

NATIONAL REPORT ON O&O – CROATIA



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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Author	ERDF PP7 Regional development agency Medjimurje REDEA Ltd., Ana Kralj, Jako Horvat, Kristina Pevec
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1. ABSTRACT

In 2014, Croatia adopted The Strategy for innovation encouragement for period 2014. - 2020. Its main objective is to increase the level of competitiveness of the Croatian economy and increase social well-being. The document entails a list of around 40 guidelines structured around four thematic pillars:

- Development of the innovation system and setting up a legal and fiscal framework to encourage innovation;
- Strengthening the innovation potential of the economy;
- Encouraging cooperation and knowledge flows between business and academia; and
- Strengthening of the human resources in innovation and creation of an attractive environment for world-class researchers.

In this National report analyses the environment for ecoinnovation in Croatia with key focused fields:

- Innovation,
- Energy,
- Environmental protection and
- Economy and demography.

2. OVERALL NATIONAL RANKING

This section will provide an overview of the national ranking according to European Innovation Scoreboard (EIS) and Eco-Innovation Scoreboard.

Knowledge, research, and innovation figure prominently in the Europe 2020 strategy and the European Commission annually publishes its Innovation Union Scoreboard, which provides a comparative assessment of the EU member states' research and innovation performance. The countries are divided into groups according to their innovation performance:

- innovation leaders (Sweden, Denmark, Finland, the Netherlands, the UK and Germany);
- strong innovators (Austria, Belgium, Norway, Ireland, France, Slovenia);
- moderate innovators (Czech Republic, Portugal, Estonia, Lithuania, Spain, Malta, Italy, Cyprus, Slovakia, Greece, Hungary, Serbia, Latvia, Poland, Croatia); and
- modest innovators (Bulgaria and Romania).

All the countries and the innovation performance groups to which they belong are shown in Figure 1. European Innovation Scoreboard 2017.

2017 EUROPEAN INNOVATION SCOREBOARD

EU MEMBER STATES' INNOVATION PERFORMANCE



Figure 1: European Innovation Scoreboard 2017¹

Croatia is a Moderate Innovator

Based on Croatian average performance scores as calculated by a composite indicator, the performance of indicator shows that Croatia is a moderate innovator (the performance below than EU average). Over time, performance has *declined by 1.4%* relative to that of the EU in 2010. With fluctuation in observed period, in 2016 achieved a score of indicator European Innovation Scoreboard (EIS) is 54,7.

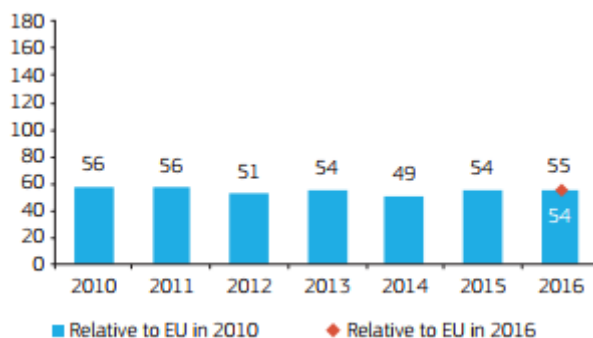


Figure 2: European Innovation Scoreboard for Croatia²

According to the results of Summary Innovation Index for Croatia in period 2010 – 2016 noticeable is a negative trend. Reasons for declined performance are lack of innovations and innovators, lower GDP per capita, a lower and negative growth rate of GDP, lower and negative growth rate of population and lower population density. In Croatia, the innovation potential has not been fully exploited.

The most striking and worrying is the trend in Croatia, and in some Member States (Bulgaria, Romania, Hungary) is that they had a public R&D intensity below the EU average and have experienced budget cuts in their public R&D in recent years instead of building R&I capacities through more investments. In EU level, performance between 2010 and 2016 improved by 2.0 percentage points.

¹ Source: https://www.rvo.nl/sites/default/files/2017/06/European_Innovation_Scoreboard_2017.pdf

² Source: https://www.rvo.nl/sites/default/files/2017/06/European_Innovation_Scoreboard_2017.pdf

In Croatia the performance of the regions is different, which is shown on the next figure³:



NUTS	Region	RII2017	Rank	Group	Change
HR03	Jadranska Hrvatska	51.5	193	Moderate -	-4.0
HR04	Kontinentalna Hrvatska	53.0	186	Moderate -	0.1

RII 2017 shows performance in 2017 relative to that of the EU in 2011. Rank shows the rank performance in 2017 across all regions. Group shows the respective performance group. Change shows the performance change over time calculated as the difference between the performance in 2017 (RII 2017) relative to that of the EU in 2011 and performance in 2011 (RII 2011) relative to that of the EU in 2011.

Croatia as a country is a Moderate Innovator. Croatia includes two NUTS 2 regions.

Kontinentalna Hrvatska (HR03) and Jadranska Hrvatska (HR04) are both Moderate - Innovators. For Kontinentalna Hrvatska (HR03), performance has decreased by -4%. For Jadranska Hrvatska (HR04), performance not changed.

Figure 3: Performance in Croatia in 2017

³ Source: https://www.rvo.nl/sites/default/files/2017/06/European_Innovation_Scoreboard_2017.pdf

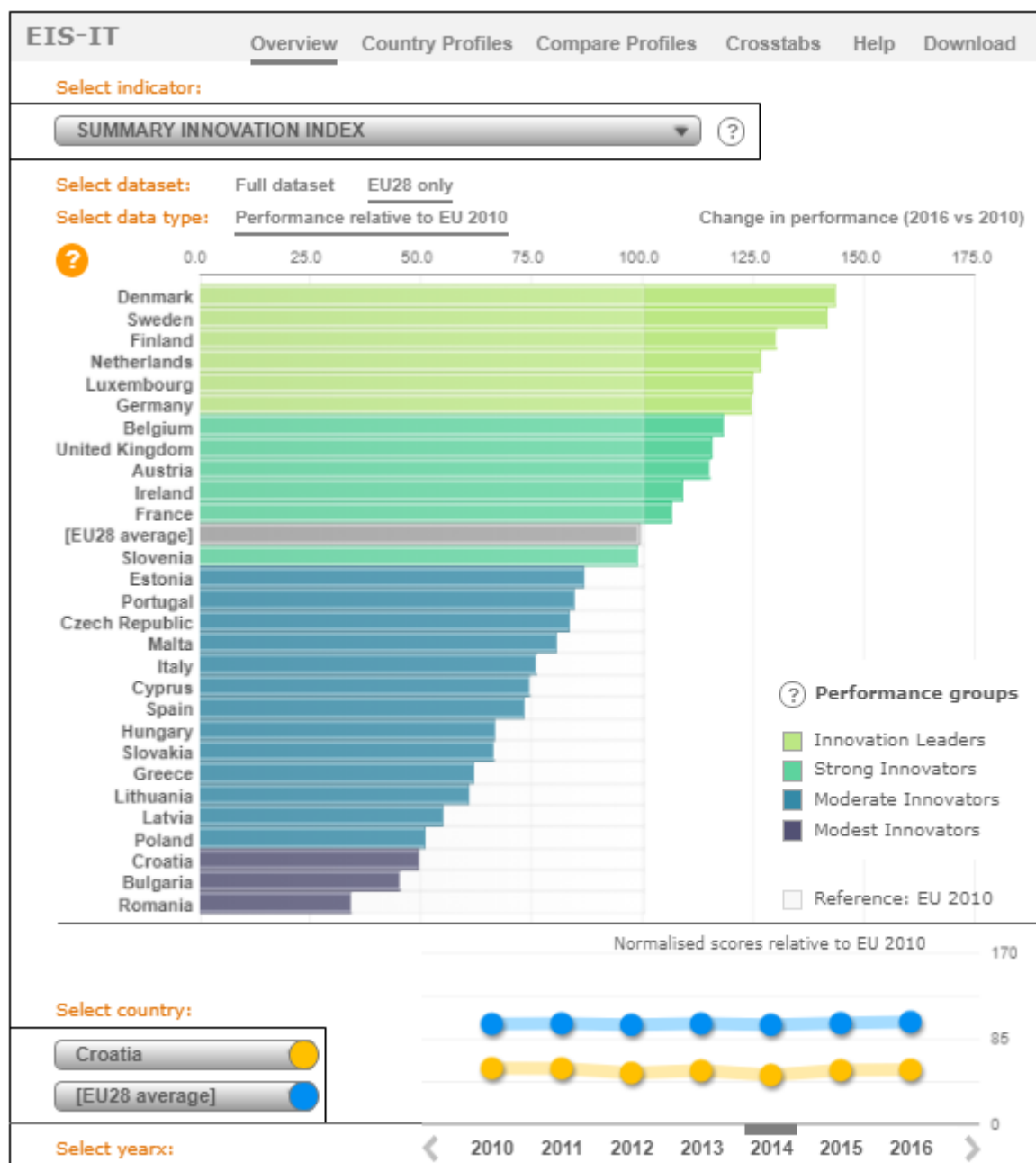


Figure 4: Performance of EU Members States innovation systems according to European Innovation Scoreboard⁴

⁴ Source: https://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en

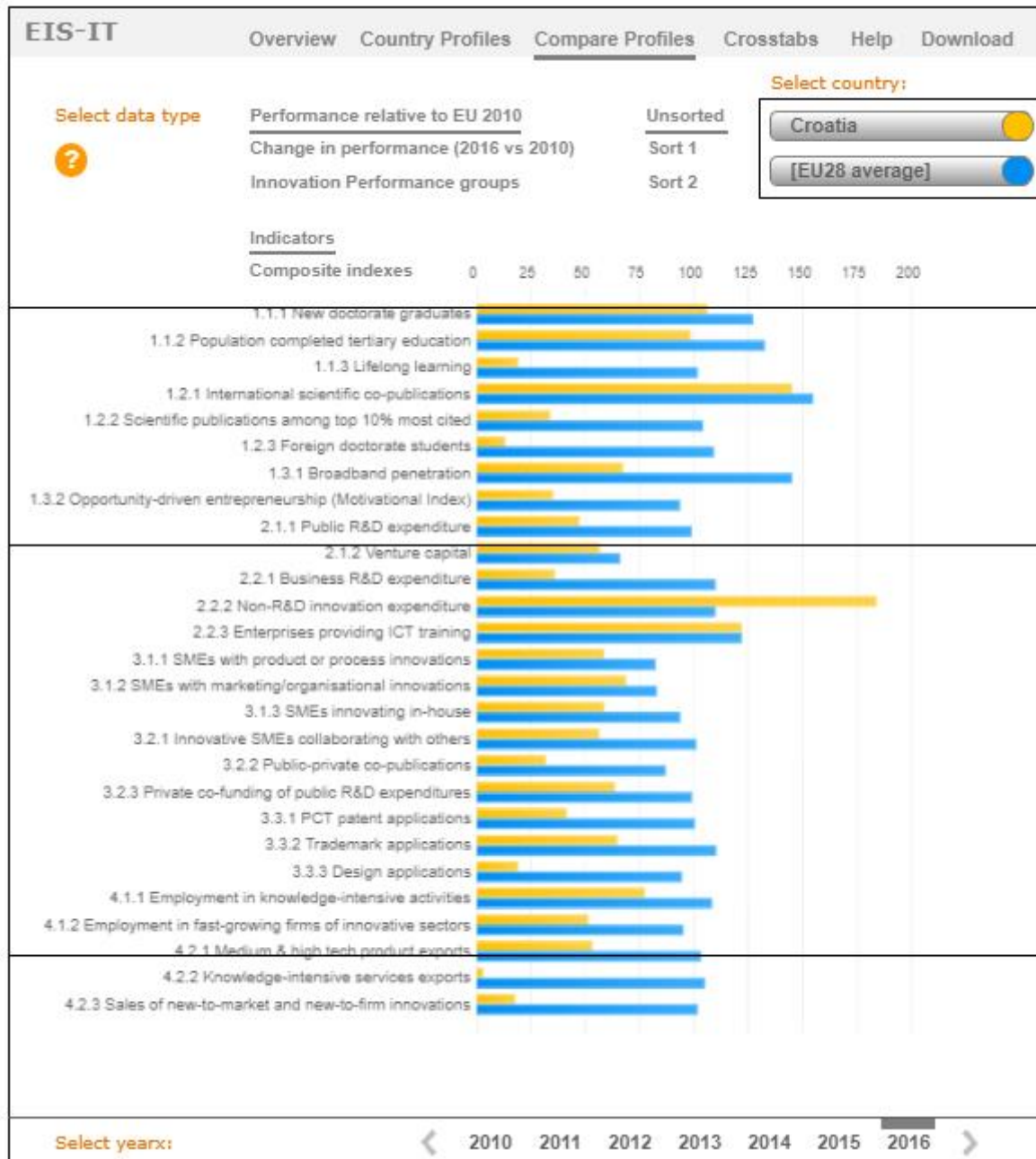


Figure 5: Croatia Performance in 2016 by dimension and indicator⁵

Eco-innovation Index and Scoreboard aim at capturing the different aspects of eco-innovation by applying 16 indicators grouped into five thematic areas.

On the scale of Eco-innovation Index, Croatia's rank is on the same level as Danube region. Eco-innovation leaders in 2016 was Germany with an aggregated score of 140. Luxembourg (score of 139) and Finland (137) followed very closely. In addition to the three top-performing countries, also Denmark, Sweden and the UK have been grouped to the "eco-innovation leading" countries.

⁵ Source: https://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en

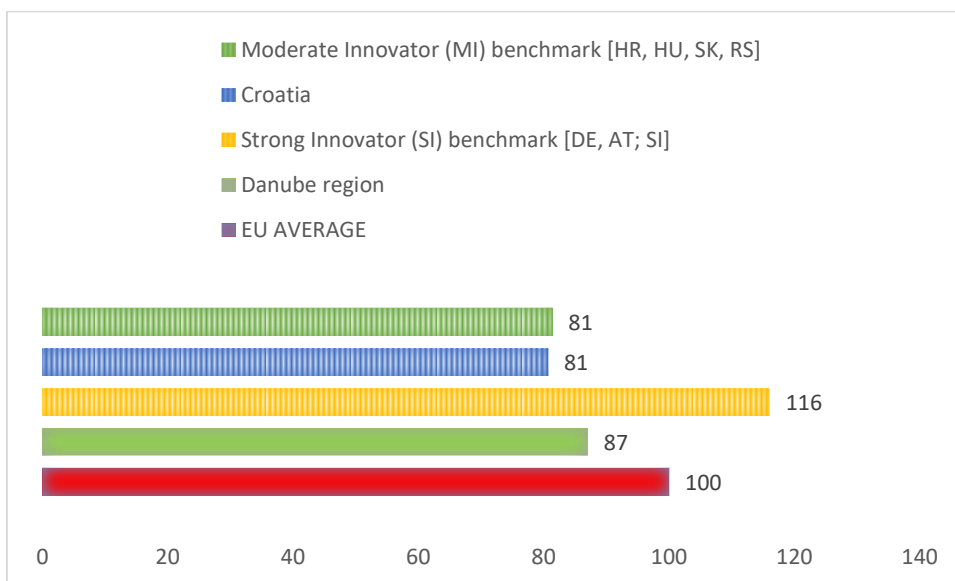


Figure 6: Eco-innovation index for Croatia compared to the EU and Danube region (Source: Eurostat)

Regarding Eco-innovation inputs, Croatia's rate is below Danube region score. The score is the lowest in comparison with all target groups.

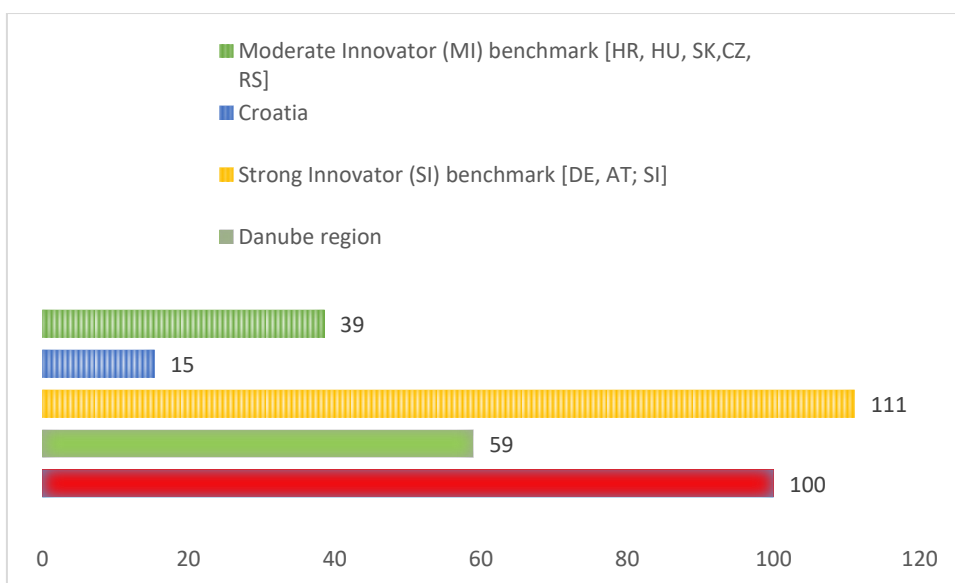


Figure 7: Eco-innovation inputs index for Croatia compared to the EU and Danube region (Source: Eurostat)

3.INNOVATION

This section is dedicated to different indicators highlighting framework conditions in Croatia.

New doctorate graduates per 1000 population aged 25-34

In Croatia, the number of doctorate graduates in 2015 reached 1,57 per 1000 population aged between 25 and 34 which is the highest number in the period from 2008 and 2015, except for 2012. That year the number was 2,3 doctorate graduates per 1000 population aged between 25 and 34, putting Croatia on the same level with strong innovators (Germany, Austria, Slovenia). As it can be seen in the figure below the remaining years in the period, the level was significantly below the EU and Danube region. When benchmarked against other moderate innovators (Hungary, Slovakia, Czech Republic, Serbia) Croatia scores at the average of the category or even higher in the period 2013 onwards.

OPPORTUNITY: On the one hand, the increase of doctoral graduates, however lower than on the EU level and Danube Region, is a positive development. On the other hand, the decision to enter doctoral programmes is often instrumental (no prospects for adequate employment motivates individuals to pursue higher levels of education). This often leads to doctoral graduates with the insufficient connection to the economy and depending on employment in the academic sector.

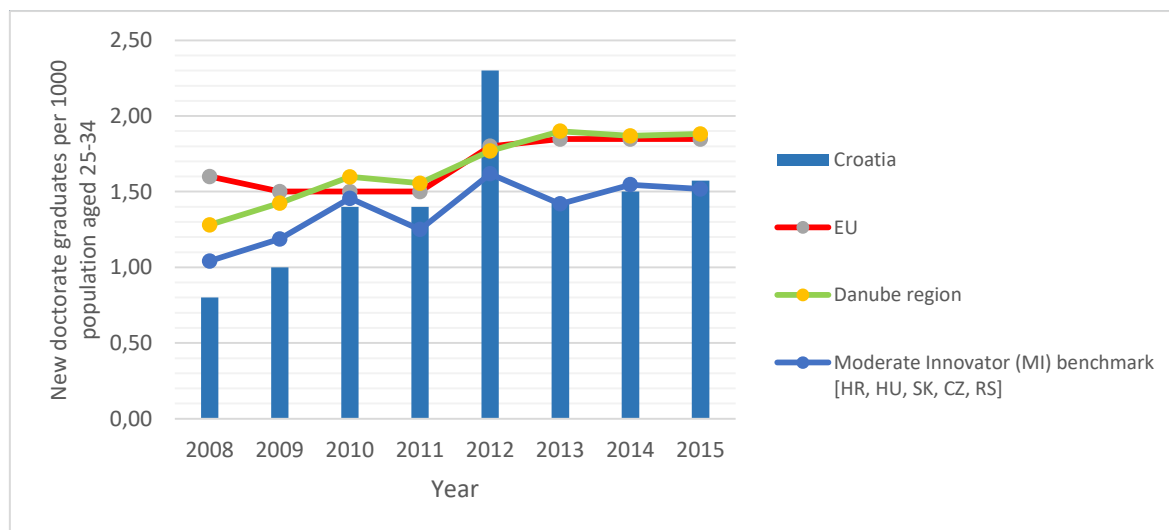


Figure 8: New doctorate graduates per 1000 population aged 25-34 indicator (Source: Eurostat)

Public R&D expenditure

In 2015 Croatia invested 0,42 % of GDP in research and development in the public sector. This represents 59,15 % of the EU member states' average and only 53,62 % of the average of strong innovators. Regarding the given indicator Croatia is lagging behind the Danube region average (0,6 % GDP) as well.

When looking into the figure below it is evident that in the period from 2008 to 2015 Croatia reported a decline in R&D expenditure in the public sector from 2009 (0,5 %) and then stagnates from 2010 onwards keeping the expenditure at 0,41-0,42 %. The trend corresponds to the overall national economic performance. At the same time, the Czech Republic as the leading country among modest innovators in this respect, reported a constant increase in R&D expenditure in the public sector, while Slovakia went from 0,26 % in 2008 to 0,85 % in 2015.

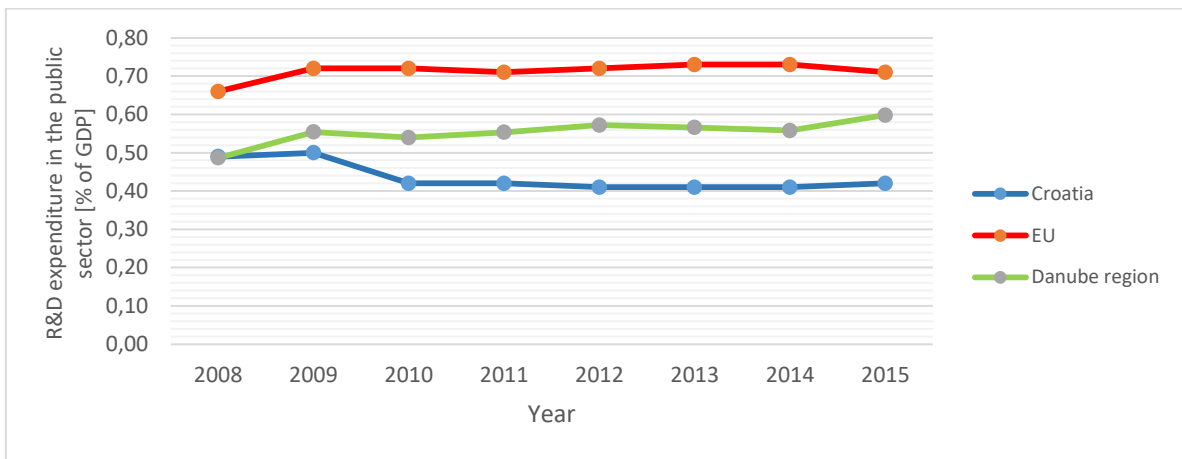


Figure 9: Public R&D expenditure as % of GDP (Source: Eurostat)

OBSTACLE: In comparison to both the EU-28, as well as the Danube region, considering a GDP share of public spending for research and innovation, it is apparent that Croatia is not investing enough in R&D. It seems that in Croatia R&D is seen as a source of potential growth and value-added but rather as a cost to be cut first in times of crisis.

Private sector R&D expenditure

The indicator of R&D expenditure within the private sector as a share of national GDP is inclusive of the business sector (BES) as well as the private non-profit (PNP) sector.

In the period between 2008 and 2015, the expenditure of R&D in the private sector remained stable but significantly below the EU average, ranging from 0,39 % to 0,44 %. At the same time in the Danube region, the expenditure ranged from 0,76 % to 0,99 %. In 2015 the expenditure in Croatia reached 33,85 % of the EU average and only 22,68 % of the average of strong innovators.

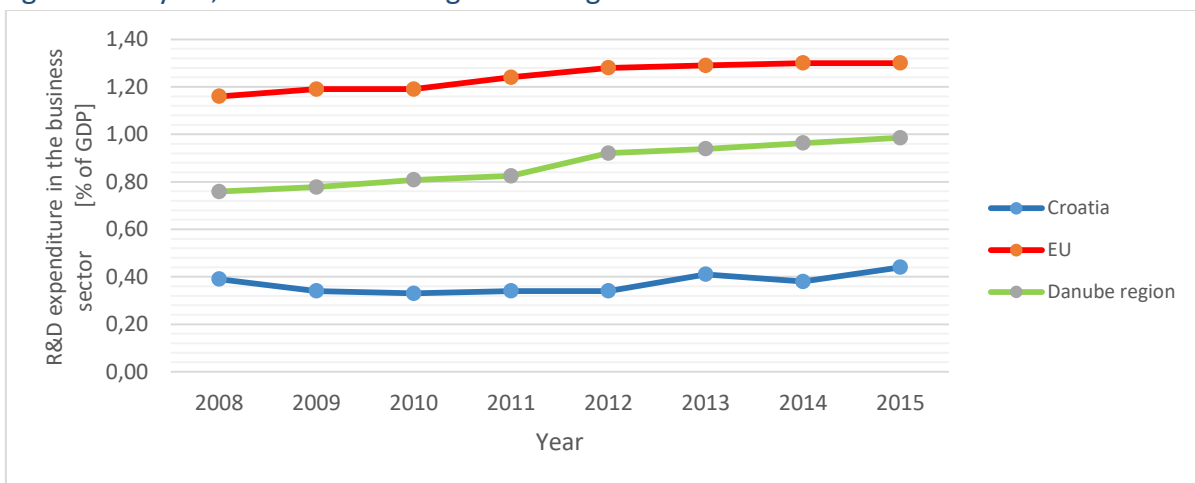


Figure 10: R&D expenditure of the private sector as % of GDP (Source: Eurostat)

OBSTACLE: In the business sector the expenditure is even lower than in the public sector while that trend is reversed in Austria for instance. This reflects characteristics of the national economy lacking in value added. This is why it is important to increase cooperation of the public and business sector to ensure that the results of R&D from the public sector are capitalized in the business sector.

Business enterprise R&D (BERD) expenditure

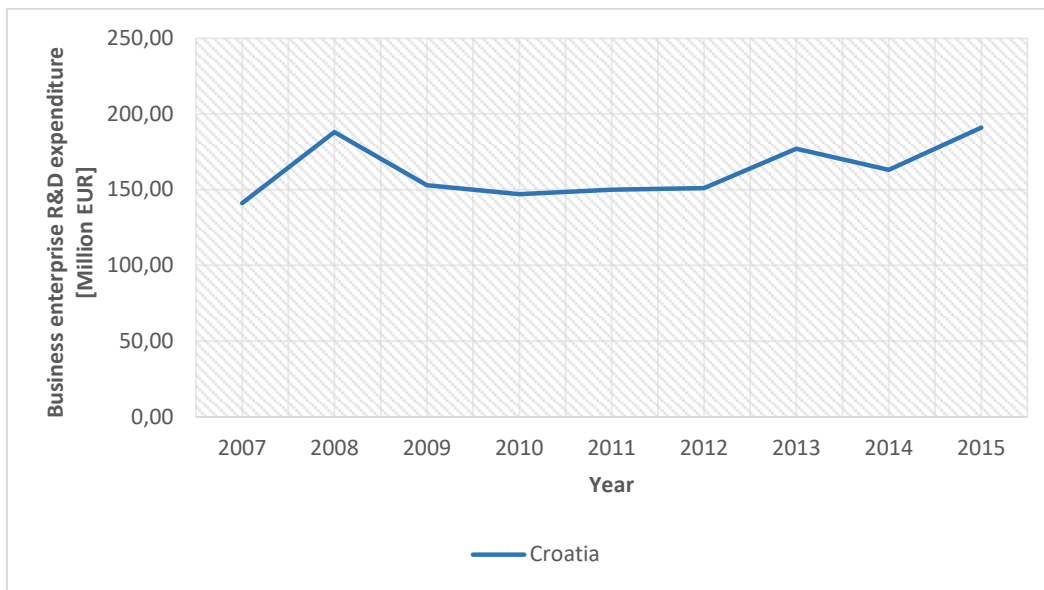


Figure 11: Business enterprise R&D expenditure by all sectors (Source: Eurostat, Innovation Output Indicator)

In the observed period (2008-2015) Croatia had increased the BERD expenditure (all sectors) by over 135 % from 141 million EUR in 2008 to 191 million EUR in 2015. The indicator includes funding from the business enterprise sector, the government sector, the higher education sector, the private non-profit sector as well as contributions from abroad.

In 2008 the increase was 133 % compared to the previous year and then plummeted again in 2010. An increase is again visible from 2012 onwards when different incentives were made available from EU programmes. At the EU and Danube Region level, it is apparent that the BERD expenditure was continuously growing in the observed period. However, the increase is not that different from the one in Croatia – 131,26 % EU, 141,39 % Danube region.

OPPORTUNITY: The total BERD expenditure has substantially increased within the observed period, following the trend visible at the EU level, which is a positive sign. Should that trend be pursued in the future, the BERD expenditure would provide additional opportunities for product/service development and knowledge sharing.

Business enterprise R&D expenditure financed by public funding as % of GDP

Business enterprise R&D (BERD) expenditure financed by public funding includes government's budget but disregards other sources of public funds such as from higher education and EU funding. As indicated in the figure below, Croatia had invested barely 0,01 % of its GDP in BERD in the period between 2007 and 2011, whereas in the remaining years of the observed period government's funding was non-existent. At the same time, in the EU 0,0833 % of GDP was invested in BERD as an average in the given period, while the Danube Region exceeded the EU average in 2011 and 2013. Among moderate innovators the situation is similar to Croatia's, except the Czech Republic where the share of GDP allocated to BERD amounts 0,12 % on average in the observed period.

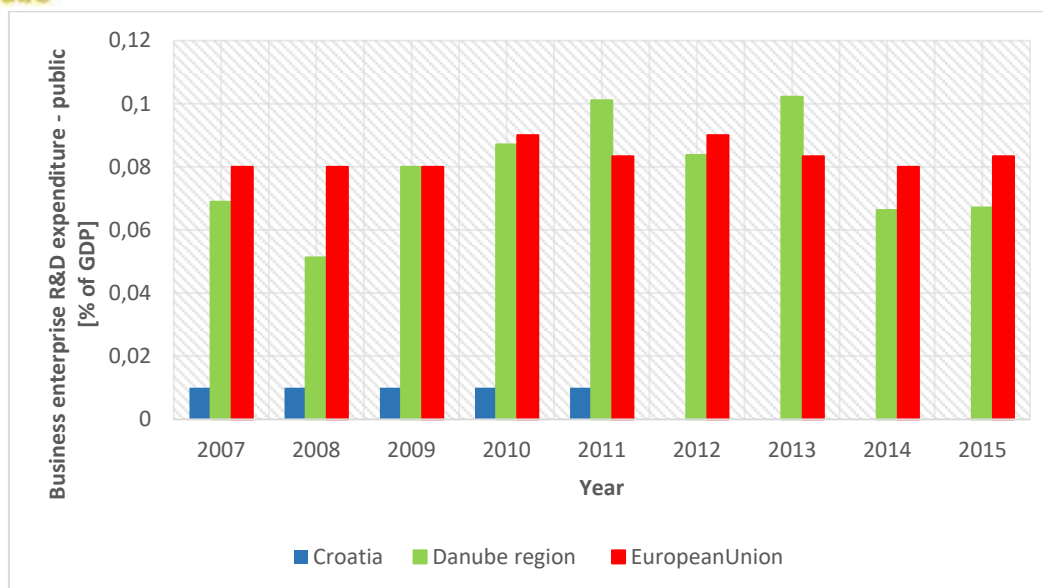


Figure 12: Business enterprise expenditure financed by public funding as % of GDP (Source: Eurostat)

OBSTACLE: Public funding of business expenditure in research and development is extremely low, which is seen as a clear obstacle hampering the support of eco-innovation.

Government budget appropriations or outlays for R&D

The amount of government budget appropriations or outlays for R&D as a share of general governmental expenditure in Croatia ranged from 1,46 % in 2008 to 1,52 % in 2016 with a constant increase, except in 2013 when the amount decreased slightly in comparison to the previous year. The share is on average larger than on the level of EU and countries of the Danube region and even Austria.

Within the Danube region, the amount is notably less than that of the European Union, on average about 20 %. However, with a slight decrease of budget appropriations and outlays within countries of the EU and a substantial increase in the Danube region (+10% from 2007 to 2016), the trend converged to achieve the smallest difference in 2016 (less than 15%).

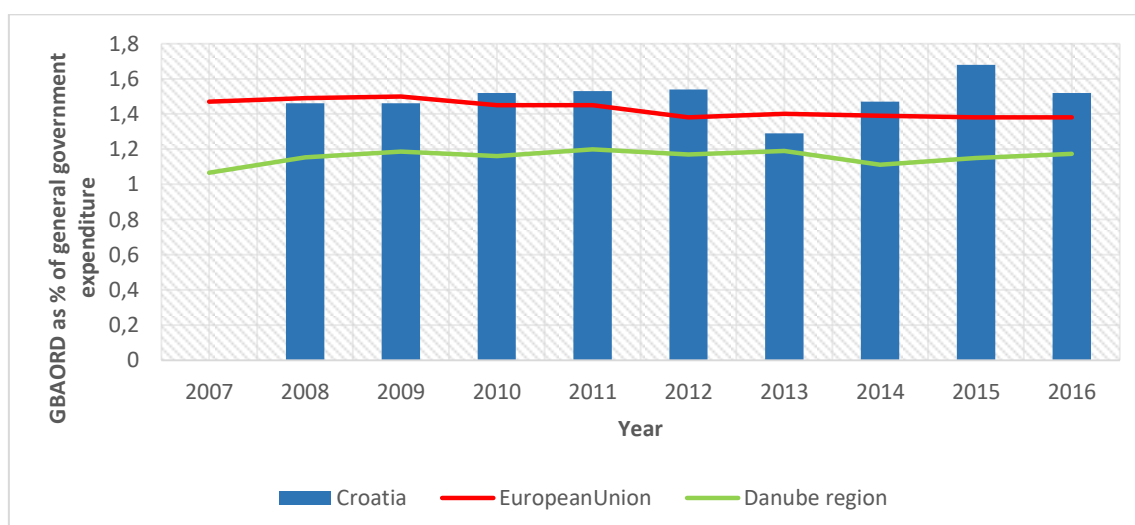


Figure 13: Government budget appropriations or outlays on R&D as % of general government expenditure (Source: Eurostat)

Note: No value for the EU28 available for 2016 yet. The EU28 value for 2015 was used as a best estimate for 2016.

OPPORTUNITY: The public sector in Croatia invests more into R&D than on average in the EU and the Danube Region. It is essential to assure that the R&D activities correspond to actual needs of the economy whenever applicable.

Gross domestic R&D expenditure (GERD)

When looking into the Gross domestic expenditure on R&D (GERD) from all sectors (including funding from the business enterprise sector, the government sector, the higher education sector and the private non-profit sector) measured as a share of GDP (figure below) Croatia's expenditure reached 0,85 % in 2015 but has been volatile in the period from 2009 onward (average 0,79 %). The EU countries have on average invested above 2,5 times a larger share of GDP in R&D than Croatia. Among other moderate innovators Croatia scores similar to Slovakia (average 0,78 %) but substantially behind the Czech Republic (average 1,69 %).

GERD has been on average almost 25 % lower in the countries of the Danube region compared to the European Union. However, Germany and Austria exceed EU's average expenditure (share of GDP) by more than 1,4 times.

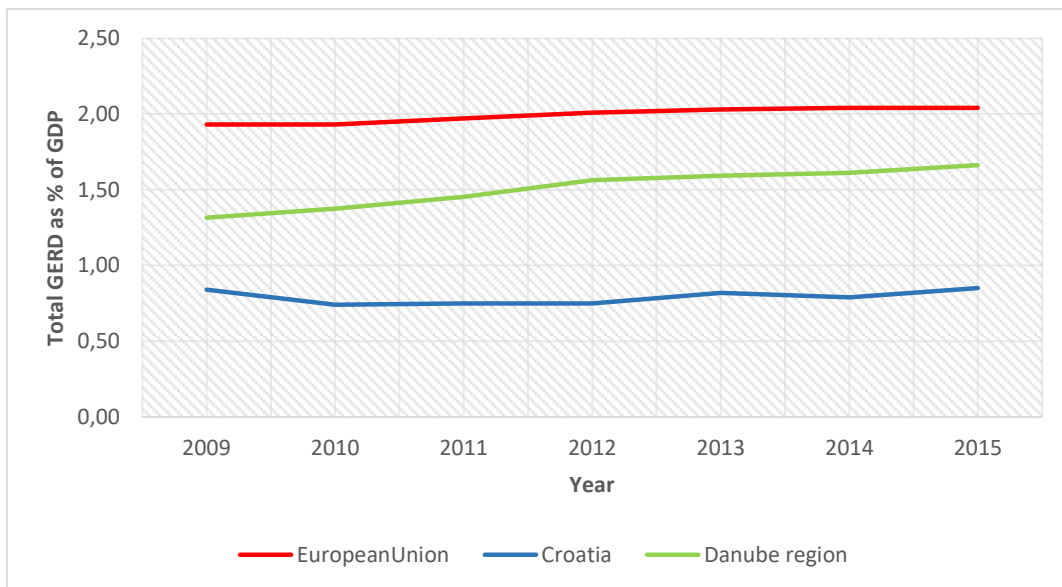


Figure 14: Gross domestic expenditure on R&D (GERD) as % of GDP (Source: Eurostat)

During the observed period, the average total intramural R&D expenditure in countries of the European Union was 530 EUR per capita and 342 EUR per capita (-35 %) in countries of the Danube region. Croatia's average expenditure was 81,96 EUR per capita (6,4 times below EU average and more than four times below the average of the Danube Region), the lowest among moderate innovators.

OBSTACLE: Since Croatia's gross expenditure on R&D in all sectors is substantially low this can be seen as an obstacle hindering the development of innovations in general, including eco-innovations.

Turnover from innovation (% of total turnover)

The actual turnover from innovation (i.e., products new to the enterprise and the market) as a share of total turnover was collected in the Community Innovation Survey from 2004 to 2012 on a biennial basis (except Croatia where the data is available for 2006-2012). The average share of turnover from innovation in the European Union was 15,32 % in the industry sector and 7,88 % in the service sector. The average is calculated with values for EU-27 including for the year 2010 with the values for EU-28 included for the year 2012. In comparison, the average for countries from the Danube region is similar to those on the EU level (17,47 % for industry and 8,7 % for services). The average for Croatia in the given period is calculated to be 14,8 % for industry and 8,78 % for services. As it is apparent from the figure below the turnover from innovation in Croatia has been volatile, corresponding to the trend of gross expenditure on R&D presented in the previous section. However, what surprises is that regarding expenditure on R&D Croatia is significantly lagging behind the EU average (both in the share of GDP and in absolute amounts per capita), while the turnover from innovation shows far more favourable figures. For instance, in services both in 2008 and 2010 Croatia surpassed the EU and Danube Region regarding turnover from innovation.

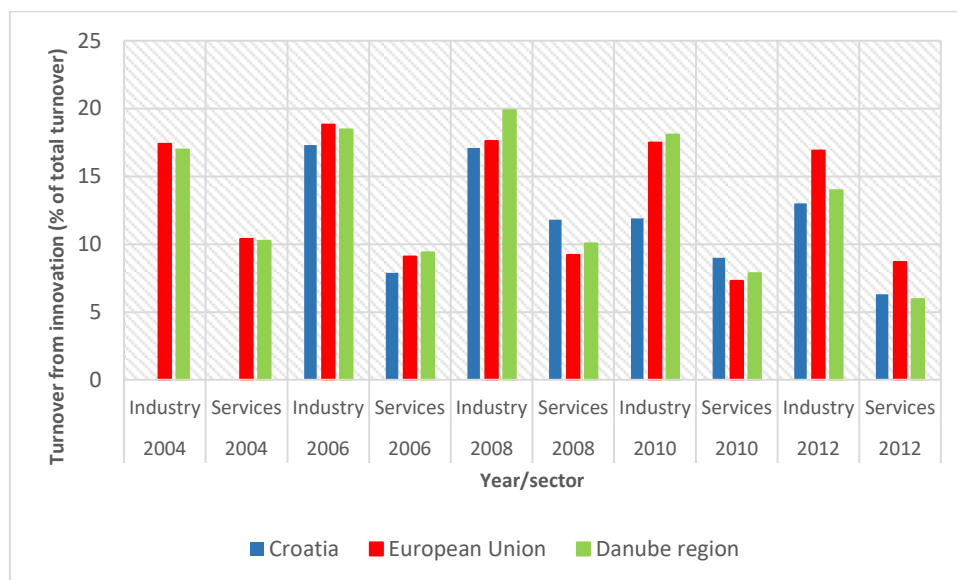


Figure 15: Turnover from innovation, as share of total turnover (Source: Eurostat, Community Innovation)

OPPORTUNITY: When comparing the turnover from innovation reported for Croatia with total national expenditure on R&D across all sectors it can be concluded that invested funds are used efficiently, especially regarding innovation in services.

Scientists and engineers as a share of active population

In the period between 2007 and 2016 the share of scientists and engineers within the Croatian active population has reached its peak in 2014 with 4,8 % (increase of 60 % in comparison to 2007 when the share was 3 %). On average in the observed period the share was 3,81 % which is significantly lower than the average share in all EU countries (5,95 %) and Danube Region (4,77 %). Croatia is surpassed by all other observed countries, except Slovakia.

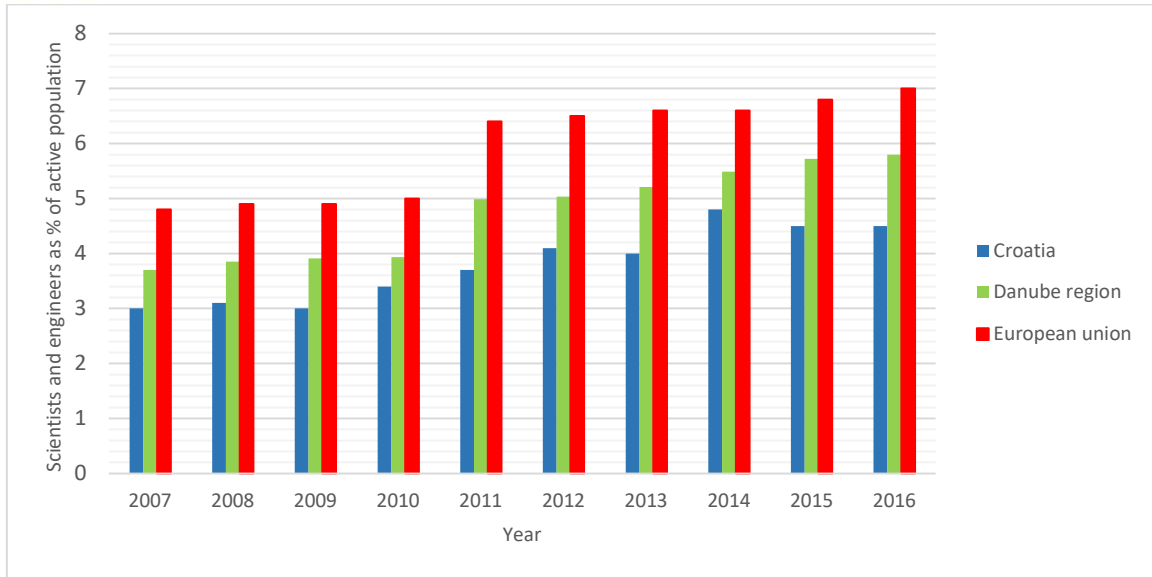


Figure 16: Scientists and engineers as share of active population in Croatia (Source: Eurostat)

OBSTACLE: The percentage of highly educated persons in the field of engineering and science in overall active population in Croatia is low. The lack of workforce of that profile has already been identified as an obstacle in terms of intensity of R&D activities and development of manufacturing sectors with higher value added. Among others, this can be attributed to the preference of young people to enrol in university programmes in social sciences as opposed to science and engineering, which has been a trend in the previous period. This is why the Croatian government has put much effort in recent years to direct youngsters towards education in the STEM field. For instance, STEM scholarships have become available in order to stimulate education in that field. On the other hand, brain drain is evident as well in the last few years but not much has been done to reverse that trend.

Employment in Knowledge Intensive Activities (KIA) and medium/high-tech manufacturing

In the observed period between 2008 and 2016 Croatia reported a gradual growth in the share of employment in knowledge intensive activities (KIA) in total employment, from 25,7 % in 2008 to 31,4 % in 2014, while decreasing slightly in 2015 to the share of 31,3 %. At the same time, EU reached a peak in 2016 with 36 % and the Danube Region with 31,54 %. As it is visible from the figure below Croatia reached the Danube Region's level in 2014. However, this indicator refers both to manufacturing and services.

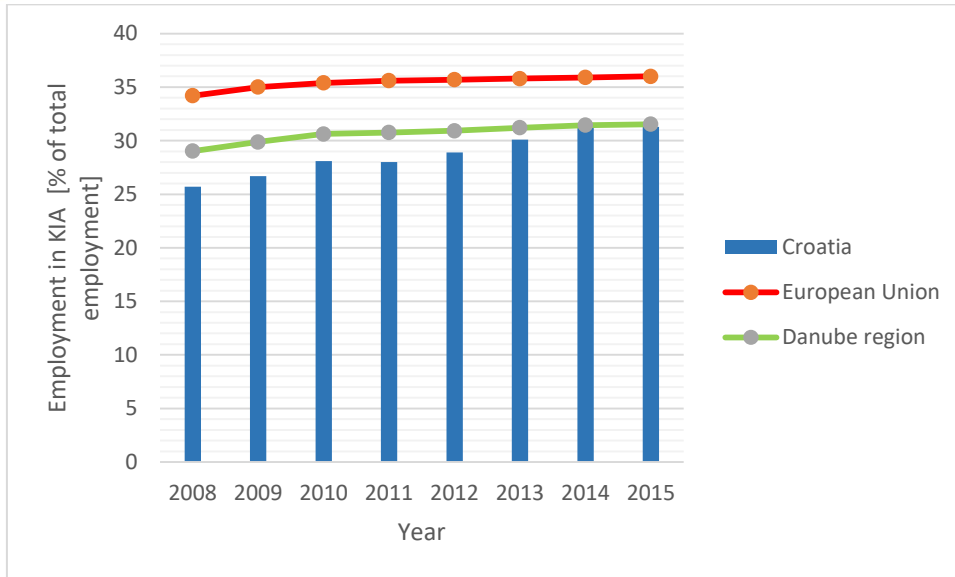


Figure 17: Employment in Knowledge Intensive Activities (KIA) as a share of total employment in Croatia (Source: Eurostat)

On the other hand, Croatia’s lagging behind the EU and Danube Region average is apparent when looking into the share of employment in medium-high and high-tech manufacturing in total employment. Namely, while the share in Croatia in the period between 2008 and 2016 was on average 3,5 %, the average on EU level was 11,3 % and in the Danube Region much lower - 7,6 %. From the figure below it is visible that the share remained stable at the EU level while being somewhat volatile in the Danube Region as well as in Croatia. In this respect Croatia is extremely low position even in comparison to other moderate innovators (Slovakia – 7,8 %, Hungary – 8,6 %, Czech Republic – 10,5 %), nearest to Bulgaria (modest innovator) with 3,7 % on average.

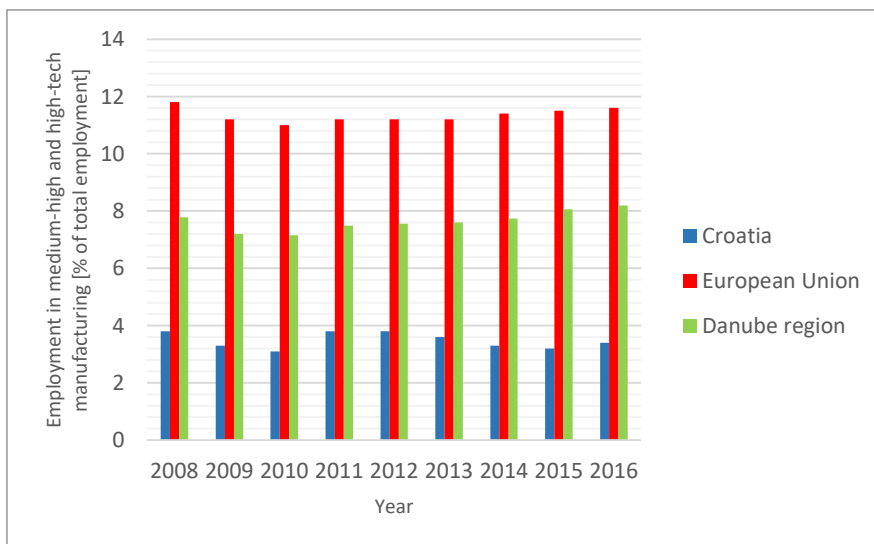


Figure 18: Employment in medium-high and high-tech manufacturing as share in total employment in Croatia (Source: Eurostat)

OPPORTUNITY: The presented data show that Croatia is following the trends in employment in knowledge-intensive activities apparent on the EU level. However, when looking into employment in medium-high and high-tech manufacturing, it can be concluded that Croatia has more potential in providing eco-innovative services than products. This can be seen as an opportunity, while on the other hand, the low share of employment in medium-high and high-tech manufacturing is an obstacle in the development of eco-innovative products.

Innovation Output Indicator

The Innovation Output Indicator is a composite indicator measuring the extent to which ideas stemming from innovative sectors are capable of reaching the market. It is developed by the European Commission to benchmark national innovation policies and is composed of the following four indicators:

- Patent applications per billion GDP (in PPS);
- Employment in knowledge-intensive activities as a percentage of total employment;
- Share of medium and high-tech goods and services in a country's exports; and
- Employment in high-growth enterprises in innovative sectors as a percentage of total employment.

Unlike all other observed countries (Austria, Bulgaria, Czech Republic, Germany, Hungary, Romania, Slovakia, Slovenia), Croatia is the only one where the Innovation Output Indicator has declined in the period from 2011 (62,86) to 2014 (59,81), by 4,85 %. While the average of the Danube Region was 85,75, Croatia's was 61,19, which is the lowest among observed countries. In comparison, in Austria, the growth was over 9 % (comparing 2011 with 2014) and in Slovenia a bit less than 2 %. The Czech Republic, on the other hand, a moderate innovator, rose almost 7 %.

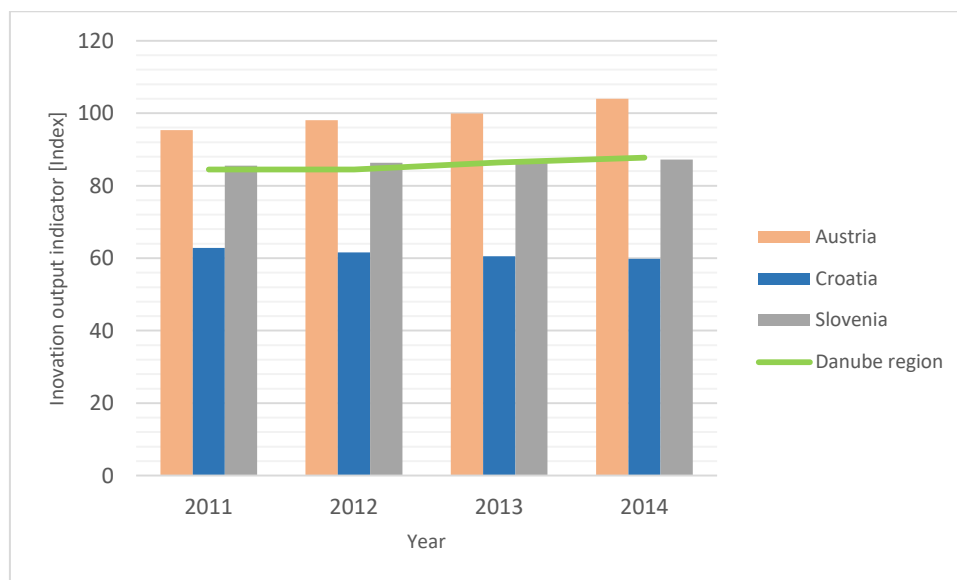


Figure 19: Innovation Output Indicator – Composite IOI Score, Index EU 2011 = 100 (Source: European Commission)

OBSTACLE: The Innovation Output Indicator highlights Croatia's lagging behind other observed countries regarding innovation policies. Much effort needs to be invested in improvements regarding patent applications, employment in KIA, the share of medium and high-tech goods and services in exports and employment in high-growth enterprises in innovative sectors. This is a clear barrier to growth in eco-innovations.

4. ENERGY

4.1 General overview of energy sector

As a member of the European Union (EU) since July 1, 2013, Croatia has adjusted its energy sector regulations and development plans to enable smooth integration into the European energy market and to ensure diversified and sustainable supply of energy resources and improved energy efficiency.

Implementation of the Energy Strategy adopted in 2009 has not been quick, primarily due to the 2009-2015 economic recession in Croatia. Croatia is working on a new energy strategy which will, in addition to the reduction of the greenhouse gas emissions, increase the security of energy supply and its sustainability, increase the availability of energy, and reduce energy dependence. The main emphasis of the strategy will be on changes in the energy sector, which has to become more effective and be in the service of citizens and the economy. The Croatian Energy Strategy has three basic energy objectives:

- Security of energy supply;
- Competitive energy system; and
- Sustainable Energy sector development.⁶

Around half of Croatia's electricity generation comes from hydropower, with most of the rest coming from thermal power plants run on fuel oil/natural gas and coal. The installed electricity generating capacities in the Republic of Croatia include hydro and thermal power plants owned by the HEP Group, increasing number of wind power plants and other power plants on renewable energy sources and a certain number of industrial power plants. Electricity generation capacities within the HEP Group consist of 16 locations with hydropower plants, 7 locations with thermal power plants and one-half of the installed capacities of the nuclear power plant Krško (located in the territory of Slovenia). Thermal power plants are gas-fired, coal-fired and fuel oil fired. The majority owner over the generation capacities in the Republic of Croatia is HEP d.d. Total available capacities of all HEP's power plants in the Republic of Croatia amount to 4 107.5 MW (including TPP Plomin and excluding NPP Krško), i.e., total capacities serving the needs of the Croatian electric power system amount to 4 455.5 MW (with 50 % of Krško capacities). Out of this amount, 1 906 MW is placed in thermal power plants (including TPP Plomin and excluding NPP Krško), 2 201.5 MW in hydropower plants and 348 MW in the nuclear unit Krško (50 % of total available capacity).⁷

Concerning gas transport, Croatia has a system of 2.775 km of high-pressure pipelines, with 10 entry points and 172 exit points with max. the capacity of 1.200.000 m³/h. The underground gas storage Okoli makes a part of the company Podzemno skladište plina, Ltd. which is owned by PLINACRO that took over management and organisation of natural gas storage activities. The designed capacity of underground gas storage is 553 million m³ and maximum injection capacity of 3.8 million m³/day and the maximum withdrawal capacity of 5.8 million m³/day.⁸

At the beginning of August 2015, in Croatia, there were 1,207 power plants which use renewable energy sources, while the total capacity of these plants was 430.88 MW, reported by the Croatian Energy Association. The Association conducted its research based on data released by the Croatian Energy Market

⁶ State Secretary at Ministry of Environmental Protection and Energy Ante Čikotić, 18.10.2016.

⁷ <http://www.eihp.hr/wp-content/uploads/2016/12/Energija2015.pdf>

⁸ <http://www.eesc.europa.eu/resources/docs/hupprezentacija1411.pdf>

There are several major energy projects in serious consideration, including a floating LNG terminal at the Island of Krk, the Ionian Adriatic Pipeline, Renovation of hydro-power plants Kosinj (22 MW) and Senj (216 MW), renovation of the combined cycle cogeneration power plant EL-TO Zagreb (90-150 MWe and up to 130 MWt) and a system of hydro-power plants on the Sava River.

Indicator: Energy dependency

Croatia imports about 50 % of the total of about 350 PJ (petajoules) of energy consumed annually. It imports 80 % of its oil needs, 40 % of gas, 35 % of electricity, and 100 % of coal needs. Croatia has an import dependency similar to the EU28 average for fossil fuels. The import dependency is much lower for gas, although it increased over the last seven years. Croatia has a long tradition of gas production by which it covers slightly above 60% of its annual domestic demand. It has to be noted that domestic consumption varies significantly depending on the period of the year and that, in winter, national consumption is significantly higher than domestic production. This variability has to be taken into consideration when assessing Croatia's security of supply.

The overall energy dependency of the country was 48,3% in 2015 (increased 10% from 2014), making it a Member state with **medium dependency** considering that the average for the European Union member states (EU-28) was 54 % in 2015. *Strong innovators* are clearly above the EU average – strongly dependent countries.

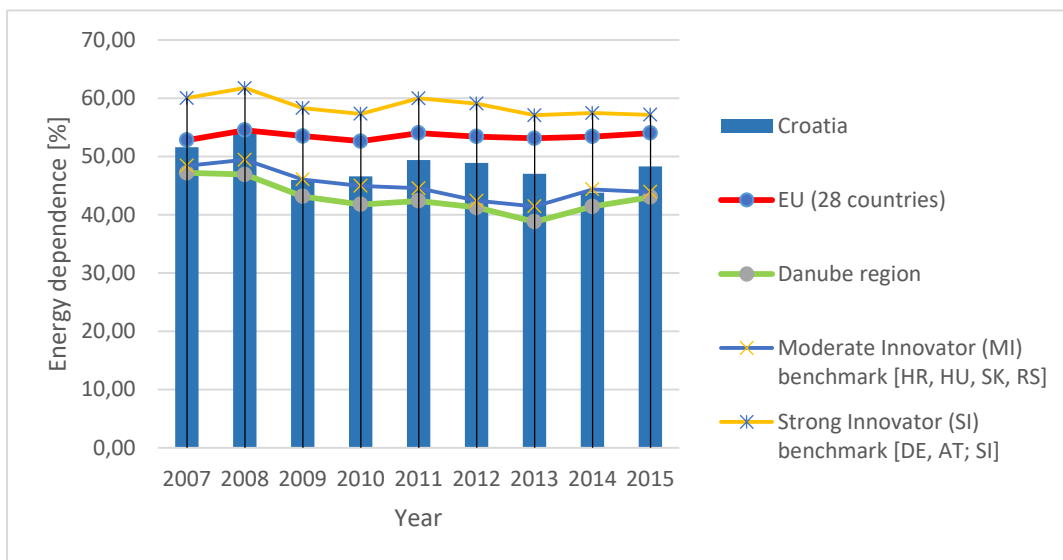


Figure 20: Energy dependence of Croatia compared to EU-28 and the Danube region (Source: Eurostat)

OPPORTUNITY: To respond appropriately to the challenges ahead, the Republic of Croatia should mitigate its imported energy dependence by building such an energy structure that will guarantee the security of supply. This can be achieved through the exploitation of its resources and potential, the efficient use of energy, the variety of energy forms used and technologies, the diversity of supply routes and energy

⁹ https://www.flandersinvestmentandtrade.com/export/sites/trade/files/market_studies/2016-Croatia-Renewable-Energy_0.pdf

sources and the use of renewable energy sources. The implementation of major energy projects which are announced (such as 210-megawatt coal-fired Plomin 2 power plant) will have the significant impact on strengthening the country's energy independence.

OBSTACLE: Consumption of the oil and the gas will increase in the future, while domestic production of oil and natural gas will drop due to depletion of reserves.

Indicator: Energy intensity of the economy

Energy intensity of the economy of Croatia is relatively high, positioning Croatia somewhere in between EU average and Danube region, proven to have high energy intensity.

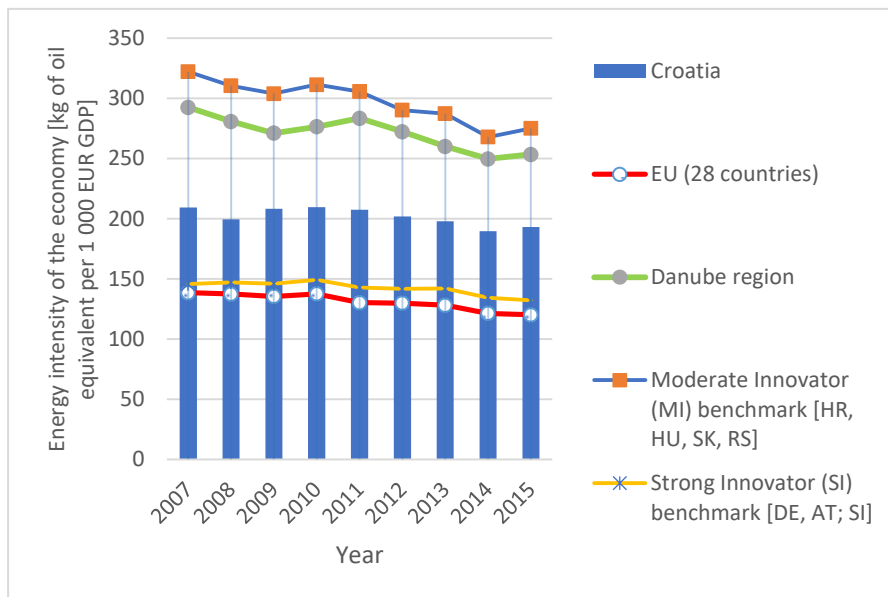


Figure 21: Energy intensity of the Croatian economy (Source: Eurostat)

OBSTACLE: Croatia is using energy less efficient than most of the countries in EU due to the slow transition from outdated, intensive energy consuming technologies in processing industry to energy efficient ones. Also, the energy performance of buildings from the national building stock is rather modest, meaning that significantly more energy is being used for heating and cooling than it is the case with energy efficient buildings.

Indicator: Share of renewable energy in gross final energy consumption

The share of renewables in gross final energy consumption stood at 29% in Croatia comparing to 16,7% in EU 28, and 22,8% in Danube region. The substantial renewable energy growth is fueled by increasing energy demand and fossil fuel price as well as energy supply insecurity. Furthermore, improved policies and incentive programs, as well as improved renewable energy components and systems, have also contributed the renewable energy growth in Croatia.

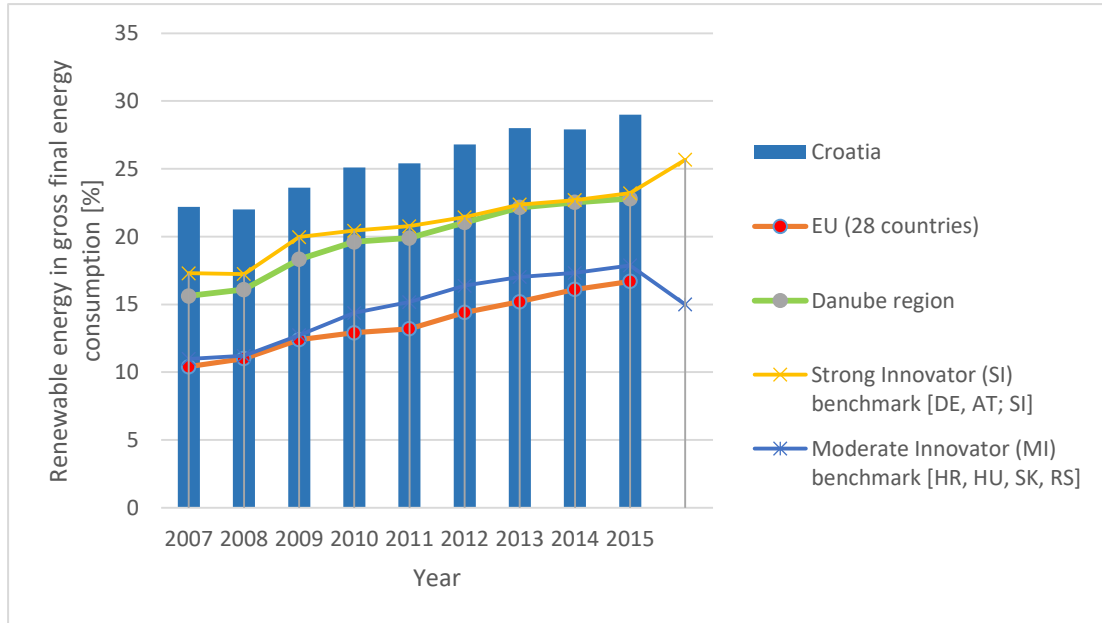
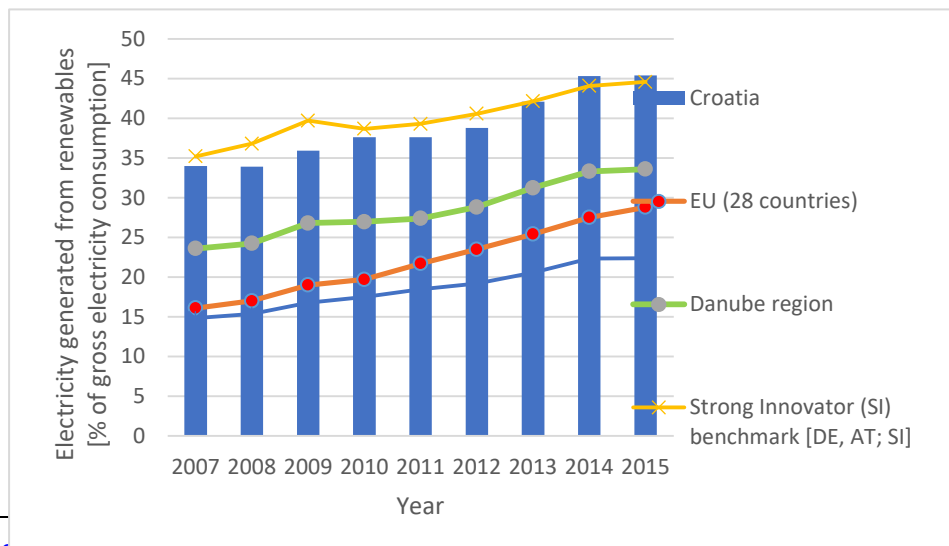


Figure 22: Share of RES in final energy consumption in Croatia (Source: Eurostat)

OPPORTUNITY: Croatia’s Energy Market Operator (HROTE) will implement new quotas and tariffs for eligible clean energy producers to keep the positive trends in generating energy from RES. Also, following the new projects of wind power plants are installed along the coastal region of the Adriatic Sea, because of favourable wind conditions, Croatia may count with even higher share of renewable energy in gross final energy consumption.

Indicator: Electricity generated from renewable sources

The growth in electricity generated from renewable energy sources during the period 2011 to 2015 largely reflects an expansion in three renewable energy sources in Croatia as well as in EU, principally wind power, but also solar power and solid biofuels. Hydropower remained the single largest source for renewable electricity generation in the EU-28 in 2015 (38.4 % of the total), the amount of electricity generated in this way was relatively similar to the level recorded a decade earlier, as production rose by 6.5 % overall.¹⁰



¹⁰ http://ec.europa.eu/economy_finance/electricity_statistics_en.htm#renewable_energy_systems

Figure 23: Share of electricity generated from RES in Croatia (Source: Eurostat)

OPPORTUNITY: Croatia is progressing wind power projects, but with sufficient political will could do much better. The country still has significant potential for wind, solar thermal and electricity, biomass and biogas. Apart from the state as a regulator which has various instruments at its disposal to implement thoroughly the renewable energy use, local authorities should assume central role and responsibility for solarizing their territories and generating the energy locally from other renewable energy sources available on their territory. Municipal utility companies would thus add electricity production to their regular activities and could provide installation and maintenance services for individual energy generating systems within the territory of their competence.

OBSTACLE: To keep up with the running expenditures within the feed-in tariff system, the incentive fee for renewable electricity generation quintupled in 2013. The latest increase of the incentive fee came in November 2017, rising from 0,0047 EUR/kWh to 0,015EUR/kWh. At present, electricity end consumers support renewable electricity generation with 5% of the paid value of electricity which is a great burden for the boost of the use of renewables. Apart from the state as a regulator which has various instruments at its disposal to implement thoroughly the renewable energy use, local authorities should assume central role and responsibility for solarizing their territories and generating the energy locally from other renewable energy sources available on their territory. Municipal utility companies would thus add electricity production to their regular activities and could provide installation and maintenance services for individual energy generating systems within the territory of their competence.

Indicator: Combined heat and power generation

Croatia's share of combined heat and power generation in electricity generation significantly dropped in 2014 and to 2015. From 12,63% in 2013., the share fell to only 6,34% in 2014 and remained almost at the same level in 2015, while in the same time, Danube region recorded strong growth for 2015.

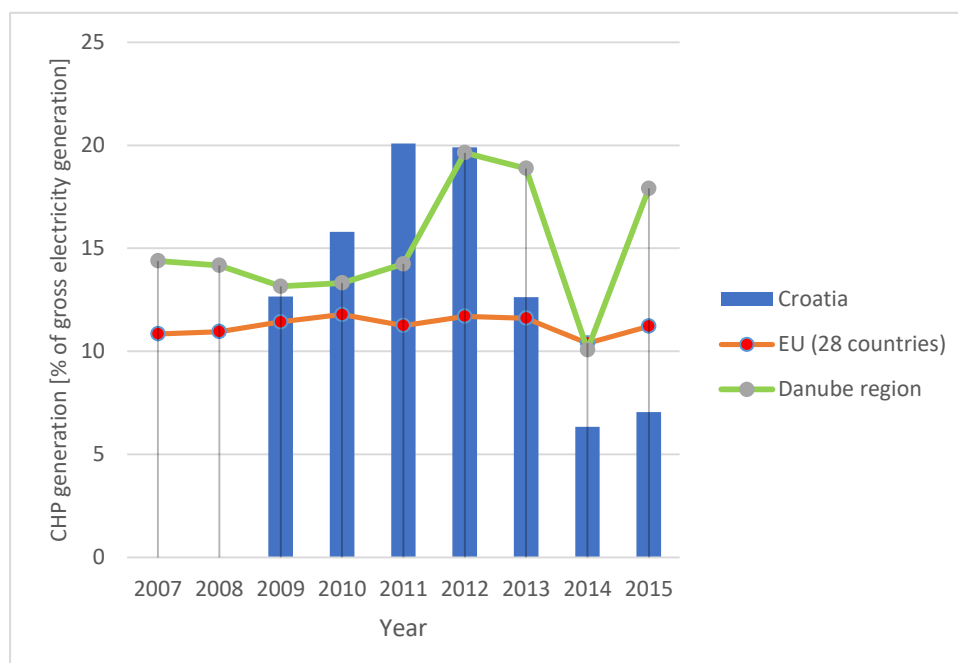


Figure 24: Figure: Share of CHP in gross electricity generation (%)(Source: Eurostat)

OPPORTUNITY: As the standard of living is increasing and simultaneously climate changes are causing an increment of average daily temperature, cooling energy generation potential of CHP and CCHP systems should not be neglected. These systems have to be installed wherever there are heating, cooling and electric needs. According to the Strategy of Energy Development in the Republic of Croatia, 100 MW micro and mini cogeneration CCHP systems and at least 300 MW cogeneration CHP systems are expected to be installed by the year 2020. One of the important targets is to employ domestic industry in development and manufacturing of cogeneration and trigeneration units.

OBSTACLE: Generally, the problem existing in the Republic of Croatia is a lack of investments in the energy and industry sectors, decreased production capacities in the existing industry companies and undefined regulation and legislation without feeding tariffs refining in heating energy generation. The problem also exists as to insufficient knowledge in the field of technology and its advantages on energy independence, security of energy supply, delayed investments in the public energy sector and reduction of power losses in distribution and transmission of the electric power subsystem.

Indicator: Greenhouse gas emissions intensity of energy consumption

Croatia decreased its emissions by 14% between 2007 and 2015. In the field of GHG emissions, all countries have rather uniformed performance when talking about emissions decrease.

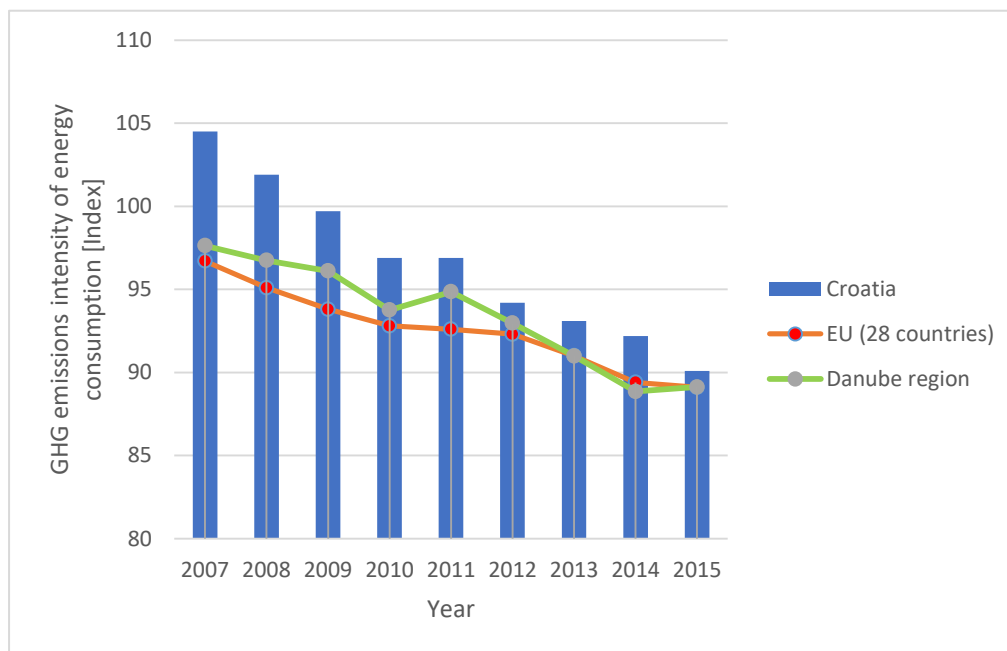


Figure 25: Share of greenhouse gas emissions intensity of energy consumption (index) (Source: Eurostat)

OPPORTUNITY: Power generation sector should play a key role in the transition to the low carbon economy in the European Union as well as in Croatia. The key driver of reduction of GHG emissions should be a new development strategy. The new development strategy should realistically evaluate and factor in environmental protection and mitigation of climate change, and create conditions for technological and industrial development, improved energy efficiency in all economic activities, upgrading of the public and personal standard of living, use of renewable energy sources which reduce negative effects on the environment and provide incentives for more intensive development of agriculture and tourism. The new development strategy should ensure conditions for economic growth and enhancement of public and personal standard of citizens by protecting the environment and climate.

Indicator: Total primary production of energy

In 2015, the primary energy production decreased by 6.7 percent compared to the previous year. The decrease is realized in the use of hydro power for 30.7 percent, while the production of all other primary energy commodities increased. The increase for the other renewable sources (such as the wind energy, solar energy, biogas, liquid biofuels and geothermal energy), amounted to 3.4 percent. Also, the production of the fool wood and other types of biomass increased by 10.7 percent Production of crude oil is increased by 12.7 percent and of the natural gas by 1.8 percent. Also, the production of the heat from heat pumps increased by 20.3 percent. ¹¹

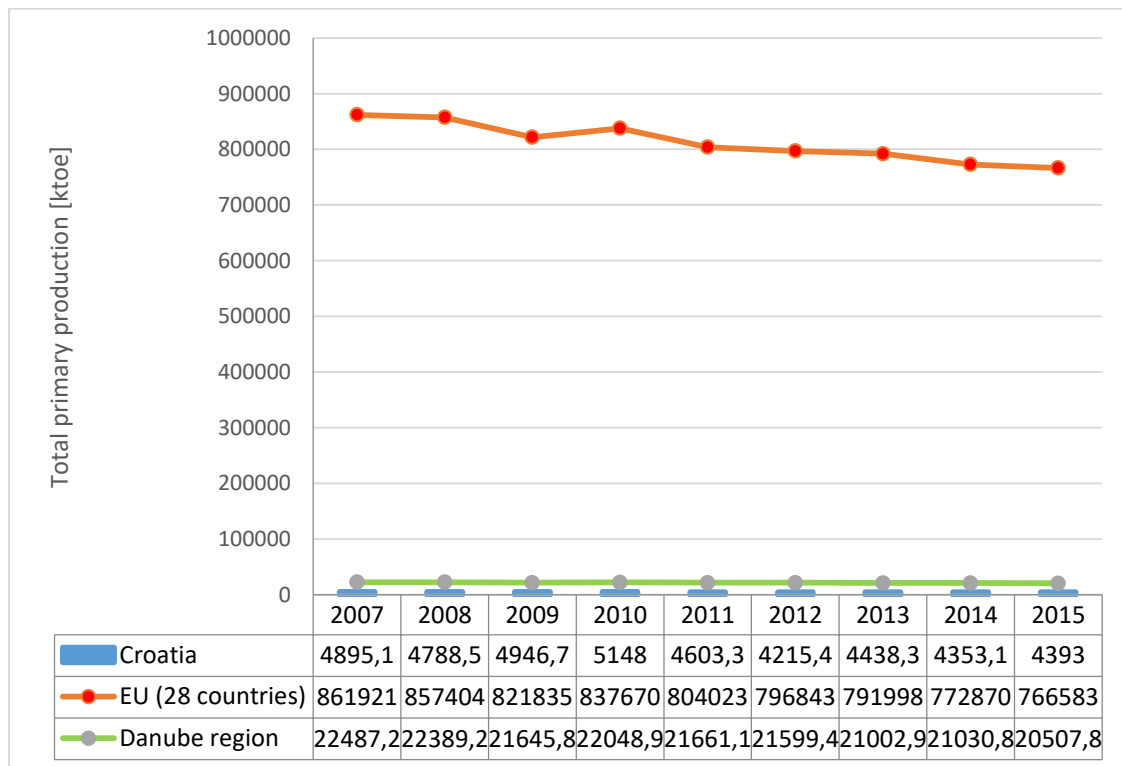


Figure 26: Share of primary production of energy by resource (TOTAL) - 1 000 tonnes of oil equivalent (Source: Eurostat)

¹¹ <http://www.eihp.hr/wp-content/uploads/2016/12/Energija2015.pdf>

4.2 Total primary production of renewable energy

In 2015, the primary energy production decreased by 6,7 % compared to the previous year. The decrease is realized in the use of hydro power for 30,7 %, while the production of all other primary energy commodities increased. The increase for the other renewable sources (such as the wind energy, solar energy, biogas, liquid biofuels and geothermal energy), amounted to 3,4 %. Also, the production of the fossil wood and other types of biomass increased by 10,7 %. Production of crude oil is increased by 12,7 % and of the natural gas by 1,8 %. Also, the production of the heat from heat pumps increased by 20,3 %.¹²

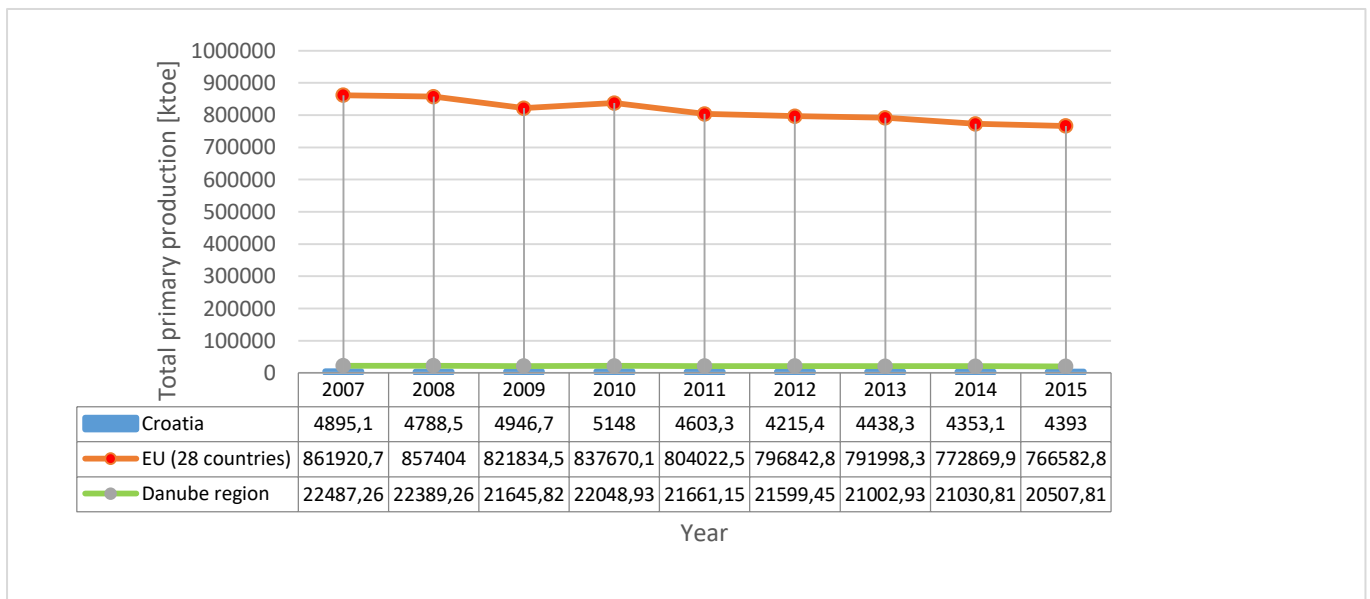


Figure 27: Primary production of energy by resource (TOTAL) 1 000 tonnes of oil equivalent (Source: Eurostat)

Energy intensity of transport compared to economic strength

This indicator compares the growth of the energy consumption of transport with that of GDP at constant prices. The energy consumed by all types of transport (road, rail, inland navigation and aviation) is covered, including commercial, individual and public transport, except maritime and pipeline transport. This indicator compares the growth of the energy consumption of transport with that of GDP at constant prices. Croatia is ranked as the country (along with Bulgaria) as a Country with the highest growth – Index 103,7 in 2015.

¹² <http://www.eihp.hr/wp-content/uploads/2016/12/Energija2015.pdf>

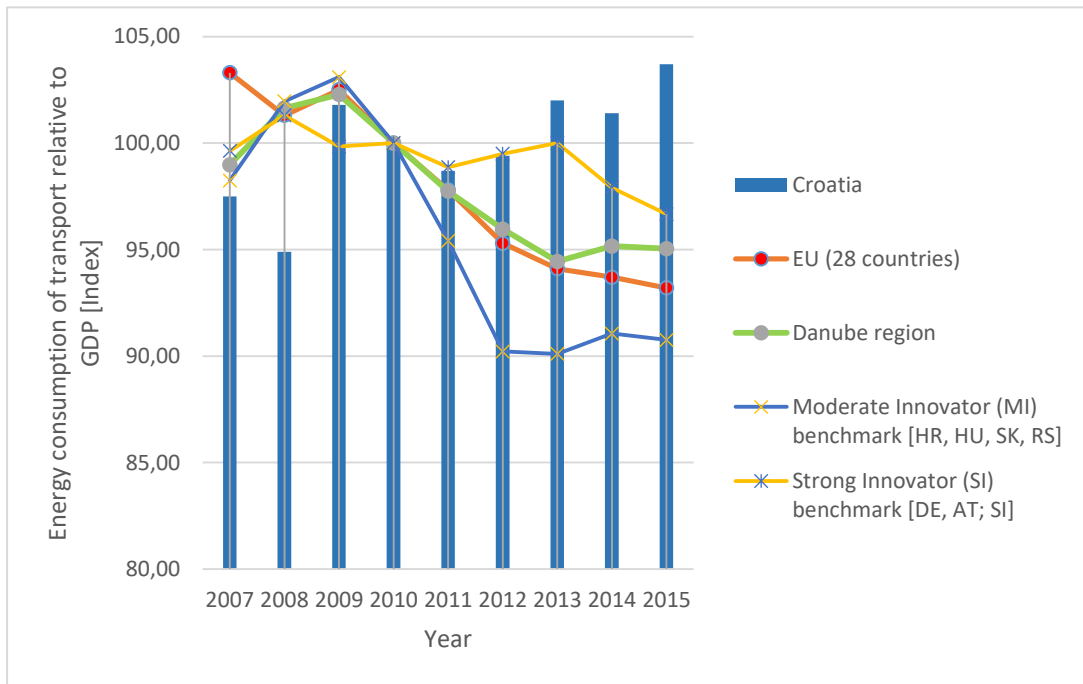


Figure 28: Share of Energy consumption of transport relative to GDP (Index) (Source: Eurostat)

Productivity of energy consumption

This indicator measures the ratio between gross domestic products (GDP) by the gross inland consumption of energy. Energy productivity in Croatia is in line with the results of the average of Danube region. Also, energy product growth for Croatia is modest throughout the years.

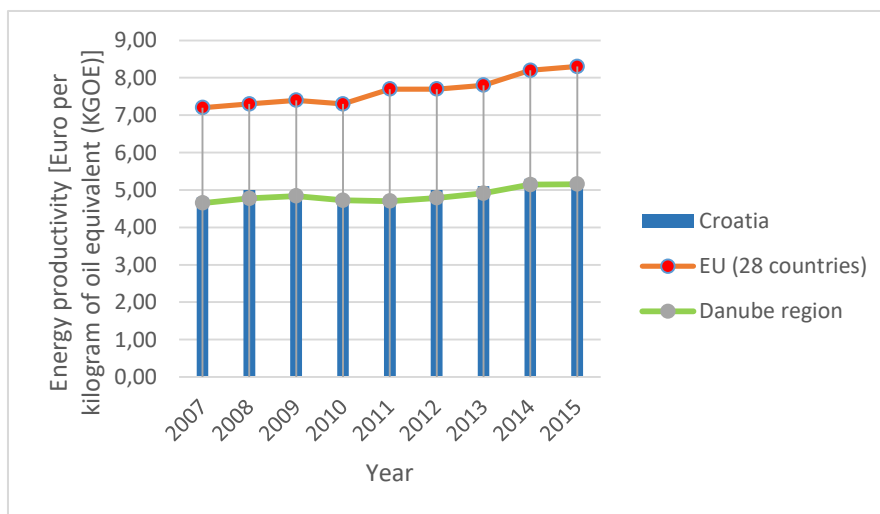


Figure 29: Share of Energy productivity (in EUR per kilogram of oil equivalent – kgoe) (Source: Eurostat)

Electricity prices in households

This statistic shows the electricity prices for household end users. In 2016, the average electricity price for households in Croatia was 13,11 euro cents per kWh which places Croatia below the average of Danube region. In 2013, the Republic of Croatia finally opened up its retail electricity market, although the energy entities in the HEP Group accounted for about 80 % of the total trading volume. Competition in the retail market for households is emerging.

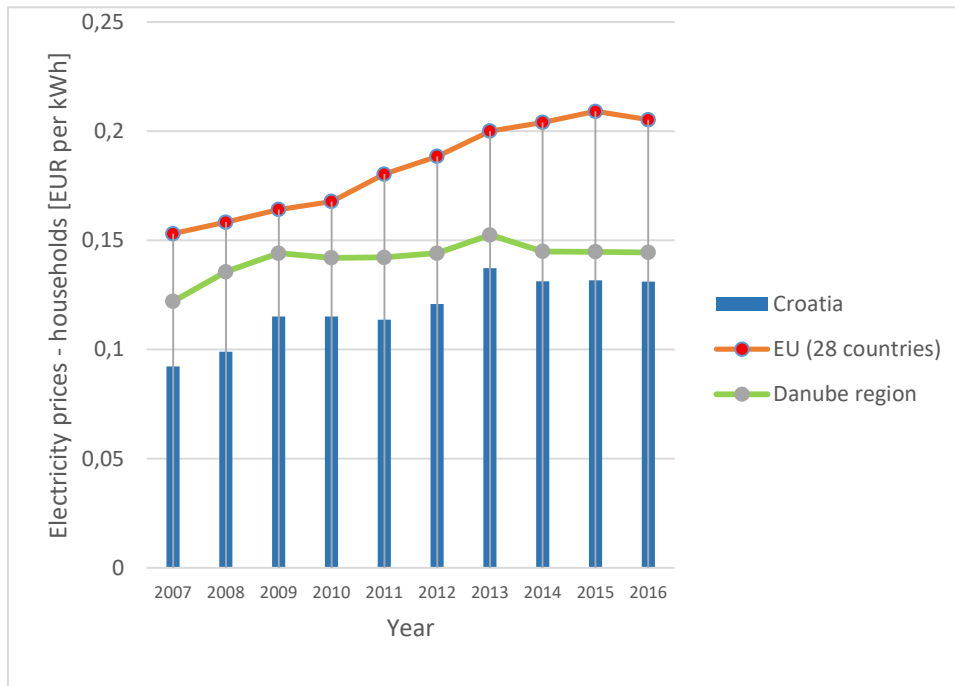


Figure 30: Share of Electricity prices in households (EUR per kWh) (Source: Eurostat)

Electricity prices in industry

This statistic shows the electricity prices for industry users. In 2016, the average electricity price for households in Croatia was 0,09 EUR per kWh.

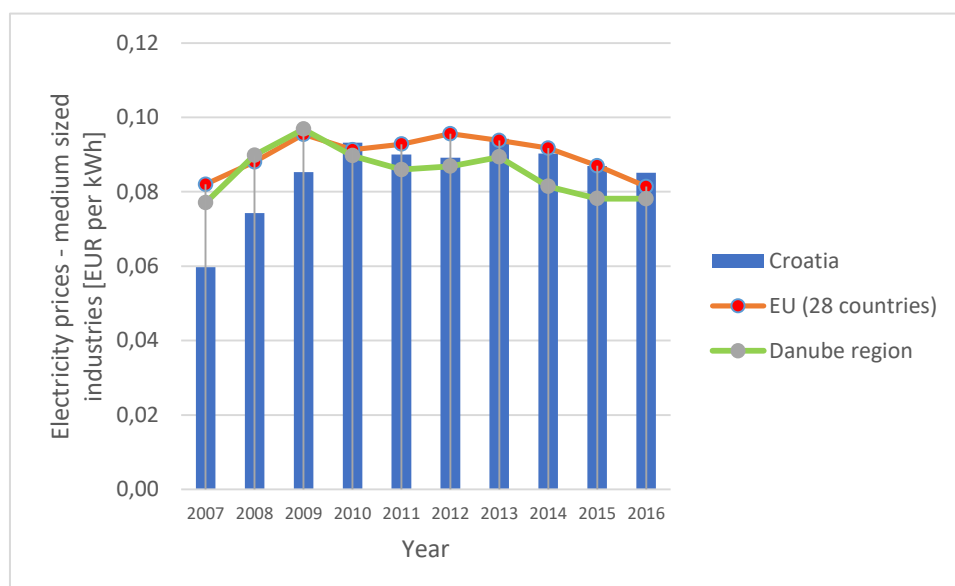


Figure 31: Share of Electricity prices in industry (EUR per kWh) (Source: Eurostat)

National energy policy

Legal framework for energy sector in Croatia

The power industry is of special (national) importance in Croatia. The general guidelines of Croatia's government policy regarding the electricity sector are set out in the Strategy of Energy Development (Official Gazette No. 130/09) (the Strategy). At the time the Strategy was adopted, Croatia's main aim was to adjust and prepare the energy sector in general, which includes the electricity sector, for accession into the EU and participation in the single EU market, but at the same time to preserve Croatia's national interest. The strategy is to achieve a balance between the liberalisation of the electricity market and necessary government intervention, to enhance energy efficiency and to use more alternative energy sources and technologies that protect the environment. Croatia's further aim is to achieve security of supply (especially in the import of electricity), competitiveness in the international market and sustainable energy development.

In the meantime, the global crisis affected the energy sector, which resulted in a volatile market and prices and lack of planned investments. Consequently, although the main principles remain, the Strategy is not entirely in line with the current market and some of its goals will be hard to attain. As a result, the government has adopted several national action plans modifying aims set by the Strategy, implementing specific measures for the realisation of EU and national energy targets.

Furthermore, on 1 July 2013 Croatia became a member of the European Union and joined the EU energy market. One of Croatia's obligations as part of its accession process was the incorporation of the EU Third Energy Package. Thus, in 2012 and 2013, new legislation was adopted governing the electricity sector, later amended in line with EU legislation: the Energy Act (Official Gazette No. 120/12, 14/14, 95/15, 102/15), the Energy Activities Regulations Act (Official Gazette No. 120/12) and the Electricity Market Act (Official Gazette No. 22/13, 102/15). These acts incorporate respective EU directives, in particular Directive 2009/72/EC, 2009/28/EC and 2005/89/EC and a number of EU regulations. Since 2006, Croatia has been a party to the Energy Community Treaty (Official Gazette International Treaty No. 6/06). According to the Croatian Constitution, international agreements take priority over domestic laws and form an integral part of Croatian legislation.

Croatian law regulates six electricity activities:

- generation,
- transmission,
- distribution,
- supply,
- retail and
- electricity market organisation.

Traditionally, all activities were performed exclusively by the Croatian national electricity utility, HEP Grupa (HEP Group). However, through the process of liberalisation and opening of the electricity sector to market competition, certain electricity activities became market activities, while others remained as HEP's exclusive activity. Thus, generation, retail and supply of electricity (except when performed as a public service) are performed as market activities (the price and quantity of delivered power are freely

negotiated). On the other hand, the transmission and distribution of electricity, electricity market organisation and supply (when performed as a public service) are regulated activities and are performed as public service obligations.

HEP Group consists of Hrvatska elektroprivreda dd (HEP dd) as the parent company and several subsidiaries, each of which performs regulated and market activities.

HEP dd has undergone an unbundling process to meet the requirements of the Electricity Market Act. It opted for the independent transmission operator model, meaning that the transmission system operator (renamed HOPS d.o.o.) remained part of the vertically integrated undertaking HEP Group; however, it had to secure physical, technical and financial independence from HEP dd. HEP-Operator distribucijskog sustava d.o.o. (HEP-DSO) is the Croatian distribution system operator. It is also part of the HEP Group but independent from other HEP Group undertakings and activities.

In August 2017 there were 46 registered electricity generation undertakings, 19 suppliers and 28 retail undertakings. Although the number of registered electricity undertakings has been growing continuously since Croatia joined EU, HEP Group still holds a dominant position in the Croatian electricity market. HEP's position on the market has changed rapidly in the past couple of years because new competitors have been entering the market, especially the supply market, where these new competitors, such as German RWE and Slovenian GEN-I, offer lower prices. Since HEP started losing its customers, it has been forced to lower its prices.

The use of **alternative energy sources** (water, wind, sun, geothermal sources, combined heat and power (CHP), etc.) is one of Croatia's strategic plans as outlined in the Strategy. According to the Strategy, Croatia has great natural and technical potential. Following EU requirements, in late 2013 Croatia adopted a National Action Plan for Renewable Energy Sources until 2020 (Action Plan), as the implementing instrument for the realisation of EU targets (20-20-20) and national energy strategy. To meet the targets, the government has shifted its focus from encouraging wind farm construction (the incentives have been quite high in recent years) to energy production from biomass, biogas, cogeneration plants and small hydropower plants. Croatia has already reached its 20 % target.

The Energy Act also expressly states that use of alternative energy sources and CHP is in Croatia's interest (article 13). According to the Electricity Market Act, any generator that uses renewable energy sources may be awarded 'eligible producer status', under conditions set by the law.

Effective from 1 January 2016, the new Act on Renewable Energy Sources (RES) and High Efficient Cogeneration (Official Gazette No. 100/15) (RES Act) harmonises for the first time national and EU legislation (in particular Directives 2009/28/EC and 2012/27/EU) in the field of renewable energy and aims to stimulate and enhance production of 'green' energy. RES Act introduces market premium as the new incentive model, which replaces the present feed-in tariff model. Feed-in tariffs have been kept as incentive model for smaller plants only, up to 30 kW.¹³

EU Energy Efficiency Directive - EED

In Croatia, the EED has been transposed by the Law on Energy Efficiency (NN 127/14), which is in force since 11 May 2014. Under Croatian law, large companies and companies of the energy sector are addressees of the transposition act.

¹³ <https://gettingthedealthrough.com/area/12/jurisdiction/80/electricity-regulation-croatia/>

The energy audit obligation applies to large companies, which are defined as businesses whose total assets are at least HRK 130m (approx. EUR 17m), with an income of at least HRK 260m (approx. EUR 34m) and/or an average of at least 250 employees during the business year (at least two of the above-mentioned criteria have to be fulfilled). Energy audit obligation of large companies also includes energy audit of affiliated and dependant companies. The requirements for carrying out energy audits will be defined in the respective forthcoming decree. Exemptions hereof apply to businesses with energy or environmental management system that contains the obligation of regular energy audits being certified by an accredited independent body following the relevant EU standards.

Energy suppliers are obliged to annually provide information on billing and consumption to their final consumers. Additionally, they have to submit information on the energy consumption of the public sector to the national energy management information system.

Energy distributors are obliged to provide annual information to their final consumers and report the amount of their energy consumption to the competent ministry. Additionally, energy distributors will have to achieve certain annual energy saving objectives by the national energy saving program. If they fail to achieve these objectives, they will have to contribute to the Environment Protection and Energy Efficiency Fund equivalent to the amount that is needed for achieving the objectives. National energy-saving programs and bylaws regulating further obligations have yet to be enacted.

Energy companies, i.e. **energy distributors, distribution system operators and energy suppliers**, are obliged to provide their customers with information on energy agencies or similar institutions which will provide further details of energy efficiency improvement measures, comparative end-user profiles and/or objective technical specifications for energy-using equipment.

Disregard of these legal obligations may entail a fine of up to 500.000 HRK (approx. EUR 65.000).¹⁴

Energy Performance of Buildings Directive - EPBD

Official implementation of the EPBD within Croatian regulations started in 2008 under the MCPP, and involved improving the technical regulation and amending the Physical Planning and Building Act. As a result of the latter, certain parts of the transposition became the responsibility of the Ministry of Economy (Act of Energy End-use Efficiency), in particular, energy certification, regular inspection of heating and air-conditioning (AC) systems in buildings, and the establishment of an independent control system.

Following the calculations for defining reference buildings and setting requirements for new buildings as well as for the reconstruction of existing buildings within a cost-optimal framework, the implementation of the new technical regulation 2015 has become the standard to follow in practice. Several computer programmes have been developed to facilitate the calculations based on European standards. Some are commercial programmes, but the government envisages the development of a programme that would be available to all users free of charge. The national methodology for the energy performance of buildings (algorithms) that was adopted for this purpose is periodically corrected, in line with the experience acquired in implementing cost-optimal analyses.

As the building sector in Croatia accounts for 43 % of final energy consumption, special attention must be paid to the more intense implementation of national programmes of building renovation. Therefore, a continuation of promotional activities is planned. The establishment of an internet platform for

¹⁴ <http://mobile.deloitte-tax-news.de/unternehmensrecht/files/eu-energy-efficiency-30112015.pdf>

information on available energy efficiency mechanisms and financial and legal frameworks and instruments is envisaged to better spread information to all relevant market participants. The establishment and administration of a system for monitoring, measurement and verification of energy savings are planned to appropriately monitor the implementation of measures for energy efficiency improvement.¹⁵

Renewable Energy Directive

The European Union's goal by 2020 is to use 20 % of energy from renewable sources. The renewable energy sources are wind, solar energy, hydro and tidal power, geothermal energy and biomass. A higher share of renewable energy sources in final consumption enables reducing the production of greenhouse gases, as well as a decrease in the dependence on imported electricity. The development of RES industry stimulates technological innovation and job creation in Europe. The use of energy from renewable sources is encouraged in the buildings sector on the EU level both in new and reconstructed buildings.

Regarding Croatian plans for 2020, and by the Renewable Energy Directive (2009/28/EC), the Republic of Croatia has committed to reaching a share of 20 % of energy from renewable sources in its gross final energy consumption, and this has been incorporated into the Energy Strategy of the Republic of Croatia.

The Republic of Croatia has fulfilled all obligations under the above-mentioned Directive and surpassed target for 2020.

Building refurbishment Strategy

Long-Term Strategy for Mobilising Investment in the Renovation of the National Building Stock of the Republic of Croatia, from April 2014 is part of an ambitious project of building renovation, which also includes a Plan for increasing of the number of nZEBs (in particular nearly zero family houses).

National action plan for renewable energy sources to 2020

The overall national target for the share of energy from RES in the gross final consumption of energy is 20% in 2020. The target use of RES for 2020 was adopted by the Republic of Croatia by the calculation under to Directive 2009/28/EC and the document for the Energy-Climate Pact.

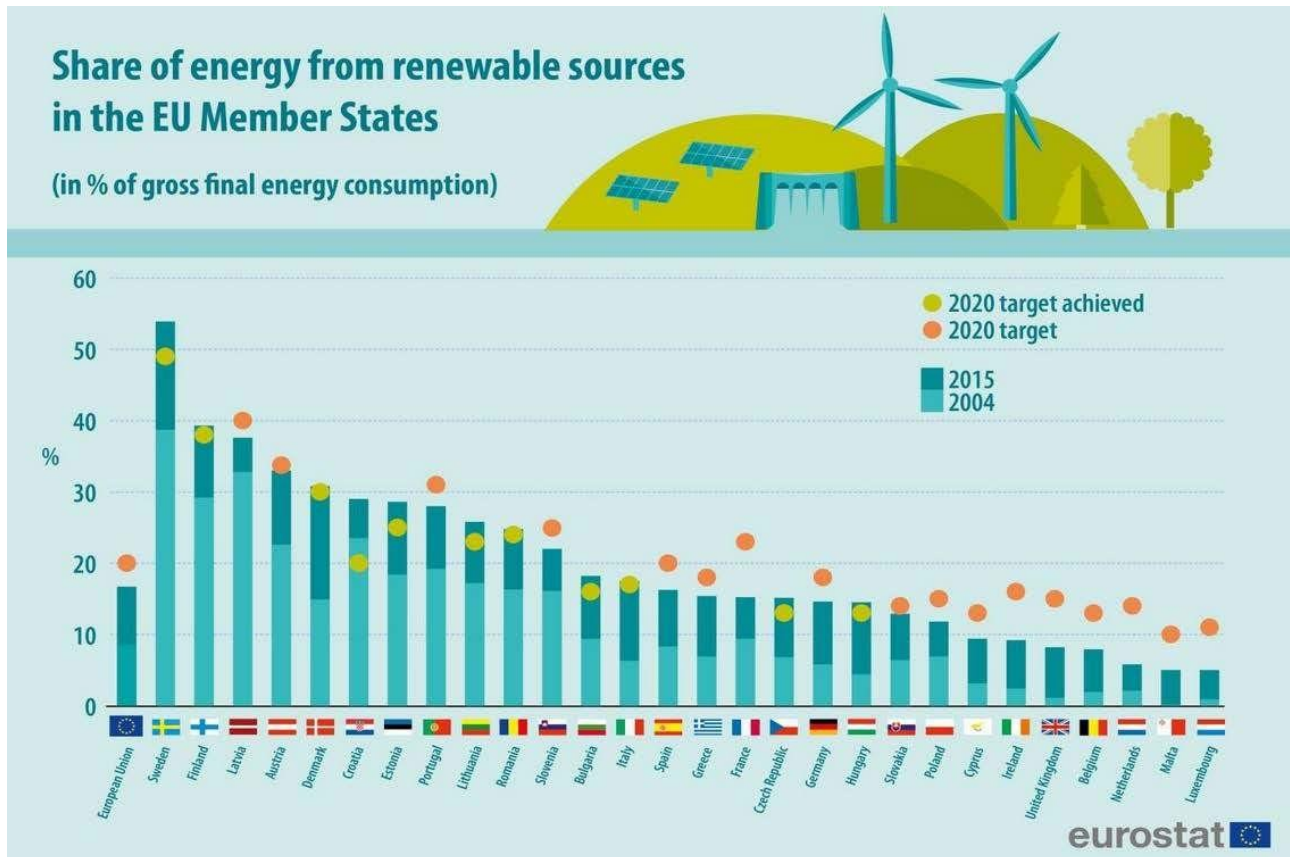
The calculation of the target is comprised of two parts: 5,5 % is added to the share of RES in 2005, while the remainder is based on the remaining total potential of renewable energy according to per capita energy consumption weighted by the GDP/population index, and tied to the European Union average. These two elements are added to obtain the total share of RES in the total direct energy consumption in 2020. For the Republic of Croatia, this means: $12,8 + 5,5 + 1,8 = 20 \%$.

The European Union supplemented Directive 2013/18/EC with Directive 2009/28/EC on the promotion of the use of energy from renewable sources, for the purpose of defining the targets for the Republic of

¹⁵ <https://www.epbd-ca.eu/outcomes/2011-2015/CA3-2016-National-CROATIA-web.pdf>

Croatia. The adopted share of RES in the gross final energy consumption for 2005 was 12,6 % and is 20 % for 2020.¹⁶

Croatia already exceeded national target set is one of the most successful countries in EU measured by share of renewable energy used.



Source: World Economic Forum¹⁷

Sustainable energy action plan – SEAP

The EU Member States are obliged to reduce greenhouse gas emissions by 20 % by 2020. Aware of the fact that these objectives can be met only by the active involvement of local communities, European Commission has launched an ambitious initiative Covenant of Mayors which in June 2010 included 1779 cities. One of the commitments by joining the initiative is the development of Sustainable energy action plan - SEAP (Action Plan) for the cities. In Croatia, Covenant of Mayors initiative joined more than 70 cities (by April 1st, 2016)¹⁸ and municipalities, and the Action Plan is developed for the majority of them. In Action Plan Croatian cities for the first time analyse their energy consumption and greenhouse gas emissions in their territory.

¹⁶ National action plan for renewable energy sources to 2020, Ministry of Economy of Republic of Croatia

¹⁷ <https://www.weforum.org/agenda/2017/04/who-s-the-best-in-europe-when-it-comes-to-renewable-energy/>

¹⁸ <https://www.enu.hr/javni-sektor/sporazum-gradonacelnika/>

5. ENVIRONMENTAL PROTECTION

Environment protection indicators

Indicator Environmental protection expenditure of the public sector by type: Environmental protection expenditure

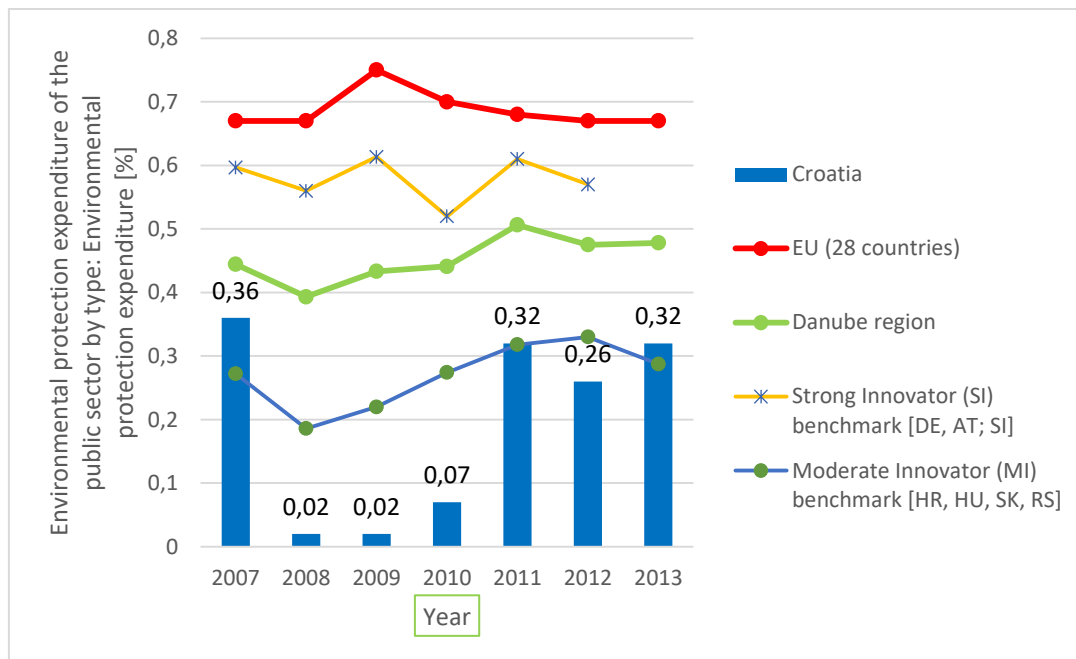


Figure 32: Environmental protection expenditure in Croatia with comparison with Danube region and EU (Source: Eurostat)

OPPORTUNITY: The figure shows the percentage of GDP expenditure for environment protection. In 2013, Croatia spent only 0,32 of GDP for environmental protection, what is below the expenditure of Danube region which average is 0,48. The average expenditure of EU countries is 0,67. Above indicator is the result of Croatia's efforts to harmonize legislation with EU acquis in the frame of the accession process to the EU led to a stronger legal framework for environmental protection and sustainable development.

In 2007, the Croatian Parliament adopted a new EPA to improve the quality and implementation of environmental impact assessments, introduce strategic environmental assessments, reinforce public participation in environmental matters, ensure access to environmental information, and strengthen integrated industrial pollution prevention and control. An increase of indicator Environmental protection expenditure was observed between 2010 and 2011 year when spending on environmental protection moved from 0,07 % to 0,32 % of GDP. In 2010, Croatia successfully concluded negotiations for Chapter 27-Environment, and established transnational agreements. From 2011 onwards, minimal annual changes occurred. The ratio is the same in 2011 and 2013, only in 2012 a minor drop is noticeable. The ratio is remaining almost unchanged, in another word, the development of Croatian expenditure on environmental protection is at the same level.

Indicator: Greenhouse gas emissions

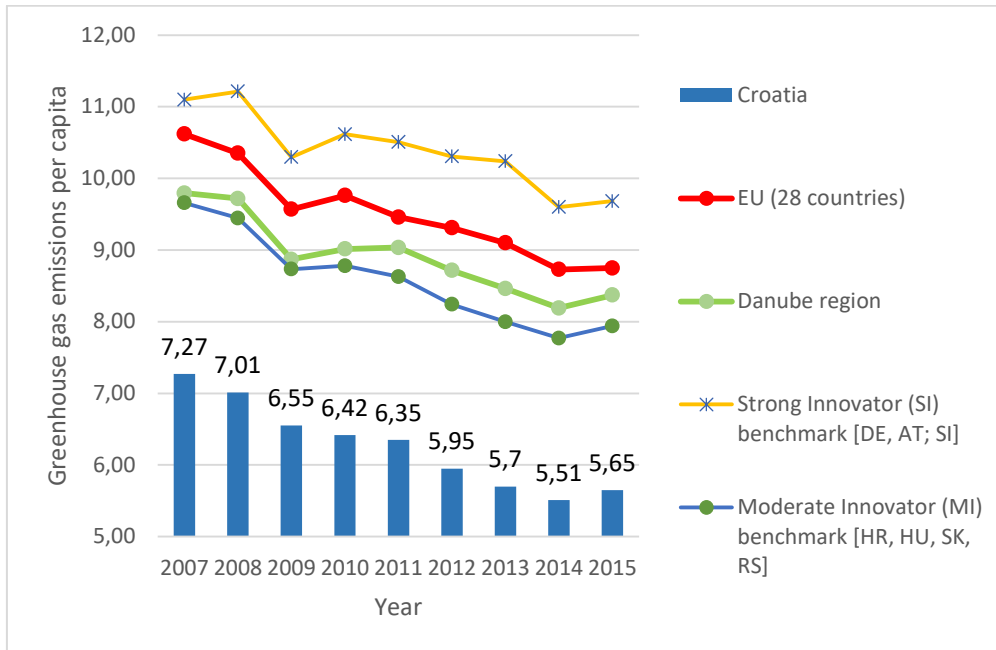


Figure 33: Greenhouse gas emissions per capita in Croatia in comparison with Danube region and EU (Source: Eurostat)

The figure shows Greenhouse gas emissions in tonnes of CO₂ equivalent per capita for Croatia in comparison with Danube region and EU. The Republic of Croatia became a party to the United Nations Framework Convention on Climate Change (UNFCCC) on 17 January 1996 when the Croatian Parliament passed the law on its ratification (Official Gazette, International Treaties No. 2/96). Croatia is a country with low emissions of greenhouse gases per capita, but vulnerable to climate change. Croatia has committed to keeping greenhouse gas emissions to the 1990 level.

As the figure shows, the Greenhouse gas emissions in Croatia is decreasing over years. The primary reason for GHG decrease was an economic crisis, respectively, industrial production and consequently, a decrease in fuel consumption, as well as reduction in cement, lime and steel productions, which was contributed to the GHG emission decrease. In comparison with Danube region and EU average, the indicator is below. Decreasing is also result of implementing praxis increasing energy efficiency.

OPPORTUNITY: The priority objective of Croatia is the fulfillment of the obligations under the Kyoto Protocol in reducing greenhouse emissions compared to the year 1990. According to current trends and projections, it is very likely that Croatia will achieve this goal.

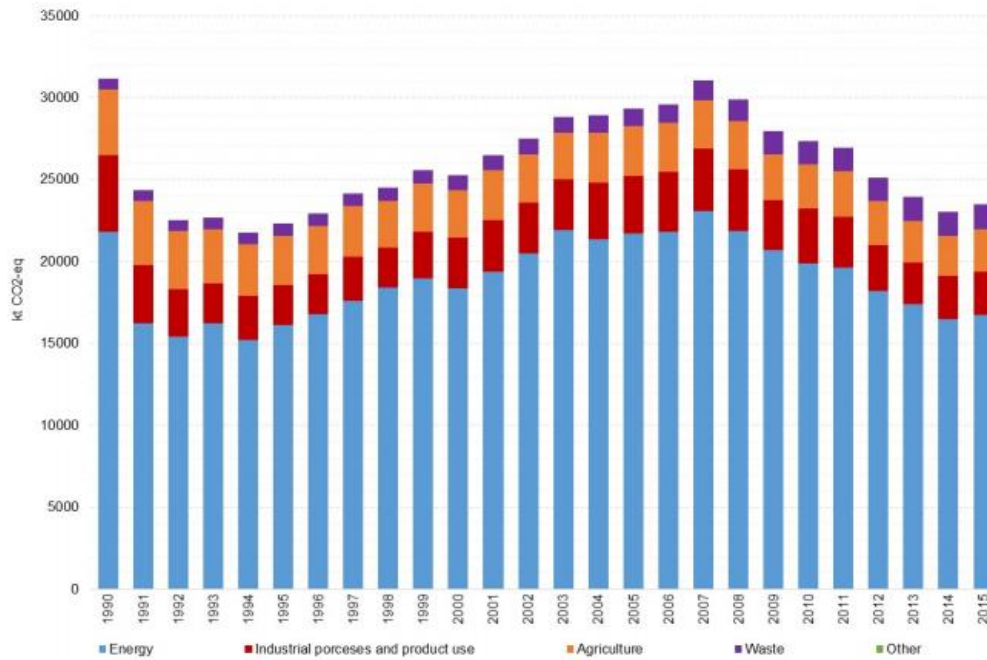


Figure 34: Trend of GHG emissions, by sectors, in Croatia¹⁹

Greenhouse gas emission (GHG) sources and sinks are divided into **five main sectors**: *Energy, Industrial Processes and Product Use, Agriculture, Land Use, Land-Use Change and Forestry (LULUCF) and Waste*. The methodology for emission calculation could be described as a product of the particular activity data (e.g., fuel consumption, cement production, number of animals, increase of wood stock, etc.) with corresponding emission factors.

The largest contribution to the GHG emission in 2015 excluding LULUCF has the Energy sector with 71,2 %, followed by Industrial Processes and product use with 11,3 %, Agriculture with 10,9 % and Waste with 6,6 %. This structure is with minor changes consistent with all the observed period from 1990 to 2015. In the year 2015, the total GHG emissions in Croatia was 23,502.1 kt CO₂-eq excluding LULUCF sector while the total emission was 18.510,4 kt CO₂-eq including the LULUCF sector which represents removals by sink from 21,2 % in that year.

Carbon dioxide – CO₂ is the most significant anthropogenic GHG. The most significant anthropogenic sources of CO₂ emissions in Croatia are the processes of fossil fuel combustion for electricity or/and heat production, transport and industrial processes (cement and ammonia production). The results of the CO₂ emission calculation in Croatia are presented in next table.

¹⁹ Source: Croatian agency for the environment and nature: Croatian greenhouse gas inventory for the period 1990-2015, 2017

Table: CO₂ emission/removal by sectors from 1990-2015 (CO₂ kt)²⁰

GHG source and sink categories	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015
Energy	20,758.8	15,263.4	17,485.2	20,811.7	18,987.5	18,764.8	17,363.4	16,610.0	15,725.6	15,924.6
Industrial processes	2,580.7	1,682.5	2,236.9	2,554.6	2,128.2	1,889.4	1,707.7	1,840.8	1,981.9	1,924.8
Agriculture	50.0	46.3	60.9	85.5	88.0	105.2	101.2	74.6	69.5	69.3
LULUCF	-6,627.4	-9,155.2	-7,700.8	-7,879.6	-7,340.2	-6,357.2	-6,117.9	-6,600.5	-6,667.7	-5,092.1
Waste	0.54	0.54	6.15	0.16	0.05	0.05	0.08	0.04	0.04	0.05
Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total CO₂ emission	23,390.1	16,992.8	19,789.1	23,451.8	21,203.7	20,759.4	19,172.4	18,525.4	17,777.1	17,918.7
Net CO₂ emission	16,762.7	7,837.6	12,088.4	15,572.3	13,863.6	14,402.2	13,054.5	11,925.0	11,109.4	12,826.7

Indicator: Environmental protection expenditure of the public sector by type % of GDP

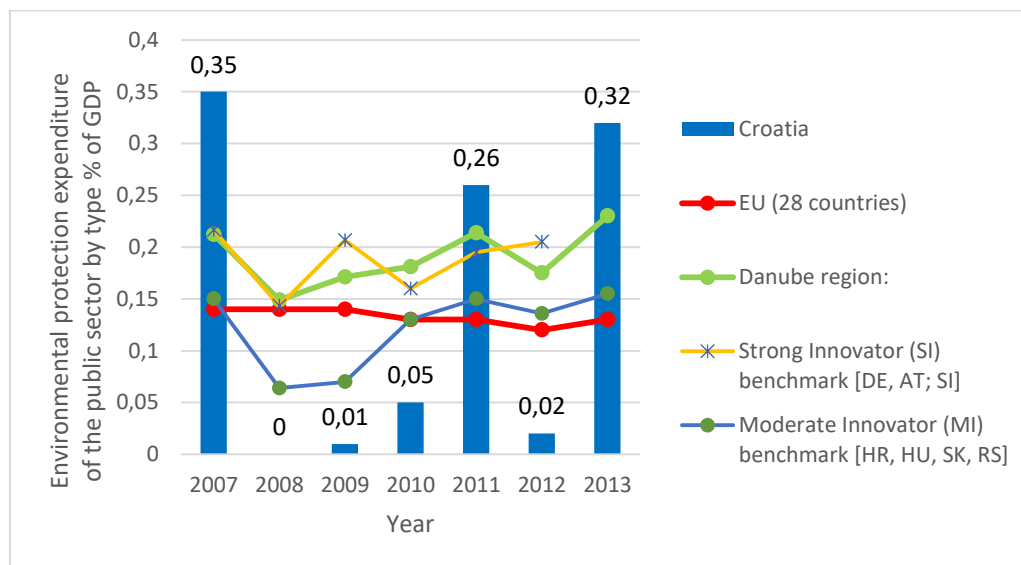


Figure 35: Environmental protection expenditure of the public sector by type % of GDP (Source: Eurostat)

OPPORTUNITY: EU environmental politics created a policy to increase financing in the environmental sector. The environment sector faces strong competition for public financial support, as a strong competition for public financial support, as Croatia has several priority issues to solve in other sectors as well. Government spending is limited by the amount of debt and spending constraints. Considering trends in environmental expenditures, a certain increase in public domestic spending on environmental protection can be observed, which is shown in the above figure.

Before the global financial crisis that started in 2008, Croatia's economy grew by between 4 – 6 % annually from 2000 to 2007. In 2008 the country experienced an abrupt economic slowdown that was recovered in 2015, although there was a brief respite in 2010. Croatia went back into recession in 2012. The crisis increased poverty from 10 % in 2008 to 14 % in 2012. Croatia's economy will face pressure in the medium term as a result of the continuing global financial crisis and the country's dependence on the economic cycles of the European Union (EU).

²⁰ Source: Croatian agency for the environment and nature: Croatian greenhouse gas inventory for the period 1990-2015, 2017

Presented state of economy follows the level of public spending on the environment in Croatia during the examined period. On the EU level and Danube region, expenditure on environmental protection is lower.

With the growth of the economy, Croatian economy will be able to invest more in environmental protection.

Resource efficiency

The major factors that drive material resource efficiency in Croatia are environmental concerns, political documents and economic interests. The Strategy of Sustainable Development of the Republic of Croatia holds the key position as the document that directs long-term economic and social development and environmental protection towards sustainable development of Croatia.

Indicator: Resource productivity and Domestic material consumption - tonnes per capita

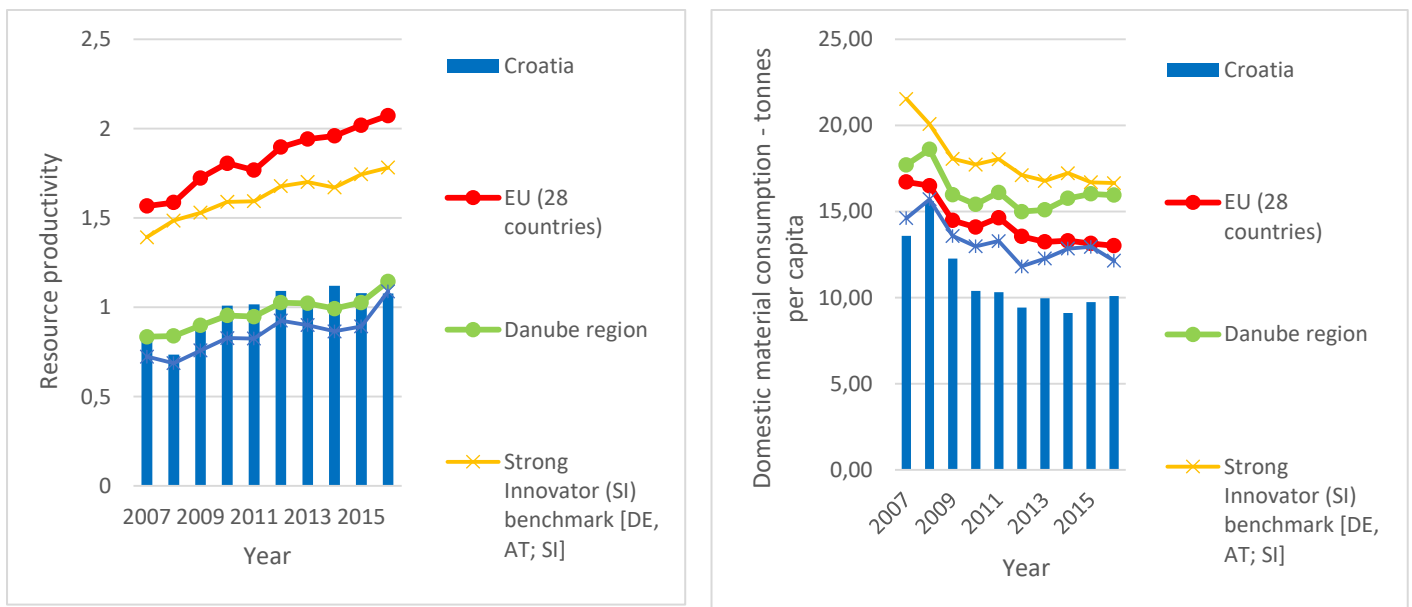


Figure 36: Resource productivity (left) and Domestic material consumption (Source: Eurostat)

OBSTACLE: The growth of the economy and industrial production in Croatia is connected with an increase in energy consumption. Observing Croatian economy, noticeable is high demand of environmental services, such as water supply and the disposal of waste water, the management of solid waste, maintaining a clean air environment, clean sea and preserving the natural habitat. Croatia has no specific national resource efficiency strategy or a specific plan for resource efficiency.

The Strategy for Sustainable Development emphasizes the concept of an efficient and sustainable management of the natural resource is presented in national environmental legislation. Main objectives for Croatia according to Strategy are:

- nature protection, which implies the conservation of biological and landscape diversity and protection of natural values;
- sustainable economic development that would have as little impact as possible on nature degradation and waste production;
- quality and stable energy supply with necessary reduction of negative impacts on the environment and society – this implies increasing the share of energy production from renewable energy sources and

- implementation of energy efficiency measures in all sectors;
- promotion of cleaner fuels and more sustainable transport technologies; and
 - sustainable management of the Adriatic sea, coast and islands and conservation of marine ecosystems.

The Strategy also encourages the sustainable production and consumption principles, promotes rational energy management, implementation of energy efficiency measures and increase in renewable energy consumption.

Regarding results on above figures, presented indicators and accomplished results are obstacles according to the fact that there is no policy that regulates the system. Furthermore, the indicators should consider as an opportunity because there is space for improvement.

Waste and Recycling

Croatia has a clear understanding of waste management requirements and has already made significant progress towards their implementation. The importance of waste management is politically and institutionally fully recognized and the Government has so far secured financing to cover new investments and operating costs. Waste management at national and local levels is ensured by waste management plans, which are an important tool for achieving the goals defined in the National Waste Management Strategy.

Croatia is committed to providing separate collections of waste paper, metal, plastic and glass, WEEE, waste batteries and accumulators, end-of-life vehicles, waste tires, waste oil, waste textiles and medical waste from January 2015. A local government should carry out the separate collection of hazardous waste, waste paper, metal, glass, plastics and textiles and coarse (bulky) waste as a way of providing:

- one or more functioning recycling yards or mobile units in its territory;
- setting an appropriate number and types of containers for the separate collection of hazardous waste, waste paper, metal, glass, plastics and textiles, not covered by the waste management system for a special category of waste; and
- informing households about the location and change of location of the recycling yard, mobile units and containers for the separate collection of hazardous waste, waste paper, metal, glass, plastics and textiles and transport services for bulky waste at the customer's request.

Waste management centers are crucial to the safe management of municipal solid waste. The implementation of the principle of generator responsibility is supported by packaging waste recovery and puts pressure on industrial waste generators to improve their waste management.

Indicator Recycling rates for packaging waste

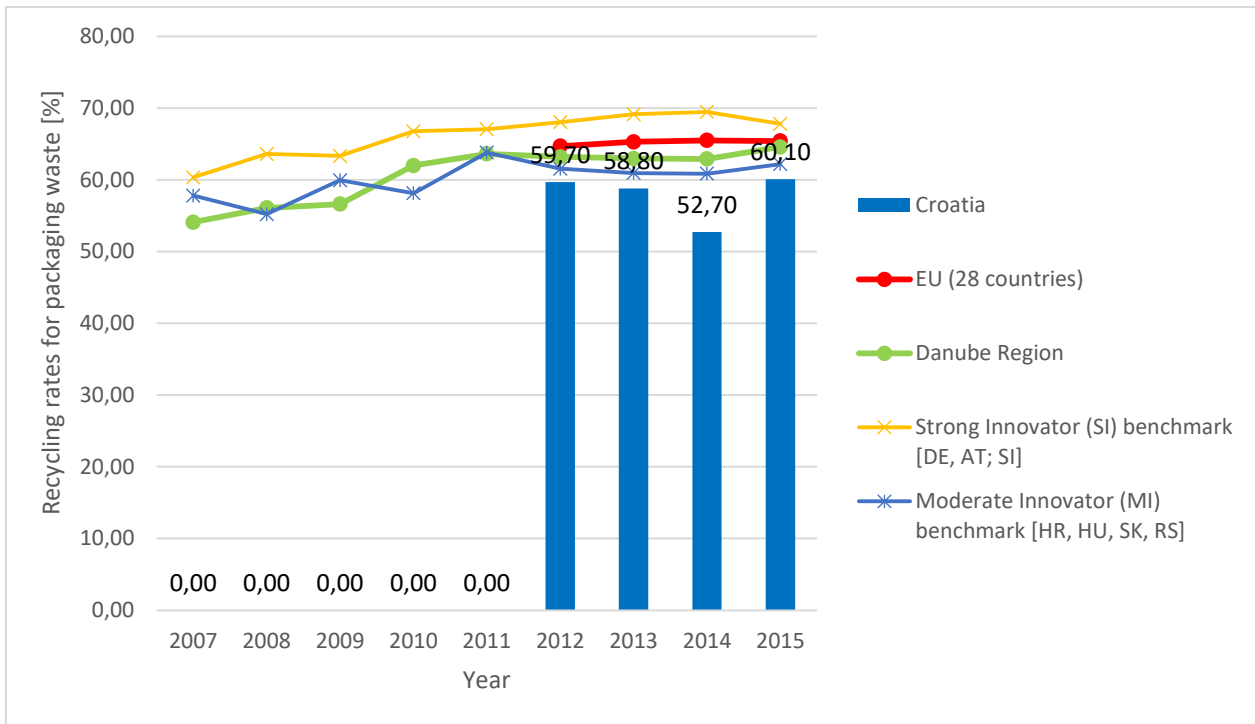


Figure 37: Recycling rates for packaging waste (Source: Eurostat)

OPPORTUNITY: Packaging waste represents a growing waste stream and Croatia finds important to implement measures aimed at achieving a reduction in volumes of packaging waste generated. Also, Croatia is trying to reduce final disposal of such waste by reuse, recycling and other forms of recovery. The quantity of packaging is increasing. Use of packaging is increasing noticeably for paper and cardboard, glass and especially the packaging made from plastic, while the quantities of packaging made of metal and wood are slightly decreasing. Metal packaging is mostly disposed at landfills, while quantities of wood packaging are negligible. Waste collection in containers and recycling yards is still most commonly used. For example, in 2014, 162,9 kg of packaging waste was generated per inhabitant in the EU-28. This quantity varied between 48,3 kg per inhabitant in Croatia and 220 kg per inhabitant in Germany.

The positive results in Croatia are already visible. Separate collection and recycling of certain waste types have increased rapidly. More positive effects are expected from the further development of the packaging waste management system.

OBSTACLE: An analysis of the current state shows how sufficient capacities for the treatment of packaging waste exist in Croatia. Changes in organisation and control of the management system are needed, as well as changes in the current technologies for the treatment of packaging waste in accordance with the new technological trends in packaging production and the demands of a market approach in waste management in the framework of circular economy.

Indicator Recycling rate of municipal waste

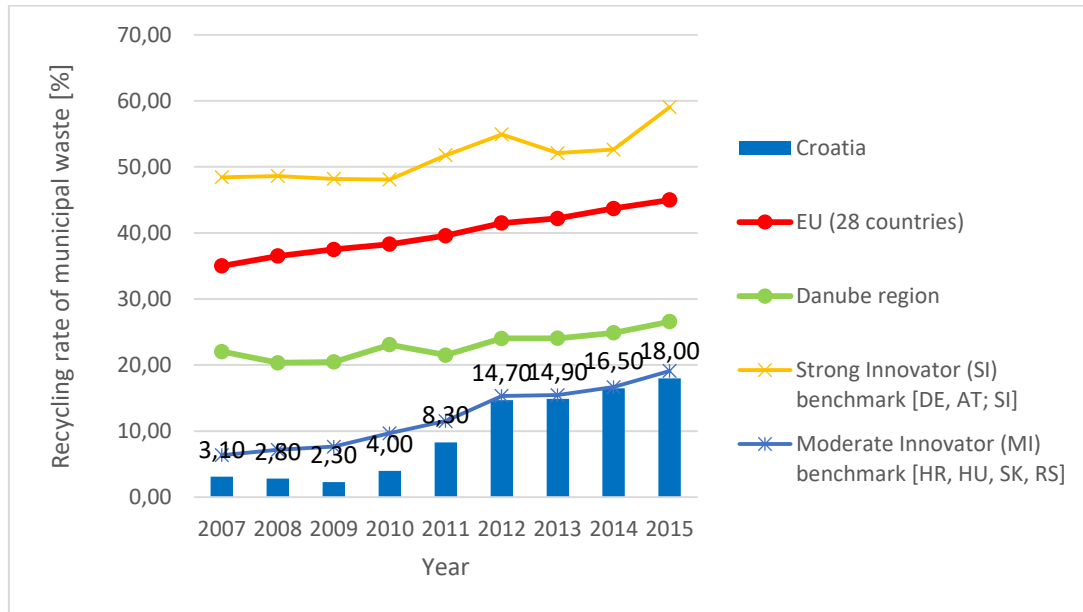


Figure 38: Recycling rate of municipal waste (Source: Eurostat)

OPPORTUNITY: Croatian citizens produced 1.679.765 tons of municipal waste last year. Mentioned means that per capita number annually is 392 kg, or over a kilogram a day. Compared to the number in 2015, last year's waste figure was 1,56 % higher – but Croatians are still below the EU average where a resident produces 477 kg of waste. The highest rates of separation of municipal waste were in Medjimurje County and Primorje-Gorski Kotar County.

On the above figure is shown the increase of recycling of municipal waste over the years. A slight increase of the quantities of municipal waste is expected by 2030. With the current 1,650,000 t/year, in 2030, 2,000,000 tonnes of municipal waste is predicted. But in order to stop the growth trend of produced municipal waste, increase the rate of separate collection and recycling, and decrease the portion of landfilled biodegradable waste, Croatia will establish a municipal waste management system, promoting waste prevention and waste separation.

OBSTACLE: The main challenge is to increase separate collection from municipal waste and to develop the infrastructure for recycling of municipal waste (e.g., waste management centers). Croatia has set goal "Separately collect 60% of the mass-produced municipal waste (primarily paper, glass, plastic, metal, bio-waste, etc.)". For Croatia, it is necessary to secure an infrastructure that promotes and facilitates the separate collection of individual types of municipal waste: waste paper, cardboard, glass, plastic, metal, bio-waste, bulky waste, etc.

In 2015, a total of 24 % of municipal waste was separately collected while the recycling rates for paper, metal, plastic and glass from municipal waste in 2015 were 25 %, i.e., half of the aimed amount for 2020. To meet the prescribed goal of 50 % recycling rates in 2020, it is necessary to, in as short deadlines as

possible, secure a higher rate of municipal waste separation and the highest quality of separately collected recycling waste. The planned increase in quantities of separately collected types of municipal waste (paper/cardboard, plastic, metal, bio-waste, bulky waste).

Another important goal is “Decrease total quantities of produced municipal waste by 5 % in comparison to the total produced quantities of municipal waste in 2015”. To achieve a goal, Croatia will implement following measures: waste prevention measures, establishing re-use centers and home composting.

Indicator Recycling rate of e-waste

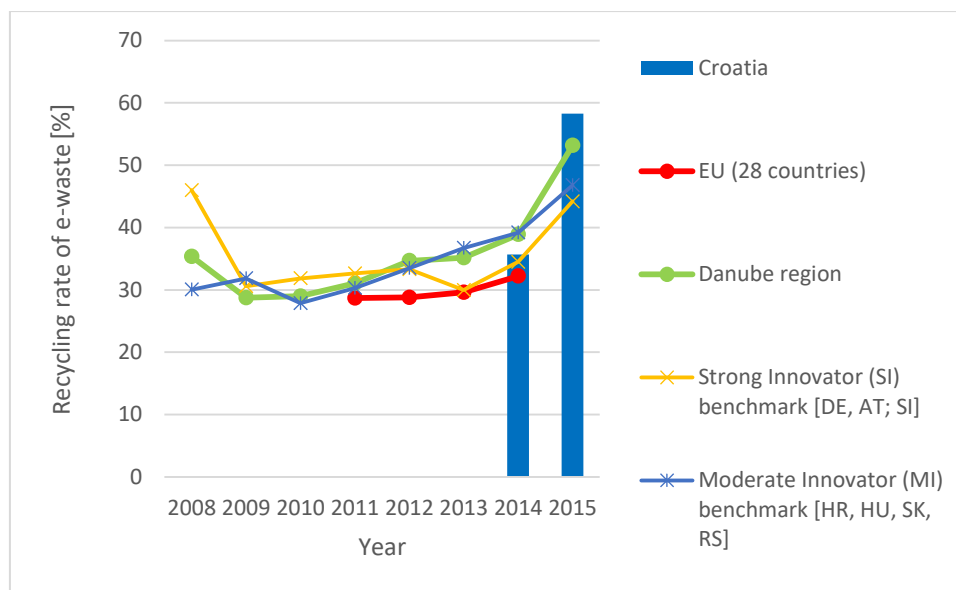


Figure 39: Recycling rate of e-waste (Source: Eurostat)

OPPORTUNITY: The system for collection and recovery of waste electrical and electronic equipment has shown a quick progression since its original implementation, and in 2010 the goal defined by the Ordinance on waste electrical and electronic equipment management was met - 4 kg of collected waste EE devices and equipment per capita.

After the decrease of collected quantities in the following years, in 2015, the goal was met once again and waste EE devices and household equipment were collected at a rate of 4,73 kg per capita. From 2016, the goal of the separate collection will be expressed as a portion of the quantities put on the market in the previous three years, with which RC will meet the goal significantly easier. Further increase of legislative goals necessitates the improvement of collection organisation. In 2015, the minimal prescribed goals were met for recovery and recycling applied per category of EE devices and equipment, ranging from 70 to 80% for recovery and 50 to 80 % for recycling, depending on the EE equipment category.

As the above figure shows, Croatia has the highest recycling rate of e-waste in EU.

5.1 Environmental challenges

Croatia is situated at the Southeast of the European continent, in between the Mediterranean, Middle Europe and Balkans. Croatia’s geophysical location determines the environmental characteristics of the country, with the long coastal region, littoral highlands and the central plains. The rich natural diversity in

Croatia has a substantial impact on the development of tourism and at the same time on the overall economic growth of the country. It is essential for sustainable development and general progress of Croatia to invest in the preservation of the environment.

Environmental issues are not just of high importance for economic growth, but also for human health and well-being. The main tasks of the Croatian environmental policy are to **protect Croatia's natural heritage and natural resources, as well as foster resource-efficiency and integrate environmental concerns in other policy areas**. These are serious tasks as the degree of environmental protection is still lower in Croatia than in other developed European countries. Environmental protection investments and current expenditure made by the public sector accounted for an EU-28 average of 2,0 % - 2,2 % of GDP during the period 2006-2015. Croatia is far below this average, with less than 2 %.

Expansion of transport and tourism, increased energy consumption, social and physical processes are interconnected and correlated factors that put increasing demands on the environmental structure in Croatia, particularly high quality and reliable environmental services, such as water supply and the disposal of waste water, the management of solid waste, maintaining of clean air environment, clean sea and preserving the natural habitat.

Over the past years, the **environmental protection system in Croatia has been continuously improving**. However, considerable investments in the environmental infrastructure are still needed to reach adequate levels of environmental services and standards and to be fully in line with the acquis. *In general, it can be stated that environment is well preserved, but still, the level of environmental protection needs to be increased to reach the EU level.* The adequate environmental infrastructure is one of the prerequisites for further social and economic development of the country but also a present indicator of the living standard of the population. To improve environmental infrastructure it is necessary to address the main problems in the environmental sub-sectors, mainly waste and water. According to the environmental issues of waste and water, there are several crucial problems detected and described in the text below.

Waste

Referring to waste management system in Croatia, one of the major problems as well is disposing a large amount of municipal waste at landfills while the system of separate collection is still not enough developed to reach the EU standard. Generation of municipal waste in Croatia had been increasing until 2008 (1.79 million tonnes generated in 2008), which was followed by decrease mostly caused by economic crisis and decrease of general consumption. An amount of 1.63 million tonnes of municipal waste was generated in 2010, which means 369 kg/cap/year - still significantly lower than EU average (502 kg/cap/year).

Landfilling remains the main disposal option for municipal waste. Since 2008, the amount of waste disposed of in Croatian landfills had had a continuously slight decreasing trend and in 2010 it amounted to 1.54 million tonnes landfilled. At present, almost all amount of biodegradable municipal waste (paper, green and kitchen waste) is being disposed at landfills.

Separate collection of municipal waste is increasing, especially concerning packaging waste and a waste of electrical and electronic equipment (WEEE). The amount of separately collected types of municipal waste (types other than mixed municipal waste, e.g., bulky waste) in 2010 accounted 14 % (227 651 t). However, part of this quantity still ends up in landfills. Percentage of population served by an organised collection of municipal waste was 96 % in 2010, which represents an increase in comparison to the estimated 86 % in 2004 and especially 57 % in 1995. Scattered and non-compliant landfills, and a large

number of illegal dumpsites, pose a significant threat to human health and environment. For a total of 301 official landfills, at the beginning of 2012 remediation of 107 landfills was completed (the waste was removed completely from 66 locations). The waste was actively landfilled at 148 official landfills. Out of 23 3000 estimated illegal dumpsites, 750 have been remediated (waste removal). It is estimated that total amount of the waste disposed of all official landfills has increased from approximately 35.5 million m³ in 2004 to 41 million cubic meters in 2010. The volume of waste that is depositing at landfills has gradually increased because of the larger proportion of the population with an organised collection of waste, and also due to the increased volume of waste produced per inhabitant. The infrastructure currently available for the management of waste is insufficient and of the inadequate standard; the lack of waste treatment facilities represents an obstacle for the establishment of an integrated management system. The waste management system is not completely functional, although there have been improvements introduced during the last several years, including the start of the establishment of waste management centres which create conditions for an efficient functioning of the integrated waste management system. Mainly the waste is disposed at the nearest landfill to where the waste is produced.

The measures for the separate collection of individual waste components have been implemented, but in general, it can be stated that the level of separate collection and recycling is low compared to the EU. A set of regulations on special categories of waste was adopted between 2005 and 2008 and it introduced producer responsibility principle in managing such types of waste.

For those special waste categories, the quantities collected and recovered/recycled in 2011 were: 125 258 t for packaging waste, 35 104 t end-of-life vehicles, 17 233 t waste electric and electronic equipment, 16 754 t waste tires, 8 480 t waste batteries and accumulators, 6 391 waste lubricant oils and 1 196 t edible oils.

As regards hazardous waste, still there is no adequate infrastructure for the disposal and therefore, the hazardous waste, which cannot be recycled or recovered in Croatia, is sent for export. In 2010, 18 937 t of hazardous waste was exported. The average amount of hazardous waste produced in EU countries was 196 kilos per capita in 2008, while in 2010 there were 198 kilos per capita. Croatia is way beyond that level. In 2008, the hazardous waste produced in Croatia was 15 kilos per capita and in 2010 there were 16 kilos per capita of produced hazardous waste.

Water

The other important issue of environmental policy is facing the problems of public water supply. Croatia belongs to a group of countries relatively rich in water and the water resources have not yet become a restrictive factor of development. Surface and ground waters are the most important water sources of the public water supply. However, there is a great spatial and seasonal disparity in quantity between surface and ground waters. While in 1990 the percentage of average supply from the public water supply systems in Croatia amounted to only 63 %, in 2006 it reached the value of 80 %, which corresponds to the estimated EU average¹⁵. The remaining population is supplied partially from the local water supplies or individually from own wells, both without an adequate drinking water quality control. Large regional disparities are observed throughout the country.

The highest level of water supply is in Istria County (about 99 %) and the lowest in Bjelovar-Bilogora (only 31 %). All urban centers have a relatively high ratio of water supply. The losses of water quantities supplied to consumers in Croatia are estimated to be about 40 % due to the network leakages. The rate of

connection of population to the sewage system in Croatia is 43,6 % while in the EU that rate is mostly between 50 to 80%. Once again, there are significant differences between regions with the highest connection in the area of Littoral and Istrian basins (58 % of the population) and the lowest in Dalmatian basins (only 31 % of the population).

The major problems with the wastewater drainage occur in minor settlements up to 2,000 inhabitants inhabited by 40% of the population. There is an especially high number of settlements with less than 500 inhabitants in Croatia (5,387 settlements) inhabited by about 800,000 inhabitants. In such settlements, due to technical, technological and financial limitations, the construction and operation of centralized public.

According to UNESCO (2003) Croatia holds 5th place in Europe and 42nd place in the world in terms of its richness in water resources. The majority of sewage systems in cities are obsolete and significantly permeable. Only 28 % of the municipal waste water in Croatia is treated in waste water treatment plants, while in the majority of the EU member states this figure does not fall below 60-70 %. An additional challenge is a large number (135) of municipal companies operating in this sector (some in the public water supply sector, too), which results in inefficiency.

5.2 Environmental legislation

The legal EU framework is constantly evolving and Croatia is obliged to harmonize its national legislation to with the EU acquis. In November 2013 European Parliament and the Council of EU adopted the 7th Framework Action Programme for environmental protection until 2020. Thus, it should be expected that Croatia, as the newest Member State, will have to implement the programme and additional actions for environmental protection. This means, **in particular, to give incentive to the public and private research and innovation efforts required for the development of innovative technologies that will reduce the cost of transition to low carbon, resource-efficient, safe and sustainable economy and to increase effort to reach existing targets and reviewing approaches to green public procurement.** Consequently, Croatia has, among other things, in July 2015 changed the Environmental Protection Act (Official Gazette No. 78/15) to improve the system of nature protection through effective monitoring, division of responsibilities and improve the process of environmental impact assessment (e.g., some public and private projects). Further adjustments expected in late 2015 when is expected that the Government of Croatia enacts Legislation harmonization plan with the EU for 2016.

Legal Framework

Croatia's efforts to harmonize its legislation with the European Union (EU) acquis in the frame of the accession process to the EU led to a stronger legal framework for environmental protection and sustainable development. In 2010, Croatia successfully concluded negotiations for Chapter 27- Environment, and established transitional agreements related to heavy investment areas including air quality, climate change, waste management, water quality, industrial pollution, risk management and chemicals. Significant legislative gaps remain in some environmental domains, such as soil protection. Few provisions on soil protection can be found in forestry and agricultural legislation.

The European Union (EU) requires from its member substantial investments into the environment. The EU environment policy focuses on sustainable development and aims to protect the environment for present and future generations. In order to protect the environment, EU brings into force the laws:

Regulations and international treaties ratified or signed by the Republic of Croatia

Environmental Protection

Regulations

- Environmental Protection Act (Official Gazette 80/13, 153/13, 78/15)
- Instructions on the form, the tenor and the manner of keeping records of inspections performed by environmental inspectors (Official Gazette 79/95)
- Environmental protection emergency plan (Official Gazette 82/99, 86/99, 12/01)
- National Environmental Action Plan (NEAP) (Official Gazette 46/02)
- Regulation on technical standards of environmental protection from VOC emissions by storage of petrol and its distribution (Official Gazette 135/06)
- Ordinance on the availability of data on fuel economy and CO2 emissions of new passenger cars (Official Gazette 120/07)
- Regulation on information and participation of the public and public concerned in environmental matters (Official Gazette 64/08)
- Regulation on the Environmental Information System (Official Gazette 68/08)
- Ordinance on the register of use permits establishing integrated environmental requirements and of decisions on integrated environmental requirements for existing installations (Official Gazette 113/08)
- Ordinance on the register of installations in which dangerous substances have been identified and on the register of reported major accidents (Official Gazette 113/08)
- Ordinance on measures for environmental damage remediation and remediation programmes (Official Gazette 145/08)
- Decision on publishing rules on state aid for environmental protection (Official Gazette 154/08)
- Strategy for Sustainable Development of the Republic of Croatia (Official Gazette 30/09)
- List of persons eligible to be appointed members and deputy members of committees in procedures of strategic assessment, environmental impact assessment of projects and establishment of integrated environmental requirements (Official Gazette 126/09, 65/12)
- Ordinance on awards and prizes for environmental achievements (Official Gazette 31/10)
- Ordinance on requirements for issuing approvals to legal persons for performing professional environmental protection activities (Official Gazette 57/10)
- Act on Protection against Light Pollution (Official Gazette 114/11)
- Regulation on environmental permit (Official Gazette 8/14)
- Regulation on the prevention of major accidents involving dangerous substances (Official Gazette 44/14)
- Regulation on environmental impact assessment (Official Gazette 61/14, 3/17)
- Regulation on voluntary participation by organisations in the Eco-Management and Audit Scheme (EMAS) (Official Gazette 77/14)
- Regulation on the development and implementation of the documents under the Strategy for marine environment and coastal zone management (Official Gazette 112/14)
- Ordinance on the expert council (Official Gazette 121/14)
- Ordinance on registry of installations containing hazardous substances and register of reported major accidents (Official Gazette 139/14)
- General Binding Rules for poultry farming (Official Gazette 140/14)
- General Binding Rules for pig farming (Official Gazette 140/14)
- Ordinance on the official identity card and label (badge) of environmental inspectors (Official Gazette 156/14)
- Ordinance on the manner of sealing premises, areas and working instruments of supervised persons pursuant to environmental protection regulations (Official Gazette 156/14)
- Ordinance on the availability of data to consumers on fuel economy and CO2 emissions of new passenger cars (Official Gazette 7/15)
- Ordinance on the environmental pollution register (Official Gazette 87/15)
- Regulation on environmental technical standards for reduction of volatile organic compound emissions from refuelling of motor vehicles with petrol at service stations (Official Gazette 44/16)
- Ordinance on the environmental label "Environmentally Friendly" (Official Gazette 91/16)

- Ordinance on the EU Ecolabel (Official Gazette 116/16)
- Regulation on the strategic environmental assessment of strategy, plan and programme (Official Gazette 3/17)
- Regulation on environmental liability (Official Gazette 31/17)
- International treaties
- Convention on Environmental Impact Assessment in a Transboundary Context (Espoo 1991)
- Protocol on Strategic Environmental Assessment (Kiev 2003)
- Convention on Transboundary Effects of Industrial Accidents (Helsinki 1992)
- European Landscape Convention (Florence 2000)
- Protocol on Pollutant Release and Transfer Registers to the Aarhus Convention (Kiev 2003)
- Stockholm Convention on Persistent Organic Pollutants (Stockholm 2001)
- Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus 1998)
- Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam 1998)
- Act on Ratification of the Amendment to the Convention on Environmental Impact Assessment in a Transboundary Context, Sofia, 27 February 2001, and of the Amendment to the Convention on Environmental Impact Assessment in a Transboundary Context Cavtat, 4 June 2004

Timeline of environmental legislation

Croatia became a party to the Convention on 17 January 1996 when the Croatian Parliament passed the law on its ratification (OG, International Treaties 2/96). For Croatia, the Convention came into force on 7 July 1996. As a country undergoing the process of transition to market economy, Croatia has, assumed the commitments of countries included in Annex I. By the amendment that came into force on 13 August 1998 Croatia was listed among Parties included in Annex I to the Convention.

Croatia ratified the Protocol in April 2007 and entered into force on 28 August 2007. By ratifying the Protocol (OG, International Treaties 5/07), Croatia, as the Protocol Annex B party, takes over the obligation of limiting the greenhouse gases emission in the period 2008-2012 to 95% of total emission in the base year, obliged to create a national greenhouse gas inventory and periodically national communication on climate change, according to which it reports on performing the obligations of the United Nations Framework Convention on Climate Change. Form and terms of submitting the national greenhouse gas inventory and national communication are defined by decisions and instructions of the Conference of Parties.

By accessing to the European Union (hereinafter referred to as the EU) on 1 July 2013, Croatia has, due to the obligations arising from the EU acquis communication, implemented into its legal system obligations on reporting on implementation of policy and measures. Croatia committed to reduction of emissions and increase of greenhouse gases removal and long-term emission projections that will be periodically submitted to the EU authorities.

Since 2002, Croatia has prepared five national communications, at which the Second, Third and Fourth National Communication were integrated into one national communication, while the last one, the Fifth National Communication was submitted to the Convention Secretariat in February 2010. This Sixth National Communication of the Republic of Croatia, as all the previous, was prepared according to Guidelines for the Preparation of National Communications by Parties included in Annex I to the Convention (FCCC/CP/1997/7, Part II). Annotated outline for Fifth National Communication prepared by the Convention Secretariat was applied as well, not having a status of the official obligation yet, but help

countries to prepare their national communications more consistently, as required by the Convention and the Protocol.

This Sixth National Communication covers the four-year period from 2008 till 2011 although some information related to legal framework, policies and measures and research in the field of climate change are given for 2012 and 2013.

In April 2013, the Economic Programme of Croatia (Government 2013) was presented, with the Government committing itself to promote investments in energy efficiency and energy renovation of buildings, renewable energy sources, and technologies with low greenhouse gas emissions (in particular for the development of heating systems, heat pumps, biomass, and gas generation plants). However, experts say that published proposal for an RES Action Plan could undermine these ambitions at least in the field of the development of renewable energies. The Economic Programme also foresees the preparation of a Climate Change Adaptation Strategy and a related Action Plan to prevent adverse effects in sectors such as water resources, agriculture, forestry, biodiversity, fisheries, and human health. In 2015, The Ministry of Agriculture, in cooperation with the Ministry for Environment and Natural Protection, published a Strategy for a Low Carbon Development for Croatia.

In various sectors (e.g. waste, agriculture, transport, tourism, energy and industry, forestry), working groups have been established to debate new objectives and measures to be undertaken to achieve Croatia's 2020 goals and to draft projections for the year 2050.

Environmental protection

The Environmental Protection Act (EPA) was promulgated in 1994 and amended in 1999. In 2007, the Croatian Parliament adopted a new EPA. The 2007 EPA includes obligations to improve the quality and implementation of environmental impact assessments (EIA), introduce strategic environmental assessments (SEA), reinforce public participation in environmental matters, ensure access to environmental information, and strengthen integrated industrial pollution prevention and control (IPPC). The act also introduced decentralization of administrative responsibilities for environmental protection. To date, the EPA is supplemented by 17 implementing regulations, 1 decision and 25 ordinances. A new EPA was adopted in July 2013 to provide an improved basis for further harmonization of national environmental legislation with the EU acquis. In particular, it:

- Introduces the environmental permit (possession of the permit is no longer obligatory prior to issuing the location permit for installation, but prior to putting the installation into operation);
- Improves the existing EIA procedure related to screening (i.e. assessing the need for the EIA);
- Further improves the system for prevention and remedying of environmental damage;
- Improves the system for granting authorizations for professional work in environmental protection;
- Improves the system for environmental inspection; and
- Introduces the concept of integrated management of marine and coastal areas.

Croatia has made progress in terms of fulfilling several main obligations in the 2007 EPA, such as:

- the adoption of the National Sustainable Development Strategy in 2009;
- the establishment of new organizational units responsible for environmental protection in counties and major cities;
- the adoption of implementing regulations to strengthen EIA and of environmental protection programmes for a range of counties, the City of Zagreb and other major cities.

However, some of 2007 EPA provisions remain unimplemented, such as the adoption of the new eight-year National Environmental Protection Plan (NEPP), which would identify new priority environmental protection goals at the national level, define implementation measures, set implementation deadlines and identify responsible authorities.

Air protection

The 2011 Air Protection Act is the primary legislative act regulating air protection, climate change mitigation and adaptation, ozone layer protection and industrial pollution. The 2011 Act was crucial in establishing a legal and institutional framework to implement the emissions trading scheme for installations and aviation, and to achieve 2020 greenhouse gas emissions target for sectors not included in the EU trading scheme (agriculture, services, transport, households and small industrial plants). It also created a legislative basis for regulating the geological storage of carbon dioxide in an environmentally safe manner, and for strengthening air quality, greenhouse gas emissions monitoring, and administrative and inspection supervision.

The Air Protection Act sets out the competences and liabilities for: air protection; air improvement and protection planning documents; air quality monitoring and assessment; measures for prevention and reduction of air pollution; air quality reporting and data exchange; the issue of permits for monitoring air quality and emissions into the air; air protection information systems; air protection funding; and administrative and inspection supervision. Croatia made an important step towards fulfilling the Act's obligations by joining the third phase of the EU ETS in January 2013. Transitional periods have been agreed with the EU for participating in the EU ETS for aviation (2014), modernizing existing IPPC installations (2017), and limiting emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations (2015). The permit process for existing installations has been slow and funding for upgrading such installations remains insufficient.

Nature protection

The 2003 Nature Protection Act was decisive in establishing a strong and comprehensive legislative framework for protecting flora and fauna, maintaining biological and landscape diversity, preserving ecological stability, improving the disturbed natural balance and restoring its regeneration capabilities. In 2005, Croatia adopted a new Nature Protection Act to incorporate the provisions of all relevant MEAs and EU directives. The amendments in 2008 and 2011 among other things enlarged the earlier nature protection framework about the protected natural values, aiming at the preservation of the overall biological and landscape diversity. The details of the implementation of the Act have been specified in 18 regulations, 23 decisions and more than 30 ordinances relating among other things to the management of protected species and areas, including national and regional parks, nature parks and reserves. A new Nature Protection Act was adopted in July 2013.

Waste

The 2004 Waste Act, amended in 2006, 2008 and 2009, establishes a comprehensive legal framework for waste management. It covers the principles and aims of management, planning documents, authorities and responsibilities related to management, costs, information systems and requirements for facilities where waste management shall be carried out, methods for performing activities, transboundary transport of waste and concessions, and supervision of waste management.

While Croatia has made major efforts to fulfill the Waste Act obligations, the progress on the ground has been slow among other things due to heavy investment needs. Transitional agreements have been drawn up with the EU to remediate existing landfills and build new waste management centers (2018), and concerning the amount of biodegradable municipal waste to be landfilled (2020), and the amount of waste landfilled in existing non-compliant landfills (2017). Although the Waste Act is interlinked with a large number of sectoral laws, Croatia's efforts to consolidate them have to date been somewhat insufficient.

Water

Water protection and management, including water supply and wastewater disposal, is regulated by the 2009 Water Act and the 1995 Water Management Financing Act, last amended in 2013, alongside accompanying secondary legislation. The Water Act regulates the activities and organization of water management and protection, and public water supply and public sewerage activities. It sets out a comprehensive institutional organization of the water utility sector. This act replaces the former Utility Management Act, and thus supersedes provisions related to drinking water supply, sewerage and wastewater treatment, transferring the jurisdiction of public water utilities to the Ministry of Agriculture, Water Management Directorate. The Water Management Financing Act defines water management revenues, the most significant of which are water charges. Reforms of the water sector are proceeding, and some key commitments have been met, such as the preparation and adoption of the River Basin Management Plan. Investments in infrastructure have been insufficient.

Implementation

While there has been a significant strengthening of the legal framework for environmental protection and sustainable development since 1999, Croatia has been slow regarding implementing new legislation, in particular at the subnational level. This has been particularly the case in areas demanding high infrastructure investments, such as air protection, waste and water management. This is primarily linked to insufficient State budget allocations and low financial investment due to the social and economic situation in Croatia and the global economic and financial crisis. Weak implementation of environmental legislation at the local level is also linked to insufficient administrative capacity in particular on chemicals, climate change, IPPC, nature protection and noise. The Government has made insufficient efforts to ensure regulatory harmonization of the existing and new environmental and sectoral legislation and establishes a stable mechanism of regulatory improvement that allows wide consultation within the Government and with other stakeholders. For example, the reform of the environmental legal system is largely based on ad hoc legal fixes.

5.3 Environmental taxes

To protect the environment, some states use different fiscal and parafiscal instruments that can be financially significant. One of these instruments is environmental taxes, which have a positive influence on the environment. The aim of this part of the National report is to analyse types, importance and financial impact of environmental taxes in EU and Croatia. Analysis of an average revenue share from environmental taxes in GDP had shown that in the period between 2000 and 2015 the biggest average was recorded in Denmark (4,52 %) and Netherlands (3,45 %), and the lowest in France (1,97 %) and Spain (1,82 %).

In Croatia, there are eight different types of environmental taxes and charges. Their total share of revenues in the state budget was 4,11 % of gross domestic product in 2015. In the period between 2007 and 2015 budgets of the Republic of Croatia collected the highest amount of tax revenue from energy tax, while

natural resources taxes were negligible.

General tax changes, implemented in EU members in the period from the mid-2013 to the mid-2015 were made by amending the existing legal rates and/or base of direct and indirect taxes. However, specific tax reforms were conducted by increasing indirect and reducing direct taxes. For example, 18 EU countries decreased income tax base. A great number of countries also reduced income tax base, and 15 among them reduced it by introducing new tax incentives and allowances. In the year 2014 Croatia changed her tax system, i.e. the existing tax forms – interestingly, almost as a rule, change included an increase in legal rate and/or base. Particularly interesting are changes in environmental taxes and excise duties. Environmental taxes, including excise duties on energy and electricity, were raised in 15 countries, while tobacco and alcoholic drink excise duties were raised in 20 Member States (including Croatia). Should we analyse environmental taxes, but leaving the energy excise out of the equation, it can be concluded that 14 Member States raised their tax rate (including Croatia), and it was decreased in only 2 members (Bulgaria and Ireland).

Environmental taxes have three key roles and functions:

- internalisation of external costs (i.e. optimal tax rate should correspond to overall social marginal costs of pollution, the so-called Pareto efficiency of environmental use),
- educational (serve to encourage potential pollutants, i.e. emitters of harmful substances to reach a decision about whether to pay an additional tax unit or to give up emission of additional unit of pollution, an end result being levelled marginal costs of pollution of all emitters), and
- financial (all taxes are usually financially generous, and collected funds could serve in environment protection).

In addition to these functions, environmental taxes also have the function of improving environmental quality. One of the fundamental objectives of the Europe 2020 Strategy is "sustainable growth that includes promotion of competitive green economy that makes efficient use of resources" (European Commission, 2010a).

Basic subgroups within environmental taxes are as follows:

1. Energy taxes (including the CO₂ taxes). This group includes taxes on energy products for transport (the most important being petrol and diesel) and for stationary use (fuel oils, natural gas, coal and electricity). The CO₂ taxes are included in this group and not among pollution taxes for statistical reasons (it is often not possible to identify CO₂ taxes separately in tax statistics because they are integrated with energy taxes) because they are partly introduced as a substitute for other energy taxes and the revenue from these taxes is often large compared to the revenue from the pollution taxes, which would distort international comparisons. Energy taxes include, for example, mineral oil and motor oil tax, petrol (lead and non-lead) taxes, diesel, fuel oils, petroleum, kerosene tax, natural gas tax and electricity consumption tax.
2. Transport taxes. This group includes taxes related to the ownership and use of motor vehicles, tax on other transport equipment (e.g. planes) and related transport services (e.g. duty on charter or scheduled flights), but only when they conform to the general definition of environmental taxes. The group also includes "one-off taxes related to imports or sales of the equipment or recurrent taxes such as an annual road tax. This group includes, for example, registration and use of motor oil tax, tax on import and sales of vehicles, road and highway tax, tax on insurance of luxurious yachts and passengers in the air traffic.

3. Pollution taxes. This group includes taxes on measured or estimated emission to air (except CO₂ taxes) and water, on the management of waste and noise.
4. Resource taxes covers taxes on extraction of raw materials, except oil and gas.

Indicator: Environmental tax revenues (%)

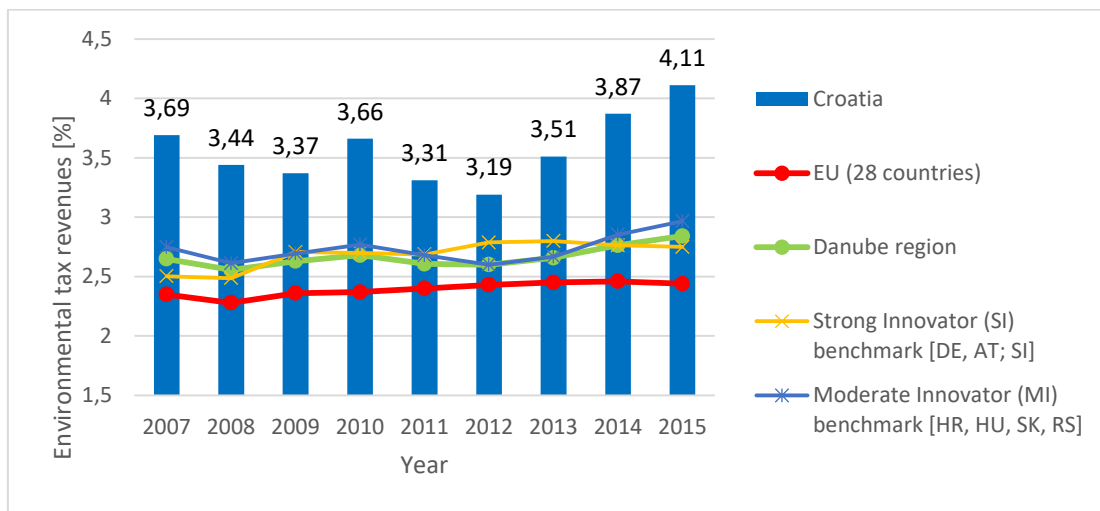


Figure 40: Figure: Environmental tax revenues (%) (Source: Eurostat)

The most commonly used economic tools for the environment are taxes, charges and tradable permit systems. Mostly used tax instruments are tax allowance and benefits, special taxes and pollution charges (the so-called environmental taxes), accelerated depreciation of permanent assets for environmental protection, exempts from customs duty payment for the import of environmental equipment, increase of public (state) procurement for environmental products etc. The advantage of fiscal instruments is their efficiency and the fact that they can raise revenues to reduce distorting taxes elsewhere in the EU economy.

The approach to environmental taxation in the EU has concentrated on the use of taxes to improve the environment, while using the revenue raised to reduce the distortionary taxation on labour and production. This policy is often regarded as producing a double effect whereby the environment is improved and at the same time the economy benefits through reduction in these distortionary taxes.

According to a report from European Environment Agency (2000), most evidence of the effectiveness of environmental taxes has been in the northern European Member States (in Scandinavia, Finland and the Netherlands). The evidence indicates that many environmental taxes do have a positive influence on the environment.

Croatia implements the following eight basic types of environmental taxes and charges:

- special motor vehicle tax,
- excise duty on electricity,
- excise duty on natural gas,
- excise duty on solid fuels,
- charges for environment pollutants,
- charges for the environment users and
- charges for the environmental impact of waste and special environmental charge for motor vehicles.

Charges in both EU and Croatia usually include funds collected through funds for environmental and water protection or from public companies offering utility services. In Croatia there are different charges (i.e. parafiscal charges) that are most commonly associated with the use of natural resources and environment protection (e.g. water charge, water protection charge, sand and gravel extraction charge, charges in the system of management of waste vehicles, waste tyres, waste batteries and car batteries, waste oils, packaging and packaging waste).

OBSTACLE: Environmental taxes can influence on the behaviour of economic entities and natural persons, aiming to improve and/or prevent negative environmental impacts and provide benefits such as economic incentive to reduce pollution and resource use.

It can be observed that during the 2007 – 2015 period the share of environmental taxes revenue in Croatia's GDP was the highest in 2015 (4,11 %), and the lowest in 2012 (3,19 %). The highest share of environmental taxes revenue in 2015 we can explain by the implementation of environmental taxes and the lowest environmental taxes revenue could be partially explained as a consequence of recession and constant tax law changes in Croatian fiscal policy. Observation of environmental taxes, charges and excises show wide dispersion and diversity among Member States. For example, Denmark has as many as 21 different types of environmental taxes and charges; consequently, it also has the biggest share of environmental taxes in GDP. Italy has 10, and Croatia 8 different environmental taxes.

Croatia should raise public awareness on buying greener automobiles, which would greatly contribute to the environmental protection and preservation.

Indicator: Implicit tax rate on energy

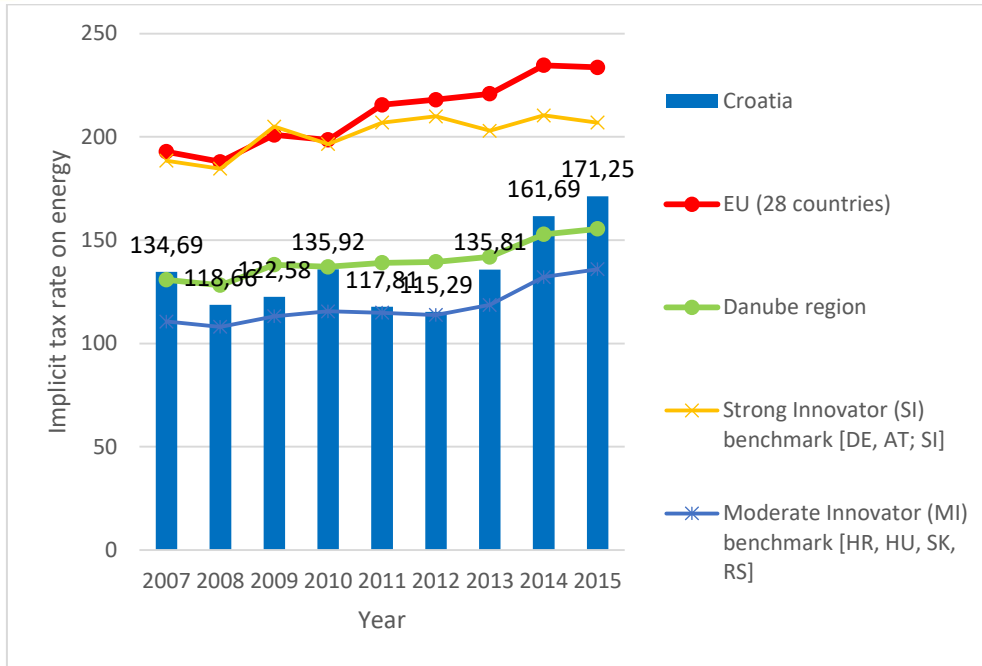
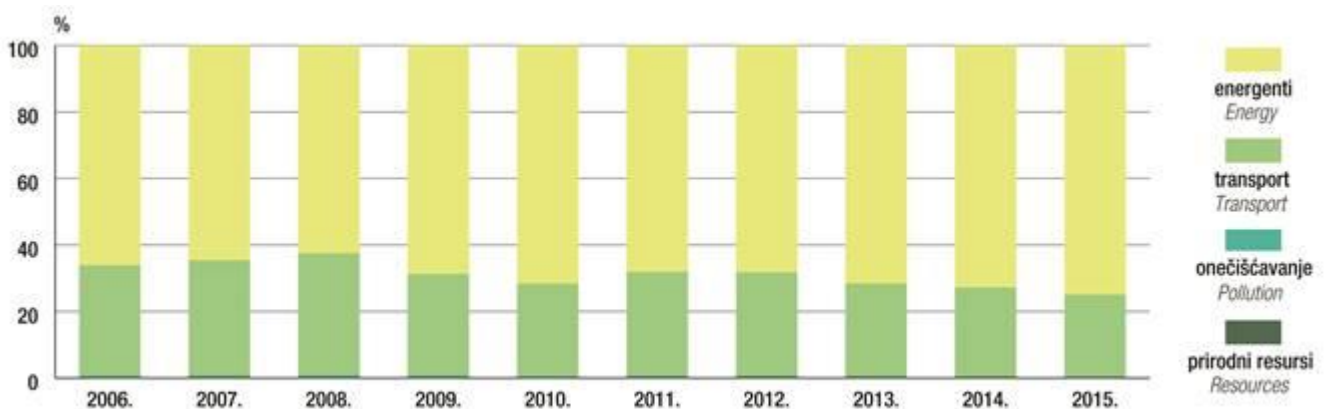


Figure 41: Implicit tax rate on energy (Source: Eurostat)

Environmental taxes revenue under the main environmental taxes categories (energy, transport, pollution, natural resources) in Croatia in the period between 2007 and 2015. Next figure shows tax revenues by category in Croatia in period 2006 – 2015.

Figure 42: Tax revenues, by categories, 2006 – 2015



OPPORTUNITY: During the entire observed period (2007-2015) and taking into account all analysed categories of environmental taxes in Croatia, the biggest share had energy taxes (same as in EU), i.e. budgets received the most revenues from that environmental tax category. The highest amount in the category was recorded in 2015. The continuous growth indicator is noticeable over the years. An increase of environmental taxes resulted in an increase of revenues on that base. Precisely those types of taxes are implemented to try and influence the behaviour of economic subjects and natural persons with the aim to

improve and/or prevent negative environmental impacts.

Croatia and EU funds

The EU grants provide increased focus on environmental goals and compliance Croatian laws with EU. Research has shown that implementing eco-innovative solutions strongly depends on the financing of the public sector (national and local governments) and EU funds.

By accession to the European Union, the Republic of Croatia was given an opportunity to use Structural instruments – the European Regional Development Fund, the European Social Fund and the Cohesion Fund.

Croatia has taken some useful measures in the application of its taxation policy (e.g. electric cars are excluded from special tax on-road vehicles) that make a useful move towards green initiatives. The Government has established the Environmental Protection and Energy Efficiency Fund (EPEEF) to provide extra-budgetary sources for financing green initiatives and environmental protection projects. However, the share of green horizontal subsidies in these funds is relatively low.

6. ECONOMY AND DEMOGRAPHY

Economy

Indicator: GDP at market prices in PPS (Purchasing Power Standards)

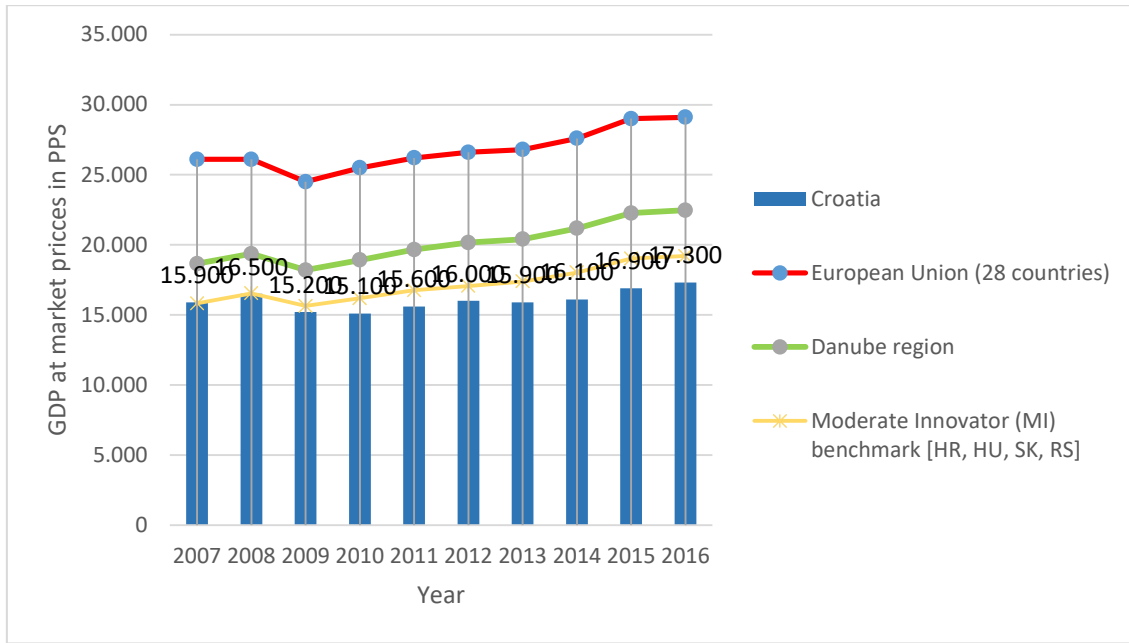


Figure 43: Gross domestic product at market prices in PPS per capita in Croatia, the EU and the Danube region (Source: Eurostat)

OPPORTUNITY: After the long crisis, better days are coming for Croatia. Croatia's economy is recovering strongly from the deepest recession of its history. The recovery is driven by both exports (mainly tourism) and internal demand (including investments supported by European funds).

At 1,7 % (q-o-q), GDP growth in the third quarter in 2016 was higher than expected in autumn. All components of domestic demand contributed to this strong performance. While exports of goods suffered a temporary setback, exports of services jumped by 3,5 % q-o-q due to another strong tourist season. Growth likely decelerated in the fourth quarter of 2016, but all in all, Croatia's economy is expected to have grown by a solid 2,8 % in 2016. Growth set to gather pace in 2017, and slow down thereafter. The strong growth momentum gathered in the the second half of 2016 is projected to carry over to 2017 and receive extra impetus from the government's expansionary fiscal stance.

Consumption, in particular, is projected to benefit from tax cuts and expand by 3,4 %. Corporate investment is projected to rebound, as ample liquidity and favourable financing conditions support credit expansion. EU investment funds are expected to provide an additional boost to public investment. Government consumption is set to grow more moderately, but overall domestic demand is expected to drive real GDP growth. Export growth is expected to slow down somewhat, especially in services, while the strength of domestic demand is expected to underpin steady import growth. As a result, net exports are projected to detract from growth. Overall, real GDP is expected to grow by 3,1 % in 2017. The positive trend in consumption is set to continue in 2018 but moderate slightly as the boost from tax cuts lessens. Investment, on the other hand, is projected to remain strong also thanks to abundant liquidity. The

external environment is set to remain supportive, but as export market shares stabilise following the substantial gains since EU

accession, export growth is set to slow. Import growth, on the other hand, is expected to remain vigorous. This, combined with a rebound in import prices both in 2017 and 2018, is set to contribute to a further erosion of the current-account surplus, to about 1,3 % of GDP in 2018.

Compared with EU and Danube region, Croatia is still under the average of 41 % and 23 %. Based on previous quarters and expected positive trend Croatia's BDP will grow in 2018.

The positive trend in goods exports and tourism could also continue in 2017 and 2018, with further significant gains in export market shares.

Indicator: Real GDP growth



Figure 44: Real GDP growth (Source: Eurostat)

OBSTACLE: Global economic activity remains trapped for a prolonged period of subdued growth, mainly due to weak investment activity, sluggish recovery of world trade and high levels of debt. Croatia public debt in 2016 is 82,9 % of GDP.

However, public finances are recovering and the deficit is in 2017 below the Maastricht threshold and the high public debt-to-GDP ratio is decreasing (partly due to exchange rates developments).

Also, the growth has not translated into a satisfactory decrease in unemployment, as the new jobs are

essential of temporary nature, and labour force is shrinking because of emigration and demographic effects.

Croatia is experiencing excessive macroeconomic imbalances, mainly due to high public and private debt, in a context of low productivity and weak potential growth. Croatia's main weaknesses are identified in these areas:

- inefficient public administration, including the governance of the State Owned Enterprises;
- poor fiscal framework;
- weak business environment, with high administrative burden and many regulatory restrictions;
- a pension system that facilitates early retirement and leaves the elderly at risk of poverty and social exclusion;
- a system of social protection characterised by inconsistencies, fragmented coverage and lack of transparency; and
- a financial sector characterized by high level of nonperforming loans and low profitability, as well as by exposure to exchange rate risks.

OPPORTUNITY: After being severely hit by the financial and economic crisis, Croatia's economy has progressively returned to growth. Croatia's economy shrank by nearly 10 percent between 2006 and 2016, due to the sharp contraction in domestic demand following the global crisis. In 2015, the economy returned to growth, driven by strong exports as well as by a rebound in private consumption and investment (besides favourable base effects, the former benefitted from lower energy prices, reductions in personal income tax, while the latter reflected, inter alia, increased public investment via enhanced absorption of EU structural funds). The growth further gathered momentum in 2016 on the back of strong and broad-based recovery, with real GDP expanding by 2,9 %.

Looking ahead, Croatia's economy is expected to continue growing at a robust pace in both 2017 and 2018 (by 3.1% and 2.5% respectively, according to the Winter 2017 Commission's forecast) reflecting buoyant private consumption, though net exports are projected to contribute negatively to growth (as imports are to grow at the faster pace than exports).

Above mentioned trends in Croatia, follow the trend in EU countries and EU general. The growth of the GDP in EU and Danube region is faster than growth in Croatia. Recovery in the euro zone slowed down from 2 percent in 2015 to 1,6 % in 2016, largely due to a lost momentum of domestic demand and exports. Confidence in the economy of the euro zone remained resilient following the Brexit vote. Forecasts for the entire EU suggest a leveling off in activity with 1,8 % GDP growth estimates for both 2017 and 2018.

Employment

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

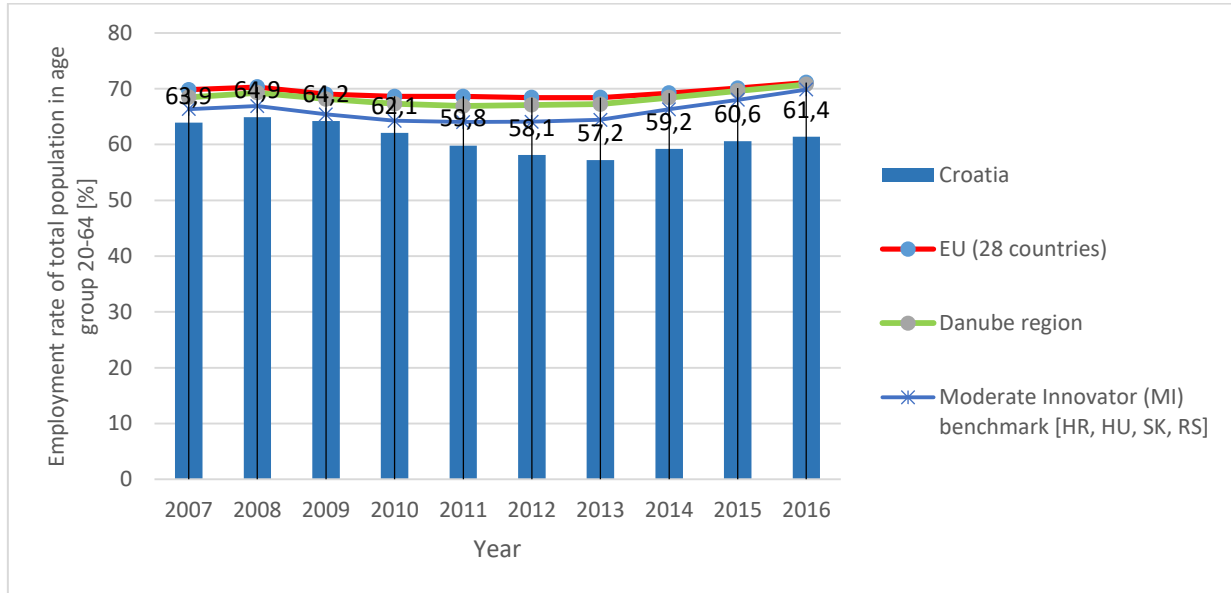


Figure 45: Employment rate as a share of population age 20-64 in Croatia (Source: Eurostat)

OBSTACLE: The employment rate target for Croatia stands at 62,9 %, and the latest data show a steady progress with 60,6 % in 2015. In 2016, the unemployment rate fell to 13,4 %, a decrease of more than 3 % compared to the previous year. However, these improvements are mainly due to a shrinking labour force, and the majority of the new jobs was under fixed and short-term contracts.

In addition, youth and long-term unemployment remain high. According to the EU Commission, no progress was observed in addressing the main weaknesses related to the labour market. In particular, the announced measures encouraging longer working lives and streamlining pension provisions were not

implemented. Limited progress was registered in providing up- and re-skilling measures: this is of particular concern, as 50 % of the unemployed are long-term unemployed who run a higher risk of becoming inactive due to their obsolete or eroded skills. It should be noted that, even if Croatia meets its employment target, it will be still below the level of other European countries.

Indicator: Total unemployment rate (%; Percentage of active population)

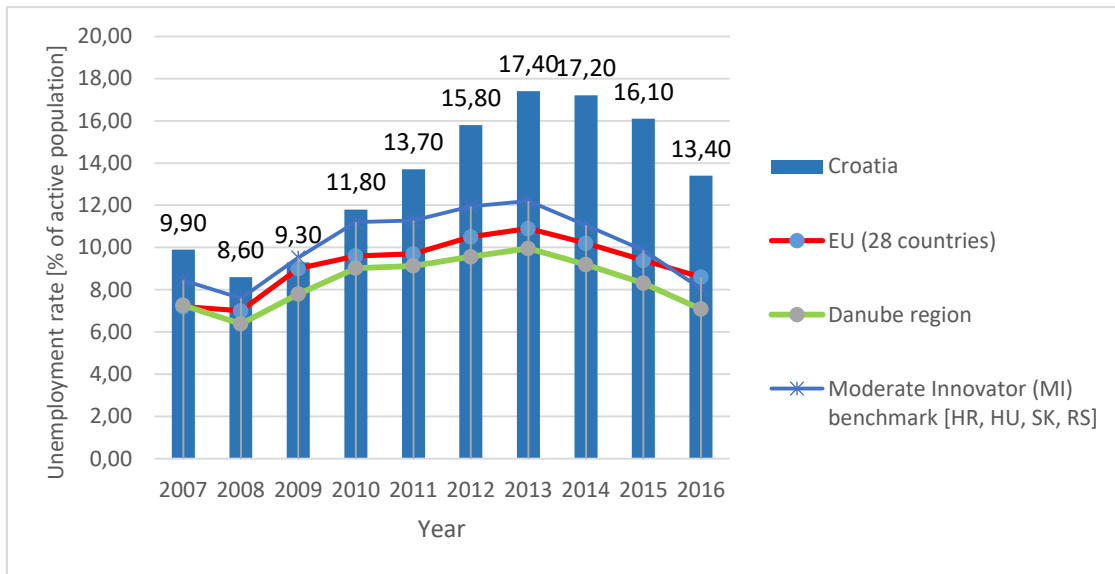


Figure 46: Unemployment rate in Croatia, EU and Danube region (Source: Eurostat)

OBSTACLE: Unemployment has resumed its downward trend but remains at high levels. After its peak of 17,4 % in 2013 and 2014, the unemployment rate fell to 16,1 % in 2015, as the economy emerged from recession. The decline in the unemployment rate accelerated in 2016 (13,4 % for the year as a whole) on the back of both shrinking labour force (due to demographic dynamics and net migration outflows) and rising employment. This trend is to continue into 2017, bringing the share of unemployed persons in the labour force to 11,3 % in January 2017.

Croatian unemployment

Unemployment decreased by 3 % in 2016, due to the continued shrinking of the labour force but also increasing employment. By 2018, the unemployment rate is projected to drop to 9,3 %, as employment continues to recover, while the labour force broadly stabilises around current levels. After several years of restraint, the average compensation of employees is estimated to have risen by 1,7 % in 2016 and should accelerate to around 2,4 % in 2017.

The main reason behind the exit out of the Unemployment Register in recent months was employment, mainly in manufacturing and trade sectors, but the trend slowed down when compared to the previous year. A more noticeable pressure release on the Croatian Employment Service is expected in the upcoming months due to increased employment in both tourist and agricultural sectors. Anticipated recovery in other sectors—mainly in industry and construction—should further relieve the pressure placed on the labour market. Hence, expected is a rise in employment and a further fall in unemployment, with labour force stabilizing in 2017.

In regards to EU trend in unemployment, Croatia's rate is almost twice higher.

In the European Union and the Danube region, unemployment, in general, has been on the rise since 2008, which is due to the economic crisis which caused bankruptcy and financial trouble for many employers, and thus led to considerable job loss, fewer job offerings, and consequently, to a rise of the unemployment

rate. Older workers are struggling to find new jobs despite their experience, and young graduates are struggling to find new jobs, because they have none. All in all, the number of unemployed persons worldwide is projected to rise, this is not down to the economic crisis alone, but also the industrial automation of processes previously performed by workers, as well as rising population figures.

In general, the conclusion is that unemployment rate in Croatia is high but in the next years is going to decrease.

Indicator: Long-term unemployment rate total

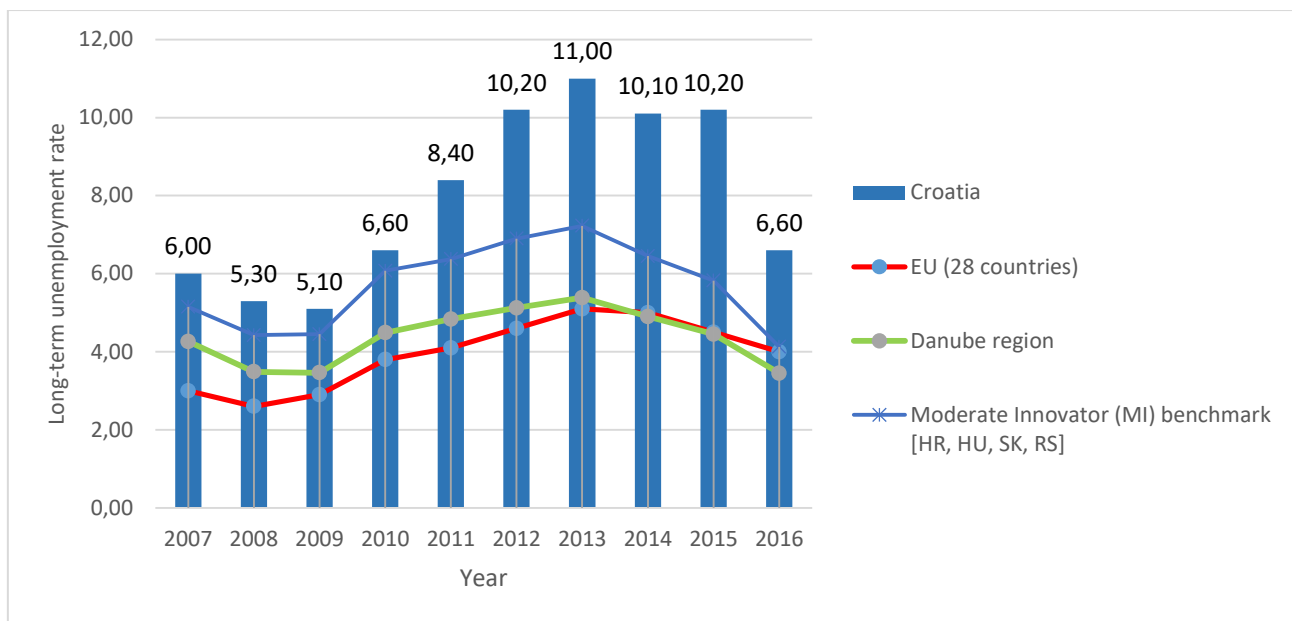


Figure 47: Long-term unemployment rate (Source: Eurostat)

OBSTACLE: In Croatia, the long-term unemployment rate refers to the share of unemployed persons since 12 months or more in the total number of active persons (those who are either employed or unemployed) in the labour market. Croatia Long-Term Unemployment Rate was rising in the crisis years.

Unfortunately, long-term unemployment (when somebody is waiting for a job longer than 1 year) is a particular problem because it leads to poverty and social exclusion, persons forget their knowledge and skills or they become obsolete, they lose self-esteem and a sense of self-reliance and so on. Furthermore, employers are also suspicious on the long-term unemployed person, believing that his or her situation is his or her own failure or inactivity.

The long-term unemployment rate in Croatia is 2% above the rate in EU and in Danube region. The relatively high level of long-term unemployment in Croatia is the consequence of more limited labour flows, or a lower number of newly employed together with a slight reduction in the number of those quitting their jobs. Long-term unemployment particularly affects women; almost a half of them had been unemployed for over two years.

Indicator: Harmonised unemployment rate (age group 15-24)

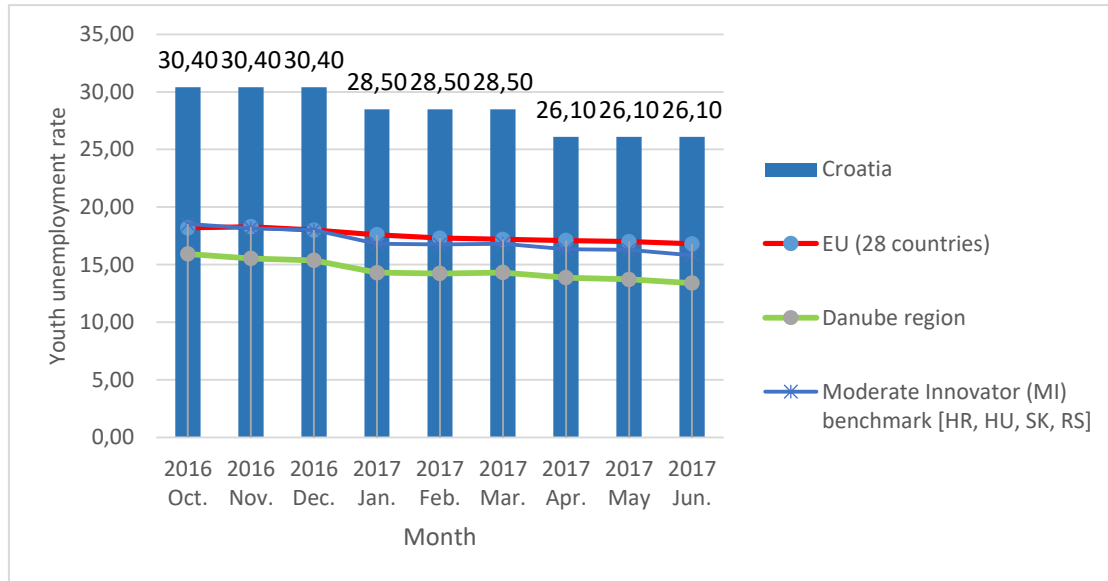


Figure 48: Harmonised unemployment rate in age group 15 – 24 (Source: Eurostat)

OBSTACLE: Croatia’s youth unemployment rate is currently one of the highest in Europe. It should be noted that it has always been above EU average. In 2012 youth unemployment rate in Croatia stood at 41,7 %. Moreover, between 2008 and 2012 it grew almost twice as fast as the general unemployment rate: while general unemployment increased by 38 %, in the same period youth unemployment did so by 58 %. This is important for understanding that Croatia did not just “import” youth unemployment along with the economic crisis: the economic crisis just deepened the already existing structural barriers to effective youth employment.

Even though the previous government introduced certain measures to combat youth unemployment, or at least alleviate its consequences, negative trends perpetuated. Recent analysis shows some progress, mostly when it comes to expanding active labour market measures among unemployed youth aged 15-29. Youth unemployment in Croatia has also been sizeably reduced, but remains at elevated levels (30,4 % in December 2016 as compared to a peak of 54,5 % at the start of 2013). According to the Commission Winter 2017 forecast, the unemployment rate is to fall to a single-digit figure in 2018.

Unemployment is a crucial economic factor for a country; youth unemployment is often examined separately because it tends to be higher than unemployment in older age groups. It comprises the unemployment figures of a country’s labour force aged 15 to 24 years old (i.e. the earliest point at which mandatory school education ends). Typically, teenagers and those in their twenties who are fresh out of education do not find jobs right away, especially if the country’s economy is experiencing difficulties, as can be seen above.

Despite crisis is over, young people are still facing difficulties in finding a job. Young in EU and Danube region have more success and opportunities in finding a job after education, while young in Croatia are struggling.

7. CONCLUSION

In 2014, Croatia adopted The Strategy for innovation encouragement aiming to increase the level of competitiveness of the Croatian economy and increase social well-being. According to the national ranking of the European Innovation Scoreboard (EIS) and Eco-Innovation Scoreboard, Croatia is the moderate innovator. On the scale of Eco-innovation Index, Croatia's rank is on the same level as Danube region and the number of innovators is on the same level as in developing countries. In comparison to the EU-28, as well as the Danube region, considering a GDP share of public spending for research and innovation, it is apparent that Croatia is not investing enough in R&D. Additionally, Croatia's youth unemployment rate is currently one of the highest in Europe.

However, Croatia's economy is recovering strongly from the deepest recession of its history. The recovery is driven by both exports, mainly tourism, and internal demand, including investments supported by European funds. The percentage of highly educated persons in the field of engineering and science in overall active population in Croatia is low. The lack of workforce of that profile has already been identified as an obstacle regarding the intensity of R&D activities and development of manufacturing sectors with higher value added. Among others, this can be attributed to the preference of young people to enrol in university programmes in social sciences as opposed to science and engineering, which has been a trend in the previous period. This is why the Croatian government has put much effort in recent years to direct youngsters towards education in the STEM field.

Observing Croatian economy, noticeable is high demand of environmental services, such as water supply and the disposal of wastewater, the management of solid waste, maintaining a clean air environment, clean sea and preserving the natural habitat. Croatia has no specific national resource efficiency strategy or a particular plan for resource efficiency. Government spending for environmental protections is lower than in Danube region since it is limited due to the amount of debt and spending constraints.

Croatia is using energy less efficient than most of the countries in EU due to the slow transition from outdated, intensive energy consuming technologies in processing industry to energy efficient ones. The problem existing in the Republic of Croatia is a lack of investments in the energy and industry sectors, decreased production capacities in the existing industry companies and undefined regulation and legislation. The problem also exists as to insufficient knowledge in the field of technology and its advantages on energy independence, security of energy supply, delayed investments in the public energy sector and reduction of power losses in distribution and transmission of the electric power subsystem.

The country still has significant potential for wind, solar thermal and electricity, biomass, and biogas. Apart from the state as a regulator which has various instruments at its disposal to implement the renewable energy use thoroughly, local authorities should assume central role and responsibility for generating the energy locally from other renewable energy sources available on their area. Municipal utility companies would thus add electricity production to their regular activities and could provide installation and maintenance services for individual energy generating systems within the field of their competence.

In the business sector, the expenditure is even lower than in the public sector. This reflects characteristics of the national economy lacking in value added. This is why it is essential to increase cooperation of the public and business sector to ensure that the results of R&D from the public sector are capitalized in the business sector. Federal funding of business expenditure in research and development is meagre, which is seen as an apparent obstacle hampering the support of eco-innovation.