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CLIMA 325
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ENV 993
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COVER NOTE

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Delegations will find attached document SWD(2017) 412 final.

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COMMISSION STAFF WORKING DOCUMENT

Energy Union Factsheet Slovenia

Accompanying the document

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE, THE COMMITTEE OF THE REGIONS AND THE EUROPEAN INVESTMENT BANK

Third Report on the State of the Energy Union

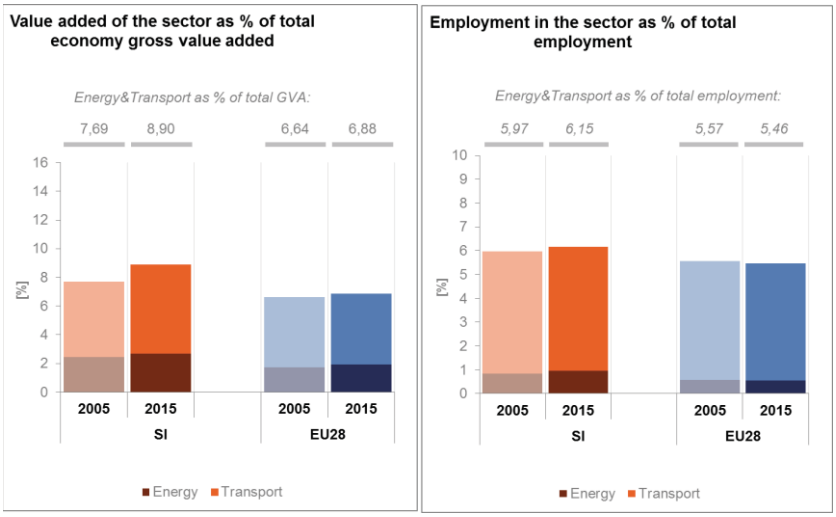
{COM(2017) 688 final} - {SWD(2017) 384 final} - {SWD(2017) 385 final} - {SWD(2017) 386 final} - {SWD(2017) 387 final} - {SWD(2017) 388 final} - {SWD(2017) 389 final} - {SWD(2017) 390 final} - {SWD(2017) 391 final} - {SWD(2017) 392 final} - {SWD(2017) 393 final} - {SWD(2017) 394 final} - {SWD(2017) 395 final} - {SWD(2017) 396 final} - {SWD(2017) 397 final} - {SWD(2017) 398 final} - {SWD(2017) 399 final} - {SWD(2017) 401 final} - {SWD(2017) 402 final} - {SWD(2017) 404 final} - {SWD(2017) 405 final} - {SWD(2017) 406 final} - {SWD(2017) 407 final} - {SWD(2017) 408 final} - {SWD(2017) 409 final} - {SWD(2017) 411 final} - {SWD(2017) 413 final} - {SWD(2017) 414 final}

Slovenia

Energy Union factsheet[1]

1. Macro-economic implications of energy activities

Energy and transport are key sectors for the overall functioning of the economy as they provide an important input and service to the other sectors of the economy. Together the activity in these two sectors[2] accounted for 8.9 % of the total value added of Slovenia in 2015. Similarly, their share in total employment[3] was 6.2 % in 2015, of which 5.2 % in the transport sector and 1 % in the energy sector.



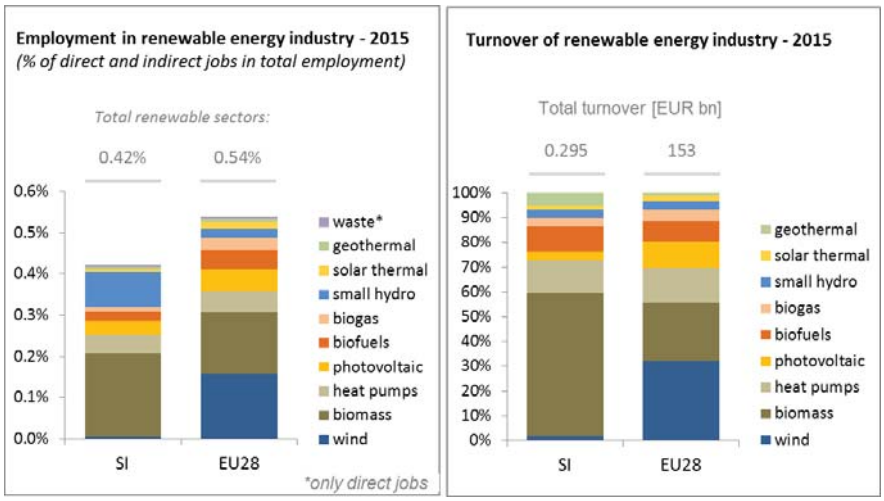
(source: Eurostat)

According to EurObserv'ER, in 2015, the share of direct and indirect renewable energy related employment in total employment of the economy in Slovenia was at about 0.42 %. The turnover of the renewable energy industry in the same year was estimated at around EUR 0.29 billion, more than half being attributed to biomass (57 % of total renewable turnover), followed by heat pumps (13.5 %) and biofuels industries (10 %).

1 The indicators used in this country factsheet largely build on indicators developed for the Commission Staff Working Document "Monitoring progress towards the Energy Union objectives – key indicators" (SWD(2017) 32 final) https://ec.europa.eu/commission/sites/beta-political/files/swd-energy-union-key-indicators_en.pdf

2 Gross value added and employment in NACE sectors D-Electricity, gas, steam and air conditioning supply and H-Transportation and storage

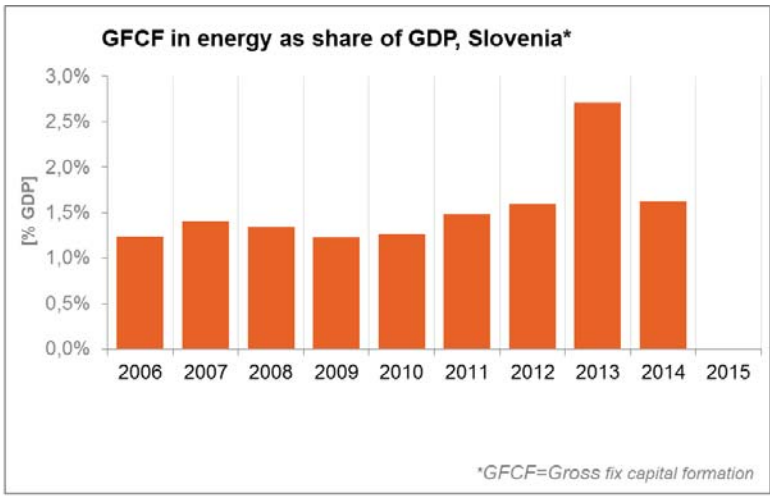
3 National accounts, Eurostat



(source: EC based on Eurobserv'Er and Eurostat)

The decarbonisation of the energy and transport sectors will require significant investments and economic activity beyond the remit of these sectors themselves. The energy transition implies a structural shift in economic activity. Energy-related investment and jobs will in part migrate from traditional fossil fuel based activities towards construction, equipment manufacturing and other services related to the deployment of low carbon and clean energy technologies. At the moment, the efforts related to the low-carbon and clean energy transition in sectors beyond can only be partially quantified and are therefore not included in this analysis.

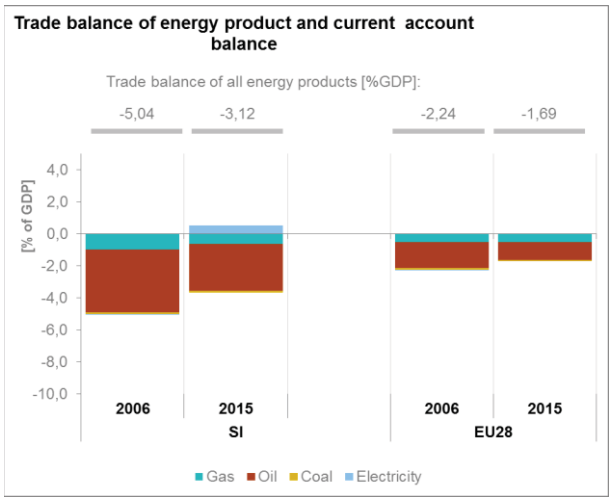
An indication of the level of efforts and challenges encountered by Slovenia in the energy sector is given by the Gross fixed capital formation (GFCF)[4]. Investments in the electricity and gas sectors, which are taken as reference sectors, experienced an increasing trend since 2010, but in 2014 felt back to 2012 level. They represented around 1.6 % of the country's GDP in 2014, higher than in the pre-crisis period.



(source: Eurostat)

[4] Gross fixed capital formation consists of resident producers´ acquisitions, less disposals, of fixed tangible or intangible assets. This covers, in particular, machinery and equipment, vehicles, dwellings and other buildings. It also includes foreign direct investment (FDI). Steam and air conditioning supply are also included in the figures mentioned above as Eurostat reports electricity, gas, steam and air conditioning supply together.

In terms of trade, Slovenia is overall a net importer of fossil fuels. The trade deficit in energy products has fallen from about 5 % of GDP in 2005 to 3.1 % in 2015. The largest decrease is accounted for by oil and gas, also reflecting lower prices on fossil fuels. The trade balance for electricity was positive in 2015 (0.5 % of GDP).

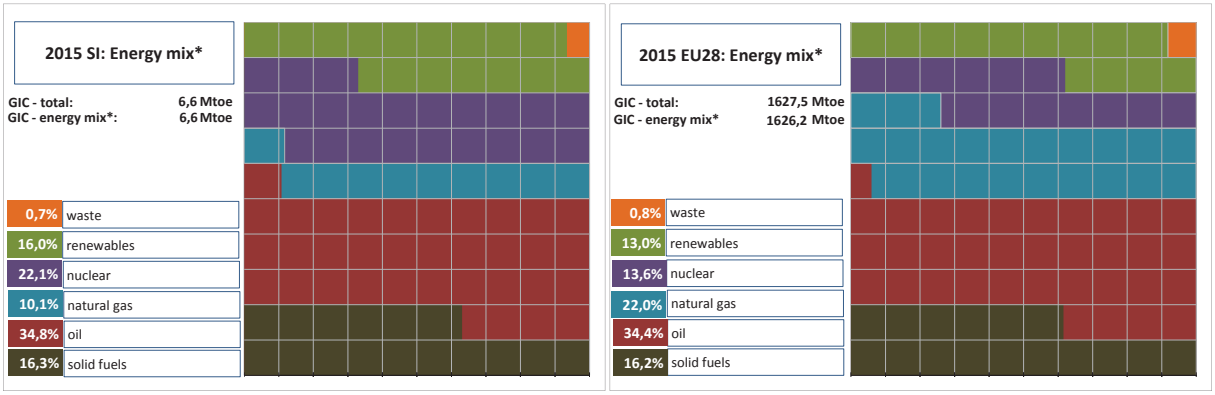


(source: Eurostat)

2. Energy security, solidarity and trust

2.1. Energy Mix

In comparison to the average energy mix in the EU, Slovenia's energy mix of primary products has a higher share of nuclear (22.1 % versus 13.6 %) and of renewables (16 % versus 13 %). On the other hand, the share of natural gas is significantly lower in Slovenia than on average in the EU (10.1 % versus 22 %).



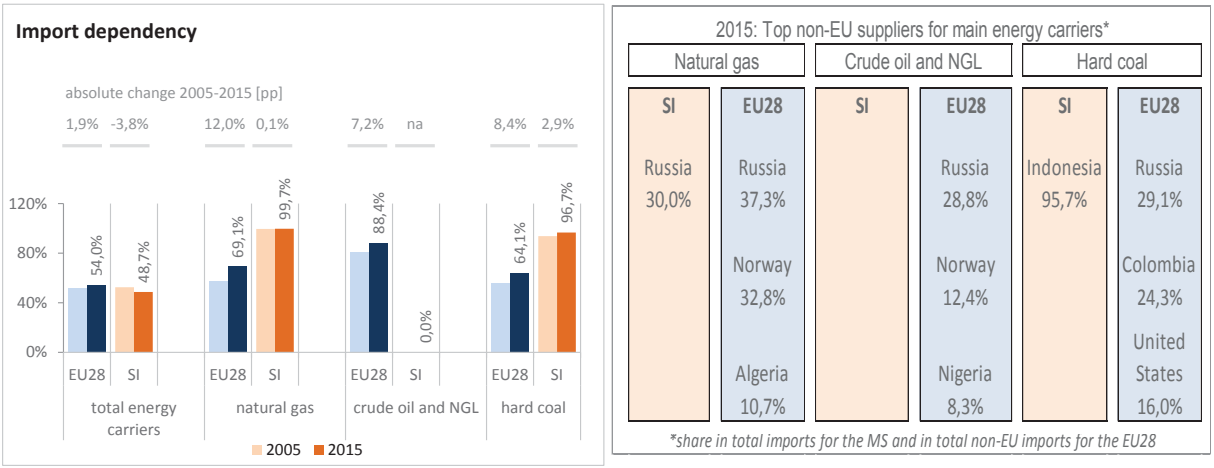
**energy mix as share share in GIC-excluding electricity and derived heat exchanges , GIC=gross inland consumption*

(source: Eurostat)

2.2. Import dependency and security of supply

48.7 % of Slovenia's energy consumption is imported, which is a slightly lower value than the EU average (54 %). This lower import dependency is mainly due to the lower share of natural gas in the energy mix and the higher shares of renewables and nuclear energy compared to the EU average.

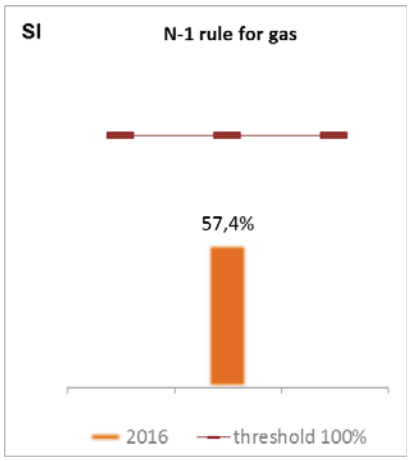
The overall import dependency of Slovenia decreased by 3.8 percentage points between 2005 and 2015, while at the EU level, import dependency increased by 1.9 percentage points between the same years. Nevertheless, in the area of natural gas Slovenia is completely dependent on imports via neighbouring Member States. Slovenia imports around 60 % of its natural gas from Russia, which is above the EU average. 30 % of these imports are directly supplied to the country via long-term contracts, while the rest is mainly supplied by short-term contracts concluded with gas hubs and exchanges (at least 50 % of this gas bought via short-term contracts also originates in Russia). As there are no operating refineries in the country, Slovenia imports refined products and no crude oil. Concerning solid fuels imports, Slovenia only imports limited quantities of hard coal, while the vast majority of electricity produced in thermal coal power plants in Slovenia results from the use of locally sourced brown coal and lignite.



(source: Eurostat)

Imports of uranium and nuclear fuels are not included in Eurostat's energy balances and therefore import dependency cannot be calculated in the same way as for the main fossil fuels. Hence, complementary information is provided on imports of uranium and nuclear fuels. In Slovenia in 2015 about 38% of the electricity produced was based on nuclear power. As the nuclear power plant in Krško has been constructed by Westinghouse, the plant is not reliant on fuel imports from Russia.

The security of gas supply regulation requires that, if the single largest gas infrastructure fails in one Member State, the capacity of the remaining infrastructure is able to satisfy total gas demand during a day of exceptionally high gas demand. Slovenia does not fulfil the N-1 criteria as seen in the below graphic and the country has a derogation until December 2018 pursuant article 6.10 of the Security of Gas Supply Regulation. On the basis of planned infrastructure projects as referred to in the updated Slovenian Risk Assessment, the TSO has projected to comply with the N-1 standards as of 2019, notably as reverse flow at Rogatec interconnection point should be enabled by the end of 2018.

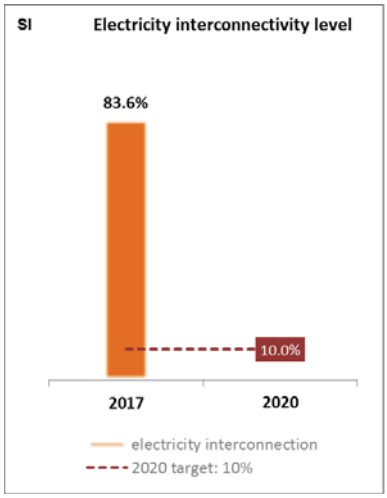


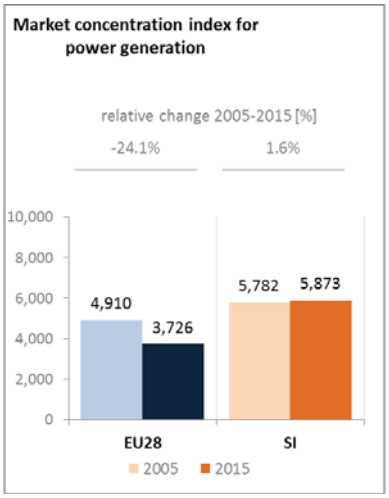
(source: gas coordination group)

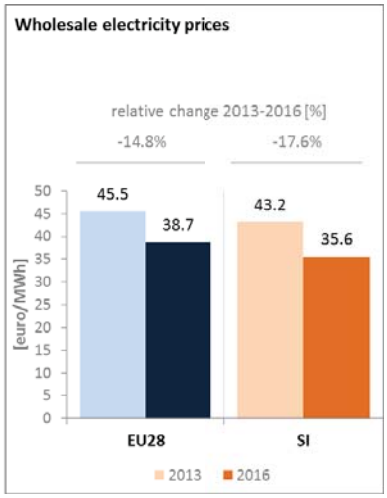
3. Internal market

3.1. Interconnections and wholesale market functioning

3.1.1. Electricity







(source: EC services based on ENTSOE and European power exchanges) *source: EC services based on Eurostat* *source: EC services based on Platts*

Slovenia's electricity interconnection level[5] was at 83.6 % in 2017 and thereby being already well above the 2020 target of 10 %. Nevertheless, Slovenia has several electricity Projects of Common Interest under the guidelines of trans-European energy infrastructure, including two electricity clusters with a high voltage transmission line between Slovenia, Croatia and Hungary and a high voltage transmission line between Slovenia and Italy in order to optimise electricity trade, contribute

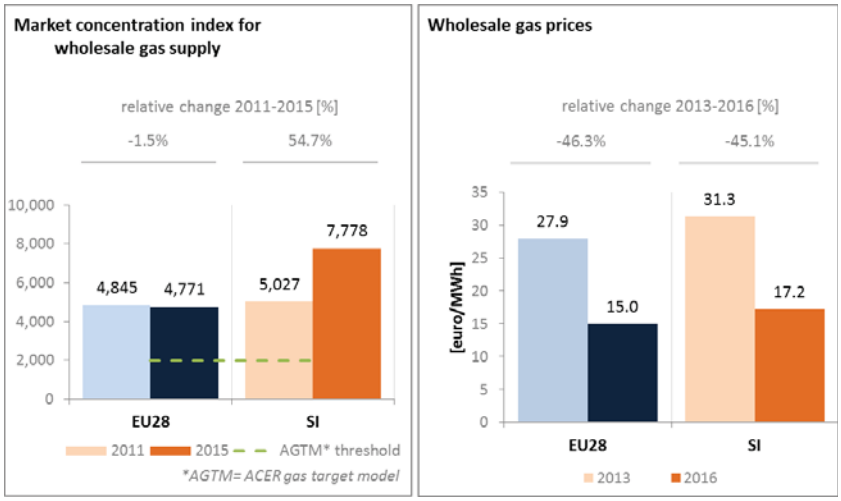
[5] The interconnectivity level is calculated as a ratio between import interconnection and net generation capacities of the country (i.e. the 2017 value is the ratio between simultaneous import interconnection capacity [GW] and net generating capacity [GW] in the country at 11 January 2017, 19:00 pm as resulted from ENTSO-E Winter Outlook 2016/2017)

to security of supply and better deal with loop flows. Moreover, Slovenian and Croatian TSOs and DSOs also launched a joint project co-financed by CEF in the field of smart grids[6].

Concentration on the power generation market is above the EU average and has also slightly increased between 2005 and 2015 as the largest generator in the country also increased its market share slightly between 2005 and 2015. Furthermore, the modest size of the market does no facilitate the development of many different generators that would lead to a lower market concentration. Wholesale electricity prices in Slovenia are below the EU average in 2016.

3.1.2. Gas

Wholesale gas prices are at a similar level than the EU average and have experienced a strong decline mostly in line with the EU average with 45.1 %, further reducing the still existing gap to the EU average wholesale price for natural gas. The observed increase in the market concentration index for wholesale gas supply of over 50 % is mainly caused by methodological reasons, namely changes in the calculation of the underlying indicator[7].



(source: ACER for the left graph and EC services based on Platts, gas hubs, Eurostat for the right graph)

3.2. Retail electricity and gas markets

3.2.1. Electricity

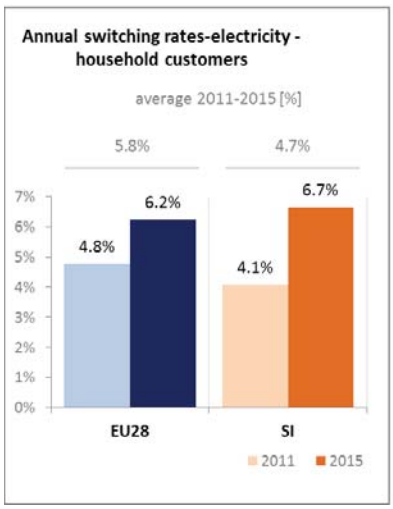
In 2015, household electricity prices in Slovenia were below the EU average and contrary to the average development at EU level, the electricity prices for households decreased between 2013 and 2016 by 1.7 %. However, this decrease is lower than the decrease of wholesale electricity prices in Slovenia over the same period, which can be partially explained by an increase in the share of taxes

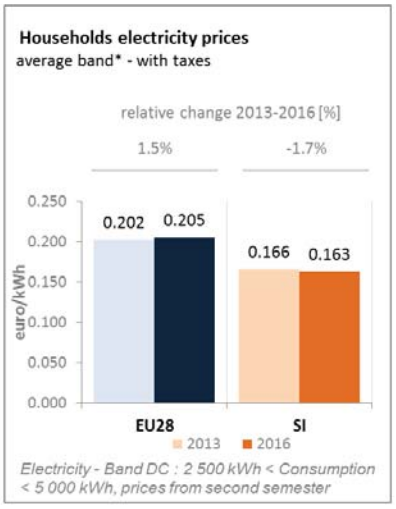
[6] See also http://www.sincrogrid.eu/.

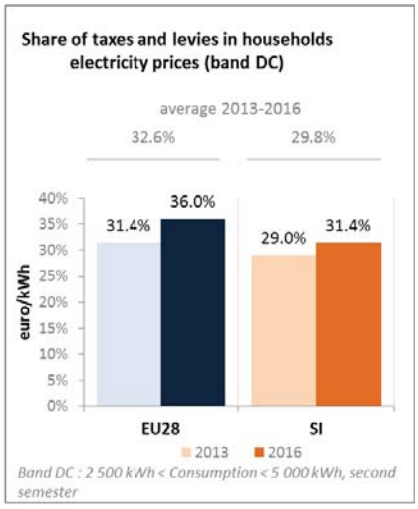
[7] The main reason being that imports from Austria to Slovenia were assigned to Austrian producers in the calculation of the 2011 value, but in 2015 for these volumes the share of the upstream companies selling as were considered in proportion to Austrian market concentration levels. As Gazprom is the dominant supplier in the Austrian market, this changed calculation also led to an increase the concentration index for Slovenia.

in retail electricity prices from 29 % to 31,4 % in 2016 – a value that is nevertheless still below the EU average.

The share of smart meters for electricity has increased by 10 percentage points from 2013 to 2015 to a penetration of 44 % at present. Annual switching rates by consumers from one electricity supplier to another were marginally higher than the EU average with 6.7 % in 2015 and have increased faster than the EU average.





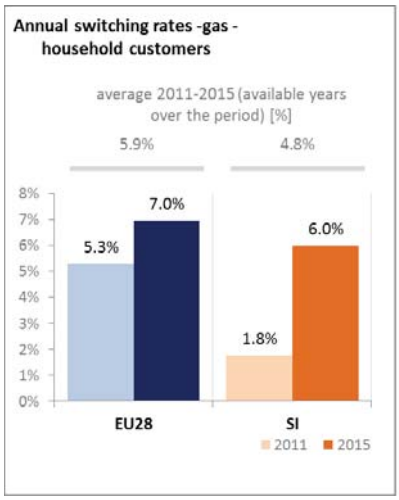


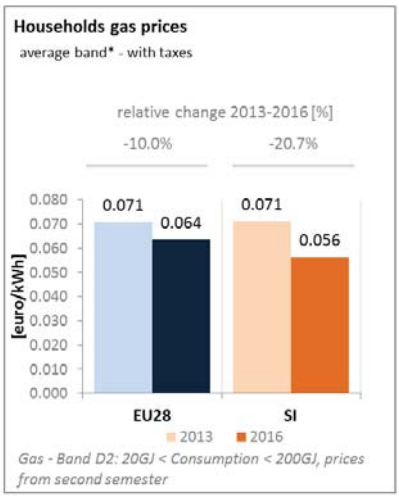
(source: ACER) *(source: Eurostat)* *(source: Eurostat)*

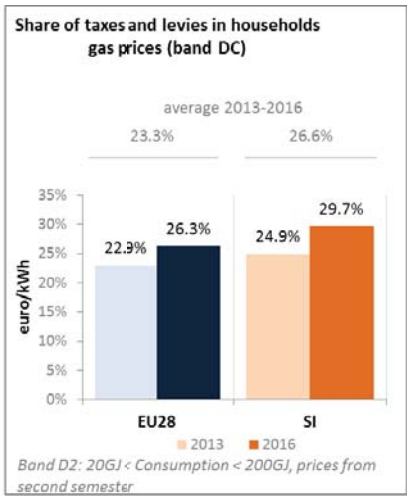
3.2.2. Gas

Between 2013 and 2016 household prices for natural gas decreased significantly by 20.7% and are below the EU average, while the share of taxes and levies in household gas prices increased and stays above the EU average. Gas prices for households and SMEs nevertheless are higher than in most neighbouring countries. While the market uptake of gas smart meters has not yet taken place in Slovenia – as in the majority of Member States with the exception of the Netherlands and the United Kingdom – the annual switching rate for households increased considerably from 2011 to 2015 and with 6% is only slightly below the EU average. This also coincides with the overall very positive assessment of the retail gas market by consumers, which scores the highest of all the markets of all EU Member States[8].

[8] See: 12th Consumer Markets Scoreboard 2016, http://ec.europa.eu/consumers/consumer_evidence/consumer_scoreboards/12_edition/docs/consumer_markets_scoreboard_2016_en.pdf.



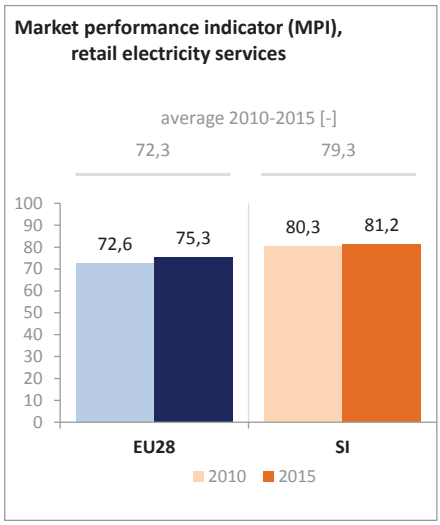


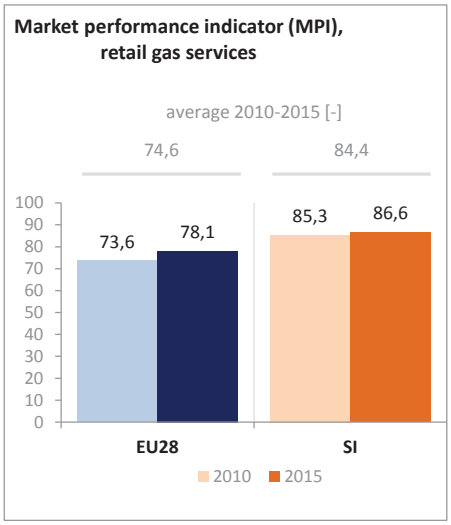


(source: ACER) *(source: Eurostat)* *(source: Eurostat)*

3.2.3. Market performance indicators

According to the periodical survey of DG JUST, the Slovene consumers are more satisfied than the EU average about the services received on energy retail markets and this satisfaction has even further increased during the past five years.

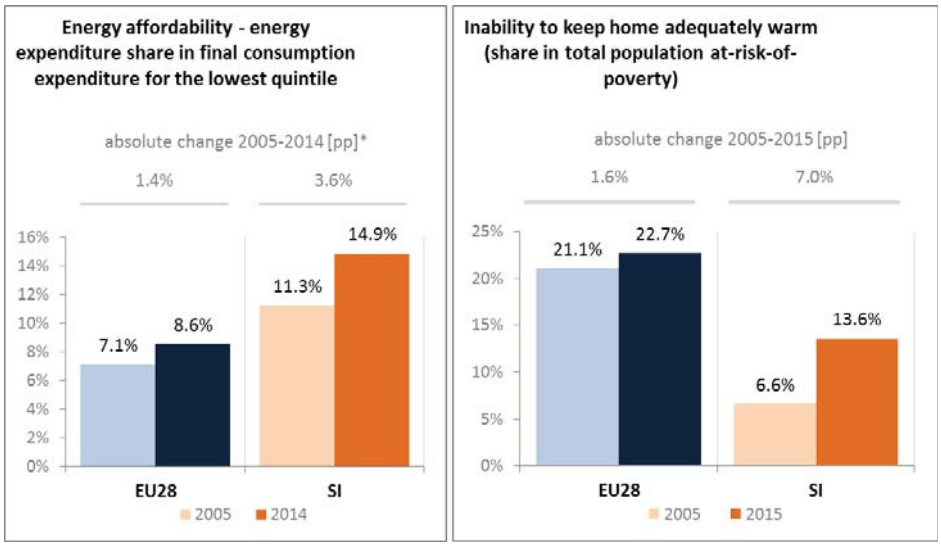




(source: DG JUST survey)

3.3. Energy affordability

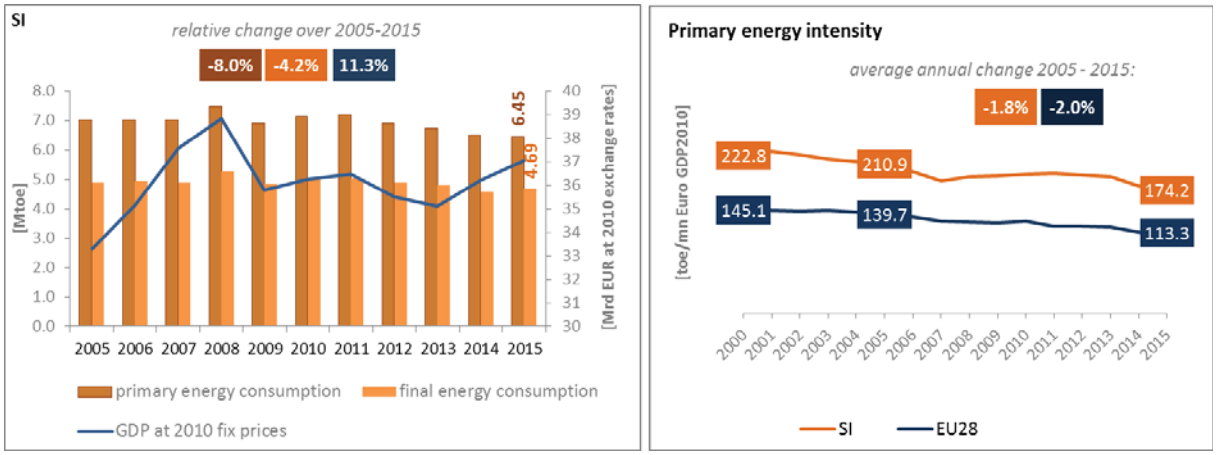
In Slovenia, the energy expenditure share in final consumption expenditure for the lowest quintile is with 14.9 % nearly twice as high as the EU average of 8.6 %. In contrast, a smaller percentage of the population at risk of poverty is unable to keep their home adequately warm with 13.6 % in contrast to the EU average of 22.7 %. While this share has increased much faster in Slovenia from 2005 to 2015 than on average in the EU, recent years show a steady decline of the share which peaked in 2012 with 17.3 %.



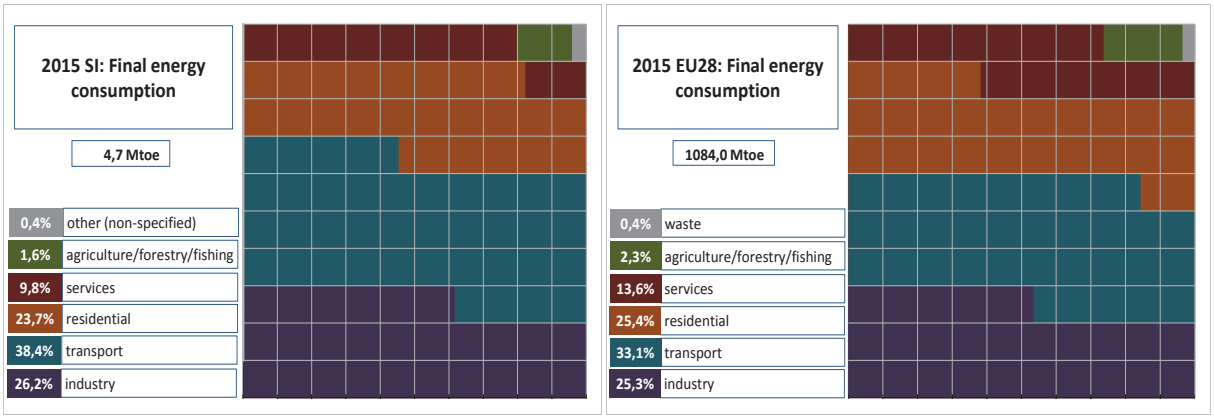
(source: ad-hoc data collection of DG ENER based on HBS with the support of Eurostat and national statistics)

4. Energy efficiency and moderation of demand

Since 2005, Slovenia decreased its primary energy consumption by 8 % to 6.45 Mtoe in 2015. Over the same period, final energy consumption also decreased by 4.2 % to 4.69 Mtoe in 2015. Even if Slovenia has already achieved levels of primary and final energy consumption below the indicative national 2020 targets (7.3 Mtoe in primary energy consumption and 5.1 Mtoe in final energy consumption), the country needs to continue its efforts in order to keep these levels until 2020.



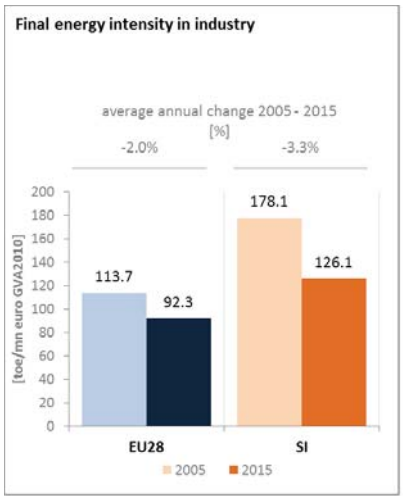
(source: Eurostat)



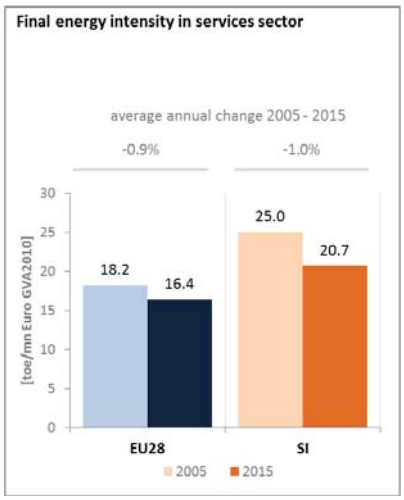
(source: Eurostat)

Although primary energy intensity decreased over the 2005-2015 period, it remains above the EU average and it decreased at a slower pace. The energy intensity of Slovene industry is above the EU average, but decreased faster with an average annual reduction of 3.3 % between 2005 and 2015 than the EU average, where the reduction was 2 % annually. In addition, the energy intensity in the residential sector and in the services sector is also well above the EU average, with the intensity in the residential sector also decreasing slower than the EU average.

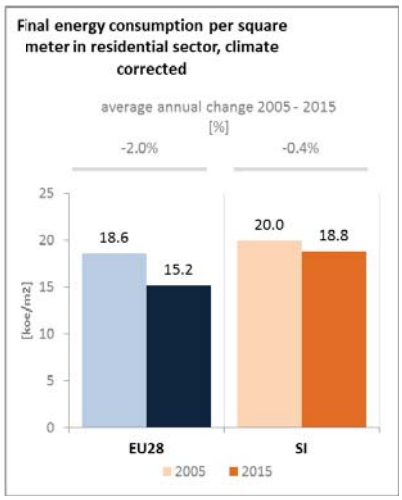
On the implementation of the Energy Efficiency Directive, in 2015 Slovenia reported progress from the previous year in achieving their annual savings under Article 7 (Energy efficiency obligation schemes). Therefore, in this context, the country needs to continue its current effort to ensure that the required final energy savings are achieved by 2020.



(source: Eurostat)



(source: Eurostat)



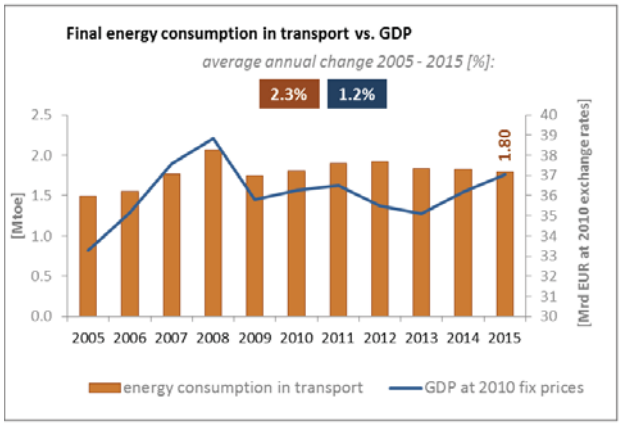
(source: Odyssee database)

In 2015 in Slovenia, transport was the largest energy consuming sector representing a 38.4 % share in the total final energy consumption, which is well above than the EU average of 33.1 %. While the shares of the industry and residential sector correspond to the average EU values, the energy consumption of the services sector is with 9.8 %, considerably below the EU average of 13.6 %.

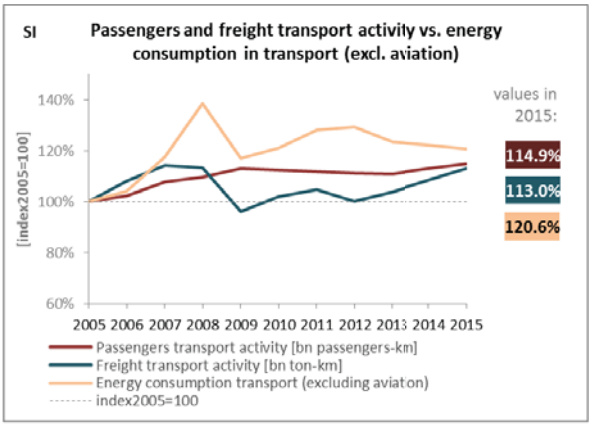
Between 2005 and 2015 in Slovenia, the final energy consumption in transport recorded an average annual increase of 2.3 %, higher than the 1.2 % average annual increase of the Slovenian GDP.

Overall, energy consumption in transport increased in 2015 by more than 20 % since 2005. This high increase originates mainly from road transport mainly, which includes transit transport.

The share of collective land transport into total passengers' transport decreased slightly between 2005 and 2015, indicating a slightly higher use of private transport means in Slovenia.

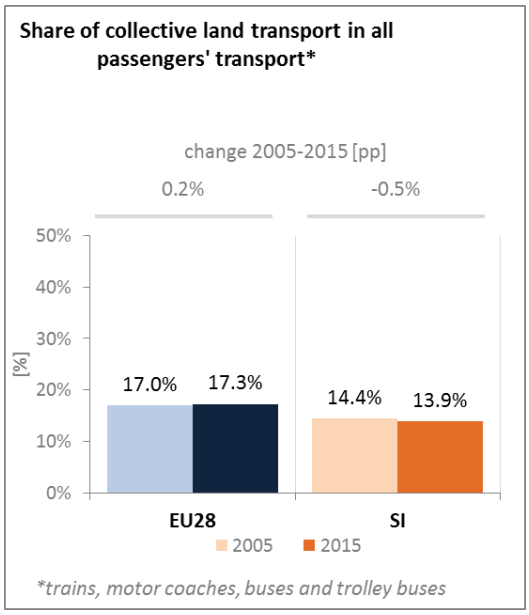


(source: Eurostat)



passengers transport activity=Private cars + bus+ rail + tram & metro
freight transport activity=road+rail+inland wate"ways+pipeline

(source: Eurostat and DG MOVE pocketbook)



(source: Eurostat)

In November 2016, the National programme of development of transport until 2030 was adopted, based on the Transport development strategy of Slovenia (2015). The programme provides for activities, means of implementation and estimated funding needs for all the measures included in the strategy. The programme envisages EUR 9 billion in infrastructure investments for the period 2016-2022, and a further EUR 7.9 billion to be invested by 2030.

Regarding infrastructure, the main focus will be on the development of railway infrastructure with priority projects in the TEN-T network, including the construction of the second track on the Divača–Koper railway line, the upgrade of the Zidani Most–Celje and Maribor–Šentilj lines and the renovation of the Karavanke railway tunnel. For road network the priorities are the completion of the

Draženci-Gruškovje motorway, the construction of the second tube of the Karavanke motorway tunnel and establishment of an electronic tolling system for haulage vehicles, which will enable tolling according to the actual kilometres travelled. Investment in the further development of airport and port infrastructure will continue, including increasing the capacities of the container terminal and upgrading the remaining infrastructure and equipment of the port of Koper.

The plan is also to promote integrated public passenger transport (IPPT). The establishment of the IPPT authority, which will manage the transport of passengers in rail transport and interurban line bus transport and harmonise these with urban transport, is planned for 2017.

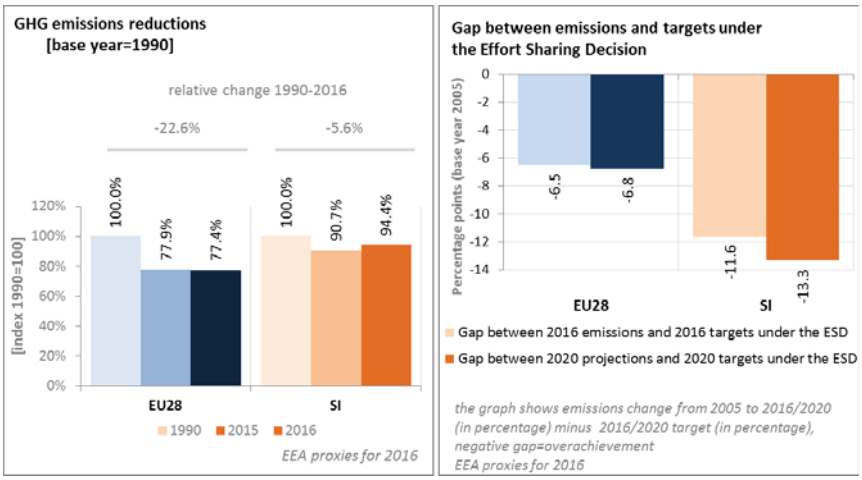
One of the measures to support the transition to sustainable mobility was also the set-up of a network of 26 high-speed electric charging stations on motorways. Further measures to provide incentives for recharging infrastructure and the increase in the number of electric vehicles are planned. In the efforts to promote sustainable mobility, the government also launched a pilot project for civil servants to be able to use an electric vehicle sharing scheme instead of conventionally fuelled cars.

Finally, part of the measures to stimulate the growth potential will also be the restructuring of tax burdens, which aim at promoting environmental objectives (the Green Budget Reform project). In this respect, a recast of the Motor Vehicles Tax Act is planned, with an additional emphasis on the environmental component in the taxation of vehicles.

5. Decarbonisation of the economy

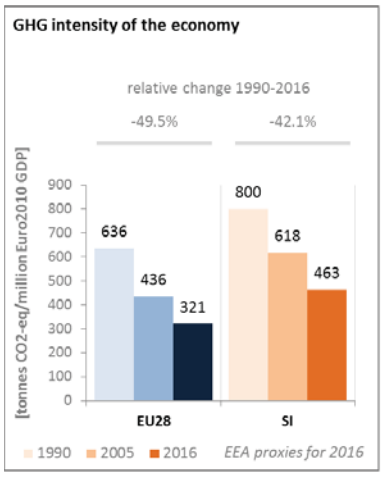
5.1. GHG emissions

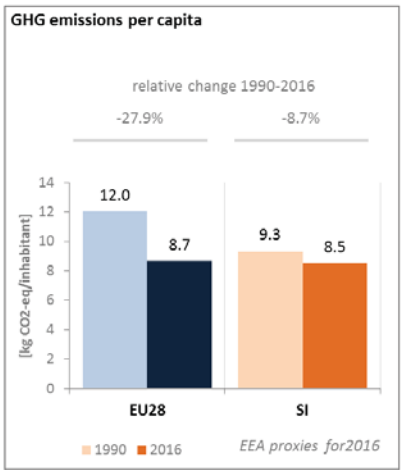
Slovenia is on track to achieve its greenhouse gas (GHG) emission reduction target for 2020. Slovenia committed to a non-ETS GHG target of +4 % in 2020 compared to 2005 levels. According to national projections, Slovenia will reduce its non-ETS emissions by -9.3 % between 2005 and 2020. It is well on track to meet its 2020 target.



(source: EC and EEA)

While Slovenia was able to reduce the carbon intensity of its economy by 42.1 % since 1990, it is still above the EU average by more than a third. The share of transportation, responsible for 31.8 % of emissions, remains above the EU average due to the sale of fuel to vehicles transiting the country.



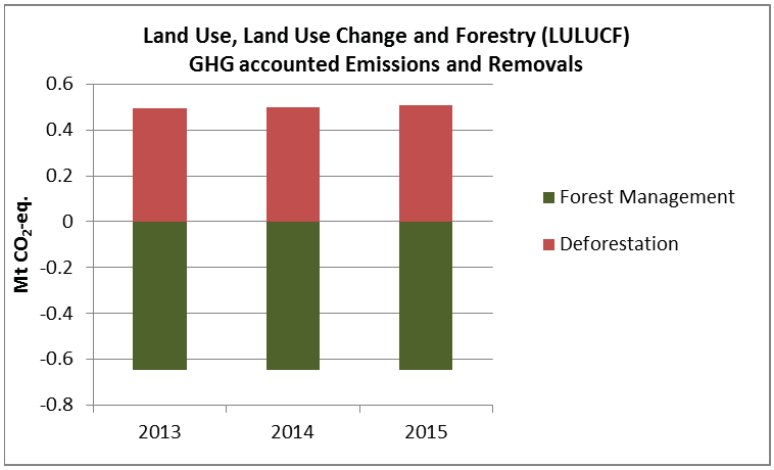


Largest Sectors of GHG Emissions in 2015	SI	EU28
Energy/power industry	29.3%	30.9%
Transport	31.8%	21.0%
Industry	16.4%	19.9%
Agriculture (incl. forestry & fishery)	11.8%	12.0%
Residential & Commercial	7.5%	12.8%
Waste	3.1%	3.2%
Other	0.0%	0.2%

(source: EC and EEA)

Preliminary accounts under the Kyoto Protocol for Slovenia show overall removals of -0.1 Mt CO_2-eq. as an annual average in the period 2013-2015. For comparison, the annual average of the EU-28 accounted for removals of -119.0 Mt. CO_2-eq. It should be noted that in this preliminary simulated accounting exercise, removals from Forest Management were capped to -0.65 Mt CO_2-eq per year, due to significantly exceeding the limit of the difference between the reported sink and the accounting forest management reference level. Slovenia is the only EU Member State with no accounted activities by Afforestation.

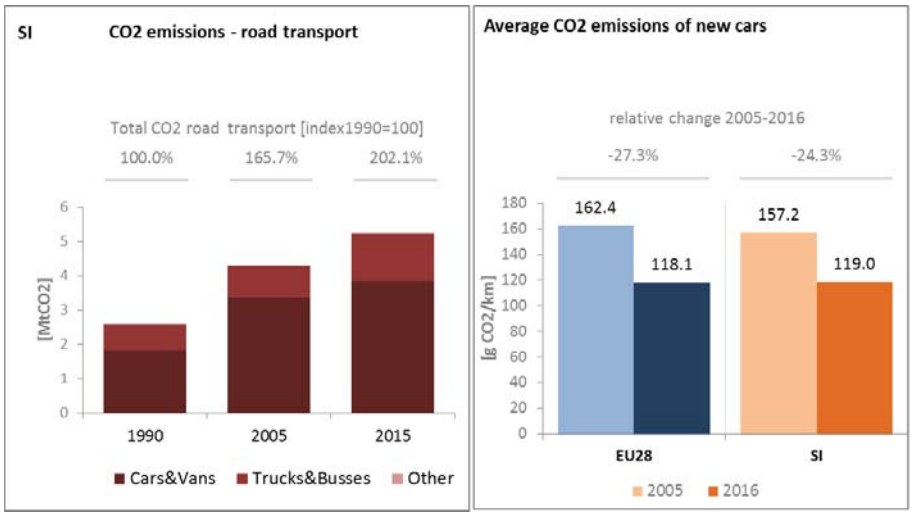
All emissions by Deforestation are offset by removals by Afforestation, resulting in a slightly negative balance. Overall, there is a very minor decreasing trend in removals due to increasing emissions by Deforestation over the course of the three-year period.



Note: Forest Management credits are capped and presented as yearly averages when the total Forest Management credits of the considered period exceed the simulated cap over the same period.
(source: EC and EEA)

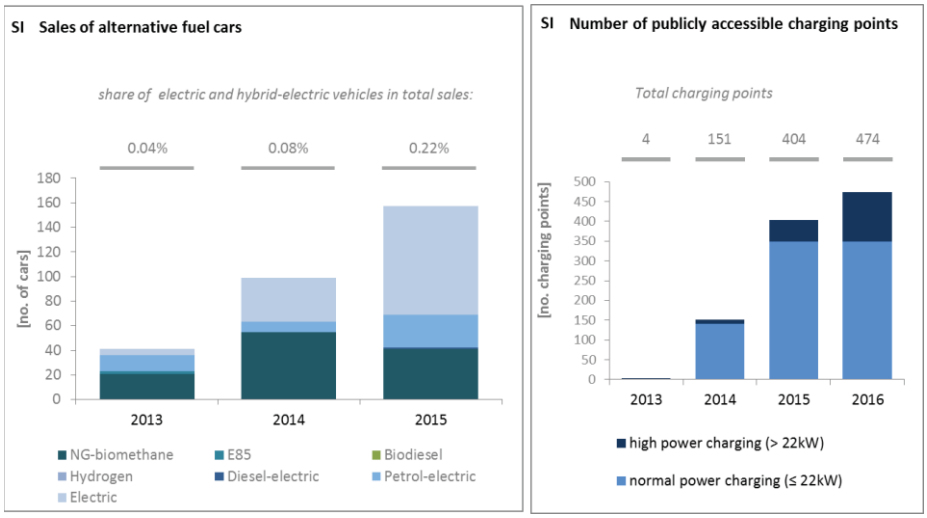
CO_2 emissions in transport and alternative fuelled vehicles

The average CO_2 emissions of new cars in Slovenia were in 2016 slightly above the EU average and have decreased at a slower pace between 2005 and 2016 than the EU average.



(source: EEA/UNFCCC)

Over the last three years the number of electric charging points in Slovenia has more than tripled, from 151 units in 2014 to 474 units in 2016.



(European Environment Agency) *(European Alternative Fuels Observatory)*

National Policy Frameworks under Directive 2014/94/EU on alternative fuels infrastructure have to establish targets, objective and measures for the development of the market of alternative fuels in the transport sector and the deployment of the relevant infrastructure. Slovenia has submitted its National Policy Framework as requested under article 3 of the Directive 2014/94/EU.

A detailed assessment of the Slovenian National Policy Framework in terms of its compliance with the requirements of Directive 2014/94/EU on alternative fuels infrastructure, its contribution to achievement of long-term energy and climate objectives of the Union and coherence of its targets and objectives in terms of cross-border continuity has been published as part of the Communication on Alternative Fuels Action Plans (COM(2017)652) and the related staff working document SWD(2017)365.

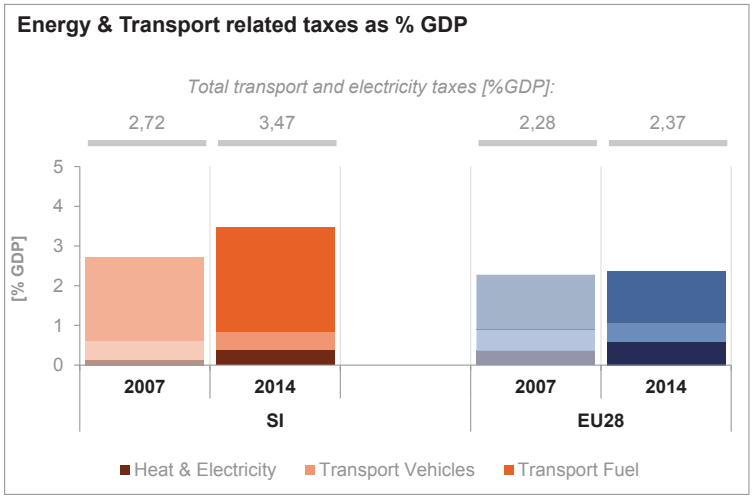
5.2. Adaptation to climate change

Slovenia has a National Adaptation Strategy in place. The NAP has been prepared taking into account national risk assessments and an action plan of measures will follow based on a comprehensive national Climate Change Vulnerability Assessment. Sectors that have devoted most attention to climate change adaptation action are water management (and associated risks of flood and drought), agriculture and forestry. No monitoring and reporting framework is operational to date. A system for periodic review of adaptation action has been developed in the framework of the NAP.

5.3. Taxes on energy and transport and fossil fuel subsidies

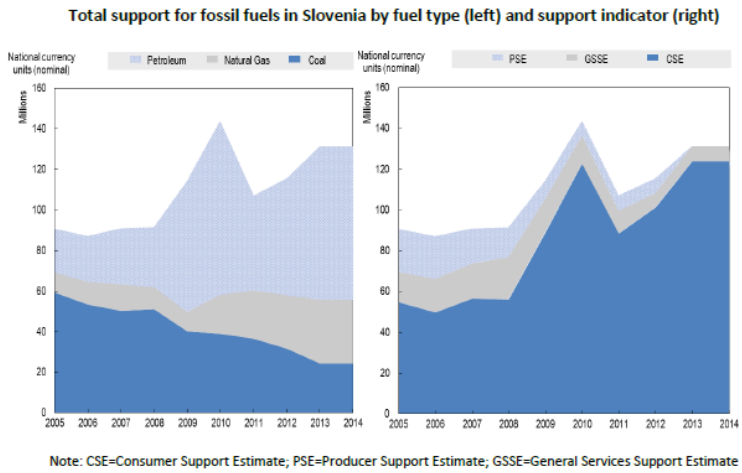
Slovenia uses taxation as part of its climate policy and has a carbon tax in place since 1996, also applying to the transport sector since 2012. In addition, the registration tax on vehicles is partly based on CO_2 emissions.

The overall tax burden on energy and transport (including carbon taxation) in Slovenia amounts to 3.5 % of GDP, which is considerably higher than the EU average (more than 1 percentage point in 2014). It is particularly the tax burden on transport fuel that is higher (almost double in 2014), while taxation on vehicles is broadly in line with the EU-average. Taxation of heat and electricity is slightly below the EU-average, but showed an increase with respect to 2005. The overall tax burden has increased during the period from 2.7 % to 3.4 %, mainly reflecting increasing tax revenue from motor fuels.



(source: Eurostat)

Most of the support for fossil fuels in Slovenia is in the form of consumer support to end-users and industries. The refund on excise duty for diesel in commercial transport has been increasing since 2012 and reached about EUR 42 million in 2014, representing 50 % of all reimbursements for energy sources. In 2012, market price support for coal, the main producer support, was terminated. Following this, coal use fell and the virtual elimination of producer support resulted.

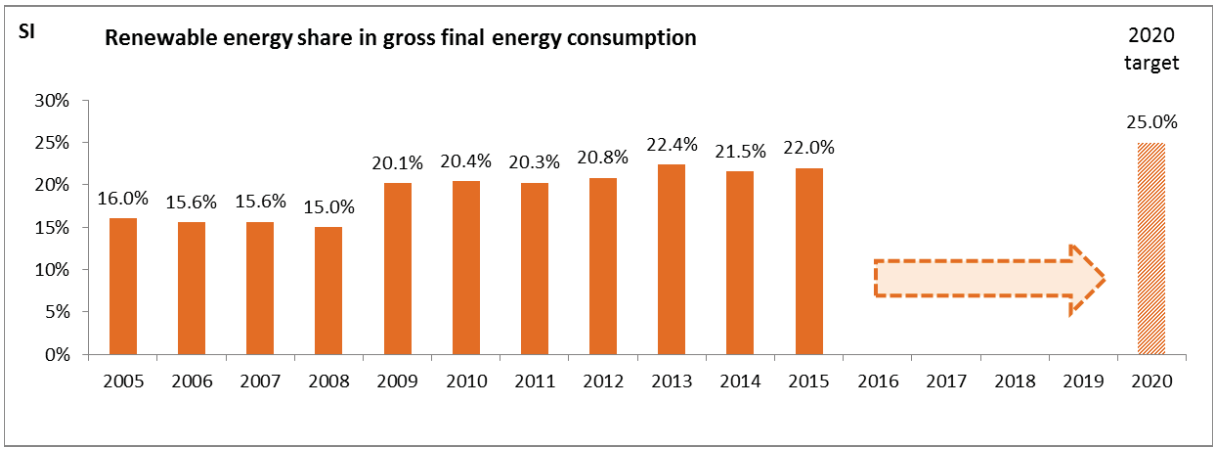


(source: OECD Inventory of Support Measures for Fossil Fuels 2015)

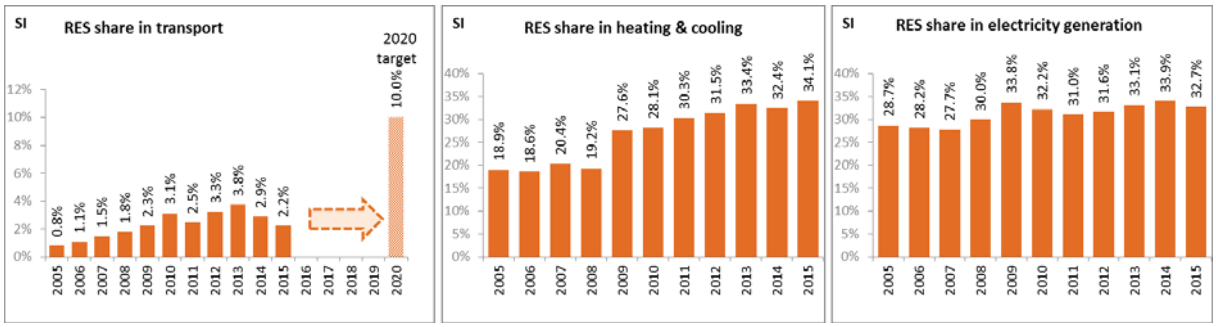
5.4. Renewable energy

Concerning renewable energy, Slovenia's RES share in final energy consumption in 2015 was 22 % therefore putting the country on track to reach the 2020 target of a 25 % share. Furthermore, Slovenia met the 2013-2014 indicative trajectory on the RES share and was already in 2015 well above its indicative trajectories for 2015-2016 and for 2017-2018.

With 34.1 %, Slovenia's RES share in heating and cooling is significantly above the EU average of 18.6 %. Its RES share of 32.7 % in electricity generation is slightly above the EU average of 28.8 % but has slightly decreased since 2009. However, the RES share in transport is – with only 2.2 % in 2015 – below the EU average of 6.7 % and has been decreasing in recent years. Additional efforts in this area would be necessary if the binding 10 % target for 2020 is to be reached.



(source: Eurostat-SHARES)

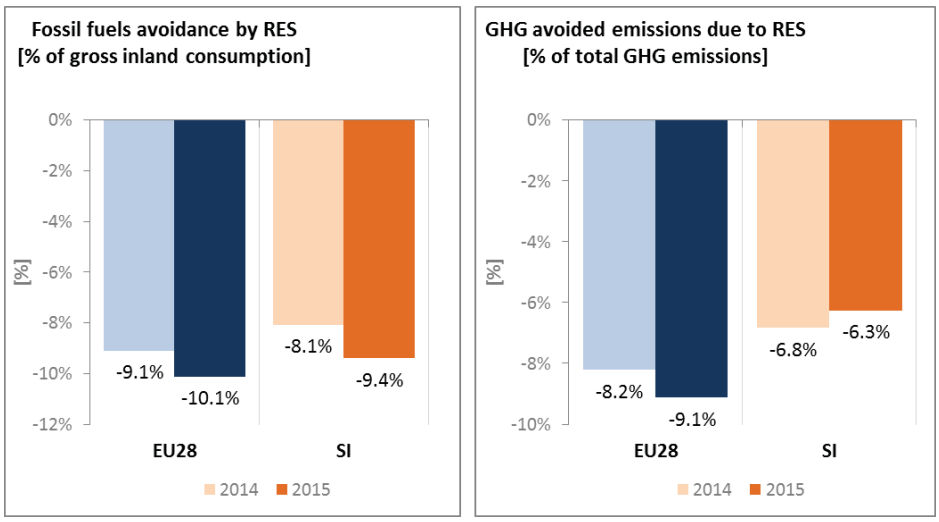


(source: Eurostat-SHARES)

In Slovenia, electricity from renewable sources is promoted through a feed-in tariff and a premium tariff, both granted through a tender procedure. Producers of electricity from renewables may choose between a guaranteed feed-in tariff and a bonus (premium) on top of the free market price for electricity. Hardly any wind power is installed in Slovenia despite favourable climatic conditions especially in the west of the country.

The support for renewable energy for heating purposes is done mainly through loans, grant subsidies and building obligations, while the main incentives for renewable energy use in transport are a quota system, tax exemptions and subsidies in the form of non-repayable grants. Furthermore, there is an obligation to ensure that biofuels are offered at petrol stations.

Due to a consistent deployment of renewables since 2005, it is estimated that Slovenia avoided about 9,4% of the fossil fuel in gross inland consumption and about 6,3 % of GHG emissions at national level in 2015[9].



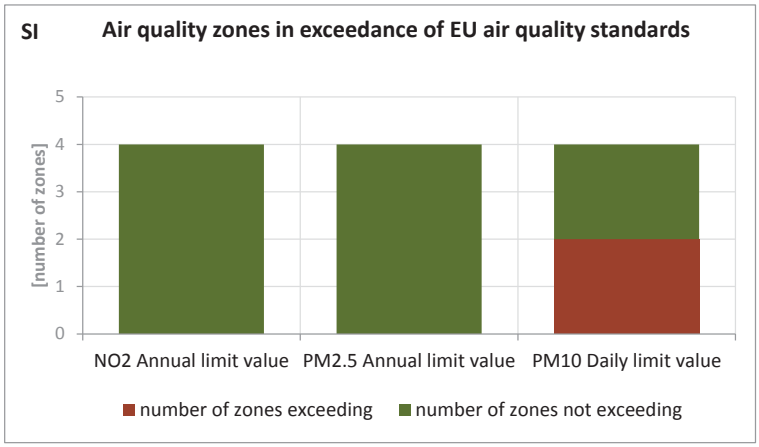
(source: EEA)

[9] Avoided GHG emissions mentioned here have a theoretical character as these contributions do not necessarily represent 'net GHG savings per se' nor are they based on life-cycle assessment or full carbon accounting.

5.5. Contribution of the Energy Union to better air quality

Air quality in Slovenia continues to give causes for concern. For the year 2013, the European Environment Agency estimated that about 1,960 premature deaths were attributable to fine particulate matter ($PM_{2.5}$) concentrations and over 150 to nitrogen dioxide (NO_2) concentrations[10].

For PM, Slovenia reported exceedances of the binding EU air quality standard[11]. For the year 2015, Slovenia reported exceedances of the limit value for PM_{10} in 2 out of the 4 air quality zones in Slovenia as shown in the figure below[12].

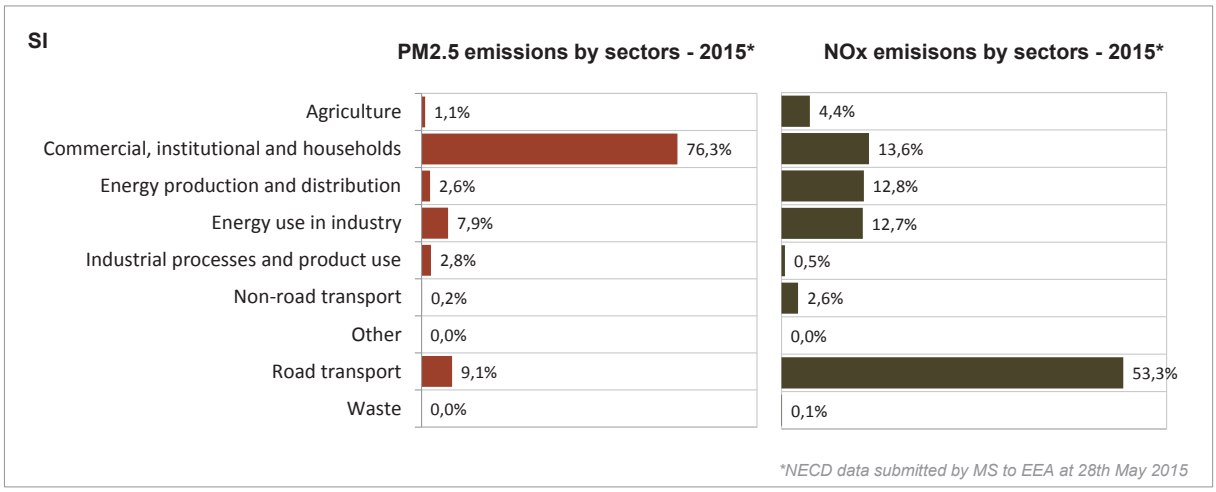


(source: EEA)

The health-related external costs from air pollution in Slovenia have been estimated to be more than EUR 988 million/year (income adjusted, 2010), which includes the intrinsic value of living a healthy life without premature death as well as the direct costs to the economy such as healthcare costs and lost working days due to sickness caused by air pollution[13].

The Energy Union can substantially contribute to addressing these air quality problems through measures reducing emissions of both GHG and air pollutants such as PM and nitrogen oxides (NO_x) from major contributing sectors such as (road) transport, energy production, industry and residential heating (e.g. stoves and boilers) as shown in the figure below[14].

[10] European Environment Agency, 2016, Air Quality in Europe – 2016 Report, table 10.2. The report also includes details as regards the underpinning methodology for calculating premature deaths.
[11] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe, OJ L 152, 11.6.2008, p.1-44
[12] Compliance data as reported by the Member States as part of their official annual air quality report for the calender year 2015 (available on the European Environment Agency's (EEA) Eionet/Central Data Repository), http://cdr.eionet.europa.eu/si/eu/aqd
[13] See also the EU Environmental Implementation Review Country Report for Slovenia, SWD(2017)57 final of 3.2.2017
[14] National emission data as reported by the Member States to the EEA (available on the EEA's Eionet/Central Data Repository), http://cdr.eionet.europa.eu/si/eu/nec_revised



(Source: EEA. This table reflects only sources of primary $PM_{2,5}$ emissions.)

6. Research, innovation and competitiveness

6.1. Research and innovation policy

Most energy research in Slovenia is managed by the National Research Agency, which operates within the Ministry of Education, Science, Culture and Sport. Energy research priorities in Slovenia are nuclear energy (which has strongest emphasis); electric power and power systems; thermal power and processes; renewable energies; and energy conservation in buildings. Research in renewable energies covers small hydropower and micro-hydro turbines; solar energy, including advanced solar cells; wood biomass (in particular forestry management and social aspects of the use of wood for energy); green chemistry and biogas and geothermal energy. There is also considerable research in electric power engineering and power systems operation and management, including the development of smart grids and integration of renewable energy into power systems.

Energy research projects are funded through general or framework programmes, of which the 'Operational Programme for the Implementation of the European Cohesion Policy in the 2014-2020 period (OP EKP)' is the biggest. There is also a National Renewable Energy Action Plan which includes research and innovation (R&I) funding through the Resolution on Research and Innovation Strategy of Slovenia 2011-2020, complemented by the National Energy Programme for 2011–2030.

Slovenia's Smart Specialisation Strategy (S4) is an implementing document relating to the already adopted strategic documents (also OP EKP and S4). Smart Specialisation is a platform for concentrating development investments in areas where Slovenia has the critical mass of knowledge, capacities and competences and where there is innovation potential for placing Slovenia within global markets and thus enhancing its recognisability. Three priority areas (P1 - Healthy working and living environment, P2- Natural and traditional resources for the future and P3 - (S) Industry 4.0) comprise all together nine areas of application in the framework of which focus areas and technologies are identified. Energy is integrated in all three priority areas, e.g.: focus area and technologies related to 'Conversion, distribution and energy management' in the 'Smart cities and communities' area of application (P1), focus area on 'Production of energy based on alternative sources' in the 'Networks for the transition to circular economy' (P2), focus area and technologies related to 'E-mobility and energy storage systems' in the 'Mobility' area of application (P3).

Slovenia is not an active contributor to the ongoing work of the Strategic Energy Technology (SET) Plan. It does not participate in any of the fifteen temporary working groups which have been set up to implement the integrated SET Plan.

Regarding the Horizon 2020 programme, Slovenia has received so far 1.1% of the EU contribution devoted to the 'secure, clean and efficient energy' part of the programme. As of September 2017, 67 participations from Slovenian organisations have been awarded over EUR 20 million in Horizon 2020 energy projects. This includes a grant of EUR 1.2 million to INEA d.o.o. for its participation in project GOFLEX (grid integration of renewables) and four grants totalling almost EUR 6.8 million to Slovenian beneficiaries participating in project FutureFlow (TSO cooperation).

6.2. Investments and patents in the Energy Union R&I priorities

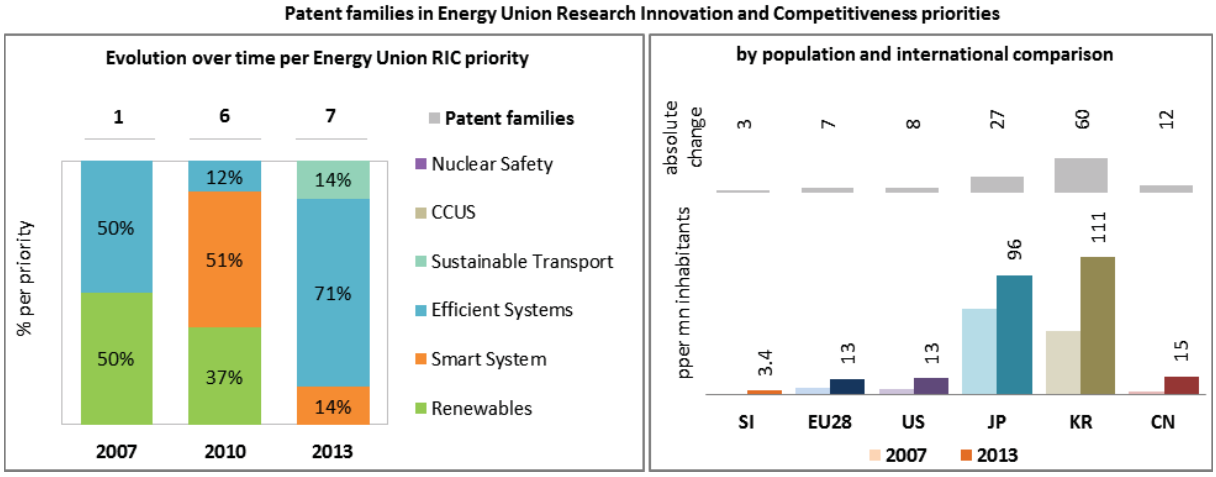
The European Commission does not have any data regarding the public (national) investments in the Energy Union R&I priorities.

Private investment in the Energy Union R&I priorities in 2013 was estimated at EUR 49 million (0.3% of the private R&I investment in Energy Union R&I priorities in the EU). The focus was on the the Efficient Systems priority which received 95 % of these investments. The remaining 5% was attracted by Sustainable Transport.

In 2013, the most recent year for which complete patent[15] statistics are available, 9 companies and research organisations based in Slovenia filed 7 patents in low-carbon energy technologies (0.11% of the EU total). The focus was on Efficient Systems (71%), followed by the Smart system and Sustainable Transport priorities (14% each).

In 2013, private investments and patents in the Energy Union R&I priorities were lower than the EU average when normalised by GDP and by population respectively. In the period 2007-2013, both private R&I investment and the number of patents in Energy Union R&I priorities have increased on average by 67% and 55% per year, displaying higher rates of increase than the indicators at EU level (6% and 15% respectively).

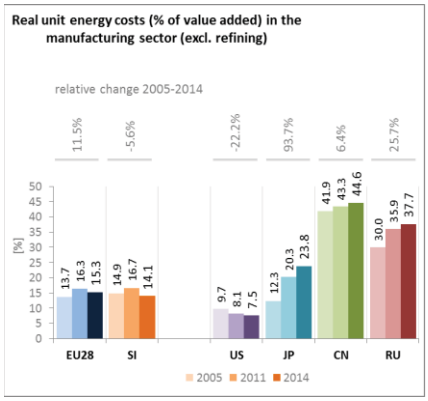
[15] In the context of this document, the term 'patent' refers to patent families, rather than applications, as a measure of innovative activity. Patent families include all documents relevant to a distinct invention (e.g. applications to multiple authorities), thus preventing multiple counting. A fraction of the family is allocated to each applicant and relevant technology.

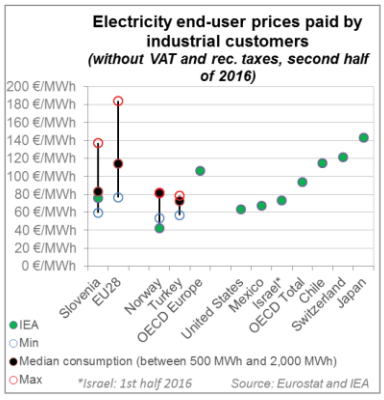


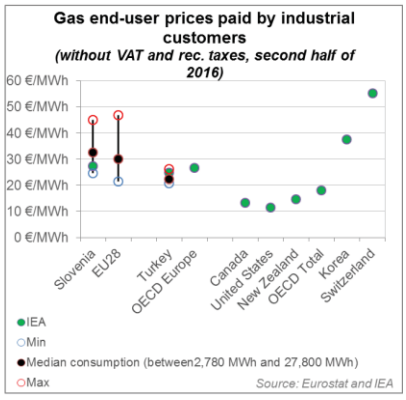
(Data sources: Public investment as available in the International Energy Agency RD&D Statistics database[16] for codes relevant to Energy Union RIC priorities. Patent data based on the European Patent Office PATSTAT database[17]. Private investment as estimated by JRC SETIS. Detailed methodology is available from the JRC[18].)

6.3. Competitiveness

In 2014, the real unit energy costs (RUEC)[19] in Slovenia with 14.1 were below the EU average of 15.3 and have decreased by 5.6 % since 2005. They are nearly twice the RUEC of the US, but well below those in Japan, China or the Russian Federation. The electricity prices paid by industrial customers in Slovenia are below the EU average. However, gas prices for industrial consumers are above the EU average.





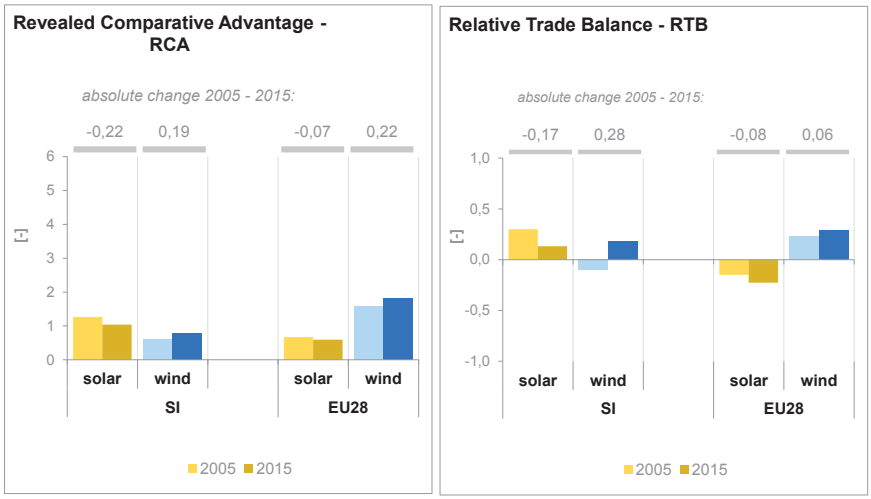


(source: ECFIN) *(source: Eurostat and IEA)*

Regarding the competitiveness in solar energy, Slovenia is performing quite well. Even though the revealed comparative advantage indicator[20] is just about the value of 1, the Slovenian economy was

[16] http://www.iea.org/statistics/RDDonlinedataservice/
[17] https://www.epo.org/searching-for-patents/business/patstat.html#tab1
[18] https://setis.ec.europa.eu/related-jrc-activities/jrc-setis-reports/monitoring-ri-low-carbon-energy-technologies
[19] This indicator measures the amount of money spent on energy sources needed to obtain one unit of value added.
[20] The RCA index for product "i" is defined as follows: $RCA_i = \frac{x_{j,i}/\sum_i x_{j,i}}{x_{w,i}/\sum_i x_{w,i}}$ where X is the value of exports, and j is the country and w is the reference group, the World economy. 2005 refers in the text to the indicator average

above the EU average in 2015 due to a strong specialisation in power electronics for solar photovoltaics panels. The relative trade balance[21] confirms that Slovenia is a net exporter of solar components, in particular power electronic products, while the EU on average is a net importer. The Slovenian economy is not specialised in the manufacturing of wind technologies and components as indicated by a relative comparative advantage indicator below 1. In terms of relative trade balance, Slovenia reduced its gap with respect to the EU average and became also a net exporter for wind components in 2015.



(source: UN comtrade)

7. Regional and local cooperation

Slovenia is part a member of the High Level Group on Central and South Eastern Europe Gas Connectivity (CESEC) together with Austria, Bulgaria, Croatia, Greece, Hungary, Italy, Romania and the Slovak Republic. The objective of the High Level Group is to establish a regional priority infrastructure roadmap and advance its implementation in order to develop missing infrastructure and improve supply security. CESEC has decided in September 2016 to move its cooperation into new areas aiming to create a regional electricity market as well as boosting renewable energy and energy efficiency. Infrastructure projects in the CESEC region are mainly supported through CEF funding, totalling up to EUR 72.5 million of which EUR 45.2 million are foreseen for electricity projects. In the framework of the societal challenge for secure, clean and efficient energy of the Horizon 2020 programme, EUR 228.1 million were allocated to participants from the region in order to stimulate research and innovation.

The EU macro-regional strategies for the Danube Region, the Adriatic and Ionian Region, and the Alpine Region in which Slovenia takes part can be used as a basis for regional cooperation on energy. European Territorial Cooperation – 'Interreg' – under EU cohesion policy also provides further opportunities for cross-border, transnational and interregional cooperation, including in the Energy Union areas.

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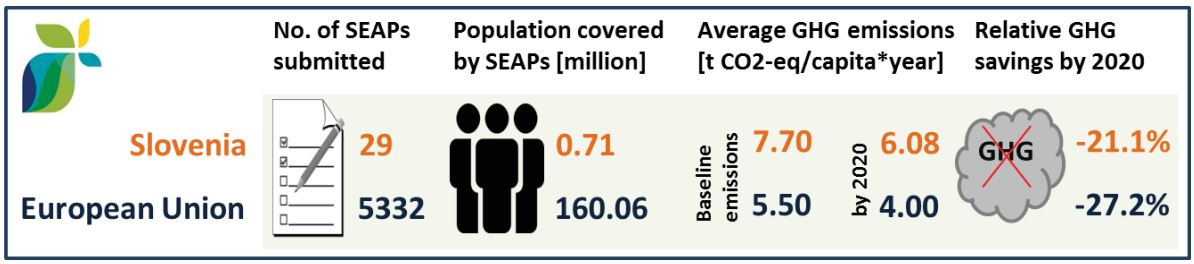
over the 2000-2009 period, while 2015 represents the average over the 2010-2016 period. The same applies for the RTB indicator - see below.

[21] The RTB indicator for product "i" is defined as follows: $RTB_i = \frac{X_i - M_i}{X_i + M_i}$ where X_i is the value of product's "i" exports and M_i imports.

Cities and urban areas have a key role in the energy and climate challenge. The Urban Agenda for the EU, established by the Pact of Amsterdam in May 2016, better involves cities in the design and implementation of policies, including those related to the Energy Union. It is implemented through Partnerships, in which the Commission, Member States, cities and stakeholders work together on a number of important areas, including on Energy Transition, Urban Mobility, Air Quality, Climate Adaptation and Housing. Slovenia is participating in the partnerships on Urban Mobility and Housing, as member.

By 2016 in the context of the Covenant of Mayors, the sustainable energy action plans delivered by 29 Slovene municipalities had been assessed. Overall, these 29 municipalities cover about 710,000 inhabitants representing around 35 % of the total population in Slovenia. All together, these municipalities committed to reduce by 2020 the GHG emissions by 21,1% (as compared to 1990 baseline).



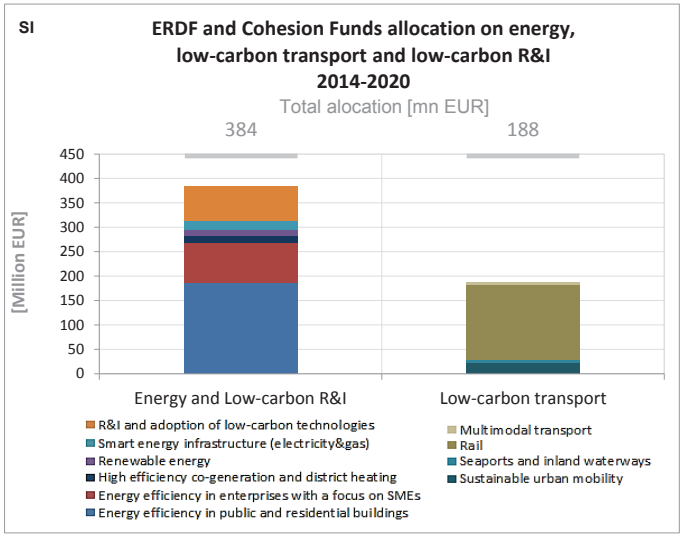
(source: JRC 2016. Notes: SEAP=sustainable energy action plan, GHG=greenhouse gas emissions)

In Slovenia, by September 2016, 2 cities (covering 0.01 million inhabitants) have committed to conduct vulnerability and risk assessment and develop and implement adaptation plans in the framework of the Covenant of Mayors for Climate and Energy.

8. Cohesion policy and EU clean energy investments

EU cohesion policy makes a key contribution to delivering the Energy Union objectives on the ground, including important investment possibilities to implement energy policy objectives in Slovenia which are complemented by national public and private co-financing, aiming at optimal leverage. It also ensures integrated territorial solutions to energy and climate challenges, supports capacity building and provides technical assistance.

Over 2014-2020, cohesion policy is investing some EUR 314 million in energy efficiency improvements in public and residential buildings and in SMEs, as well as in in high-efficiency cogeneration and district heating, renewable energy and smart electricity distribution grids in Slovenia. Cohesion policy is also investing significantly in R&I and in SME competitiveness in Slovenia, based on the national strategy for smart specialisation. For Slovenia, the strategy includes a focus on smart cities and communities, smart buildings and homes, networks for transition to a circular economy, factories of the future and mobility. At this stage, at least EUR 70 million is foreseen for investments in R&I and adoption of low-carbon technologies in Slovenia, but this might increase further in line with the evolving content of the smart specialisation strategy. A further estimated EUR 188 million is invested in supporting the move towards an energy-efficient, decarbonised transport sector.



(source: DG REGIO)

These investments are expected to contribute to around 2,500 households with improved energy consumption classification, a decrease of around 23,000,000 kWh per year of primary energy consumption of public buildings, around 80 MW of additional capacity of renewable energy production and 300,000 additional users connected to smart grids, as well as to around 25 km of reconstructed or upgraded railway lines. Overall, the EU cohesion policy investments in Slovenia over 2014-2020 are expected to contribute to an estimated annual decrease of GHG emissions of around 63,000 tonnes of CO2 equivalent.

For example, the general hospital in Brežice is one of the oldest in the country, dating back to 1872. Ceilings, facades, walls and floors have been thermally insulated, doors and windows replaced and roofs upgraded. A new air-conditioning system to provide cooling and ventilation in the operating theatres has been installed and hot water is now provided through solar heating. Part of the hospital's energy supply has been switched to renewable energy sources, notably solar energy alongside heat pumps which have been installed to extract energy from groundwater. As a result, total energy costs have decreased by 14 %, CO2 emissions reduced by 27 % and water consumption has fallen by 11 %. Total investment for the project amounted to EUR 2 million, of which the Cohesion Fund contributed EUR 1 million.

As another example, the "CENILS – innovative light sources (ILS) technology transfer in central Europe" project aimed to create and maintain a network of universities, laboratories and businesses across central Europe to share information about developing and making effective use of innovative light sources. The project created approximately five jobs through the implementation of two pilot actions, aimed at promoting two promising ILS applications. At least 40 people from the Central Europe programme area and members of the Principal Target Group (PTG) performed these pilot actions. These activities strengthened human resources and knowledge development. Moreover, it promoted an exchange of qualified personnel within different regions, contributed to the management of demographic change, migration and countered the problems associated with brain-drain. Total investment amounted to EUR 1 million, of which the contribution from the European Regional Development Fund (ERDF) was EUR 900,000. The project started in September 2012 and was concluded in December 2014.

As a further example, the "Energy renovation of Centre for School and Extracurricular Activities Bohinj" is being implemented as a demo/ pilot energy efficiency project of nearly zero energy public building. The building is intended for summer or winter camp programmes for primary school pupils and as a sports facility for sport associations, clubs and other NGOs. Measures are being made on building envelope, heating system, ventilation and air-conditioning and use of electric power. Energy savings are expected to amount to 247 MWh/year, on a heated area of 1772 m^2. The total value of

the investment is EUR 1.5 million, of which the Cohesion Fund is contributing with EUR 276,000. The project started in November 2015 and is planned to be finished by August 2017.

Through its support to sustainable transport systems, the Connecting Europe Facility (CEF) also contributes to the goals of the Energy Union. Following Slovenian participation in the CEF – Transport 2014-2015 Calls, the Slovenian action portfolio comprises 21 signed grant agreements, allocating EUR 152.9 million of actual CEF Transport Funding to Slovenian beneficiaries (state-of-play February 2017)[22]. The transport mode which receives the highest share of funding is rail (84.9% of actual funding). The rail actions address works to upgrade the railway sections belonging to both the Mediterranean and Baltic – Adriatic Core Network Corridors, as well as the implementation of the European Railway Traffic Management System (ERTMS).

The Slovenian road actions fall into three main groups, with the objectives concerning the development and modernisation of the motorway infrastructure, the implementation of Intelligent Transport Systems and Services (ITS), and innovation aiming at the greening of road transport. Slovenia also participates in five multi-beneficiary maritime actions focusing on development of the Port of Koper, improving the environmental performance of maritime transport and its integration in the logistics chain.[23]

[22] Note that European Economic Interest Groups and International Organisations are excluded from the analysis.

[23] Source: INEA