

There are 1800 licenced photovoltaic installations in the Northwest region; 57 of those with capacity exceeding 1 MWe. The biggest installation Alkoun is located in Ústecký region near Chomutov with 12,9 MWe of capacity.[17] Near Chomutov, in the Hrušovany municipality, a small installation of 90 kWe from 2008 is located on the rooftops of publicly owned buildings, having a positive contribution to the local budget.[18] There are 17 enterprises operating with photovoltaics (1 seller, 15 installers, 1 in services) in the Northwest region.[19]

The data on the current employment in the RES energy in the Northwest region are unavailable. According to EurObserv'ER data, RES energy employs 39 000 people (direct and indirect employment[20]), while photovoltaics employs 1 900 people and wind energy 1 300 people in the Czech Republic. Bioenergy production (heat and electricity) employs 21 000 people and biofuels account for 4 100 employees, out of the 39 000.[21]

RES development has a potential for job creation: JRC estimated the number of jobs created by RES-E development in the Northwest under the maximum technology deployment projection of EUCO32.32.3 scenario at around 828 FTE jobs for wind power deployment, 194 FTE jobs for deployment of photovoltaics and 1 305 jobs for bioenergy. JRC assessed the Northwest region as one with restricted decarbonizing employment potential, meaning that "these regions under the EUCO3232.5 scenario do not deploy decarbonized employment to a comparable level of existing coal related levels,"[22] compared with around 10 000 jobs in the coal industry, though other opportunities exist also in other areas of decarbonisation such as energy efficient housing. However, it should be noted that this is estimate is only for direct jobs in the electrical power sector. Information on the match of coal workers and potential employment in RES are not available.

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[16] https://csve.cz/clanky/aktualni-instalace-vte-cr/120

[17] Regional Energy Balances, Ministry of Industry and Trade, https://www.mpo.cz/assets/cz/energetika/statistika/energeticke-bilance/2021/6/UEK-2018.pdf

[18] https://calla.cz/atlas/detail.php?kat=1&id=1755

[19] Clean energy technologies in coal regions, JRC, https://publications.jrc.ec.europa.eu/repository/handle/JRC117938

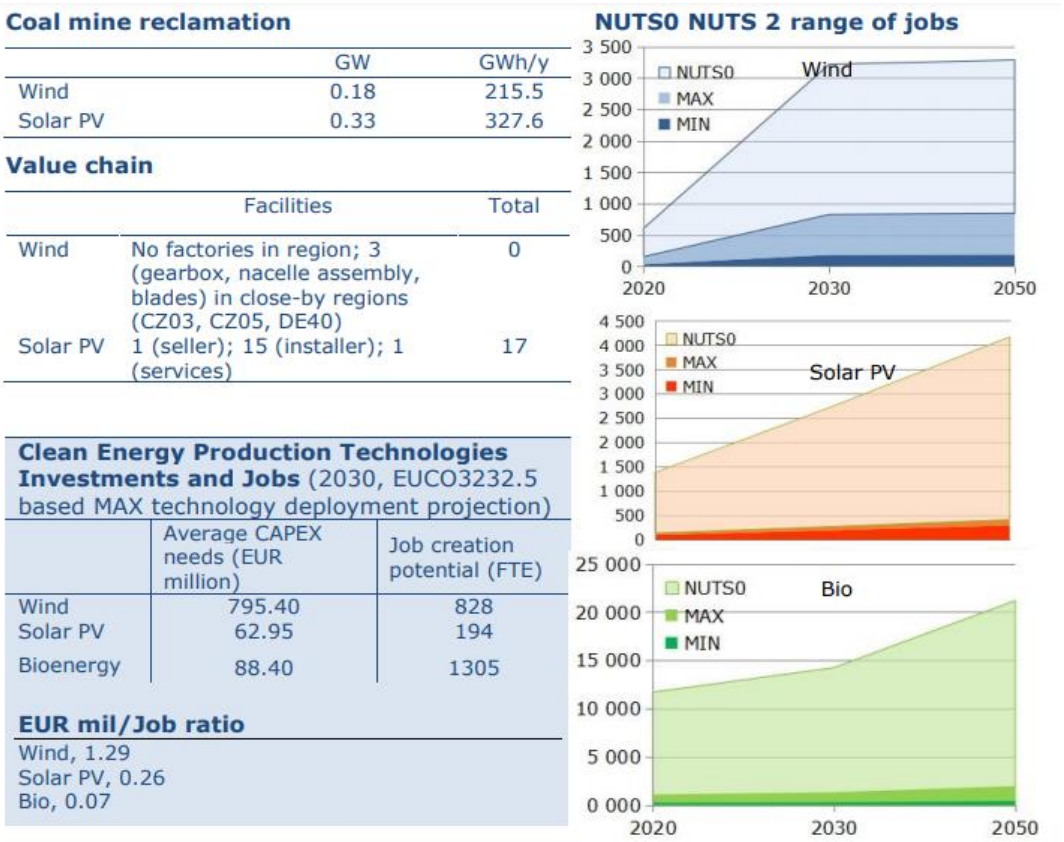
[20] Direct employment includes renewable equipment manufacturing, renewable plant construction, engineering and management, operation and maintenance, biomass supply and exploitation. Indirect employment refers to secondary activities, such as transport and other services.

[21] 19th annual overview barometer, EurObserv'er, https://www.eurobserv-er.org/category/2019/

[22] Ibid.

Adding to that, a study in the making by WiseEuropa (with direct input from the authors of this paper) concludes that earlier coal phase-out scenarios equate to swifter RES deployment, especially given soaring EU ETS prices. This swifter deployment has a positive impact on employment, creating up to 30,000 more jobs than what will be lost in fossil energy in the coming decade.[23] Presumably, a 10-20% share of those will occur in the Northwest region.

Figure 15: Selected EU stats on job creation in RES development (2020)



Coal mine reclamation

	GW	GWh/y
Wind	0.18	215.5
Solar PV	0.33	327.6

Value chain

	Facilities	Total
Wind	No factories in region; 3 (gearbox, nacelle assembly, blades) in close-by regions (CZ03, CZ05, DE40)	0
Solar PV	1 (seller); 15 (installer); 1 (services)	17

Clean Energy Production Technologies Investments and Jobs (2030, EUCO3232.5 based MAX technology deployment projection)

	Average CAPEX needs (EUR million)	Job creation potential (FTE)
Wind	795.40	828
Solar PV	62.95	194
Bioenergy	88.40	1305

EUR mil/Job ratio

Wind, 1.29
Solar PV, 0.26
Bio, 0.07

Source: JRC

Figure 16: Employment in renewable energy in Czechia (2018)

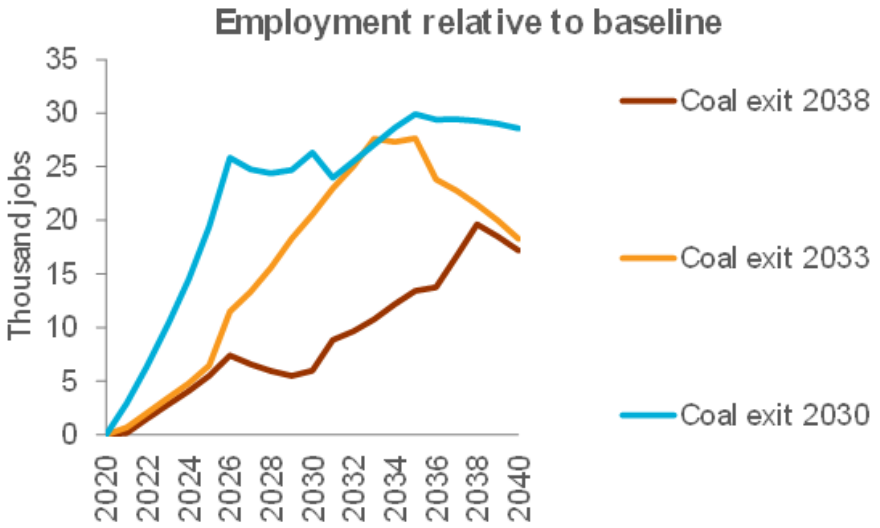
2018 EMPLOYMENT DISTRIBUTION BY SECTOR

	Country total	Biomass	Wind	Biofuels	Heat pumps	PV	Hydro	Biogas	Waste	Solar thermal	Geothermal
Czechia	39 100	16 700	1 300	8 000	5 300	1 900	1 300	4 100	200	200	<100

Source: EurObserv'er

[23] Macroeconomic impacts of early coal phase out in the Czech Republic, WiseEuropa and AMO, upcoming 2021.

Figure 17: Expected impacts of three Czech coal phase-out scenarios on employment (incl. energy bill, high ETS, 2021)



Source: WiseEuropa (upcoming)

2.3 Regional energy policy

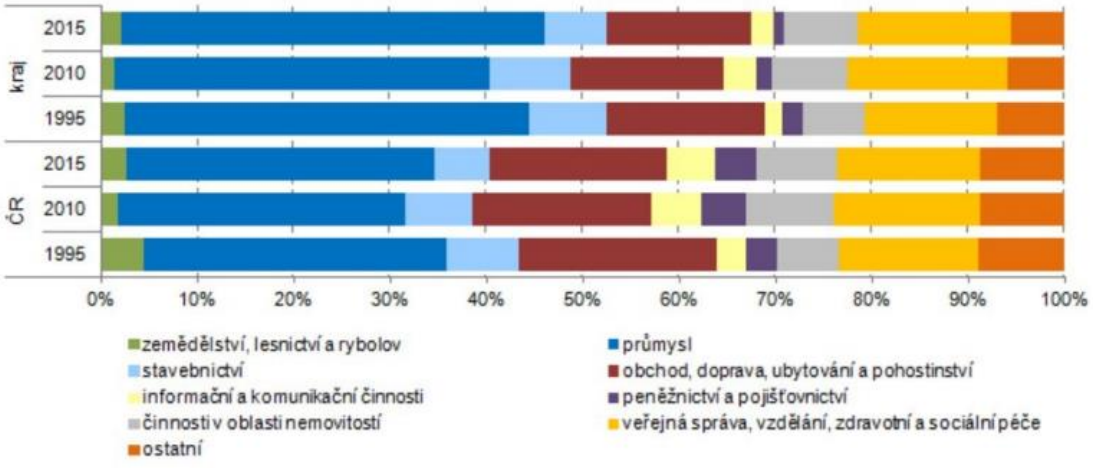
Ústecký krajadopted its updated territorial energy policy in 2020, a complex document envisaging relevant developments up to 2045.[24] The document provides a detailed sectoral assessment of energy production and consumption, but the angle remains rather narrow. With regard to environmental aspects, greater focus is on local pollution by particulate matter than on GHG emissions, whose balance is actually missing altogether. The policy presumes an increasing share of RES in electricity production, identifying particular potential in PV (incl. on brownfields) and biomass plants but also observing that the support for such sources is beyond the competences of regional authorities. As for the potential for new wind installations, which is promising from a technical point of view (tens of MWe), it recalls the barriers that stand in the way including limits set in regional development plans and from ecosystem and species protection. The indicative regional target for RES & energy usage of waste share on primary energy consumption is set at 11% by 2044, showing an extremely limited level of ambition clearly not in line with global, EU and national climate mitigation targets. A specific regional target for GHG emissions reduction is missing.

[24] Territorial Energy Policy, Ústecký kraj, https://www.kr-ustecky.cz/assets/File.ashx?id_org=450018&id_dokumenty=1748687

The updated territorial energy policy of Karlovarský kraj was adopted in 2018, with an outlook to 2042.[25] It follows the same logic as the aforementioned document from Ústí nad Labem with similarly vague targets relevant for climate mitigation. However, it provides a more concrete assessment of RES development in the region, setting the technical and economically viable potential for wind energy, while taking into account the various barriers, at 119 MW (leading to up to 2.5-fold increase in annual power production as compared to baseline). Technical potential of PV at residential, public and commercial buildings has been calculated at 125.3 MW. A summary of tools available for the implementation of a broad set of targets set in the policy offers a useful insight into what regional authorities are entitled (and expected) to do. These include the adoption of territorial development plans, implementation of legislation and strategies in the area of air quality, pollution and waste management, EIA, advisory in the context of available grants or subsidies, collaboration with local NGOs as well as initiating thematic education in schools.

In sum, it appears that the valid territorial energy policies are largely technical documents that neither provide a backbone for an ambitious energy transition, including a swift and scaled deployment of RES, nor are they strongly concerned with GHG emissions and climate mitigation targets. Given their limited competences in the topic, regional authorities are not likely to become key initiators of change.

Figure 18: Value added (btto) per sector: Ústecký kraj vs. CZ

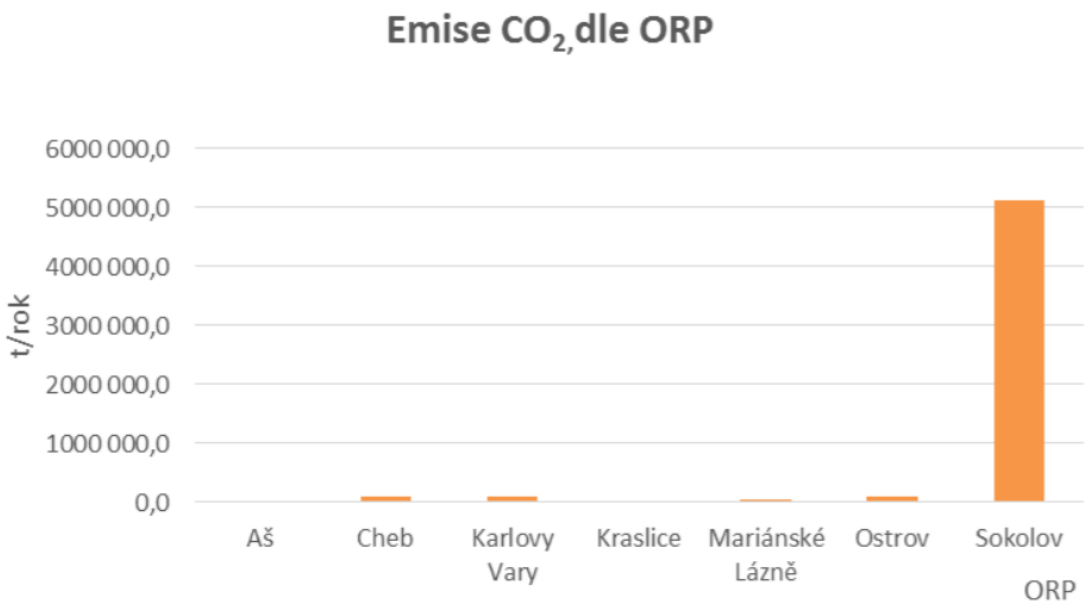


Source: Territorial Energy Policy of Ústecký kraj, data retrieved from CZSO

[25] Territorial Energy Policy, Karlovarský kraj, https://www.kr-karlovarsky.cz/samosprava/dokumenty/Documents/koncepce/OZZ_uzemne_energeticka_koncepce.pdf

Green: agriculture, forestry and fisheries; dark blue: industry; light blue: construction; brown: trade, transport, hospitality; light yellow: information and communications; purple: financial and insurance services; grey: real estate; light orange: public administration, healthcare and social services; dark orange: other

Figure 19: Annual CO2 emissions per district of Karlovarský kraj (2015)

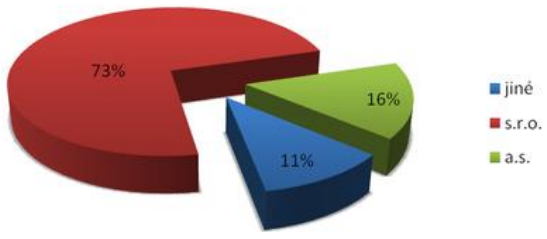


Source: Territorial Energy Policy of Karlovarský kraj

Figure 20: Photovoltaic installation by legal status of licence holders (2013)

1/ Share of individual photovoltaic installations by legal status of licence holders (blue: other, red: s.r.o., green: a.s.); 2/ Share of installed capacity by legal status of licence holders

Graf č. 6 – Procentuální podíl počtu FVE instalací k 8. 5. 2013, dle právní subjektivity držitelů licencí. Zdroj dat: ERÚ



Graf č. 7 – Procentuální podíl instalovaného výkonu FVE k 8. 5. 2013, dle právní subjektivity držitelů licencí. Zdroj dat: ERÚ

3. ANALYSIS AND CONCLUSION

The deployment of RES in the Northwest region had stagnated in the past 8 years following the quick rise between 2008 and 2012, similarly to the national trend of RES deployment. The latest events, however, indicate that this might change in the near future. The launching of the Modernisation Fund with at least €6bn of funding available for RES development and decarbonisation is a major factor: in the preliminary call for the ModFund, over 8 000 projects registered for the program „New renewable energy sources in energy industry" (RES+) for a sum of €20bn - 78% of the sum of all registered projects.[26] Right now, there is €40m allocated for the photovoltaic projects under 1 MWp and €140m for projects over 1 MWp in the official call.[27] At the same time, the price of solar photovoltaics and wind energy is rapidly decreasing, which is also a major driver for RES deployment.

Geographic factors might hinder the RES deployment at some point due to the limited suitable area for their installation (especially for wind farms), but currently there is still a huge potential to be used. The public is very favorable towards RES deployment in general, however, local installation, especially in the case of wind power plants, may be an issue.[28] Here, the economic impacts might be a turning point for the local approach - with the right legislation, an increase in community energy projects and local production could bring attractive economic benefits.

Also, the rapid rise of allowance price in the EU ETS system accelerates t decarbonisation process, and energy industries are launching their projects in order to stay in the game. For example, Sokolovská uhelná, a major electricity producer in the Karlovarský region, is planning huge photovoltaic projects. The same goes for ČEZ, a public company operating in the CEE.

Notably, these incentives come from the EU level and there is a lack of initiative on the national level. The national decision on coal phase-out was postponed until the end of the year 2021, and the state support for the new RES is

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[26] Ministry of the Environment, https://www.mzp.cz/cz/news_20210305-Cesko-je-na-zmenu-energetiky-pripravene-ukazal-obrovsky-zajem-o-Modernizacni-fond-Zacatkem-dubna-odstartuji-prvni-ostre-vyzvy and https://www.mzp.cz/C1257458002F0DC7/cz/news_20210305-Cesko-je-na-zmenu-energetiky-pripravene-ukazal-obrovsky-zajem-o-Modernizacni-fond-Zacatkem-dubna-od-startuji-prvni-ostre-vyzvy/$FILE/predregistracni_vyzva_priloha.pdf

[27] Czech State Environmental Fund, https://www.sfzp.cz/dotace-a-pujcky/modernizacni-fond/vyzvy/

[28] Tomáš Chabada and Jan Krajhanzl, Hnutí DUHA - Friends of the Earth CZ, https://www.hnutiduha.cz/sites/default/files/publikace/2021/01/verejne_mineni_o_oze_2020.pdf

insignificant.[29] There are multiple legislative barriers for RES installation, specifically for the deployment of agrivoltaics, accumulation of energy, or roof installations. The regulatory barriers also extend to the installation of new sources, especially wind farms, that might take several years to set up. With the general election coming up in the autumn of 2021, a new legislative cycle will have to commence before any reasonable transposition of substantive parts of EU climate/energy legislation can be expected, including RED II.

So far, the socio-economic impacts in the Northwest region have been limited or remain unknown due to the lack of data (see chapters 2.2.3 and 2.3). There is a limited number of enterprises operating in the RES value chain. The RES installations are mostly privately owned, although they bring economic benefits to the municipalities in their proximity. In the future, it is expected thatRES deployment could create as many as 2 500 jobs in the Northwest region. The future economic impacts will be determined by the approach of national as well as regional governments: an active support of the industry going hand-in-hand with the elimination of regulatory barriers might increase the positive economic impacts.

As for the factors most important in determining the socio-economic impacts of RES deployment in the future, the distribution of the Modernisation Fund will play a key role. So far, for the community energy projects, which have the highest potential of maximising the local economic benefits of RES deployment due to being locally owned by households/municipalities/small businesses, the allocation accounts for a mere 1.5% share of the fund (i.e. less than the support allocated for the modernization of public lighting systems). In addition to that, the installation of new RES shall be supported by 38.7% of the fund - 60% of which is designated for the ETS facilities.[30] A further 13.3% of the Fund is allocated to improving energy efficiency and reducing GHG emissions in the ETS facilities and 26% share is dedicated to the modernization of district heating systems (which are generally the ETS facilities) - in this program, coal regions, including the Northwest region, obtained a special allocation given their high utilization of district heating. To sum up, the ETS facilities are the main recipients of support with a 62.5% allocation.[31] The support itself is an economic benefit and it will importantly determine the structure of ownership of new RES installations.

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[29] Resolution of the government of the Czech republic of 24 May 2021 No. 481, https://apps.odok.cz/attachment/-/down/IHOAC3DB9Q9K

[30] Czech State Environmental Fund, https://www.sfzp.cz/dokumenty/detail/?id=2344

[31] Czech State Environmental Fund, https://www.sfzp.cz/dotace-a-pujcky/modernizacni-fond/programy/

The structure of ownership will then be influenced by the (lack of) political will and capability to eliminate the legislative barriers for RES development, such as legislative barriers for energy storage, community energy or household photovoltaic installations. Enabling a regulatory environment for community projects, especially with participation of municipalities, could help create local resilient and sustainable energy systems.

Furthermore, the extent and character of RES support together with the support of innovation and research will determine the creation of synergies between the local economies and RES deployment. The same RES deployment can have a very different economic impact, depending on the condition of local industry. A functional support has the potential to strengthen the role of local enterprises in the RES value chain. In this sense, stakeholders identify the stability of the economic environment as a key variable in the creation of viable economic models.

In the Northwest specifically, other funds to support the decarbonisation are available and might also bring a stronger RES position in the local economy. For instance, the Just Transition Fund supports the development of clean energy structures where the Modernisation Fund is not sufficient or optimal for support. In the Ústecký region, Green Energy Technologies Centre of UJEP should be supported from the JTF finances as its goal is to expand the existing educational activities and scientific research capacity to educate experts and create a research environment to deal with the implementation of energy transformation in the region.[32] On top of that, support for the energy transition and RES deployment is envisaged from the National Recovery Plan (RRF) and several Operational Programmes.

Finally, RES deployment and its impact will also be conditioned by the approach of key stakeholders: first, these are large energy/utility companies and their willingness to transition and create sustainable projects for revitalisation of the former lignite mines and their utilization for RES deployment or energy storage. Second, the regional governments might develop a leadership role and create the much-needed regional policies (bridge the national and municipal level, ensure support for local projects, create ambitious strategies etc.). Third, the approach of small investors including municipalities and their willingness to initiate the RES installment will be vital.

[32] University of J E Purkyně, Ústí nad Labem, https://www.ujep.cz/cs/29946/ujep-chce-vyznamne-prispet-k-transformaci-usteckeho-kraje-z-uhelneho-na-kreativni

Key conclusions:

- RES deployment has been stagnating for the past 8 years both in the Czech Republic and the Northwest region specifically. The ambition on the national level regarding new RES installations (as set in the NECP and related strategies) is low, however, external incentives (soaring price of EU ETS allowances, Modernization Fund, falling prices of new RES installations) will drive a new wave of RES deployment. The government should enable a smooth transition by removing regulatory barriers for RES deployment and related services, creating a stable environment in the RES sector, and setting ambitious goals and meaningful support for RES, including for local ownership. This will also improve the position of local enterprises in the RES value chain.

- The character of the support together with the legislative environment will determine the main economic beneficiaries of the transition. So far, the rules for distribution of the Modernisation Fund allocate over 60% of the finances to the EU ETS facilities (primarily big coal and heavy industry enterprises), which might hinder a widespread distribution of economic benefits. Apart from channeling the finances more evenly, it is also advisable to eliminate the regulatory barriers for rooftop installations or community energy projects which obstruct the development of smaller RES projects.

- RES deployment in the Northwest region will bring around 2 300 new jobs according to the Joint Research Center of the European Commission. Given that there are around 10 000 jobs in the Northwest coal industry, it is necessary to create other viable economic alternatives outside the energy sector in order to compensate for the expected job losses.

4. ANNEX

Complete table compiled by authors on installed capacity & electricity production in the Northwest region & CZ

5. METHODOLOGICAL NOTES

In order to gain the needed data and information, several relevant stakeholders were addressed (apart from the research conducted through the analysis of available data) with the following questions:

- In what condition is the new RES deployment in the Northwest region (ÚK, KVK)? Are there any synergies of local industries with renewable energy companies/industries in the region? Are there any enterprises that are part of the RES value chain (manufacturing, design, construction etc.)?

- Are the RES facilities owned locally or by external subjects? If they are owned externally, do they provide any benefits (taxes revenues, bonuses etc., similarly to the benefits municipalities close to coal infrastructure get from the coal business) to local communities (municipalities and citizens)?

- In the Northwest, is there a labour force with the relevant skills that could be employed in the local RES deployment and RES value chain. Would a lack of relevant skills or training be a barrier to the industry if it did want to expand regionally?

The responses of approached stakeholders and the individual research indicate the lack of relevant data to assess the current socio-economic impacts of RES deployment in the Northwest region specifically, and the lack of the detailed data in general. The following stakeholders were identified and addressed through mail or personal communication, with the following responses.

- Chamber of RES, response: data not available, provided a publication on the RES socio-economic impacts in general

- Czech Energy Regulatory Office, response: data are not available, provided detailed data on the RES installed capacity between 2010 and 2020

- Guild of Accumulation and Photovoltaics, response: the data not available

- Czech Biomass Association, without response

- Czech Statistical Office, response: provided a general publication on RES and GHG emissions

- Modern Energy Union, response: data not available