DANUBE REGION strategy
Energy

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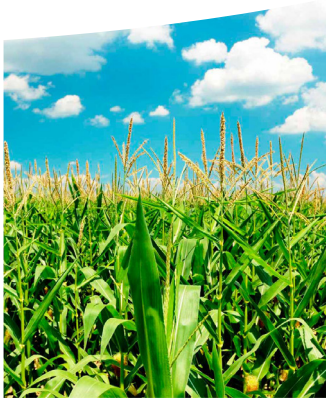

Danube Region Biomass Action Plan

PREPARED BY

ÉMI

ÉMI NON-PROFIT LIMITED LIABILITY COMPANY FOR QUALITY CONTROL AND INNOVATION IN BUILDING

NEW SZÉCHENYI PLAN

The action plan was commissioned by the Sustainable Energy Priority Area of the Danube Region Strategy.

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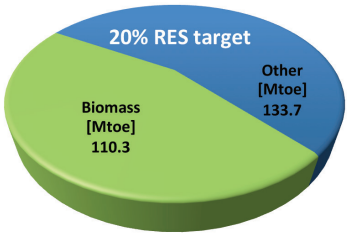
1 EXECUTIVE SUMMARY

Energy from biomass has great importance for all countries in the Danube Region[3] (DR) as it is renewable and each country has significant potential to increase energy production from this source.

Graph No. 1: **Expected RES supply by 2020 (source: NREAPs)**



According to the National Renewable Energy Action Plans[4] (NREAPs) of the Member States of the European Union (EU-27[5]), biomass for heating, cooling and electricity generation is expected to provide about two fifth of the projected renewable energy production in 2020. In 2010 112.8 Mtoe[6] energy was produced from biomass and renewable wastes (this amount equals to 68% of primary production of renewable energy) in the EU, while in the Danube Region[7] the total biomass supply amounted to 27.3 Mtoe[8].

Furthermore the use of biomass as an energy source helps addressing climate change (sustainable and reduces CO2 emissions), security of supply concerns (helps to cope with dependency on fossil fuels and on imported energy) and contributes to economic growth and job creation, particularly in rural areas.

Preface

The idea of the Danube Region Biomass Action Plan (DRBAP) is to be traced back to the EU Strategy for the Danube Region[9] (EUSDR, DRS or Strategy), which is a macro-regional development strategy of the European Union. In the framework of the Strategy an Action Plan[10] has been developed for eleven priority areas, defining concrete actions to be achieved through the implementation of the Strategy.

The Action Plan has set 17 actions for the Energy Priority Area ("To encourage more sustainable energy - PA2)"[11] in order to support energy systems (energy infrastructure and energy markets) and promote energy efficiency and sustainable energy. The sustainable use of biomass is envisaged in PA2 actions 8, 11 and 16.

For the implementation of these steps a Roadmap has been developed by the Priority Area and the concept of the Danube Region Biomass Action Plan has been born. The aim of the DRBAP is to contribute to the fulfilment of the milestones listed in the Roadmap.

On the occasion of the 5th Steering Group Meeting of the Priority Area 2 of the Danube Region Strategy at 5 December 2012 in Budapest the Steering Group decided to launch the implementation of the Roadmap and adopted the DRBAP concept with the involvement of ÉMI, an external expert.

3 Information about the Participating Countries of the DRS available at: http://www.danube-region.eu/pages/the-danube-region
4 Member States of the European Union, n.d. National Renewable Energy Action Plans. Available at: http://ec.europa.eu/energy/renewables/action_plan_en.htm
5 European Commission, n.d. EUROSTAT. Available at: http://epp.eurostat.ec.europa.eu/
6 40. European Commission, n.d. EUROSTAT (code: ten00082). Available at: http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home
7 In terms of biomass supply in 2010, data are only available for 10 participant states of the EUSDR, namely: AT, BG, HR, CZ, DE, HU, RO, SRB, SI and SK.
8 Banja, M. (Joint Research Centre, Renewable Energy Unit, Renewable Energy Monitoring/Mapping in Europe and Africa Action), 2013. Bioenergy in Danube River Basin (DRB) [PowerPoint presentation].
9 European Union Strategy for Danube Region COM(2010) 715. Available at: http://www.danube-region.eu
10 Action Plan of the European Union Strategy for Danube Region SEC(2010) 1489. Available at: http://www.danube-region.eu
11 Information about Priority Area 2 of the EUSDR available at: http://www.danube-energy.eu/

Aim, concept and methods

The aim of the DRBAP is to summarise, showcase and analyse the state of play of the Danube Region regarding biomass use. Based on the findings, the study aims to identify concrete priorities for further improvement to promote the development of a common position on the use of biomass in the countries of the DRS. It also aims to formulate concrete recommendations at EU, national and regional level.

The DRBAP has built upon the results of the Transnational Action Plan for Central Europe[12] (TAP) developed by the 4biomass project, which included countries from the Central European region; out of the TAP countries, 5 are also members of the Danube Region Strategy as well. The recommendations formulated in the TAP have been analysed by the 14 DRS countries in the DRBAP. As a result, the Danube Region Biomass Action Plan reflects the views of all Danube region countries regarding biomass.

The research concept was to collect all available information about the Danube Region and then based on this to compile a comprehensive study reflecting the considerations of all countries of the Danube Region Strategy regarding biomass use. To achieve this, the following scheme was followed:

Graph No. 2: Preparation methodology

Structure and contents

The DRBAP consists of six main chapters: introduction, biomass policy framework, assessment of the Danube Region countries, Regional analysis, conclusions & main findings and the recommendations chapter.

The **introduction** chapter outlines the background and the aim of the DRBAP, describes the actions and methods of the compilation as well as the difficulties and lessons learnt at the data collection.

The overview of the current **policy framework** is indispensable when talking about renewable energy in general and biomass in particular. This chapter summarises the most important policies currently in place regarding biomass, such as the EU climate and energy package[13] or the Renewable Energy Directive[14]. It also addresses the sustainability requirements concerning biomass use.

The **assessment of the countries of the EUSDR** chapter is the core of the DRBAP; it showcases the current state of biomass use in the countries of the EUSDR. This chapter presents the countries of the EUSDR individually by their general country profiles, relevant policies such as national bioenergy policies and also their biomass potential.

Thereafter the Danube Region is assessed in the **Regional analysis** on the basis of the available data in terms of energy production and consumption, 2020 targets and biomass use, broken down into solid biomass, renewable municipal wastes, biogas and biofuels. In this part the various data of the countries are compared to each other to give a comprehensive picture about the region.

12 Environmental Policy Research Centre, 2011. Transnational Action Plan for Central Europe – Recommendations for policy makers and implementing authorities towards sustainable bioenergy development by a joint and consistent policy approach. Available at: http://www.4biomass.eu
13 The European Union, 2008. The EU climate and energy package. Available at: http://ec.europa.eu/clima/policies/package/index_en.htm
14 Directive 2009/28/EC on the promotion of the use of energy from renewable sources

The outcome of the assessments was summarized in the following statements in the **conclusions & main findings** chapter of the DRBAP:

- There is lack of available biomass related data in the Danube Region;
- Biomass has the greatest significance among renewable energy sources in the Danube Region;
- Forestry sector is the main biomass supplier and going to keep its dominance until 2020;
- Significance of the agriculture and waste sector will increase rapidly to 2020;
- Biomass supply is continuously increasing;
- Bioenergy production is dominated by solid biomass;
- The Danube Region has remarkable producers in all areas;
- The majority of consumed energy derives from solid biomass and no change is expected until 2020;
- Most bioenergy is consumed in the form of heat and no change is expected to 2020;
- The share of bioenergy in energy consumption of renewable sources in the Danube Region will decrease to 2020;
- Import of biofuels is expected to increase significantly.

Finally the last chapter of the DRBAP contains the formulated **recommendations** based on inputs from DRS countries. This package comprises of various recommendations from general to sectoral throughout how to improve cooperation between the countries of the region. The chapter also shows the reviews of the EUSDR countries on the recommendations formulated by the 4biomass project. The chapter also incorporates additional recommendations formulated by the participating states of the EUSDR and also recommendations formulated by the authors of the DRBAP on how the use of biomass could be improved in the Danube Region and how the countries could cooperate more effectively to enhance their efforts in the future.

Outlook

The Danube Region Biomass Action Plan assessed the state of play of the Danube Region regarding biomass use to map the current policies on national and European level, thereby identifying the areas for further improvement in order to encourage the sustainable use of biomass.

The countries of the EUSDR vary widely in terms of their current state of biomass production and consumption, which could provide a good basis for knowledge sharing and transfer on regional level by using best practices and successful support schemes as well. With the progressive implementation of the recommendations formulated in the DRBAP the improvement of cooperation and the extension of the sustainable use of biomass can be started.

In parallel, a further assessment of the countries is also recommended to explore the possible ways of how to create synergies and coordination between policies and how to synchronize support schemes. Biomass

databases – national or regional – should be developed in order to be able to assess the progress achieved and to identify further fields for possible improvements.

Joint effort and international projects could be the best way of reaching rapid development in all respects. In this regard the countries of the Danube Region Strategy have a great opportunity with the upcoming Danube Region Transnational Program[15] which will provide support for such projects and promote the development of biomass use.

With join effort and commitment the Danube Region has the potential to be one of the leading regions in the field of biomass and this Action Plan intends to contribute to this ambitious goal.

Graph No. 3: **Further recommended activities**

15 Concerning the added value of macro-regional strategies COM(2013) 468 final, p.9: New (Danube and South-East Gateway) and existing transnational programmes

2 INTRODUCTION

2.1 Background and aim of the Danube Region Biomass Action Plan

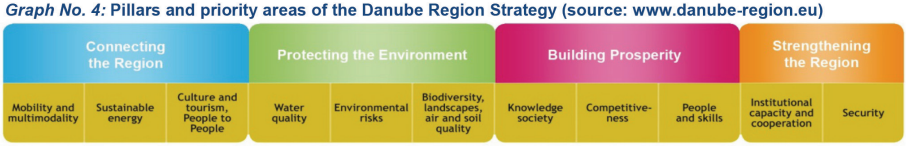
2.1.1 The EU Strategy for the Danube Region[16]

The EU Strategy for the Danube Region (EUSDR) is a macro-regional strategy adopted by the European Commission in December 2010 and endorsed by the European Council in 2011. The Strategy was jointly developed by the Commission, together with the Danube Region countries and stakeholders, in order to address common challenges together. The Strategy seeks to create synergies and coordination between existing policies and initiatives taking place across the Danube Region.

The EUSDR is a united response to challenges affecting an area which stretches from the Black Forest to the Black Sea, including over 100 million inhabitants. Many of the region's problems know no borders: flooding, transport and energy links, environmental protection and challenges to security all demand a united approach. The 14 countries in the region, with the support of the European Commission, are cooperating to develop projects and actions that meet these challenges and build prosperity in the Danube region.

The Danube Region Strategy addresses a wide range of issues; these are divided among four pillars and 11 priority areas.

Graph No. 4: **Pillars and priority areas of the Danube Region Strategy (source: www.danube-region.eu)**



Priority Area 2 (PA2) of the EUSDR „To encourage more sustainable energy" is coordinated by Hungary and the Czech Republic, with the involvement of a wide network of key players and stakeholders from the 14 countries of the Danube region. The energy priority area concentrates its work around two pillars: (1) energy systems (energy infrastructure and energy markets) and (2) energy efficiency and renewable energy.

The participating countries of the DRS are: Austria, Bulgaria, Czech Republic, Germany (Baden-Württemberg and Bavaria), Hungary, Romania, Slovak Republic, Slovenia, Croatia as EU Member States; Serbia, Bosnia and Herzegovina, and Montenegro as EU accession countries; and Moldova and Ukraine as neighbourhood countries.

2.1.2 Aim of the DRBAP

The Danube Region Biomass Action Plan addresses biomass as a renewable energy source. The main aim of the DRBAP is to contribute to the execution of the Actions listed in the general Action Plan of the European Union Strategy for the Danube Region prepared by the European Commission.

16 Official website of the European Union Strategy for the Danube Region. Available at: www.danube-region.eu

The Actions addressed by the DRBAP are:

- ACTION 8 – To extend the use of biomass (e.g. wood, waste), etc.;
- ACTION 11 – To explore the possibility to have an increased energy production originating from local renewable energy sources to increase the energy autonomy;
- ACTION 16 – To facilitate networking and cooperation between national authorities in order to promote awareness and increase the use of renewable energies.

The DRBAP document aims to build upon the results of the "Transnational Action Plan for Central Europe (TAP) - Recommendations for policy makers and implementing authorities towards sustainable bioenergy development by a joint and consistent policy approach" developed by the 4biomass project in 2011. The TAP included countries from the Central European Region of which five are Danube Region countries. The recommendations formulated in the TAP have been reviewed by the 14 DRS countries of the EUSDR. As a result a recommendation package has been delivered which reflects the needs of the countries lying around the Danube.

The aim of the DRBAP is also to create synergies and coordination between existing policies and initiatives of the countries across the Danube Region and to formulate recommendations on the EU and regional level. The DRBAP includes recommendations for the improvement of cooperation and the development of further activities in order to extend the sustainable use of biomass as well. The DRBAP's role is to summarize and showcase the state of play of the Danube Region regarding biomass use and to identify the concrete priorities for further improvement.

The unique achievement of the study is that the DRBAP reflects not only the considerations of EU Member States but also of countries outside the EU. No studies or Action Plans covering the entire Danube Region have been developed before in this field.

2.1.3 The DEMO project inventory

In parallel with the development of the DRBAP a DEMO project inventory has been developed as well. This inventory is an online database, which includes sustainable projects that can be considered as good examples from the Danube Region.

Most importantly the inventory includes information on specific aspects of selected biomass projects – concrete, physically implemented plants/systems – identified by the countries. The following data that can be found in the inventory about these demo projects: size, location, technology, feedstock, biomass consumption per annum, running time, energy production, costs, employment, etc.

The DEMO project inventory can be found at the following website:

www.danubebiomass.eu

2.2 Methodology & experiences of the data collection

2.2.1 Actions and methodology

The compilation of the DRBAP involved the following steps and methods.

Step No. 1: Information collection

Method: desk research and direct information collection (data sheet).

As the first phase of the work, relevant national, regional and EU level strategies, documents, databases and available studies had been collected. The countries of the Danube Region Strategy and relevant international organizations had been asked to provide reliable relevant policy and strategic documents for the study, regarding the current use of renewables, specifically biomass, such as energy strategies, action plans, roadmaps, etc. Then the collected and received information had been assessed, analysed and the gaps for further information had been identified.

In parallel a data request sheet had been developed for the participating countries to fill the identified gaps and to ask for specific information on data related to energy, use of biomass, national market environment, future targets, strategies, specific needs and recommendations regarding biomass use in the future. These data sheets aimed to serve as brief national Status Quo Reports, including the most relevant facts and figures, legal framework, policy assessment and recommendations of the individual countries.

The data sheets had been filled out by 8 participants out of 15. The data providers experienced difficulties with the task, because the requested data proved to be too deep and specific compared to the existing statistical databases. The lack of such first-hand data meant that for the preparation of the DRBAP the internet sources were used more extensively than originally planned.

The most important sources besides the filled data sheets consisted of the policy documents provided by countries, the NREAPs and data from open internet sources such as EUROSTAT, EurObserv'ER Barometer and Joint Research Centre.

Apart from the desk research and the direct information collection a consultation had been launched on the recommendation package formulated by the partners of the 4biomass project in the TAP. The consultation aimed to ask for the views of the countries of the EUSDR regarding all the 61 recommendations of the TAP. In this consultation all countries participated and expressed their views. For the results of the consultation please see chapter 7., Recommendations.

These received and gathered documents, information and data gave the basis of the DRBAP analysis. For the full list of references please see the chapter on References.

Step No. 2: Compilation and presentation of the draft DRBAP

Method: aggregation of information

Based on the results of the desk research, screening of policies and the received national Status Quo Reports the first draft of the Danube Region Biomass Action Plan has been compiled. The first draft and the results of the information collection were presented in the 6th Steering Group Meeting of the Priority Area 2 (Energy) of the Danube Region Strategy in June 2013 as a first discussion step. After the meeting the further development of the DRBAP had begun.

Step No. 3: Dissemination, discussion and modification of the DRBAP

Upon completion of the final draft of the DRBAP, it has been sent to the Steering Group members (who serve as contact points to the countries of the Danube region) for further discussion with national stakeholders. Besides, the draft has been sent to relevant international and national organizations and associations.

Based on the received feedbacks and requests for modification the DRBAP had been fine-tuned and finalized.

2.2.2 Experiences & difficulties with data collection

As stated before in the information collection phase, the countries of the EUSDR had been asked to fill in a data sheet with specific biomass related data. The sheet inter alia requested for biomass energy statistics, such as energy production and consumption; potential; utilization; energy plants, etc.

The data request sheet aimed to comprehensively assess the state of biomass in each participating country, but certain countries had difficulties with filling in the received questionnaire, because the requested data proved to be too detailed and specific compared to the existing statistical databases. Most of the requested data – although it differed by countries – proved to be difficult to access (i.e. different organizations had different type of biomass data therefore collecting all of the information required a significant amount of coordination) or were not available at this time.

Therefore it can be inferred that in certain DR countries nationwide biomass related data measurement methods and processes are underdeveloped which leads to a lack of comprehensive national biomass database.

2.3 Biomass in a nutshell

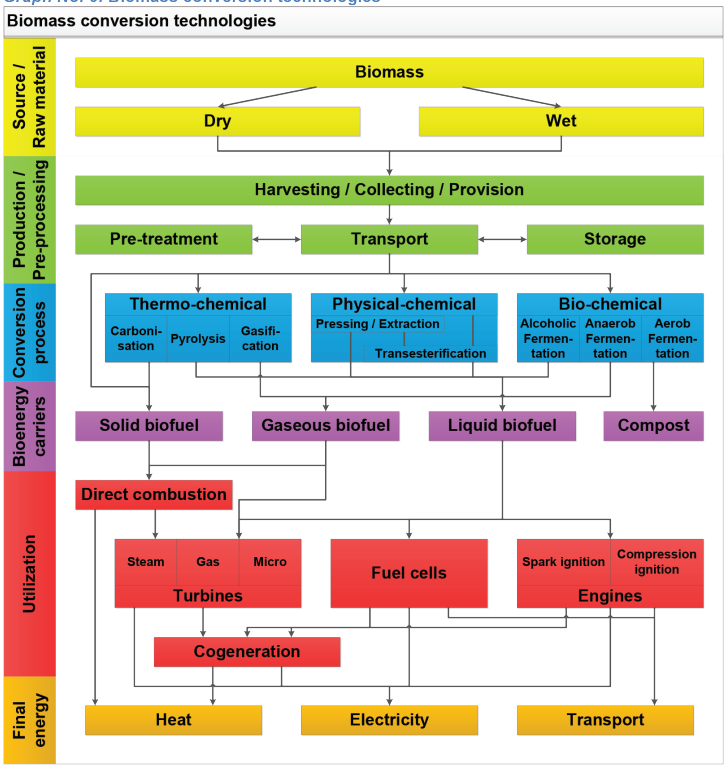
2.3.1 Biomass supply chain and conversion technologies

Besides the essential terms and definitions related to biomass (see Glossary) it is also important to outline briefly the supply chain and the conversion technologies; how biomass becomes consumable final energy. Graph No. 5 shows the path of biomass from land to consumer by addressing the main stages of the supply chain.

Graph No. 5: Biomass supply chain

Biomass resources can be converted using numerous technologies to bioenergy carriers. Graph No. 6 serves to show these processes.

Graph No. 6: Biomass conversion technologies[17]



3 BIOMASS POLICY FRAMEWORK

3.1 EU policy framework

This chapter of the study only presents the main relevant elements of the EU policy framework regarding biomass from the beginnings to the 2030 climate and energy framework.

3.1.1 A European Strategy for Sustainable, Competitive and Secure Energy[18]

In March 2006 the EU Commission released a new European Energy Policy, which had set out the new energy landscape of Europe, outlined questions to debate and suggested possible actions at the European level. The strategy defined three main objectives, namely sustainability, competitiveness and security of supply and to meet these objectives it put forward concrete proposals and measures. Inter alia the new policy aimed to start to promote renewable energy sources.

3.1.2 EU Biomass Action Plan[19]

The Biomass Action Plan (EUBAP) is part of the new European Energy Policy. It had been recognized that to cope with Europe's dependency on fossil fuels and on imported energy, using biomass is one of the key ways of ensuring sustainable energy and the security of supply in Europe.

In 2005 biomass accounted for around half of all renewable energy used in the EU and met 4% of the EU's energy needs. The EUBAP aimed to more than double the biomass use to around 150 million toe by 2010. The Commission identified three sectors in which biomass use should have been prioritised (heat production, electricity production and transport) and specified various measures to improve biomass in these sectors and set out measures to promote adequate supply of biomass. The EUBAP encouraged Member States to establish National Biomass Action Plans (NBAPs[20]).

With this action plan Europe has committed itself to promote the use of biomass.

3.1.3 The EU climate and energy package – the EU 2020 targets

In March 2007 EU leaders set concrete targets aiming climate change, increasing the EU's energy security and sustainability and strengthening its competitiveness to help EU become a highly-efficient and low carbon economy. These targets were enacted through the climate and energy package as a set of binding legislation in 2009 and also known as the "20-20-20" targets.

There are three main objectives set in the package as follows:

i. A 20% reduction in EU greenhouse gas emissions from 1990 levels;

ii. Raising the share of EU energy consumption produced from renewable resources to 20%;

iii. A 20% improvement in the EU's energy efficiency.

These targets have also become one of the five headline targets of the Europe 2020 "A strategy for smart, sustainable and inclusive growth" which is the EU's ten-year growth strategy.

[18] Green Paper: A European Strategy for Sustainable, Competitive and Secure Energy COM(2006) 105 final.
[19] Biomass Action Plan COM(2005) 628 final.
[20] Member States of the European Union, n.d. Biomass action plans. Available at: http://ec.europa.eu/energy/renewables/bioenergy/national_biomass_action_plans_en.htm

3.1.4 Renewable Energy Directive

The Renewable Energy Directive (RES Directive) 2009/28/EC on the promotion of the use of energy from renewable sources – adopted in April 2009 and implemented by the Member States by December 2010 – sets targets related to the adoption of renewable energy within overall energy markets in EU Member States. The RED amends and subsequently repeals Directives 2001/77/EC[21] (promotion of electricity produced from RES) and 2003/30/EC[22] (promotion of the use of biofuels or other renewable fuels for transport) and includes all aspects of generation and use of energy from renewables.

The targets formulated in the RED aims:

- to reach 20% share of energy consumption from renewable sources by 2020 across all sectors in EU;
- to reach 10% share of renewable energy consumption specifically in the transport sector by 2020;
- and to achieve at least 35% of greenhouse gas emission saving from the use of biofuels and bioliquids by mid-2010.
  - o In the case of installations that were in operation on 23 January 2008 the 35% reduction obligation shall apply from 1 April 2013.
  - o With effect from 2017 this target is set to 50% and from 2018 to 60% for biofuels and bioliquids produced in installations in which production started on or after 1 January 2017.

Besides the targets, the RES Directive also improves the legal framework for promoting renewable electricity, requires each Member State to adopt a national renewable energy action plan (NREAP) that establishes pathways for the development of renewable energy sources including bioenergy, creates cooperation mechanisms to support the achievement of the targets cost effectively and establishes sustainability criteria for biofuels.

In the NREAPs the Member States set individual targets for the share of energy from renewable sources consumed in transport, as well as in the production of electricity and heating for 2020 and specify how they wish to meet these national targets. The NREAPs also address planning and pricing schemes, access to electricity networks and promote energy from renewable sources.

The progress of reaching the goals set in the NREAPs has to be reported[23] every second year from 2011 onwards to see how far the EU has got in reaching the policy targets. In accordance with the reporting requirements of the Member States the European Commission publishes a Renewable Energy Progress Report every second year. The EC published the 1st report[24] in 2013, which mainly concluded the followings[25]:

- Most Member States experienced significant growth in renewable energy consumption;
- 2010 figures indicate that the EU as a whole is on its trajectory towards the 2020 targets with a renewable energy share of 12.7%;
- In 2010 the majority of Member States already reached their 2011/2012 interim targets set in the RES Directive;

[21] Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market
[22] Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport
[23] Member States of the European Union, 2011. Renewable Energy Progress reports. Available at: http://ec.europa.eu/energy/renewables/reports/2011_en.htm
[24] Renewable energy progress report COM(2013) 175 final
[25] Official website of the European Commission. Available at: http://ec.europa.eu/energy/renewables/reports/reports_en.htm

- As the trajectory grows steeper towards the end, more efforts will still be needed from the Member States in order to reach the 2020 targets;
- With regard to the EU biofuels and bioliquids sustainability criteria, Member States' implementation of the biofuels scheme is considered too slow.

Implementation of the renewable energy directive in the Energy Community Treaty[26]

The 10th Ministerial Council of the Energy Community decided to adopt the RES Directive on 18 October 2012 (Decision 2012/04/MC-EnC[27]). With the final Decision on the adoption of the RES Directive the Energy Community laid down national RES targets for each Contracting Party, established mechanisms for cooperation on renewable energy within the EU and between EU Member States and third countries. The Contracting Parties can participate in all cooperation mechanisms and the RES statistical transfers for the purposes of target achievement became possible and this is independent from the physical flow of electricity.

With this Decision of the Energy Community the common framework for the promotion of energy from RES became identical in the non-EU states to the EU Member States of the EUSDR.

Report on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling[28]

In February 2010 the European Commission presented a report on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling. In the report the EC made recommendations on the requirements for a sustainability scheme that should be voluntarily adopted by the Member States.

For details please see the "Summary of biomass related sustainability requirements" section below.

Proposal for a directive amending the RES Directive[29]

In October 2012 the European Commission published a proposal for a directive with the aim to limit conventional biofuel production, improve the greenhouse gas performance of biofuel production processes, encourage a greater market penetration of advanced (low-ILUC) biofuels, improve the reporting of greenhouse gas emissions and to protect existing investments until 2020.

Please see details in the "Summary of biomass related sustainability requirements" section.

Transparency Platform

Article 24 of the Directive 2009/28/EC requires the EC to establish an online public transparency platform which serves for increasing transparency and facilitating and promoting the cooperation between EU Member States, in particular concerning statistical transfers and joint projects. The article requires the EC to make the following public on the transparency platform:

i. Member States' (MS) national renewable energy action plans (referred to Article 4);

ii. Member States' forecast documents referred to their estimated excess production of energy from RES, their estimated potential for joint projects and their estimated demand for energy from RES to be satisfied (referred to Article 4(3));

[26] Official website of the Energy Community. Available at: http://www.energy-community.org
[27] Decision 2012/04/MC-EnC on the implementation of Directive 2009/28/EC and amending Article 20 of the Energy Community Treaty.
[28] Report from the Commission to the Council and the European Parliament on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling COM(2010)11 final.
[29] Proposal for a Directive amending Directive 98/70/EC and Directive 2009/28/EC – COM(2012) 595 final.

iii. Member States' offers to cooperate on statistical transfers or joint projects;

iv. Information on the statistical transfers between MS, such as the duration of arrangements and the quantity and price of the energy involved (referred to Article 6(2));

v. The proportion or amount of electricity, heating or cooling from renewable energy sources produced by any joint project in their territory (that become operational or refurbished after 25 June 2009) and the proportion or amount of electricity produced by any installation in the territory of a third country, which is to be regarded as counting towards the national overall target of one or more MS (referred to Article 7(2, 3) and 9(4, 5));

vi. MS' reports on progress in the promotion and use of energy from RES (the 1st by the end of 2011 and every two years thereafter till the end of 2021) (referred to Article 22);

vii. EC reports on the basis of the MS' progress reports and the monitoring analysis of the origin of biofuels and bioliquids consumed in the Community and the impact of their production (referred to Article 23(3)).

Besides Article 24 of the RES Directive the EC shall make the following information public on the transparency platform:

i. Biofuels – emissions from cultivation reports (referred to Article 19(2, 4)). MS-s should submit a list of those areas on the territory of MS-s where the typical GHG emissions from cultivation of agricultural raw materials can be expected to be lower than or equal to the default emission values set in the RES Directive to the EC (with a description of the method and data used). EC should submit a report to the EP on the feasibility of drawing up lists of areas in third countries with similar contents required by MS-s under article 19(2).

ii. Bioenergy – sustainability criteria (referred to Article 17). The RES Directive requires the EC to submit a report to the European Parliament and the Council on requirements for a sustainability scheme for energy uses of biomass, other than biofuels and bioliquids. To comply with this requirement on 25 February 2010 the EC presented a report on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling. For details see the "Summary of biomass related sustainability requirements" section below.

iii. Biofuels – progress reports. Directive 2003/30/EC[30] on the promotion of the use of biofuels or other renewable fuels for transport requires the MS-s to submit reports to the EC before 1 July each year, on the measures taken to promote the use of biofuels or other renewable fuels to replace diesel or petrol for transport purposes; on the national resources allocated to the production of biomass for energy uses other than transport; and on the total sales of transport fuel and the share of biofuels and other renewable fuels placed on the market for the preceding year.

3.1.5 Summary of biomass related sustainability requirements

This section summarizes the main sustainability requirements related to biomass use in the EU.

RES Directive – binding requirements for biofuels and bioliquids

The RES Directive established sustainability criteria for biofuels and bioliquids in its articles 17, 18 and 19. Article 17 defines what sustainability requirements the biofuels and bioliquids have to meet in order to be

[30] Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport.

taken into account for the purposes mentioned in points a) measuring compliance with the requirements of this Directive concerning national targets; b) measuring compliance with renewable energy obligations; c) eligibility for financial support for the consumption of biofuels and bioliquids. These requirements are shown in the following table.

	Requirements*
Greenhouse gas emission savings	1. The GHG emission saving from the use of biofuels and bioliquids shall be at least 35%. With effect from 1 January 2017 this shall be at least 50%. From 1 January 2018 the saving shall be at least 60% or biofuels and bioliquids produced in installations, in which production started on or after 1 January 2017.
Production	2. Biofuels and bioliquids shall not be made from raw material obtained from land with high biodiversity value.
	3. Biofuels and bioliquids shall not be made from raw material obtained from land with high carbon stock.
	4. Biofuels and bioliquids shall not be made from raw material obtained from land that was peat land in January 2008.
	5. Agricultural raw materials cultivated in the Community and used for the production of biofuels and bioliquids shall be obtained in accordance with the requirements and standards under the provisions referred to under the heading 'Environment' in part A and in point 9 of Annex II to Council Regulation (EC) No 73/2009 of 19 January 2009 establishing common rules for direct support schemes for farmers under the common agricultural policy and establishing certain support schemes for farmers and in accordance with the minimum requirements for good agricultural and environmental condition defined pursuant to Article 6(1) of that Regulation.

* Only the main elements of the requirements. For the details of the requirements please see the Directive.

The criteria apply since December 2010.

Article 18 of the RES Directive describes how Member States have to verify compliance with the sustainability criteria for biofuels and bioliquids. The sustainability of biofuels could be checked by Member States or through voluntary schemes which have been approved by the European Commission [31]. Article 19 sets out the rules of how greenhouse gas emission impact of biofuel and bioliquids shall be calculated.

Supplement of the RES Directive – Report on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling

In February 2010 the European Commission presented a report on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling. The report was accompanied by an impact assessment on the requirements for a sustainability scheme for energy uses of biomass other than biofuels and bioliquids, setting out the results as an extension of the RED. On the basis of the analysis the establishment of a binding and harmonised scheme was not necessary, so the Commission only made recommendations – which were mainly based on the sustainability scheme included in Directive

[31] Information about the biofuel sustainability schemes available at: http://ec.europa.eu/energy/renewables/biofuels/sustainability_schemes_en.htm

2009/28/EC on biofuels and bioliquids – that should be voluntarily adopted by the Member States in order to ensure the consistency between national sustainability schemes.

Proposal for a directive that amends the RES Directive

In October 2012 the EC announced a proposal for a directive that amends the RES Directive and the Fuel Quality Directive (98/70/EC[32]). The main aim of the directive would be to limit global land conversion for biofuel production and raise the climate benefits of biofuels used in the European Union. The proposal also aims at protecting existing investments until 2020.

The aims of the proposal are to:

i. Limit the contribution that conventional biofuels (with a risk of ILUC emissions) make towards attainment of the targets in the Renewable Energy Directive and encourage a greater market penetration of advanced (low-ILUC) biofuels

The Directive limits the use of food-based biofuels to 5% that could be counted to meet the 10% EU renewable energy target by 2020 set in the RED for the reason to stimulate the development of the second generation biofuels from non-food feedstock, which also emits substantially less greenhouse gases than fossil fuels but does not directly interfere with global food production. Furthermore it proposes the multiple counting of credits for second-generation (low-ILUC) biofuels.

ii. Improve the greenhouse gas performance of biofuel production processes

It also promotes the increase of the greenhouse-gas-saving threshold to 60% that should be applied to new biofuels production plants starting their operation on or after July 2014 and in the case of installations that are in operation on 1 July 2014 the facilities would only be required to achieve 35% greenhouse gas emission reductions until December 2017 and to achieve 50% reduction thereafter.

iii. Improve the reporting of greenhouse gas emissions

The Directive also proposes mandatory reporting for fuel producers to assess the greenhouse gas performance of their produced biofuels with consideration of the estimated global land conversion impacts – indirect land use change (ILUC).

3.1.6 Timber Regulation[33] (EUTR)

The EU Timber Regulation[34] (also known as the Illegal Timber Regulation) lays down the obligations of operators who place timber and timber products on the EU market. The aim of the EUTR is to counter the trade of illegally harvested timber and timber products through three key obligations:

i. Prohibits the placing of illegally harvested timber and products derived from such timber on the EU market.

ii. Requires EU traders who place timber products on the EU market to exercise "due diligence". "Due diligence" aims to minimise the risk of placing illegally harvested timber, or timber products containing illegally harvested timber, on the EU market by requiring operators to undertake a risk management exercise.

iii. Requires economic operators (referred to as traders in the EUTR) to keep records of their suppliers and customers.

[32] Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC.
[33] Official website of the European Commission. Available at: http://ec.europa.eu/environment/forests/timber_regulation.htm
[34] Regulation (EU) No 995/2010 laying down the obligations of operators who place timber and timber products on the market.

The Regulation applies since 3rd March 2013 and is legally binding to all EU Member States, which are responsible for laying down effective, proportionate and dissuasive penalties and for enforcing the Regulation. Due diligence systems will be developed and operated by "Monitoring organizations" (the Regulation provides for these to be recognized by the European Commission) for which any private entity (operators as well) can apply. The Commission adopted a regulation on the procedural rules for the recognition and withdrawal of recognition of monitoring organisations and also adopted an implementing regulation on the risk assessment and risk mitigation measures, which are part of the „due diligence system" as well as on the frequency and nature of checks (which Member States` competent authorities will conduct) on the monitoring organizations to ensure they comply with the requirements of the Regulation for to aim to ensure the uniform implementation of the EU Timber Regulation.

3.1.7 Green Paper „A 2030 framework for climate and energy policies"[35]

The Green Paper "A 2030 framework for climate and energy policies" adopted by the European Commission in March 2013 has launched a public consultation till 2 July 2013 on what the 2030 climate and energy policy framework should contain. The aim of this paper was to consult stakeholders to obtain their views for the development of the 2030 framework. All citizens and organisations including public authorities as well as other relevant stakeholders from outside the EU were welcomed to contribute to this consultation.

The EU has a clear framework up to 2020 and is making a good progress towards meeting its climate and energy targets for 2020. To provide clarity on a policy framework for 2030 the consultation asked for insights and viewpoints on the basis of a set of questions – e.g. relating to the main lessons from the 2020 framework; type, nature and level of climate and energy targets for 2030; coherence between different policy instruments; competitiveness and security of energy supply; and distribution of efforts between Member States.

The results of this consultation will allow the new 2030 framework to build on the experience and lessons learnt from the 2020 framework and to identify where improvements can be made. Moreover, it will take into account the longer term perspective set out by the Commission in 2011 in the Roadmap for moving to a competitive low carbon economy in 2050, the Energy Roadmap 2050 and the Transport White Paper.

The consultation resulted in 595 responses; a report containing the main outcomes of the consultation has been published on the website of the European Commission[36].

[35] Official website of the European Commission. Available at: http://ec.europa.eu/energy/green_paper_2030_en.htm
[36] Information about the main outcomes of the "2030 framework for climate and energy policies" public consultation available at: http://ec.europa.eu/energy/consultations/20130702_green_paper_2030_en.htm

3.2 Joint Declaration on biomass sustainability by the countries of the Danube Region Strategy

In 13 June 2013 the countries of the Danube Region Strategy adopted a joint declaration on biomass sustainability which declares that

- in most countries strict regulation is already in place;
- biomass is generally produced in a sustainable manner;
- national systems may not be always perfect, but these are developing constantly;
- the import of biomass used for energy is at a very low level and can be sufficiently controlled in the frame of the EU Timber Regulation and relating regulations;
- new EU-wide obligatory sustainability criteria would
  - o unavoidably create additional administration and costs especially for the EU producers, without any additional benefit for the environment, thus creating market distortion and disadvantage in competition for the producers of the Member States;
  - o possibly devalue and erode the existing well developed and widely accepted national criteria, indicator and monitoring systems;

therefore there is no need to develop additional binding sustainability criteria for solid biomass at EU level.

4 ASSESSMENT OF THE COUNTRIES OF THE EUSDR

This section outlines the general profiles – such as the macro-economic indicators, agriculture, forestation and climate – and the policy framework of the individual DRS countries. In order to find the common problems and formulate a region-wide recommendation package for the encouragement of sustainable energy use it is important to learn about the general profile, the availability of resources and current bioenergy policies of the individual countries.

The short descriptions are based on data provided by the EUSDR countries in the questionnaires (data sheets) and on desk research. In this chapter the data in the tables originating from the questionnaires are marked in bold and data from the desk research are written with normal fonts.

4.1 Austria

Table No. 1: **General profile and macro-economic indicators of AT**			Date of data
EU membership		Yes, as of 1 January 1995	-
Area [km2]		83,871	-
Population [persons]		8,221,646	2013
Population density [inhabitants/km2]		98	2013
Life expectancy at birth [years]		81	2011
Navigable length of the Danube [km]		n/a	-
Current use of Danube as a transport route	Low		-
	Medium	n/a	
	High		
GDP [millions of €]		307,004	2012
GDP/capita [€]		36,513	2012
Inflation rate [annual average rate of change, %]		2.6	2012
Unemployment rate [annual average, %]		4.2	2012

Table No. 2: **Agriculture, forestation and climate of AT**				Date of data
Total area eligible for agriculture [km2]			n/a	-
Utilised agricultural area [km2]			32,680	-
Total area eligible for forestation [km2]			n/a	-
Utilised forest area [km2]			34,058	2010
Total area eligible for biomass cultivation [km2]			n/a	-
Utilised biomass cultivation area [km2 or %]			n/a	-
Planned forestation per annum [km2]			n/a	-
Classified national nature area [km2]			27,468	-
Agriculture share in GDP [%]			n/a	-
Agriculture share in employment [%]			n/a	-
Agriculture area split [m2]	Arable land	Total	n/a	-
		Energy crops	338	2006[37]
	Permanent crops (orchards and vineyards)		n/a	-
	Permanent pastures (areas for natural grasses and grazing of livestock)		n/a	-
	Non cultivable		n/a	-
	Other (please specify)		-	-
Climate type			temperate	-
Average annual temperature [C°]			n/a	-
Average annual precipitation [mm]			n/a	-
Average wind velocity [km/h]			n/a	-
Average annual sunshine [hours]			n/a	-

Potential

The territory of forest is growing in Austria. Currently 22 million m^3 wood is cut annually and 7.6 million m^3 more could be utilized without harming the nature.[38]

Policy assessment

National bioenergy policy

The most important renewable energy sources in Austria are large-scale hydro for electricity production and biomass for electricity and heat production. Energy policy has a strong focus on renewable energies, among which biomass is a very important source.

i. The Austrian Strategy for Sustainable Development[39] (2002) specifies 52 indicators on quality of life, business development, living space protection and responsibility. Indicator reports summarize how the goals of the strategy are met.

ii. The Austrian Biomass Strategy has been prepared but was not fully adopted; however it has provided inputs to the national Energy Strategy regarding biomass use.

[37] National Renewable Energy Action Plan 2010 of Austria.

[38] Austrian Energy Agency, 2009. Country Study on Political Framework and Availability of Biomass. Available at: www.4biomass.eu

[39] Federal Ministry of Agriculture, Forestry, Environment and Water Management, 2002. Austrian Strategy for a Sustainable Development. Available at: http://www.lebensministerium.at/

iii. The Austrian Energy Strategy[40] (2010) aims to pave the way for a sustainable energy system beyond 2020. The key objectives are the security of supply, environmental compatibility, cost effectiveness, social compatibility and competitiveness.

iv. The Austrian Forestry Act[41] (1975, last amended in 2011) implements the sustainability criteria and states that the forest area cannot be decreased.

Biomass within the NREAP - bioenergy targets

National renewable action plan 2010 has been created in accordance with directive 2009/28/EC. Austria shall reach 34% renewable energy share (equals to 388PJ) in gross final energy consumption by 2020. The value for 2011 has already reached 31.0%. Biofuel use shall be increased to 10% till 2020. To reach the targets new agricultural biomass resources needed to be used and increased import of biofuels are expected.

Table No. 3: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020

	Unit	
Share of energy from renewable sources in gross final consumption of energy in 2005	%	23.3
Target of energy from renewable sources in gross final consumption of energy in 2020	%	34.0
Expected total adjusted energy consumption in 2020	ktoe	27,109
Expected amount of energy from renewable sources corresponding to the 2020 target	ktoe	9,217

Austria imports a large amount of forestry biomass products 4.2 ktoe (in 2006), which is basically one-fourth of their domestic resource. It is estimated that the domestic resource will increase approximately by 28% till 2020. A significant increase can be expected in case of agricultural products and by-products. The internal production will grow from 0.9 million ktoe (2006) to 9.8 million ktoe (2020).

The total contribution (installed capacity) of biomass (solid, gas and liquid) will grow from 9,600 MW (in 2005) to 13,179 MW (in 2020) in electricity and will be the third most important source after hydro and wind power.

Biomass and especially solid biomass plays and will keep the most important role in heating and cooling sector, because of 86% of renewable heating and cooling will come from using biomass. This will be a small reduction compared to the share in 2005.

Biodiesel will provide the majority, 48% of the biofuel that will be produced in 2020.

Financial support and economic incentives for bioenergy

In general the Federal States have their own funding sources to support the use of bioenergy; however some incentives are applied throughout the country.

i. Local biomass heating production (central heating including machine installation, storage and heat distribution, network for heating supply over a wide area; resource efficiency and increase energy efficiency) is supported.

ii. Reduced VAT on biomass (10% against 20% on fossil fuels) – also historically a social measure to promote the use of cheap wood as energy resource.

[40] Federal Ministry of Economy, Family and Youth and the Federal Ministry of Agriculture, Forestry, Environment and Water Management, 2010. The Austrian Energy Strategy. Available at: http://www.lebensministerium.at
[41] Austrian Forestry Act, 1975. Available at: http://www.lebensministerium.at

iii. Support schemes for "green" residential building investments (new, refurbishment) - this social measure includes the promotion of biomass use.

iv. Support schemes for „green" commercial building investments (office, industry) promotion of energy efficiency in building sector (incl. biomass use).

v. Feed-in tariff system (green electricity law) - response to failure of former green certificate system, also following the successful example of the feed-in tariff system in Germany.

vi. Tax incentives for biofuels (including blends with bio component)

Key actors

i. Österreichischen Biomasse-Verband: http://www.biomasseverband.at
The vision of the Austrian Biomass Association (representing 1200 individuals and companies) is a full transition to an efficient, renewable energy system with the best possible contribution of local, sustainably produced biomass.

ii. ARGE Biokraft: http://www.biokraft-austria.at
This Association of liquid biofuel represent biodiesel, bioethanol producers and oil companies to coordinate and represent common interest of Austrian producers.

iii. ARGE Kompost & Biogas: www.kompost-biogas.info
This Vienna based umbrella organization represents more than 490 plants from the compost and biogas sector.

iv. BIOENERGY 2020+: www.bioenergy2020.eu
It is a cooperation of five scientific institutions which, as multilocational competence centres, drive forward application-oriented research in the field of bioenergy in Austria

v. ProPellets Austria - Pellets Association Austria: www.propellets.at
It is an association of the Austrian wood pellet industry. The members are companies that produce, process wood pellets, manufacture heating boilers or wood pellet stoves.

4.2 Bosnia and Herzegovina

Table No. 4: General profile and macro-economic indicators of BIH			Date of data[42]
EU membership		No, accession country	-
Area [km2]		51,197	-
Population [persons]		3,875,723	2013
Population density [inhabitants/km2]		76	2013
Life expectancy at birth [years]		76.12	n/a
Navigable length of the Danube [km]		none	-
Current use of Danube as a transport route	Low	-	-
	Medium	-	
	High	-	
GDP [millions of €]		25,666	2011
GDP/capita [€]		6,684	2011
Inflation rate [annual average rate of change, %]		n/a	-
Unemployment rate [annual average, %]		n/a	-

Table No. 5: Agriculture, forestation and climate of BIH			Date of data
Total area eligible for agriculture [km2]		10,239	-
Utilised agricultural area [km2 or %]		n/a	-
Total area eligible for forestation [km2]		21,850	-
Utilised forest area [km2 or %]		n/a	-
Total area eligible for biomass cultivation [km2]		n/a	-
Utilised biomass cultivation area [km2 or %]		n/a	-
Planned forestation per annum [km2]		n/a	-
Classified national nature area [km2]		n/a	-
Agriculture share in GDP [%]		8.3	-
Agriculture share in employment [%]		20.5	2008
Agriculture area split [% of total area eligible for agriculture]	Arable land – Total	n/a	-
	Arable land – Energy crops	n/a	-
	Permanent crops (orchards and vineyards)	n/a	-
	Permanent pastures (areas for natural grasses and grazing of livestock)	n/a	-
	Non cultivable	n/a	-
	Other (please specify)	-	-
Climate type		moderate continental, mountain, mediterranean	-
Average annual temperature [C°]		n/a	-
Average annual precipitation [mm]		n/a	-
Average wind velocity [km/h]		n/a	-
Average annual sunshine [hours]		n/a	-

[42] Central Intelligence Agency. The World Factbook. Available at: https://www.cia.gov/library/publications/the-world-factbook/

Potential[43]

According to the UNDP Human Development Report, biomass and waste currently make up 3.7% of Bosnia's energy supply. It is estimated that 1 million m^3 of biomass are available annually for energy production.

Forests and forestland cover around 43% of Bosnia and Herzegovina's territory which is around 2.7 million hectares. The forest decreases by around 0.1% each year. It is estimated that wood waste in BIH can annually produce approximately 5,200 GWh of electricity with an additional 600 MW of installed capacity.

Landfill gas is also produced in a pilot project in Sarajevo that has 350 kW of electric capacity.

Regarding residues from field crops, fruit tree plantations, and livestock activities, it is reported that there is a significant potential for their collection and utilisation, along with wastes including manures from intensive farms with recourse to incineration or anaerobic digestion.

Policy assessment[45]

Biomass strategy at Entity level[44] will be developed with the engagement and support of the relevant policy makers and other stakeholders.

National bioenergy policy[45]

An in-Depth Review of Energy Efficiency Policies and Programmes is on-going, a delay is experienced regarding the development of the national Energy Efficiency Action Plan. Energy policy development is within the competence of the two Entities of BiH. Till today the policy has not been formulated and agreed on state level.

The Strategy of Development of BiH (2007) states that sustainable development of the energy sector and stimulations of the development of renewable sources are both important priorities of the document.

Biomass within the NREAP – bioenergy targets

As a Contracting Party of the Energy Community, Bosnia and Herzegovina was expected to submit its national Renewable Energy Action Plan by mid-2013; however, until now it has not been finalized.

In 2009 the share of renewable energy sources in the gross final consumption was 34% and it is expected that by 2020 the country will reach 40%.

Table No. 6: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020

	Unit	
Share of energy from renewable sources in gross final consumption of energy in 2009	%	34.0
Target of energy from renewable sources in gross final consumption of energy in 2020	%	40.0
Expected total adjusted energy consumption in 2020	ktoe	n/a
Expected amount of energy from renewable sources corresponding to the 2020 target	ktoe	n/a

[44] Energy Charter Secretariat, 2012. In-Depth Deview of Energy Efficiency Policies and Programmes: Bosnia and Herzegovina. Available at: http://www.encharter.org

[45] Entity is used as term for territorial divisions. Bosnia and Herzegovina comprising two entities – a joint Federation of Bosnia and Herzegovina (FBiH) and the Republika Srpska (RS).

Financial support and economic incentives for bioenergy[45]

i. Feed-in tariff
It is available for electricity generated from renewables, with installed power up to 5 MW is 5.8 €c/kWh on the 10 kV voltage for the BIH utility, and a 6.6 €c/kWh on the 10 kV voltage for other utility. Tariff adjustment coefficient is also used, which is 0.77 in case of biomass.

ii. Fund for environmental protection
It is a financial scheme that supports projects aiming at reducing emissions and the impact on the environment.

iii. European Bank for Reconstruction and Development (EBRD) loan
EBRD provided a €10 million loan to finance energy efficiency and renewable energy projects by private companies in BiH. The credit to Raiffeisen Bank is used for lending to companies investing in sustainable energy projects.

iv. CARDS project (Community Assistance for Reconstruction, Development and Stabilisation)
The European Commission has directly supported the energy sector of BiH in the process of reform through the funding.

v. Biomass Energy for Employment and Energy Security Project
It aims to save 120,000 tonnes of CO2 equivalent over 15 years by retrofitting or installing biomass-fired boilers in 20 schools across the country.

Key actors

Biomass in Bosnia and Herzegovina association[46]

Established at the end of 2011 by more than 20 companies. Members are representing consulting companies, producers of energy, technology of biomass based fuel, as well as individual private entrepreneurs and non-governmental organizations from the whole country.

[45] Energy Charter Secretariat, 2012. In-Depth Deview of Energy Efficiency Policies and Programmes: Bosnia and Herzegovina. Available at: http://www.encharter.org
[46] Balkans.com Business News, 2011. "Biomass in Bosnia and Herzegovina" association launched. Available at: http://www.balkans.com

4.3 Bulgaria

Table No. 7: General profile and macro-economic indicators of BG			Date of data
EU membership		Yes, as of 1 January 2007	-
Area [km2]		110,879	-
Population [persons]		6,981,642	2013
Population density [inhabitants/km2]		63	2013
Life expectancy at birth [years]		73.5	2011
Navigable length of the Danube [km]		n/a	-
Current use of Danube as a transport route	Low		-
	Medium	n/a	
	High		
GDP [millions of €]		39,668	2012
GDP/capita [€]		5,414	2012
Inflation rate [annual average rate of change, %]		2.4	2012
Unemployment rate [annual average, %]		12.2	2012

Table No. 8: Agriculture, forestation and climate of BG			Date of data
Total area eligible for agriculture [km2]		**54,865.7**	**2011**
Utilised agricultural area [km2]		**50,879.5**	**2011**
Total area eligible for forestation [km2]		**41,481.1**	**2011**
Utilised forest area [km2]		**37,747.8**	**2011**
Total area eligible for biomass cultivation [km2]		n/a	**-**
Utilised biomass cultivation area [km2 or %]		n/a	-
Planned forestation per annum [km2]		**14.2**	**2011**
Classified national nature area [%]		**34.3**	**2011**
Agriculture share in GDP [%]		**4.7**	**2011**
Agriculture share in employment [%]		**3**	**2012**
Agriculture area split [km2]	Arable land – Total	**32,272.4**	**2011**
	Arable land – Energy crops	**26,481.7**	**2011**
	Permanent crops (orchards and vineyards)	**1,598.9**	**2011**
	Permanent pastures (areas for natural grasses and grazing of livestock)	**16,783.1**	**2011**
	Non cultivable	**3,582.4**	**2012**
	Other (please specify)	-	-
Climate type		temperate	-
Average annual temperature [C°]		n/a	-
Average annual precipitation [mm]		n/a	-
Average wind velocity [km/h]		n/a	-
Average annual sunshine [hours]		n/a	-

Policy assessment

National bioenergy policy

i. Energy Strategy until 2020[47] (2008, renewed in 2010 and June 2011)

The energy policy aims to take steps against high dependency of energy imports by improving energy safety through the diversification of energy supplies, an increase in liquid fuel stocks and a better utilisation of local energy resources. With environmentally sound development Bulgaria aims to further develop renewables and increase energy efficiency and to achieve the liberalisation of energy markets. Biomass utilisation is foremost enhanced in local, decentralized heat production.

A law on Energy and Energy Efficiency was adopted at the end of 2003.

ii. National Long-Term Programme to Encourage the Use of Biomass for the period 2008-2020[48] (2008)

The document was compiled with an aim to reduce external dependency, insecurity of energy prices and supplies, but also as a response to the Biomass Action Plan of the EU. The Programme takes into account Directive 2003/30/EC on encouraging the use of biofuels or other renewable fuels in the transport sector. The document estimates that the unused potential of biomass (forest, agriculture, waste, sludge) is 809 Mtoe annually, which could serve 9% of final energy consumption.

Biomass within the NREAP – bioenergy targets

According to 2009/28/EC the share of renewable sources within gross final consumption almost has to double within 15 year.

Table No. 9: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020

	Unit	
Share of energy from renewable sources in gross final consumption of energy in 2005	%	9.4
Target of energy from renewable sources in gross final consumption of energy in 2020	%	16.0
Expected total adjusted energy consumption in 2020	ktoe	10,738
Expected amount of energy from renewable sources corresponding to the 2020 target	ktoe	1,718

According to the NREAP, the aggregate technical potential for the generation of energy from renewable sources in Bulgaria is approximately 4500 toe per year. Its distribution among the various types of sources is uneven, with the largest share held by hydro power (~29%) and biomass (~34%).It is estimated that the technical potential of solid biomass is 1524 ktoe.

In 2006 forestry biomass supply was approximately 2.5 million tonnes resulting in 759 ktoe primary energy production, and it is planned to be increased to 2.9 million tonnes and 930 ktoe production in 2020. In case of agricultural biomass almost a 5-time increase can be expected in supply but 33-time growth in energy production.

In 2005 there was no installed capacity in place but this is expected to be changed and over 300 MW will be used for electricity generation by 2020.

[47] Energy Strategy of the Republic of Bulgaria till 2020. For reliable, efficient and cleaner energy (2011). Available at: www.mi.government.bg
[48] National Long-Term Programme to Encourage the Use of Biomass for the period 2008-2020 (2008). Available at: www.strategy.bg

Regulation scheme

i. Renewable and Alternative Energy and Biofuels Act[49] (2007)
The Act regulates the public relationships related to encouraging the production and use of electric, heat and/or cooling energy from RES and AES, as well as production and the use of biofuels. The Act also introduces an incentives mechanism for the production of heat and/or cooling energy from RES by issuing certificates of origin.

ii. Energy from Renewable Sources Act[50] (ERSA, 2011, last amended in 2012)
The Energy Act regulates the generation, import and export, transmission, transit transmission, distribution of electricity, heat and natural gas, oil and oil product transmission through pipelines, trade in electricity, heat and natural gas, as well as the powers of state bodies in formulating energy policy, regulation and control.

Financial support and economic incentives for bioenergy

Feed-in tariff[51]

A new tariff system was adopted recently, that simplifies the processes of licensing. Depending on the type of fuel: BGN 182 - 287 per MWh (about €ct 9.3–14.7 per kWh) tariff is paid to producers. In 2012 a retroactive grid usage fee was introduced for all RES plants connected to the grid since 2010, which has to be paid by the plant operators. For plants using biomass or biogas, the grid usage fee amounts to 10% of the respective feed-in tariff.

Key actors

i. ABEA – Association of Bulgarian Energy Agencies: http://www.abea-bg.org/
Non-government organization, supports its members' activity and unifies their efforts either for preparation of suggestions for improvement of the national and local (municipal) normative base so that a sustainable energy policy to be ensured and towards their participation in joint projects at national, European, and international/worldwide level.

ii. SEC – Sofia Energy Centre: http://www.sec.bg/en/
SEC was established in 1997 as a successor of European Community Energy Centre Sofia and has gained a lot of experience in the execution and implementation of different European energy projects in Bulgaria. During its activity period the company has been involved very successfully in different PHARE, THERMIE, SYNERGY, SAVE, ALTENER, FP4, FP5, FP6, FP7 and IEE projects and actions.

iii. Energy Utilisation Biomass Association (EUBA): www.euba.bg
Established in 2001 with the participation of companies and individuals to share information on biomass and to foster the use of biomass. EUBA is a member of AEBIOM.

[49] Renewable and Alternative Energy Sources and Biofuels Act, Prom. SG. 49/19.06.2007. Available at: http://www.investbulgaria.com/BulgarianRenewableEnergyAct.php
[50] Energy from Renewable Sources Act. Available at: http://www.res-legal.eu/search-by-country/bulgaria/
[51] Legal sources on renewable energy. Available at: http://www.res-legal.eu/search-by-country/bulgaria/

4.4 Croatia

Table No. 10: General profile and macro-economic indicators of HR			Date of data[52]
EU membership		Yes, as of 1 July 2013	-
Area [km2]		56,594	-
Population [persons]		4,475,611	2013
Population density [inhabitants/km2]		79	2013
Life expectancy at birth [years]		76.2	n/a
Navigable length of the Danube [km]		n/a	-
Current use of Danube as a transport route	Low		-
	Medium	n/a	
	High		
GDP [millions of €]		43,904	2012
GDP/capita [€]		10,268	2012
Inflation rate [annual average rate of change, %]		3.4	2012
Unemployment rate [annual average, %]		19.1	2012

Table No. 11: Agriculture, forestation and climate of HR			Date of data
Total area eligible for agriculture [km2]		n/a	-
Utilised agricultural area [km2 or %]		n/a	-
Total area eligible for forestation [km2]		n/a	-
Utilised forest area [km2 or %]		n/a	-
Total area eligible for biomass cultivation [km2]		n/a	-
Utilised biomass cultivation area [km2 or %]		n/a	-
Planned forestation per annum [km2]		n/a	-
Classified national nature area [km2]		n/a	-
Agriculture share in GDP [%]		n/a	-
Agriculture share in employment [%]		2.1	2012
Agriculture area split [% of total area eligible for agriculture]	Arable land – Total	n/a	n/a
	Arable land – Energy crops	n/a	n/a
	Permanent crops (orchards and vineyards)	n/a	n/a
	Permanent pastures (areas for natural grasses and grazing of livestock)	n/a	n/a
	Non cultivable	n/a	n/a
	Other (please specify)	-	-
Climate type		mediterranean, continental	-
Average annual temperature [C°]		n/a	n/a
Average annual precipitation [mm]		n/a	n/a
Average wind velocity [km/h]		n/a	n/a
Average annual sunshine [hours]		n/a	n/a

[52] Central Intelligence Agency. The World Factbook. Available at: https://www.cia.gov/library/publications/the-world-factbook/

Potential

A study[53] shows that the technical potential of forest based biomass is 18.10 PJ, out of which 3.95 PJ is comprised of forest residues. Approximately 50% of this source could be used in medium scale combined heat and power installations and the other 50% could go into co-firing resulting in 186 GWh electricity production.

Agricultural residues, by-products or manure could be used for biogas production. Its technical potential is 12.56 PJ, but probably only 20% of it can be realized resulting in 2.5 PJ and 244 GWh electricity output per year. Straw (without conflict with feedstock) could be used for small scale heat production in straw fired boilers. Its technical potential is 14.25 PJ

The study also shows that energy crops could be grown and their respective technical potential is estimated to be 4.32 PJ resources. If only half of this source is utilized in medium scale CHP installations, it could deliver 209 GWH electricity and 299 GWH heat annually.

Policy assessment

National bioenergy policy

i. Energy Strategy of the Republic of Croatia[54] (2009)

The strategy aims to reduce the country's dependency on imported energy and to diversify energy supplies. It also identifies the need for increased sustainable supply of energy resources and improved energy efficiency. It indicates that a total investment of €15 billion will be needed for energy sector projects (60% directed to the power sector, 30% to the oil and gas sector and 10% to the district heating sector). On the basis of the Energy Sector Development Strategy National Energy Programs are developed. The strategy states "Croatia defines a goal to, along with the existing incentive measures and removing the existing administrative barriers, use around 15 PJ of biomass in energy purposes in 2010, while in 2020 double, around 26 PJ. Part of this biomass shall be used in many biomass fired power plants of total power of 85 MW in 2020, preferably cogeneration plants"

ii. National Renewable Energy Action Plan[55] (2013)

The plan is in line with the European Union directive on renewable sources which contains measures through which member countries must ensure 20 per cent of renewables in energy consumption by 2020. To meet the EU goal, the government wants to encourage small hydroelectric power plants, biomass and biogas (instead of wind farms) because these projects have the biggest impact on the economy.

Biomass within the NREAP - bioenergy targets

Table No. 12: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020

	Unit	
Share of energy from renewable sources in gross final consumption of energy in 2009	%	12.6
Target of energy from renewable sources in gross final consumption of energy in 2020	%	20.0
Expected total adjusted energy consumption in 2020	ktoe	n/a
Expected amount of energy from renewable sources corresponding to the 2020 target	ktoe	n/a

[53] Greek Centre for Renewable Energy Sources and Saving (CRES) and North-West Croatia Regional Energy Agency, 2010. Hellenic Aid – USAID programme: SYNENERGY, Action 1: Regional Renewable Energy Assessment, Biomass in Croatia.
[54] Ministry of Economy, Labour and Entrepreneurship of the Republic of Croatia, 2009. Energy Strategy of the Republic of Croatia. Available at: www.mingo.hr
[55] Source: www.vlada.hr

The most important renewable energy source for electricity production is hydropower; however a biomass cogeneration power plant project (20 MWe, 35 MWth) is under construction.

Regulation scheme[56]

i. Energy Act (OG 68/01, 177/04, 76/07)

The act foresees the development of an Energy Strategy for a period of ten years and as a result Croatia adopted a new Energy Development Strategy for the period up to 2020 in 2009. A special section of the Energy Act deals with Energy Efficiency and Renewable Energy Sources. Feed-in tariffs for electricity produced from RES and cogeneration have been amended.

ii. Act on Electricity Market (OG 177/04, 76/07)

It was amended in order to simplify and shorten administrative procedures for RES-E projects, particularly small projects.

iii. Act on the Regulation of Energy Activities (OG 177/04, 76/07)

The act establishes the Croatian Energy Regulatory Agency (HERA) as an independent legal entity and defines its roles and responsibilities.

iv. Act on Production, Distribution and Supply of Thermal Energy (OG 42/05)

It states that cogeneration plants have the priority in selection of solutions for new production objects. Energy subject that uses cogeneration and waste, bio-waste or renewable energy sources for heat production can gain the status of eligible heat producer.

Financial support and economic incentives for bioenergy[57]

i. Feed-in tariff: "qualified producers" are eligible for a fixed price per kWh of electricity supplied to the grid after signing a contract with the Croatian Energy Market Operator (HBOR).

ii. Environmental Fund Loan: loans are given for the promotion of renewable energy sources.

iii. Croatian Bank for Reconstruction and Development: loans are provided for projects where electricity is generated from renewable sources.

Key actors

i. Energy Regulation Agency (HERA): www.hera.hr

It is the regulatory body of the energy sector and responsible for price control. The Agency is an autonomous, independent and non-profit public institution based on the Act on the Regulation of Energy Activities.

ii. Croatian Forestry Association: www.sumari.hr

The Croatian Forestry Association is in favour of supporting the use of forestry biomass. It is also a member of AEBIOM.

[56] Energy Institute Hrvoje Pozar, 2012. Energy Efficiency Policies and Measures in Croatia. Available at: http://www.odyssee-indicators.org/
[57] Legal sources on renewable energy. Available at: http://www.res-legal.eu/search-by-country/croatia/

4.5 Czech Republic

Table No. 13: General profile and macro-economic indicators of CZ			Date of data
EU membership		Yes, as of 1 May 2004	-
Area [km2]		78,867	-
Population [persons]		10,162,921	2013
Population density [inhabitants/km2]		129	2013
Life expectancy at birth [years]		76.9	2011
Navigable length of the Danube [km]		none	-
Current use of Danube as a transport route	Low	-	-
	Medium	-	
	High	-	
GDP [millions of €]		152,926	2012
GDP/capita [€]		14,557	2012
Inflation rate [annual average rate of change, %]		3.5	2012
Unemployment rate [annual average, %]		7	2012

Table No. 14: Agriculture, forestation and climate of CZ				Date of data
Total area eligible for agriculture [km2]			**35,400**	**2011**
Utilised agricultural area [km2]			**25,160**	**2011**
Total area eligible for forestation [km2]			**25,959**	**2011**
Utilised forest area [%]			**33.8**	**2011**
Total area eligible for biomass cultivation [km2]			**11,200**	**2011**
Utilised biomass cultivation area [km2]			**7,400**	**2011**
Planned forestation per annum [km2]			**217.5**	**2011**
Classified national nature area [km2]			**12,486**	**2011**
Agriculture share in GDP [%]			**2.8**	**2011**
Agriculture share in employment [%]			**2.9**	**2011**
Agriculture area split [% of total area eligible for agriculture]	Arable land	Total	**71**	**2011**
		Energy crops	**19.2**	**2011**
	Permanent crops (orchards and vineyards)		**31.5**	**2011**
	Permanent pastures (areas for natural grasses and grazing of livestock)		**12.4**	**2011**
	Non cultivable		**7.9**	**2011**
	Other (please specify)		-	-
Climate type			**mild**	-
Average annual temperature [C°]			**7.3**	**2011**
Average annual precipitation [mm]			**1,100**	**2011**
Average wind velocity [km/h]			**11.8-38.5**	**2011**
Average annual sunshine [hours]			**1,330-1,800**	**2011**

Potential

When calculating all the residual biomass it can be estimated that the total energy potential is approximately 82 PJ. Practically, however, the usable potential can be estimated only at approximately 35 PJ of energy.[58]

Policy assessment

National bioenergy policy

i. National Energy Policy until 2030[59] (2004)
The State Energy Policy adopted a set of renewable targets to be achieved by 2030 (15-16% of total energy consumption and 17% of electricity production).

ii. Biomass Action Plan for the Czech Republic 2012-2020[60] (2012)
Its aim is primarily to define measures and principles that will lead to the purposeful use of the energy potential of biomass and which will help meet the country's obligations related to the production of energy from renewable sources until 2020. While there is mainly wood and residual wood biomass currently being processed, the share of agricultural biomass is bound to increase in the future.

Biomass within the NREAP – bioenergy targets

The NREAP (2010) established that renewable energies must represent 13.5% of final energy consumption and over 14.0% of final electricity consumption by 2020.

Table No. 15: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020

	Unit	
Share of energy from renewable sources in gross final consumption of energy in 2005	%	6.1
Target of energy from renewable sources in gross final consumption of energy in 2020	%	13.5
Expected total adjusted energy consumption in 2020	ktoe	32,531
Expected amount of energy from renewable sources corresponding to the 2020 target	ktoe	4,382

In 2006 altogether 5867 thousand tonnes of forestry biomass have been used mostly coming as direct biomass supply resulting in 1536 ktoe primary energy production. By 2020 the domestic source is expected to grow to 9900 thousand tonnes out of which 2716 ktoe energy will be produced focusing on indirect supply (sawmills, pulp and paper, etc.)

Agricultural source was negligible representing 88 thousand tonnes (32ktoe), while biomass from waste was 235 thousand tonnes (76ktoe). This amount is expected to grow almost tenfold to reach 800 thousand tonnes and 360ktoe.

By 2020 it is expected that biomass contribution (gross electricity generation) to electricity within renewable sources will reach 53% (6165 GWh) compared to the 23% (721 GWh) in 2005. In heating and cooling biomass is forecasted to keep its dominance.

[58] Tluka, P., Jelínek, F. (CZ Biom – Czech Biomass Association), 2009. Country Study on Political Framework and Availability of Biomass. Available at: www.4biomass.eu
[59] Ministry of Industry and Trade of the Czech Republic, 2004. National Energy Policy.
[60] Ministry of Agriculture of the Czech Republic, 2012. Biomass Action Plan for the Czech Republic 2012-2020. Available at: www.eagri.cz

Regulation scheme

i. Energy Management Act (2000, 2006, 2010)
It sets minimum requirements for energy demand in buildings, energy audits in buildings and energy labelling of electrical appliances. It also promotes the use of CHP and of renewable energy sources

ii. Energy Act (2005, 2009)
Its objectives are improved energy efficiency, reduction of negative environmental effects of energy production and liberalization of the energy sector. It also specifies the responsibilities of the Energy Regulation Office.

iii. Act on the promotion of electricity production from renewable energy sources (2005)
Offering a choice between a feed-in tariff (a guaranteed price) or a "green bonus" (an amount paid in addition to the market price). The Czech Republic has implemented the EU Directive 2001/77/EC in its national legislation.

Financial support and economic incentives for bioenergy[61]

i. A feed-in system for RES-E and cogeneration came into force in 2002.
The basic act for the support of RES for energy production is the Act on the promotion of electricity produced from renewable energy sources. Preferential connection to the grid is established which includes the obligation for operators of the regional grid systems and the transmission system operator to purchase all electricity from renewable sources; the guarantee of revenue per unit of electricity produced over a 15-year period as of the date a plant is put into operation.

ii. Green bonuses (premium on the market price of electricity) – electricity produced from renewable sources can be placed on the single electricity market. Producers can choose if they sell electricity for purchase prices or offer it to trader for „market-price" and simultaneously get extra green bonuses. It is approximately 65 €/MWh for the year 2012.

iii. European Regional Development Fund- State Environmental Fund: The Operational Programme for 2007-2013 includes the subsidy scheme "Exploitation of Renewable Energy Sources". OP Environment: Construction of new facilities and renovation of existing facilities in order to increase the use of RES for heat production, electricity generation and cogeneration.

iv. Tax exemption: Properties used solely for the purpose of improving the environment are exempt from real estate tax. According to a regulation issued by the Ministry of Finance, this includes constructions used exclusively for solar thermal collectors, biogas, biomass and geothermal energy sources (including heat pumps). Exemption from real estate tax can be claimed through the tax return.

Biomass transport

During the last couple of years a cross-border trade of biomass has been increasingly developing in Central Europe. The biggest importer in the region is Italy, followed by Austria and Germany. In Austria, 90% of the imports of firewood come from the Czech Republic, Slovakia and Hungary. Most of the international trade focuses on wood and wood products. The importance of liquid biofuels trade has been decreasing during the last couple of years.

[61] Related acts: § 9 par. 1 letter M Act No. 338/1992 and § 1 par. 2 letters I, J, K, L Regulation No. 12/1993. Source: www.res-legal.eu

Key actors

i. CzBA – Czech Biogas Association: www.czba.cz/
Czech Biogas Association was founded in January 2007 as national technology platform in the field of biogas production and utilisation. CzBA currently associates more than 40 biogas industry members and leading R&D institutions as well as engineers, biogas plant operators, project specialists and other experts not only from the Czech Republic.

ii. Czech Renewable Energy Agency: http://www.czrea.org/

iii. Czech Biomass Association (CZ Biom): http://biom.cz/
CZ Biom is a non-governmental non-profit organization and professional association supporting the development of phyto-energy in the Czech Republic. It is the Czech Republic's biggest professional organisation engaged in the issue of using biomass in all its forms as an energy source. Established in 1994, CZ Biom employs ten experts and currently represents roughly 160 firms and members.

4.6 Germany: Federal states of Baden-Württemberg and Bavaria

Table No. 16: General profile and macro-economic indicators of Bavaria, DE			Date of data
EU membership		Yes, as of 23 July 1952	-
Area [km2]		**70,551**	-
Population [persons]		**12,519,728**	n/a
Population density [inhabitants/km2]		**177.5**	n/a
Life expectancy at birth [years]		**80.7**	n/a
Navigable length of the Danube [km]		**213**	n/a
Current use of Danube as a transport route	Low		-
	Medium	**x**	
	High		
GDP [millions of €]		**456,632**	n/a
GDP/capita [in PPS]		n/a	-
Inflation rate [annual average rate of change, %]		**1.8**	n/a
Unemployment rate [annual average, %]		**3.6**	**2013**

Table No. 17: General profile and macro-economic indicators of Baden-Württemberg, DE			Date of data
EU membership		Yes, as of 23 July 1952	-
Area [km2]		35,752	-
Population [persons]		10,747,905	2009
Population density [inhabitants/km2]		301	n/a
Life expectancy at birth [years]		n/a	-
Navigable length of the Danube [km]		n/a	-
Current use of Danube as a transport route	Low		-
	Medium	n/a	
	High		
GDP [millions of €]		376,280	2011[62]
GDP/capita [in PPS]		n/a	-
Inflation rate [annual average rate of change, %]		n/a	-
Unemployment rate [annual average, %]		n/a	-

[62] Source: Portal of the Baden-Württemberg Statistics Office. Retrieved 31 July 2012. GDP of State. Available at: www.statistik-bw.de

Table No. 18: **Agriculture, forestation and climate of Bavaria, DE**				Date of data
Total area eligible for agriculture [km2]			**31,400**	**2012**
Utilised agricultural area [%]			**45**	**2012**
Total area eligible for forestation [km2]			**25,000**	**2012**
Utilised forest area [%]			**35**	**2012**
Total area eligible for biomass cultivation [km2]			**4,170**	**2012**
Utilised biomass cultivation area [%]			**13**	**2012**
Planned forestation per annum [km2]			**-**	**-**
Classified national nature area [km2]			**1,587**	**2012**
Agriculture share in GDP [%]			**15**	**2012**
Agriculture share in employment [%]			**2.9**	**2012**
Agriculture area split [% of total area eligible for agriculture]	Arable land	Total	**65.6**	**2012**
		Energy crops	**13**	**2012**
	Permanent crops (orchards and vineyards)		**-**	**-**
	Permanent pastures (areas for natural grasses and grazing of livestock)		**33.9**	**2012**
	Non cultivable		**-**	**-**
	Other (please specify)		**-**	**-**
Climate type			**temperate**	**-**
Average annual temperature [C°]			**8.1**	**n/a**
Average annual precipitation [mm]			**940**	**2012**
Average wind velocity [km/h]			**low**	**2012**
Average annual sunshine [hours]			**1,595**	**2012**

Table No. 19: **Agriculture, forestation and climate of Baden-Württemberg, DE**				Date of data
Total area eligible for agriculture [km2]			n/a	-
Utilised agricultural area [km2 or %]			n/a	-
Total area eligible for forestation [km2]			n/a	-
Utilised forest area [km2 or %]			n/a	-
Total area eligible for biomass cultivation [km2]			n/a	-
Utilised biomass cultivation area [km2 or %]			n/a	-
Planned forestation per annum [km2]			n/a	-
Classified national nature area [km2]			n/a	-
Agriculture share in GDP [%]			n/a	-
Agriculture share in employment [%]			n/a	-
Agriculture area split [% of total area eligible for agriculture]	Arable land	Total	n/a	-
		Energy crops	n/a	-
	Permanent crops (orchards and vineyards)		n/a	-
	Permanent pastures (areas for natural grasses and grazing of livestock)		n/a	-
	Non cultivable		n/a	-
	Other (please specify)		-	-
Climate type			temperate	-
Average annual temperature [C°]			n/a	-
Average annual precipitation [mm]			n/a	-
Average wind velocity [km/h]			n/a	-
Average annual sunshine [hours]			n/a	-

Policy assessment

National/regional bioenergy policy

i. Integrated Energy and Climate Change Programme[63] (2007)
The goals are: Increase the share of renewable energy in electricity production to at least 30%; increase the share of biofuels in overall fuel consumption to 7%; Increase the share of renewables-generated heat to 14% by 2020.

ii. National Biomass Action Plan for Germany[64] (2009)
To meet the targets agreed in Meseberg, the share of bioenergy within primary energy demand must rise significantly by 2020 compared to the figures for 2007. According to a study conducted by the German Environment Ministry (Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety), a rise from 792 PJ in 2007 to 1,309 PJ in 2020 is needed as a minimum. To implement bioenergy expansion, the policy framework and the promotional measures have been strategically structured in the Action Plan.

iii. Energy Concept or an Environmentally Sound, Reliable and Affordable Energy Supply[65] (2010, supplemented in 2011)
Economic efficiency, security of supply and environmental compatibility: these are the central goals of German energy policy. It is envisaged that 80% of electricity will come from renewable sources by 2050 and for that the restructuring of the entire energy system is needed. The share of RES in gross final energy consumption will grow from roughly 10% in 2010 to 60% in 2050.

iv. Baden-Württemberg Energy Plan 2020
Its goals are: increase energy efficiency by 2% per year and reduce primary consumption of energy, expand renewable energies to at least 20% in electricity production, 16% in heat supply and 12% in primary consumption of energy, develop cogeneration to 20% of net electricity production

v. Climate Program Bavaria 2020[66]
Its goals are: Reduce in annual energy-related CO2 emissions below 6 tonnes per capita (prerequisite: further use of nuclear energy) by, inter alia, doubling the share of renewable energies in final consumption of energy to 20%, increase energy productivity by 30%, increase the share of renewable energies in electricity production to 30%, increase the contribution of geothermal energy to each electricity and heat supply to 1-2%, increase the share of biomass in primary consumption of energy to 8%.

Biomass within the NREAP – bioenergy targets

The binding target of renewable energy in final energy consumption is 18%; however the Federal Government decided to go one step further and reach 19.6% by 2020.

[63] German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2007. The Integrated Energy and Climate Programme of the German Government. Available at: www.bmu.de
[64] German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2009. National Biomass Action Plan for Germany. Available at: http://www.bmelv.de
[65] German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2010 (supplemented in 2011). Energy Concept or an Environmentally Sound, Reliable and Affordable Energy Supply. Available at: www.bmu.de
[66] Bavarian State Ministry of Health and Care, 2007. Bavarian Climate Programme 2020. Available at: www.stmug.bayern.de

In 2006 biomass from forestry represented 9,792 ktoe and biomass from agriculture represented 7,357 ktoe in primary energy production. According to NREAP forestry biomass will grow to 12,000 ktoe and agricultural biomass will reach approximately 9,000 ktoe. The Action Plan expects a biomass demand altogether of about 21,000 ktoe (880 PJ) of final energy, corresponding to a primary energy demand in biomass of about 33,400 ktoe (1,400 PJ). The contribution of domestic biomass is expected not to exceed 23,900 ktoe (1,000 PJ) of primary energy in 2020.

Regulation scheme[67]

i. The Renewable Energy Act (2000, 2004, 2009), seeks to give renewable electricity preferential grid access and provide a feed-in tariff scheme to support renewables, differentiated by technology type, for a period of 20 years.

ii. Renewable Energy Heat Act (2009, 2011)

iii. The Renewable Heat Act came into force on 1st January 2008. From 1 January 2010, when replacing an existing heating system in a residential building, 10% of heat demand must be covered by renewable energies. Along with solar radiation and ambient heat, bioenergy and geothermal heat may also be used. This regulation goes beyond federal statutory provisions.

iv. Gas Grid Access Ordinance, Gas Grid Payment Ordinance, Incentives Ordinance (2008)
The target is to facilitate the feed-in of Germany's existing biogas potential of 6 billion m^3 per year by 2020 and 10 billion m^3 per year by the year 2030.
Biomethane can be transported via the gas grid to supply heat or fuel, and can also be used in CHP plants and in the transport sector.

v. Biomass ordinance, Biomass-electricity sustainability ordinance, Biofuel-sustainability ordinance
As far as biofuels are concerned – in order to be able to claim a tax relief or to claim a remuneration – proof must be provided that the biofuels or in case of bio-electricity the liquid biomass have been sustainably produced.

vi. Act on Combined Heat and Power Generation (2002, 2009) seeks to increase the share of electricity from CHP plants within electricity production.

Financial support and economic incentives for bioenergy

Feed-in[68]

In Bavaria the use of small-scale district heating is preferred, and there is a possibility for subsidies.

Bavaria has a feed-in tariff varying between 0.14 and 0.25 €/kWh, depending on feedstock and plant capacity like biogas from 0.14 to 0.06 €/kWh.

[67] German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Renewable Energy. Available at: www.erneuerbare-energien.de
[68] Legal sources on renewable energy. Available at: http://www.res-legal.eu/en/search-by-country/germany/

Key actors

i. Bundesverband BioEnergie e.V.(BBE): http://www.bioenergie.de/
Established in 1998, it is an umbrella organization of the bioenergy market acting in the field of bioenergy, heat and transportation.

ii. Fachverband Biogas: http://www.biogas.org/
Since its establishment in 1992 its membership reached 4700, consisting of producers, planners and service providers. It represents a strong political lobby power on federal level to increase the use of biogas.

iii. German Energy Agency (DENA): www.dena.de
It is the centre of expertise for energy efficiency, renewable energy sources and intelligent energy systems. It is a performance- and profit-oriented company and was established with a mission to operate as the interface between politics and business. Consequently it finances its projects with the help of a large number of partners from the public and private sectors.

iv. Central Agricultural Raw Materials Marketing- and Development-Network (C.A.R.M.E.N) :www.carmen-ev.de
Founded in July 1992, it is a non-profit association working in the field of biomass. Since 2001 it has been part of the Competence Centre for Renewable Raw Materials in Straubing and funded many biomass projects with the help of the Bavarian government.

v. DBFZ – German Biomass Research Centre: http://www.dbfz.de
Funded in Berlin in 2008 as a non-profit organization with 161 scientists it is one of the largest biomass research centres in the field of bioenergy systems, biochemical and thermo-chemical conversion and bio-refineries.

4.7 Hungary

Table No. 21: General profile and macro-economic indicators of HU			Date of data
EU membership		Yes, as of 1 May 2004	-
Area [km2]		93,028	-
Population [persons]		9,939,470	2013
Population density [inhabitants/km2]		107	2013
Life expectancy at birth [years]		74.5	2011
Navigable length of the Danube [km]		**417**	-
Current use of Danube as a transport route	Low		-
	Medium		
	High	**x**	
GDP [millions of €]		96,968	2012
GDP/capita [€]		9,763	2012
Inflation rate [annual average rate of change, %]		5.7	2012
Unemployment rate [annual average, %]		10.9	2012

Table No. 22: Agriculture, forestation and climate of HU			Date of data
Total area eligible for agriculture [km2]		**5,338**	**2012**
Utilised agricultural area [km2]		**5,338**	**2012**
Total area eligible for forestation [km2]		**1,928**	**2012**
Utilised forest area [km2]		**1,928**	**2012**
Total area eligible for biomass cultivation [km2]		**6,251**	**2012**
Utilised biomass cultivation area [km2]		**6,251**	**2012**
Planned forestation per annum [km2]		**150**	**2009**
Classified national nature area [km2]		**4,671**	**2012**
Agriculture share in GDP [%]		**3.20**	**2012**
Agriculture share in employment [%]		**5.20**	**2012**
Agriculture area split [% of total area eligible for agriculture]	Arable land – Total	**78.50**	**2012**
	Arable land – Energy crops	[ha] [69]2,523	2006
	Permanent crops (orchards and vineyards)	**3.30**	**2012**
	Permanent pastures (areas for natural grasses and grazing of livestock)	**14.20**	**2012**
	Non cultivable	**2.50**	**2012**
	Other (please specify)	**0.00**	**2012**
Climate type		**continental**	**-**
Average annual temperature [C°]		**11.4**	**2012**
Average annual precipitation [mm]		**470**	**2012**
Average wind velocity [km/h]		**8.64**	**n/a**
Average annual sunshine [hours]		**2,404**	**2012**

[69] Hungarian Renewable Energy Action Plan. Available at: http://ec.europa.eu/energy/renewables/action_plan_en.htm

Potential

Hungary has an outstanding biomass-based green energy production potential in European comparison. A background study[70] for the Hungarian Renewable Energy Action Plan[71] presented a few theoretical biomass energy potential surveys which indicated the following potential values shown in table No. 24 below.

Table No. 23: Theoretical potential of biomass energy in Hungary

Calculations by	Low values [PJ/a]	High values [PJ/a]
Hungarian Academy of Sciences (2005-2006)	203	328
ENERGIAKLUB (2006)	58	223
European Environment Agency (EEA, 2006)	145,5	-
FVM (2007)	260	-

According to the Hungarian Renewable Energy Action Plan, the energy content of biomass which can potentially be secured for energy generation in the medium term (7-15 years) is 188.26 PJ per year.

Table No. 24: Quantities of biomass which can potentially be secured for energy generation in the medium term

	Realistically produced /collected (million t/year)	Energy content (PJ/year)	Electricity (GWh/year)
From forestry	3.25	45.5	2,275
Produced for this purpose	5.6	74.16	6,180
Agric. by-product, waste	5.4	62	5,100
Other by-product, waste	0.55	6.6	550
total	**14.8**	**188.26**	**14,105**

Policy assessment

National bioenergy policy

i. Hungarian Energy Strategy[72] till 2030, with an outlook to 2050 (October 2011)

It contains detailed proposals for the Hungarian energy sector and the decision-makers for a time horizon until 2030, including a roadmap until 2050. It aims to achieve energy independency by energy savings and increasing the share of renewable energy sources to the greatest possible level as well as safe nuclear energy and the electrification of transport on the basis of the former, by creating a bipolar agriculture and by integration with the European energy infrastructures.

It states that in 2009, 8% of all electricity came from renewable sources, out of which 68.5% was biomass-based. Much of that energy is generated by the co-burning of firewood and coal in low-efficiency, obsolete power plants, which should be replaced for sustainability and energy efficiency reasons. The local energy utilisation of the by-products of agriculture (e.g. straw and maize stalk) and sewage water and sludge in biomass power and biogas plants, among other options, are treated as a priority.

[70] PYLON Kft, 2010. Background study for the Hungarian Renewable Energy Action Plan. Available at: www.mekh.hu
[71] see note72.
[72] Ministry of National Development (Hungary), 2012. National Energy Strategy. Available at: www.kormany.hu

Biomass within the NREAP – bioenergy targets

The Hungarian Government is willing to go beyond the mandatory target of 13% and reach 14.65% renewable energy share in gross final consumption of energy in 2020.

Table No. 25: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020

	Unit	
Share of energy from renewable sources in gross final consumption of energy in 2005	%	4.3
Target of energy from renewable sources in gross final consumption of energy in 2020	%	14.65[73]
Expected total adjusted energy consumption in 2020	ktoe	19,644
Expected amount of energy from renewable sources corresponding to the 2020 target	ktoe	2,879

Rather than large power plant capacities, Hungary wishes to support biomass use for the local generation of thermal energy. This would also support the development of agricultural and forestry sectors, as well as rural players and ensure higher income.

It is estimated that 7.8 to 8 million tonnes/year of biomass will be required to satisfy the growing renewable energy demand up to 2020. To satisfy this demand Hungary needs to rely on the current forests, new plantations (2010–2015), the firewood and logging waste derived from these as well as on agricultural by-products, herbaceous and ligneous energy crops, by-products and waste. A significant portion of this volume is available from the public and private forests of Hungary.

Still there is a need to set policy framework for the biogas plants, connecting biomethane systems to the national network and promoting public transport using biogas fuel.

It is expected that the share of the generation of renewable heat energy within the total heat energy consumption will increase to 25% from the current 10% by 2030, including the individual heat energy generating capacities (biomass, solar and geothermal energy).

Regulation scheme

The Electricity Act[74] (2007) adopted the Directive 2001/77/EC. The Act establishes the legislative framework for the obligatory feed-in of electricity produced from renewable energy sources at a subsidized tariff. Detailed rules of the feed-in tariff system can be found in Government Decree Nr. 389/2007[75]. The introduction of certificates of origin in Hungary is also stipulated by law (see Government Decree Nr. 309/2013. (VIII. 16.) on the guarantees of origin for RES-E and high-efficiency cogeneration).

Financial support and economic incentives for bioenergy

Various measures within the New Széchenyi Plan[76] are designed to promote energy recovery from agricultural and forestry by-products, waste and also by establishing biofuel capacities for electricity generation and heat utilisation. The use of biomass systems in public buildings and district heating systems are also supported.

[73] Hungary has undertaken to reach 14.65% share of renewable energy in gross final energy consumption until 2020 as a National target, but it has only an obligatory target share of 13% to reach as stated in the RES Directive.
[74] Act LXXXVI. of 2007 on Electricity (Hungary). Available at: http://www.mekh.hu/en/data-of-public-interest/legislation/electricity.html
[75] Government Decree No 389/2007 (XII. 23.) on the feed-in obligation and feed-in tariff of electricity produced from renewable energy resources or from waste and electricity generated in co-generation facilities. Available at: http://www.mekh.hu/en/data-of-public-interest/legislation/electricity.html
[76] New Széchenyi Plan, launched in 2011. Available at: http://www.nfu.hu/new_szechenyi_plan

Feed-in tariff[77]

Hungary introduced a feed-in tariff system ("KÁT") in 2003 which now supports renewable and waste based electricity production. Feed-in tariffs are higher than the electricity market price (except for large hydro power installations above 5 MW installed capacity). On the other hand the responsible party for the so called KÁT balance group (MAVIR Ltd, the TSO) has to buy this electricity and pays the feed-in tariff to the producer for the electricity sold into the balance group. Then the TSO distributes this electricity and its cost among obligated electricity suppliers in the proportion of their customers' forecasted consumption (except for universal service providers with regulated electricity prices who do not have to receive this electricity from the 1st of January 2013). The obligated suppliers take this additional costs into account when they price their products, so finally their consumers pay for the KÁT support.

The Hungarian Energy and Public Utility Regulatory Authority determines in its decision the feed-in quantity and feed-in period for each eligible electricity producer. The producers can sell in the KÁT system until the feed-in period expires or until the feed-in quantity is used up. The determination of the KÁT period and quantity is to ensure that the producer only gets support until his investment is returned. (In the case of biomass and biogas plants the benchmark feed-in period is 15 years, for landfill gas 5 years.)

The feed-in tariffs for biomass (among other technologies) from 1 January 2013 are the following:

Table No. 26: Feed-in tariffs for biomass in Hungary	Power plants commissioned before 01.01.2008	Power plants commissioned after 01.01.2008		
		Installed capacity of power plant		
		Under 20 MW	Between 20-50 MW	Above 50 MW
Peak period [HUF/kWh]	37,72	35,96	28,76	22,36
Valley period [HUF/kWh]	33,76	32,18	27,75	14,31
Deep-valley period [HUF/kWh]	13,78	13,13	10,50	14,31

Key actors

i. Union of Biomass Product Line: http://www.bitesz.hu/
In 2007 the founders of the union decided to establish an organization that covers the whole life of biomass from production to the final consumer. Its main goal is to help achieve the highest possible percentage of biomass utilisation from energy plants as well as from residues of agricultural production.

ii. Association of Biomass Power Stations: http://www.biomasszaeromuvek.hu/
Consists of two major biomass based power plants. Their aim is to find guarantee for the extension of the feed-in tariff period, support for green-heat and the development of energy crop plantation support schemes.

[77] Official website of the Hungarian Energy and Public Utility Regulatory Authority: www.mekh.hu

4.8 Moldova

Table No. 27: General profile and macro-economic indicators of MD			Date of data
EU membership		No	2013
Area [km2]		33,851	-
Population [persons]		3,619,925	2013
Population density [inhabitants/km2]		107	2013
Life expectancy at birth [years]		**65 men / 73.4 women**	**2012**
Navigable length of the Danube [km]		**n/a**	-
Current use of Danube as a transport route	Low	**x**	**2012**
	Medium		
	High		
GDP [millions of €]		**5,490.4**	**2012**
GDP/capita [€]		**1,540**	**2012**
Inflation rate [annual average rate of change, %]		**4.1**	**2012**
Unemployment rate [annual average, %]		**6.7**	**2012**

Table No. 28: Agriculture, forestation and climate of MD			Date of data
Total area eligible for agriculture [thousand hectares]		**3,384.6**	**2012**
Utilised agricultural area [thousand hectares]		**2,398**	**2012**
Total area eligible for forestation [thousand hectares]		**462.7**	**2012**
Utilised forest area [thousand hectares]		**450.6**	**2012**
Total area eligible for biomass cultivation [km2]		**n/a**	-
Utilised biomass cultivation area [km2 or %]		**n/a**	-
Planned forestation per annum [km2]		**n/a**	-
Classified national nature area [km2]		**n/a**	-
Agriculture share in GDP [%]		**25.7**	**2011**
Agriculture share in employment [%]		**27.5**	**2011**
Agriculture area split [% of total area eligible for agriculture]	Arable land – Total	**53.5**	**2012**
	Arable land – Energy crops	**n/a**	-
	Permanent crops (orchards and vineyards)	**8.8**	**2012**
	Permanent pastures (areas for natural grasses and grazing of livestock)	**10.3**	**2012**
	Non cultivable	**2.9**	**2012**
	Other (fallow lands, forests, hayfields)	**24.5**	**2012**
Climate type		**temperate**	-
Average annual temperature [C°]		**10.5**	**2011**
Average annual precipitation [mm]		**428**	**2011**
Average wind velocity [km/h]		**2.9**	**2011**
Average annual sunshine [hours]		**2,466**	**2011**

Potential

According to a survey[78] ordered by the Energy Community, solar energy and geothermal energy for heating have the highest theoretical and economic potential. According to the estimations the theoretical potential of biomass is 1 Mtoe, the technical potential is 0.5 Mtoe and the economic potential is 0.4 Mtoe. The main sources of biomass to be used for energy purposes are the forestry, agriculture, livestock sector, food industry and farmsteads of the residential sector.

More than half (59%) of the households in Moldova use some type of biomass for space heating, cooking or water heating. A wheat straw residue has the highest short- and medium-term potential for heating among renewable energy sources. Annually, on average, 700 thousand tons of straw is produced, which makes it possible to generate about 700 million kWh of thermal energy per year.

The potential for biofuels is currently unknown. However, some estimates show that with the use of 50.000 ha, which represents 2.5% of the overall arable land in the country, 52.500 tons of biofuel could be produced, which would cover 26% of the fuel need for agricultural works.

Policy assessment

The country is heavily dependent (95%)[79] on energy imports which makes it difficult to control energy prices. To reduce the dependency the Moldavian Government aims to cover 20% of its energy needs with renewables by 2020.

National bioenergy policy

National Energy Strategy (2007) envisages the development of energy policy till 2020 focusing on the diversification of supplies; increased energy system efficiency; wider use of renewable energy sources; energy market liberalization and on the restructuring of the energy sector in the framework of the integration into the European energy system. This is the first policy document where the use of renewable energy sources is fostered as an alternative primary domestic energy source.

With regard to EU Policy Framework related to Moldova, a new Energy Strategy until 2030 has been adopted, the main objectives of which are to build new generation capacities and establish and strengthen the electricity and gas transmission connections with neighbouring countries.

As a contracting party of the Energy Community since 17 March 2010, the Republic of Moldova has to take necessary steps for the full implementation of the Directive 2009/28/EC with January 1st 2014 as the deadline.

Biomass within the NREAP – bioenergy targets

The country has drafted a National Renewable Energy Action Plan, which focuses on renewables to increase the security of energy supply, to enable long term sustainable development and to reduce climate change and therefore it is a key document in the Republic of Moldova for promoting the use of renewable energy.

[78] Energy Community, Biomass Consumption Survey for Energy Purposes in the Energy Community, Final Report, February 2012, http://www.energy-community.org/pls/portal/docs/1796178.PDF

[79] Moldova Energy and Biomass Project, 2012. Estimation of the energy potential of biomass from agricultural crops at regional and rayon levels for 2009-2010. Available at: www.biomasa.aee.md

Table No. 29: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020		
	Unit	
Share of energy from renewable sources in gross final consumption of energy in 2009	%	11.7
Target of energy from renewable sources in gross final consumption of energy in 2020	%	20.0
Expected total adjusted energy consumption in 2020	ktoe	2,160
Expected amount of energy from renewable sources corresponding to the 2020 target	ktoe	432

The overall target for renewable energy consumption in 2020 is a 20% RES contribution to the energy consumption, with 10% RES in electricity, 10% RES in transport and a 27% share in heating. The value for green electricity was 2% in 2009 coming from small-scale hydro power plants. Reaching the target requires investment mainly in wind power and to some extent into biogas from 2015 onward. Regarding heating and cooling 20% share was reached in 2009, therefore a 7% increase is needed which will predominantly come from agricultural waste, wood and wood waste, and solar thermal power. In nominal terms this means that the volume of solid biomass will grow from 237 ktoe in 2009 to 334 ktoe by 2020 utilised only in individual households (without district heating).

The Government expects that biomass will remain, during the current decade, a source of decentralized heat supply; however, in the future small-scale cogeneration will be fostered.

A law on biofuel production support is needed to set obligations on sustainability requirements and blending fuels. However it is expected that the 10% target will be reached by imports only due to the conflict between the utilisation of land for biofuel purposes and for food production within the country.

Regulation scheme[80]

i. The law on electricity and law on gas were adopted in 1998 within the framework of the reorganization and in order to increase the competitiveness of the energy sector. Approximately 10% of the electricity market was liberalized in 2003 and the country is preparing new electricity and gas laws that are consistent with European laws and allow for better market competition.

ii. The Renewable Energy Law (2009) required the regulatory agency to provide a tariff-based system for rewarding investments. A cost-plus case-by-case approach has been used since 2009 which did not encourage investors to make investments. The law sets the responsibility of the National Agency for Energy Regulation (ANRE) to approve the tariffs for electricity and fuel produced from RES.

iii. There is no current legislation that states specific measures promoting biomass in Moldova.

Financial support and economic incentives for bioenergy

i. Feed-in[82]

Pursuant to article 12 of Law No. 160-XVI on renewable energy of 12.07.2007, ANRE approves the tariffs for each type of renewable energy and fuel, calculated by the producer based on the methodology approved by ANRE. The calculation takes into account the recovery of investments, eventually in construction, expansion or modernization of facilities and lines of communication, transport and distribution of energy and fuel, in a period up to 15 years, on the condition that the prescribed rate of return does not exceed twice the corresponding rate

[80] Source: Official website of the National Agency for Energy Regulation, Moldova. Available at: www.anre.md

of traditional energy. When approving tariffs the prices of similar products on the international market shall be taken into account.
Feed-in tariffs are not applicable yet, because the only renewable electricity tariff set to date by ANRE Decision No. 493 as of 30.11.2012 is approx. 0.12 €/kWh for a 95 kW solar PV project and ANRE Decision No. 389 as of 11.11.2010 is approx. 0.108 €/kWh for a 85 kW biogas plant project.

ii. EU funding
The Moldova Energy and Biomass Project[81] with a total budget of 14 million € (EU) and 0.56 million € (UNDP), has been launched. The objective of the project is to heat more than 130 kindergartens, schools, healthcare centres and other rural public institutions as well as more than 500 households with biomass-based energy generated locally.

Key actors

i. BioEnerGroup: www.bioenerg.md
The Association for Alternative Energy provides sustainable solutions for energy production and technology standards. Its mission is to promote alternative energy sources and to assure a legal framework for its development and optimal investment in Moldova.

ii. Energy Efficiency Agency: www.aee.md
It is the administrative body for energy efficiency and renewable energy, operated under the Ministry of Economy. It is responsible for the implementation of the government's policy.

[81] Moldova Energy and Biomass Project. Available at: www.biomasa.aee.md

4.9 Montenegro

Table No. 30: General profile and macro-economic indicators of MNE			Date of data
EU membership		No, accession country	-
Area [km2]		13,812	-
Population [persons]		653,474	2013
Population density [inhabitants/km2]		47	2013
Life expectancy at birth [years]		75.5	2011
Navigable length of the Danube [km]		**none**	**-**
Current use of Danube as a transport route	Low	**-**	-
	Medium	**-**	
	High	**-**	
GDP [millions of €]		3,149	2012
GDP/capita [€]		5,069	2012
Inflation rate [annual average rate of change, %]		2.0	2012
Unemployment rate [annual average, %]		14.1	2013

Table No. 31: Agriculture, forestation and climate of MNE				Date of data
Total area eligible for agriculture [km2]			**2,545**	**2011**
Utilised agricultural area [km2]			**2,212**	**2011**
Total area eligible for forestation [km2]			7,306.5	2009
Utilised forest area [%]			54	2009[82]
Total area eligible for biomass cultivation [km2]			n/a	-
Utilised biomass cultivation area [km2 or %]			n/a	-
Planned forestation per annum [km2]			n/a	-
Classified national nature area [km2]			**908.7**	**2011**
Agriculture share in GDP [%]			n/a	-
Agriculture share in employment [%]			**6.2**	**2011**
Agriculture area split [% of total area eligible for agriculture]	Arable land	Total	n/a	-
		Energy crops	**0%**	**2013**
	Permanent crops (orchards and vineyards)		n/a	-
	Permanent pastures (areas for natural grasses and grazing of livestock)		34%	2009
	Non cultivable		n/a	-
	Other (please specify)		n/a	-
Climate type			Mountain-, onshore-, and continental	-
Average annual temperature [C°]			**16.4**	**2011**
Average annual precipitation [mm]			**140**	**2012**
Average wind velocity [km/h]			n/a	-
Average annual sunshine [hours]			**2,500**	**2012**

[82] Montenegro Statistical Office (MONSTAT), 2009. Statistical Yearbook 2009. Available at: www.monstat.org

Potential

Biomass is mainly used in small scale. An analysis done by the Energy Community83 shows that almost three fourths of the households (70.6%) use some type of biomass for space heating, cooking or water heating. Firewood is used in general, but pellets and briquettes are also used by some people.

A study done by CRES[84] estimated the potential of different biomass sources. Potential biomass resources in Montenegro sum up to 12,030,126 GJ, which is equivalent to 26% of the country's total primary energy supply.

The results show that the technical potential of forest based biomass is 3.3 PJ whereof 50% could be used for co-firing and 19 GWh energy could be produced. Furthermore 68 GWh annual heat production could be reached by using firewood in households.

The theoretical potential of biogas is 0.83 PJ whereof 30% could be realized, producing 24 GWh electricity annually. Energy crops could have the highest potential generating 362 GWh electricity and 517 GWh heat for industrial and medium scale use and an additional 827 GWh heat in households if approximately 10% of pasture land is turned into energy crop production.

Policy assessment

National bioenergy policy

The Energy Policy particularly outlines the need to establish adequate legal, institutional, financial and regulatory frameworks required for sustainable development of the energy sector.

i. The Energy Efficiency Strategy of Montenegro[85] (2005) realised the need for further steps in biomass market development and efficient use of local renewable resources, such as firewood.

ii. The Energy Development Strategy of Montenegro by 2025[86] (2007) represents the Montenegrin vision of energy management, which includes nine specific policy objectives, whereof one targets to support the creation of conditions for higher utilisation of renewable energy resources. The document foresees that 5-10 MW total capacity could be established by using biomass until 2025 but no biogas facility development is envisaged. Biofuel production will be increased only after 2010.

iii. The Energy Development Strategy of Montenegro by 2030[87] (2012) replaces the previous Strategy and sets new targets for the future. The document summarises the biomass potential of Montenegro based on studies done recently. Reference scenario shows that biomass use will increase form 560 GWh in 2010 to 1,554 GWh by 2030 whereof approximately two-thirds are due to heat use and the rest is for electricity generation.

iv. The Energy Policy of Montenegro by 2030[88] (2011) defines the main goals and objectives of the Energy Policy, which are (1) Security of the energy supply; (2) Development of a competitive energy market; and (3) Sustainable energy development. It also states the key strategic commitments and the instruments to be used. The Government committed itself to create a

[83] Centre for Renewable Energy Sources and Saving (CRES), 2011. Biomass consumption survey for energy purposes in the Energy Community, Montenegro National Report. Available at: www.energy-community.org

[84] Centre for Renewable Energy Sources and Saving (CRES) and North-West Croatia Regional Energy Agency, 2010. Hellenic Aid – USAID programme: SYNENERGY, Action 1: Regional Renewable Energy Assessment, Biomass in Montenegro.

[85] IIPA Energy Consulting, 2005. Energy Efficiency Strategy of Montenegro.

[86] Ministry of Economy of Montenegro, 2007. Energy Development Strategy of Montenegro by 2025. Available at: www.energetska-efikasnost.me

[87] Ministry of Economy of Montenegro, 2012. Energy Development Strategy of Montenegro by 2030.

[88] Ministry of Economy of Montenegro, 2011. Energy Policy of Montenegro by 2030. Available at: www.energetska-efikasnost.me

favourable environment for development and utilisation of RES and to reach the national target regarding the RES share in the gross final consumption of energy. Montenegro would like to use its renewable energy potential to the highest intent.

Biomass within the NREAP – bioenergy targets

Montenegro is a signatory of the Energy Community and therefore has an obligation to harmonize its legislation with EU directives in the field of energy. Regarding renewable energy, the most important directive is the 2009/28/EC on the promotion of energy from renewable sources and a National Renewable Energy Action Plan has to be submitted to the EC Secretariat till mid-2013, but this is in delay.

Montenegro's national target is a 33% share of renewable energy sources within the gross final energy consumption until 2020. The share was 26.3% in 2009.

Table No. 32: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020

	Unit	
Share of energy from renewable sources in gross final consumption of energy in 2005	%	26.3
Target of energy from renewable sources in gross final consumption of energy in 2020	%	33.0

Regulation scheme

The Energy Law (2010) defines energy related activities, the conditions for and method of carrying out energy activities, aiming to provide quality and efficient supply of energy to final consumers, it sets the responsibility of the Energy Regulatory Agency to regulate the energy market and provide licenses for the following: generation of electricity; transmission of electricity (including ancillary services); distribution and retail supply of electricity for tariff consumers.

Financial support and economic incentives for bioenergy[89]

Feed-in tariff (Decree on the Tariff System for the Establishment of Preferential Prices of Electricity from Renewable Sources of Energy and Efficient Co-generations)

The tariff system for electricity produced by biomass/biogas was introduced in 2011. Before that preferential prices were used for hydropower and wind power generation.

Feed-in tariffs for different renewable sources:

- For small hydropower plants the amount of the preferential price depends on the quantities of electricity and ranges from 0.05 €/kWh for more than 15 GWh, to 0.1 €/kWh for less than 3 GWh;
- For other types of RSE the amounts depend on the type of facility, and range from 0.09 €/kWh for plants on biogas from waste, to 0.15 €/kWh for solar power plants (installed in buildings) and biogas plants;
- For CHPs the amounts depend on the installed capacity of the facility, and range from 0.08 EU/kWh for capacities of 5 to 10 MW to 0.1 €/kWh for capacities of up to 1 MW.

There is no financial support for thermal biogas production.

[89] Filled data sheet (questionnaire) of Montenegro.

Energy/food trade-off[91]

Montenegro imports food for several hundred billion Euros every year despite the fact that the country has plenty of unused arable land. Possible production of energy corps instead of food production is a major issue.

Biomass trade[91]

It is a priority for Montenegro to use its own capacities of biomass. Especially in the North of Montenegro there is a big unused wood resource either in forestry and industry. If there are imports/exports of biomass in the future, they will be done with Serbia.

Key actors

The Energy Regulatory Agency is the autonomous, functionally independent and non-profit organization entrusted with the power to regulate the energy sector of Montenegro in accordance with the Energy Law.

4.10 Romania

Table No. 33: General profile and macro-economic indicators of RO		Date of data
EU membership	Yes, as of 1 January 2007	-
Area [km2]	238,391	-
Population [persons]	21,790,479	2013
Population density [inhabitants/km2]	91	2013
Life expectancy at birth [years]	n/a	-
Navigable length of the Danube [km]	n/a	-
Current use of Danube as a transport route	n/a	-
GDP [millions of €]	131,747	2012
GDP/capita [€, in PPS]	6,556	2012
Inflation rate [annual average rate of change, %]	n/a	-
Unemployment rate [annual average, %]	n/a	-

Table No. 34: Agriculture, forestation and climate of RO				Date of data
Total area eligible for agriculture [km2]			147,000	n/a
Utilised agricultural area [km2 or %]			79,000	2006
Total area eligible for forestation [km2]			n/a	-
Utilised forest area [km2]			64,480	n/a
Total area eligible for biomass cultivation [km2]			n/a	-
Utilised biomass cultivation area [km2 or %]			0.2	2006[90]
Planned forestation per annum [km2]			n/a	-
Classified national nature area [km2]			n/a	-
Agriculture share in GDP [%]			7.9	n/a
Agriculture share in employment [%]			n/a	-
Agriculture area split [% of total area eligible for agriculture]	Arable land	Total	64	n/a
		Energy crops	n/a	-
	Permanent crops (orchards and vineyards)		2.7	n/a
	Permanent pastures (areas for natural grasses and grazing of livestock)		22	n/a
	Non cultivable		n/a	-
	Other (please specify)		n/a	-
Climate type			n/a	-
Average annual temperature [C°]			n/a	-
Average annual precipitation [mm]			n/a	-
Average wind velocity [km/h]			n/a	-
Average annual sunshine [hours]			n/a	-

[90] National Renewable Energy Action Plan of Romania.

Potential

Wind, biomass and hydro power have the highest potential as renewable energy sources. In 2010 the share of biomass within the final energy consumption was 17%. According to the NREAP, the economic biomass potential of Romania for thermal use is about 7600 thousand toe (88.388 GWh) per year. Calculations show that approximately 43% of the available sources have been used in 2004 for heating purposes (mainly direct burning in stoves) coming from wood and agricultural biomass.

In Romania over 550 industrial hot water and steam boilers run on fuel wood. In 2004 the total installed capacity for cogeneration units reached 4.100 MW. One biomass plant produces electricity.

Policy assessment

National bioenergy policy[91]

i. The Energy Roadmap for Romania (2003) was approved by the Government in the frame of the EU accession. The document encourages the use of renewable sources in order to reduce the energy import dependency. Large-scale use of renewables is one of the three major development directions (others are related to the reduction of energy intensity)

ii. The Strategy for Using Renewable Energy Sources (2003) has a clear target for electricity generated from renewable energy sources that should reach 33% by 2010. It states that by 2015 23.37 TWh electric energy and 3,528 thousand toe thermal energy will be coming from renewables, whereof 3,654 GWh will be from biomass sources.

iii. The National Energy Efficiency Action Plan (2004) sets a target of 40% reduction of energy intensity by 2015. This will be reached by reducing the energy consumption of buildings (41%), in the energy sector (29%), in the industry (16%) and in the transport sector (14%).

iv. The Romanian Energy Strategy for the period 2007-2020 (2007) states that the share of electric energy produced from renewables within the gross national electricity consumption should reach 38% by 2020. The document aims to reduce energy dependency by fostering the use of renewable energy, promoting the use of domestic coal with CCS technology and developing nuclear energy.

v. National Strategy for Sustainable Development – Horizons 2013-2020-2030. (2008)
The document sets short, medium and long term objectives as well. Its main objective is to approach and reach the average level of the sustainable development indicators of the EU.

Biomass within the NREAP – bioenergy targets

The National Renewable Energy Action Plan was adopted in 2010. According to the Action Plan Romania is willing to reach 24% in final energy consumption, 22% in heating and cooling consumption, 10% in transport and 43% in power production by 2020.

Table No. 35: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020

	Unit	
Share of energy from renewable sources in gross final consumption of energy in 2005	%	17.8
Target of energy from renewable sources in gross final consumption of energy in 2020	%	24.0
Expected total adjusted energy consumption in 2020	ktoe	30,278
Expected amount of energy from renewable sources corresponding to the 2020 target	ktoe	7,267

[91] National Renewable Energy Action Plan of Romania.

The NREAP does not include details over the projections of RES-H&C technologies in 2020.The document states that "If in 2006 more than 46 thousand tonnes/year were consumed for the delivery of heat from thermal power plants based on biomass, in 2020 a consumption of more than 100 thousand tonnes/year will be expected to be reached".

Data from 2006 show that primary energy production of biomass coming from forestry was 1.2 ktoe. A smaller volume, 0.8 ktoe came from the agricultural (straw) and 1.4 ktoe from waste (municipal solid waste mainly). The Government aims to slightly increase these numbers by 2020 as follows: 1.8 ktoe from forestry and 1.6 ktoe from agriculture.

Regulation scheme

i. The Energy law (13 / 2007) – general provisions for promotion of renewable energy sources.

Financial support and economic incentives for bioenergy[92]

i. Romania has introduced mandatory quotas of electricity supplied from renewable sources for each supplier and developed a Centralised Market of green certificate since November 2005 ensuring the use of renewable energy used for electricity generation. Green certificates can be traded bilaterally between companies.

ii. Romania ratified the Kyoto Protocol and since 2000 it has been applying the mechanism "Joint implementation" as host country. Ever since many investments projects have been realised that aim to promote the use of renewable energy mainly on local authorities' level.

There is a need to develop appropriate regulatory environment for the promotion of biomass based thermal energy generation.

Key actors

i. Association Biofuels Romania: http://www.asociatia-biocombustibili.ro/
The association started its operation in 2003 with the aim to foster energy autonomy using renewable sources by project implementations in Romania. It also aims to export ethanol and biofuels.

ii. ICEMENERG – Energy Research and Modernising Institute: http://www.icemenerg.ro
Its establishment dates back to 1960 in order to modernise the electricity system. They perform research and development activities among others in the field of energy efficiency, renewable energy, energy security, eco technologies, etc. The institute carries out engineering services as well.

iii. Romanian National Energy Regulatory Authority (ANRE): www.anre.ro
It is in charge of regulating the electricity and gas sectors since 1998. Romanian Agency for Energy Conservation was merged with ANRE.

[92] National Renewable Energy Action Plan of Romania.

4.11 Serbia

Table No. 36: General profile and macro-economic indicators of SRB			Date of data
EU membership		No, accession country	-
Area [km2]		77,474	-
Population [persons]		7,243,007	2013
Population density [inhabitants/km2]		93	2013
Life expectancy at birth [years]		n/a	-
Navigable length of the Danube [km]		n/a	-
Current use of Danube as a transport route	Low		-
	Medium	n/a	
	High		
GDP [millions of €]		29,932	2012
GDP/capita [€]		4,148	2012
Inflation rate [annual average rate of change, %]		n/a	-
Unemployment rate [annual average, %]		n/a	-

Table No. 37: Agriculture, forestation and climate of SRB				Date of data
Total area eligible for agriculture [km2]			n/a	-
Utilised agricultural area [km2 or %]			n/a	-
Total area eligible for forestation [km2]			n/a	-
Utilised forest area [km2 or %]			n/a	-
Total area eligible for biomass cultivation [km2]			n/a	-
Utilised biomass cultivation area [km2 or %]			n/a	-
Planned forestation per annum [km2]			n/a	-
Classified national nature area [km2]			n/a	-
Agriculture share in GDP [%]			n/a	-
Agriculture share in employment [%]			n/a	-
Agriculture area split [% of total area eligible for agriculture]	Arable land	Total	n/a	-
		Energy crops	n/a	-
	Permanent crops (orchards and vineyards)		n/a	-
	Permanent pastures (areas for natural grasses and grazing of livestock)		n/a	-
	Non cultivable		n/a	-
	Other (please specify)		n/a	-
Climate type			n/a	-
Average annual temperature [C°]			n/a	-
Average annual precipitation [mm]			n/a	-
Average wind velocity [km/h]			n/a	-
Average annual sunshine [hours]			n/a	-

Potential[93]

There is no specific official monitoring; however numerous studies have been carried out by Serbian universities and institutions to assess the biomass potential. Serbia is rich in renewable energy sources and has the highest electric energy potential coming from hydro power. Currently 2.83 GW is generated in 16 plants.

The total technical biomass energy potential in Serbia today is approximately 2.7-3.3 million toe annually, whereof 1.1 Mtoe potential is being used. The greatest potential lies in agricultural biomass – about 1.7 million toe, while there is around one million tons in forest biomass. According to current estimates a high share of wood biomass could be used for pellets and heat production. Agricultural biomass could be used for combined electricity and heat generation and also for biogas production. At the moment there is no mechanism in place to collect biomass for energy purposes, therefore the security of supply should be guaranteed. There is a growing interest in pellet production, however with the intention of foreign exportation.

Policy assessment

National bioenergy policy[95]

i. Energy Sector Development Strategy of the Republic of Serbia by 2015 (2005)
The main objective of the document is to determine priority directions of the development in the energy sectors and take the first steps to harmonise legislation with EU policies. It foresees initiation of five priority development programs to be realized till 2015. The third priority refers to the promotion of new renewable energy sources for distributed heat and power generation and efficient energy production. A new Serbian Energy Development Strategy is under preparation.
Due to the ratification of the Treaty in 2006 that established the Energy Community, Serbia was obliged to develop legislation to implement directives related to renewable energy source.

ii. Biomass Action Plan for the Republic of Serbia 2010-2020 (2010)
The aim of the BAP is to define a strategy for biomass utilisation as RES, within the framework of actual potentials, national strategies, as well as national and European directives. Short and medium term actions are proposed to overcome barriers related to licensing, feedstock supply, communication, technology, finance and monitoring.
There is still no specific legislation for the promotion of biomass and also official definitions of terms (related to biomass potentials and its utilisation as an energy source) should be provided in order to establish a stable market. There is no specific policy promoting the production and use of biogas.

Biomass within the NREAP – bioenergy targets

The NREAP was adopted in May 2013 and published on the Energy Community website at the end of June 2013 firstly among the contracting parties. Legislative framework should be in compliance with the Directive 2009/28/EC until 1 January 2014.

An ambitious binding target was set for renewable energy production. Renewables should reach 27% in gross final consumption by 2020, which equals to 2,563.6 ktoe. This means that 621.0 ktoe increase should be reached between 2009 and 2020. The share of RES in the electricity sector will amount to 36.6%, in the heating and cooling sector it will amount to 30%.

[93] Ministry of Energy and Mining of the Republic of Serbia and NL Agency (former SenterNovem), 2010. Biomass Action Plan for The Republic of Serbia 2010-2012.

According to the reference scenario, increase of the share of RES necessary in the heating and cooling sector should go from 1,059 ktoe in 2009 to 1,167 ktoe in 2020, which amounts to 10.2% and the majority will be covered by increased biomass use. Biomass based CHP plant installations will have to be increased by 33%, individual household use by 34%, biomass district heating system by 16% and biogas CHP systems by 7% compared to 2009.

Table No. 38: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020

	Unit	
Share of energy from renewable sources in gross final consumption of energy in 2009	%	21.2
Target of energy from renewable sources in gross final consumption of energy in 2020	%	27.0
Expected total adjusted energy consumption in 2020	ktoe	n/a
Expected amount of energy from renewable sources corresponding to the 2020 target	ktoe	n/a

In case of biofuels, local sources will not be enough to cover the 10% mandatory target by 2020, therefore imports will be needed in 2018.

Regulation scheme

i. Energy law (2011, last amendment in 2012)
Serbia introduced new feed-in tariffs for renewable electricity and certificates for green energy to allow producers to export electricity.

ii. The Law on Rational Use of Energy (2013) prescribes conditions and manner of efficient use of energy and energy carriers in the energy production, transmission, distribution and consumption sectors.

Financial support and economic incentives for bioenergy[94]

Different feed-in tariffs have been determined by the regulatory body. For biomass installations the following prices apply:

- Up to 1 MW: 13. 26 c€/kWh
- between 1 and 10 MW: 13.82-0.56 c€/kWh
- over 10 MW: 8.22 c€/kWh

Biogas power plants:

- Up to 0.2 MW: 15.66 c€/kWh
- between 0.2 and 1 MW: 16.5- 4.19 c€/kWh
- over 1 MW and for plants fired by biogas from animal origin waste: 12.31 c€/kWh

Key actors

i. Energy Agency of the Republic of Serbia: www.aers.rs
It is the regulatory body for electricity, natural gas, oil and combined heat and power established in 2005 by the Energy law. It is also responsible for policy development in the field of energy efficiency and renewable energy.

ii. National Association for Biomass "Serbio": http://serbio.rs
It was established in 2012 by six civil associations, pellet manufacturers and individuals working in the field of biomass. Its aim is to develop the biomass market by creating favourable business environment and by awareness raising activities.

[94] National Renewable Energy Action Plan of Serbia.

4.12 Slovakia

Table No. 39: General profile and macro-economic indicators of SK			Date of data
EU membership		Yes, as of 1 May 2004	-
Area [km2]		49,035	-
Population [persons]		5,488,339	2013
Population density [inhabitants/km2]		112	2013
Life expectancy at birth [years]		n/a	-
Navigable length of the Danube [km]		n/a	-
Current use of Danube as a transport route	Low		-
	Medium	n/a	
	High		
GDP [millions of €]		71,096	2012
GDP/capita [€]		13,155	2012
Inflation rate [annual average rate of change, %]		n/a	-
Unemployment rate [annual average, %]		n/a	-

Table No. 40: Agriculture, forestation and climate of SK				Date of data
Total area eligible for agriculture [km2]			n/a	-
Utilised agricultural area [km2]			24,517	-
Total area eligible for forestation [km2]			n/a	-
Utilised forest area [km2]			20,000	-
Total area eligible for biomass cultivation [km2]			n/a	-
Utilised biomass cultivation area [km2 or %]			n/a	-
Planned forestation per annum [km2]			n/a	-
Classified national nature area [km2]			n/a	-
Agriculture share in GDP [%]			n/a	-
Agriculture share in employment [%]			n/a	-
Agriculture area split [% of total area eligible for agriculture]	Arable land	Total	n/a	-
		Energy crops	n/a	-
	Permanent crops (orchards and vineyards)		n/a	-
	Permanent pastures (areas for natural grasses and grazing of livestock)		n/a	-
	Non cultivable		n/a	-
	Other (please specify)		n/a	-
Climate type			n/a	-
Average annual temperature [C°]			n/a	-
Average annual precipitation [mm]			n/a	-
Average wind velocity [km/h]			n/a	-
Average annual sunshine [hours]			n/a	-

[95] SK BIOM, 2009. Country Study on Political Framework and Availability of Biomass. Available at: www.4biomass.eu

Potential

Table No. 41: Energy production from biomass energy sources

Type of biomass	Technically exploitable potential	Current exploitation	Unused potential
Bio-fuels	2,500	330,000	2,170
Biomass	11,237	3,523	7,714
Forest biomass	1,864	494,000	1,370
Heating plants	1,837	0,000	1,837
Wood processing industry	4,406	2,638	1,768
Agricultural biomass	2,322	60,000	2,262

Slovakia is highly dependent on energy imports, which is more than 90% of its total energy demand.

Biomass could be utilized in district heating systems in settlements with a population of 3-10 thousand people. These systems are currently run on coal, oil or natural gas. Biomass energy has the potential to combine economic, environmental and social benefits.

Current electricity production is 30 GWh from biomass and 2 GWh from biogas. The utilisation of biogas in Slovakia is completely negligible. There are only 5 biogas plants, which use agricultural biomass.

Policy assessment

National bioenergy policy

i. The Energy Policy of the Slovak Republic[96] (2006) sets the main priorities of the Slovak energy policy. It aims to align the national legislation with EU Directives. The main objectives of the strategy are to ensure sufficient volume of energy and its efficient utilisation, safe and continuous supply and maximise savings on the consumption side.

ii. National Energy Efficiency Action Plan 2008-2016
It sets the objective of 9% energy savings by 2016 that corresponds to 10.3 TWh (37.2 PJ) in terms of final energy.

iii. Energy Security Strategy of the Slovak Republic[97] (2008)
It states that 11% energy savings of the average final energy consumption over 2001-2005 (12.6 TWh or 45.5 PJ) will be reached by 2020. The strategy also shows that the greatest prospects offered by RES up to 2020 lie in heating and cooling.

Biomass within the NREAP – bioenergy targets

Table No. 42: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020

	Unit	
Share of energy from renewable sources in gross final consumption of energy in 2005	%	6.7
Target of energy from renewable sources in gross final consumption of energy in 2020	%	14.0
Expected total adjusted energy consumption in 2020	ktoe	11,226
Expected amount of energy from renewable sources corresponding to the 2020 target	ktoe	1,572

[96] N Ministry of Economy of the Slovak Republic, 2006. Energy Policy of the Slovak Republic. Available at: www.economy.gov.sk
[97] Technical University of Košice, 2008. Energy Security Strategy of the Slovak Republic.

National target is to increase the share of renewables in the country's final consumption to 14% in 2020.

Electricity production from RES is dominated by electricity generated in large hydropower plants, accounting for more than 90% of all plants using RES. The NREAP states that the overall theoretical energy potential of agricultural biomass in Slovakia can be quantified at 29,449 GWh or 106,054 TJ of heat, which is 13.2% of total energy consumption (800 PJ).

Direct supply of wood biomass from forests and other wooded land for energy generation amounted to 183 ktoe and indirect supply of wood biomass for energy generation amounted to 270 ktoe in 2006. Agricultural biomass source is almost as important with 151.8 ktoe production in the same year, mostly due to corn production. It is estimated that by 2020 energy production will mainly come from agricultural biomass (2,194 ktoe) due to the increased use of residues and by-products. The use of forest biomass will more than double till 2020 resulting in 1,222 ktoe energy production. Biomass will not be imported to reach the targets.

Increased use of biomass will reduce dependency on natural gas used for heating purposes. Currently the heating is produced mainly (54%) in combined heat and power systems. The rest is coming from local and district heating plans, which mainly (95%) use fossil fuel. Increased use of biomass can be expected in this market.

In the field of biofuels, significant growth in second-generation biofuels is projected by around 2020, which will make an appreciable contribution to the target of 10% use in transport. Sustainability criteria are currently implemented in Slovakia partially in accordance with existing legislation on the protection of nature, the landscape and soil.

Regulation scheme

The act on the promotion of renewable energy and high efficiency cogeneration and amending certain laws ("Act No 309/2009 on the promotion of RES") was approved in 2009. It created a stable business environment for renewable electricity market by providing 15 years of guarantee of prices. The regional distribution system operator is obliged to provide priority connection and ensure priority access.

Financial support and economic incentives for bioenergy[98]

i. Feed-in tariff

Electricity from renewable sources is supported mainly through a fixed feed-in tariff. The feed-in tariff consists of two parts: the price of electricity for losses (market price) and a surcharge. The market price is paid for all electricity supplied from RE facilities up to a support limit of 125 MW. The surcharge is billed by the plant operator for the electricity generated, less the internal technological consumption of electricity.
Biomass: 11.224- 17.1 c€/kWh
Biogas: 9.308-14.987 c€/KWh

ii. Tax regulation mechanisms: Electricity generated from renewable sources is exempt from excise tax.

iii. Subsidies: Plant operators may receive subsidies for the support of renewable electricity from the European Structural Fund

[98] Legal sources on renewable energy. Available at: www.res-legal.eu/search-by-country/slovakia

Key actors

i. Slovak Biomass Association (SK-BIOM): www.skbiom.sk

It was established in 1990 with the objective of disseminating knowledge on bio-energy in order to support biomass based energy production in the Slovak Republic. Its main aim is the widespread implementation of environmentally sound and cost-effective biomass energy systems in Slovakia. It is a member of the European Biomass Association.

4.13 Slovenia

Table No. 43: General profile and macro-economic indicators of SI			Date of data
EU membership		Yes, since 1 May 2004	-
Area [km2]		20,273	-
Population [persons]		1,992,690	2013
Population density [inhabitants/km2]		98	2013
Life expectancy at birth [years]		n/a	-
Navigable length of the Danube [km]		none	-
Current use of Danube as a transport route	Low	-	-
	Medium	-	
	High	-	
GDP [millions of €]		35,319	2012
GDP/capita [€]		17,183	2012
Inflation rate [annual average rate of change, %]		n/a	-
Unemployment rate [annual average, %]		n/a	-

Table No. 44: Agriculture, forestation and climate of SI				Date of data
Total area eligible for agriculture [km2]			n/a	-
Utilised agricultural area [km2 or %]			n/a	-
Total area eligible for forestation [km2]			0	2013
Utilised forest area [km2]			10,806	2013
Total area eligible for biomass cultivation [km2]			n/a	-
Utilised biomass cultivation area [km2 or %]			n/a	-
Planned forestation per annum [km2]			0	2013
Classified national nature area [km2]			1,846	2013
Agriculture share in GDP [%]			n/a	-
Agriculture share in employment [%]			n/a	-
Agriculture area split [% of total area eligible for agriculture]	Arable land	Total	n/a	-
		Energy crops	n/a	-
	Permanent crops (orchards and vineyards)		n/a	-
	Permanent pastures (areas for natural grasses and grazing of livestock)		n/a	-
	Non cultivable		n/a	-
	Other (please specify)		n/a	-
Climate type			alpine, continental and mediterranean	-
Average annual temperature [C°]			9.7	2012
Average annual precipitation [mm]			1,552	2009
Average wind velocity [km/h]			n/a	-
Average annual sunshine (for Ljubljana) [hours]			2,260	2012

Policy assessment

National bioenergy policy[99]

i. National Energy Programme (2010) The Slovenian energy policy is based on this programme. The first version was adopted in 2004 and it has been regularly updated. It aims to reduce CO2 emissions and increase the use of renewable sources in order to reach the targets set by the European Union up to 2030.

ii. Operational Programme for the Energy Utilisation of Biomass is a national strategy to foster bioenergy use. The objective of the Programme is to increase bioenergy production from wood biomass. This strategy is in line with the targets set in the National Energy Programme.

Biomass within the NREAP – bioenergy targets

In total energy use, the most important renewable energy source is wood biomass.

A great proportion of electricity is produced from hydro power, but biomass is the second largest renewable source. Renewable energy sources are important sources of primary energy, because the country has only limited sources of fossil fuel such as gas or oil. Already in 2005 the share of renewables in gross final consumption reached 16.2% and the Government intends to reach 25% by 2020, which is an ambitious target.

Table No. 45: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020

	Unit	
Share of energy from renewable sources in gross final consumption of energy in 2005	%	16
Target of energy from renewable sources in gross final consumption of energy in 2020	%	25
Expected total adjusted energy consumption in 2020	ktoe	5,323
Expected amount of energy from renewable sources corresponding to the 2020 target	ktoe	1,331

In the heating and cooling sector the share of renewables was 20% in 2008 and the target level is 30.8% by 2020, which can be even exceeded. The government will set a mandatory 20% minimum share for heat generated from renewables. In case of electricity generation 28% was produced from renewable sources and it is targeted to reach 39.3% in 2020.

The share of RES in transport was 1.22% in 2008 and the set target is 10% which will be achieved by using second-generation biofuels. The biofuel production in Slovenia began in 2005 and reached 7 ktoe in that year.

Regulation scheme

The Law on Energy (2007, 2010) regulates that the annual and premium prices for the feed-in tariff are set at least once a year. It ensures the liberalization of the energy market.

Financial support and economic incentives for bioenergy[100]

i. Feed-in tariffs

Electricity produced from renewable sources can benefit from receiving fixed or premium tariff valid for 15 years. Biomass producers are eligible for the fixed rate in general if connected to the grid. More than 70% efficiency should be also reached in heat production to be used in district heating or for technological processes. Premium price can be reached above 5 MW production

[99] National Renewable Action Plan of Slovenia.
[100] Legal sources on renewable energy. Available at: www.res-legal.eu/search-by-country/slovenia

capacity. Green electricity preferential tariff for purchase in case of small biomass installations is 17.0-22.0 c€/kWh.

ii. Subsidies, preferential loans
These are both available and subsidies can cover even 50% of the investment costs.

There is no direct support for heating and cooling in Slovenia. The generation of heating is supported by subsidies and low interest loans for households through the Eco Fund scheme. Cohesion fund is also used.

Key actors

i. Energy Agency: http://www.agen-rs.si/sl/
The agency started its operation in 2001 with the aim to supervise and develop the energy market of Slovenia. It is the regulatory body for providing licenses and setting network charges in the electricity and gas sectors. It also issues guarantees on the origin of electricity produced from renewable energy sources.

ii. SLOBIOM- Slovenian Biomass Association: www.slobiom-zveza.si
It was established in 1997 and has the intention to accelerate the introduction of biomass co-operation with the Government, responsible Ministries and international co-operations, especially with the Austrian Biomass Association. It is also a member of AEBIOM.

4.14 Ukraine

Table No. 46: General profile and macro-economic indicators of UA			Date of data
EU membership		No	2013
Area [km2]		603,550	-
Population [persons]		44,573,205	2013
Population density [inhabitants/km2]		74	2013
Life expectancy at birth [years]		n/a	-
Navigable length of the Danube [km]		none	-
Current use of Danube as a transport route	Low	-	-
	Medium	-	
	High	-	
GDP [millions of €]		**263,450**	n/a
GDP/capita [€]		**5,809**	n/a
Inflation rate [annual average rate of change, %]		n/a	-
Unemployment rate [annual average, %]		n/a	-

Table No. 47: Agriculture, forestation and climate of UA			Date of data
Total area eligible for agriculture [km2]		420,000	n/a
Utilised agricultural area [km2 or %]		n/a	-
Total area eligible for forestation [km2]		94,000	n/a
Utilised forest area [km2 or %]		n/a	-
Total area eligible for biomass cultivation [km2]		n/a	-
Utilised biomass cultivation area [km2 or %]		n/a	-
Planned forestation per annum [km2]		n/a	-
Classified national nature area [km2]		n/a	-
Agriculture share in GDP [%]		6.5	n/a
Agriculture share in employment [%]		n/a	-
Agriculture area split [% of total area eligible for agriculture]	Arable land – Total	n/a	-
	Arable land – Energy crops	n/a	-
	Permanent crops (orchards and vineyards)	n/a	-
	Permanent pastures (areas for natural grasses and grazing of livestock)	n/a	-
	Non cultivable	n/a	-
	Other (please specify)	n/a	-
Climate type		n/a	-
Average annual temperature [C°]		n/a	-
Average annual precipitation [mm]		n/a	-
Average wind velocity [km/h]		n/a	-
Average annual sunshine [hours]		n/a	-

Potential

A study[101] has been carried out which shows that the country has quite a large, about 21 mtoe biomass potential annually. Out of this amount about 1 mtoe/year (5% of the total potential) is being used currently, as firewood, wood residues, waste, straw and sunflower husk.

The theoretical and technical potential for forest biomass is 312.24 PJ and 89.08 PJ accordingly. Theoretical potential of agricultural residues and manure is 1,259.29 PJ and the technical potential is 501.43 PJ.[102]

Pellets and briquettes are also produced; however most of them (90%) are being exported. Firewood is used mainly in households of rural areas for heating purposes (stoves). In 2009 the consumption was 2,657 thousand m^3. Another study[103] concluded that in the period of 2009-2010 more than 16 million tonnes of biomass was used in households, which is about 2,584 ktoe.

Biogas is produced only in 3 facilities, due to the fact that there is no feed-in tariff in place to promote the connection to the electricity grid. Ukraine could cover 13-15% of its energy demand if the available biomass potential was well utilized.[105]

Policy assessment

National bioenergy policy

i. Programme of Economic Reforms for 2010-2014
The document identifies major challenges of the inefficient and outdated energy sector and as solutions it sets the following main objectives: fostering energy efficiency through price signals and improving the competitiveness and reliability of the power sector.

ii. The Energy Strategy of Ukraine until 2030 was released for consultation in June 2012. It is an important document because this should drive energy policy reforms. Its aim is to develop an integrated and effective regulatory framework to facilitate more competition, deregulation and diversity in energy supply sources; increased development of domestic energy resources; measures to drive energy efficiency; cost-reflective pricing and improved conditions to attract private investment[104].

Biomass within the NREAP – bioenergy targets

As a Contracting Party of the Energy Community, Ukraine submitted a *"Communication to the European Commission on production and demand for energy from renewable sources in Ukraine"* in mid-2013 and is still obliged also to submit the National Renewable Energy Action Plan. Ukraine will need to double its share of energy from renewable sources in gross final consumption and reach 11% by 2020. However it is not yet known how biomass will be contributing to fulfil the target.

Table No. 48: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020

	Unit	
Share of energy from renewable sources in gross final consumption of energy in 2005	%	5.5
Target of energy from renewable sources in gross final consumption of energy in 2020	%	11.0
Expected total adjusted energy consumption in 2020	ktoe	n/a
Expected amount of energy from renewable sources corresponding to the 2020 target	ktoe	n/a

[101] SEC Biomass: SURVEY on Biomass Consumption for Energy Purposes in Ukraine; 2011
[102] Biomass Energy Use project, 2010. Potential of biomass for energy in Ukraine.
[103] Centre for Renewable Energy Sources and Saving (CRES), 2011. Biomass consumption survey for energy purposes in the Energy Community, Ukraine National Report. Available at: www.energy-community.org
[104] International Energy Agency, n.d. Ukraine 2012, Energy Policies Beyond IEA Countries series.

Regulation scheme

The Law on electricity guarantees grid access for renewable energy producers. The regulator sets the level of „green" tariff for electricity generated biomass and biogas at a rate of 2.3. New rules are applied since April 2013 according to which local content requirement has to be fulfilled in newly established facilities, meaning that materials, technical equipment and services used for the facilities construction are to be of Ukrainian origin to a certain extent.

Financial support and economic incentives for bioenergy

i. Tax exemption

According to the Tax Code of Ukraine transactions for importing the equipment and materials for the development of production and development and consumption of biofuels are exempt from tax. Income of biofuel producers from the sale of biofuels and profits derived from activities on the simultaneous electrical and thermal energy (or heat generation using bio-fuels) are also exempted.

ii. Feed-in

Financial support is provided at the expense of the State under the State Target Economic Program on Energy Efficiency and Development of Energy Production from Renewable Energy Sources and Alternative Fuels for 2010-2015 approved by the resolution of the Cabinet of Ministers of Ukraine dated 01.03.2010 №243.

Key actors

i. Scientific Engineering Center "Biomass": http://biomass.kiev.ua/en/

Since its establishment in 1888 the Center has been providing consulting and engineering services in the field of energy production from biomass.

ii. NGO Renewable Energy Agency: http://www.rea.org.ua/en/

Non-governmental organization created in 2003 for the promotion of renewable energy sources development in Ukraine. They also conduct feasibility studies and assessments.

5 REGIONAL ANALYSIS

5.1 Renewable energy profiles

The aim of this section is to outline the energy landscape of the Danube Region by showing the significance of renewables and specifically biomass in primary energy production and in gross final consumption of energy.

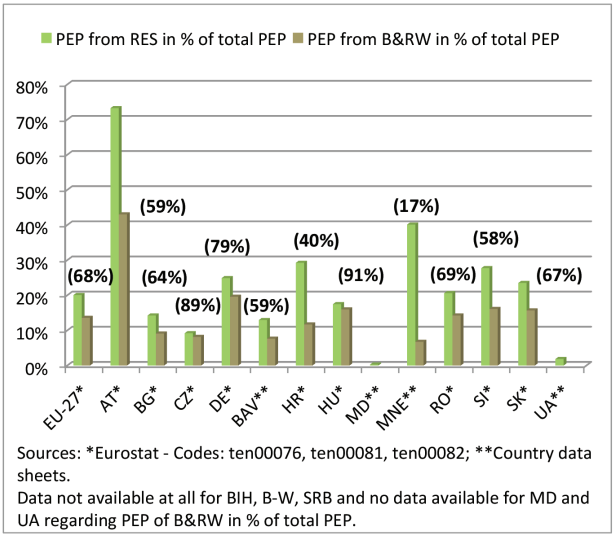
5.1.1 Energy production

Primary energy production (PEP) from renewable energy sources (RES) and specifically from biomass & renewable wastes (B&RW) in 2010 as a share of total primary energy

Graph No. 7 shows the share of the primary energy from renewable energy sources (green bars) as well as from biomass and renewable wastes (brown bars), both compared to the total primary energy production in 2010.

On average, 20% of the total primary energy produced in the EU-27 was originating from renewable energy sources, while 68% of this renewable energy (166,851 ktoe) was coming from biomass and renewable wastes that equalled to 14% of the total primary energy production.

Graph No. 7: **Primary energy production from renewable energy and biomass & renewable wastes in 2010 as a share of total primary energy**



Sources: *Eurostat - Codes: ten00076, ten00081, ten00082; **Country data sheets.
Data not available at all for BIH, B-W, SRB and no data available for MD and UA regarding PEP of B&RW in % of total PEP.

In terms of primary energy produced from RES, Austria was the most outstanding from among the countries of the EUSDR, where 73% of the produced primary energy was covered by renewables. The share of RES in the total primary energy production of Montenegro – with 40% – was remarkable as well. Germany (entire country), Croatia, Romania, Slovenia and Slovakia also had a RES share above the EU-27 average (20%). Bulgaria, Czech Republic, Bavaria (Germany), Hungary, Moldova and Ukraine proportionally produced less than the average of the EU-27. Ukraine and Moldova produced the least primary energy from RES with 2% and 0.3% respectively. The reasons of this high heterogeneity among the countries of the EUSDR in terms of the share of RES in primary energy production is most probably to be traced back to available resources, policy conditions and the level of development.

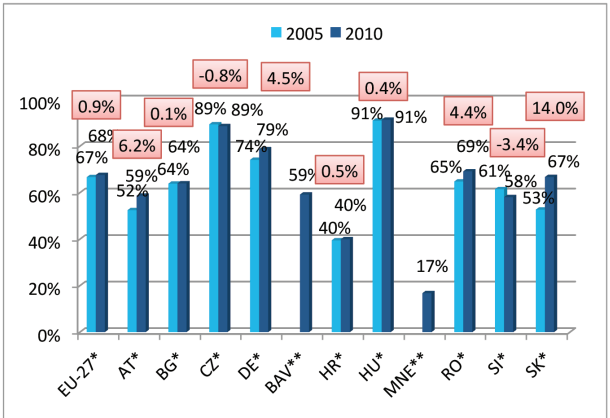
The significance of biomass and renewable wastes within the renewable energy sources can be seen by comparing the two adjacent columns of Graph No. 7. In the EU-27 the average share of B&RW in the primary energy production of RES was 68% (numbers in brackets). In most of the countries the share of B&RW was in a +/-11% range of this average (AT, BG, DE, DE-BAV, RO, SI, SK). The Czech Republic and Hungary had the highest share of B&RW in primary energy production of RES with 89% and 91% respectively. Croatia and Montenegro produced well below the EU-27 average (40% and 17%). Unfortunately no data are available for Baden-Württemberg (Germany), Ukraine and Moldavia in this respect.

From Graph No. 7 it can be concluded that the share of renewable energy in total primary energy production in 2010 differed widely in the countries of the EUSDR, but the amount of biomass and renewable wastes covered more than half of the produced renewable energy in almost all countries (except for Croatia and Montenegro). That means that the majority of the countries had significant renewable energy production from biomass and renewable wastes and these were counted as the most important renewable energy sources in production.

Primary energy production from biomass & renewable wastes in % of primary production of renewable energy in 2005 and 2010

Graph No. 8 shows the share of biomass and renewable wastes in the total primary production of renewable energy in the Danube Region in respect of two years; 2005 (light blue) and 2010 (dark blue). The EU-27 average totalled 67% in 2005 and increased to 68% by 2010, thus the average European growth in between these two years amounted to 0.9% (red rectangles above bars).

Graph No. 8: **Primary energy production from biomass & renewable wastes in % of primary production of renewable energy (2005 and 2010)**



Sources: *Eurostat - Codes: ten00081, ten00082, **Country data sheets. Data not available at all for BIH, B-W, MD, SRB, UA and data not available for BAV and MNE regarding year 2005.

Regarding this five year period the graph clearly shows that in most countries of the EUSDR, biomass and renewable wastes had an increasing importance as renewable energy sources. In all countries – except for the Czech Republic and Slovenia – the share of biomass and renewable wastes in RES has increased. In Slovakia this share grew by a noteworthy 14%.

These share increases lead to the conclusion that biomass gains more and more importance as a renewable energy source so it must be addressed and promoted sufficiently in the Danube Region in the future to use it as efficiently and sustainably as possible.

Primary energy production from biomass

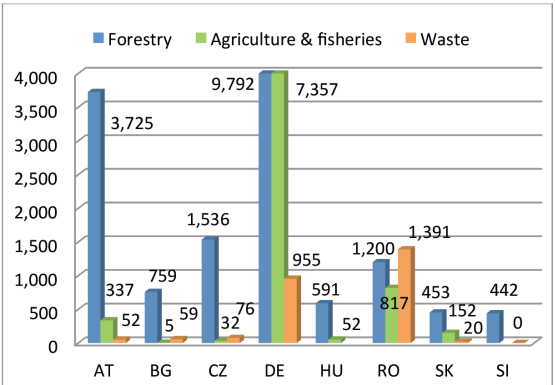
In respect of the energy produced from biomass, detailed data are available only for the EU Member States of the Danube Region[105].

Primary energy production from biomass in 2006

The EU countries of the Danube Region Strategy have each made a statement in their National Renewable Energy Action Plans (NREAPs; submitted in 2010) on the primary energy values produced from biomass in respect of three sectors, forestry, agriculture & fisheries and waste (see Graph No. 9). These values are based on the net amount[106] of biomass resources. The countries have also estimated the value of domestic primary energy production for 2015 and 2020 (see Graph No. 10 below).

It is clear from the values given that Germany[108] produced far more primary energy from biomass in total and especially in the forestry and agriculture & fisheries sectors compared to the other countries of the EUSDR. But when addressing Germany it is important to note that only Baden-Württemberg and Bavaria are members of the EUSDR. Unfortunately there are no separately available data for these States but only for the entire Germany.

Graph No. 9: **Primary energy production by source of biomass in 2006 [ktoe]**



Source: NREAPs
Data not available at all for B-W and BAV and data not available for HU regarding waste and for SI regarding agriculture and fisheries.

As Graph No. 9 illustrates, in 2006 in the EU Member States of the DRS as a whole, most of the biomass derived from forestry; more than twice as much as from agriculture & fisheries, and seven times more than from the waste sector.

Primary energy production from forestry biomass exceeded the production from the other two types individually in all of the countries, except for Romania. The amount of primary energy production of biomass originating from agriculture & fisheries and waste combined did not exceed the amount of energy produced from forestry biomass in all of the countries, with the exception of Romania.

In Romania the waste sector supplied the most biomass for the purpose of primary energy production, followed by the forestry and agriculture & fisheries sectors. The amount of biomass derived from each sector was the most balanced in Romania.

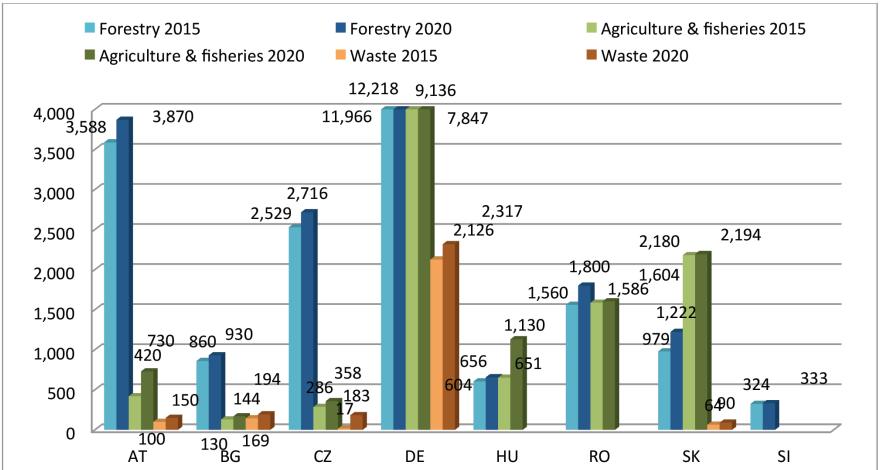
Regarding all the above it can be concluded that in 2006 the forestry sector was the main biomass source supplier in the EU MS of the EUSDR, prior to the agriculture & fisheries and the waste sectors.

[105] Croatia is not included in these data.
[106] Net amount of biomass resource = domestic resource + imports – exports

Estimated primary energy production from biomass in 2015 and 2020

Estimations for 2015 and 2020 regarding the primary energy production from biomass show a similar picture as was detailed for 2006. These estimations have taken only the amount of domestic resources into consideration. In all sectors German[107] production is estimated to be the most outstanding, however, not all DR countries have made such estimations.

Graph No. 10: **Primary energy production from biomass in 2015 and 2020 [ktoe]**



Source: NREAPs

Data not available at all for B-W and BAV and data not available for HU, RO regarding waste and for SI regarding agriculture & fisheries and waste.

Graph No. 11 below demonstrates the planned progress of the countries in the field of the energy production from biomass by demonstrating the expected growth of primary energy production of the countries from 2006 to 2020.

On the basis of Graph No. 10 it is clear that the greatest potential lies in the agriculture & fisheries sector since Graph No. 11 indicates that Bulgaria forecasted more than 32-fold, Hungary more than 20-fold, Slovakia more than 13-fold and the Czech Republic more than 10-fold growth in production. Germany forecasted the lowest growth by estimating an increase by 24%. Unfortunately no forecasted data are available for Baden-Württemberg, Bavaria, and Slovenia in this respect.

Significant growth is expected also in the waste sector since all countries which made estimations plan to at least double the quantities produced in 2006 by 2020. No estimation is available for Hungary, Romania and Slovenia in this regard.

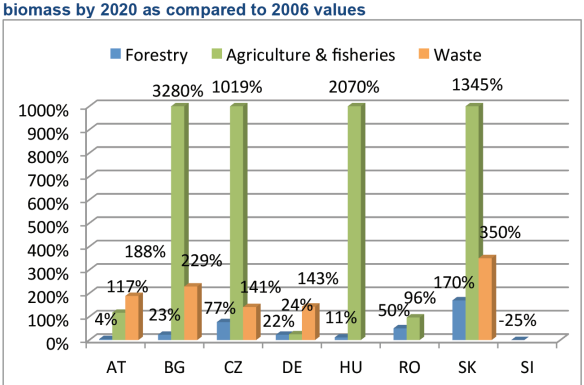
As compared to the agriculture & fisheries as well as to the waste sectors the growth forecasted for the forestry sector is not significant; Slovakia counts on the greatest increase with an increment of 170%, while Slovenia expects a decrease by 25% in production in this sector. The rest of the countries expect an

[107] It is important to note that only Baden-Württemberg and Bavaria are covered by the EUSDR.

increase between 4% and 77% by 2020 as compared to the values in 2006.

The values on Graph No. 11 clearly indicate that priority will be given to biomass from the agriculture & fisheries and waste sectors against forestry sector in all countries. In 2006 forestry sector dominated as the main biomass supplier for energy production and according to the estimations it will dominate in 2020 as well, but energy production from agriculture & fisheries derived biomass will catch up in many countries.

Graph No. 11: **Prospective growth of primary energy production from biomass by 2020 as compared to 2006 values**



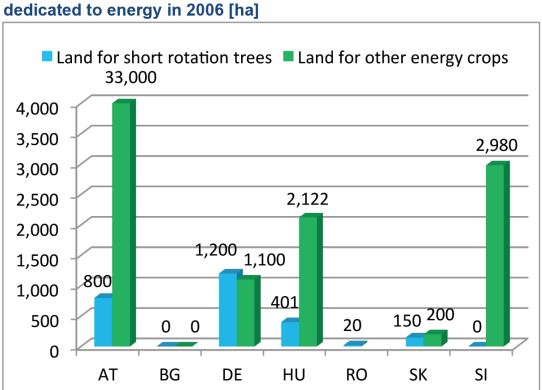
Source: NREAPs
Data not available at all for B-W, BAV and data not available for HU, RO regarding waste and for SI regarding agriculture & fisheries and waste.

Agricultural land use for production of crops dedicated to energy in 2006

Graph No. 12 shows the area of agricultural land used for energy crops in the EU Member States of the EUSDR in 2006.

Two types of land usage are indicated on the graph: (1-blue) land for short rotation trees and (2-green) land for other energy crops. By comparing Graph No. 12 to Graph No. 9, it can be seen that in Austria a total of 33,800 hectares were used for production of energy crops in 2006 which supplied 337 ktoe of primary energy from the agriculture & fishery sector derived biomass, while in Germany a total of 2,300 hectares were used for energy crops and 7,357 ktoe of primary energy was produced in the same sector from biomass.

Graph No. 12: **Agricultural land use for production of crops dedicated to energy in 2006 [ha]**



Source: NREAPs
No available data for B-W, BAV and CZ.

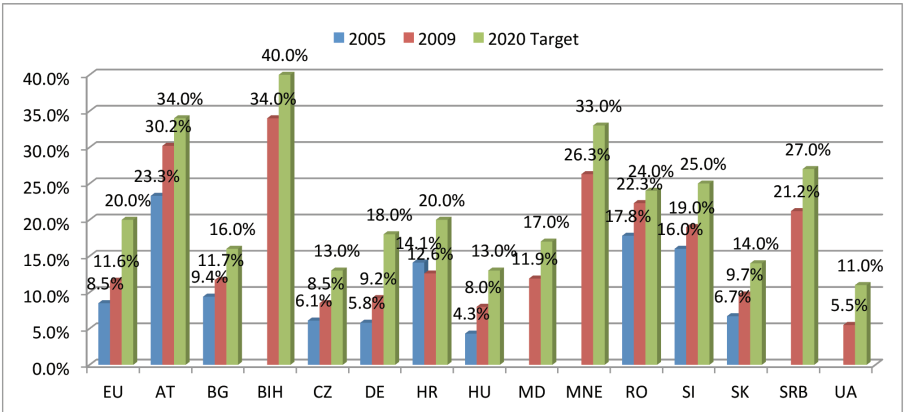
Therefore it can be concluded that energy crops were not the main contributors to primary energy supply from biomass in the agriculture & fishery sector in 2006.

5.1.2 Energy consumption & 2020 targets

Share of energy from renewable sources in gross final consumption of energy

The well-known RES Directive targeted to reach 20% share of energy consumption from RES by 2020 in the European Union. The Directive also set forth individual, mandatory target shares for Member States to be reached by 2020. In 2012 the Energy Community also adopted[108] the RED Directive and laid down RES targets for all Contracting Parties. With that adoption all countries of the EUSDR have their own RES targets for 2020, which values vary widely from a share of 11% (Ukraine) up to 40% (Bosnia and Herzegovina). Graph No. 13 demonstrates these target shares along with the actual shares reached by the countries in 2005 and 2009.

Graph No. 13: **Share of energy from renewable sources in gross final consumption of energy in 2005, 2009, 2020**



Sources: NREAPs; Eurostat – Code: t2020_31; D/2012/04/MC-EnC
Data not available for B-W and BAV.

In 2009 the average share of energy from renewable sources in final energy consumption amounted to 11.6 % in the EU-27 countries. As EU Member States, Austria, Bulgaria, Romania, Slovenia and as non-Member States Croatia, Bosnia and Herzegovina, Moldova, Montenegro and Serbia reached higher share than the EU-27 average in 2009. Based on the set targets Austria, Bosnia and Herzegovina, Romania, Slovenia (as EU MS-s) and Montenegro and Serbia (as non MS-s) are to have a share higher than the EU average in 2020.

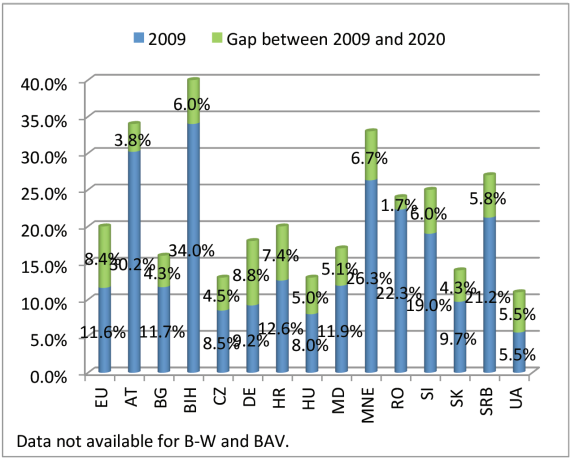
This means that in 2009 nearly two-thirds of the countries of the EUSDR consumed proportionately more energy from RES than the European average, and according to the targets for 2020 still half of the countries will consume as much as (HR) or more than the EU's targeted consumption.

Taking only the current EU MS-s of the EUSDR into account (in this case HR as well), in 2009 five countries out of nine had consumed more energy from RES than the European average and four out of nine are still expected to consume as much as (HR) or more than the EU's expected average consumption in 2020.

[108] Decision 2012/04/MC-EnC on the implementation of Directive 2009/28/EC and amending Article 20 of the Energy Community Treaty

RES share to be reached by 2020 (compared to 2009 values) in gross final consumption of energy

Graph No. 14: **RES share to reach by 2020 compared to 2009 values in in gross final consumption of energy**



Data not available for B-W and BAV.

To reach the 2020 RES target share the EU as a whole has to increase the RES share in final energy consumption by 8.4% to 2020 compared to the 2009 values. As seen on Graph No. 14 only Germany[109] will exceed this rate of increment.

The targeted increases to be reached by the countries of the EUSDR from 2009 to 2020 (in this eleven years period) are ranging from 1.7% (Ukraine) to 8.8% (Germany[112]). This heterogeneity is caused by the shares of RES in final consumption of energy in 2009 and also to the endowments and potentials of the specific countries.

As seen from the prospective growth of primary energy production of biomass by 2020 and the targeted growth of RES share in consumption, it is expected that the consumption of energy derived from biomass will increase as well.

RES shares in 2010 compared to the 1st interim target

Article 3(2) of the RES Directive requires EU Member States to ensure that the share of energy from RES equals or exceeds the values stated in the indicative trajectory set out in the Directive. Based on the indicative trajectory MS-s shall reach their targeted growths (the share differential between the share for that MS in 2005 and targeted by 2020) in the following pace:

- 1st interim target (as an average for the two year period 2011 to 2012): 20%
- 2nd interim target (as an average for the two year period 2013 to 2014): 30%
- 3rd interim target (as an average for the two year period 2015 to 2016): 45%
- 4th interim target (as an average for the two year period 2017 to 2018): 65%

Graph No. 15 shows the first interim targets of the EU-members in the Danube Region (2011-2012) as well as the actual share of energy from renewable sources in final consumption in 2010.

In respect of the progress in the first interim target Austria, Bulgaria, Germany , Hungary, Romania and Slovenia exceeded the target by more than 2%, while the Czech Republic, Slovakia and the EU-27 (as an average), exceeded the target by 1-2%.

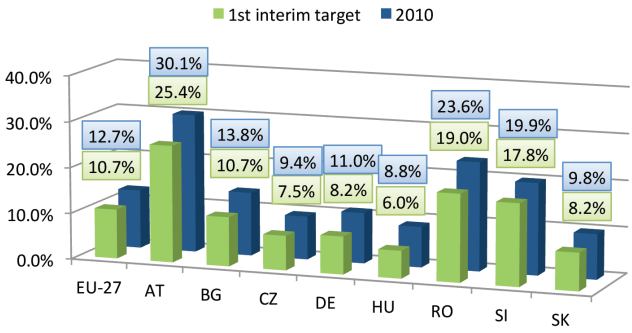
[109] It is important to note that only Baden-Württemberg and Bavaria are covered by the EUSDR.
[110] It is important to note that only Baden-Württemberg and Bavaria are covered by the EUSDR.

Unfortunately, no similar data are available for the non-EU countries of the Danube Region Strategy.

It can be clearly seen that all of the EU-member countries of DRS over-fulfilled their targets, which indicates that the Region is progressing as targeted to fulfil the 2020 targets.

Unfortunately no reports with unified data are available on the shares of biomass within the final consumption of energy at present.

Graph No. 15: **2010 RES shares compared to the 1st interim target**



Data not available for B-W and BAV.

5.2 Bioenergy in detail

Based on the available data of the countries of the Danube Region Strategy this section aims to give a detailed insight into the bioenergy use in the Region by analysing the energy production and consumption derived from different sources of bioenergy. Four main sources are considered, namely solid biomass, renewable municipal wastes, biogas and biofuel. Data of the individual countries of the EUSDR have been compared to discover the gaps and highlight the differences.

As mentioned in the introduction chapter of this study, the countries of the EUSDR had been asked to fill in a data sheet requesting specific biomass related data, but the underdeveloped biomass related databases of the Region resulted in a significant shortage of data. Therefore in most of the cases studied in this section only the data of the EU Member States of the EUSDR are available, which were collected mainly from the National Renewable Energy Action Plans, from previous biomass studies and from online databases. It is also important to note that from Germany only Baden-Württemberg and Bavaria are members of the EUSDR, however, data was available only for the entire Germany in the cases studied below.

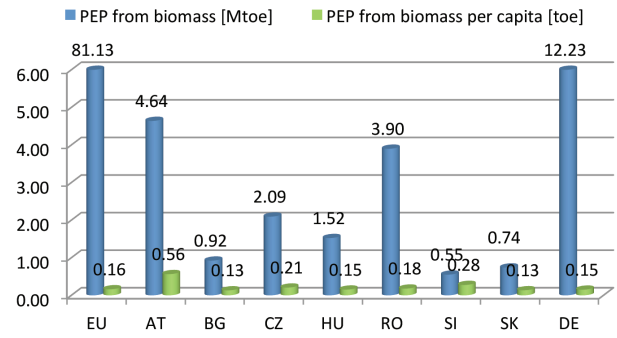
5.2.1 The current state of solid biomass in the Danube Region

This section shows the development of the energy production and consumption from solid biomass.

Primary energy production from solid biomass

In 2010 the countries of the EUSDR[111] produced almost 18% of the primary energy production from solid biomass in the EU. Germany[112] produced 12.23 Mtoe, which was nearly the same amount as the countries of the EUSDR[114] produced altogether and this accounted for a remarkable 15.1% of the entire EU production.

Graph No. 16: **Primary energy production from solid biomass in 2010**



DE: PEP of biomass: 12.23 Mtoe; 0,15 toe per capita
Source: EurObserv'ER, 2012. *Solid Biomass Biometer, 2012*; Central Intelligence Agency. *The World Factbook*.
No available data for BAV, BIH, B-W, HR, MD, MNE, SRB and UA.

In terms of production per capita the average in the European Union was 0.16 toe. As Graph No. 16 indicates the majority of the countries of the EUSDR produced per capita nearly the same or a higher amount of energy from biomass. From among the countries of the EUSDR, Austria was well above the European average; its per capita production was 3.5 times as high (0.16 vs 0.56 toe). The Czech Republic, Romania and Slovenia also exceeded the average per capita production of the European Union.

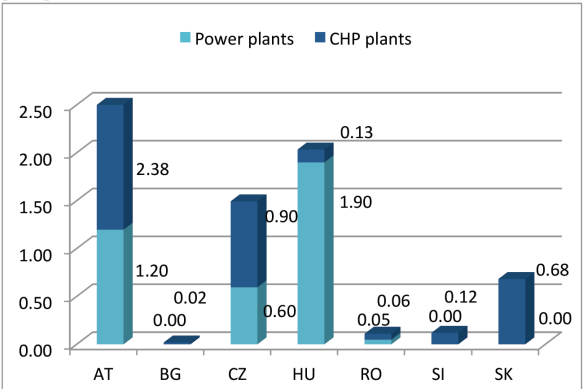
[111] In terms of primary energy production from solid biomass in 2010, data are only available for seven participant states of the EUSDR, namely: AT, BG, CZ, HU, RO, SI, SK.
[112] It is important to note that only Baden-Württemberg and Bavaria are covered by the EUSDR.

These outstanding indices are results of developed processes, promotion and experience in biomass utilisation, which provide a great opportunity for the Region, because these countries could share their knowledge and best-practices with the less advanced countries of the EUSDR.

Gross electricity generation from solid biomass in 2010

In 2010 the 27 member countries of the European Union altogether produced 70.66 TWh bioelectricity from solid biomass. The contribution of the entire Germany was more than 15% to this production, whereof the exact share of Baden-Württemberg and Bavaria is unfortunately not known. The gross electricity production of Austria was also remarkable with more than 5% contribution to the total EU-27 production. Austria, Bulgaria, the Czech Republic, Hungary, Romania, Slovenia and Slovakia altogether produced 11.4% of the EU-27 production.

Graph No. 17: **Gross electricity generation from solid biomass in 2010 [TWh]**



DE: Power plants: 7.52 TWh; CHP plants: 3.21 TWh
EU: Power plants: 26.05 TWh; CHP plants: 44.61 TWh
Source: EurObserv'ER, 2012. *12th EurObserv'ER Report – The state of renewable energies in Europe*.
No available data for BAV, BIH, B-W, HR, MD, MNE, SRB and UA.

Looking at the share of the different type of electricity generation plants in the European Union which use solid biomass, power plants generated almost 37% and CHP (combined heat and power) plants generated slightly more than 63% of the total production. This ratio is similar in the EUSDR[113]; 30.1% of gross electricity was produced by power plants and 69.9% by CHP plants. However, this average holds a great variety in individual country rates. For example, Bulgaria, Slovenia and Slovakia produced electricity from solid biomass in CHP plants only, but in contrast Hungary produced 93.4% of the electricity in power plants.

Concerning the Danube Region[116] it can be stated that in 2010 most of the electricity from biomass was produced in CHP plants; however, concerning the countries individually, there were examples for power plants dominating (Hungary) or significantly contributing to (Austria, Czech Republic, Romania) the production.

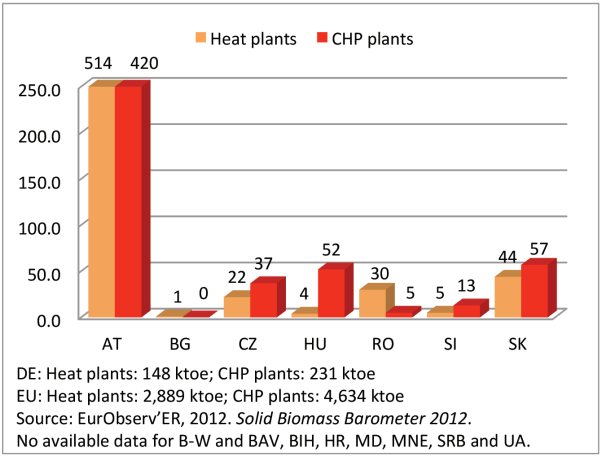
Heat production from solid biomass in the transformation sector[114]

In the transformation sector the EU produced a total of 7,523 ktoe heat from solid biomass in 2010. The EU countries of the Danube Region Strategy[115] produced together 16% of this quantity.

Individually Austria had the highest share within this 16%, with 12.4% that equals to 934 ktoe. Thus the total heat production of Austria from biomass was higher than the production of all the other EU countries in the Danube Region altogether.

[113] In terms of gross electricity generation from solid biomass in 2010, data are only available for seven participant states of the EUSDR, namely: AT, BG, CZ, HU, RO, SI, SK.
[114] Transformation sector: heat sold to district heating networks. Source: EurObserv'ER, 2012. Solid Biomass Barometer 2012.
[115] In terms of heat production from solid biomass in the transformation sector in 2010, data are only available for seven participant states of the EUSDR, namely: AT, BG, CZ, HU, RO, SI, SK.

Graph No. 18: **Heat production from solid biomass in the transformation sector[114] by types of producing plants in 2010 [ktoe]**



DE: Heat plants: 148 ktoe; CHP plants: 231 ktoe
EU: Heat plants: 2,889 ktoe; CHP plants: 4,634 ktoe
Source: EurObserv'ER, 2012. *Solid Biomass Barometer 2012*.
No available data for B-W and BAV, BIH, HR, MD, MNE, SRB and UA.

Analysing the heat production from solid biomass in the two major types of power plants it can be seen that in the 27 countries of the EU 38.4% of the heat was produced by heat plants and 61.6% by CHP plants in 2010.

In the countries of the EUSDR[118] as a whole, the share of the two plant types was somewhat similar; heat plants produced 51.5% and CHP plants produced 48.5% of the heat that was sold in district heating. In the countries individually there were differences; in Austria, Bulgaria and Romania the heat plants dominated while in the Czech Republic, Germany[116], Hungary, Slovenia and Slovakia the CHP plants produced more.

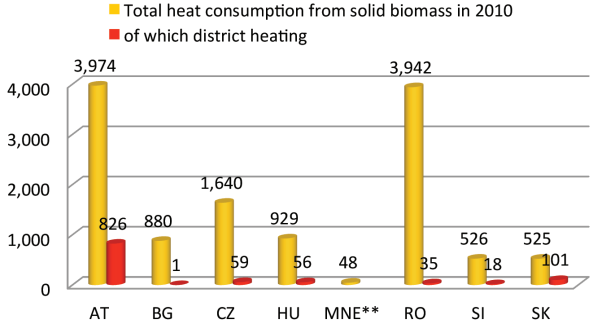
Thus it can be concluded that in the Danube Region[118] heat production from solid biomass in the transformation sector in terms of plants types was balanced in 2010, while in terms of the countries individually greater deviations could be experienced from the regional average.

[116] It is important to note that only Baden-Württemberg and Bavaria are covered by the EUSDR.

Heat consumption from solid biomass

The heat consumption of end users generated from solid biomass amounted to 67,216 ktoe in the whole European Union in 2010, of which 7,415 ktoe was consumed through district heating. Seven countries of the Danube Region Strategy[117] were responsible for 18.5% (12,464 ktoe) of the total EU-27 consumption.

Graph No. 19: **Heat consumption from solid biomass* in 2010 [ktoe]**



DE: Total heat consumption from solid biomass in 2010: 8,677 ktoe; of which district heating: 379 ktoe
EU: Total heat consumption from solid biomass in 2010: 67,216 ktoe; of which district heating: 7,415 ktoe
Sources: EurObserv'ER, 2012. *12th EurObserv'ER Report – The state of renewable energies in Europe;* **Country data sheet
* Consumption of the end user (either as heat sold by the district heating or self-consumed, either as fuels for the production of heat and cold).
No available data for BAV, BIH, B-W, HR, MD, SRB and UA.

Graph No. 19 shows the amount of total bioheat consumption sold through district heating and the total bioheat consumption of end users in 2010. In the European Union the consumption sold through district heating amounted to 11% of the total consumption of end users.

In the countries of the EUSDR[120] this rate was only 8.8%. According to Graph No. 19 Austria and Slovakia had the highest rate of bioheat consumption sold through district heating, with 20.8% and 19.2% respectively. In the rest of the countries shown on the graph less than 5% of the bioheat consumption was sold through district heating in 2010.

[117] In terms of heat consumption from biomass in 2010, data are only available for eight participant states of the EUSDR, namely: AT, BG, CZ, HU, MNE, RO, SI and SK.

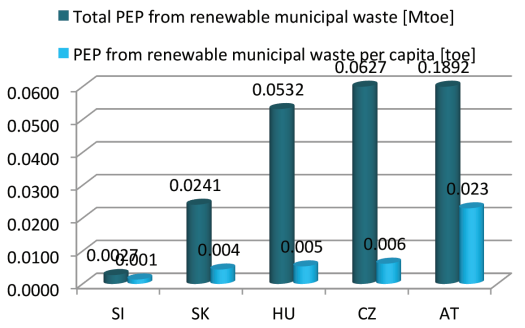
5.2.2 The current state of renewable municipal waste in the Danube Region

The section below demonstrates the current state of the production of primary energy, electricity and thermal energy generated from renewable municipal wastes.

Primary energy production from renewable municipal waste

In respect of the primary energy produced from renewable municipal waste data are only available for five EU Member States of the EUSDR[118].

Graph No. 20: **Primary energy production from renewable municipal waste in 2010**



Germany: Total PEP of renewable municipal waste: 2,271.2 ktoe; 0.028 toe/inhabitant

EU: Total PEP of renewable municipal waste: 8,003.4 ktoe; 0.016 toe/inhabitant

Sources: EurObserv'ER, 2012. *12th EurObserv'ER Report – The state of renewable energies in Europe*; Central Intelligence Agency. *The World Factbook*.

No available data for BAV, BIH, B-W, BG, HR, MD, MNE, RO, SRB and UA.

Graph No. 20 indicates the total primary energy production from renewable municipal waste and the per capita values for five EUSDR countries. The EU-27 together produced 8,003 ktoe primary energy from renewable municipal waste in 2010, while the five countries of the EUSDR altogether produced 332 ktoe (0.332 Mtoe) primary energy which was 4.1% of the EU-27 production. Germany produced an outstanding amount of primary energy (2,271 ktoe) from renewable municipal waste, which amounted to 28.4% of the total production of the EU, but as it was mentioned earlier, in Germany's case, not the whole country is covered by the EUSDR[119].

Based on the data available, production per capita has been calculated in regard of primary energy production from renewable municipal waste. The EU MS-s produced per capita 0.016 toe primary energy from renewable municipal waste in 2010, which allows a comparison to the same data of the countries of the EUSDR[121]. Only Austria exceeded this EU average (with 45%) from among the DRS countries[121]. The Czech Republic, Hungary, Slovakia and Slovenia produced less than 40% of the EU's average primary energy production from renewable municipal waste.

From the above displayed per capita data the conclusion can be drawn that the Czech Republic, Hungary, Slovakia and Slovenia were behind the EU average, therefore in this respect there is a room for improvement in these countries.

Gross electricity generation from renewable municipal waste

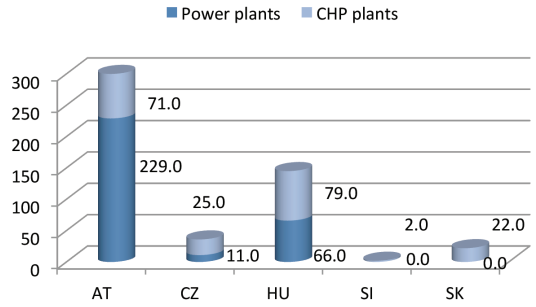
In respect of electricity produced from renewable municipal waste, data are available only for Austria, Hungary, the Czech Republic, Slovakia and Slovenia out of the fifteen members of the EUSDR.

[118] In terms of primary energy production from renewable municipal waste in 2010, data are only available for five participant states of the EUSDR, namely: AT, CZ, HU, SI and SK.

[119] It is important to note that only Baden-Württemberg and Bavaria are covered by the EUSDR.

Graph No. 21 shows the amount of electricity produced from renewable municipal waste in 2010 split between power and CHP plants. The 27 countries of the European Union generated altogether 17,208 GWh electricity from renewable municipal waste in 2010, which amount was generated almost equally by power plants and by CHP plants (53.8% vs. 46.2%). The analysed countries of the EUSDR[120] generated a quite small portion of the EU total electricity production; slightly less than 3%.

Graph No. 21: **Gross electricity generation from renewable municipal waste in 2010 [GWh]**



DE: Power plants: 3,373 Gwh; CHP plants: 1,213 GWh
EU-27: Power plants: 9,259 GWh; CHP plants: 7,949.3 GWh
Source: EurObserv'ER, 2012. *12th EurObserv'ER Report – The state of renewable energies in Europe*.
No available data for BAV, BIH, B-W, BG, HR, MD, MNE, RO, SRB and UA.

Analysing the rates of power plants generating energy, as seen in the previous paragraph 53.8% of gross electricity in the EU from renewable municipal waste was generated by power plants and 46.2% by CHP plants. In the analysed EUSDR countries this breakdown was similar but power plants had a slightly bigger share, as 60.6% of the gross electricity was produced by such plants. In Austria power plant electricity generation dominated with the production of 76.3% of all electricity from renewable wastes. In the Czech Republic and Hungary CHP plants generated more electricity (69.4% and 54.5% respectively) while in Slovenia and Slovakia all electricity from renewable municipal waste was generated by CHP plants in 2010.

Summarizing the above, in the analysed countries of the Danube Region[123] the majority of the produced gross electricity from renewable municipal waste came from power plants as an average. However, as data was available only for five countries of the EUSDR[123] making conclusions for the entire Region would be misleading.

[120] In terms of gross electricity production from renewable municipal waste in 2010, data are only available for five member states of the EUSDR, namely: AT, CZ, HU, SI, SK.

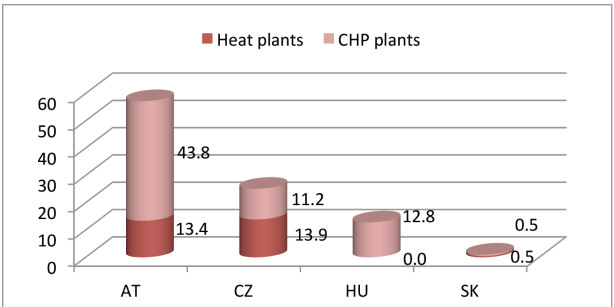
Heat production from renewable municipal waste combustion in the transformation sector[121]

For the case of thermal energy produced from renewable municipal waste in the transformation sector in 2010, data are unfortunately available only for four countries of the EUSDR[122] as shown on Graph No. 22.

The European Union produced 521.8 ktoe bioheat by heat plants and 1,456.3 ktoe by CHP plants (26% vs 74%), which was sold to district heating networks. The four countries of the EUSDR for which data are available, produced altogether nearly 5% of the EU total bioheat production.

Studying the ratio of bioheat produced in CHP plants and heat plants for the countries indicated in the diagram combined, one can see that CHP plants produced 67.8% and heat plants produced the remaining 32.2%. The share of the two types of plants was similar also on EU level, as stated previously, but CHP plants produced slightly more, the ratio was 74-26. In terms of the individual countries, Austrian production was 23-77; Czech was 55-45; Hungarian was 0-100 and Slovakian was 50-50.

Graph No. 22: **Heat production from renewable municipal waste combustior in the transformation sector in 2010 [ktoe]**



DE: Heat plants: 196.1 ktoe; CHP plants: 368.2 ktoe
EU: Heat plants: 521.8 ktoe; CHP plants: 1,456.3 ktoe
Source: EurObserv'ER, 2012. *Renewable municipal waste barometer 2012*.
No available data for BAV, BIH, B-W, BG, HR, MD, MNE, RO, SRB, SI and UA.

As these four countries cannot represent the whole Danube Region, further conclusions cannot be made in this respect.

[121] Heat sold to district heating networks.
[122] In terms of heat production from renewable municipal waste combustion in the transformation sector in 2010, data are only available for four participant states of the EUSDR, namely: AT, CZ, HU and SK.

5.2.3 The current state of biogas in the Danube Region

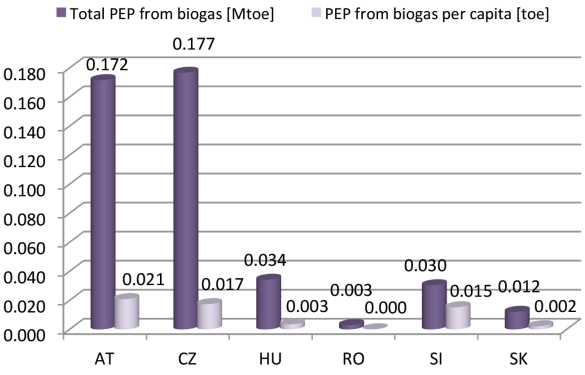
The present section of the study demonstrates the current state of biogas production in the Danube Region. In the cases studied in this section we could not access any data on such countries of the Danube Region as are currently not members of the European Union.

Primary energy production from biogas

Graph No. 23 demonstrates the total primary energy produced from biogas in 2010 as well as the total primary energy in relation to the population of the specific countries. Data were only available for six EU Member States of the EUSDR[123] as this can be observed on the graph.

In 2010 the entire EU produced 10.895 Mtoe primary energy from biogas, which represented 0.022 toe of primary energy per capita. The production of the six countries of the EUSDR126 equalled to 3.9% of the EU total production of primary energy from biogas. Comparing the productions per square kilometre, none of the countries of the EUSDR126 reached the EU average (0.022 toe per km^2).

Graph No. 23: **Primary energy production from biogas in 2010**



DE: Total primary energy production of biogas: 6.67 Mtoe; 0.082 toe/km2
EU: Total primary energy production of biogas: 10.895 Mtoe; 0.022 toe/km2
Source: EurObserv'ER, 2012. 12th EurObserv'ER Report – The state of renewable energies in Europe.
No data available for BAV, BIH, B-W, BG, HR, MD, MNE, SRB and UA.

In Austria the per capita production of primary energy from biogas was only slightly less than the EU average with 0.021 toe. The per capita production of the Czech Republic and Slovenia was less by 20% and 29% than the average of the EU (exactly 0.017 and 0.015 ktoe per capita respectively) while Hungary, Romania and Slovakia each produced less than 16% of the EU average.

As a conclusion it can be stated that the analysed countries lag behind the European Union average in terms of primary energy production from biogas, therefore it is an area where further developments could take place.

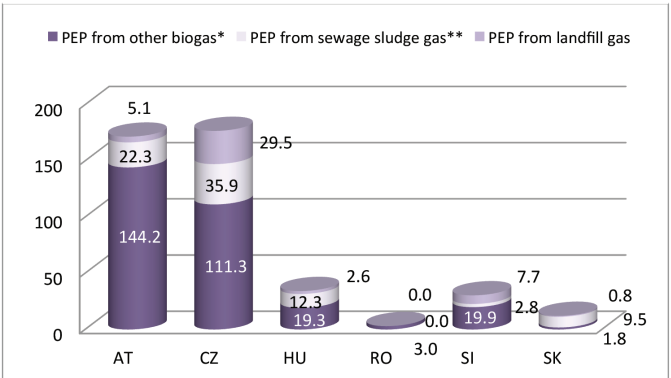
Studying the breakdown of the total primary energy produced from biogas it can be clearly seen from Graph No. 24 that in most analysed countries the majority of primary energy was produced from other biogas, which comprises gas from decentralised agricultural plants, municipal solid waste methanisation plants and centralised co-digestion plants.

In the European Union 64.3% of total primary energy production from biogas was derived from other biogas. Sewage sludge gases (urban and industrial combined) were responsible for 9.8% of the total

[123] In terms of primary energy production from biogas in 2010, data are only available for six member states of the EUSDR, namely: AT, CZ, HU, RO, SI and SK.

primary energy production from biogas and landfill gases for the remaining 25.9%. The share of primary energy produced from the different biogas types as an average was quite the same in the analysed countries: other biogas 70% – sewage sludge gas 19.3% – landfill gas 10.7%.

Graph No. 24: **Primary energy production from biogas by type in 2010 [ktoe]**



DE: PEP of other biogas: 6,034.5 ktoe; sewage sludge gas: 402.6 ktoe; landfill gas: 232.5 ktoe
EU: PEP of other biogas: 7,009.1 ktoe; sewage sludge gas: 1,065.1 ktoe; landfill gas: 2,821 ktoe
Source: EurObserv'ER, 2012. 12th EurObserv'ER Report – The state of renewable energies in Europe.
No data available for BIH, BG, HR, MD, MNE, SRB and UA.
gestion plant
* Decentralised agricultural plant, municipal solid waste methanisation plant, centralised co-digestion plant
** Urban and industrial

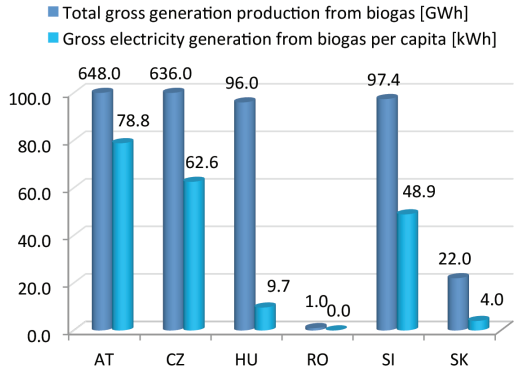
So the majority of primary energy derived from biogas was produced together by decentralised agricultural plants, municipal solid waste methanisation plants and centralised co-digestion plants in 2010 in the European Union and in the Danube Region as well[124] while energy production from sewage sludge gas and landfill gas was less significant.

[124] In terms of primary energy production from biogas in 2010, data are only available for six participant states of the EUSDR, namely: AT, CZ, HU, RO, SI and SK.

Gross electricity generation from biogas

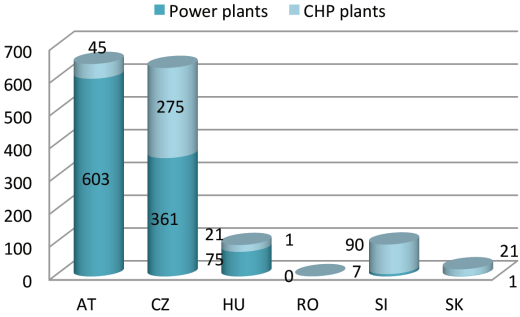
The following graphs (No. 25 and 26) present the amount of gross electricity production derived from biogas in 2010. Data in this regard are only available for six countries of the EUSDR[125] as can be seen on the graphs.

***Graph No. 25:* Gross electricity generation from biogas in 2010**



DE: Total electricity prod: 16,205.0 GWh; per capita: 199.7 kWh
EU: Total electricity prod: 30,331.7 GWh; per capita: 60.2 kWh
Source: EurObserv'ER, 2012. *12th EurObserv'ER Report – The state of renewable energies in Europe*; Central Intelligence Agency. *The World Factbook.*
No data available for BAV, BIH, B-W, BG, HR, MD, MNE, SRB and UA.

***Graph No. 26:* Gross electricity generation from biogas by production plants in 2010 [GWh]**



DE: Power plants: 14,847 GWh; CHP plants: 1,358 GWh
EU: Power plants: 24,529 GWh; CHP plants: 5,803 GWh
Source: EurObserv'ER, 2012. *12th EurObserv'ER Report – The state of renewable energies in Europe*.
No data available for BAV, BIH, B-W, BG, HR, MD, MNE, SRB and UA.

The total gross electricity generation of the European Union from biogas was 30,331.7 GWh in 2010, which represented 60.2 kWh per capita. Although Germany is not covered entirely by the EUSDR (only Baden-Württemberg and Bavaria) but it is noteworthy to mention that Germany generated more than 50% of the EU total production of electricity from biogas with 16,205 GWh.

The countries analysed altogether generated less than one tenth of the German production (1,500.4 GWh), which was equal to 4.9% of the EU total production in 2010.

Comparing the per capita figures, Austria and the Czech Republic generated above the EU average; Slovenia 18.8% less; and the production of Hungary, Romania and Slovakia was well under the European average.

Studying the breakdown of the production it is clear that power plants generated proportionately much higher amount of electricity in most of the studied countries than CHP plants, except for Slovenia and Slovakia.

In the European Union as a whole, power plants generated more than 4 times as much electricity as CHP plants. The six analysed countries of the EUSDR generated 2.3 times as much gross electricity from biogas in power plants as in CHP plants.

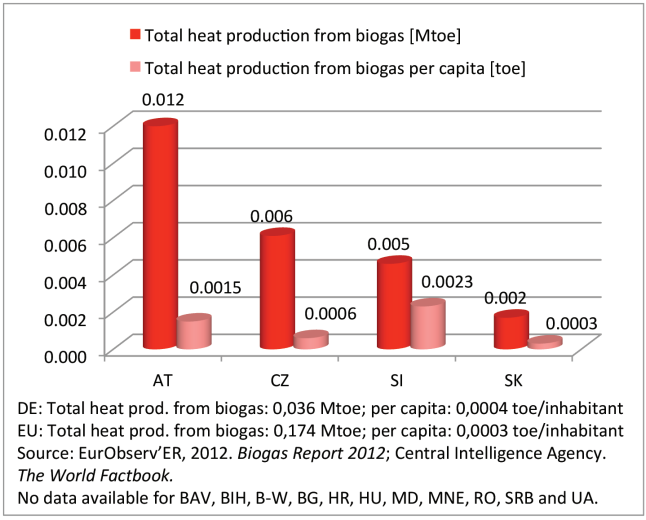
[125] In terms of gross electricity generation from biogas in 2010, data are only available for six participant states of the EUSDR, namely: AT, CZ, HU, RO, SI, SK.

Regarding the individual countries, the ratios of gross electricity generated by power and CHP plants differed widely as follows (power plants – CHP plants): in Austria 93.1-6.9, in the Czech Republic 56.8-43.2, in Hungary 78.1-21.9, in Romania 0-100, in Slovenia 7.4-92.6, and in Slovakia 4.5-95.5. Therefore it can be said that in one half of the country group power plants and in the other half CHP plants dominated the gross electricity production from biomass in 2010.

Gross heat production from biogas in the transformation sector[126]

In respect of heat produced from biogas in the transformation sector in 2010 (as Graph No. 27 demonstrates) data were available only for four countries of the EUSDR[127].

Graph No. 27: **Gross heat production from biogas in the transformation sector in 2010**



DE: Total heat prod. from biogas: 0,036 Mtoe; per capita: 0,0004 toe/inhabitant
EU: Total heat prod. from biogas: 0,174 Mtoe; per capita: 0,0003 toe/inhabitant
Source: EurObserv'ER, 2012. *Biogas Report 2012*; Central Intelligence Agency. *The World Factbook*.
No data available for BAV, BIH, B-W, BG, HR, HU, MD, MNE, RO, SRB and UA.

The 27 countries of the European Union produced totally 174 ktoe heat from biogas in the transformation sector in 2010. Austria, the Czech Republic, Slovenia and Slovakia altogether produced slightly more than 14% of the EU's total production.

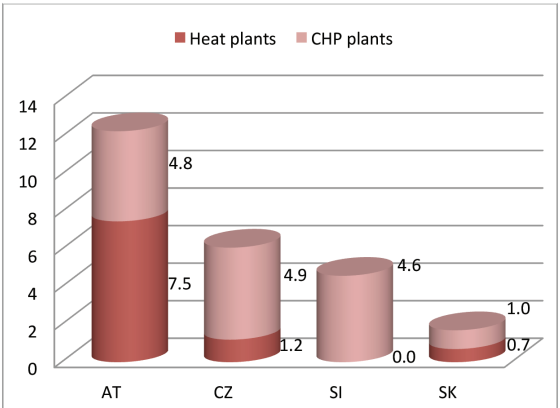
Analysing the amount of bioheat productions per capita could give a more comparable picture about the countries (light red columns on Graph No. 27).

In the European Union the per capita heat production from biogas amounted to an average of 0.0003 toe in 2010. As Graph No. 27 indicates, the individual productions of the countries of the EUSDR[130] equalled or exceeded the EU average production. The Slovenian production was the most outstanding with 0.0023 toe per capita, which was 6.7 times more than the total EU production per capita.

[126] Heat sold to the district heating network or to the industrial units.
[127] In terms of heat production from biogas 2010, data are only available for four participant states of the EUSDR, namely: AT, CZ, SI, SK.

Therefore concerning heat production from biogas, sold to the district heating network or to the industrial units, it can be seen that the analysed countries of the EUSDR were on the same or higher level as the European average in 2010. Nevertheless these four countries do not represent the whole Danube Region, so making conclusions from this amount of data would not be appropriate in this respect.

Graph No. 28: **Gross heat production from biogas in the transformation sector by production plants in 2010 [ktoe]**



DE: Heat plants: 13.6 ktoe; CHP plants: 22.4 ktoe
EU: Heat plants: 44.1 ktoe; CHP plants: 129.8 ktoe
Source: EurObserv'ER, 2012. *Biogas Report 2012*; Central Intelligence Agency. *The World Factbook.*
No data available for BAV, BIH, B-W, BG, HR, HU, MD, MNE, RO, SRB and UA.

The share of heat and CHP plants in heat production from biogas in the European Union was 25.4-74.6 in average. As Graph No. 28 illustrates, this ratio varied in the four analysed countries of the Danube Region. In the Czech Republic, Slovenia and Slovakia the CHP plants dominated the heat production market, but in Austria heat plants produced more thermal energy to be sold to the district heating network or to the industrial units than CHP plants.

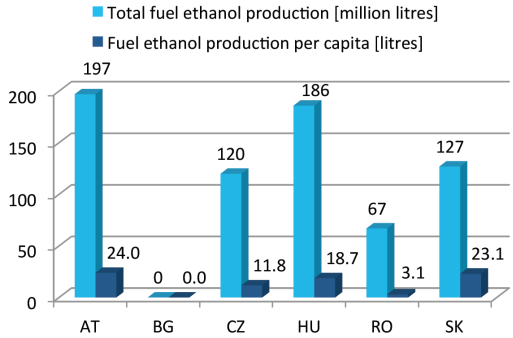
5.2.4 The current state of biofuels in the Danube Region

This section provides an analysis of the data of the EU member states of the Danube Region Strategy only since data for the non-EU countries are currently not available in this respect.

Fuel ethanol production

Graph No. 29 highlights the production of fuel ethanol from among the biofuels in 2010 in the DRS countries. Data are available only for seven countries from the Region[128].

Graph No. 29: **Fuel ethanol production in 2010**



DE: Total: 761 million liters; per capita: 9.4 litres/head
EU: Total: 4,268 million liters; per capita: 8.5 litres/head
Source: EurObserv'ER, 2012. *Biofuels Report 2012;* Central Intelligence Agency. *The World Factbook*.
No available data for BAV, BIH, B-W, HR, MD, MNE, SRB, SI and UA.

The fuel ethanol production of the European Union resulted in 4,268 million litres in 2010, whereof Germany itself[129] produced 761 million litres, i.e. 17.8% of the total EU production. The countries of the EUSDR131 displayed on the graph produced together approximately the same quantity as Germany; 697 million litres of fuel ethanol which equals to 16.3% of the total European production.

Analysing the productions per capita gives a more accurate view on how these countries performed as compared to their potential. In the entire EU 8.5 litres of fuel ethanol were produced per capita in average in 2010, while the individual countries of the EUSDR analysed here exceeded this amount, with the exception of Romania (with 3.1 litres per capita) and Bulgaria (where no fuel ethanol production took place) in 2010. In the Czech Republic, Hungary, Slovakia and Austria the production was well above the EU average with 39, 121, 173 and 183 per cent respectively.

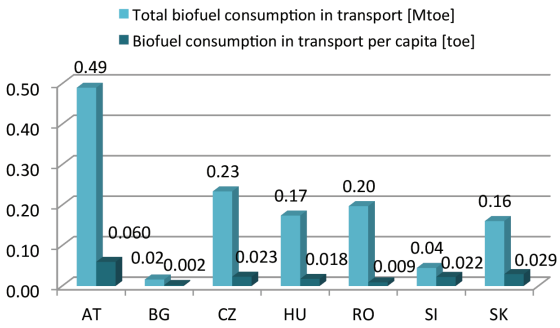
The fact that the production of fuel ethanol on a per capita level significantly exceeded the EU average in numerous countries of the EUSDR in 2010, provides an opportunity for sharing knowledge and best-practices with countries being less developed in this field and thus helping the Danube Region become a leader in this area.

[128] In terms of fuel ethanol production in 2010, data are only available for six participant states of the EUSDR, namely: AT, BG, CZ, HU, RO, SK.
[129] It is important to note that only Baden-Württemberg and Bavaria are covered by the EUSDR.

Biofuel consumption in transport

In 2010 the total biofuel consumption in transport amounted to 13.56 Mtoe in the European Union as Graph No. 30 indicates. In respect of biofuel consumption, data are only available for seven countries of the EUSDR[130].

Graph No. 30: **Biofuel consumption in transport in 2010**

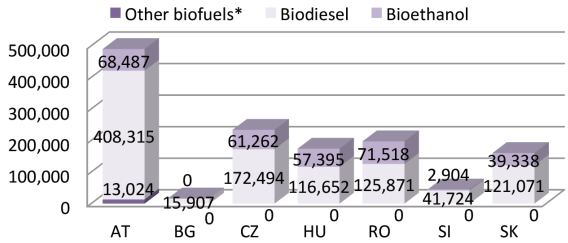


DE: Total: 3.04 Mtoe; 0.037 toe/head
EU: Total: 13.56 Mtoe; 0.027 toe/head
Source: EurObserv'ER, 2012. *12th EurObserv'ER Report – The state of renewable energies in Europe*; Central Intelligence Agency. *The World Factbook*.
No available data for BIH, HR, MD, MNE, SRB and UA.

The total biofuel consumption of these seven countries was 1.32 Mtoe, which was 9.7% of the EU total consumption. The per capita consumption of biofuel in transport amounted to 0.027 toe on average in the European Union in 2010, which was only exceeded by Austria and Slovakia from the analysed countries of the EUSDR. The highest per capita consumption was registered in Austria amounting to 0.06 toe biofuel in 2010, which was more than double of the EU average. The Czech Republic, Hungary and Slovenia were not far from the EU average, these countries each exceeded 65% of that figure. The production of Bulgaria and Romania lagged far behind the EU average.

From the figures of Graph No. 30 it can be seen that the majority of the analysed countries were less advanced regarding the biofuel consumption in transportation in 2010. Austria as a leader in this field in the EU could share its best-practices and knowledge with the other countries of the EUSDR to improve the whole Region's performance in biofuel usage in transportation.

Graph No. 31: **Biofuel consumption in transport by type in 2010 [toe]**



DE: Other biofuels: 53,908 toe; Biodiesel: 2,234,954 toe; Bioethanol: 751,290 toe
EU: Other biofuels: 149,787 toe; Biodiesel: 10,565,285 toe; Bioethanol: 2,847,620 toe
Source: EurObserv'ER, 2012. *12th EurObserv'ER Report – The state of renewable energies in Europe*.
No available data for BIH, HR, MD, MNE, SRB and UA.

[130] In terms of biofuel consumption in 2010, data are only available for seven participant states of the EUSDR, namely: AT, BG, CZ, HU, RO, SI, SK.

Graph No. 31 illustrates the breakdown of biofuel consumption in transport of the countries analysed in 2010 by types of biofuel. As it can be seen on the graph the consumption of biodiesel was much higher than that of the bioethanol (and that of other biofuels) in each country studied. Almost without exception the consumption of biodiesel was minimum twice as much as the consumption of bioethanol (except for Romania, where it was only 1.8 times higher). Therefore it can be concluded that biodiesel was more commonly used in the consumer side of transport in 2010. Other biofuels, for example pure vegetable oils, were produced only by Germany and Austria, amounting to a quantity of approximated 54,000 toe and 13,000 toe respectively in 2010.

5.2.5 Summarization of the state of biomass in the Danube Region

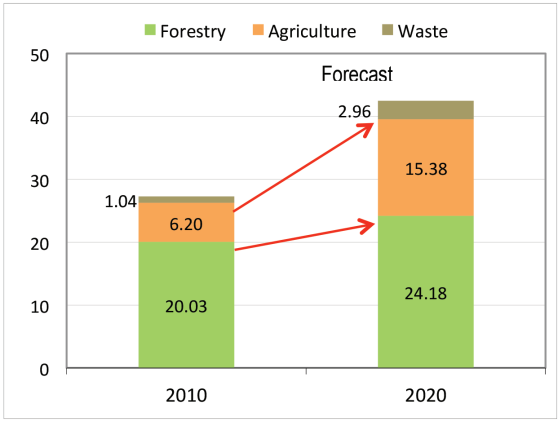
The summarization in this section has been prepared based on data of the Joint Research Centre[131]. However, the following analyses are covering only Austria, Bulgaria, Croatia, the Czech Republic, Germany, Hungary, Romania, Serbia, Slovakia and Slovenia. Concerning Germany, the following section is based on data for the entire country, but it is important to note that only two of its federal states are covered by the EUSDR, namely Baden-Württemberg and Bavaria, therefore the aggregate quantities and figures in this section will not reflect exactly the Danube Region.

Biomass supply

Graph No. 32 demonstrates the biomass production of the above mentioned countries of the Danube Region[132] in 2010 and the forecast for 2020, according to three categories of source: forestry, agriculture and waste.

The total production of biomass amounted to 27.26 Mtoe in 2010, which is expected to increase by 55.9% to 2020, to reach an amount of 42.52 Mtoe energy production from biomass.

Graph No. 32: **Biomass supply by source [Mtoe]**



When analysing the three sources, it is clear that forestry had the largest share in 2010 (i.e.) 73.5%, but its share is expected to decrease by 16.7% (to 56.8%) until 2020. Despite this decrease, forestry will maintain the dominant position.

The agriculture sector had the second highest share in 2010 amounting to 22.7% of the total biomass production. This share is expected to grow by 13.5% to 2020, providing 36.2% of the total supply, which means that the production derived from agriculture will be almost 2.5 times as much as it was in 2010.

The waste sector had the smallest share and production in 2010 with 3.7%. This value is expected to triple by 2020, thus the waste sector is forecasted to supply an amount of biomass that equals to around 3 Mtoe energy. With this increase it is expected to have a 7% share from the total supply in 2020.

Bioenergy consumption

The next graph (No. 33) shows the aggregated bioenergy consumption in the analysed countries of the EUSDR[133] in 2010 as well as a forecast for 2020.

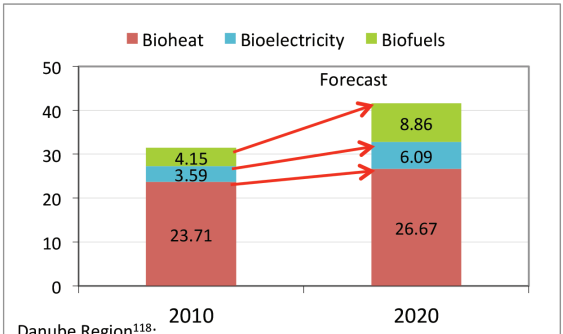
[131] Banja, M. (Joint Research Centre, Renewable Energy Unit, Renewable Energy Monitoring/Mapping in Europe and Africa Action), 2013. Bioenergy in Danube River Basin (DRB) [PowerPoint presentation].
Data sources for the presentation: (1) EU MS countries: Member States of the European Union, n.d. National Renewable Energy Action Plans. Available at: http://ec.europa.eu/energy/renewables/action_plan_en.htm
(2) Non-EU countries: Members to the Treaty establishing Energy Community, n.d. National Renewable Energy Action Plans. Available at: http://www.energy-community.org

[132] In terms of biomass supply in 2010 and in 2020, data are only available for 10 participant states of the EUSDR, namely: AT, BG, HR, CZ, DE, HU, RO, SRB, SI and SK.

[133] In terms of bioenergy consumption in 2010 and in 2020, data are only available for 10 member states of the EUSDR, namely: AT, BG, HR, CZ, DE, HU, RO, SRB, SI and SK.

The most bioenergy was consumed in the form of heat in 2010 with a value of 23.71 Mtoe. The consumption of bioelectricity amounted to 3.59 Mtoe, while that of biofuel totalled 4.15 Mtoe. So the total bioenergy consumption was 31.45 Mtoe, which amounted to 9.5% of the total final energy consumption and 66.9% of the renewable energy final consumption. With this figure, this group of countries covered 2.7% of the final energy consumption and 21.8% of the renewable energy final consumption of the EU-27.

Graph No. 33: **Bioenergy consumption [Mtoe]**



Danube Region[118]:
Final energy consumption in 2010: 330.5 Mtoe; forecast to 2020: 352.5 Mtoe
Renewable energy consumption in 2010: 47 Mtoe; forecast to 2020: 72.8 Mtoe
EU-27:
Final energy consumption in 2010: 1,152.5 Mtoe; forecast to 2020:

According to the forecasts, an increase of 2.96 Mtoe is expected in bioheat consumption in this region by 2020 as compared to 2010. In bioelectricity an increase of 2.5 Mtoe is expected and in biofuel 4.71 Mtoe. Based on these estimates, the greatest increase is expected in biofuel consumption, which is supposed to more than double by 2020 according to the forecasts.

The total consumption of bioenergy in this group of countries is expected to become 41.62 Mtoe by 2020, which will amount to 11.8% of the final energy consumption and 57.2% of the renewable energy consumption. Thus the share of bioenergy is expected to increase by 2.3% within the final energy consumption; however it will probably decrease by 9.7% within the renewable energy consumption.

Compared to the aggregate expected values of the EU for 2020, the bioenergy consumption of the countries analysed is expected to make up 3.5% of the final energy consumption and 16.8% of the renewable energy consumption. Compared to the figures of the year 2010, these estimates would represent an increase by 0.8% within the final energy consumption and a decrease by 5% in the consumption of renewables.

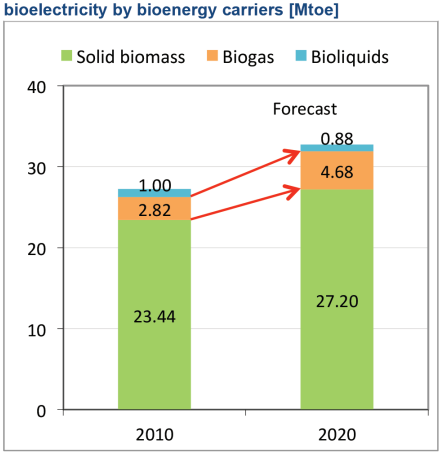
Bioheat and bioelectricity consumption

Graph No. 34 illustrates the combined consumption of bioheat and bioelectricity as per bioenergy carriers in the Danube Region[134].

The consumption of bioheat and bioelectricity together were responsible for 86.7% (27.26 Mtoe) of the total bioenergy consumption, which share will reduce to 78.7% (32.76 Mtoe) to 2020 based on the forecasts.

As evident from the graph, in the analysed countries the majority of the consumed heat and electricity in 2010 originated from solid biomass. It amounted to 23.44 Mtoe, which equalled to 86% of the total consumption. According to the forecasts this amount will increase to 27.2 Mtoe by 2020, which would mean a 16.2% growth. This growth would lead to solid biomass having an almost 83% share in the consumption of total bioheat and bioelectricity, thus in the total consumption it would still be the most significant source but with a slightly lower share than in 2010.

Graph No. 34: **Consumption of bioheat and bioelectricity by bioenergy carriers [Mtoe]**



In 2010 consumption of bioheat and bioelectricity produced from biogas amounted to 2.82 Mtoe, which represented a 10.3% share from the total consumption of total bioheat and bioelectricity. Based on the forecasts this share will increase to 14.3%, which would be a 4% growth in share that equals to 1.86 Mtoe in energy.

Bioliquids had a minor significance in the total consumption of bioheat and bioelectricity in 2010, with a share of 3.7%. The consumption amounted to 1 Mtoe in 2010 and a slight decrease is expected to be experienced by 2020 on the basis of the forecasts, which would result in a 0.88 Mtoe consumption of heat and electricity produced from bioliquids. With this reduction bioliquids would have a 2.7% share in the total consumption breakdown.

Aggregating the information above, solid biomass was the most intensively used type of biomass carrier in 2010, because of its availability and the easy convertibility to heat and electricity with the current technologies. Solid biomass is expected to keep its dominance in 2020 as well but with a slightly smaller share. According to the estimates we could experience a dynamic increase in biogas use until 2020 with a final share of 4% in bioheat and bioelectricity consumption. Bioliquids, primarily used in the transport sector had the smallest share in 2010 in bioheat and bioelectricity consumption and no change is expected in this pattern until 2020.

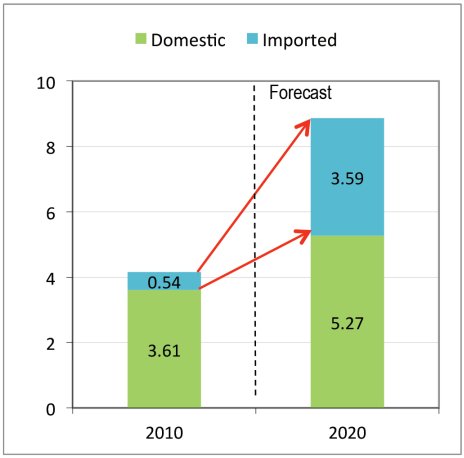
[134] In terms of bioheat and bioelectricity consumption in 2010 and in 2020, data are only available for 10 participant states of the EUSDR, namely: AT, BG, HR, CZ, DE, HU, RO, SRB, SI and SK.

Biofuel consumption

Graph No. 35 shows the values for energy consumption of biofuels in the above mentioned countries of the Danube Region[135] in 2010 and forecast for 2020.

The energy consumption is demonstrated in two main categories: domestic and imported biofuel. The total consumption amounted to 4.15 Mtoe in 2010, which comprised of 87% domestic and 13% imported biofuel. The total consumption is supposed to more than double by 2020 (8.86 Mtoe), from which 59.5% will be provided from domestic biofuel and up to 40.5% from imported biofuel.

Graph No. 35: **Energy consumption from biofuels [Mtoe]**



This means that the majority of the consumption is still expected to be covered by domestic biofuel but its proportion will drop dramatically as compared to 2010. As the figures indicate, the consumption of bioenergy produced from domestic biofuel will increase by 46% while the consumption of bioenergy from imported biofuel will increase by a significant 564.8% from 2010 by 2020. This expected dramatic change in the origin of consumed biofuels can be clearly seen on Graph 35.

[135] In terms of biofuel consumption in 2010 and in 2020, data are only available for 10 participant states of the EUSDR, namely: AT, BG, HR, CZ, DE, HU, RO, SRB, SI and SK

6 CONCLUSIONS & MAIN FINDINGS

GENERAL

- **There is lack of available biomass related data in the Danube Region**
  Fundamentally, it has to be stated that the lack of specific and unique biomass related data made it difficult to make appropriate conclusions for the Danube Region, especially because data were missing for the non-EU countries of the EUSDR in almost all studied cases. Data for the EU Member States of the Region were more accessible from internet sources and from the National Renewable Action Plans, but data were still missing in certain cases.
  Nevertheless a few conclusions and main findings can be made on the basis of the analyses of this study.

- **Biomass has the greatest significance among renewable energy sources in the Danube Region**
  According to the figures of section 4.2.1, energy derived from biomass & renewable wastes accounted for more than the half of the primary production of renewable energy in seven countries of the EUSDR[136] in 2005. As data for 2010 indicated these shares showed an increasing trend in the majority of the countries, therefore it can be concluded that the role of biomass & renewable waste is increasing in the Danube Region. By 2010 in eight member states of the EUSDR[137] the share of biomass & renewable wastes exceeded 50% of primary production of renewable energy, and fell short of it in only two Member States.

SOURCE OF BIOMASS

- **Forestry sector is the main biomass supplier and it is going to keep its dominance until 2020**
  Forestry provides the greatest amount of biomass source for the purpose of energy production. In 2010 forestry sector supplied 73.5% of the total amount of biomass that equalled to 20.03 Mtoe energy. Furthermore it is expected to maintain its dominance in 2020 as well, with 56.8% share in total biomass supply.

- **Significance of the agriculture and waste sector will increase rapidly to 2020**
  Biomass supply of the agriculture and the waste sectors is expected to more than double by 2020 compared to 2010 values.
  Biomass originating from agriculture equalled 6.20 Mtoe energy in 2010 and is expected to be nearly 2.5 times as high by 2020 (15.38 Mtoe). In 2010 this represented a 22.87% share in total supply that will grow by 7% by 2020.

  Waste sector derived biomass equalled to 1.04 Mtoe in 2010, which is going to almost triple by 2020 (2.96 Mtoe) according to the forecasts. This amount represented 3.8% share in total supply in 2010 and will represent 7% in 2020.
  The growth of the agriculture and the waste sectors in supply also implies that the importance of forestry will decrease.

[136] Austria, Bulgaria, Czech Republic, Hungary, Romania, Slovenia and Slovakia.
[137] Austria, Bulgaria, Czech Republic, Hungary, Romania, Slovenia, Slovakia and the State of Bavaria, (Germany).

- **Biomass supply is continuously increasing**

  Supply of the forestry, agriculture and waste sectors together is expected to increase the total supply of biomass by 55.9% by 2020. The amount of biomass supplied in 2010 was 27.27 Mtoe and will increase to 42.52 Mtoe by 2020 according to forecasts.

ENERGY PRODUCTION FROM BIOMASS

- **Bioenergy production is dominated by solid biomass**

  The majority of bioenergy is produced from solid biomass and biomass is mainly utilised to produce energy in the form of solid biomass among bioenergy carriers.

  o As the analysis of the study showed, the primary energy production from solid biomass of the individual countries of the EUSDR was proportionally around the European Union average in 2010. The Austrian, Czech, German , Romanian and Slovenian production even exceeded the EU average. The average production of the countries of the Danube Region altogether exceeded the European average as well.

  o In primary energy production from renewable municipal waste the countries of the EUSDR lagged behind the European average in 2010. Only Austria and Germany[141] were able to exceed the EU average.

  o In terms of primary energy production from biogas, the countries of the Region lagged behind as well in 2010. In that case only Germany[141] produced more primary energy than the EU average.

  o Fuel ethanol production of the countries of the EUSDR was remarkable in 2010. 4 out of 6 countries analysed produced well above the EU average.

- **The Danube Region has remarkable producers in all areas**

  In all of the studied cases of primary energy production from bioenergy carriers, there was at least one state from the EUSDR, which significantly exceeded the European Union average production. This means that the Region has great expertise, knowledge and experience in all sorts of bioenergy productions, from which the Region can benefit, e.g. advanced countries could help to improve less developed ones through joint projects and knowledge sharing.

ENERGY CONSUMPTION FROM BIOMASS

- **The majority of consumed energy is derived from solid biomass and no change is expected until 2020**

  Most of the energy from biomass consumed in the Region is derived from solid biomass. Biogas and bioliquids as the other two main types of bioenergy carriers have limited relevance as compared to solid biomass.

  In 2010 the breakdown of the consumption of bioheat and bioelectricity together by bioenergy carriers comprised 86% of solid biomass, 10.3% of biogas and 3.7% of bioliquids. By 2020 the biggest growth in consumption is expected in energy produced from biogas (66% increment). The shares of bioenergy carriers in energy consumption in 2020 are going to be the following: 83% solid biomass, 14.3% biogas and 2.7% bioliquids.

[138] It is important to note that only Baden-Württemberg and Bavaria are covered by the EUSDR.
[139] In terms of primary energy production from solid biomass in 2010, data are only available for eight EU MS of the EUSDR, namely: AT, BG, CZ, HU, RO, SI, SK.
[140] In terms of primary energy production from renewable municipal waste in 2010, data are only available for five EU MS of the EUSDR, namely: AT, CZ, HU, SI and SK.
[141] In terms of primary energy production from biogas in 2010, data are only available for six EU MS of the EUSDR, namely: AT, CZ, HU, RO, SI and SK.
[142] In terms of fuel ethanol production in 2010, data are only available for six EU MS of the EUSDR, namely: AT, BG, CZ, HU, RO, SK.

- **Most bioenergy is consumed in the form of heat and no change is expected to 2020**
  In 2010 75.39% of bioenergy was consumed in the form of heat, 13.2% in the form of biofuels and 11.41% in the form of electricity. Biofuel consumption is expected to more than double by 2020, while bioelectricity consumption will increase by 69.6% and bioheat only by 12.5%. Therefore the bioenergy consumption mix is expected to comprise 64.08% heat, 21.29% biofuels and 14.63% electricity in 2020.

- **The share of bioenergy in energy consumption of renewable sources in the Danube Region will decrease by 2020**
  Bioenergy had a share of 66.9% in energy consumption of renewable sources in the Region in 2010, which is expected to shrink by 16.8% and have a share of 57.2% in consumption of renewable energy in 2020.

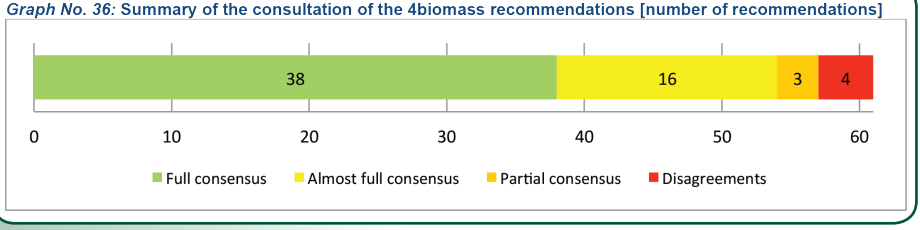
- **Import of biofuels will increase dramatically**
  Consumption of biofuels amounted to 4.15 Mtoe in 2010, which comprised 87% domestic and 13% imported biofuels. By 2020 the consumption will increase to 8.86 Mtoe, which will comprise 59.5% domestic and 40.5% imported biofuels according to forecasts, which means that long distance transportation will increase as well, therefore road transports should be limited and preferably the more environmentally friendly railway and waterway transports should be used.

7 RECOMMENDATIONS

7.1 Recommendations by the 4biomass project

At the beginning of the compilation of the Danube Region Biomass Action Plan a consultation had been launched on the recommendation package elaborated by the partners of the 4biomass project. The member states of the Danube Region Strategy had been asked to express their views about all of the 61 4biomass recommendations whether they agree or not. The consultation resulted in 38 recommendations with full consensus and 16 recommendations with almost full consensus (disagreement by only one or two member states).

Graph No. 36: Summary of the consultation of the 4biomass recommendations [number of recommendations]



The rates above indicate that the member states of the EUSDR could formulate a uniform opinion regarding the use of biomass in most cases. See all the recommendations in groups below.

7.1.1 Full consensus

All participants of the EUSDR agreed to the following recommendations.

General recommendations

- **Adjust instruments and measures for promotion of renewable energy to nature protection and biodiversity strategies. All laws and financial incentives should be in accordance with sustainability and biodiversity strategies in each country to prevent further habitats and species losses.**
- **Secure planning reliability and the right of continuance of support measures for an acknowledged time, sudden changes undermine investors' confidence.**
- **Extend and adapt statistic systems to the changed conditions in the energy market with respect to bioenergy. Collect appropriate data at all stages of the value chain to support bioenergy development.**
- **Develop extensive land use concepts for multi-functional biomass use, e.g. sustainable agro-forestry systems like e.g. short rotation coppice (SRC) and thereby combine food production, drinking water recovery, husbandry, bioenergy production, nature protection and public recreation in one region.**

Overcoming existing barriers

- **Clearly define the domestic biomass/RES potential in all partner countries. Regularly updated inventories on bioenergy potential are needed for all EU Member States (and for all countries of the EUSDR).**

- **Facilitate investments by adjusting (and possibly reducing) unrelated or obsolete legal and technical regulations.**
- **Support investments where it is reasonable and responsible to reduce long return costs.**
- **Monitor the effects of subsidies for products and technologies to avoid undesirable developments and adjust support instruments.**
- **Reduce lead times for licence procedures for investing in bioenergy production by lowering bureaucratic hurdles.**

Flanking measures

- **Make policy planning transparent, consult stakeholders, inform the public early enough, and establish an open dialogue on aims and developments.**
- **Introduce and support specialised curricula in universities for research on and teaching of bioenergy development and deployment.**
- **Establish and support agencies and institutes for dissemination of information and knowledge on bioenergy issues.**
- **Support market introduction of innovative technologies to place innovative products on the market.**
- **Support consumer consulting services to enhance consciousness of energy efficiency and energy conservation.**
- **Provide information and advice for forest and agricultural enterprises on bioenergy production, utilisation and marketing.**
- **Encourage bioenergy partnerships between foresters/forest owners or farmers and communities/ public services.**
- **Communicate the public benefit of the investment to the inhabitants living in the surrounding area and enable local participation.**
- **Support innovative social movements for energy self-sufficiency with renewable sources. For example, a number of bioenergy villages and regions and energy cooperatives have decentralised their energy supply.**

Sectoral recommendations

Biomass production from forestry and agriculture, biogenic waste

- **No biomass production on land with high carbon stock, such as primary forests, wetlands, peat land and nature protected areas.**
- **Prefer biogenic waste for energy production, use biomass residues from food and fodder production and material use.**
- **Bioenergy production plants should be properly sited and scaled to avoid unfavourable impacts on citizens and to minimise GHG emissions.**

Biomass for heating and cooling

- **Biomass is a limited source that should be used as efficiently and economically as possible. National, regional and local governments should stimulate the heat and cold production from locally available biomass, if possible in cogeneration with electricity based on biomass supplies from areas within a radius not exceeding a stipulated number of kilometres. This can be an alternative to promoting large scale electricity production which requires supplies from remote areas.**
- **Continuously promote energy efficient bioenergy technologies and require fast socially acceptable and economically viable deployment.**
  Introduce incentives for consumers to replace inefficient technology.
- **Use existing district heating grids for transport of bioheat (and cooling) within local and regional areas.**
  Accelerate construction of new heating and cooling systems in the context of integrated urban planning.

Biomass for electricity

- **Use biomass for electricity production preferably in cogeneration with heat use.**
- **Use the surplus of produced heat in other industrial processes to save energy and sources.**

Biomass for transport fuels

- **Use agricultural plants like rapeseed for biodiesel, and maize, wheat and beets for bioethanol (so-called first generation fuels) for the production of transport fuels only in amounts which do not cause competition with food and fodder production.**
- **Assess the possible advantages for the development of Biomass-to-Liquid Biofuels (BtL, second generation fuels) for your country.**
- **Assess the possible advantages for the development of Waste-to-Liquid Biofuels (WtL, third generation fuels).**

Special case biogas – for heating and cooling, electricity and transport fuels

- **Mobilize primarily residues and wastes for biogas production.**
- **Material flows should be canalised by communal and regional actors, land-filling and incineration should be reduced or even avoided, cascading utilisation enables holistic exploitation.**
- **Be aware of promoting biogas production from annual agricultural crops.**
- **Consider possible negative impacts of biogas plants in the surrounding area and nearby settlements in integrated spatial planning.**
- **Incorporate sustainability requirements into permit and authorisation procedures for construction of biogas plants issued by local or regional authorities.**
- **Support electricity from biogas primarily in combination with heat.**

- **Promote upgrading biogas to biomethane and regulate its legal integration into the natural gas grid.**

Transport of biomass

- **Optimize biomass logistics to reduce CO_2 emissions.**
- **If medium and long distance biomass transports cannot be avoided, concentrate on railway networks and waterway transport.**

7.1.2 Almost full consensus

With the following recommendations only one or two participating states of the EUSDR disagreed.

General recommendations

- **Ambitiously convert the national energy system from fossil fuels to available domestic renewable sources ensuring that they are socially acceptable – step by step.**
  Only Hungary disagreed with the following comment: "According to the National Energy Strategy 2030 the nuclear energy and coal firing with CCS technology plays an important role in the national energy mix."
- **Harmonize all laws and ordinances with involved ministries and authorities to avoid unclear and inconsistent legislation and promotion, regularly amend them in defined time intervals on the basis of periodical monitoring. Clearly define and relate legal acts, adjust the often numerous and confusing prescriptions.**
  Slovakia disagreed with this recommendation.
- **Initiate integrated spatial planning and energy planning, coordinate them on all administrative levels.**
  Hungary disagreed with the following comment: "It is not in every case necessary. Too many coordination could lead to bureaucratic barriers."
  Slovakia disagreed as well.
- **Give subsidies only to environmentally sound proposals with high GHG emission reduction potential and significant energy efficiency and energy conservation rates.**
  Austria disagreed with the following comment: "This could be a hurdle too high to overcome. It would also make sense to support certain projects which conserve energy and do not reduce GHG emissions significantly."
  Serbia disagreed too with the comment: "In bioenergy technologies which constantly advance „the high GHG emission reduction" and „significant" energy efficiency rates are not constant values and could cause confusions, discourage investors and stop investments in green energy. We also agree with the comment made by the representatives from Austria: „This could be a hurdle too high to overcome. It would also make sense to support certain projects which conserve energy and do not reduce GHG emissions significantly."."

Overcoming existing barriers

- **Phase out subsidies for fossil fuels and nuclear power because they are a large obstacle to fast biomass/RES production and use.**
  Hungary disagreed with the following comment: "According to the National Energy Strategy 2030 the nuclear energy plays an important role in the national energy mix."
  Ukraine disagreed as well with the following comment: "The issue needs regulation according to perspectives of using mentioned resources in energy balances of the countries.
  We support biotypes of fuel development and increasing of their part in energy balance of the country. Particularly, according to the draft National Renewable Energy Action Plan till 2020 it is foreseen that the volume of energy produced from biomass will make 6.3 million toe (electricity – 2.3 million toe and heat – 4.0 million toe)."

Flanking measures

- **Create incentives or require obligations for biomass/RES in newly constructed public buildings as showcases for the public.**
  The Czech Republic abstained with the following comment: "Public buildings should set an example. Incentives could be developed but we do not support setting obligations for public bodies."
  Serbia disagreed with the following comment: "Introduction of biomass/RES in a newly constructed building is desirable, but could not be set as obligation. Incentives for public object are inadmissible. Public buildings should promote biomass efficiency utilization as a good practice example."

Sectoral recommendations

Biomass production from forestry and agriculture, biogenic waste

- **Encourage legally binding sustainability requirements to include solid and gaseous biomass for the whole supply chain and secure their certification.**
  Bavaria (Germany) disagreed with the following comment: "Only for imported biomass."
  Slovakia disagreed as well.

- **Introduce incentives for environmentally sound cropping systems.**
  Bavaria (Germany) abstained with the following comment: "Sometimes."

- **Increase cultivation of energy plants and short rotation crop plantations with regard to landscape. This can prevent air, climate and drinking water pollution and soil deterioration.**
  Ukraine disagreed with the following comment: "Drinking water, soil and air pollution, climate changes may be prevented by the planting of perennial plants.
  Usage of energy cultures potential, particularly perennial plants for energy production is an important issue for Ukraine.
  Together with this, we think that these crops should be grown at the soils that are not applicable for growing the food crops and with obligatory eligibility to biomass sustainability criteria."

- **Promote breeding of new, site-adapted plants for energy use.**
  Ukraine disagreed with the following comment: "With the population raising on the first place steps the question of its providing by food. Thus the alternative of planting energy plants becomes in particular production of synthetic types of fuel.
  The biggest potential in Ukraine for biomass production belongs to agricultural wastes; their management (recycling) is a priority for biofuel production."
  Hungary disagreed as well.

- **Mobilise unused and redundant wood and agricultural potential as raw material.**
  Ukraine disagreed with the following comment: "For raw materials we propose to use firstly forestry and agricultural waste, not unused and redundant wood.
  As a raw material for biofuel production first of all must be use the waste of wood cutting and milling (technically achievable heat-energy potential of wood cutting and milling, for example, in 2011 was 1,303.8 thousand toe)."

- **Mobilise new biomass sources, e.g. planting energy crops on degraded land (contaminated by former industrial or military impacts) and set-aside land, for energy plantations.**
  Document these degraded areas in land registers.
  Baden-Württemberg (Germany) disagreed with the second sentence of the recommendation.

Biomass for electricity

- **Wood pellets and briquettes should be primarily deployed as fuel in small- and medium-scale units because of their relatively high energy density and favourable storage and transport conditions.**
  Serbia disagreed with the following comment: "This restriction is unnecessary; it is up to investors to estimate which is the optimal capacity of plant."

Biomass for transport fuels

- **Because GHG emission reductions achieved through the use of biofuels for transport are rather modest, other solutions should be considered and their development accelerated to achieve the EU 2020 target of 10 per cent RES share in transport.**
  Hungary disagreed with the following comment: "The Hungarian bioethanol has a suitable GHG emission reduction value. The reach of the 2020 target is achievable through using first generation biofuels."
  Ukraine disagreed too with the following comment: "Draft National Renewable Energy Action Plan foresees achieving 10% of energy, produced from RES, in total energy consumption in transport sector (particularly by the means of bioethanol) till 2020."

Special case biogas- for heating and cooling, electricity and transport fuels

- **Use biomethane as storage and as an energy reserve for fluctuating renewable energy from wind and solar installations.**
  Slovakia and Moldova disagreed with this recommendation.

Transport of biomass

- **Deploy biomass as far as possible on decentralised plants which can be provided with input material from the surrounding area.**
  Thus, first satisfy the local needs, particularly for heating purposes in rural areas, and trade only the surplus.
  Baden-Württemberg (Germany) disagreed.

7.1.3 Partial consensus

11 to 12 members of the EUSDR agreed to the following recommendations.

Overcoming existing barriers

- **Gradually reduce co-firing of coal with biomass with the aim to phase out coal entirely.**
  Croatia abstained from the following comment: "Energy mix composition cannot be imposed as it is the competence of each MS to decide upon it."
  The Czech Republic abstained as well from the following comment: "Increased energy use of waste is envisaged to compensate for depleting reserves of coal."
  Hungary disagreed with the following comment: "According to the National Energy Strategy 2030 the coal firing plays an important role in the national energy mix."
  Moldova disagreed too.

Sectoral recommendations

Biomass production from forestry and agriculture, biogenic waste

- **Abandon conversion of permanent grassland.**
  Slovakia and Moldova disagreed with this recommendation.
  Serbia abstained with the following comment: "Recommendations is not clearly defined."

Biomass for heating and cooling

- **Give heat production the same support as electricity generation. Support should be given to energy production from biomass on the basis of net GHG emission reductions. Introduce feed-in tariffs or green certificates for heat.**
  Croatia, Baden-Württemberg (Germany) and Hungary disagreed with this recommendation.
  Austria agreed to and disagreed with it at the same time and commented the following: "Feed-in tariffs could be the wrong incentive for heat production. Investment-subsidies have shown to be the better option for heat production."
  Comment of Croatia: "Except for other specified economic instruments (e.g. investment subsidy) that should be considered."
  Comment of Hungary: "The market for heat production differs radically from the market for electricity generation, so the support schemes should be also specified."

7.1.4 Disagreements

The following recommendations resulted in disagreements among the participating states of the EUSDR which means that 5 or more countries disagreed with these specific recommendations.

General recommendations

- **Strive to achieve a new energy mix that reduces fossil and nuclear fuels as much as possible. Promote the enhancement of biomass production for energy, and trade and utilise it in a sustainable way, i.e. without endangering food/fodder production and material use.**
  The Czech Republic, Hungary, Slovakia and Ukraine disagreed. Croatia abstained.
  Comment of Croatia: "Energy mix composition cannot be imposed as it is the competence of each MS to decide upon it."
  Comment of the Czech Republic: "Nuclear energy is the most safe and clean. Yes to space for biofuels of 2nd and 3rd generations."
  Comment of Hungary: "According to the National Energy Strategy 2030 the nuclear energy and coal firing with CCS technology plays an important role in the national energy mix."

Comment of Slovakia: "Nuclear energy is important."
Comment of Ukraine: "Issue needs regulation according to concrete potential of RES in the country."

Overcoming existing barriers

- **Abandon plans for construction of new coal and nuclear plants because their construction will require considerable financial expenditures that are not available for an increase of bioenergy/RES.**

Bulgaria, Czech Republic, Baden-Württemberg (Germany), Bavaria (Germany), Hungary, Slovakia, Montenegro, Serbia and Ukraine disagreed with this. Croatia abstained.
Comment of Croatia: "Energy mix composition cannot be imposed as it is the competence of each MS to decide upon it."
Comment of the Czech Republic: "Nuclear energy is the most safe and clean. Yes to space for biofuels of 2nd and 3rd generations."
Comment of Baden-Württemberg (Germany): "Coal plants could be necessary."
Comment of Bavaria (Germany): "Nuclear plants yes."
Comment of Hungary: "According to the National Energy Strategy 2030 the nuclear energy and the coal firing plays an important role in the national energy mix."
Comment of Montenegro: "Constructing of cogeneration plants on coal should not be forbidden."
Comment of Ukraine: "The issue needs regulation according to concrete potential of RES in the country."

Sectoral recommendations

Biomass for heating and cooling

- **Withdraw support for co-firing biomass with fossil fuels.**

Bulgaria, Baden-Württemberg (Germany), Hungary and Slovakia disagreed with this specific recommendation. Austria agreed to and disagreed with it at the same time, Bavaria (Germany) and the Czech Republic abstained.
Comment of Austria: "In certain cases co-firing can be a useful technology."
Comment of the Czech Republic: "According to the new Promoted Energy Sources Act in case of electricity generated in combination from a renewable source and a non-renewable source, unless it concerns the high-efficient combined generation of electricity and heat, the promotion of electricity shall remain, under the existing law, until 31 December 2015."
Comment of Baden-Württemberg (Germany): "There could be reasons for co-firing like biomethane with natural gas."
Comment of Bavaria (Germany): "No support in Bavaria and Germany."

Biomass for electricity

- **Abolish financial support for electricity production from forest wood.**

Baden-Württemberg (Germany), Bavaria (Germany), and Hungary disagreed.
Comment of Hungary: "If the raw material originated from sustainable sources, its use could be financially supported."
Austria agreed to and disagreed with it at the same time and commented the following: "Electricity production can be useful if it is cogeneration."
The Czech Republic abstained from the following comment: "N/A. Do not know any case of such support in small or at industry level."

7.2 Recommendations of the countries of the Danube Region Strategy

- **First of all a statement was formulated in a form of a Joint Declaration that was adopted by the countries of the Danube Region Strategy on the occasion of the 6th Steering Group Meeting of the Priority Area 2, in Budapest on 13 June 2013 and which can be summarised as follows: "Biomass is generally produced in a sustainable manner in the EU; therefore there is no need for further binding sustainability criteria on European level for biomass originating from the Member-States. New EU-wide obligatory sustainability criteria would unavoidably create additional administration and costs especially for the EU producers, without any additional benefit for the environment, thus creating market distortion and disadvantage in competition for the producers of the Member States. Moreover, a new and less detailed EU biomass sustainability criteria system would possibly devalue and erode the existing well developed and widely accepted national criteria, indicator and monitoring systems. Based on all the above, the countries of the Danube Region Strategy (DRS) do not see an urgent need to develop additional sustainability criteria for solid biomass on EU level."**

In the second phase of the compilation of the Danube Region Biomass Action Plan a data request sheet was elaborated for the purpose of asking the views and recommendations of the countries of the EUSDR regarding biomass use. These recommendations are summarized below.

7.2.1 General recommendations

- **Bulgarian recommendations**
  - Promote the introduction of innovative and effective technologies for combustion of biomass.
- **Czech recommendations**
  - Prefer the use of residual agricultural biomass (like residual straw, grains, husks, livestock manure) in the local municipal sector and support local powers with a focus on a balanced budget and the local production and consumption of energy.
  - Promote local energy and thus relieve the negative trend in the export of biomass.
  - Use the planned new EU Common Agricultural Policy to the setting that will further develop the production and use of biomass for energy purpose.
  - Support the growth of energy plants.
  - Support the overall flow of biomass energy, from farmers producing raw material through producers of the energy to end users.
- **Hungarian recommendations**
  - Create regional sustainability assessments and coordinated development concepts and strategies. Set targets and plans in the local and regional strategies and action plans. The local concepts should be based on local potentials and energy needs. Manage biomass use at local level too.
  - Base programs on each other. For example: a power plant construction can be the basis of new energy plantations. Or a wood chips plant project could help the establishment of new local small boilers in the residential sector.
  - Develop the support mechanism for the sustainable production of heat from biomass.
  - Promote existing heating system enhancements, establishment of new heating systems and small-scale cogeneration. Use agricultural by-products and the wood chips for energy purposes which are not suitable for industrial use. Promote energy plantations in case of large projects.

- Prefer direct combustion of biomass only when it could not be used in a more efficient way. Primarily agricultural by-products and waste should be used for direct combustion in accordance with the waste hierarchy. Whenever direct combustion takes place it should be done in a sustainable manner, taking environmental aspects into account and the incineration could only be carried out under strict and proper control (such as technology standards, compliance with product requirements etc.)

- **Montenegrin recommendations**
  - Use wood residues from forestry management for energy production.
  - Use wood residues from industry for energy purposes, e.g. produce pellets.
  - Switch the type of heating fuel in public buildings (such as schools) to use the locally produced biomass and to prevent the exportation of these valuable wood residues.

- **Moldovan recommendations**
  - Improve the monitoring and statistical registering of available biomass. Develop and approve a feasible methodology to be able to assess the potential of biomass.
  - Elaborate normative framework and develop institutional capacities.

- **Serbian recommendations**
  - Respect priority in hierarchy of biomass use as well as principles of biomass sustainability use
  - Replace heating oil, coal and natural gas used for heating with biomass
  - Introduce biofuels in the public transport sector

- **Ukrainian recommendations**
  - Promote the production of biogas from waste waters, polygons, solid wastes, domestic animal and poultry manure
  - Support the use of products (such as pellets, briquettes, granules) made from agricultural and forestry wasted for heating public sector facilities, administrative buildings, schools and hospitals in rural areas

7.2.2 Flanking measures

- **Bulgarian recommendations**
  - Raise awareness of agriculture producers and SME's to the benefits of the utilization of production wastes
  - Start suitable educational programmes

- **Hungarian recommendations**
  - Require the regional planning of the sustainable biomass husbanding.

- **Moldovan recommendations**
  - Develop normative framework
  - Develop institutional capacities

7.2.3 Biomass production from forestry and agriculture, biogenic waste

- **Bulgarian recommendations**
  - Develop the biomass market from forestry and agriculture
  - Optimize the sustainable forest management to exploit the potential of increasing the utilization of biomass in the forestry sector. There are opportunities to utilize wood from forestry residues from logging.
  - Utilize the energy potential of waste (as a result of economic activities)
  - Develop the infrastructure to allow the usage of different types of biomass

- **Czech recommendations**
  - Condition area agricultural subsidies in the future that will be the case for crops grown on arable land effectively used the by-products, i.e. cereals and oilseeds straw and crop residues after cleaning, a certain % for energy purposes.
  - Use agricultural biomass residues in the local municipal sector, such as residual straw, grains, husks or livestock manure
  - Support the establishment of fast-growing tree plantations in flood areas of rivers or in polders.
  - Recommend the Czech Statistical Office to repeat the statistical survey of dendromass combustion in households in the Czech Republic according to its origin (survey Energy).

- **Hungarian recommendations**
  - Establish comprehensive strategies to prevent timber theft and illegal logging to protect sustainability. The strategies should address the significant poverty which causes thefts and illegal logging.
  - Harvest and utilize the flood plain indigos (invasive plants) which raw material could ground the development of local programmes. By the removal of the invasive plants native cultures could be planted.
  - Harmonize agricultural support programs, renewable energy programs and development funds.
  - Start activities related to energy plantations with public work programs which could create permanent and sustainable jobs.
  - Commercialize, enhance cooperation and coordination between national programs of the Danube Region regarding coppice systems.

    The genetic properties of commercial plant material are one of the most important factors influencing the economic as well as environmental performance of short rotation coppice (SRC) plantations. Traits like growth pattern, resistance to and tolerance of diseases and frost, water and nutrient efficiency, etc. are all key parameters for the competitiveness of the production system. Compared to e.g. agricultural crops and conventional forestry plantations, coppice systems are relatively new and have a short history of genetic improvement. At this early phase of commercialization, enhancing cooperation and coordination between national programs of the Danube Region is thus of vital importance.

    Cooperation possibility: clonal test and variety selection test with regard to the need for cooperation in the field of clonal test to spread the results of breeding activities to benefit of both growers and users the exchanges of genetic material for experimental and commercial purposes is to be encouraged.

- **Moldovan recommendations**
  - Introduce fiscal and financial incentives to promote biomass use. Fiscal incentives should refer to stimulate the import of efficient equipment for producing briquettes and pellets. Also a fiscal vacation for 1-2 years in the beginning of the producers' activity will significantly stimulate the production of solid biomass fuel in Moldova. Financial incentives should refer to the financial products available for procurement of relevant equipment.
  - Develop actions to control the disposal of agricultural and forestry residues and put them into action. No main agriculture or forestry activities should be licenced if no waste disposal plan/ contracts are available.
  - Establish a separate activity in the register of entrepreneurial activities for the production of biomass fuels

- **Serbian recommendations**
  - Develop sustainable production of biomass, biogas and biofuels by means of highly efficient technologies and ensuring financial support for such development

- **Ukrainian recommendations**
  - Use boilers on biofuels in the budget and in the industrial sector

7.2.4 Biomass for heating and cooling

- **Bulgarian recommendations**
  - Promote the introduction of innovative and effective technologies for combustion of biomass
  - Facilitate the access to finance small-scale installations
  - Make information accessible about support schemes
  - Establish a scheme to support the production of heat from renewable energy sources in residential and public buildings

- **Czech recommendations**
  - Support the preferential use of biomass for combined heat and power generation, with the highest proportion of heat energy and thus achieve high efficiency of energy conversion of biomass (at least 60-70%).
  - Set the current policies to encourage investors to greater energy efficiency.
  - Allow local and regional biomass (straw, dry grass, etc.) for the production of pellets and briquettes and their primary household use.

- **Hungarian recommendations**
  - Create consistency between the cost-based and the value-based pricing, because the price of biomass matches to the international stock exchange oil prices which are particularly typical in case of ESCOs. It is not cost-based. The shift to renewable energies does not reduce global risks which could cause the collapse of operating projects and non-realizations.
  - Create innovative financial mechanisms to reduce energy poverty, which is a problem at residential and institutional level as well. Lack of capital and weak financial competence characteristics.

- **Moldovan recommendations**
  - Introduce fiscal and financial incentives for local producers/assemblers of biomass heating solutions. Fiscal incentives should refer to stimulating the local market for assembling/ production of biomass heating solutions. The efficiency of boilers should be the key element in incentivizing this market.

- **Montenegrin recommendations**
  - Establish financial support for the installation of better isolation of buildings. In Montenegro only 13% of the households which are using solid fuel in 2011 have possessed the thermo-isolation of their buildings.
  - Introduce financial schemes for the thermal usage of biomass. Biogas energy plants would be much more economical if they could additionally sell the thermal part of their energy production.

- **Ukrainian recommendations**
  - Use waste primarily. Use forestry waste and agricultural residues for heating.
  - Use peat for heating in rural areas

7.2.5 Biomass for electricity

- **Bulgarian recommendations**
  - Simplify procedures for connection to the distribution grid of small electricity producers. Producers which will consume the RES energy produced for own needs by themselves.
  - Lay down rules relating to guarantees of origin (of renewable energy).

- **Czech recommendations**
  - Enable the development of local energy and mitigate the negative trend in overseas export of biomass and the associated risks.
  - Prepare analysis of the abuse of the aid and misreporting the type and quantity of biomass in electricity generation from biomass, which is supported under law 165/2012 Sb.
  - Focus on control activities of State Energy Inspection primarily to control the support of renewable energy sources.
  - Regularly monitor the market price of biomass in order to prevent their escalation and potential adverse impacts on final energy prices for end consumers.

- **Hungarian recommendations**
  - Require high-efficiency in biomass cogeneration plants.

- **Montenegrin recommendations**
  - Establish support scheme for capacity building and planning for electricity production from biomass. Currently there is no application in Montenegro for the usage of biomass for producing electricity.

- **Ukrainian recommendations**
  - Use primarily landfills biogas and sewage, animal waste, water waste and waste from agricultural production for electricity production.
  - Introduce industrial systems for collecting and for the utilisation of biogas.

7.2.6 Biomass for transport fuels

- **Bulgarian recommendations**
  - Promote the development, production and consumption of new generation biofuels.
  - Support new technologies for production of new generation biofuels.
  - Introduce effective systems for sustainability criteria of biofuels.
  - Exchange experiences and best practices with developed countries in area of new generation.

- **Czech recommendations**
  - Maintain the current system of „quotas".
  - Allow setting the appropriate conditions, the use of biogas as a motor fuel for vehicles at the same time contribute to the fulfilment of the obligation for renewable energy in transport.
  - Establish monitoring for verification of implementing the sustainability criteria laid down in Directive 2009/28/EC of the „biofuels" for transport.

- **Hungarian recommendations**
  - Introduce concession tenders for biofuel certification labs and support financially development labs.
  - Support transport companies, if a sufficiently large proportion of biofuels used. Coordinate this action internationally.

7.2.7 Improve cooperation between the countries of the Danube Region Strategy

- **Bulgarian recommendations**
  - Exchange experience and good practices
  - Use cooperation mechanisms under RED Directive
  - Increase R&D cooperation

7.2.8 Extend the sustainable use of biomass

- **Bulgarian recommendations**
  - Strengthen the links between research organisations and businesses in the frame of the Danube region
  - Develop links between municipalities
  - Improve administrative services and business environment

- **Czech recommendations**
  - Rural Development Programme 2014-2020
    Suitable measures to promote the development of local biomass, implement investment measures for the construction of facilities for the production of pellets and heating plants.
  - EU Common Agricultural Policy
    Cultivate multiannual crops for energy purposes and fodder crops in the „eco-regions". Set subsidies for permanent grasslands.

- **Bavaria (Germany)**
  - Develop certification systems.

- **Hungarian recommendations**
  - Increase RDI cooperation in the Danube Region.

- **Montenegrin recommendations**
  - Establish feed-in tariff for thermal biomass.
- **Moldovan recommendations**
  - Extend the „Energy and Biomass project".
- **Ukrainian recommendations**
  - Ensure the performance of indicators set out in the National Action Plan for Renewable Energy concerning the use of biomass.

7.3 Recommendations of the authors of the DRBAP

- **If medium and long distance biomass transports cannot be avoided, concentrate on railway networks and waterway transport** (as also recommended by the partners of the 4biomass project).

  In the case of the Danube Region the Danube is a great opportunity to implement this recommendation. The increased use of the Danube as a transport route (in line with the European transport policies) would be more efficient and could reduce CO2 emissions compared to road transportation, but appropriate measures would be needed e.g. to improve logistics and navigation, assure sufficient depth or promote new biomass projects to be built in the vicinity of the Danube.

  The countries of the EUSDR had been asked to express their views on the use of the Danube as a transport route:
  - Opinion of Bulgaria: "Reallocate road freight to a more environmentally friendly waterway, in line with European transport policy. The use of the Danube as a transport route would create favourable conditions for the acceleration of the economic growth in the Region. Utilize sufficiently the capacity of the Danube River for domestic and international transport and optimize navigation conditions. Measures must be taken for improving navigation and for assuring a minimum depth of 2.5 meters."
  - Opinion of Bavaria: "It is a cheap method for long distance transport, and the best connection to countries in south east of Europe."
  - Opinion of Hungary: "In the disposal of municipal waste the Danube could play an important role. "Relevant here are the options of biomass for transport, especially the disposal of municipal waste can be of great importance in the Danube. Waste - processing central plants with pyrolysis and the produced fuel (bio-oil) for the return to the city-zone of the important options."

- **Develop uniform statistical database (and/or develop current ones) in all member states of the EUSDR (or even in all EU Member States) regarding biomass.**

  As experienced during the compilation of the DRBAP, statistical data regarding biomass were not easily accessible (i.e. different organizations had different biomass data) therefore it was not possible to collect all required data from these various sources or even data were not available at the time of the collection.

  The partners of the 4biomass project also recommended such actions:
  - Extend and adapt statistic systems to the changed conditions in the energy market with respect to bioenergy. Collect appropriate data at all stages of the value chain to support bioenergy development.

- Clearly define the domestic biomass/RES potential in all partner countries. Regularly updated inventories on bioenergy potential are needed for all EU Member States.

To the above recommendations all of the participating states of the Danube Region Strategy have agreed. Austria also has given a comment for the first one, as follows: *"Especially difficult to collect data concerning the utilization of bioenergy in the heat market. For this topic, international projects to align the methods are recommended."*

Further recommendations of the authors of the DRBAP regarding this topic:

- Collect data on a yearly basis
- Use the same method for collecting and summarizing data in each country
- Store the collected data in one "hand" i.e. one organization in each country should be responsible for the storage of data. Regional database should be considered as well; store data in one "hand"/online database in the Region.
- Types of data that should be collected:
  - Current potential, resources by supply sectors (forestry; agriculture; waste)
  - Production of solid biofuels for energy purposes (e.g. pellets; briquettes)
  - Production of energy by supply sectors, by bioenergy carriers, by utilization plants/devices; by final energy sectors
    (Supply sectors: forestry; agriculture & fisheries; waste → Bioenergy carriers: solid biomass; biogas; bioliquids → Utilization devices: heat plants; electricity plants; CHP plants; small-scale boilers → Final energy sectors: primary energy; heating/cooling; electricity; biofuels)
  - Consumption of energy by bioenergy carriers, by final energy sectors and by consumer sectors (Bioenergy carriers: solid biomass; biogas; bioliquids → Final energy sectors: gross final consumption; heating/cooling; electricity; biofuels → Consumer sectors: transport; industry; residential)
  - Transportation of biomass (typical distances between production plants and the source of feedstock/the place of final energy consumption; types of transportation – roadways; railways; waterways)
  - Exports and imports

- **Implement international biomass related projects.**

A new Danube Region Transnational Programme[143] is expected to be established in the future by the European Union. Countries of the EUSDR should apply for grants from this programme to implement international projects, such as:

- Elaboration of a data collecting method and establishment of uniform databases (national or regional).
  It would facilitate future assessments and analyses of the countries of the EUSDR.
- Implementation of the actions elaborated by the DRBAP step-by-step.
  It would improve cooperation and extension of the sustainable use of biomass in the Region.
- Continue the assessment of the participating states of the EUSDR and the further development of the Danube Biomass Action Plan.
  It would help to explore possible ways of how to create synergies and coordination between policies and how to synchronize support schemes.

[143] COM(2013) 468 final, p.9 - New (Danube and South-East Gateway) and existing transnational programmes

- Help the catching up of the less advanced countries of the EUSDR.
  - Share and transfer knowledge on regional level – e.g. best practices; knowledge and experiences regarding successful support schemes; construction of biomass plants; energy plantation; harvesting; feed-in system; bioenergy policies etc.
  - Support financially the less advanced countries, e.g. establish a regional fund
- The range of possible international projects are endless, it only depends on the actual goals of the Region.

- **Continue collecting best practices from the Region and continue developing the online project inventory.**

  In the frame of the Danube Region Biomass Action Plan an online project inventory (www.danubebiomass.eu) has been developed, which includes sustainable projects that can be considered as good examples from the Region.

  The current projects that have been already uploaded to the database could be upgraded with further details and the database could be continuously extended with new projects as well.
  - Return on investment calculations could be uploaded
  - A new sub-page could be developed which would contain experiences learnt from projects and suggestions for new projects.

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9 GLOSSARY

The most important terms used in this document regarding biomass:

Term	Definition
Ancillary services[144]	All services necessary for the operation of a transmission or distribution system.
Biodiesel[145]	A methyl-ester produced from vegetable or animal oil, of diesel quality, to be used as biofuel. / Fuel obtained from vegetable or animal oil which has been transformed through a chemical process called transesterification.
Bioenergy[146]	A renewable energy made available from materials derived from biological sources.
Bioelectricity	Electricity produced from biomass.
Bioethanol[145]Error! Bookmark not defined.	Ethanol produced from biomass and/or the biodegradable fraction of waste, to be used as biofuel. / Biofuel for use in petrol engines. Plants which contain saccharose (beetroots, sugar cane, etc.) or starch (wheat, maize, etc.) can be transformed to produce bioethanol. This is obtained by fermenting the sugar extract of sugary plants or by distilling starch from wheat or maize.
Biofuels[147]	Liquid or gaseous fuel for transport produced from biomass
Biogas[148]	A fuel gas produced from biomass and/or from the biodegradable fraction of waste, that can be purified to natural gas quality, to be used as biofuel, or woodgas.
Bioheat	Heat produced from biomass.
Bioliquid[147]	Liquid fuel for energy purposes other than for transport, including electricity and heating and cooling, produced from biomass.
Biomass[147]	The biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste.
Distribution system operator[144]	A natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems and for ensuring the long term ability of the system to meet reasonable demands for the distribution of electricity.
Distribution[144]	The transport of electricity (on high-voltage, medium voltage and low voltage) or heat on distribution systems with a view to its delivery to customers, but not including supply.
District heating or cooling[147]	The distribution of thermal energy in the form of steam, hot water or chilled liquids, from a central source of production through a network to multiple buildings or sites, for the use of space or process heating or cooling.
Forestry[149]	This covers all practices by which goods are produced from forests in a reasonable and sustainable way.
Generation[144]	The production of electricity.
Geothermal energy[147]	Energy stored in the form of heat beneath the surface of solid earth.
Greenhouse gases[149]	Water vapour, carbon dioxide (CO2), methane (CH4), nitrous oxide and ozone (O3).

[144] Directive 2003/54/EC concerning common rules for the internal market in electricity.
[145] Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport and Biomass Action Plan COM(2005) 628 final.
[146] Wikipedia, 2013. Bioenergy. Available at: http://en.wikipedia.org/wiki/Bioenergy
[147] Directive 2009/28/EC on the promotion of the use of energy from renewable sources.
[148] Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport.
[149] Biomass Action Plan COM(2005) 628 final.

Gross final consumption of energy[147]	The energy commodities delivered for energy purposes to industry, transport, households, services including public services, agriculture, forestry and fisheries, including the consumption of electricity and heat by the energy branch for electricity and heat production and including losses of electricity and heat in distribution and transmission.
Primary energy	The form of energy found in nature that has not been subjected to any human-made conversions or transformations.
Producer[144]	A natural or legal person producing energy.
Pure vegetable oil[148]	Oil produced from oil plants through pressing, extraction or comparable procedures, crude or refined but chemically unmodified, when compatible with the type of engines involved and the corresponding emission requirements.
Renewable energy obligation[147]	A national support scheme requiring energy producers to include a given proportion of energy from renewable sources in their production, requiring energy suppliers to include a given proportion of energy from renewable sources in their supply, or requiring energy consumers to include a given proportion of energy from renewable sources in their consumption. This includes schemes under which such requirements may be fulfilled by using green certificates.
Renewable energy sources[144]	Renewable non-fossil energy sources (wind, solar, geothermal, wave, tidal, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases).
Support scheme[147]	Any instrument, scheme or mechanism applied by a Member State or a group of Member States, that promotes the use of energy from renewable sources by reducing the cost of that energy, increasing the price at which it can be sold, or increasing, by means of a renewable energy obligation or otherwise, the volume of such energy purchased. This includes, but is not restricted to, investment aid, tax exemptions or reductions, tax refunds, renewable energy obligation support schemes including those using green certificates, and direct price support schemes including feed-in tariffs and premium payments.
Synthetic biofuels[148]	Synthetic hydrocarbons or mixtures of synthetic hydrocarbons, which have been produced from biomass.
Transformation sector	The transformation sector comprises the conversion of primary forms of energy to secondary and further transformation.
Transmission system operator[144]	A natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long term ability of the system to meet reasonable demands for the transmission of electricity.
Transmission[144]	The transport of electricity on the extra high-voltage and high-voltage interconnected system with a view to its delivery to final customers or to distributors, but not including supply.

10 ABBREVIATIONS

BAP	Biomass Action Plan
B&RW	Biomass and Renewable Wastes
BAV	Bavaria
B-W	Baden-Württemberg
CHP	Combined Heat and Power
c€	Euro cent
DR	Danube Region
DRBAP	Danube Region Biomass Action Plan
DRS	Danube Region Strategy
EC	European Commission
EE	Energy Efficiency
EP	European Parliament
EU-27	The 27 Member States of the European Union: Belgium (BE), Denmark (DK), France (FR), Germany (DE), Greece (EL), Ireland (IE), Italy (IT), Luxembourg (LU), Netherlands (NL), Portugal (PT), Spain (ES), United Kingdom (UK), Austria (AT), Finland (FI), Sweden (SE), Cyprus (CY), Czech Republic (CZ), Estonia (EE), Hungary (HU), Latvia (LV), Lithuania (LT), Malta (MT), Poland (PL), Slovakia (SK), Slovenia (SI), Bulgaria (BG) and Romania (RO)
EU-28	EU-27 + Croatia (HR) (from 1 July 2013)
EUSDR	European Union Strategy for the Danube Region
GHG	Greenhouse Gas
ILUC	Indirect Land Use Change
J	Joule
MS	Member States
MSW	Municipal Solid Waste
n/a	not available
NREAP	National Renewable Action Plan
PEP	Primary Energy Production
RE	Renewable Energy
RES	Renewable Energy Sources
TAP	Transnational Action Plan for Central Europe (output of the 4biomass project)
toe	Tonne of Oil Equivalent
W	Watt

Notes

Notes

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Powering Europe

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HUNGARY'S RENEWAL

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