
Assumptions and Implementation of Climate and Energy Policy under the Europe 2020 Strategy

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Abstract

Purpose: The essence of the "Europe 2020" initiative, that is, the strategy for smart, sustainable, and inclusive growth, is an attempt at creating conditions fostering long-term sustainable economic growth in the European Union. To this end, economies based on knowledge, promoting environment-friendly technologies must be built in the member states of the Community, at the same time taking care to maintain social and territorial cohesion.

Design/Methodology/Approach: This paper contains a long-term analysis of selected indicators concerning climate policy in the period 2000-2018 and an assessment of their accomplishment. This paper aims at verifying the hypothesis that prolonged problems in accomplishing "20/20/20" targets related to climate and energy, that is, decreasing greenhouse gas emissions by 20% in comparison to 1990, increasing the share of renewable energy in gross final energy consumption to 20% and increasing the energy efficiency by 20%, undermine the success and timely accomplishment of certain priorities of the Strategy.

Findings: Due to the relatively high level of greenhouse gas emissions and a high consumption of conventional energy in comparison to renewable energy, the Strategy requires a longer time horizon to be implemented successfully. In the European Community one can see a division into western countries of the Community and countries of the former Eastern bloc. Delayed technological, social, and financial development in the countries of the former Eastern bloc and insufficient awareness of the European and global climate policy may postpone the common efforts to accomplish the objectives of Europe 2020 Strategy beyond the projected time horizon.

Originality/Value: It has boosted the process of building a knowledge-based economy and attempting to create conditions to reduce the share of greenhouse gases, reduce energy consumption and improve climate and energy indicators.

Keywords: Europe 2020, "20/20/20" climate/energy targets, greenhouse gas emission, renewable energy, energy efficiency.

JEL code: F5, O52, Q4, Q5.

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1. Introduction

The Europe 2020 Strategy is an improved continuation of assumptions of the Lisbon Strategy tasked with changing the economy of the European Union in order to transform it into the most competitive and dynamic economy in the world. In connection with the continuous nature of most of the key challenges related to sustainable development, the main focus of the “Europe 2020” Strategy - similar to the Lisbon Strategy reviewed in 2005 - is growth and employment. However, it must be noted that although economic growth is still perceived as the only way out of the crisis and the only method of reducing the rate of unemployment, a clear shift towards a “green economy” can be observed – a low-carbon economy based on knowledge, promoting environment-friendly technologies and economical management of resources, creating “new green” jobs, and at the same time taking care to maintain social cohesion. The implementation of this concept is to be a result of activity in three areas deemed key priorities: research and innovation, “green” economy and cohesive society.

In her previous publication, Klikocka (2019) described the purpose of *smart growth* and *inclusive growth*. However, the presented publication, as a continuation of the description of Strategy 2020 refers to the accomplishment of “20/20/20” targets in the area of climate and energy, that is, decreasing the emission of greenhouse gases by 20% in comparison to 1990, increasing the share of renewable energy in gross final energy consumption to 20% and increasing the energy efficiency by 20%. In addition, it should be emphasized that the European Union is determined to resolve that by 2020 emissions will be reduced by 30 per cent in comparison to levels recorded in 1990, if other developed countries undertake to reduce their emissions comparably, and the developing countries contribute to the extent of their covenants and capabilities.

The Lisbon strategy assumed embracing the decreasing productivity and the slowdown of economic growth and eliminating the competitive gap between the economies of the EU and the USA. The Europe 2020 Strategy also aims to introduce measures combating the effects of the global economic crisis and long-term challenges on account of globalization (e.g. aging societies or optimized utilization of resources) (Europe 2020: A strategy....).

Europe 2020 is a programme document and the implementation of objectives assumed in it will help Europe get out of the economic crisis faster, prevent a similar crisis in the future, as well as create grounds for sustainable development. A priority for this development is an economy based on knowledge and innovation, friendly to the environment, and concurrently more competitive. The new strategy consists of 3 priorities:

- smart growth: development of economy based on knowledge and innovation,
- sustainable growth: supporting economy efficiently utilizing the resources, more

environment-friendly and more competitive,
- inclusive growth: supporting economy with a high level of employment, ensuring a high level of social and territorial cohesion.

The implementation of the environmental target aims at reducing the emission of carbon dioxide by at least 20% in comparison to the level from 1990, or even by 30%, if possible, increasing the share of renewable energy sources in gross final energy consumption to 20% and increasing the energy efficiency by 20%. These provisions confirm the provisions of the climate and energy package adopted at the summit of the European Council between 11-12 December 2008.

The Europe 2020 Strategy is made of seven flagship initiatives - Resource efficient Europe being one of them. This initiative is to set a strategic framework supporting changes leading to de-carbonizing the economy and promoting efficient utilization of resources in order to: improve the economic result, simultaneously limiting the utilization of resources; identifying and creating new possibilities for economic growth and wider innovation activity and boosting the competitiveness of the EU; securing the supplies of base resources; counteracting climate change and reducing the environmental impact of utilizing the resources.

For the purposes of building Europe that makes efficient use of the resources, we must implement technology improvements, make considerable changes in the area of energy, industry, agriculture, and transport, and change our behaviours as producers and consumers. In order to provide businesses with certainty required to invest these days and to ensure that future generations will derive benefits from smart investments, we must immediately take measures, based on a regulatory framework, guaranteeing long-term stability. Increasing the efficiency of utilizing the resources also makes it possible to control costs by reducing the consumption of materials and energy, and thus contributes to improving competitiveness in the future (COM (2011) 26.02.2011).

Since the assumed objectives of the Lisbon Strategy have not been accomplished, the new strategy Europe 2020 draws from experience acquired during that period of implementation of the document, i.e. conclusions from the economic crisis fostering non-sustainable growth and emphasis on clear specification of the consequences of failure to implement the assumptions by the member states.

Europe 2020 – A strategy for smart, sustainable, and inclusive growth assumes creating an environment fostering long-term sustainable economic growth in the countries of the European Union. Table 1 presents the objective and priority established in the climate policy. The programme was developed for 2010-2020 and the European Council approved it on 17 June 2010. Works under the Europe 2020 initiative are undertaken based on the unit called the European Semester (ES). This is a systematized series of measures designed to accomplish respective goals of the

Strategy under which the European Commission in its Annual Growth Survey sets out the priorities of the EU for the following year. Based on adopted domains, National Reform Programmes (NRP) developed in respective member states and containing country-specific targets and measures to achieve them, are subject to updates (Europe 2020: A strategy...).

Table 1. *Flagship objectives and initiatives of Europe 2020 Strategy referring to objectives in the area of climate and energy*

Headline targets of the Strategy
The “20/20/20” climate/energy targets should be met – greenhouse gas emissions reduced by 20% in comparison to 1990, share of renewable energy in total energy consumption increased to 20% and energy efficiency increased by 20%*.
Flagship initiatives
Innovation Union – using research and development activities and innovation to solve the most important problems (connected, among other things, with climatic changes, energy, but also an aging society) and elimination of the gap between the world of science and the market. Resource efficient Europe – measures to decouple economic growth from the use of resources, support the shift towards a low carbon economy increasingly using the potential offered by renewable energy sources.

Note: * *The European Union will make the decision to reduce emission levels by 30 per cent by 2020 compared to levels from 1990, if other developed countries undertake to reduce their emissions comparably, and the developing countries contribute to the extent of their covenants and capabilities.*

Source: *Own.*

The efficiency of the above-described target is to be supported by the so-called flagship initiatives at the level of EU organisations, member states as well as local and regional authorities. In comparison to the strategy of Lisbon (Kok, 2004), a new instrument for implementing the Europe 2020 Strategy is the so-called *flagship initiatives* aiming to accelerate and set the right direction for the performance of each target detailed in the +Strategy (Sulmicka, 2011). The target values for the Europe 2020 Strategy are general and refer to the EU as a single economic unit. However, due to the considerable economic and social differentiation of member states, for each of them it is acceptable to adopt an appropriate point of reference and target values realisable within the time horizon adopted in the Strategy. Considering the specific characteristics of a given member state and its problem areas, a distinct means for target accomplishment can be used as well. This is linked to alignment of headline targets of the European Union adopted in the Strategy with country-specific targets and adopting relevant target accomplishment methods. An effect of measures undertaken by member states individually should be an accomplishment of common EU targets, including reinforcement of the global position of the EU (Klikocka, 2019).

2. Materials and Methods

The following article evaluates the status of indicators monitoring Strategy 2020 achieved by respective EU-28 countries in 2000-2018. Indicators of *sustainable*

growth were analysed - lasting and sustainable growth promotes “green”, low-carbon economy, efficiently utilizing natural resources, that is competitive thanks to such orientation. “Green growth” is now deemed both a chance to shift the limits of growth and an opportunity to create new jobs. The EU aspires to being a leader in the area of environmental technologies and natural environment protection. The evaluation covered indicators such as: (1) Greenhouse gas emissions, base year 1990, (2) Greenhouse gas emissions in Effort Sharing Decision (ESD) sectors, (3) Share of renewable energy in gross final energy consumption, (4) Primary energy consumption, (5) Final energy consumption.

This paper aims to verify the hypothesis that prolonged economic problems of European economies dispute the success and timely performance of certain priorities of Europe 2020 Strategy. In connection with a relatively high level of unemployment and unfavourable demographic structure in many EU member states, the success of the Strategy may require a longer time horizon. The paper employs descriptive analysis, statistical data analysis and comparative analysis methods.

3. Results

Greenhouse gas emissions, base year 1990: this indicator shows trends in total man-made emissions (of both the ESD and ETS sectors) of the ‘Kyoto basket’ of greenhouse gases. It presents annual total emissions in relation to 1990 emissions. The ‘Kyoto basket’ of greenhouse gases includes carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and the so-called F-gases (hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride (NF₃) and sulphur hexafluoride (SF₆)). These gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO₂ equivalents. The indicator does not include gas emissions and removals acted to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. It does however include emissions from international aviation. CO₂ emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals.

The EU as a whole is committed to achieving at least a 20% reduction of its greenhouse gas emissions by 2020 compared to 1990. This objective implies: - a 21 % reduction in emissions from sectors covered by the EU ETS (emission trading scheme) compared to 2005 by 2020; - a reduction of 10 % in emissions for sectors outside the EU ETS covered by the ESD (effort sharing decision). To achieve this 10% overall target each Member State has agreed country-specific greenhouse gas emission limits for 2020 compared to 2005 (European Environment Agency, 2009).

Eurostat data for respective member states indicates that the greenhouse gas emissions indicator in 2018 compared to 1990, adopted as 100%, was the best in:

Table 2. Greenhouse gas emissions (annual) (1990 = 100%)

Country	Greenhouse gas emissions (1990 = 100) (2020 - 1990 → 20%)					2018 –	2018 –
	(2020 - 2005 → 10%)					1990	2005
	2000	2005	2010	2015	2018	Target 20%	Target 10%
European Union 27	92.5	94.6	87.3	80.1	79.3	20.7	15.3
European Union 28	92.4	93.9	86.2	78.3	76.8	23.2	17.1
Austria	103.3	118.9	109.2	101.6	102.7	-2.7	16.2
Belgium	103.3	100.2	92.6	82.8	82.7	17.3	17.5
Bulgaria	58.4	63.1	59.7	60.9	57.2	42.8	5.9
Croatia	80.0	93.2	87.5	75.6	75.2	24.8	18.0
Cyprus	144.9	159.6	161.5	142.0	153.8	-53.8	5.8
Czech Republic	75.8	75.1	71.1	65.3	64.8	35.2	10.3
Denmark	101.4	95.5	90.9	70.7	70.7	29.3	24.8
Estonia	42.7	47.4	52.3	45.2	50.0	50.0	-2.6
Finland	98.7	98.6	107.1	79.1	81.4	18.6	17.2
France	101.8	102.5	94.8	85.3	83.1	16.9	19.4
Germany	84.3	80.6	76.6	73.8	70.4	29.6	10.2
Greece	122.0	131.4	114.5	93.0	90.8	9.2	40.6
Hungary	78.3	80.7	69.4	64.9	67.8	32.2	12.9
Ireland	124.0	127.7	112.5	109.6	113.6	-13.6	14.1
Italy	107.7	114.4	100.4	86.3	84.4	15.6	30.0
Latvia	40.0	43.7	47.6	43.4	46.0	54.0	-2.3
Lithuania	40.5	47.4	47.6	43.4	46.0	54.0	1.4
Luxembourg	80.7	108.8	102.4	88.7	94.2	5.8	14.6
Malta	112.6	117.0	118.8	94.2	96.1	3.9	20.9
Netherlands	101.5	99.7	99.0	91.6	88.6	11.4	11.1
Poland	83.4	85.2	87.1	82.7	87.4	12.6	-2.2
Portugal	139.1	146.2	119.0	118.0	118.9	-18.9	27.3
Romania	57.7	61.0	50.1	47.1	46.8	53.2	14.2
Slovakia	67.0	69.9	63.2	57.0	59.2	40.8	10.7
Slovenia	102.4	110.0	105.2	90.2	94.3	5.7	15.7
Spain	135.4	154.7	126.2	119.8	119.7	-19.7	35.0
Sweden	96.6	94.5	91.82	77.1	75.3	24.7	19.2
United Kingdom	91.7	89.7	79.3	66.9	61.6	38.4	28.1
Iceland	115.9	113.4	134.3	138.6	155.8	-55.8	-42.4
Lichtenstein	108.2	115.8	100.5	87.0	79.6	20.4	36.2
Norway	107.5	108.1	108.9	107.5	103.2	-3.2	4.9
Switzerland	101.2	103.2	103.3	93.4	91.0	9.0	12.2
Turkey	136.6	154.8	184.1	220.0	242.4	-142.4	-87.6

Source: Eurostat; www.eurostat.database/.

Latvia 54%, Lithuania 54%, Romania 53,2%, Estonia 50%, Bulgaria 42.8%, Slovakia 40%, United Kingdom 38.4, Czech Republic 35.2%, Hungary 32.2%, Germany 29.6%, Denmark 29.3%, Croatia 24.8%, and Sweden 24.7%. Those countries decreased their greenhouse gas emissions above the assumed threshold, that is, 20% in the relation 2020 → 1990. However, according to a headline target of the Strategy 2020, the European Union will make the decision to reduce emission levels by 30 per cent by 2020 compared to levels from 1990 if other developed countries undertake to

reduce their emissions comparably, and the developing countries contribute to the extent of their covenants and capabilities.

Table 3. Greenhouse gas emissions in Effort Sharing Decision (ESD) sectors (annual, million tonnes CO₂ equivalent)

Country	Greenhouse gas emissions in ESD sectors (annual, million tonnes CO ₂ equivalent)					Dynamics: Increase↑, decrease↓	
	2005	2010	2015	2018	Target	2018→ 2005	2018→ Target
European Union 27	2457	2373	2193	2233	·	·	·
European Union 28	2871	2743	2519	2562	2618	↓	↓
Austria	56.4	51.9	49.3	50.6	47.7	↓	↑
Belgium	78.7	78.2	72.7	71.3	68.2	↓	↑
Bulgaria	26.0	25.5	25.3	26.8	26.5	↑	↑
Croatia	17.5	17.5	15.6	17.2	19.3	↓	↓
Cyprus	4.2	4.4	4.1	4.2	4.0	=	↑
Czech Republic	62.4	62.2	61.3	64.1	67.2	↑	↓
Denmark	39.6	37.6	32.5	32.4	32.1	↓	↑
Estonia	6.3	6.7	6.1	6.3	6.0	↓	↑
Finland	34.0	33.5	30.0	30.0	28.51	↓	↑
France	395.8	379.3	353.0	343.1	342.5	↓	↑
Germany	476.1	460.3	444.1	441.2	410.9	↓	↑
Greece	62.1	55.9	45.4	44.9	60.0	↓	↓
Hungary	45.8	41.9	41.4	43.3	52.8	↓	↓
Ireland	46.6	43.3	43.0	45.4	37.6	↓	↑
Italy	330.2	303.3	273.3	274.7	291.0	↓	↓
Latvia	8.5	9.0	9.0	9.2	10.0	↑	↓
Lithuania	11.3	11.4	13.2	14.1	15.2	↑	↓
Luxembourg	10.1	9.6	8.6	9.1	8.1	↓	↑
Malta	0.9	1.0	1.3	1.5	1.2	↑	↑
Netherlands	123.2	127.4	101.1	101.8	107.4	↓	↓
Poland	182.0	202.8	186.8	218.0	205.2	↑	↑
Portugal	47.0	43.5	40.6	40.7	49.1	↓	↓
Romania	79.4	69.1	74.6	74.3	89.8	↓	↓
Slovakia	22.1	23.0	20.1	21.9	25.9	↓	↓
Slovenia	11.8	11.6	10.7	11.0	12.3	↓	↓
Spain	236.8	114.1	196.1	202.7	212.4	↓	↓
Sweden	42.5	39.2	33.9	62.7	36.1	↑	↑
United Kingdom	413.7	369.6	326.0	329.4	350.9	↓	↓

Source: Eurostat; www.eurostat.database/.

Table 3 shows that nine countries already exceeded the planned 30% threshold in 2018. In highly developed countries, such as Germany and Denmark, the reduction of greenhouse gases is also close to reducing the emission to 30% compared to the levels of 1990. A favourable trend in reducing greenhouse gas emissions in the relation 2020 → 2005 was noted in most member states of the European Union and other European countries.

However, in Poland, Cyprus, Ireland, Portugal, and Spain emissions are expected to drop further despite in the relation 2020 → 2005 there being a very noticeable

improvement of the said indicator (Table 2). This situation seems optimistic; however, considering changes and problems in the EU market (shift of economies towards low-carbon resources, United Kingdom possibly leaving the European Union), it must be assumed that the discussed process of reducing greenhouse gas emissions will be subject to slow change on a long-term basis.

Table 4. Share of renewable energy in gross final energy consumption (annual, in %)

Country	Share of renewable energy in gross final energy consumption (in %)				Target	Dynamics: Increase+, decrease -	
	2005	2010	2015	2018		2018→ 2010	2018→ target
European Union 27	10.24	14.28	17.85	18.88	.	.	.
European Union 28	9.11	13.16	16.73	17.98	20	+	-
Austria	24.38	31.20	33.54	33.43	34	+	-
Belgium	2.32	5.64	8.00	9.42	13	+	-
Bulgaria	9.17	13.93	18.26	20.53	16	+	+
Croatia	23.69	25.10	28.97	28.02	20	+	+
Cyprus	3.13	6.17	9.93	13.9	13	+	+
Czech Republic	7.11	10.51	15.07	15.15	13	+	+
Denmark	15.96	21.90	30.83	35.71	30	+	+
Estonia	17.42	24.57	28.23	30.0	25	+	+
Finland	28.83	32.44	39.32	41.16	38	+	+
France	9.60	12.67	15.01	16.59	23	+	-
Germany	7.17	11.69	14.90	16.48	18	+	-
Greece	7.28	10.08	15.69	18.00	18	+	+
Hungary	6.93	12.74	14.50	12.50	13	+	-
Ireland	2.81	5.71	9.11	11.06	16	+	-
Italy	7.55	13.02	17.52	17.77	17	+	+
Latvia	32.26	30.37	37.54	40.29	40	+	+
Lithuania	16.77	19.64	25.75	24.45	23	+	+
Luxembourg	1.40	2.86	5.05	9.06	11	+	-
Malta	0.12	0.98	5.12	7.98	10	+	-
Netherlands	2.48	3.92	5.66	7.38	14	+	-
Poland	6.9	9.25	11.74	11.28	15	+	-
Portugal	19.53	24.16	30.51	30.32	31	+	-
Romania	17.57	22.83	24.78	23.75	24	+	-
Slovakia	6.36	9.10	12.88	11.90	14	+	-
Slovenia	16.00	20.42	21.89	21.15	25	+	-
Spain	8.43	13.81	16.23	17.45	20	+	-
Sweden	40.72	46.96	53.01	54.64	49	+	+
United Kingdom	1.16	3.78	8.34	11.02	15	+	-
Iceland	60.27	70.27	70.26	72.21	.	+	.
Norway	60.10	61.51	69.19	72.75	.	+	.
Montenegro	35.91	40.66	43.09	38.81	.	-	.
North Macedonia	16.47	16.45	19.53	18.12	.	-	.
Albania	31.37	31.87	34.39	34.86	.	-	.
Serbia	14.28	19.76	22.00	20.32	.	-	.
Turkey	15.52	14.01	13.60	13.66	.	-	.
Kosovo	19.77	18.23	18.48	24.90	.	+	.

Source: Eurostat; www.eurostat.database/.

Table 5 groups EU countries with respect to the amount of reduction of greenhouse gas emissions in 2018 in relation to year zero, that is, 1990. The largest, up to 40%, reduction in emissions was recorded by countries of the former Eastern bloc such as: Latvia, Lithuania, Estonia, Romania, Slovakia, and Bulgaria. This phenomenon can be deemed very advantageous in reducing emissions.

Table 5. Division and order of states in 2018 according to the values of the Europe 2020 Strategy indicators

Asc endi ng	Greenhouse gas emissions (annual averages)				
	<70	70-80	80-90	90-100	>100
↑	Latvia Lithuania Estonia Romania Slovakia Bulgaria United Kingdom Czech Republic Hungary	Germany Denmark Croatia Sweden	Finland Belgium France Italy Poland Netherlan ds	Greece Luxemb ourgh Slovenia Malta	Austria Ireland Portugal Spain Cyprus
Asc endi ng	Greenhouse gas emissions in ESD sectors (annual - million tonnes CO ₂ equivalent)				
	<20	20-50	50-100	100-200	>200
↑	Malta Cyprus Estonia Luxembou rgh Latvia Slovenia Lithuania Croatia	Slovakia Bulgaria Finland Denmark Portugal Hungary Greece Ireland	Austria Sweden Czech Republic Belgium Romania	Netherla nds	Spain Poland Italy United Kingdom France Germany
Asc endi ng	Share of renewable energy in gross final energy consumption (in %)				
	<10	10-15	15-20	20-30	>30
↑	Netherlan ds Malta Luxembou rgh Belgium	United Kingdom Ireland Poland Slovakia Hungary Spain Italy Cyprus	Czech Republic Germany France Spain Greece	Bulgaria Lithuani a Slovenia Romania Croatia	Estonia Portugal Austria Denmark Latvia Finland Sweden

Source: Own list.

However, on the other hand, it may lead to the collapse of national economies, especially in the area of industry that is the main source of CO₂ emissions. Other

countries that reduced their greenhouse gas emissions to 80% in relation to year 1990 are: The United Kingdom, Czech Republic, Hungary, Germany, Denmark, Croatia, and Sweden. Countries other than those mentioned above have not fulfilled the provisions of Strategy 2020 so far and their greenhouse gas emission levels are still high. The highest level of emissions that have not been reduced according to Strategy 2020 is noted in Austria, Ireland, Portugal, Spain, and Cyprus. In those countries, emission levels in 2018 were considerably higher than in 1990. On the other hand, this phenomenon can point to a higher level of development of national economies based on consumption of conventional energy and a related growth in emissions.

Greenhouse gas emissions in ESD sectors: the indicator calculation is based on the emissions covered under the Effort Sharing Decision (European Environment Agency, 406/2009/EC). The Effort Sharing Decision sets national annual binding targets for emissions not covered under the EU emission trading scheme (ETS). The ESD emissions are calculated by deducting ETS verified emissions, CO₂ emissions from domestic aviation and NF₃ emissions from national total emissions. Total emissions are national totals reported under the UNFCCC (excluding LULUCF, international aviation and international maritime transport).

According to Eurostat data for respective countries, the greenhouse gas emissions indicator in Effort Sharing Decision (ESD) sectors in 2018 was positively reduced in relation to its value in year 2005 among most of the 29 European Union's communities, that is: Austria, Belgium, Croatia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, and the United Kingdom. On the other hand, greenhouse gas emissions in Effort Sharing Decision (ESD) sectors in 2018 increased in comparison to 2005 in countries such as: Bulgaria, the Czech Republic, Latvia, Lithuania, Malta, Poland, and Sweden.

These are predominantly countries of the former Eastern bloc and the increase in the said indicator may suggest that they have overcome the economic slowdown after political system transformations in 1989 and started developing their national economies which boosted the requirement for energy. As regards the greenhouse gas emissions target adopted for implementation in 2020 in Effort Sharing Decision (ESD) sectors, only some of the EU countries accomplished that target in 2018. These are: Croatia, Czech Republic, Greece, Hungary, Italy, Latvia, Lithuania, Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, and the United Kingdom (Table 3). Table 5, grouping EU countries according to greenhouse gas emissions in Effort Sharing Decision (ESD) sectors, shows that the lowest emissions, expressed as the annual million tonnes CO₂ equivalent, were noted for: Malta, Cyprus, Estonia, Luxembourg, Latvia, Slovenia, Lithuania and Croatia (less than 20 million tonnes CO₂ equivalent per year). On the other hand, the largest amounts of greenhouse gases in Europe in 2018 were emitted by: Germany, France, the United Kingdom, Italy, Poland and Spain (more than 200 million tonnes CO₂ equivalent per year). Therefore, these

are the countries from which it should be particularly expected that they reduce emissions to the adopted target levels.

Share of renewable energy in gross final energy consumption: this indicator is based on the definitions included in the Directive 2009/28/EC (Renewable Energy Directive) on the promotion of the use of energy from renewable sources. It is calculated on the basis of data collected in the framework of Regulation (EC) No. 1099/2008 on energy statistics and complemented by specific supplementary data transmitted by national administrations to Eurostat. This indicator measures how extensive the use of renewable energy is and, by implication, the degree to which renewable fuels have substituted fossil and/or nuclear fuels and therefore contributed to the decarbonisation of the EU economy. It also shows what the progress is on an EU level towards the Europe 2020 target for renewable energies of increasing the share of renewable energy in gross final energy consumption to 20% by 2020.

According to Table 4, all countries of the European Community considerably increased the share of renewable energy in gross final energy consumption in 2018 compared to 2010. Only Balkan countries, that are still not members of the Community, have a high share of renewable energy in gross final energy consumption. However, only in Turkey (13.66%) and North Macedonia (18.12%) the share of renewable energy in gross final energy consumption is low. Other analysed countries, including Iceland, Norway, Montenegro, Albania, Serbia, and Kosovo, have a significant share of renewable energy in gross final energy consumption.

Respective member states set their targets related to increasing the share of renewable energy in gross final energy consumption on their own account. Table 4 indicates that the target share of renewable energy was attained in: Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Greece, Italy, Latvia, Lithuania, and Sweden.

A noticeably low share of renewable energy in gross final energy (less than 10%) is observed in European Community countries such as the Netherlands, Malta, Luxembourg, and Belgium. Generally, the European Union aims to ensure that all countries of the Community reach a 20% share of renewable energy in gross final energy consumption. Until 2018 this target was attained in: Bulgaria, Lithuania, Slovenia, Romania, and Croatia. On the other hand, Estonia, Portugal, Austria, Denmark, Latvia, Finland, and Sweden report renewable energy exceeding 30% of gross final energy. Many of these countries have natural unconventional sources of energy such as solar energy, wind, or water, so they found it easier to maintain the declared regimes.

However, the share of renewable energy in gross conventional energy is an objective declared by respective countries. For example, Poland reported a target of 15% to be implemented by 2020. In 2018 the share of this energy was 11.28%, which means that measures to increase the share of renewable energy in gross final energy consumption

must be continued. It is worth noting that, compared to other countries, Poland is distinguished by a high share of geothermal waters and it seems that this source of unconventional energy should be considered for use (Klikocka, 2001). Moreover, a large area in Poland is covered by grain production and its part could be used for the purposes of bioethanol production (Klikocka *et al.*, 2019).

Table 6. Primary energy consumption (Europe 2020-2030). (Million tonnes of oil equivalent -TOE)

Country	Primary energy consumption (Million tonnes of oil equivalent -TOE)						Dynamics: Increase↑, decrease↓	
	2000	2005	2010	2015	2018	Target	2018→ 2005	2018→ Target
European Union 27	1397	1498	1459	1354	1376	·	·	·
European Union 28	1619	1721	1664	1538	1552	1483	↓	↑
Austria	27.49	32.71	32.86	31.62	31.80	31.5	↓	↑
Belgium	52.44	51.56	54.14	46.06	46.84	43.7	↓	↑
Bulgaria	17.65	19.22	17.40	17.96	18.36	16.9	↓	↑
Croatia	7.79	9.14	8.86	7.96	8.18	11.15	↓	↓
Cyprus	2.34	2.48	2.68	2.28	2.55	2.2	↑	↑
Czech Republic	39.13	42.51	42.66	39.74	40.39	39.6	↓	↑
Denmark	19.12	19.45	20.02	16.92	17.96	14.4	↓	↑
Estonia	4.56	5.05	5.58	5.33	6.17	6.5	↑	↓
Finland	31.62	33.56	35.50	31.15	32.66	35.9	↓	↓
France	239.8	260.9	254.4	244.4	238.9	219.9	↓	↑
Germany	317.1	321.6	315.1	295.3	291.7	276.6	↓	↑
Greece	27.07	30.17	27.11	23.23	22.42	24.7	↓	↑
Hungary	23.64	26.35	24.62	23.30	24.4	24.1	↓	↑
Ireland	13.69	14.95	14.70	13.92	14.54	13.9	↓	↑
Italy	166.1	180.8	167.3	149.1	147.2	158	↓	↓
Latvia	3.79	4.49	4.56	4.27	4.69	5.4	↓	↓
Lithuania	6.54	8.05	6.17	5.79	6.33	6.5	↓	↓
Luxembourg	3.60	4.77	4.61	4.14	4.46	4.5	↓	↓
Malta	0.81	0.92	0.93	0.75	0.82	0.7	↓	↑
Netherlands	66.94	70.11	71.72	63.74	64.71	60.7	↓	↑
Poland	84.85	87.99	96.56	90.06	101.1	96.4	↑	↑
Portugal	22.96	24.85	22.64	21.64	22.64	22.5	↓	↑
Romania	34.87	36.01	32.97	30.73	32.48	43	↓	↓
Slovakia	16.35	17.41	16.66	15.22	15.79	16.4	↓	↓
Slovenia	6.21	7.01	7.00	6.32	6.67	7.3	↓	↓
Spain	115.0	136.6	123.3	118.6	124.3	119.8	↓	↓
Sweden	45.96	49.26	48.59	44.32	46.78	43.4	↓	↓
United Kingdom	222.0	223.5	205.1	183.1	176.3	177.6	↓	↓
Iceland	3.22	3.21	5.53	5.80	6.53	·	↑	·
Norway	23.39	24.81	30.77	27.00	25.94	·	↓	·
Montenegro	·	1.02	1.09	0.99	1.04	·	↑	·
North Macedonia	2.68	2.89	2.85	2.59	2.52	·	↓	·
Albania	1.78	2.13	2.04	2.12	2.23	·	↑	·
Serbia	13.33	15.66	14.8	14.21	14.79	·	↓	·
Turkey	73.73	80.83	98.26	125.3	139.5	·	↑	·
Bosnia & Hercegovina	·	·	·	6.11	·	·	·	·
Kosovo	1.54	1.94	2.51	2.48	2.54	·	↑	·

Source: Eurostat; www.erorostat.databases.eu/

Primary energy consumption means the Gross Inland Consumption excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). This quantity is relevant for measuring the true energy consumption and for comparing it to the Europe 2020 targets. The "Percentage of savings" is calculated using these values of 2005 and its forecast for 2020 targets in Directive 2012/27/EU; the Europe 2020 target is reached when this value reaches the level of 20%.

Data given in Table 6 shows a positive trend in reducing energy consumption in most countries of the European Union in 2018 compared to 2005. An increase in primary energy consumption was only noted in Cyprus, Estonia, and Poland. This phenomenon can be explained with increased demand for energy in the above-mentioned countries due to economic growth and increased affluence of their inhabitants. However, in most countries of the Community energy consumption becomes a conscious good subject to limitations and, at the same time, more expensive, thus its consumption is reduced. Further reduction of primary energy consumption by countries of the Community should be expected. Among the analysed countries of the Community only Croatia, Estonia, Finland, Italy, Latvia, Lithuania, Luxembourg, Romania, Slovakia, and Slovenia can afford increasing their primary energy consumption, because they have not exceeded the adopted energy consumption targets (Table 6).

From Table 8 it follows that the largest consumers of primary energy in Europe are: Poland, Spain, the United Kingdom, France, and Germany (more than 100 million tonnes of oil equivalent). Thus, economies of these countries must be considered the most energy-consuming in Europe. The lowest requirement of energy is shown by citizens and economies of Malta, Cyprus, Luxembourg, Latvia, Estonia, Lithuania, Slovenia, and Croatia (less than 10 million tonnes of oil equivalent). This phenomenon may be due to the fact that these are countries with a small population and a small surface area.

Final energy consumption means all energy supplied to industry, transport, households, services, and agriculture (excluding deliveries to the energy transformation sector and the energy industries themselves). The quantity is relevant for measuring the energy consumption at a final place of energy use and for comparing it to the Europe 2020 targets. The "Percentage of savings" is calculated using these values of 2005 and its forecast for 2020 targets in Directive 2012/27/EU; the Europe 2020 target is reached when this value reaches the level of 20%.

The consumption of final energy in 20 countries of the European Community in 2018 was lower by only 5.86% in relation to the base year, that is, 2005. In order for the target adopted for the whole community of countries to be accomplished in 2020, the consumption of energy must still be reduced by 3.38%.

Table 7. Final energy consumption (Million tonnes of oil equivalent - TOE)

Country	Final energy consumption (Million tonnes of oil equivalent – TOE)						Dynamics: Increase↑, decrease↓	
	2000	2005	2010	2015	2018	Target	2018→ 2005	2018→ Target
European Union 27	980.0	1041	1024	957.4	989.5	·	↓	·
European Union 28	1133	1194	1167	1091	1124	1086	↓	↑
Austria	23.73	27.87	28.06	27.51	27.91	25.1	↓	↑
Belgium	37.72	36.60	37.72	35.93	36.33	32.5	↓	↑
Bulgaria	9.07	10.14	8.83	9.49	9.91	8.6	↓	↑
Croatia	6.00	7.24	7.21	6.59	6.85	7.0	↓	↓
Cyprus	1.65	1.83	1.93	1.67	1.86	1.8	↑	↑
Czech Republic	25.05	26.15	25.25	24.20	25.32	25.3	↓	↓
Denmark	14.72	15.50	15.52	14.21	14.96	14.4	↓	↑
Estonia	2.43	1.77	1.81	2.79	2.96	2.8	↑	↑
Finland	24.36	25.22	26.26	24.21	25.84	26.7	↑	↓
France	155.4	160.1	154.0	147.4	146.6	131.4	↓	↑
Germany	220.1	219.7	223.1	212.7	215.4	194.3	↓	↑
Greece	18.75	21.02	19.02	16.56	15.95	18.4	↓	↓
Hungary	16.15	18.74	17.45	17.40	18.54	14.4	↓	↑
Ireland	10.81	12.65	12.01	11.21	12.27	11.7	↓	↑
Italy	124.8	137.2	128.5	116.2	116.5	124.0	↓	↓
Latvia	3.25	4.02	4.12	3.79	4.18	4.5	↑	↑
Lithuania	3.77	4.67	4.81	4.86	5.55	4.3	↑	↑
Luxembourg	3.51	4.48	4.33	3.99	4.35	4.2	↑	↑
Malta	0.45	0.46	0.50	0.58	0.66	0.5	↑	↑
Netherlands	52.09	54.07	55.34	49.11	50.27	52.2	↓	↓
Poland	55.06	58.49	66.25	62.30	71.93	71.6	↑	↑
Portugal	17.96	19.01	18.10	16.01	16.91	17.4	↓	↓
Romania	22.69	24.6	11.41	21.85	25.53	30.3	↑	↓
Slovakia	10.96	11.56	11.54	10.06	11.11	9.0	↓	↑
Slovenia	4.45	4.90	5.04	4.69	4.98	5.1	↑	↓
Spain	80.02	98.08	89.09	80.35	86.84	80.1	↓	↑
Sweden	34.98	33.51	34.20	31.67	32.00	30.3	↓	↑
United Kingdom	153.3	153.0	143.1	132.7	134.7	129.2	↓	↑
Iceland	1.87	2.01	2.64	3.07	3.62	·	↓	·
Norway	18.1	18.59	19.70	18.71	19.02	·	↓	·
Montenegro	·	0.76	0.72	0.68	0.75	·	↓	·
North Macedonia	1.59	1.75	1.80	1.85	1.85	·	↑	·
Albania	1.53	1.90	1.92	1.97	2.13	·	↑	·
Serbia	6.94	9.50	9.00	8.18	9.00	·	↓	·
Turkey	56.41	63.66	74.70	93.09	101.7	·	↑	·
Bosnia & Herzegov.	·	·	·	3.50	·	·	·	·
Kosovo	0.76	0.98	1.20	1.34	1.47	·	↑	·

Source: Eurostat; www.eurostat.database/.

Based on data in Table 7, it can be concluded that among the analysed periods the best year in terms of accomplishing the target of reducing final energy consumption was 2015, whereas in the analysed year 2018 energy consumption increased and was close to that noted in the base year 2005. However, it is difficult to expect that economically weak or small EU countries, especially of the former Eastern bloc, by will reduce their requirement of energy for the needs of the population, industry, or agriculture. Table 8 shows low final energy consumption, below 10 million tonnes of oil equivalent in

2018 for: Malta, Cyprus, Estonia, Latvia, Luxembourg, Slovenia, Lithuania, Croatia, and Bulgaria. If the above-mentioned countries are to show any economic or civilizational development, it cannot be expected that they reduce the consumption of final energy by 20% in relation to 2005. Countries with strong economies such as France, the United Kingdom, Italy, and Spain clearly reduced their energy consumption levels, while Germany failed to reduce them to a similar extent. Only countries such as: Croatia, Czech Republic, Finland, Greece, Italy, Latvia, Netherlands, Portugal, Romania, and Slovenia accomplished the final energy consumption reduction targets adopted for their countries. Generally, it seems it will not be so easy for other countries of the European Community to attain the main target of Strategy 2020 (Table 7).

Table 8. Division and order of states in 2018 according to the values of the Europe 2020 Strategy indicators

Ascending	Primary energy consumption (Europe 2020-2030) (Million tonnes of oil equivalent - TOE)				
	<10	10-20	20-50	50-100	>100
↑	Malta Cyprus Luxembourg Latvia Estonia Lithuania Slovenia Croatia	Ireland Slovakia Denmark Bulgaria	Greece Hungary Portugal Austria Romania Finland Czech Republic Belgium Sweden	Netherlands	Poland Spain United Kingdom France Germany
Ascending	Final energy consumption (Million tonnes of oil equivalent - TOE)				
	<10	10-20	20-50	50-100	>100
↑	Malta Cyprus Estonia Latvia Luxembourg Slovenia Lithuania Croatia Bulgaria	Slovakia Ireland Denmark Greece Portugal Hungary	Czech Republik Finland Romania Austria Sweden Belgium	Netherlands Poland Spain	United Kingdom France Germany

Source: Own list.

4. Discussion

Building the innovation awareness of EU enterprises and implementing a system of incentives oriented at increasing the share of enterprises in financing R&D expenditure in the area of the climate package are of essential significance. Klikocka (2019) informs that in 2016, the number of European countries with increased expenditure on research and development (R&D) rose. The 3% level of R&D expenditure adopted in the Strategy was achieved in Austria (3.09% GDP) and Sweden (3.23% GDP). There were some other countries that either reached or exceeded their adopted targets for 2020; these are: Cyprus and Greece. As regards R&D expenditure in 2016, EU member states were strongly polarised, which to a great extent must be linked to the distinct structure of their economics.

The above-mentioned innovation leaders were accompanied by a considerable group of member states whose expenditure on R&D was lower than 1% of GDP (Bulgaria, Croatia, Cyprus, Greece, Lithuania, Latvia, Malta, Poland, Romania and Slovakia) or oscillated around 1.5% of GDP (Czech Republic, Estonia, Hungary, Ireland, Italy, Luxembourg, Portugal, Spain, and the United Kingdom). The presented results may suggest problems maintaining a high economic position for the European Union which in the Europe 2020 Strategy assumes boosting innovativeness and improving competitiveness by increasing expenditure on research and development to 3% of GDP (Gasz, 2014). A significant element of a global economy, next to relatively low cost of employment, should be competitiveness based on products made using new technologies. The possibility to catch up with the competitors from other regions of the world (USA, Japan, India, and China) is determined by the necessity to involve more public and private funds (both from the EU budget and from respective member states) for scientific research financing, in particular applied and developmental research, and for developing new technologies and renewable energy sources.

In a broad comparative analysis Höpker (2012) concludes that the assumed targets and accomplished results of the Lisbon strategy were not favourable and that the Lisbon strategy did not meet the political, social, and economic expectations of the European Union. None of the quantifiable targets regarding economic performance, employment, research and innovation, social cohesion and sustainable growth has been accomplished. Similarly, this refers to climate policy targets. Sulmicka (2011),

Bielski and Marks (2018) describing targets related to reduction of greenhouse gas emissions by at least 20% in comparison with year 1990 or 30% in favourable conditions, a 20% increase in the share of renewable energy in final energy consumption and a 20% increase in energy efficiency, concludes that they are also subject to controversies. In particular, in this group of targets strict standards related to reducing the emissions of CO₂ are the most controversial and can potentially have hazardous consequences. In particular, countries like Poland, with coal-based economies, in attempting to restructure their energy industry in order to meet the above-mentioned targets should remember that the implementation of the above-mentioned targets adopted in the Europe 2020 Strategy under the energy and climate package for the years 2012-2020 is part of a wider EU energy policy.

This policy also assumes cohesion with supplies security targets and should consider special characteristics of member states and their needs related to flexibility in developing sources of energy. Decarbonisation in Poland, forced by the targeted reduction in the emissions of carbon dioxide, poses a risk of a rapid increase in costs and related decrease in production competitiveness, and - as a consequence - an increase in unemployment, costs of maintenance and impoverishment of the society. The intention of unusually urgent and necessary stimulation of shifting towards renewable energy sources in the circumstances of an inevitable depletion of non-renewable energy reserves is simultaneously to diversify the fuel reserves of the EU,

reduce the emissions of greenhouse gases and create new opportunities for earning and employment in rural areas.

However, as shown by previous practice, dangerous traps may occur during the implementation of this obviously justified target. This is illustrated by the devastating effects connected with destruction of tropical forests in order to increase the oil palm crops for the needs of satisfying the rapidly growing demand for palm oil due to the introduction of the EU fuel directive. Sulmicka (2011) writes that out of the three targets mentioned, energy efficiency should be the least controversial. But also, in this case, this is not as simple and easy as it seems. Due to the so-called *rebound effect*, in practice a decrease in unit consumption often leads to an increase in general consumption through cut-downs on costs and prices and, as a result, increase in demand. Besides, the method of calculating such savings (i.e. in relation to the hypothetical consumption of energy if the level of energy consumption remained unchanged in relation to the base year) created a potential field for “creative” calculation by respective member states.

The present climate policy in the European Union and Climate packages for all countries of the world contain proposals for further tightening of the targets to be attained by 2030, 2040 and 2050. Under the measures for accomplishing the targeted maintenance of global warming below 2°C, the European Union undertook to adopt a long-term target comprising an 80-95 per cent reduction of its emission levels by 2050 in comparison with the levels from 1990. It will attain it together with a group of developed countries undertaking similar measures. In order to reduce emissions to such a level, the EU will be required to shift to low-carbon economy - zero-carbon economy.

In 2011, the European Commission published an action plan indicating the most economical way to approach a competitive low-carbon economy by 2050 and identifying milestones to facilitate the measurement of progress. The action plan shows how different sectors - from generation of electricity to agriculture - can help attain this target (Streikus *et al.*, 2019). Until the middle of the 21st century, the energy generation sector will have to become a nearly 100 per cent zero-carbon sector. Thanks to increasing the energy efficiency in 2050, EU will consume 30 per cent less energy. The use of locally generated energy can contribute to reducing the dependency on import and changing to low-carbon economy will help reduce air pollution and decrease the related costs of health care (European Commission, 2013).

5. Conclusions

To sum up, it should be emphasized that the Europe 2020 Strategy continuing the Lisbon Strategy is a ground-breaking project of strategic importance to the social and economic condition of the EU. However, also in this case it should be considered whether the adopted directions for change must be evaluated as reasonable and

whether or not it is possible to accomplish all the adopted targets simultaneously (Gasz, 2014; Kukuła, 2017; Ząbkowicz, 2017). The implementation of the *Innovation Union* priority requires that the share of the high technologies sector in the economies of EU member states be systematically increased.

This is particularly significant in the context of a necessary reduction of the competitive gap between the economies of the EU and the USA, which is connected with the need for continuous rises in expenditure on research and development, on scientific research, and especially applied and developmental research, development of new technologies and renewable energy sources, levelling differences in expenditure on research and development between member states and increased involvement of the private sector in R&D financing. The increased involvement of public and private funds will determine the possibility to catch up with global competition from other regions of the world (USA, Japan, India, and China). Therefore, the common road to accomplishing the targets of the Europe 2020 Strategy may turn out to go beyond the projected time horizon.

In addition, as anticipated by Grosse (2010), Smith (2005), Callaghan and Höpner (2005), the transfer of national legal regulation abroad is deemed one of the mechanisms ensuring advantage in international relations. This practice has been present in the common market for a long time and led to strong institutional competition between member states as well as attempts at incorporating solutions offered by national economic laws into EU law.

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