European Commission

Flagship cluster fiche

THE DANUBE BIOENERGY NEXUS (DBN)

1. RATIONALE AND OBJECTIVES

Energy production is one of the key challenges faced by the Danube Region. Energy prices are relatively high in the region. Much energy is imported, its transport is costly and markets are fragmented. In addition, the Danube Region is specifically vulnerable regarding security of supply, as demonstrated in January 2009 when gas supplies were cut. Energy production and use is also a significant source of pollution.

Most countries of the Danube Region have however a large natural potential to develop energy from renewable sources, including bioenergy made available from materials derived from biological sources.

Biofuels, produced sustainably and under efficient processes, are a low-carbon alternative to fossil fuels in the EU's energy mix and for transport in particular. Biofuels are easy to store and deploy, have a high energy density and typically emit substantially less greenhouse gases than oil, gas or coal.

Current trends in this regard focus on the stimulation of the development of alternative, so-called second generation biofuels from non-food feedstock, like waste or straw, which emit substantially less greenhouse gases than fossil fuels and do not directly interfere with global food production.

Moreover, an increasing contribution from bioenergy is expected in energy consumptions sectors other than transport (see Annex 1). Such an increased exploitation is expected to put a pressure on the biomass supply in very different sectors ranging from agriculture and forest (by) products to domestic waste (see Annex 2).

The Danube Bioenergy Nexus will address three of the four vertical priorities of the JRC's Scientific Support to the Danube Strategy initiative:

- ***Energy production:***
  Biofuels are substitutes for fossil fuels which can contribute to reduce the dependency of the Danube Region on imported fossil fuels while bioenergy as a whole will provide a substantial contribution to allow the EU countries of the Danube Region to reach the targets of the Renewable Energy Directive and beyond.
- ***Agricultural development:***
  The development of bioenergy and especially of second generation biofuels represents a great challenge but also a great opportunity for the Danube Region where agriculture is an important sector of the economy.
- ***Environment protection:***
  Biofuels generally have a better greenhouse gas performance than fossil fuels and therefore help to reduce greenhouse gas emissions and to fight climate change. The overall impact of the increasing demand for biofuels and bioenergy on the environment including water, forestry and nature conservation is also an issue that deserves further scientific research.

Related priorities of the JRC Scientific Support to the Danube Strategy initiative:

Energy production
Agricultural development
Environment protection

Related priority areas of the EUSDR:

PA 02 - Energy (coordinated by Hungary and the Czech Republic)
PA 06 - Biodiversity, landscapes, quality of air and soils (coordinated by Bavaria and Croatia)

Policy context and related legislation:

EU reference documents:

Directive 2009/28/EC on the promotion of the use of energy from renewable sources
EU Energy Roadmap 2050
EU Roadmap for a Resource Efficient Europe
Proposal for a Directive amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EC and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources [COM(2012) 595]

International partner organisations:

UNESCO
Visegrad Group

2. FLAGSHIP CLUSTER DESCRIPTION

The 'Danube Bioenergy Nexus' flagship cluster will address the challenges of energy production in the Danube Region while focusing on the development of bioenergy and its possible impacts on the agriculture sector in the Region as well as on the environment.

It is worth noting that several Danube countries are well aware of the challenges that an increasing bioenergy exploitation will pose in close future and have already prepared consistent bioenergy action plans. On the other side, other countries have progressed less in analyzing this complex issue. JRC can provide an integrated approach on the different aspects listed hereafter. For most advance countries, added value will come from the mutual validation of JRC knowledge against national expertise, while less progressing countries will be able to profit of the knowledge brought on the table in the flagship cluster to develop their own roadmap towards sustainable bioenergy resources exploitation.

Flagship cluster structure:

The flagship cluster will cover the following issues in the Danube River Basin:

- **Mapping potential of the Danube Region as concerns the development of bioenergy**

Resources for bioenergy production come from at least three main sectors: agriculture, forestry and waste management and the evaluation of the overall potential is quite a complex issue involving at least technological, environmental and economic issues. The JRC can deploy an appropriate mix of statistical and geographical tools in order to provide an assessment of the potential availability of raw material for bioenergy production in Danube area as service for Danube countries not having developed such knowledge. Danube countries already owing a similar inventory will be invited to compare their data with the JRC evaluation for mutual validation.

- **Assessment of relevant technological options**

Transformation processes from biomass to energy can follow very diverse paths leading to different products. Strengths and weaknesses of each technological choice depend on several factors, mostly local, like the availability of the raw material, access to water, the demand pattern of energy products, the cost of different forms of energy, etc. A study on the most suitable technologies can be developed, again as a service for Danube countries not already owning such knowledge. The study would be validated with more advanced countries.

- **Assessment of the impacts of bioenergy development on agriculture**

The impact of the increasing demand of different bioenergy forms (see annex 1 and 2) on the agriculture sector can be evaluated using several indicators: expected changes in land use, irrigation needs, changed patterns in agriculture and so on. An overall assessment of these impacts can be performed based on both statistical and geographical data.

- **Assessment of the impacts of bionenergy development on climate change and vice versa**

The JRC can provide a robust scientific basis for assessing bioenergy impacts on climate through the detailed calculation of greenhouse gas (GHG) factors for a large number of bioenergy forms. Moreover, the opposite link, connecting the expected changes in crucial meteorological variables (precipitation, temperature, insolation etc) with future availability of biomass is also currently investigated in other contexts, like, e.g., African continent and could be extended to the Danube area.

- **Assessment of the impacts of bioenergy development on soil quality**

Especially after the recent proposal of the European Commission con the phasing out first generation biofuels and incentivising second generation, forest and agriculture residues are becoming a relevant part of every successful strategy for bioenergy exploitation. Nevertheless, the large-scale exploitation of these resides must take into account the risk of a negative impact on soil quality. The JRC can provide a good knowledge of the current use of residues and its future expected evolution to be compared with the available JRC data on soil quality and vulnerability as guidance for planners and policy makers.

- **Assessment of the impacts of bioenergy development on biodiversity**

The JRC holds quite a detailed knowledge of areas of high biodiversity. This knowledge could be compared with an assessment of the additional pressures coming from the expected increasing bioenergy demand in order to provide guidance on policies to be put in place to reinforce biodiversity protection wherever needed.

3. OUTPUTS AND BENEFICIARIES

Products:

In the short term (within 3-5 months of the launch of the cluster), the following deliverables can be made available:

- Extension of National Renewable Energy Action Plan (NREAP) databases to non-EU countries of the Danube Region through data collection from local authorities and from the NREAPs developed or going to be developed by some Danube countries too (e.g., Serbia and Croatia)
- Update of EU countries data through the 2011 Progress Reports on the promotion and use of energy from renewable sources.

In a longer term (within approximately one year of the launch of the cluster), the following deliverables can be made available:

- Detailed maps of some raw resources potential (e.g. crop residues, forest residues, sewage and other waste, manure for biogas) can be finalised and made available as a base of data for a geographically explicit vision of bioenergy resources and their impact as described in the factsheet.
- Methodologies for assessing different sustainability aspects of bioenergy exploitation (e.g. water consumption and quality, soil erosion, etc.) for the preparation of further impact maps.

Potentially interested actors and/or beneficiaries of the research results:

EU institutions and bodies

National and regional governments of the Danube Region

Other stakeholders of the Danube Region

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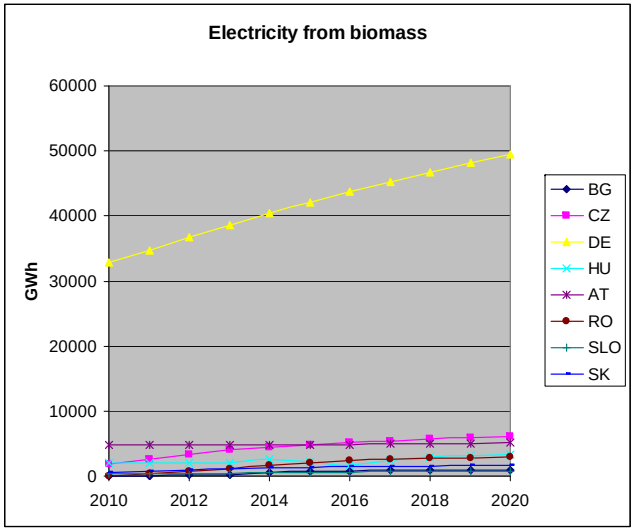
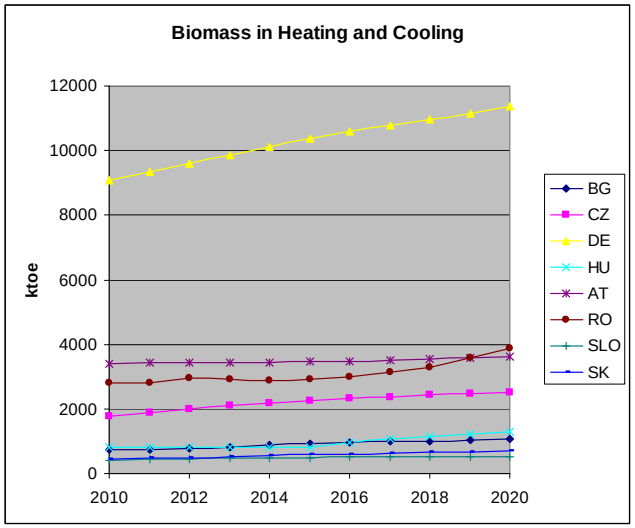
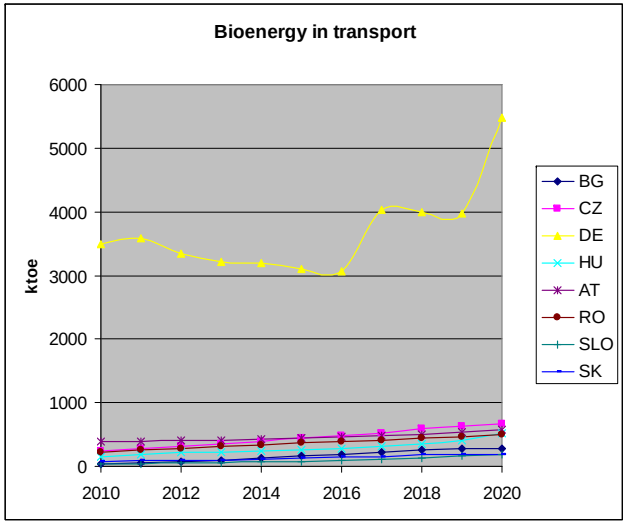
ANNEX 1

Evolution of bioenergy consumption in Electricity (left), Heating and Cooling (centre) and Transport (right) sectors in 2010-2020 according to NREAPs for EU-27 Danube countries

(Units are GWh for electricity, ktoe for H&C and transport)







ANNEX 2

Expected biomass supply for Bioenergy production in 2010-2020 in EU Danube countries according to National Renewable Energy Action Plans

in 2015 (top table) **and 2020** (bottom table) *(Units in ktoe)*

2015	BG	CZ	DE	HU	AT	RO	SLO	SK
A) Biomass from forestry, of which:	860,00	2529	12217,5	604,0413	3588	1560	324	979
1. direct supply of wood biomass from forests and other wooded land for energy generation	830	1223	8658,5	533,104	1978	720	324	434
2. indirect supply of wood biomass for energy production	30	1306	3559	70,93723	1610	840	0	545
B) Biomass from agriculture and fisheries	130	286	7846,5	650,6162	420	1586	0	2180
1. Agricultural crops and fishery products	100	143	6903	360,6573	300	0	0	180
2. By-products and residues	30	143	943,5	289,9589	120	1586	0	2000
C) Biomass from waste	144	113	2126	0	100	0	0	64
1. Biodegradable fraction of municipal solid waste	80	96	764	0	70	0	0	50
2. Biodegradable fraction of industrial waste (including paper, cardboard, pallets)	60	17	1099	0	0	0	0	2
3. Sewage sludge	4	0	263	0	30	0	0	12

2020	BG	CZ	DE	HU	AT	RO	SLO	SK
A) Biomass from forestry, of which:	930	2716	11966	655,8708	3870	1800	333	1222
1. direct supply of wood biomass from forests and other wooded land for energy generation	892	1405	8192	567,0202	2175	840	333	650
2. indirect supply of wood biomass for energy production	38	1311	3774	88,85067	1695	960	0	572
B) Biomass from agriculture and fisheries	169	358	9135,5	1129,98	730	1604	0	2194
1. Agricultural crops and fishery products	130	179	7619	719,8815	500	0	0	194
2. By-products and residues	39	179	1516,5	410,0984	230	1604	0	2000
C) Biomass from waste	194	183	2317	0	150	0	0	90
1. Biodegradable fraction of municipal solid waste	110	166	597	0	100	0	1	75
2. Biodegradable fraction of industrial waste (including paper, cardboard, pallets)	80	17	1457	0	0	0	0	2
3. Sewage sludge	4	0	263	0	50	0	0	13