Delivery of sustainable supply of non-food biomass to support a "resource-efficient" Bioeconomy in Europe

S2Biom Project Grant Agreement n°608622

D7.2a
Market analysis of heat, electricity and biofuels

15 November 2015




About S2Biom project

The S2Biom project - Delivery of sustainable supply of non-food biomass to support a "resource-efficient" Bioeconomy in Europe - supports the sustainable delivery of non-food biomass feedstock at local, regional and pan European level through developing strategies, and roadmaps that will be informed by a "computerized and easy to use" toolset (and respective databases) with updated harmonized datasets at local, regional, national and pan European level for EU-28, Western Balkans, Moldova, Turkey and Ukraine. Further information about the project and the partners involved are available under www.s2biom.eu.

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About this document

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Executive summary

The main aim of the S2Biom project is to support the sustainable delivery of non-food biomass feedstock at local, regional and pan European level through developing strategies and roadmaps that will be informed by a “computerized and easy to use” toolset (and respective databases) with updated harmonized datasets at local, regional, national and pan European level for EU28, Western Balkans, Moldova, Turkey and Ukraine. The research work foreseen will cover the whole biomass delivery chain from primary biomass to end-use of non-food products and from logistics, pre-treatment to conversion technologies.

As a part of this the S2Biom project explore perspectives for producing energy and materials from lignocellulosic biomass. The crucial general question to be addressed in WP7 is under which conditions there will be sufficient biomass to meet the EU renewable energy objectives (and the role biomass has to play in that) and provide a good feedstock basis for novel bio-based chemicals and materials. An element in WP7 is an analysis of the markets for bio-based industries. This task builds further on techno-economic data collected in WP2 and provides additional relevant information for the integrated assessment of tasks 7.3-5. For the market analysis 10 PMCs (product-market combinations) were identified as possible significant consumers of biomass resources in the Pan-European area, see list on the next page. The focus will be to quantify the demand for biomass feedstock for these PMCs in in 2020 and 2030.

The PMCs that will be discussed in this market review will be a part of the deliverable and include the PMCs 1 Heat, 2 Electricity, and 3 (Advanced) Biofuels.

The PMCs considered in the market review

1 Heat

2 Electricity

3 (Advanced) biofuels

4 C6 chemistry

5 C5 chemistry

6 Bio-methane

7 Aromatics

8 Methanol

9 Hydrogen

10 Ethylene

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1. Methodological notes

When referring to different countries, we make use of the country codes as used by the European Commission, which can be found in Annex II.

Data 2005

For all countries historical data as used in the National Renewable Energy Action Plans (NREAPs) was used for the year 2005.

Data 2010

For all countries included in this research for the year 2010 data was sourced from a variety of sources, such as national statistics, Eurostat, the EU Energy, Transport and GHG Emissions Trends to 2050 – reference scenario 2013 (EC, 2013), or the NREAPs when no other data was available.

Data 2015 and beyond

The future projections on bioenergy consumption in these three PMCs are based on data from the Green-X model as used in the FP7 project BETTER (Bringing Europe and Third countries Together through renewable EneRgies) (Green-X, 2014). For this use was made of the scenario with a 27% RES target in the EU and Energy Committee countries, assuming Turkey would not become an EU member nor Energy Community (EnC) affiliate (thus having a weaker RES target), and with cooperation within the EU possible, but no cooperation between the EU28 and non-EU28 countries (specific name of the scenario: Default-TRLowAmbition(weak)).

For Moldova and Ukraine, who were not part of the Green-X modelling, use was made of data from their respective National Renewable Energy Action Plans (NREAPs). This was further extrapolated to 2030 using the average growth in EU13 countries (Bulgaria, Cyprus, Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Malta, Poland, Romania, Slovenia, and Slovakia).

For the year 2015 a combination was made between the data available from the same sources as 2010 data and the Green-X modelling data. Most often either of the two data options was chosen in order to create a growth as smooth as possible between the historical data and the future projections. In rare cases taking the average of the two data points resulted in a much smoother growth line and was thus chosen. Only in PMC3: (Advanced) Biofuels Green-X data is also used for 2010 for some countries when this helps smooth the growth trend.

2. PMC1: Heat

2.1. Applications

Heat is generally divided into three sectors:

1) Heat demand by households: this includes mainly low temperature (< 100°C) heating for purposes such as space heating, water heating, cooking and some air conditioning.
2) Heat demand for services: this includes mainly space heating and cooling (low temperature < 100°C)
3) Heat demand in industry: this heat is used in industrial processes and is generally of higher temperature.

Furthermore, it can be divided into two categories regarding its supply:

1) Centralised: meaning that the heat is generated in a central facility and then brought to the consumer through a grid. For example district heating or CHP.
2) Decentralised: use of biomass in small-scale applications not connected to a grid. For example in wood stoves for space heating in households.

2.2. Market

2.2.1. Current market size

The current market size in this section refers to the consumption of heat from biomass resources and not to the total demand for heat per country. The current market size for heat from biomass resources is shown in Figure 1.

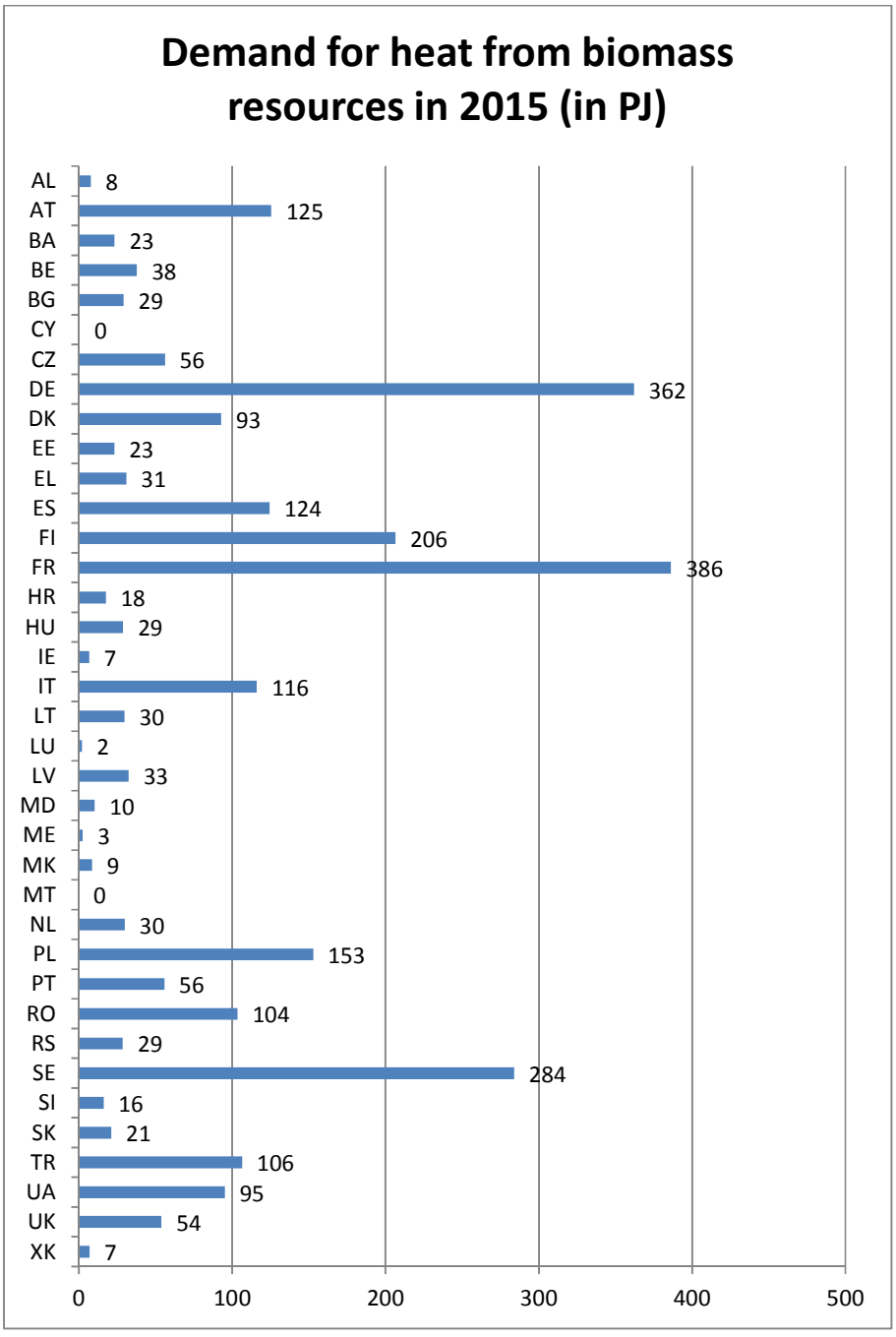


Figure 1: Consumption of heat from biomass resources in 2015 (in PJ)

Centralised vs. decentralised

Regarding centralised vs. decentralised biomass used for heat purposes in both the West Balkan region (excl. Croatia) and Turkey the demand for biomass for heating

purposes is for 98% met by decentralised installations. In the EU28 this is 68%. For the entire region 71% of the heat demand from biomass resources is supplied via decentralised technologies. No data is available for Moldova and Ukraine.

Demand by sector

In the region about half of heat demand from biomass resources stems from the household sector, see Figure 2. More than a third of the consumption is used for industrial purposes and the demand for heat from biomass in the service sector is 12%.

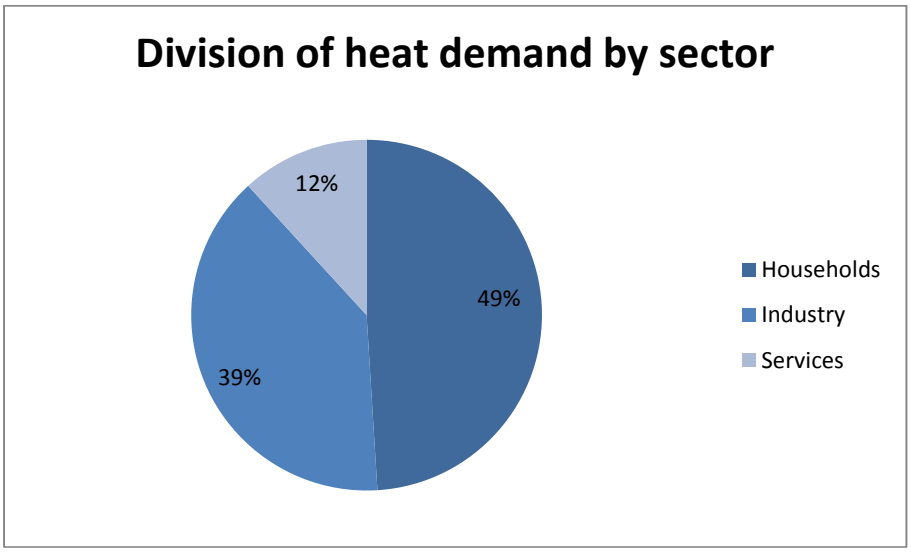


Figure 2: Share of heat demand from biomass resources by sector in 2015 in the region

2.2.2. Market development during past 10 years

Although overall the demand for heat from biomass resources increased from 2178 PJ in 2005 to 2715 PJ in 2015 in the region, not in all countries the demand has grown. For example in Bulgaria the demand was rather stable, Finland saw a drop in 2010 but returned to slightly above 2005 figures in 2015, and in Portugal and

Romania demand saw a decrease during the past 10 years. For all countries, see

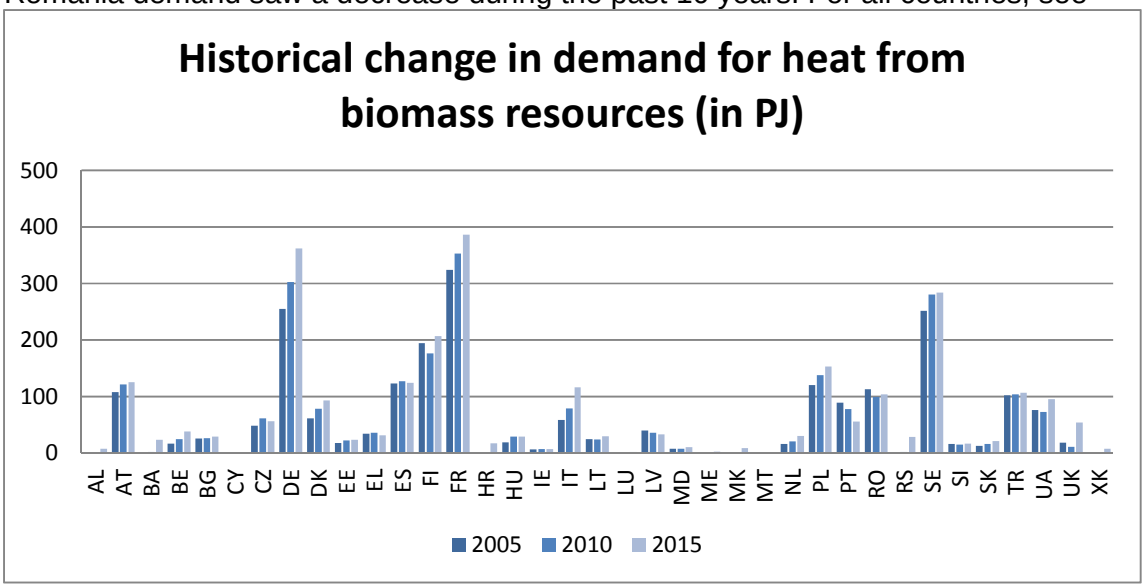


Figure 3.

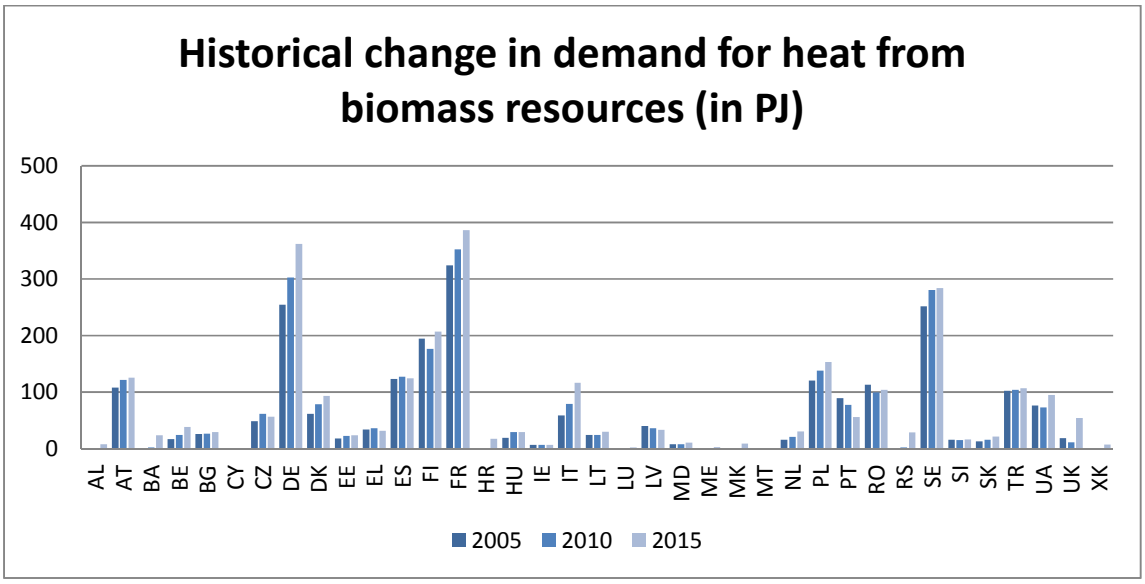


Figure 3: Historical development in heat demand from biomass sources (in PJ)

In the region the demand for heat from biomass in all three sectors, residential, industrial and services has increased over the last ten years, see Figure 4. In the sector industry the increase was the biggest, as the sector demand doubled between

2005 and 2015. For households and services the growth was much more modest and remained close to 10% over 10 years.

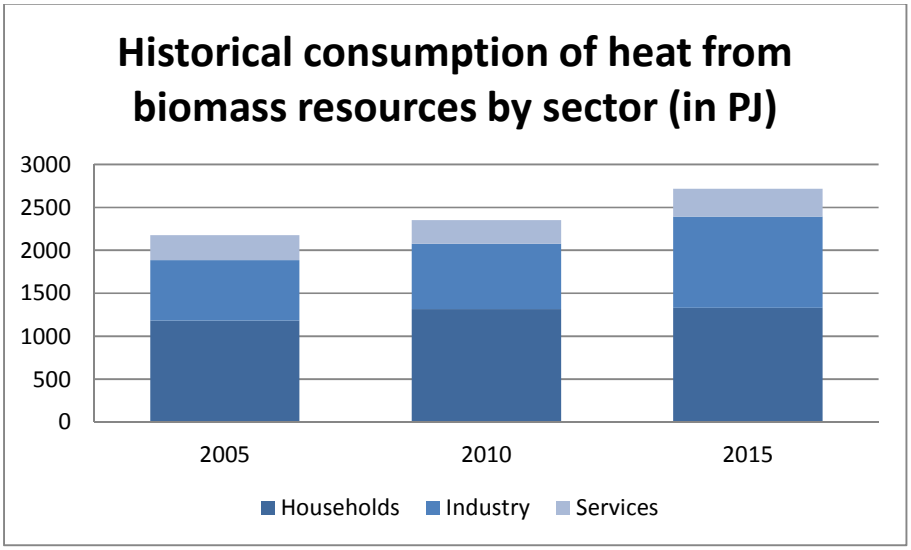


Figure 4: Growth in heat demand from biomass per sector (in PJ)

2.2.3. Expectation for 2020 and 2030

According to the projections from the Green-X model the overall demand for heat from biomass resources is expected to increase significantly between 2015 and 2030, see Figure 5, with an absolute increase of more than 2000 PJ, or on average 135 PJ/yr. This demand growth is increasing, with the yearly demand at 105 PJ/yr until 2020, 131 PJ/yr between 2020 and 2025 and 168 PJ/yr in the five year span until 2030.

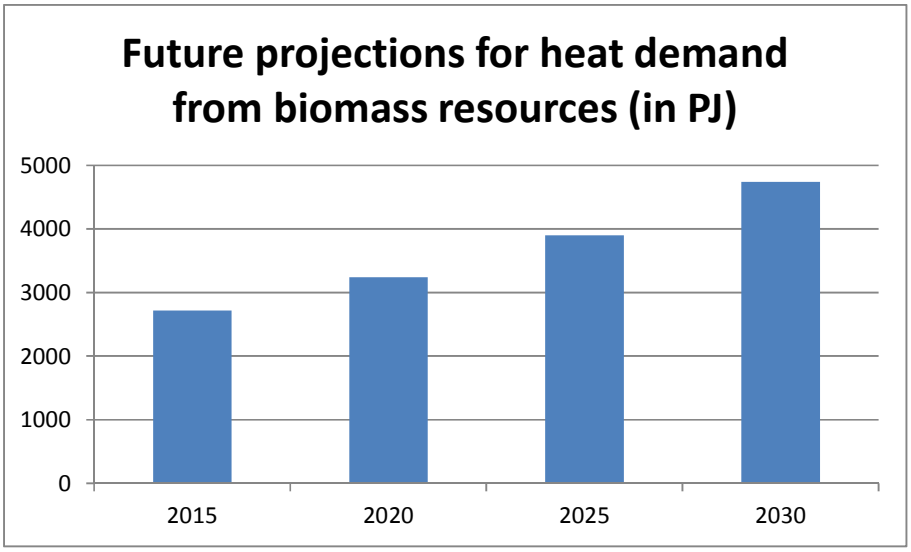


Figure 5: Total demand for heat from biomass resources in the entire region (in PJ)

In the region the demand for heat from biomass resources will increase between 2015 and 2030, see Figure 6. In some countries the demand will rise sharply, such as France, Turkey, and Ukraine. In other countries the growth is much more modest, like Estonia, Denmark, and Kosovo*. Also in some countries, the demand will remain virtually equal after 2020, such as Denmark and Greece.

* References to Kosovo shall be understood in the context of UN Security Council Resolution 1244 (1999).

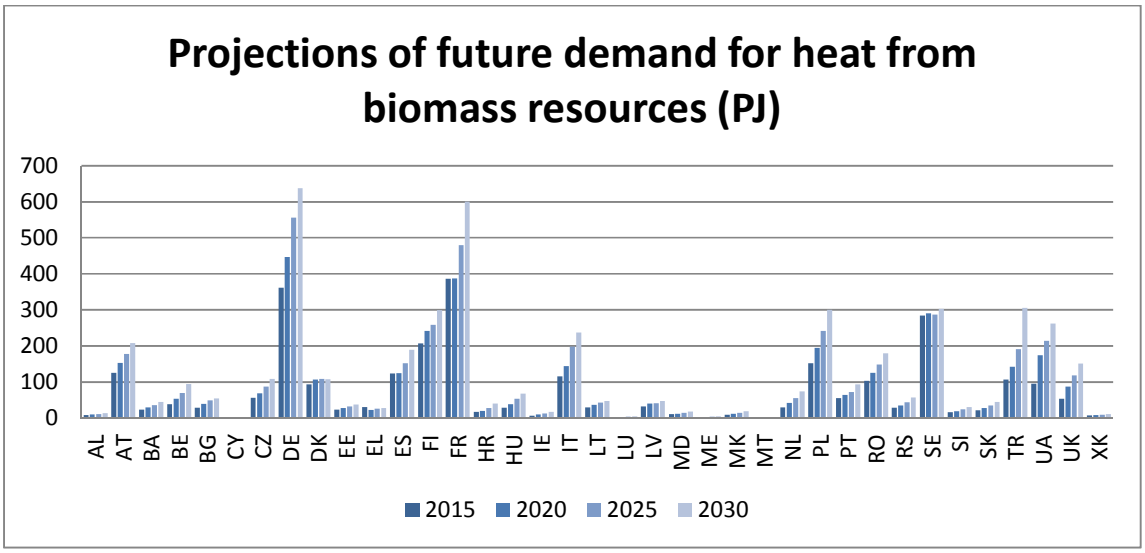


Figure 6: Heat demand from biomass resources until 2030 in all countries in the region (in PJ)

Centralised vs. decentralised

Using the Green-X modelling results we can see that there is also a shift in heat production from decentralised to centralised solutions, especially in Turkey, see Table 1.

Table 1: Share of decentralised consumption of heat from biomass resources

	2015	2020	2030
Total	71%	68%	66%
EU28	68%	66%	66%
Turkey	98%	91%	63%
Western Balkans	99%	95%	86%

Demand by sector

Although the overall demand for heat will increase until 2030, this is not the case in each separate sector, see Figure 7. There is a modest growth in the services sector and an increase of almost 200% of the industry sector, the households will be using less energy in 2030 than they use in 2015.

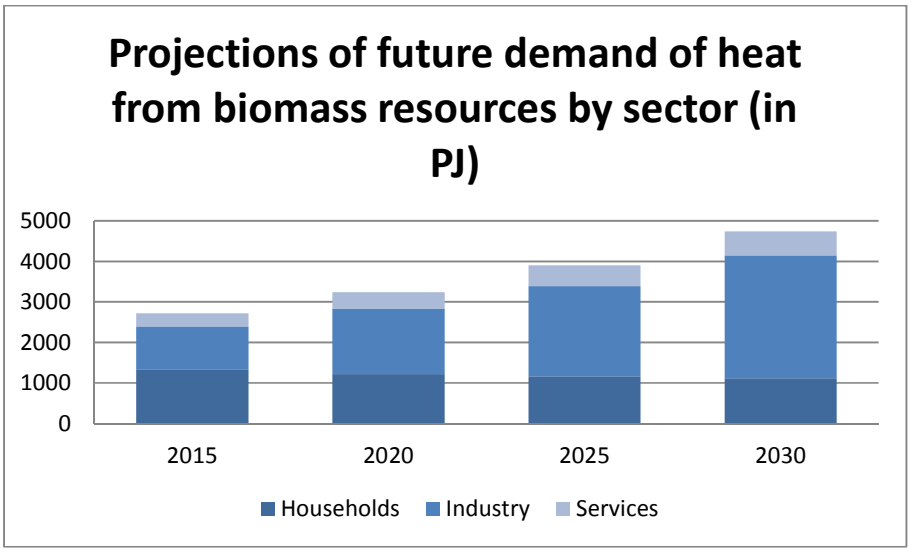


Figure 7: Expected changes in heat demand from biomass resources per sector (in PJ)

2.3. Reference production route

For households and services the most prevalent sources for meeting their heat demand are gas, coal, oil, electricity, and wood. The latter provides almost a quarter of the necessary heat on average in twelve countries in the east of Europe[†], so the use of biomass for heat generation is already significant. In households wood stoves are often used to generate heat.

For industrial applications the burning of gas or coal in boilers is most prevalent in providing the necessary heat for the production processes.

2.4. Bio-based heat production

2.4.1. Type of biomass feedstock used

According to the results from the Green-X model, most of the biomass that will be used for heat will be solid biomass, while bio-waste and biogas will play a much smaller role, see Figure 8.

[†] Bulgaria, Croatia, Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovakia, Slovenia, and Finland (ODYSSEE-MURE, 2014).

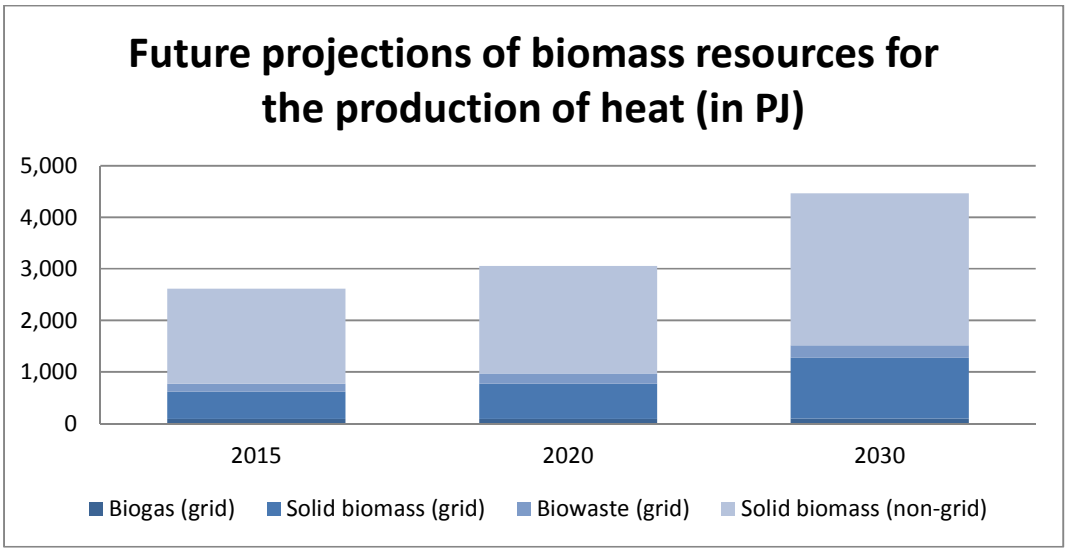


Figure 8: Sources of biomass in all regions (in PJ), except Moldova and Ukraine. Grid and non-grid are terms used in the original source (Green-X, 2014)

This solid biomass can be wood chips or wood pellets in boilers or on a larger scale co-firing in coal-fired power plants. For individual households direct combustion of forest biomass will remain important. This is especially true for more Eastern European countries, while countries like Sweden and Austria will likely make more use of pellets which have a higher calorific value (Atanasui, 2010).

3. PMC2: Electricity

3.1. Applications

Electricity has myriads of uses and is an essential part of modern life. Electricity is used by people for powering appliances that allow them to light, heat, cool, refrigerate, and operate appliances such as computers, electronics, machinery, but also for different forms of transport, such as trains and electric cars. Electricity use has increased sharply over the course of the last century and is projected to grow, albeit at as much slower pace, in the future.

3.2. Market

3.2.1. Current market size

In this section we will refer to the demand for electricity from biomass resources and not the more general demand for electricity The current market size for electricity from biomass resources is shown in Figure 9.

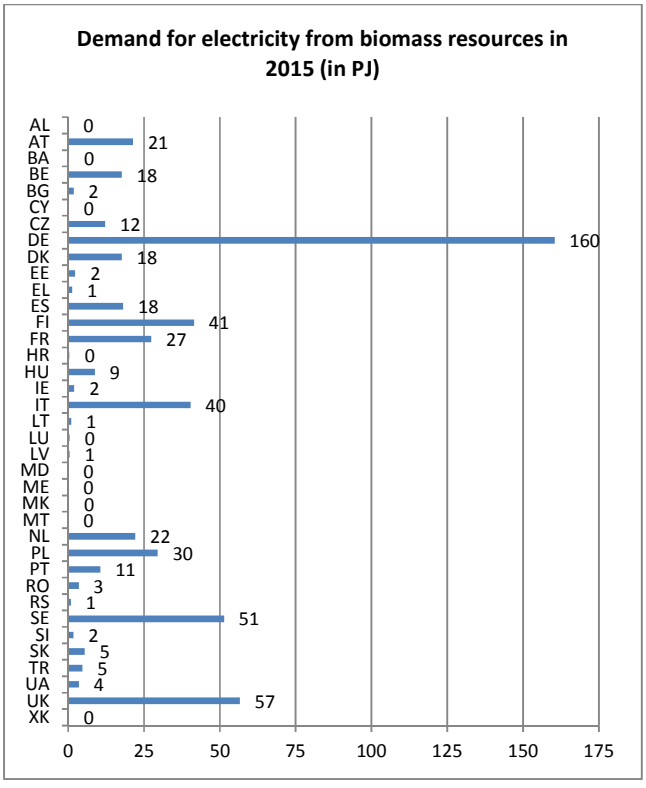


Figure 9: Demand for electricity from biomass in 2015 (in PJ)

3.2.2. Market development during past 10 years

The total demand for electricity from biomass resources has increased with more than 250% from 216 PJ in 2005 to 566 PJ in 2015, see Figure 10. This increase is for a large part due to the spectacular increase of biomass electricity from about 30 PJ to 160 PJ in Germany over the last ten years. In many other countries there was also a steady growth in biomass electricity, such as Austria, Spain, Italy and Sweden. Other countries in the past had virtually no consumption of electricity from biomass resources, but have recently increased their production of biomass electricity, such as Greece, Lithuania, Luxembourg and Slovakia.

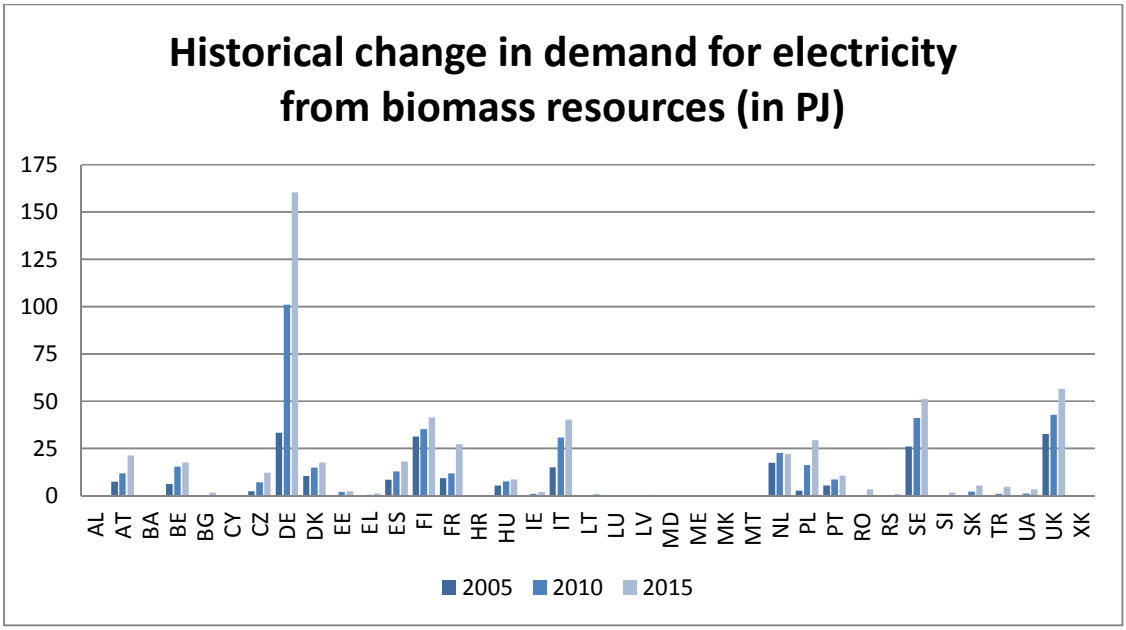


Figure 10: Production of electricity from biomass resources over the past ten years in the region (in PJ)

3.2.3. Expectation for 2020 and 2030

For the entire region it is expected that the production of electricity from biomass will increase until 2030, see Figure 11. The average growth until 2030 will be approximately 32 PJ/yr, with the highest growth in the period 2020 to 2025.

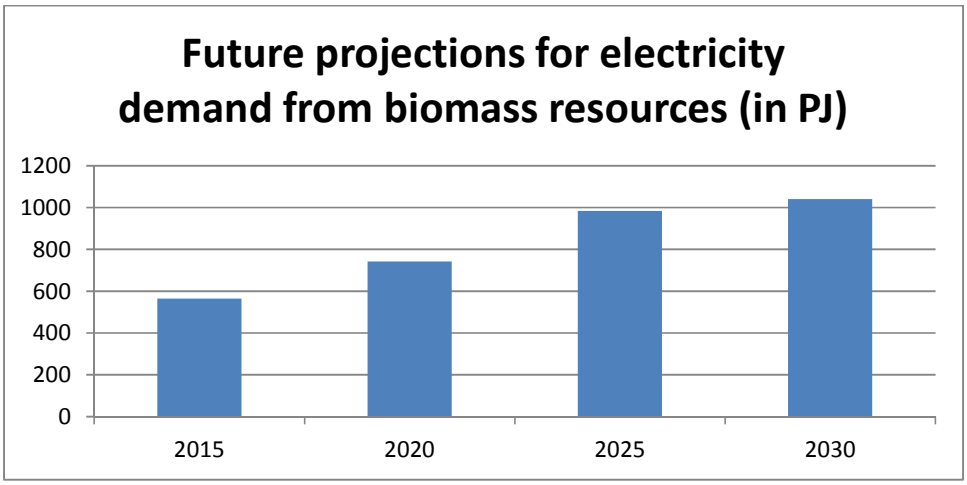


Figure 11: Change in production of electricity from biomass resources in the entire region (in PJ)

Although for the region in total a growth is expected until 2030, this is not the case in all countries, see Figure 12. Some countries see a sharp increase in the production of electricity from biomass resources, e.g. France, Italy, Serbia and Turkey. In some countries the production of electricity from biomass resources will peak in 2025 and decline afterwards, such as Denmark, Italy, and the Netherlands.

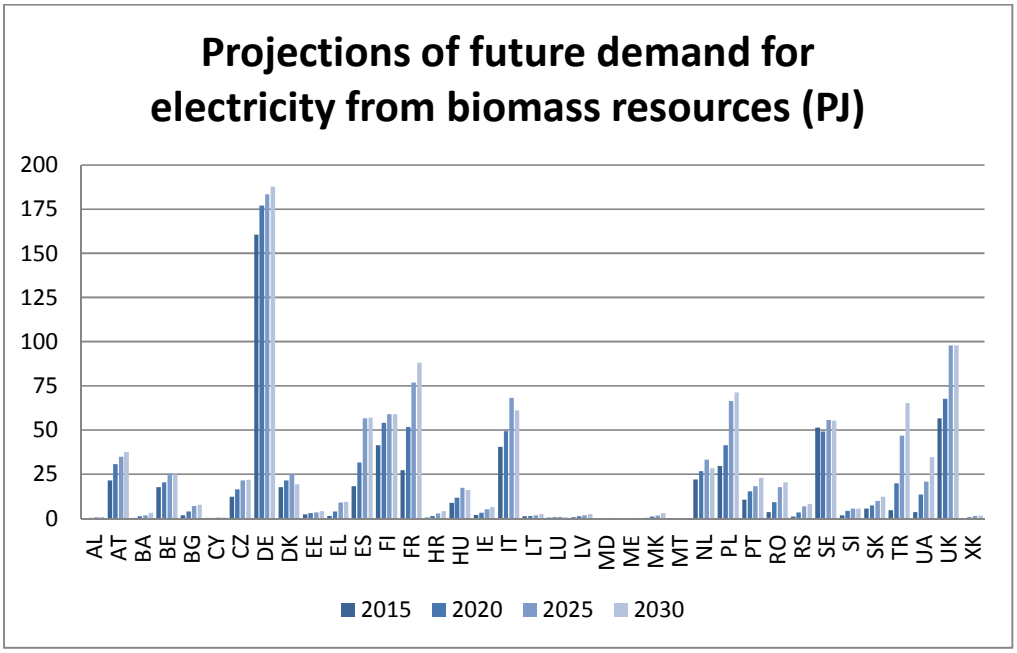


Figure 12: Expected changes in electricity production from biomass resources per country (in PJ)

3.3. Reference production route

In the EU28 almost half of the electricity produced is generated directly by burning fossil fuels (solid fuels, petroleum products and gas), with another quarter stemming from nuclear fission, see Figure 13. Only about a quarter of all electricity is generated by renewable resources.

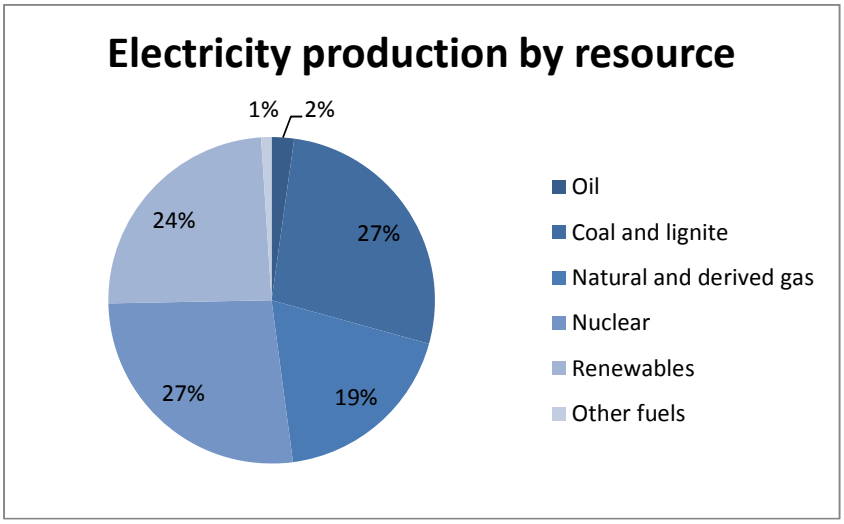


Figure 13: Electricity consumption by source for the EU28. Source: Eurostat, 2012

In the entire region, excluding Moldova and Ukraine, the share of renewables can be further subdivided into different categories as in Figure 14. A very large share of RES power comes from hydro-electric power stations and wind turbines. In total 18% of the total RES electricity comes from biomass resources.

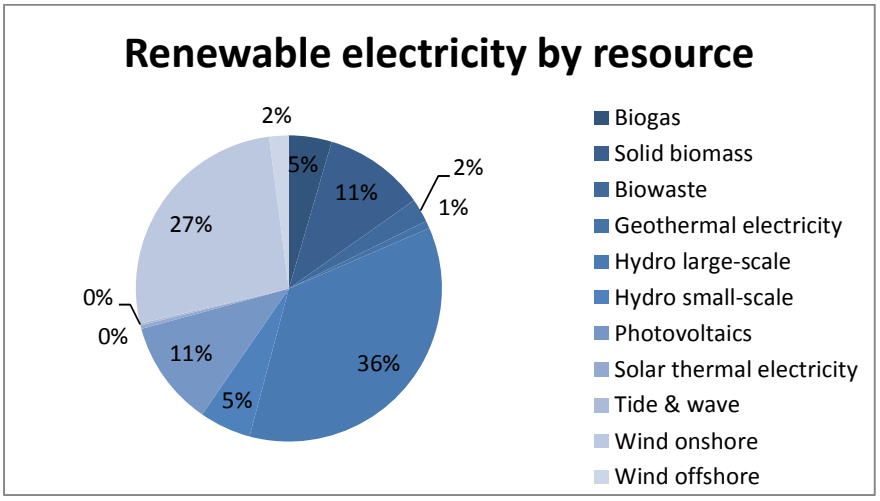


Figure 14: Division of all RES electricity in the total region (excl. Moldova and Ukraine) in 2015. Source: Green-X, 2014

3.4. Production of bio-based product

3.4.1. Type of biomass feedstock used

In the 23 EU countries that have been researched by Atanasui (2010) it was estimated that by 2020 most of the bio-electricity produced would be fuelled by either solid biomass or biogas, with a much smaller role for liquid fuels from biomass resources.

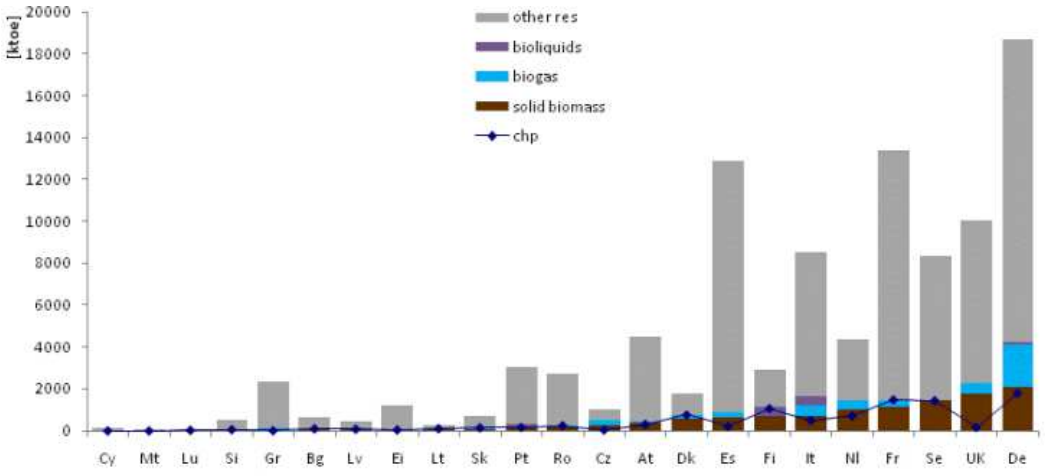


Figure 15: Resources used for the production of bio-electricity in 2020. Source: Atanasui, 2010.

4. PMC3: (Advanced) Biofuels

4.1. Applications

In general, biofuels are used as liquid fuels for road, air, and sea transport. All EU MS and Energy Community Treaty contracting parties are obliged to reach a 10% share of renewable energy in transport gross energy consumption by 2020. This target is subject to various other conditions, such as various sustainability criteria for the feedstocks to be used and the corresponding greenhouse gas savings of the fuels, a cap on the amount of conventional biofuels from food crops, and additional counting rules for advanced biofuels, electricity and hydrogen.

4.2. Market

4.2.1. Current market size

The current (2015) consumption of biofuels in the European Union, the West Balkan region and in Turkey is shown in Figure 16 . There are large differences among the countries, but these can partly be explained by a larger fuel consumption for transport in the different countries. However, also the share of final biofuel use on fuel demand in the transport sector varies widely in the EU, from 0.5% in Malta to 9% in Slovakia, see Figure 17.

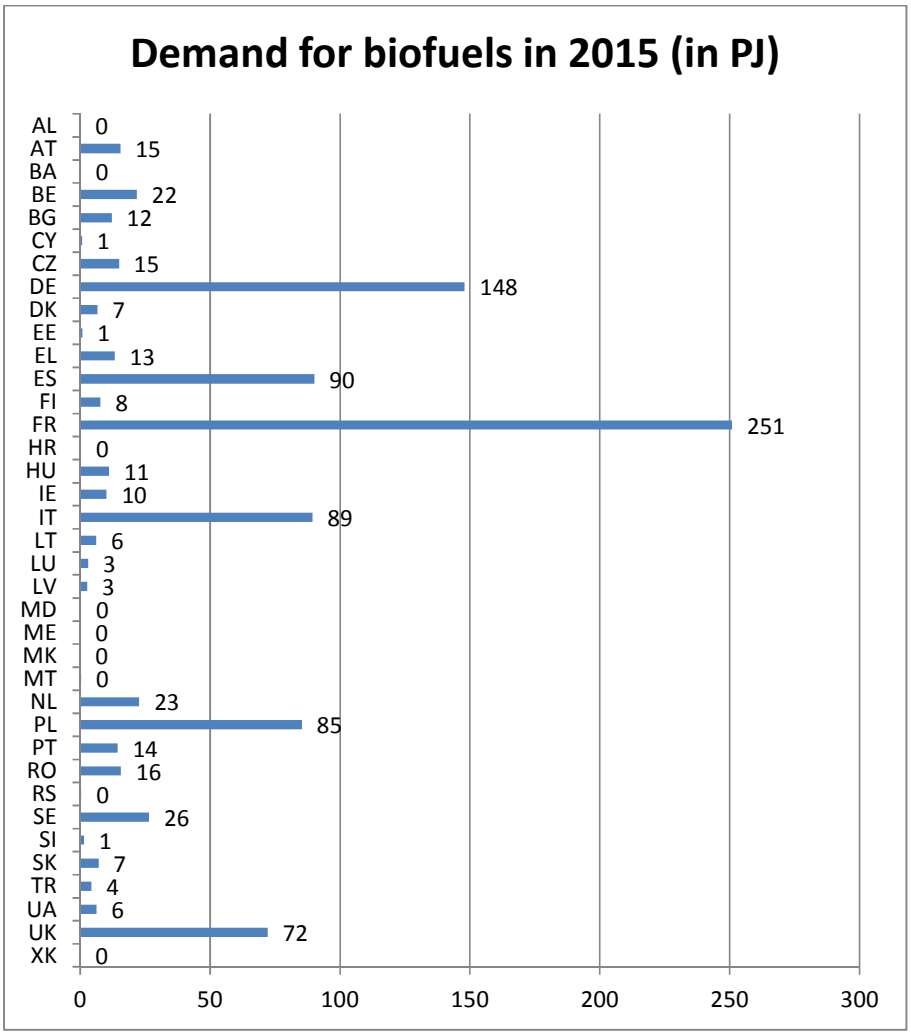


Figure 16: Biofuel use in 2015 (in PJ), 771 PJ in total

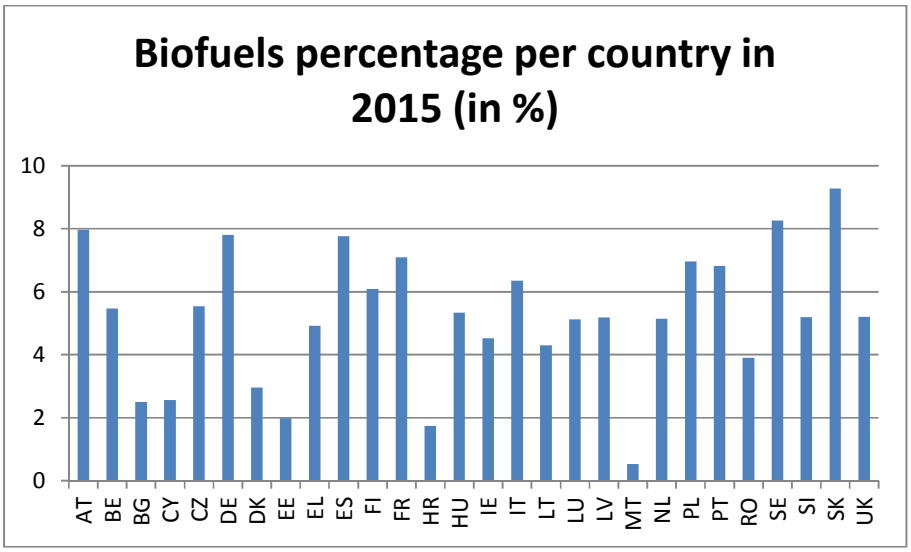


Figure 17: Percentage of biofuels in the EU28 in 2015. Source: EC, 2013

4.2.2. Market development during past 10 years

The production of biofuels has increased significantly over the last decade in the EU28 region, see Figure 18. In ten years' time the consumption level of biofuels quintupled. The highest increase was realized in the first half of the decade.

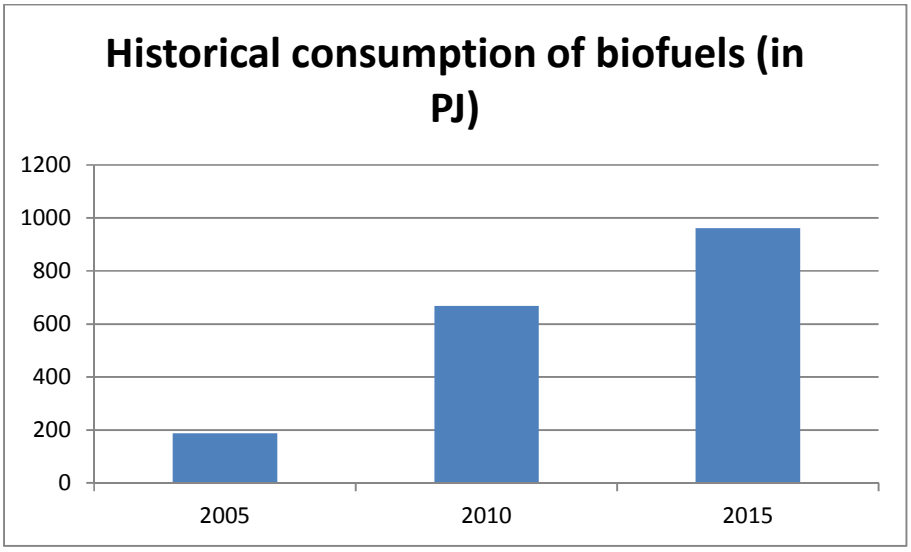


Figure 18: Production of biofuels in the region over the last ten years (in PJ)

The pan-European consumption of biofuels is mainly driven by a couple of countries with high demand, such as Germany and France, see Figure 19. However, as we've seen in Figure 17, these countries don't have a high consumption of biofuels relative to their total transport fuel consumption level.

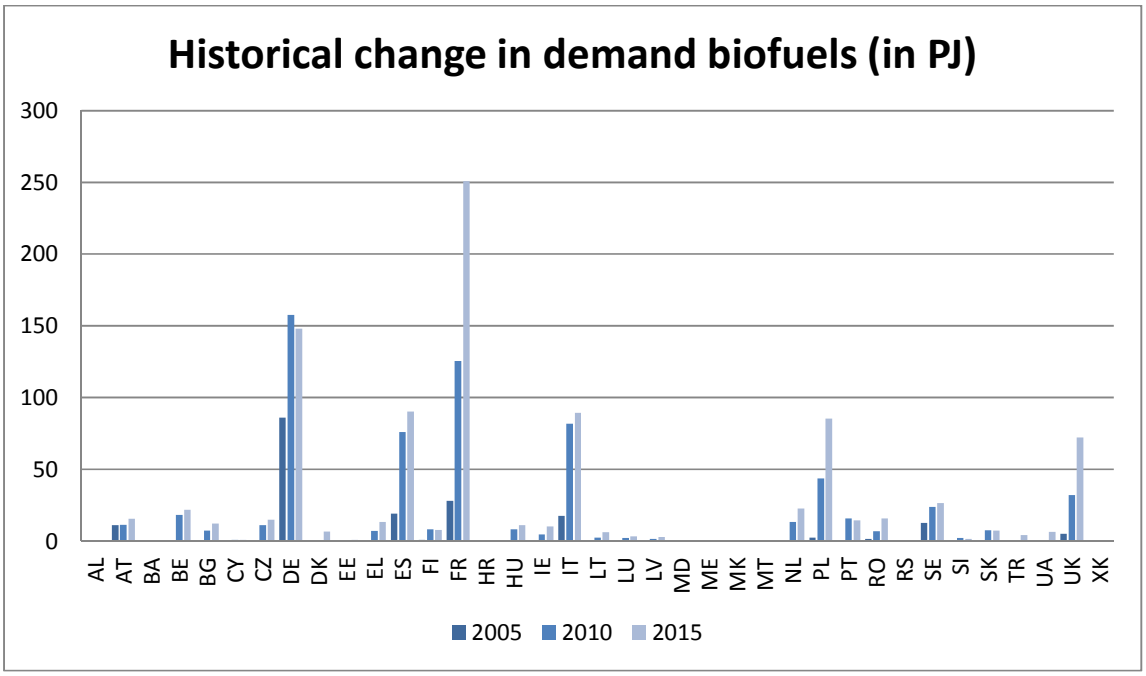


Figure 19: Biofuel consumption in the region over the past ten years (in PJ)

4.2.3. Expectation for 2020 and 2030

The total biofuel consumption is expected to grow from 962 PJ in 2015 to 1216 PJ in 2020 and then further increase to 1258 PJ in 2030, see Figure 20. However, not in all individual countries an increase in biofuel demand is expected. In some countries biofuel consumption will increase until 2020 or 2025 and decrease to below 2015 levels in 2030, such as France and Italy. Others will see an increase until 2020 or 2025 but a decrease after that, such as Poland and Romania. In other countries, however, the demand for biofuels grows continuously, e.g. Lithuania and Finland, see Figure 21.

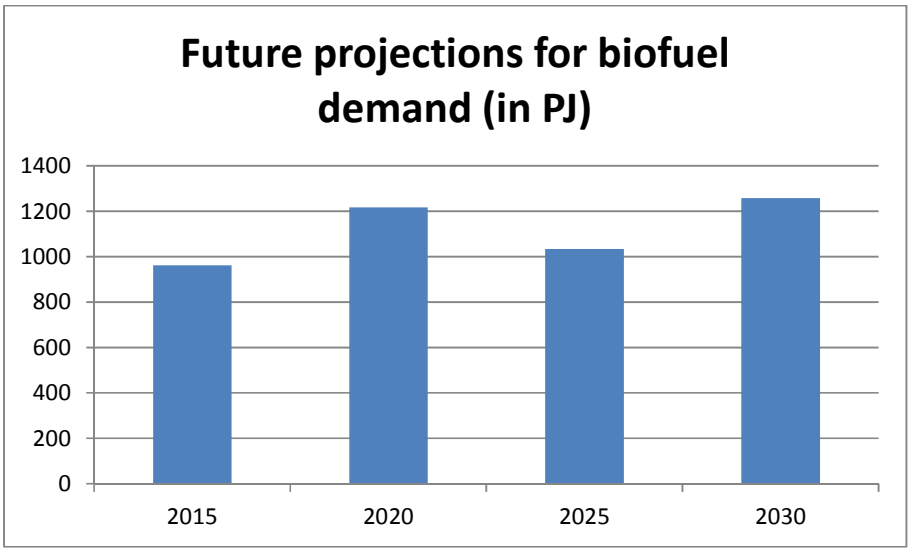


Figure 20: Growth in biofuel consumption (in PJ)

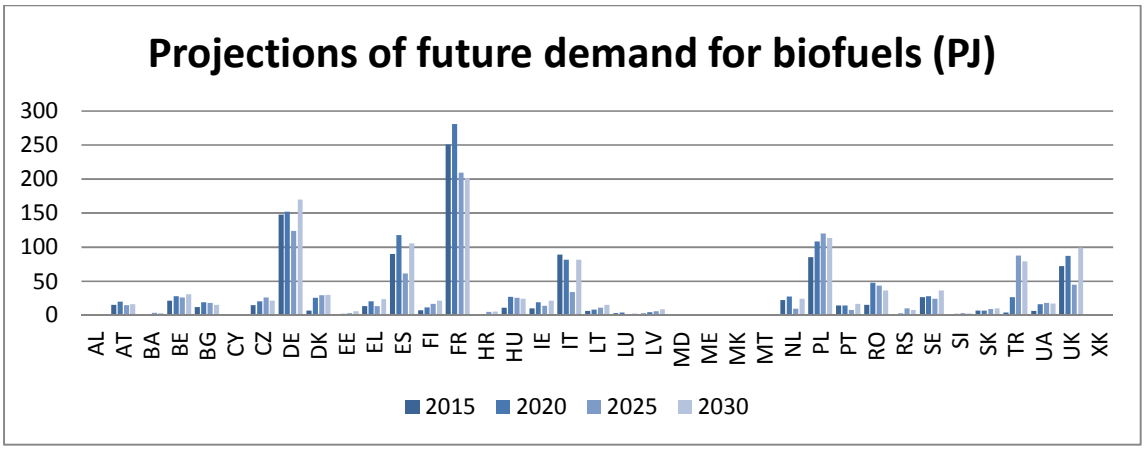


Figure 21: Expected change in biofuel consumption per country (in PJ)

In the future it is expected that for 2020 almost half of the biofuels will be imported from outside of the pan-European region, see Figure 22. However, after 2020 this share of imported biofuels will be reduced to about 20% of the total consumption. Where almost all domestically produced biofuels are first generation fuels in 2015, this is expected to change. Until 2020 this will be the case, but in the decade until 2030 there will be a swap of production from first generation biofuels to second generation biofuels. The 9.2% share of second generation biofuels in 2020 is also predicted by Atanasui (2010) for the 23 investigated EU countries, see Figure 23.

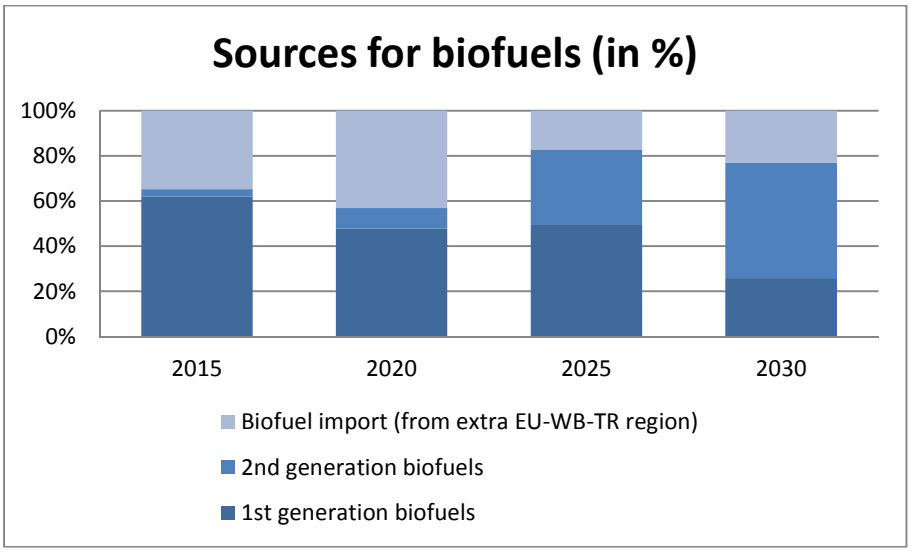


Figure 22: Division of biofuel consumption by production source and generation (excluding Moldova and Ukraine), source Green-X

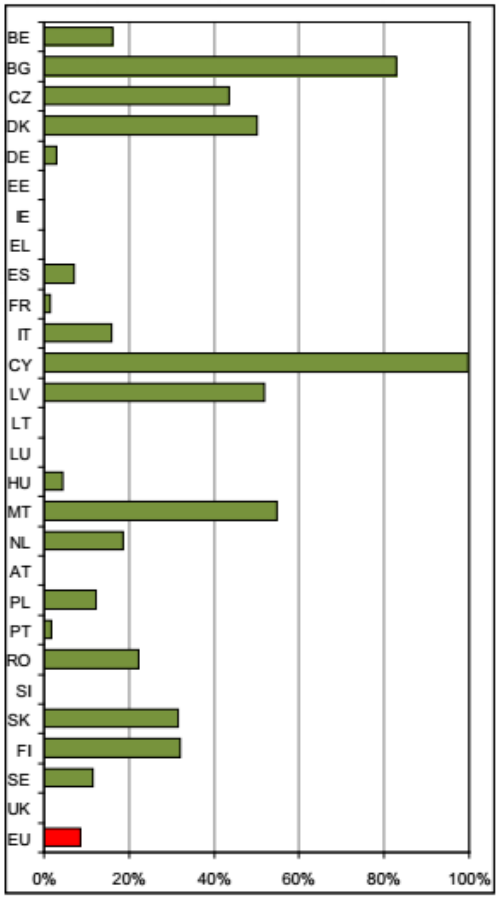


Figure 23: Shares of second generation biofuels in the 2020 target. Source: Atanasui, 2010

4.3. Reference production route

Fuels for transport are usually all derivatives from petroleum.

4.4. Production of bio-based product

In this section when referring to the bio-based product, we specifically refer to second generation or advanced biofuels only. The source of second generation biofuels according to Art. 21.2 in the RES Directive (2009/28/EC) must be wastes, residues, non-food cellulosic and ligno-cellulosic material.

4.4.1. Development during past 10 years

Second generation biofuels have not been consumed before 2010.

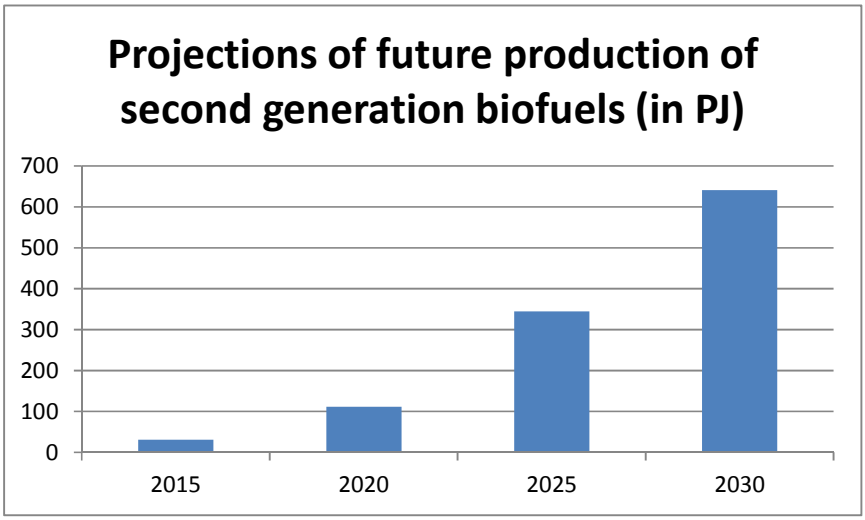
4.4.2. Current production

The current production of second generation biofuels is approximately 3% of total biofuel consumption, when assumed all imports are first generation biofuels.

4.4.3. Forecast 2020 and 2030

In 2020 it is expected 9.2% of all biofuels are second generation biofuels. This would amount to approximately 100 PJ of second generation biofuels, see

Figure **24**. By 2030 the half of all biofuels produced in the EU28, West Balkan and Turkey will be second generation biofuels. This would mean a production of more



than 600PJ.

Figure 24: Future production of second generation biofuels in the region (in PJ)

4.4.4. Type of biomass feedstock used

As stated before the source of second generation biofuels according to Art. 21.2 in the RES Directive (2009/28/EC) must be wastes, residues, non-food cellulosic and ligno-cellulosic material. Examples of biofuels from ligno-cellulosic material are cellulosic ethanol, biomass-to-liquids diesel (pyrolysis oil) and bio-synthetic gas (FT-fuels).

5. References

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Annex I

Tables with the input data for the model as used and described in this report. Light green means taken from Green-X data. Light blue is from other data sources (NREAP, national statistics, Eurostat) and orange is the average of the two.

I.1 Heat from biomass (in PJ)

	2005	2010	2015	2020	2025	2030	2040
AL	0	1	8	9	11	14	18
AT	108	121	125	153	177	208	233
BA	0	2	23	30	35	44	59
BE	17	24	38	53	70	94	135
BG	26	26	29	39	49	55	51
CY	0	1	0	1	1	1	2
CZ	48	61	56	69	88	108	146
DE	255	303	362	447	556	638	764
DK	62	79	93	106	108	107	105
EE	18	22	23	28	32	37	41
EL	34	36	31	22	26	28	40
ES	123	127	124	125	152	190	260
FI	194	177	206	242	258	299	347
FR	324	352	386	387	480	601	762
HR	0	1	18	20	28	40	54
HU	19	29	29	38	54	67	92
IE	6	7	7	9	13	17	24
IT	58	79	116	144	198	237	278
LT	24	23	30	36	43	47	50
LU	1	1	2	3	4	5	6
LV	40	36	33	40	41	48	59
MD	8	8	10	12	15	18	23
ME	0	0	3	3	4	5	7
MK	0	1	9	12	15	19	24
MT	0	0	0	0	0	0	0
NL	16	20	30	42	56	74	115
PL	120	138	153	195	242	300	415
PT	89	77	56	64	72	93	125
RO	113	99	104	126	148	180	223
RS	0	2	29	35	44	57	76
SE	251	280	284	290	287	302	313
SI	16	15	16	19	24	30	42
SK	13	16	21	28	35	45	59
TR	102	104	106	143	191	306	474
UA	76	73	95	174	215	262	337
UK	18	11	54	88	118	151	229
XK	0	1	7	8	9	11	15
Total	2178	2350	2715	3242	3899	4740	6003

I.2 Electricity from biomass (in PJ)

	2005	2010	2015	2020	2025	2030	2040
AL	0.0	0.0	0.1	0.3	0.6	0.7	1.0
AT	7.4	11.8	21.3	30.7	34.8	37.5	35.2
BA	0.0	0.0	0.2	1.1	1.8	3.1	4.1
BE	6.3	15.4	17.6	20.3	25.5	24.9	26.4
BG	0.0	0.2	1.8	3.8	6.9	7.7	11.4
CY	0.0	0.0	0.2	0.3	0.5	0.4	0.4
CZ	2.4	7.1	12.2	16.4	21.3	21.9	24.7
DE	33.4	101.1	160.4	177.0	183.4	187.6	172.0
DK	10.4	14.9	17.7	21.3	25.1	19.3	18.5
EE	0.1	2.0	2.3	3.0	3.3	4.0	4.8
EL	0.3	0.6	1.2	3.9	8.9	9.4	11.2
ES	8.6	12.8	18.1	31.6	56.7	56.9	101.1
FI	31.3	35.3	41.4	54.1	59.0	59.0	59.1
FR	9.3	12.0	27.3	51.7	76.9	88.2	140.6
HR	0.0	0.0	0.4	1.3	2.9	4.0	7.6
HU	5.5	7.5	8.8	11.7	17.3	16.1	20.1
IE	0.4	1.1	2.0	3.1	5.3	6.4	11.2
IT	15.1	30.8	40.4	49.3	68.2	61.0	65.5
LT	0.0	0.5	1.0	1.4	1.9	2.4	6.4
LU	0.2	0.3	0.5	0.5	0.7	0.6	0.6
LV	0.1	0.2	0.5	1.1	1.6	2.5	5.5
MD	0.0	0.0	0.0	0.1	0.2	0.3	0.3
ME	0.0	0.0	0.0	0.1	0.1	0.2	0.5
MK	0.1	0.0	0.3	0.9	1.5	2.9	4.0
MT	0.0	0.0	0.0	0.0	0.1	0.1	0.2
NL	17.4	22.7	22.1	26.6	33.3	28.3	32.4
PL	2.9	16.4	29.5	41.4	66.3	71.3	93.1
PT	5.6	8.7	10.6	15.2	18.2	22.8	34.3
RO	0.0	0.4	3.4	9.1	17.7	20.3	30.0
RS	0.2	0.1	0.9	3.3	6.8	8.1	11.5
SE	26.0	41.1	51.4	49.2	55.6	55.2	62.2
SI	0.4	0.2	1.7	4.2	5.6	5.5	6.3
SK	0.2	2.3	5.5	7.2	9.9	12.1	13.8
TR	0.0	1.0	4.7	19.8	46.7	65.2	96.5
UA	0.1	1.3	3.5	13.5	20.8	34.6	46.1
UK	32.8	42.9	56.6	67.7	97.8	97.8	114.6
XK	0.0	0.0	0.1	0.5	1.2	1.4	2.1
Total	**216**	**391**	**566**	**743**	**984**	**1040**	**1275**

I.3 Biofuels consumption (in PJ)

	2005	2010	2015	2020	2025	2030	2040
AL	0	0	0	0	2	1	1
AT	11	11	15	20	15	17	49
BA	0	0	0	1	4	3	2
BE	0	18	22	28	26	31	69
BG	0	7	12	19	18	16	44
CY	0	1	1	1	2	1	4
CZ	0	11	15	20	26	21	52
DE	86	158	148	152	124	170	493
DK	0	1	7	26	30	30	70
EE	0	0	1	2	3	6	21
EL	0	7	13	20	13	24	69
ES	19	76	90	118	61	106	374
FI	1	8	8	11	17	21	60
FR	28	126	251	281	209	202	527
HR	0	0	0	1	5	5	7
HU	0	8	11	27	26	24	57
IE	0	5	10	19	14	21	53
IT	17	82	89	82	34	82	268
LT	0	2	6	9	11	15	49
LU	0	2	3	4	1	3	13
LV	0	1	3	4	6	9	31
MD	0	0	0	2	2	2	4
ME	0	0	0	0	0	0	1
MK	0	0	0	1	2	2	1
MT	0	0	0	1	1	1	2
NL	0	13	23	27	10	25	94
PL	2	44	85	108	120	114	234
PT	1	16	14	14	8	17	50
RO	2	7	16	48	44	36	85
RS	0	0	0	3	10	8	6
SE	13	24	26	28	24	37	105
SI	0	2	1	2	3	3	12
SK	1	7	7	7	9	10	23
TR	0	0	4	26	88	79	57
UA	0	0	6	16	18	17	41
UK	5	32	72	87	45	100	351
XK	0	0	0	0	1	1	1
Total	**188**	**668**	**962**	**1216**	**1033**	**1258**	**3379**

Annex II

AL – Albania
AT – Austria
BA – Bosnia and Herzegovina
BE – Belgium
BG – Bulgaria
CY – Cyprus
CZ – Czech Republic
DE – Germany
DK – Denmark
EE – Estonia
EL – Greece
ES – Spain
FI – Finland
FR – France
HR – Croatia
HU – Hungary
IE – Ireland
IT – Italy
LT – Lithuania
LU – Luxembourg
LV – Latvia
MD – Moldova
ME – Montenegro
MK – Macedonia
MT – Malta
NL – the Netherlands
PL – Poland
PT – Portugal
RO – Romania
RS – Serbia
SE – Sweden
SI – Slovenia
SK – Slovakia
TR – Turkey
UA – Ukraine
UK – United Kingdom
XK* – Kosovo