

NATIONAL REPORT – CZECH REPUBLIC



WP3	Strategy for eco-knowledge
ACTIVITY 3.2	Analysing the environment for ecoinnovation in partner countries
DELIVERABLE 3.2.2	National report on obstacles and opportunities

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1. ABSTRACT

Czech Republic has seen rising investments from both private and public sector during the past few years. The energy sector is changing with higher focus on renewable sources of energy, supported by new environmental policy outline since 2012. The gradual change holds its importance as the country is among the most energy independent countries in the EU, consuming mostly what is produced inland. As a major exporter of medium and high-tech products, country also leads in non-R&D related innovation investments

The biggest challenge slowing the nation down is the stagnating number of people willing to dedicate its future to research and science. Despite the recent rise in funds the doctorate studies are still largely underfunded and not attractive to tertiary education graduates. Even though the overall share of university educated population is rising, the pace of that is below regional average. Public and private sphere cooperation is improving over the past five years, but still it does not reach the regional average either. Lack of research-dedicated personnel is showing also in low number of registered patents at International or European authorities.

Environmental related topics are still being rather pioneered in Czech Republic. The energy sector is largely dependent on fossil fuels and the gradual change begun only few years ago. The country is by far below the regional standard in using the renewable sources of energy, despite the recent trend. The realized environmental taxes are still a hot topic with the traditional dependency of the nation on brown coal and the environmental taxes related revenue is on the level of most of the Danube region countries on the east.

Czech Republic is still a young country in the field of both environmental policies and eco-innovations. The biggest focus should be drawn to the improvement and generation of new human resources capable of taking on the research in the field. There are promising aspects of the issue, such as the high number of population involved in any way of life-long learning. But the support of university research, cooperation between public and private sector on bringing the innovations from research to practice is vital in Czech Republic.

To draw a conclusion, the funding has improved in the past, now the importance lies on the quality and number of scientists that can use it. Most essential improvement to be made is in the human resources, specifically in the national ability of generating them. The country must raise the attractiveness of doctorate studies and further scientific careers to improve its innovative performance in eco-innovations.

Through all the changes in the past decade the importance of eco-innovations rises in the Czech Republic. The overall presence of both progress and ecology and their link together brings more of the general support to the eco-innovations, which is not left unnoticed by broad research and business sphere. In both science and business there is growing number of those who take on the opportunities of eco-innovations, and the awareness in the relevant circles rises as well.

1.1 ANALYSIS OUTLINE

The National Report on obstacles and opportunities is for the Activity 3.2 focused on eco innovations in partner countries. As deliverable 3.1.2, this analysis focuses on Czech Republic and its opportunities in eco innovations. In its complexity, it operates mainly with the national ratings measured every year within European Innovation Scoreboard, which offers different views on innovation performance of each country. The methodology of this scoreboard changes over years. For the purposes of this deliverable the Scoreboard data were limited to the most relevant criteria and summarized in chapter 3, dedicated to Innovation. As a prequel, the overall national rating trend is discussed in the chapter 2. The field most relevant for the eco-related innovation, energetics, is described in the Czech Republic context in the chapter 4. Following part offers the view on current environmental legislation, that can ease or harden the way of eco-innovations being pursued by both public and private investors. As the eco-innovations are mostly driven by financial gains, present due to current constrains put on developed countries, the economy and demography of the country is discussed as well to complete the picture. Even though the opportunities and obstacles are mentioned throughout the document, the final chapter offers a compact conclusion of possibilities of future progress in eco-innovations in Czech Republic.

2. OVERALL NATIONAL RANKING

This section will provide an overview of the national ranking per 2 main composite indexes applied within the methodology. The national rating is provided within the European Innovation Scoreboard 2017 database, offering two sets of overall performance comparison - Relative performance as compared to EU in 2010, and Relative performance as compared to the EU in 2016¹

2.1 Current Innovation Index of Czech Republic

Czech Republic has similar national rating as the Danube region average, exceeding it by 3.7 %. The country falls short on the European average of 2016 by a categorical margin, clearly offering space for improvement in the future development

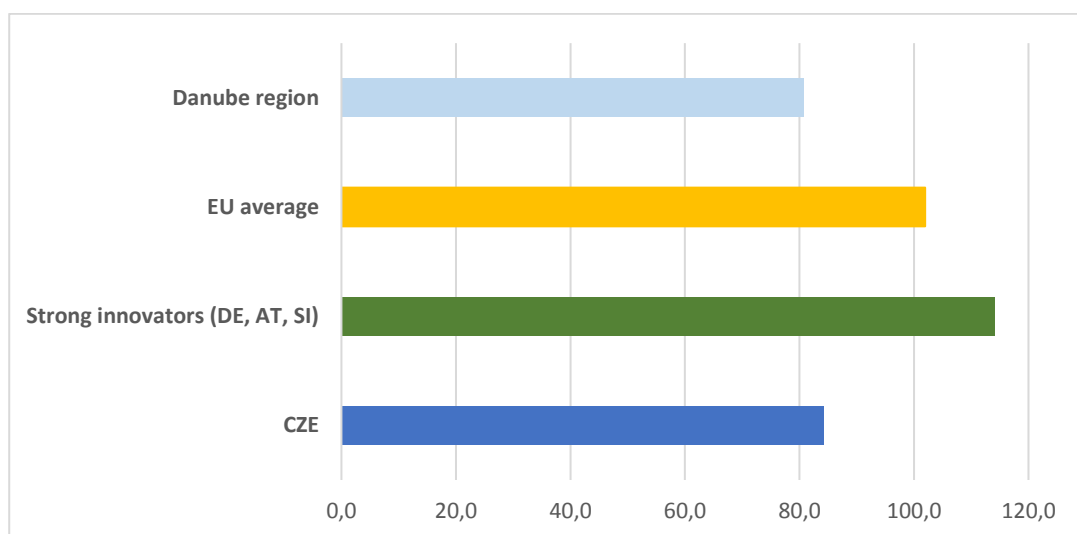


Figure 1: Innovation performance relative to that of the EU in 2010

¹ Source: European Innovation Scoreboard (EIS) Database 2017 (<http://ec.europa.eu/DocsRoom/documents/24141> 9.12.2017)

This does not necessarily mean that Czech Republic would constitute a “typical country” of the region. Looking at the country indexes available from the current member states falling into the Danube Region geographical category, the area is very diverse as visible in Figure 2. Czech Republic is described as Moderate Innovator compared to the EU-28 and to the Region itself.

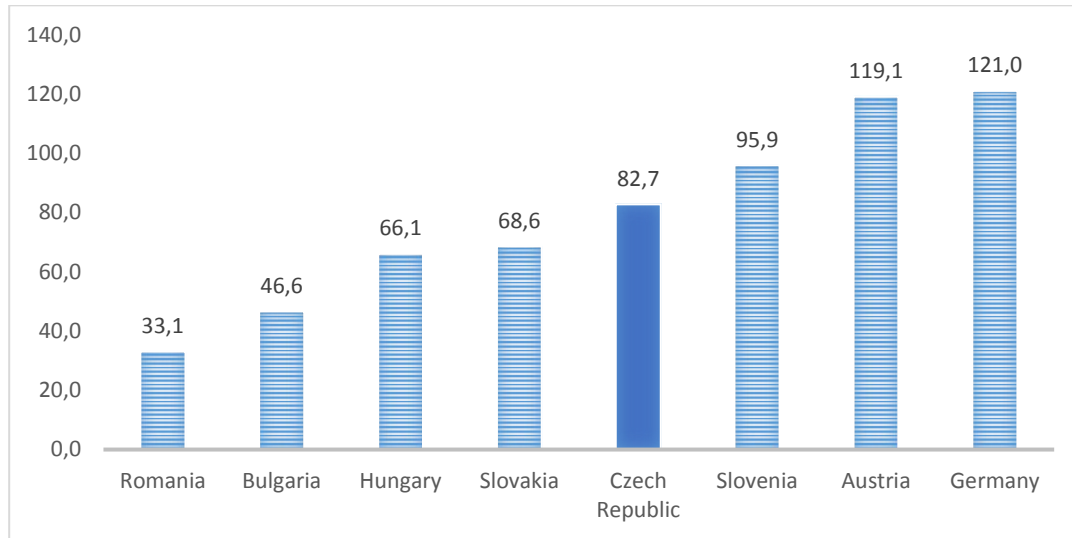


Figure 2: Innovation performance of individual Danube Region countries relative to that of the EU 2016

2.2 Innovation index of Czech Republic in time

The summary innovation index as compared to EU in 2010 is measuring the performance of each country in time, looking at the progress done over the last 6 years of data collection. The overall value and ranking of Czech Republic is similar to last comparison, Czech Republic holds the similar value as the Danube Region itself, being in the better half of countries of its area, but not reaching the performance of the EU-28.

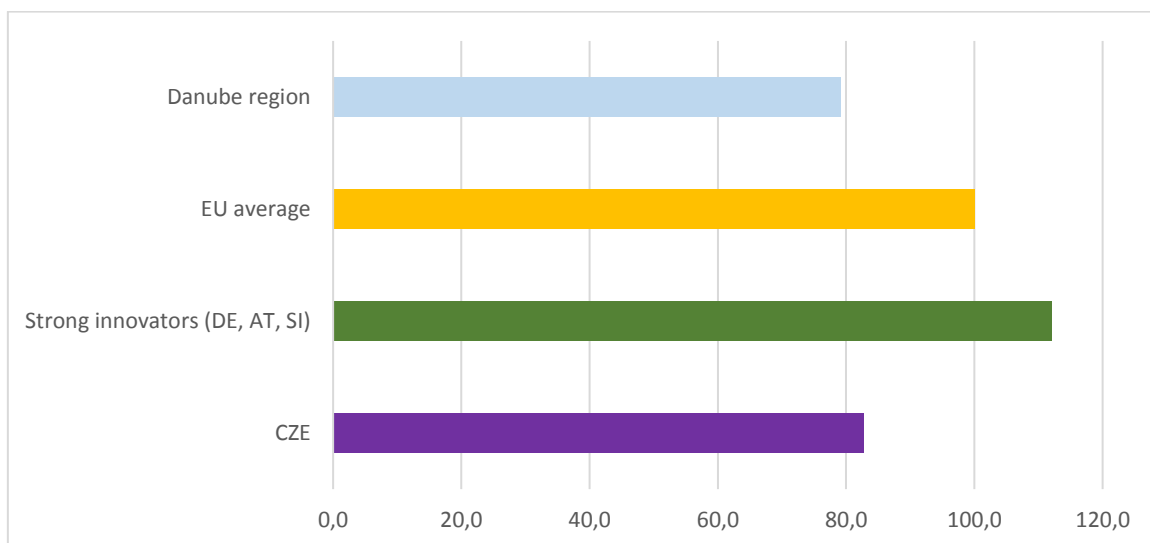


Figure 3: Innovation performance as compared to EU in 2010

However, the development of Czech Republic national ranking in the Summary Innovation Index is more dynamic. Although the European trend is more to the positive values, Czech rating is decreasing in the last five years. The pace of the decrease is faster than the one of Danube Region average, which has the same tendency.

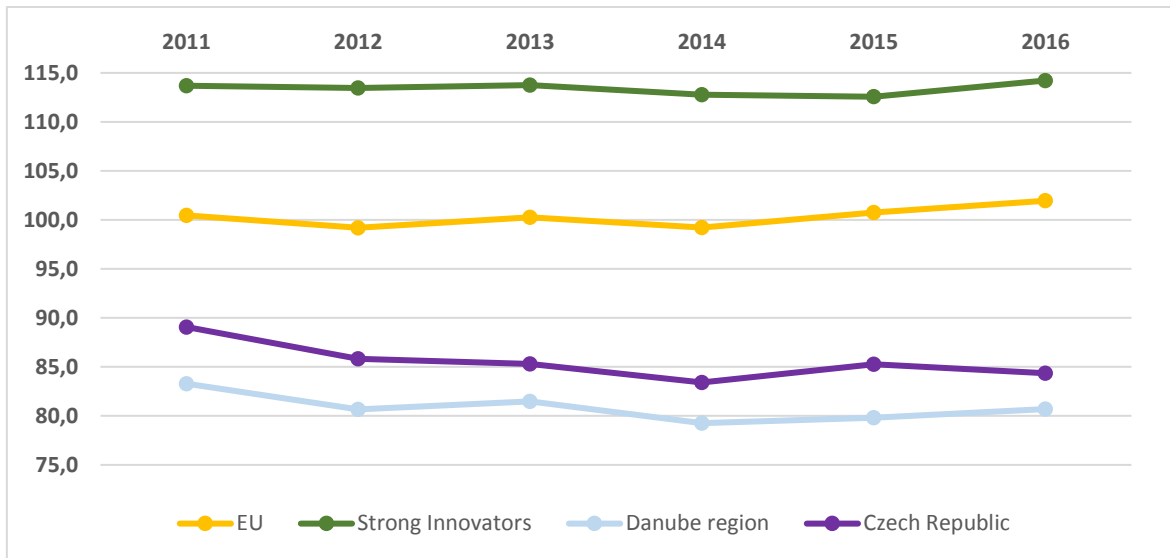


Figure 3: Summary Innovation Index in time, as compared to EU 2010

3. INNOVATION

The European Innovation Scoreboard has its methodology of and the Summary Innovation Index is calculated based on different indicators, enabling to measure more than just financial contributions and simple factors into nation’s innovative performance. Bellow selected indicators are embedded in the methodology, even though they do not represent the complete list. The selection was made in order slim it down to a summary for the purposes of this chapter.

3.1 HUMAN RESOURCES

Human resources category is measured by indicators closely looking at the educational system of Czech Republic, notably the doctorate graduates constituting the scientific population employed not only at the Universities, but also in commercial research

3.1.1 Indicator: New doctorate graduates per 1000 population aged 25-34

Looking at the Figure 4 chart, Czech Republic is clearly the under-performer in this category. Number of new doctorate graduates is the lowest from the values displayed, being behind both the European and the Danube Regional average. The value has also a stable trend with very little improvement made over the past seven years.

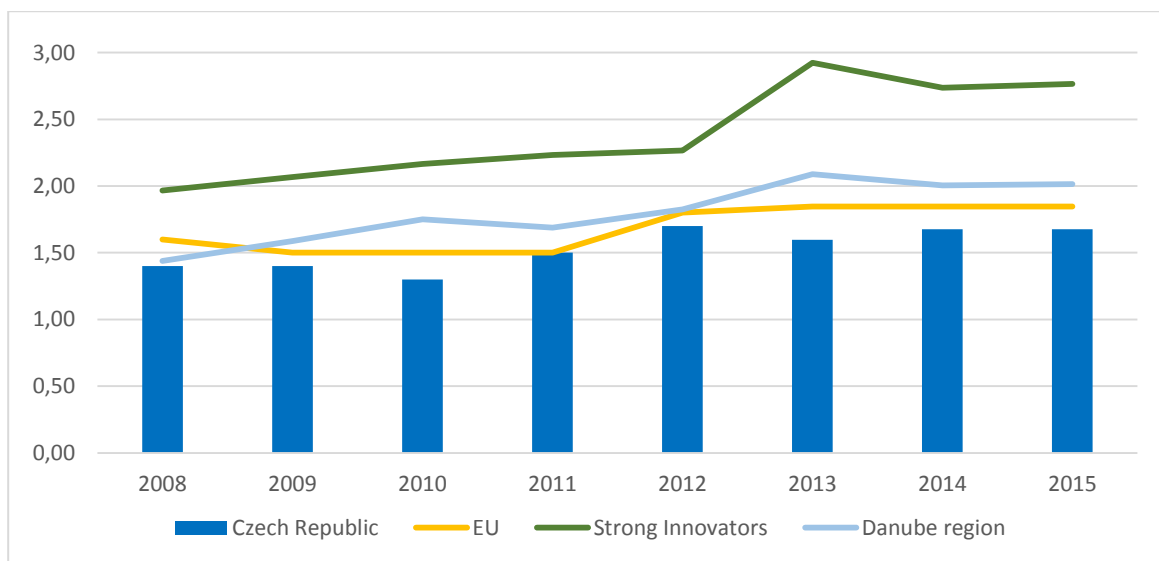


Figure 4: New doctorate graduates per 1000 population aged 25-34 indicator in Czech Republic compared to SI benchmark, and the average of the EU and Danube region

3.1.2 Indicator: Population aged 25-34 with tertiary education

Contrary to the previous indicator, the percentage of people aged 24-34 with completed tertiary education is increasing over the years measured in the Scoreboard. Czech Republic is not in the top of the Danube Region, since the Innovation leaders took a high leap in 2014, and even the average of three top innovators in the region did not reach the EU average earlier than in 2016. Yet still the Czech Republic is following the European trend of transition to the knowledge economy with the increase of University graduates in the age range for over 10%.

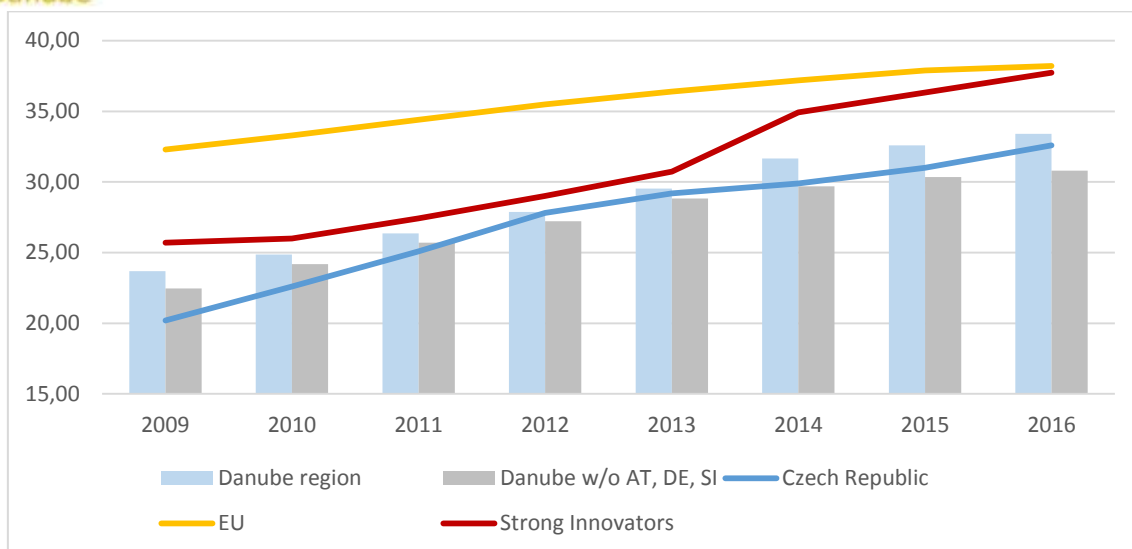


Figure 5: Population aged 25-34 having completed tertiary education (percentage share)

Obstacle: Even though the overall university education is being more accessible and the society in Czech Republic is on its way to higher share of tertiary education graduates, the number of doctorate graduates is not increasing with the same pace. The lack of interest or will of university students to continue the education to even higher level is an obstacle in involving more future employees in innovative research.

Opportunity: The strong innovators in the Danube Region took a leap in 2012, improving their performance from 2.27 to almost 3% of doctorate graduates in the age range. The measures taken in the countries that are leading the region might be taken as a best practice and is something worth investigation.

3.1.3 Indicator: Lifelong learning

The percentage of population under 65 years of age involved in any kind of life-long learning is above the regional average despite its decrease from the stable 10% in 2014. With the increasing trend, Czech Republic is third in the Danube Region, in front of Germany, leading this area indicating the innovative environment.

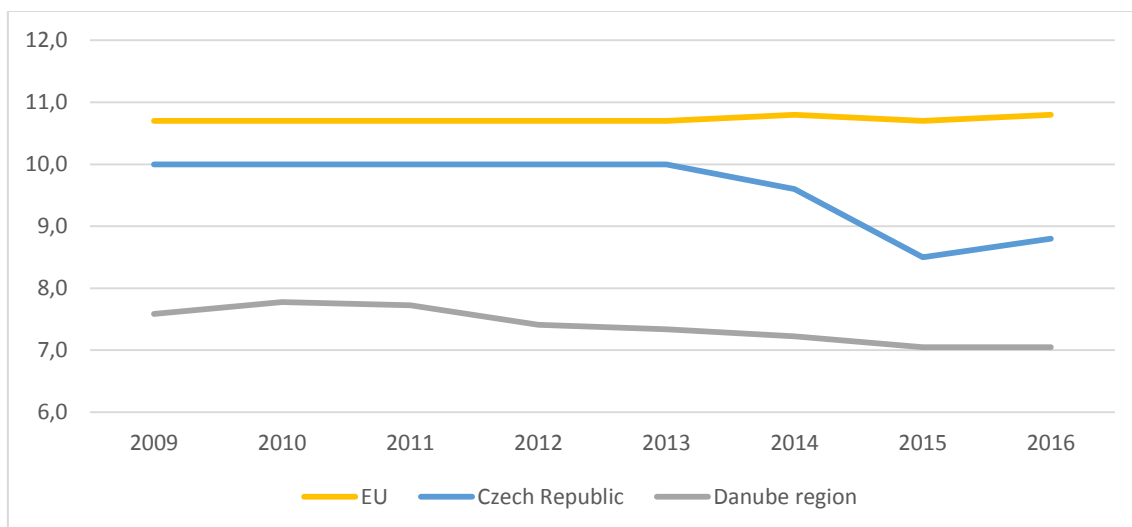


Figure 6: Population aged 25-64 involved in lifelong learning (percentage share)

Opportunity: Comparing this figure with the previous indicator, the life-long learning cannot fully substitute the doctoral studies and university based scientists, but it can be a helping factor in further employing the percentage of population in innovation related jobs.

3.2 INVESTMENTS

Looking at the financial side of innovation, this group of indicators measures and compares the ability of Czech Republic both prioritize in its budget and attract private funds to innovation related ventures.

3.2.1 Indicator: Public R&D expenditure as % of GDP

The public funding of Resource and Development has undergone a tremendous change over the measured period. In 2009 the Czech budget counted with the 0.56% of GDP for R&D related expenses, missing the Danube region average by 0.01 margin and falling behind the EU average for almost 0.2%. Over the following years there has been a massive increase of funding, putting Czech Republic above both EU and Danube Region average in the measured values.

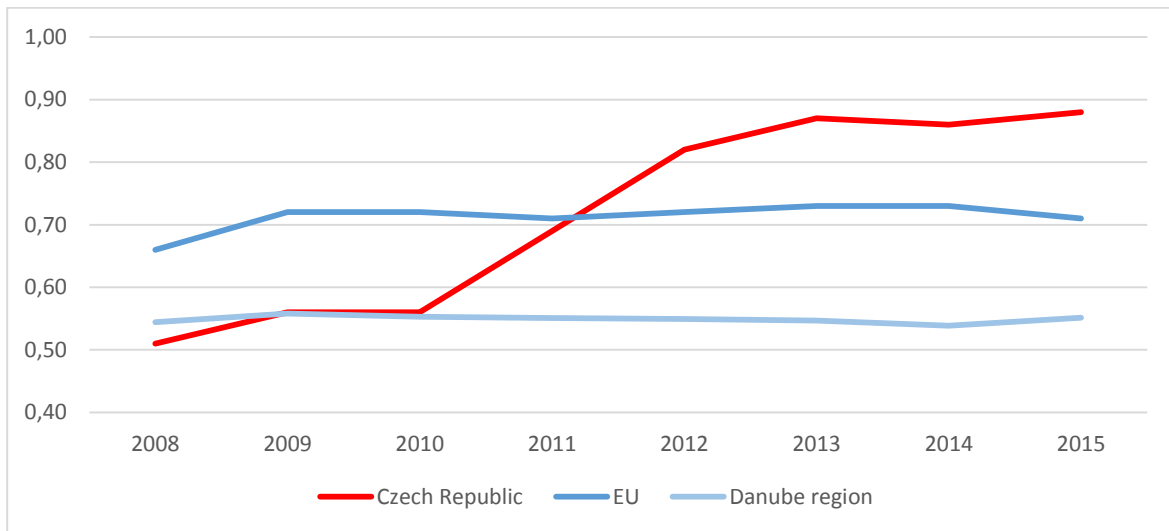


Figure 7: Public R&D expenditure as % of GDP for Czech Republic, the European Union and the Danube region

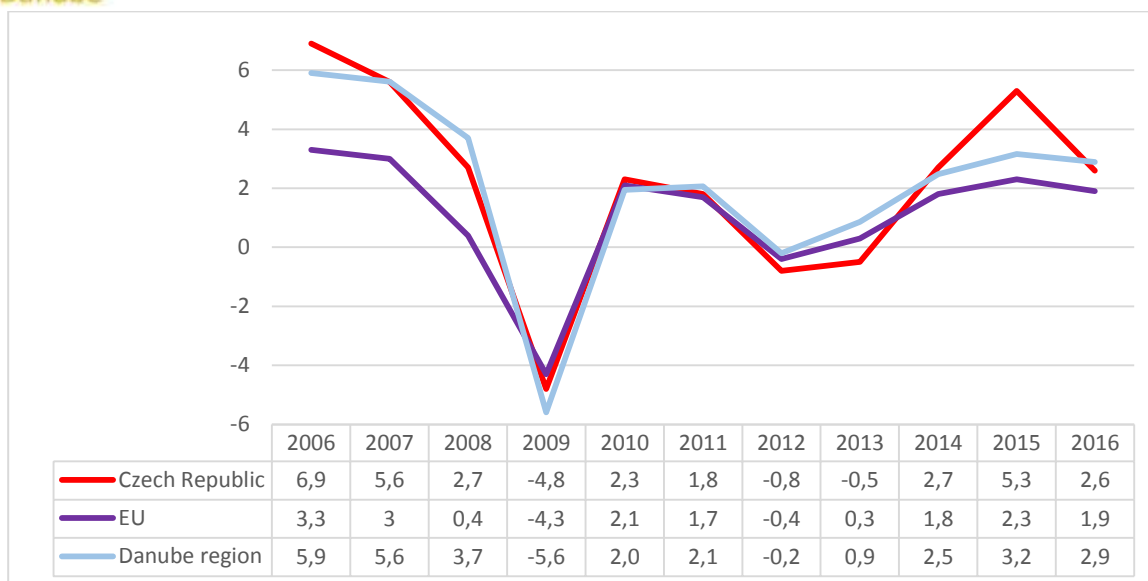


Figure 8: Real GDP growth (%) in Slovenia, the EU and the Danube region

As Figure 8 illustrates, the real GDP growth follows the European trend with the financial crisis in 2008. Overall the economy is slightly over-performing the EU average in the last three years

Opportunity: With the more positive economic situation over the past years and the increase in R&D investments from Public sector, the innovation scoreboard might register improvements in other areas in the future if the funds were allocated effectively

3.2.2 Indicator: Private sector R&D expenditure as % of GDP

Contrary to the public expenses, in the private sector the performance of Czech Republic is below Danube Region average and falling behind the EU-28 by more than 0.2%. Despite the poor performance, the country has been closing this gap over the past five years, improving quicker than EU or Danube Region on average.

Obstacle: There has been a decline in the positive trend in 2015. We do need the current data to see whether this decline continues, but if so, it would be an obstacle to further development of innovative business in private sector.

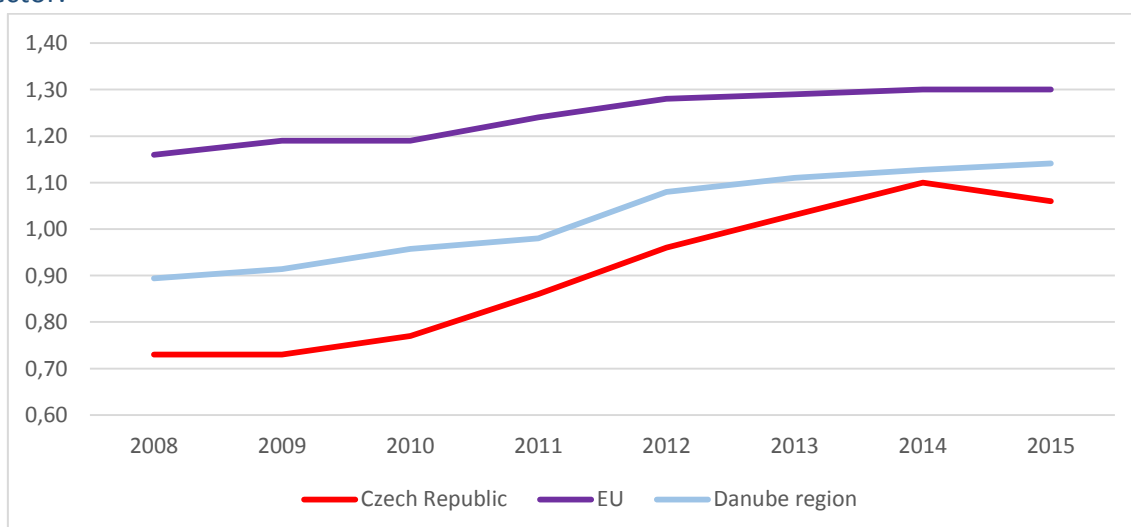


Figure 9: R&D expenditure of the private sector as % of GDP

3.2.3 Indicator: Non-R&D innovation expenditures

This indicator measures non-R&D innovation expenditure as a percentage of total turnover. Several of the components of innovation expenditure, such as investment in equipment and machinery and the acquisition of patents and licenses, measure the diffusion of new production technology and ideas² Even though Czech Republic falls behind in the R&D expenditures in the Private sector, in this indicator the country is over-performing both Regional and EU-28 averages, which might show that the private finances in Innovation do play a role, just not in the R&D field.

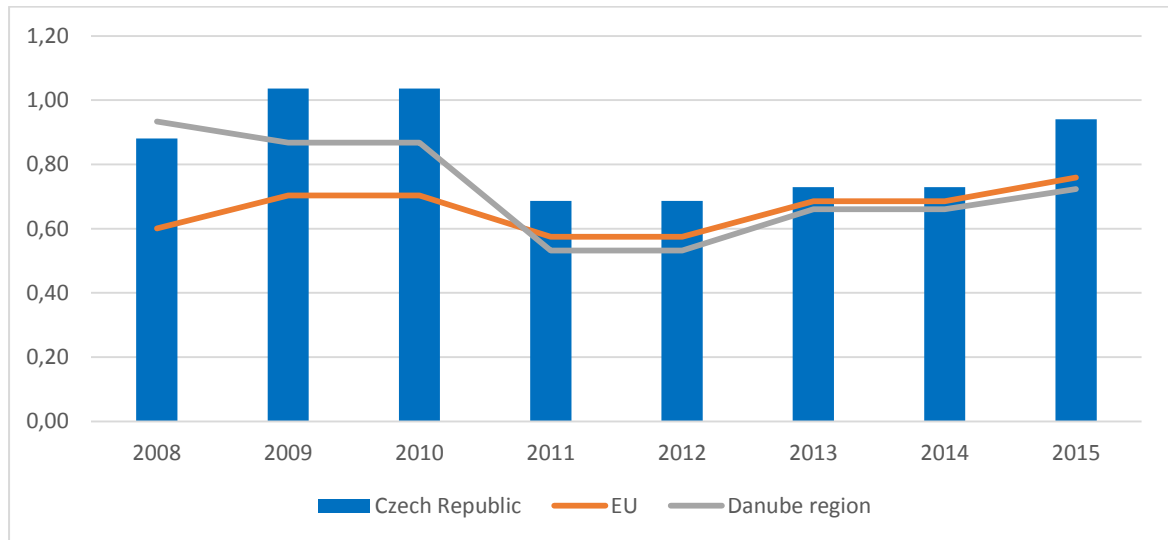


Figure 10: Non-R&D innovation expenditures (percentage of turnover)

3.2.4 Indicator: Enterprises providing training to develop or upgrade ICT skills of their personnel

Percentage of enterprises providing training in Information and Communication Technology skills for their employees is stable and not changing over the years, which means Czech Republic is not following neither the Regional, nor the European trend³. Even though the total share of enterprises dedicating their resources to provide such training is 2% higher than the Regional average and even matching the average of EU-28 during the past two years, the trend of strong innovators is to increase such investments, which is not happening in the Czech Republic for the past eight years.

Obstacle: Should this trend continue, the increasing importance of digital economy might cause Czech Republic to fall behind in this indicator, worsening the overall innovation score of the country.

² Interpretation from the EIS 2017 Methodology report (<http://ec.europa.eu/DocsRoom/documents/25101> 9.12.2017)

³ Having the data stay on one precise percentage for eight years is bringing up the question of statistical error or a start of data collecting later than 2008

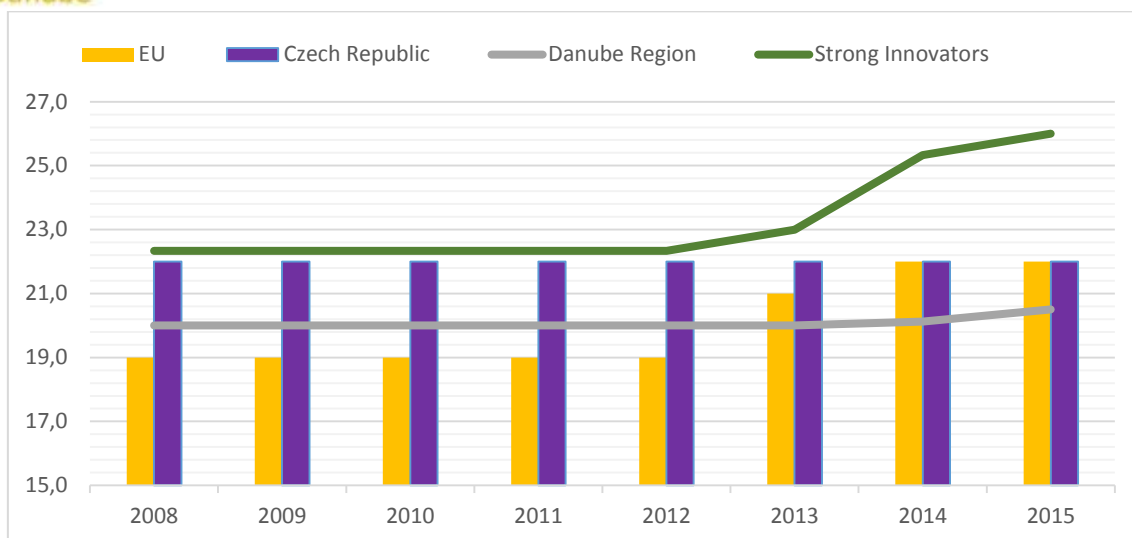


Figure 11: Enterprises providing training to develop or upgrade ICT skills of their personnel (percentage of all enterprises)

3.3 INNOVATION ACTIVITIES

This group of indicators measures the innovators and their intellectual assets in perspective of collaboration

3.3.1 Indicator: Innovative SMEs collaborating with others

The innovation co-operation activities within the Small and Medium Sized Enterprises is measured by the frequency of agreements within them. Here Czech Republic is being moderately above the Danube Region average, even over-performing the EU-28 Average. With some level of volatility, the trends are stable for the countries, having its ups and downs without long-term tendency for increase or decrease. This makes Czech Republic stand in a good light, showing that the collaboration is fostered in the country

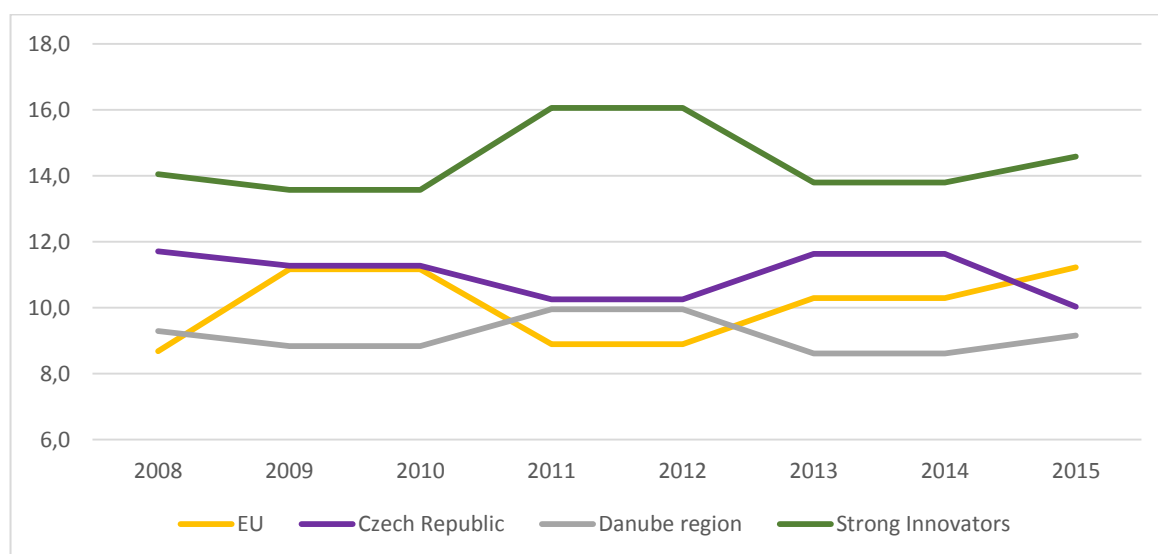


Figure 12: Innovative SMEs collaborating with others (percentage of SMEs)

3.3.2 Indicator: Private co-funding of public R&D expenditures

The public-private cooperation is typical for co-funded university activities in innovation research. All the government and educational activities with the participation of businesses is measured in this indicator. Two main observations can be made from the Figure 13. Czech Republic was falling behind both Regional and European average by its multiple value. Still in 2015 Czech Republic is low performer in this indicator. The second observation is much more positive, as Czech percentage of Private co-funding of public R&D Expenditures is increasing in the past four years, slowly closing the gap.

Opportunity: Czech Republic is improving its investments in both Public and Private sector, related to R&D and Innovation. The cooperation in educational sphere and with the universities can help to narrow the gap the country has in human resources indicators.

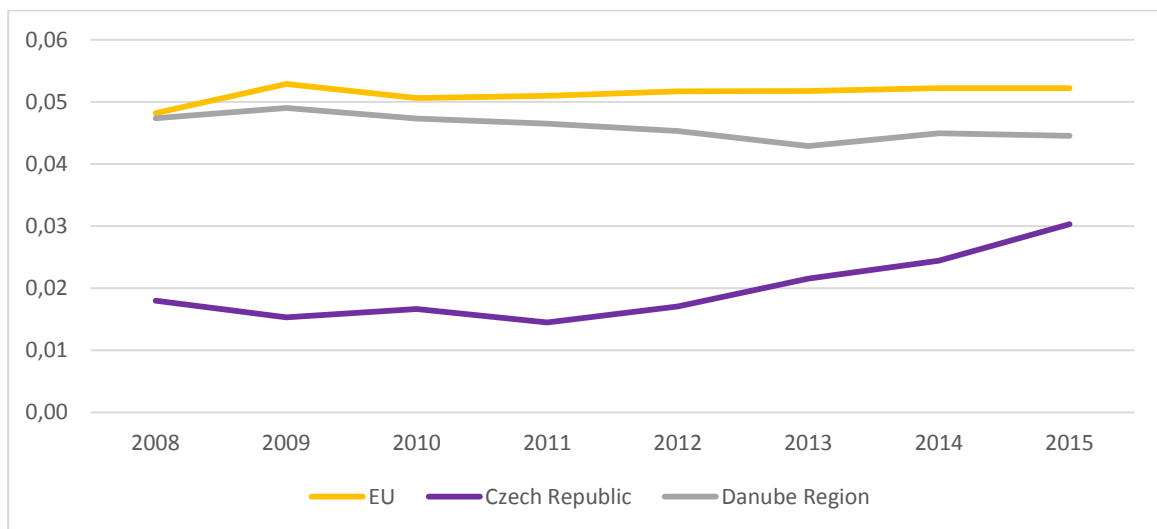


Figure 13: Private co-funding of public R&D expenditures (percentage of GDP)

3.3.3 Indicator: PTC Patent applications

The number of Patent application at the International Patent System and at the European Patent Office is showing that the Czech Republic is slowly increasing its share of patent applications compared to GDP. However, it falls together with the modest innovators of the Region in low performing countries of the EU. The overall average is almost four times lower than the one of the EU-28 and five times lower than the leaders of the Danube Region.

Opportunity: Having the leaders of the EU in this indicator within the same region holds possibilities for further cooperation, that could improve the performance of the country in this field

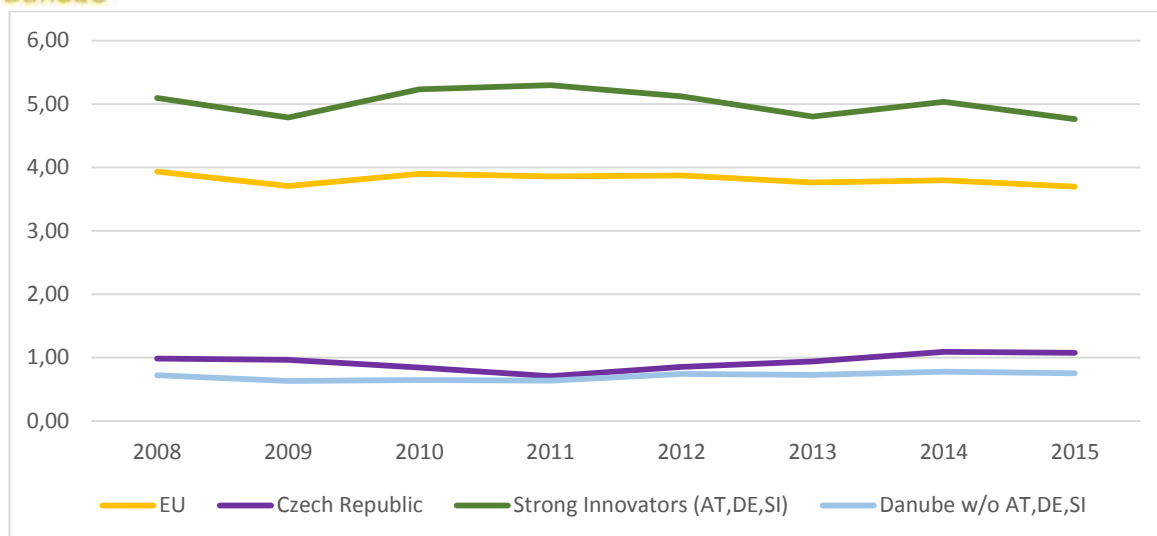


Figure 14: PCT patent applications per billion GDP (in PPS)

3.4 IMPACTS

The below indicator measures how are the innovative setting of the country and the benchmark regions utilised into the economic impacts, transforming the nation economy to the knowledge-based one.

3.4.1 Indicator: Employment in knowledge-intensive activities

The employment in knowledge-intensive activities is on average below the EU-28 level in the Danube Region. Czech Republic is one of the better performers in the area, yet still not reaching the level of the EU average. More importantly the EU itself is showing increasing trend in this indicator, having more of the knowledge-intensive dedicated employees over the past eight years of measurement. Czech Republic does not show this kind of progress, reaching its high in 2013 and decreasing again in the following years. With the improved performance in 2015, the indicator can be viewed as not changing in the big picture.

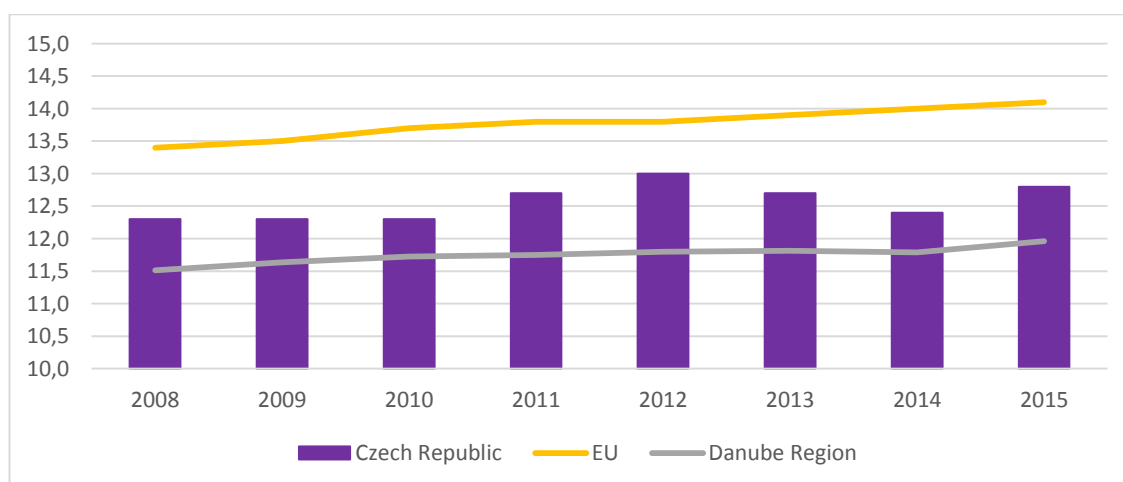


Figure 15: Employment in knowledge-intensive activities (percentage of total employment)

3.4.2 Indicator: Employment in fast-growing enterprises of innovative sectors

Czech Republic is above average nation in the employment in fast-growing enterprises of innovative sectors, showing the possible space for further development of innovative economy. There has been a steep decrease of the trend in 2015, visible not only in the Czech Republic but also in the Danube Region and the EU, probably having the same root cause (a change of methodology or a revision of the scope of the fast-growing enterprise term might be considered)

Opportunity: As shown in the dedicated chapter, Czech Republic is tackling the lack of labour force on the market. With the high demand for employees in the fast-growing enterprises of innovative sectors and some reserves in the human resources rating in the Innovation Scoreboard, these three topics combined can offer a solution in private involvement in further education.

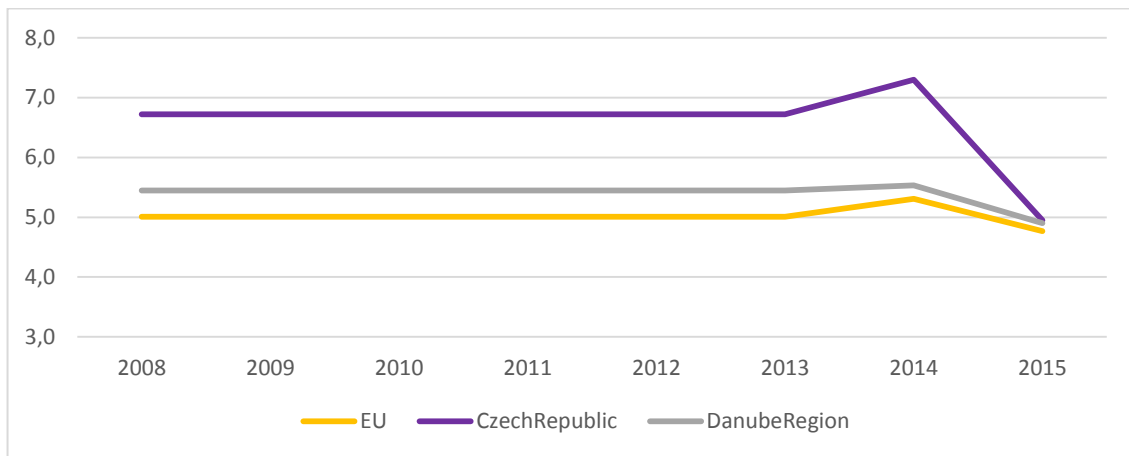


Figure 16: Employment in fast-growing enterprises (percentage of total employment)

3.4.3 Indicator: Medium and high tech product exports

Czech Republic is leading in the indicator of medium and high product exports, showing that the manufacturing of innovative products can together with the export oriented economy lead to high performance. The trend of manufacturing the high-tech products is increasing in both the Danube region and the EU. Data in the figure 17 also show that Danube region is more oriented on products than on services yet. This conclusion is supported also on the next indicator.

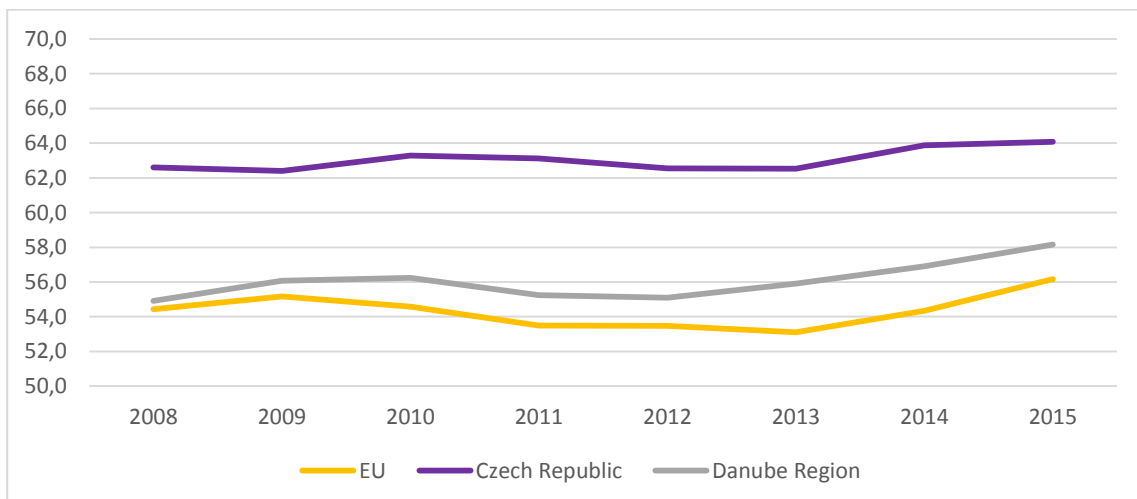


Figure 17: Exports of medium and high technology products as a share of total product exports

3.4.4 Indicator: Knowledge-intensive services export

While Czech Republic is leading in exporting the products of knowledge-intensive activities and innovative solution as, services are not so common as an export community for the country, falling behind the Danube regional average and representing only slightly more than a half of EU-28 percentage. There is however an increasing trend, improving the performance over the past eight years.

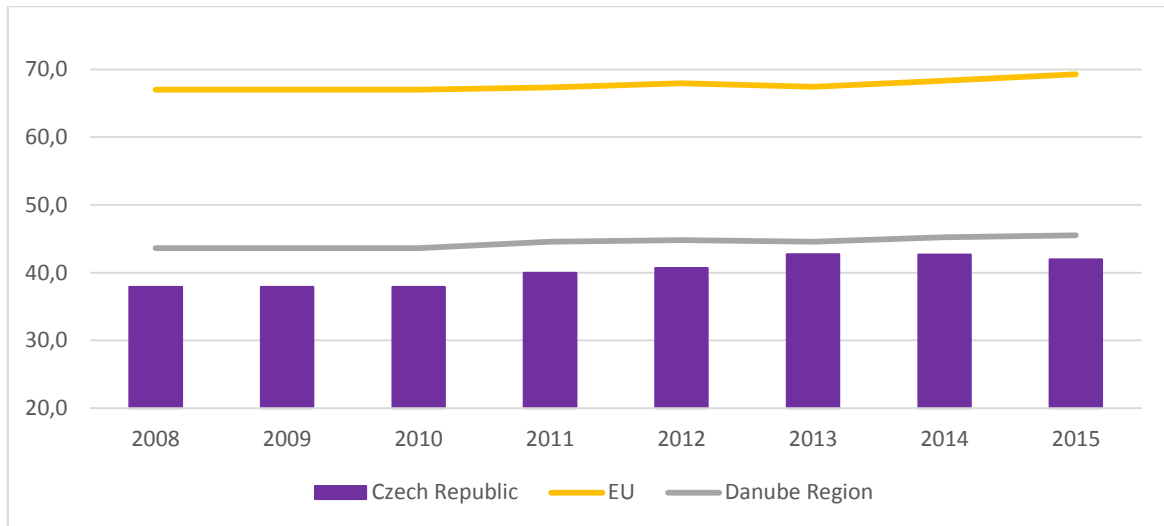


Figure 18: Knowledge-intensive services exports as percentage of total services exports

4. ENERGY

4.1 General overview of energy sector

Fossil fuels based power plants are still the dominant source used for production of electrical energy in the Czech Republic, constituting almost half of the overall production. The nuclear energy falls in second, with nuclear power plants in Temelin and Dukovany producing over one third of overall electric energy in the country. The rest is divided into the renewable sources of energy, including wind, solar and water plants. Performance balance is in surplus as Czech Republic exports around 20% of its produced electricity abroad.

Dominant producer of electricity is the state-co-owned company CEZ, which creates almost three quarters of the overall electricity production. The company operates 10 coal, 2 nuclear, 37 water, 1 steam, 13 solar and 2 wind power plants. Three plants using the biomass fuel and one bio-gas station.

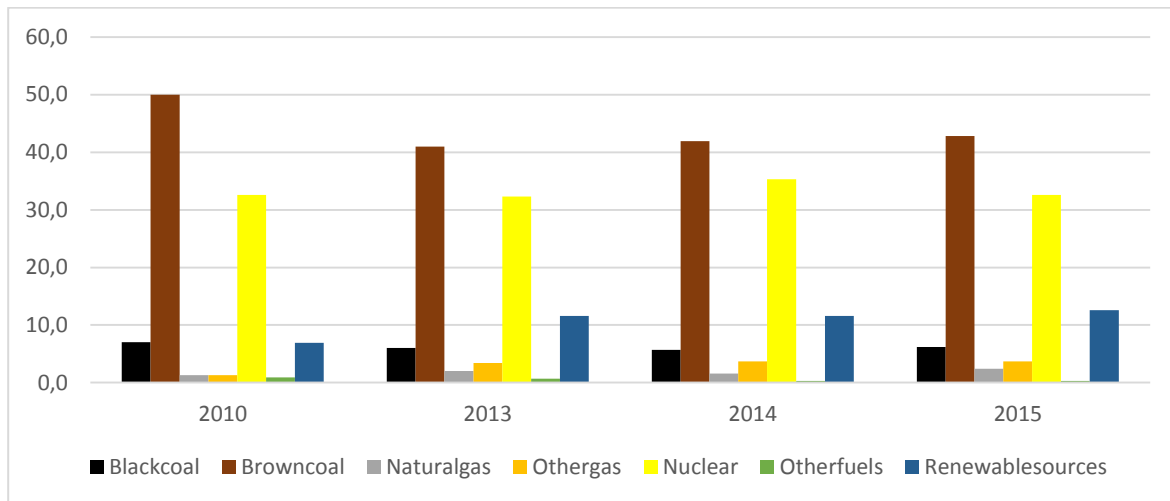


Figure 18: Percentage of energy production per source for measured years

4.1.1 Indicator: Energy dependence

Czech Republic is exporting its produced electricity, mainly from the nuclear power sources. It's dependency on domestic fossil fuels makes the country less dependent on imports. The overall energy dependency is not as low as in 1990 (15%), and increases over time, following the EU-28 trend. However, within both EU and the Danube region, Czech Republic is one of the least dependent countries, currently holding the dependency level closely above 30%, which is being low compared to other member states.

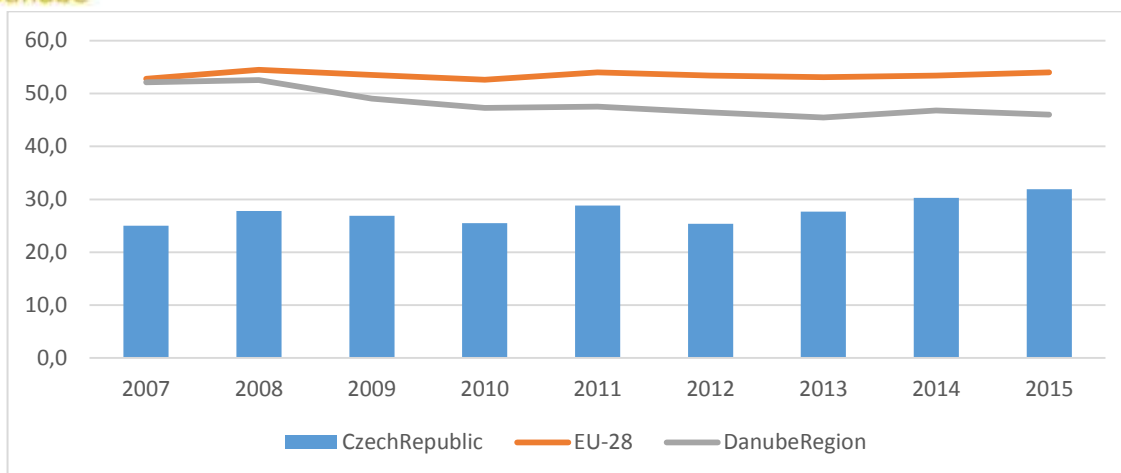


Figure 19: Energy dependence of Czech Republic compared to EU-28 and the Danube region

4.1.2 Indicator: Energy intensity of the economy

This indicator is the ratio between the gross inland consumption of energy and the gross domestic product (GDP) for a given calendar year. It measures the energy consumption of an economy and its overall energy efficiency.⁴ As visible on the figure 19, Czech Republic is above the Danube regional average, which in this case is not positive rating. Czech Economy uses comparatively more energy to generate the GDP than the rest of Danube region, also more than doubling the needs of the average EU-28. However, the trend is positive, the value is decreasing over the past 8 years, which is true for the entire EU on average, but even there the pace of Czech Republic is slightly quicker, closing the gap year by year.

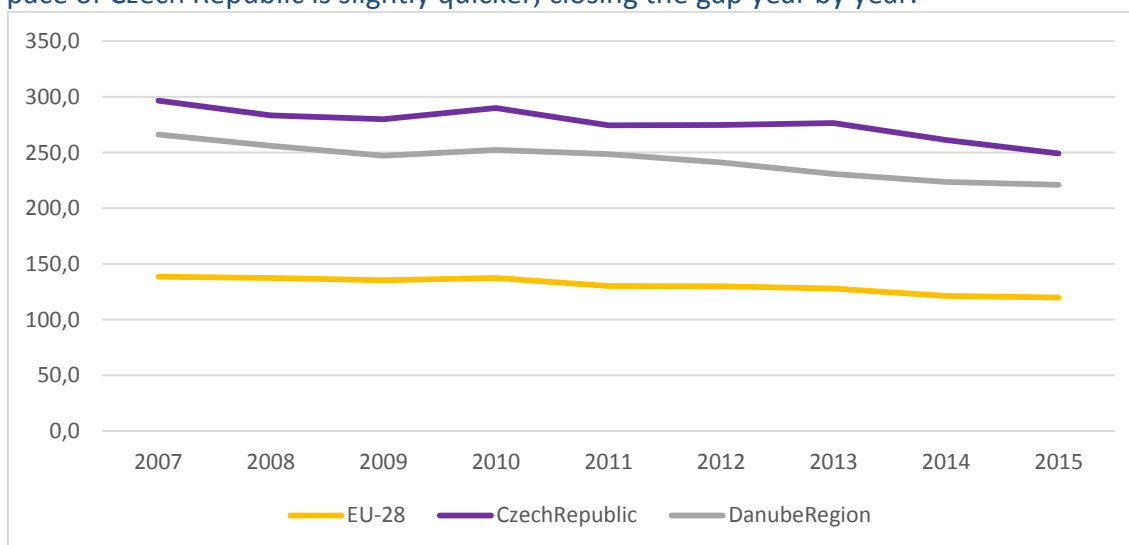


Figure 20: Gross inland consumption of energy divided by GDP

4.1.3 Indicator: Share of renewable energy in gross final energy consumption

Figure 21 and 22 tell a different story of Czech performance in the indicator that measures the share of renewable energy in the energy consumption. Looking at the overall data throughout the years, Czech Republic is improving in this area, yet still falls very short on both Regional and European average.

⁴ Source: Energy intensity of the Economy, Eurostat (<http://ec.europa.eu/eurostat/web/products-datasets/-/tsdec360> 9.12.2017)

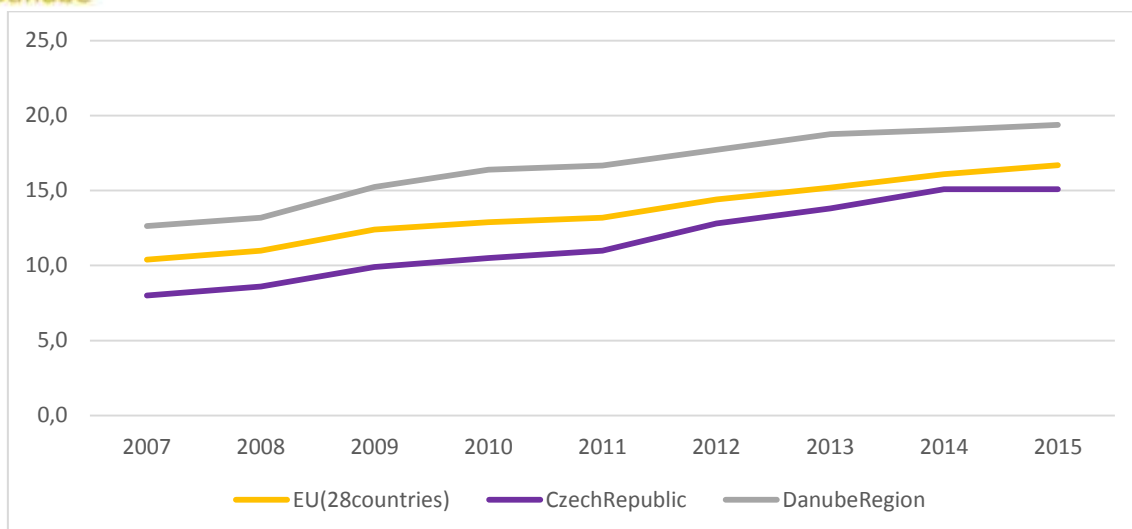


Figure 21: Share of RES in final energy consumption in Czech Republic

However, every country has its target set for the period, and while the regions are not meeting their targets on average, Czech Republic has exceeded its target consumption value in 2015

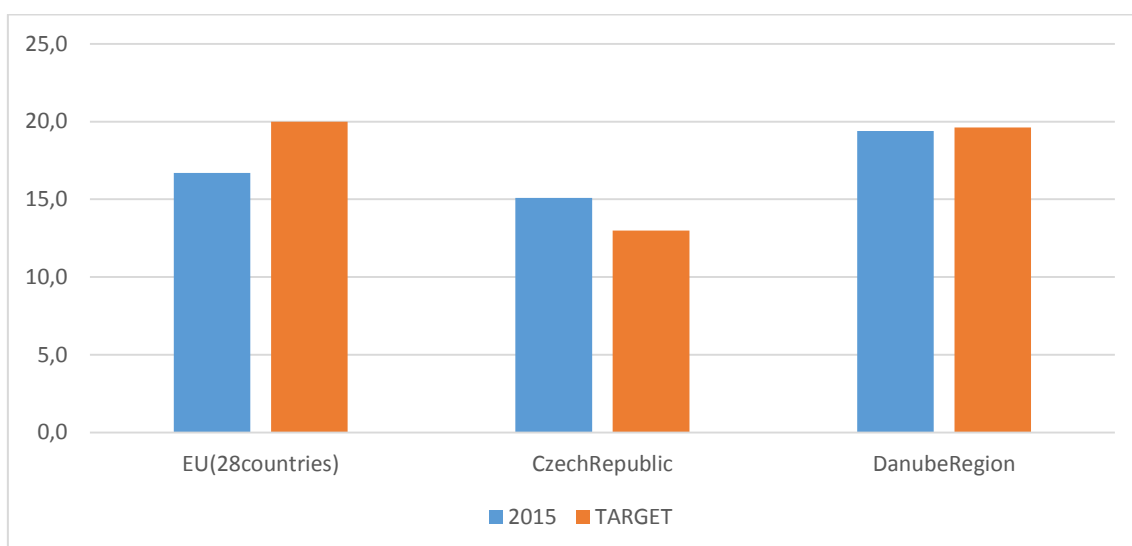


Figure 22: Share of RES in final energy consumption for chosen benchmark in 2015 vs. target

4.1.4 Indicator: Electricity generated from renewable sources

In the figure 23 the share of electricity generated from the renewable sources in Czech Republic covers the consumption of it from Figure 22. We can see stable increase from 2008 to 2015, as the RES energy is more state supported. Unlike on the previous figure here the Czech Republic falls behind Danube region and EU-28 average by a big margin, which also means that the energy from RES is a matter of export in at least some of the Danube Region states.

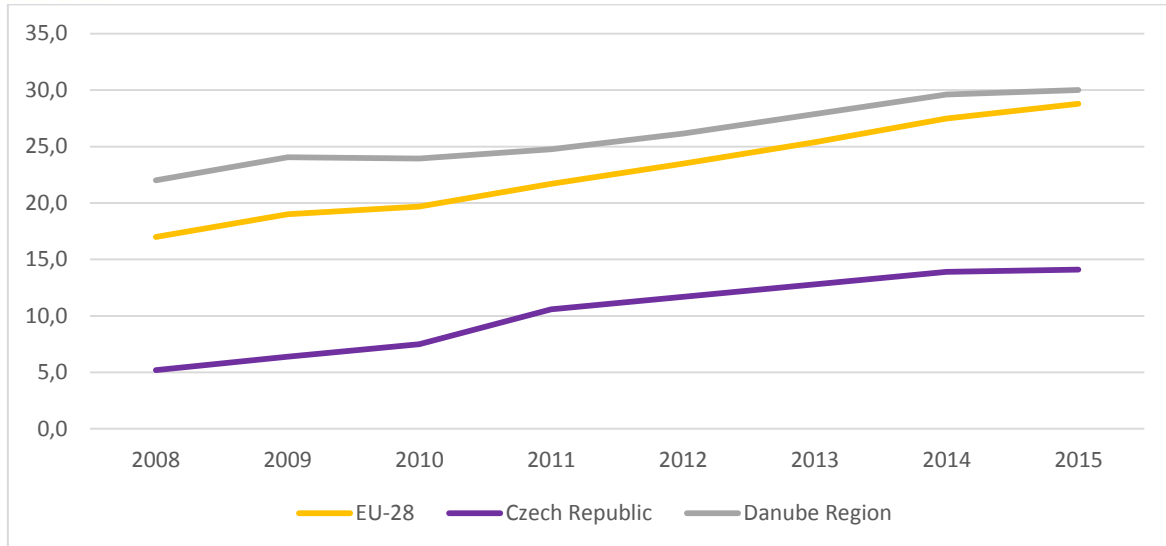


Figure 23: Share of electricity generated from RES in Czech Republic

4.2 National energy policy

The Czech Republic is a member of International Energy Agency, that publishes a detailed report on each of their member countries every year, offering structured review.⁵

The Czech Republic recently approved a new National Energy Policy (SEP) that aims to reduce energy consumption and improve the economy's energy intensity. The SEP broadly seeks to strengthen security of energy supply and build a competitive and sustainable energy sector. While the Czech Republic has experienced strong growth in the renewable energy sector – notably solar PV – policy changes have created uncertainty. Meanwhile, greenhouse gas emissions, which have been falling since 2000, are expected to increase. Coal dominates the power sector and is the largest source of carbon emissions and also poses a substantial threat to local air quality.

The IEA country review examines the impact of the SEP. The review warns that reaching long-term energy targets will require greater effort if the country is to play its part in the on-going global energy transition.

The review finds that natural gas supply security remains strong, and the country is expected to remain a net exporter of electricity. The expansion of nuclear power is one of the main pillars of the SEP, and will play a greater role in coming years. The SEP also establishes key targets for energy security, emissions, energy savings, electricity generation and affordability.

⁵ Source: International Energy Agency IEA (<https://www.iea.org/countries/membercountries/czechrepublic/> 9.12.2017)

5. ENVIRONMENTAL PROTECTION

5.1 Spending and climate action

5.1.1 Indicator: Environmental protection expenditure

Compared to the last decade Czech Republic is increasing its investments in the environmental protection, spending around 0.5 % GDP per year. While this amount is somehow copying the average trend of the Danube region, it still falls behind the European average. The improvement made is more of a long-term shift than increasing trend, showing that more fundamental change would be needed in case Czech Republic is required to increase its pace of investment growth.

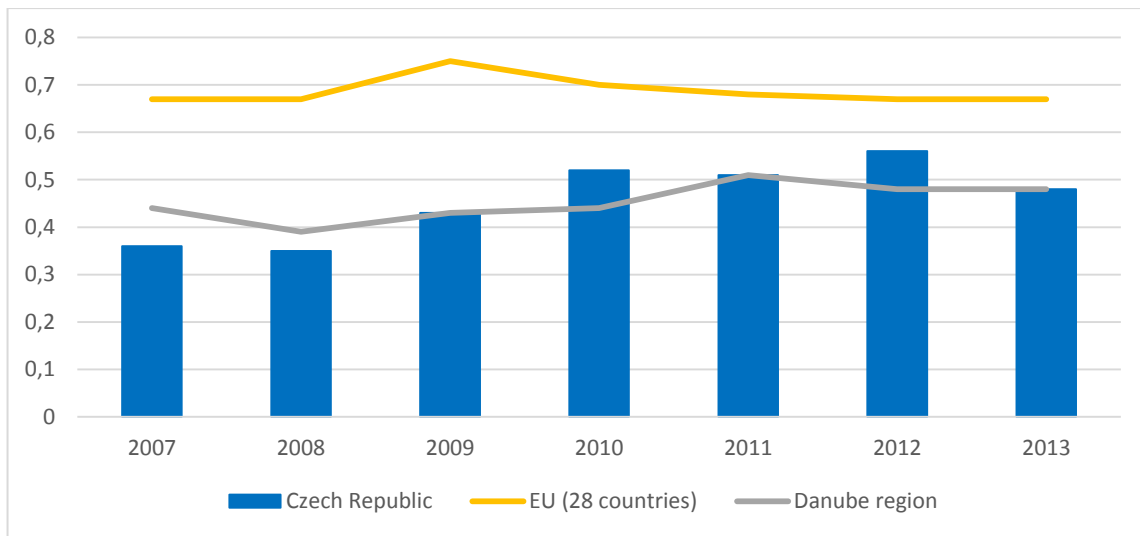


Figure 24: Environmental protection expenditure (% GDP)

5.1.2 Indicator: Greenhouse gas emissions (Tonnes of CO2 equivalent per capita)

Czech Republic is the unfortunate leader in this indicated value. The country emissions per capita is among the highest in the entire EU, which might be due to the country use of fossil fuels to produce large portion of its electrical energy. While the numbers might be alarming in comparison with the EU and regional average, it is important to note that the indicated value has been decreasing steadily over the entire measured period. This can be of course said for most of Europe, however the pace of Czech Republic improvement is almost twice as fast as the EU average.

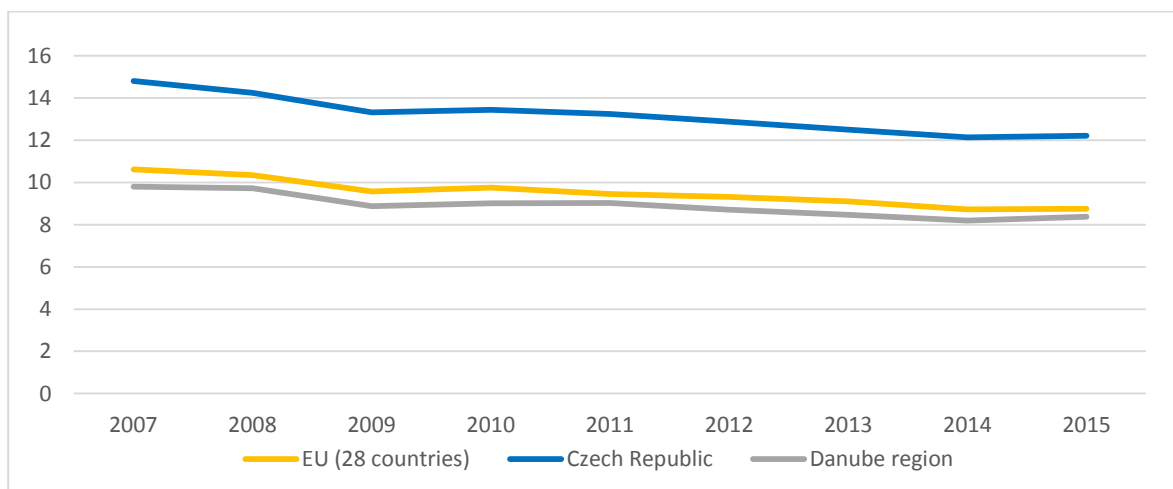


Figure 25: Tonnes of CO2 equivalent per capita

5.2 Environmental conservation taxes

5.2.1 Indicator: Environmental tax revenues (% of GDP)

The environmental tax revenues comparison shows that the definition of strong, moderate and modest innovators by the summary innovation index does not apply in every aspect of the measured reality. The tax revenues are highest in the Balkan region, led by Serbia and Croatia, followed by moderate revenues from eastern Danube region members Bulgaria and Romania with revenues around 2.5-2 % of GDP. Czech Republic is together with Slovakia among the lowest performers in this category, not taxing the environmentally challenging consumption by far as much as the rest of the EU. Moreover, the tax revenue is rather stagnating, as the changes copy the GDP growth trend, lowering the percentage of the revenue compared to it.

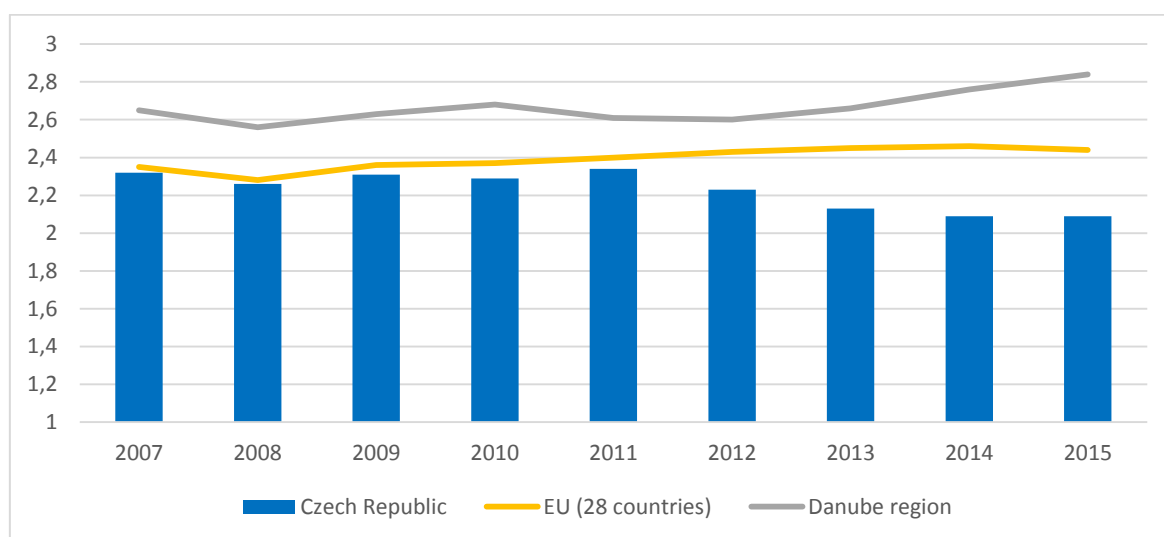


Figure 26: Environmental tax revenues (% GDP)

5.2.2 Indicator: Energy taxes – absolute (million EUR)

What was shown in the Figure 26 and the indicator 5.2.1 is supported in the figure 27 as well. The absolute revenue from the energy taxes imposed on Czech tax payers is not changing over the years, showing that the growing economy is not reflecting on growing environmental taxation. Czech Republic is among the countries with the lowest energy taxes in both absolute and compared values.

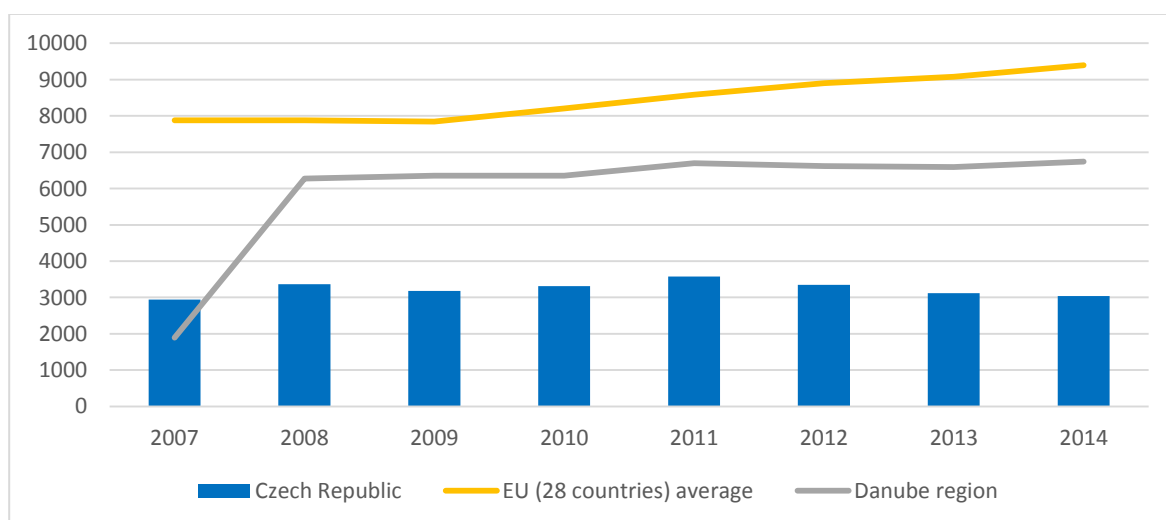


Figure 27: Energy taxes revenue (million EUR)

5.2.3 Indicator: Implicit tax rate on energy (EUR per ton of oil equivalent)

The last indicator measuring the environmental taxation among the EU countries is completing the picture of the opportunity that lies before the Czech Republic in this field. Together with absolute and compared tax revenues, Czech Republic is modest innovator even in the tax rate on energy consumption, showing that the environmental taxes are not on European level. Looking at the trends, there has been no change in environmental taxes concept even in the new legislation valid from 2012 (will be reviewed in 2019).

Opportunity: The environmental taxes have not been changing and the revenues from it are not bound to GDP development, which has been increasing in the past few years. There is a space for new concept, that would more follow the European trends.

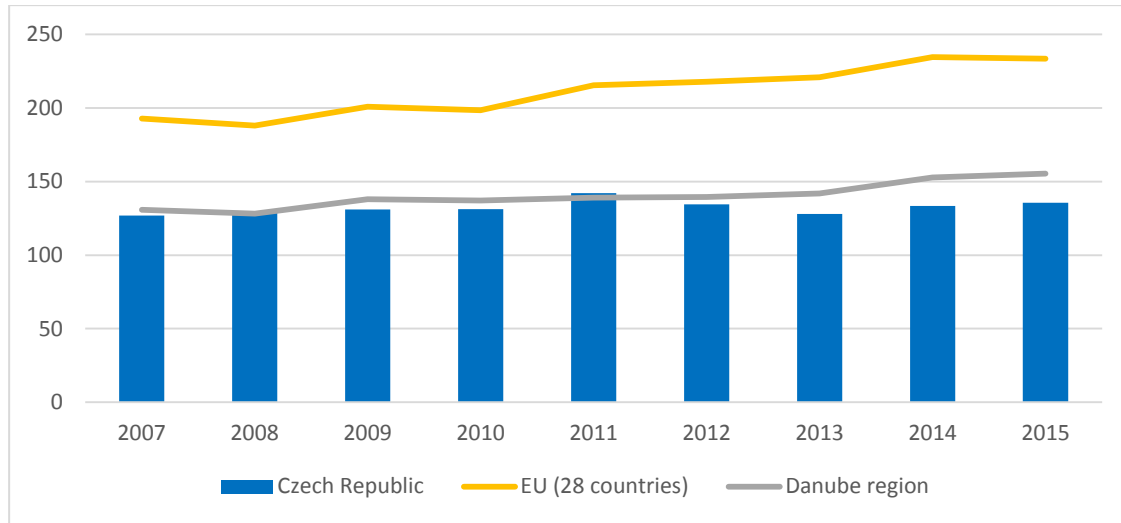


Figure 28: Implicit tax rate on energy (EUR per tonne of oil equivalent)

5.3 Resource efficiency

5.3.1 Indicator: Resource productivity (EUR per kilogram)

The outcome value compared to the resources needed to achieve it is steadily increasing in the EU. The European average is showing high values in both yearly measurements and the overall increasing trend. Czech Republic is on the Danube average, which means that it is falling behind the EU-28 average by a half of it. While EU has high increasing trend, Czech Republic efficiency is increasing only mildly.

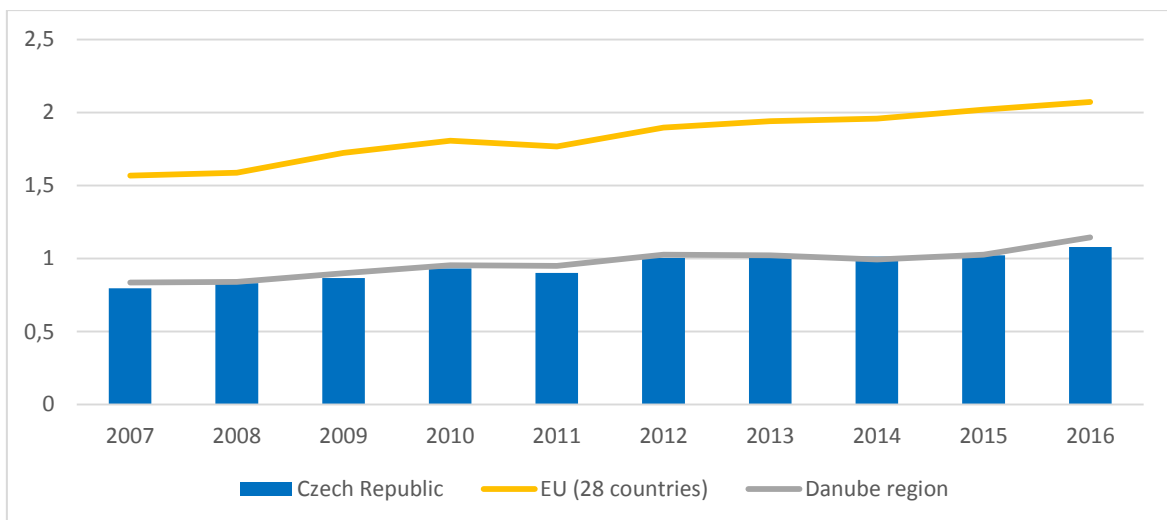


Figure 29: Resource productivity (EUR per kilogram)

5.3.2 Indicator: Domestic material consumption (tons per capita)

Opposed to the resource productivity the domestic material consumption of Czech Republic is steadily decreasing. As the resource productivity, cannot be the root cause, the overall shift from industry to service economy is the main factor causing this trend.

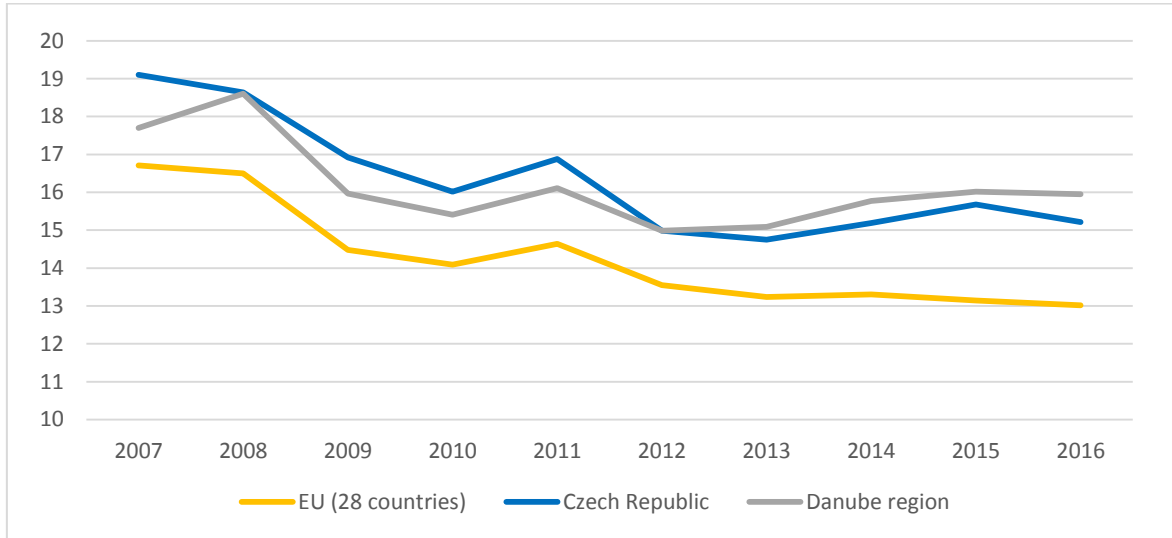


Figure 30: Domestic material consumption (tons per capita)

5.4 Recycling rates

5.4.1 Indicator: Recycling rates for packaging waste (%)

Czech Republic is overall leader in the recycling rates for packaging waste in both the Danube region and the EU. The country rates are almost 10 percent higher than the EU average, with the increased trend since 2013.

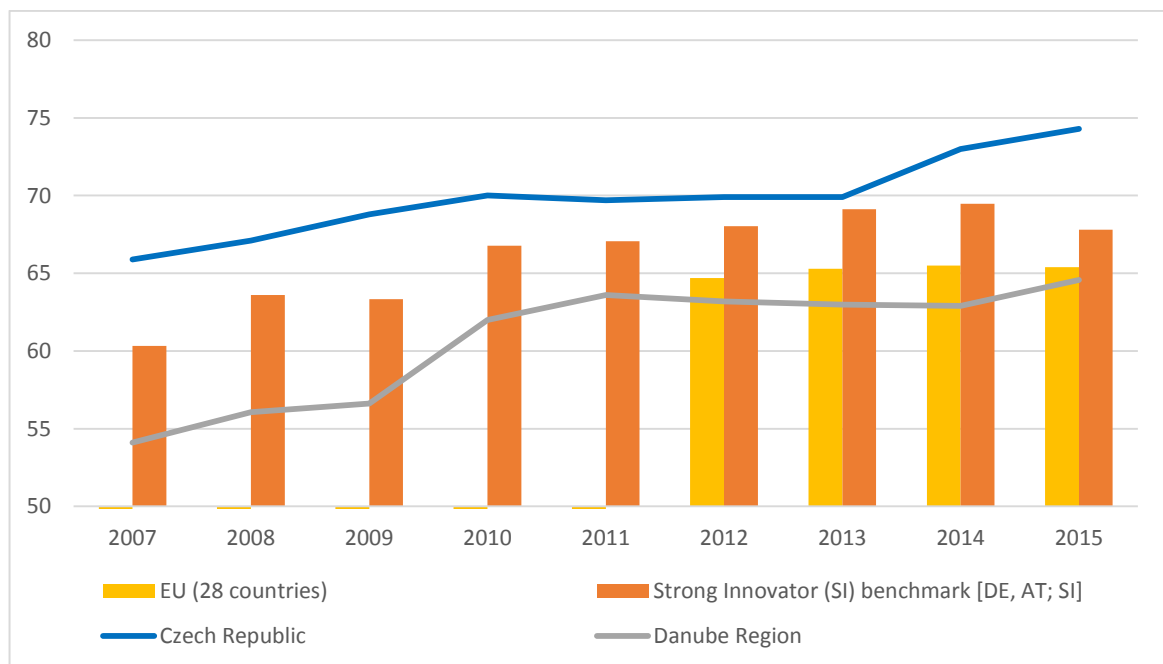


Figure 31: Recycling rates for packaging waste (%)

5.4.2 Indicator: Recycling rate of municipal waste (%)

Unlike the previous indicator, Czech Republic is falling short of EU average in the municipal waste recycling rate. Showing the increasing trend typical for most of the EU countries, the pace of improvement is higher than the regional average, showing possible opportunity to become a leader in overall recycling in the EU.

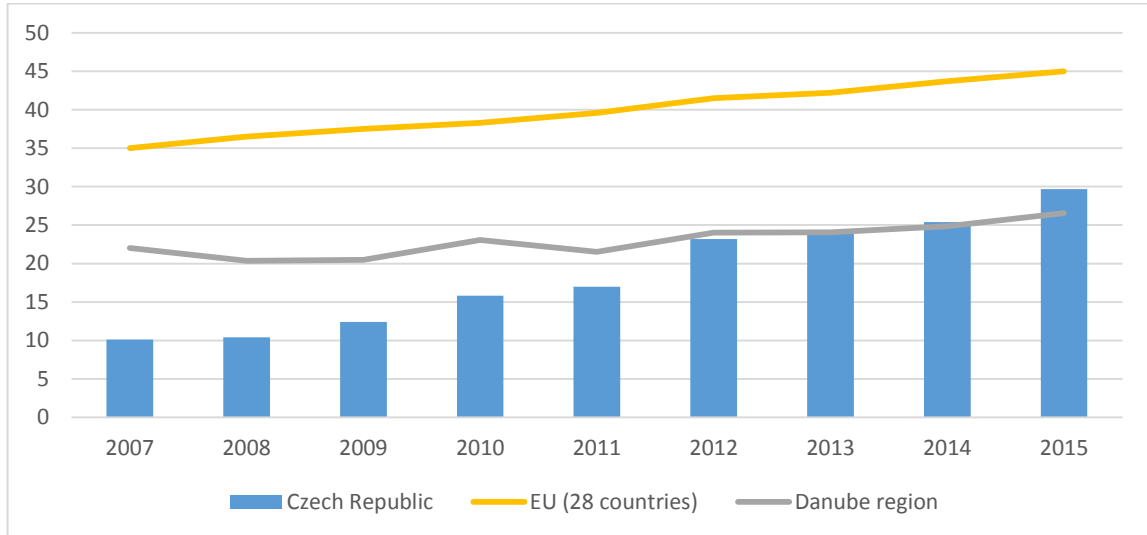


Figure 32: Recycling rate of municipal waste (%)

5.4.3 Indicator: Recycling rate of e-waste (%)

Recycling rate of old electrical devices is not high overall in the EU, coming close to thirty percent in the measured years. Due to data unavailability for this indicator it can be assumed that the EU average is copying the trend from 2011-2014, steadily increasing over the years. Danube region is showing promising values, being strong innovators on its average. Bulgaria is leading with almost 97% of old electrical devices being recycled in 2015, which is either impressive model to be applied, or a statistical error.

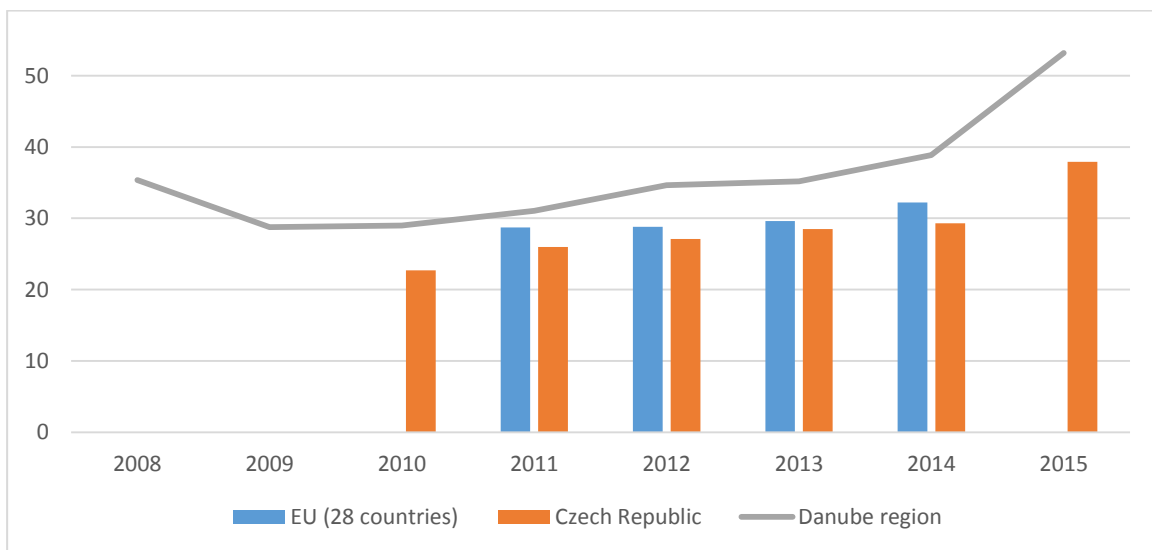


Figure 33: Recycling rate of electronic waste (%)

5.5 Environmental challenges

The State of the Environment Report (SoER)⁶ of the Czech Republic is a basic reporting document of the Czech Republic. The SoER is published annually based on Act No. 123/1998 Coll., on the right to information on the environment, and on the Resolution of the Government No. 446 of the 17th of August 1994.

The state of the environment in the Czech Republic is improving. There has been a long-term trend of decline in emissions of acidifying substances, ozone precursors, primary particles, secondary particulate precursors as well as greenhouse gas emissions from the manufacturing industry. Pollution of surface and groundwater has also been following a trend of long-term decline.

Air pollution is closely linked to developments in household heating, transport, the energy sector and the industrial sector. In the energy sector, electricity and heat generation from renewable energy sources has been growing, especially due to photovoltaic power stations as well as biogas stations. However, the generation of electricity in coal-fired power stations and associated environmental pollution is declining only very slowly.

Despite this decrease in emissions, emissions still cause acidification of ecosystems and agricultural land, and defoliation of forest stands. NO_x emissions are also a precursor to ground-level ozone, which damages plants and reduces their resistance to stress factors of the environment.

Air quality in certain regions and localities remains unsatisfactory. Household heating is a major, and difficult to regulate, source of emissions of PM₁₀. It produces roughly 40% of particulate matter emissions. Main issues are obsolescence and low efficiency of combustion in heating units and to some extent behavioural traits of households.

There is still high pressure on the landscape connected with land-use development, particularly in large urban areas, and with the construction of transport infrastructure, which are both associated with allocation of agricultural and forest land resources for construction activities. This has increased landscape fragmentation and increased pressure on plant and animal habitats. As a result, migration patterns of animals are changing and there has been an overall decline in biodiversity.

The increasing extent of built-up areas also disrupts the ability of the landscape to retain water and protect against floods. Water retention in the landscape is essential for recharging water resources, which are important for drinking water supply and agriculture.

Positive developments include the decline in water consumption, and the improving quality of surface water. Although a growing share of wastewater is being treated, pollution from non-point sources – agriculture – is growing.

The total waste production has had stagnating to slightly decreasing trend. Although landfilling remains the main common method of municipal waste management, the trend is decreasing in favour of material and energy recovery.

⁶ Source: European Environment Agency, Czech Republic country briefing (<https://www.eea.europa.eu/soer-2015/countries/czech-republic> 9.12.2017)

5.6 Environmental legislation

The main policy responses are defined in the **State Environmental Policy of the Czech Republic 2012–2020**, which sets a framework for the effective protection of the environment in the following main areas:

- Protection and sustainable use of resources
- Climate protection and improvement of ambient air quality
- Protection of nature and landscape
- Safe environment

A large amount of financial resources and legislation effort has been spent in improving ambient air quality in locations where air quality limit values were being exceeded. The aim of this effort is to improve or maintain air quality and reduce emissions of the main polluting substances into the air, with an emphasis placed on the use of environmentally friendly energy generation and energy efficiency. Nevertheless, an increase in fuel and energy prices forced households to re-evaluate their heating methods and return to solid-fuel heating (brown coal and wood, but also municipal waste and fuels with worse quality). This shift led the government to offer financial support for the replacement of old boilers for environmentally-friendly boilers and to offer financial support for people to install domestic insulation.

The Czech Republic has also given significant support to renewable energy in the last few years. This support has led to a growth in electricity generation from photovoltaic cells as well as from biomass. Construction of photovoltaic stations on agricultural land has changed land-use categories and led to the extensification of agricultural land. The financial support for biogas energy stations caused a risk for agriculture. Agricultural commodities (e.g. crops, rape) are now produced for energy use (biofuels or electric power made from biomass) instead of for human consumption. The support to the new RES has been adjusted accordingly.

5.7 Environmental taxes

The Czech Republic has a comprehensive system of environmental charges, both of emissions to air and water and on some products. In Czech Republic are a charge on the conversion of agricultural and forest land to other purposes. The most important environmental taxes in Czech Republic are taxes of energy (tax rates are higher than in other East European countries).

SO₂ (29 EUR/tonne) and NO_x (24 EUR/tonne) charges and other air emission charges generated dozens of millions every year for environmental fund. Water effluent charges and water extraction charges in place is important for environmental fund too. Charges on conversion of agricultural and forest land are partially earmarked for environmental fund.

Major environmental taxes in Czech Republic:

- electricity tax – 1.05 EUR/megawatt hour
- solid fuels tax – 0.32 EUR/GJ
- gas tax (for production warm) – 1.03 EUR/megawatt hour

In the figure 34 the values show that Czech Republic is on the level of Danube Region average. If we disregard Germany, who is the overall leader in the field, with more than 58 billions of euro in environmental tax revenues in 2015, constituting 1/7 of total environmental tax income of the entire EU. The level of

environmental taxation is increasing in the EU on average, which is a trend that Czech Republic does not follow and its tax revenue remains stable.

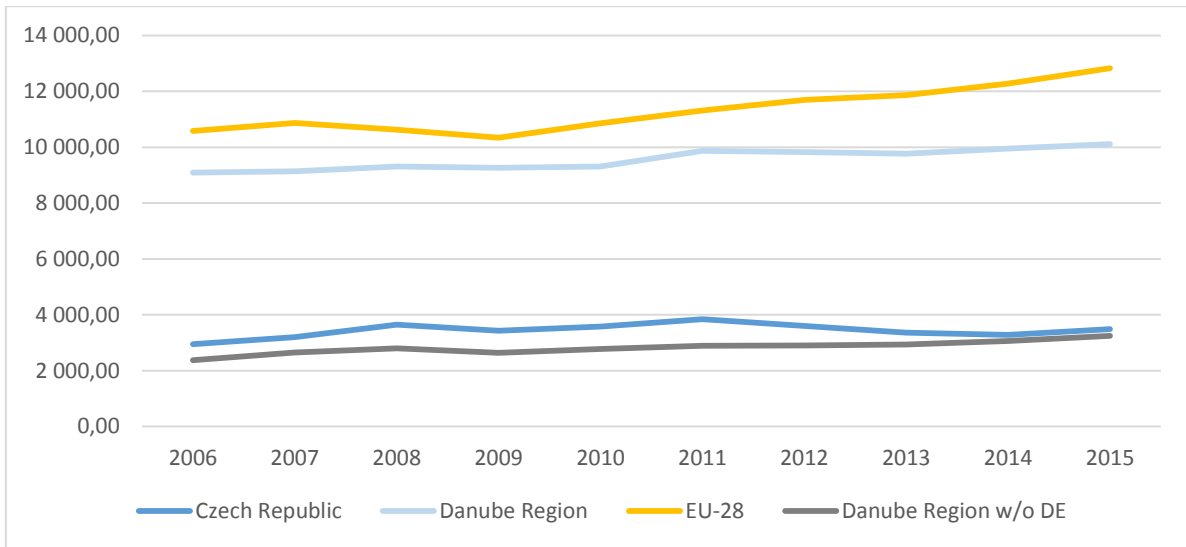


Figure 34: Environmental tax revenues in million EUR

6. ECONOMY AND DEMOGRAPHY

Czech Republic is a developed economy country with the strong export oriented social market based on services, manufacturing and innovation. As a member of European Single Market in scope of the European Union, it is part of the EU economy and a member of OECD. Czech Republic is stable and prosperous country leading in the category of post-communist states. As member of the EU, Czech Republic did not accept euro and is using its own currency Cask Koruna (CZK). The economy of the country is diverse, with the high Economic Complexity Index (ranks 7th in 2016) relying on high-tech industry and engineering in electronics, automotive, machine-building, steel production, transportation equipment, chemical production and pharmaceuticals. In services, Czech Republic relies on R&D, ITC and software development and nanotechnology.

As shown in the indicators below, Czech Republic is a developed economy with growing potential, holding the first place in EU unemployment low. GDP growth is forecast to be well above potential in 2017 due to buoyant investment and private consumption, but is expected to moderate in 2018 and 2019. While exports are forecast to continue growing solidly thanks to robust global demand, their positive effect on GDP growth is set to be neutralised by strong import growth. The labour market is nearing full employment and inflation is projected to remain close to the central bank's target of 2%. The headline government balance is on course to remain in surplus territory.

Czech Republic maintains a high-income welfare state and the continental type of the European social model. Its population is stable and slowly rising throughout the decades to 10.6 million inhabitants in 2017 (increase of 3,5% since 2001) As fertility rates are low the main factor in this increase is migration, with approximately 300 000 immigrants coming to the country in the last decade. The age structure is changing throughout the years with decline of an active population and increase of the people category over 65 years old, which holds challenges for the social model in near future. Czech society is quite homogenous, with 95% of the population belonging to Czech nationality. With the immigration ensuring the population growth and needs of the nation labour market it is expected to change in time.

6.1 Indicator: Gross domestic product at market prices in PPS per capita

Comparing the performance of Czech Republic to that of EU-28 leaves us with comparing the country to regional benchmarks. Overall Danube Region is growing at a considerable pace of 8 percent over the past eleven years, including the years after the economic crisis in 2008. Countries considered as strong innovators in the region are stagnating with no growth or decrease measured in this indicator. On the other hand, the Danube region data that exclude the stagnating trinity are experiencing stable growth over the years. Czech Republic is in the middle of this trend, growing at a slower pace than the dynamic region, yet still maintaining the positive performance over time.

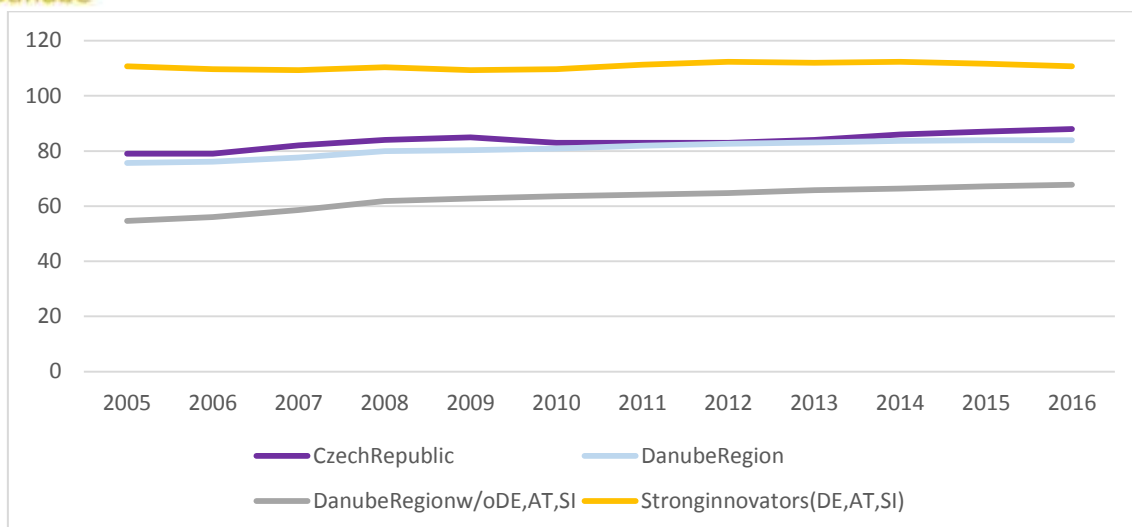


Figure 35: Gross domestic product at market prices in PPS per capita in Czech Republic and benchmarking regions, compared to the EU-28 average as 100%

6.2 Indicator: Employment rate as a share of total population of age group 20-64

Czech Republic is leading both the employment rates at its high and unemployment statistics at its low. Exhausted labour market without sufficient flexibility is one of the major obstacles of better economic performance of the country.

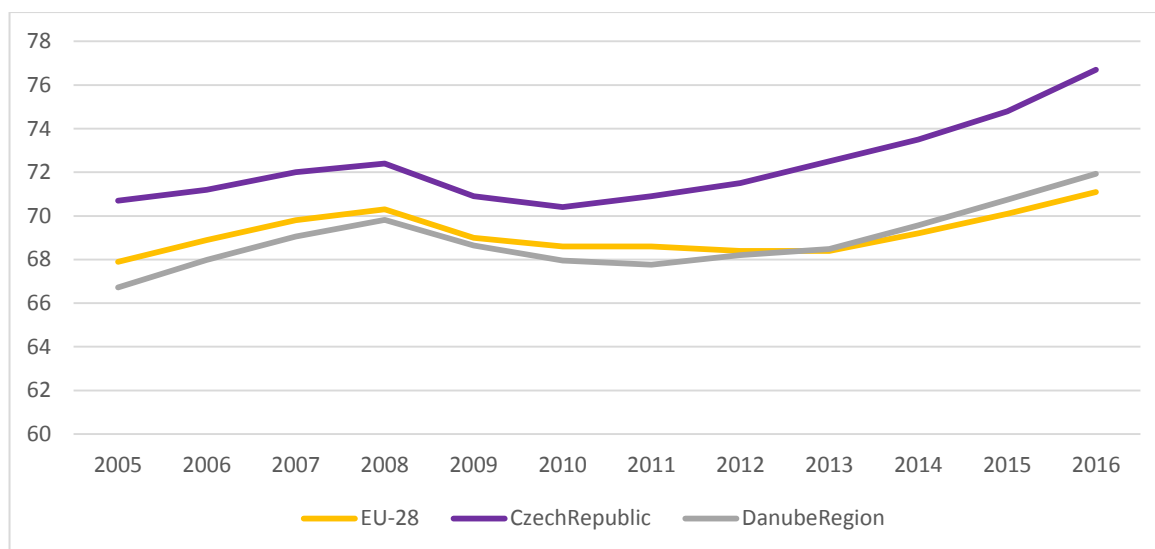


Figure 36: Employment rate as a share of population age 20-64 in Czech Republic

6.3 Indicator: Unemployment rate as a share of active population

Looking at the figure 27 it only complements the data from the previous indicator. Labour market is on its record low in available labour force, causing challenges to the enterprises to hire new employees to both knowledge-based and unqualified job roles

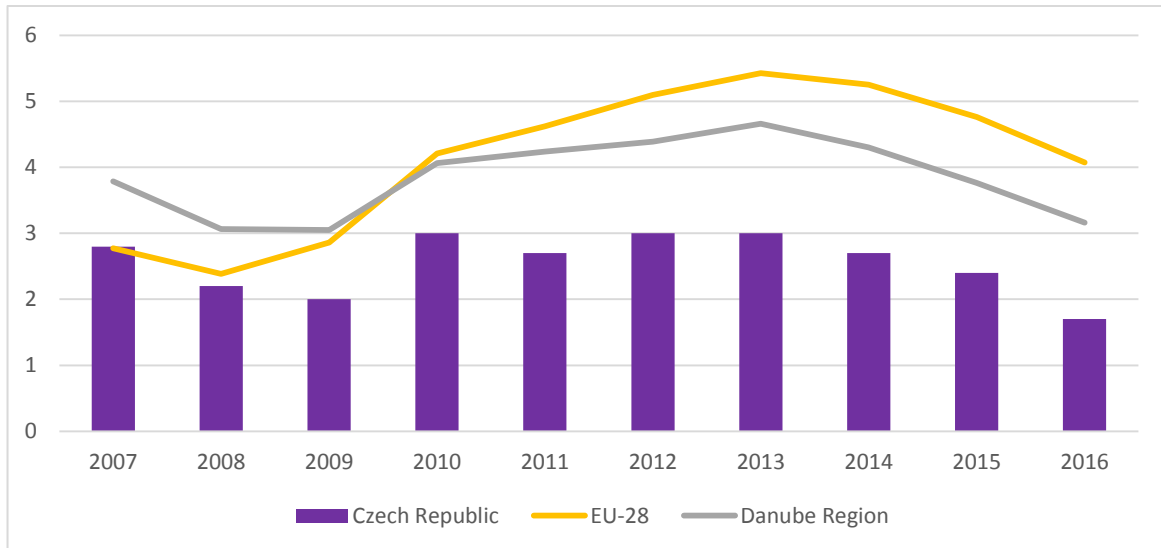


Figure 37: Unemployment rate as a share of active population in Czech Republic

7. CONCLUSION

In conclusion, the innovative performance of the Czech Republic has a growing funding in past years from both private and public sector. With the investments being made in the innovation field it is unfortunate that the overall National Innovation Rating is only on 84% of the EU, keeping the average of its region and falling behind the innovative leaders in the area. Out of the measured values the lowest trends and the biggest obstacle is identified in the human resources. With the labour market, lacking flexibility due to record low unemployment, it is important to ensure the shift from low to high-knowledge intensive labour force in the economy. While the overall university graduates share on the population rises, the percentage of those graduates who decide to continue with the studies, making its future in research and development in the innovative fields is below average and not improving. Consequently, the Czech Republic is not offering as many innovative solutions as it could with its economic performance, falling behind also in the PTC patents statistics average.

Higher percentage of population that would be employed in innovation seeking is the main goal for Czech Republic in the future, if the country wishes to improve on its innovation rating and continue in the growth into the knowledge-based economy. The growing cooperation between private and public sector together with increased funding continuity can help, when being directed right.

With the environmental policies being adjusted to European standards, Czech energy and economics are making the transition from fossil fuels to renewable sources of energy, as is expected by the member of the EU and developed economy in the world. With growing interest in new eco-innovative technologies, it is again the number of people after graduation devoted and motivated by both public and private sector to further involve themselves in eco-innovative research that is being the biggest challenge of the country. While research and innovations are supported when they happen, the support needs to come to involve human resources in the R&D in the first place.

The overall environmental care awareness is the European trend, causing the decrease of energy consumption, taxation of environmentally challenging activities and reusing of waste and resources. While Czech Republic is leading in the recycling, the taxation concepts are outdated. Combining the lack of environmental taxes and the coal burning energy production, Czech Republic has a clear opportunity to focus on in the next decade.

Czech economy is still growing and the R&D sector is getting more and more attention. With the increased public and private funding supported by cooperation of the two, it may be a question of time until Czech Republic further develops a broader hub of experts, increasing its merit in the international community and becoming the innovative leader together with the strongest economies in the region.