

ENERGY BARGE

Building a Green Energy and Logistics Belt

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Deliverable 6.2.3

Identification and exchange of good practices at regional level

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I About the ENERGY BARGE project

The Danube region offers a great potential for green energy in the form of biomass. The main objective of ENERGY BARGE is to exploit this potential in a sustainable way, considering the Renewable Energy Directive 2009/28/EC, thereby increasing energy security and efficiency in the Danube countries. The project brings together key actors along the entire value chain, biomass companies and Danube ports as well as relevant public authorities and policy stakeholders. The project maps value chains and facilitate the market uptake of biomass, support better connected transport systems for green logistics and provide practical solutions and policy guidelines. The Agency for Renewable Resources (FNR) coordinates the project with its fourteen partners from Austria, Bulgaria, Croatia, Germany, Hungary, Slovakia and Romania.

Project coordinator

Agency for Renewable Resources

Fachagentur Nachhaltende Rohstoffe e.V.	FNR	Germany
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Project partners

BioCampus Straubing GmbH	BCG	Germany
Deggendorf Institute of Technology	DIT	Germany
Austrian Waterway Company	VIA	Austria
Port of Vienna	PoVi	Austria
Bioenergy2020+ GmbH	BE2020	Austria
International Centre of Applied Research and Sustainable Technology	ICARST	Slovakia
Slovak Shipping and Ports JSC	SPaP	Slovakia
National Agricultural Research and Innovation Centre	NARIC	Hungary
MAHART-Freeport Co. Ltd.	MAHART	Hungary
International Centre for Sustainable Development of Energy, Water and Environment Systems	SDEWES Centre	Croatia
Public Institution Port Authority Vukovar	PoVu	Croatia
Technology Centre Sofia Ltd.	TCS	Bulgaria
Romanian Association of Biomass and Biogas	ARBIO	Romania
Federation of owners of forests and grasslands in Romania	Nostra Silva	Romania

II About this document

This report corresponds to *D 6.2.3 Identification and exchange of good practices at regional level* of ENERGY BARGE. It has been prepared by:

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1 Background

Deliverable “D 6.2.3 Identification and exchange of good practices at regional level” is based on Activity 6.2 as described in the latest approved version of the Application Form of the project ENERGY BARGE (Project Code: DTP1-175-3.2).

- Activity 6.2 *Identification of legal and administrative barriers* (Lead: FNR)

The objective of Deliverable 6.2.3 is to outline the framework conditions on regional level that foster companies from the biomass/bioenergy sector to utilise biomass for energetic purposes in a way that could provide information for companies from other regions in an exemplary manner.

The basis for the identification of the case to be studied were a set of case selection criteria defined in ENERGY BARGE D 3.2.3 “Regional case studies for biomass and bioenergy production” (see Annex 1). All partners were expected to check the potential regional cases known to them on the basis of these selection criteria, by filling in the template for at least one, maximum three, potential cases.

The main categories are:

- Thematic criteria
- Geographical criteria
- Performance criteria
- Organizational criteria

The completed template for each case study can be found in Annex 2.

The geographical coverage aimed for a set of case studies, which comprises the seven Danube-adjacent project partner countries: Austria, Bulgaria, Croatia, Hungary, Germany, Slovakia and Romania. For each of these countries, one case study location was identified. The Bulgarian study on the biodiesel plant of Bulmarket in Ruse however has not been conducted until today due to administrative challenges. As a back-up, the Hungarian port partner MAHART conducted an own case study about a biomass plant case in Mohács.

The focus was on outlining the status quo of these cases with respect to a set of characteristics and subsequently on analysing the success factors (enablers & inhibitors) influencing this status quo.

Table 1 lists the name of the selected case as well as an overview of the type of cases and their role in the biomass and bioenergy supply chain on the basis of the feedstock.

Table 1: Cases selected, including a description of case types and role in the supply chain.

Country	Case	Type	Role(s) in supply chain	Location
Austria	Agrana	Company; Bioethanol plant; large-scale	Processor, Trader	Pischelsdorf
Croatia	Spačva	Company; Integrated wood-manufacturing plant incl. wood pellet & wood chips production; decentral/medium-scale	Processor, Trader, End user	Vukovar
Hungary 1	Association of Hungarian District Heating Enterprises (MaTaSzSz), example Bioenergy-Duna Ltd	Company; Biomass powerplant for district heating, based on wood chips; decentral/small-scale	End User	Mohács
Hungary 2	Hungrana Starch and Isosugar Manufacturing and Trading Co. Ltd	Company; Bioethanol plant; large-scale	Processor, Trader	Szabadegyháza
Germany	Region of renewable raw materials, ADM Rapeseed Plant & Clariant Bioethanol Plant	Cluster region; corporate examples: Oil mill (large-scale) & bioethanol plant (demo-scale)	Processor, Trader (ADM), Processor (Clariant)	Straubing
Slovakia	Intech Energo / Narodna energeticka	Company; decentral biomass powerplants (small-scale)	Trader, End user	nationwide
Romania	FOREST AND BIOMASS ROMANIA SA	Company; plantations for oilseed, wood & short rotation coppice	Supplier, Trader	Petris/ Timisoara



2 Executive summary

A crucial point that constitutes the basis for many of the business cases that were identified as good practice examples by the ENERGY BARGE project partners is a close cooperation of public and private actors from the biomass/bioenergy sector on regional level. The establishment of regional clusters to promote the networking activities among the relevant market actors proved to be an efficient measure, e.g. in case of the Croatian *Vukovar-Srijem County Development Agency Ltd. HRAST* or the German regional cluster *Renewable Raw Materials*. The establishment of a cluster, operating as a “one stop service centre”, provides the opportunity for companies to enhance their visibility for potential business partners and makes it more attractive for foreign and domestic investors to expand their businesses in the field renewable raw materials in the region. Through an efficient marketing, regions can motivate further companies settling in the respective areas. Flagship projects can enhance the awareness of the selected regions and the entire Danube area.

The development of an economic profile of a region through the establishment of a cluster in the field of renewable resources/energy could also be supported through the settlement of research and education entities or by enhancing the cooperation with these institutions. For example, in the region of Straubing in Germany, the involvement of research and education entities has been a driving factor for political actors to actively support the development of the bioenergy sector in a region,. Furthermore, by integrating ports as biomass logistics hubs into the concept of a cluster, the Danube as a potential environmentally friendly transport axis could come to the fore and receive additional support from the political site.

For internationally oriented companies, like the Austrian industrial company AGRANA, regional framework conditions regarding the generation of bioenergy play a minor role for the alignment of a business, whereas regulations on EU or national level have a higher impact on the business operations. In view of the proposal of the European Commission for the future form of the biofuels directive (RED II), in case of AGRANA this would mean a significant change as the company would need to convert its bioethanol plant towards the utilisation of second generation biomass as feedstock. The volatile legislative situation on the issue of first and second generation biofuels on national and EU level has also been depicted as important risk factors by other case studies.

Overall, success factors for functioning as a model region in the field of biomass utilisation and bioeconomy comprise a broad and continuous political support and funding on regional level. A strong actor base from the research and industrial sector, various sources of biomass feedstock supply, including versatile logistics options, enable the integration of biomass supply and bioenergy carrier production as well as a stringent development strategy.

3 Good practices at regional level

The following good practice examples on regional level with regard to local biomass production outline the framework conditions that foster companies from the biomass/bioenergy sector to utilise biomass for energetic purposes in a way that could provide information for companies in other regions in an exemplary manner. The selection of the respective cases has been conducted in accordance with the compilation of Deliverable 3.2.3 of the ENERGY BARGE project. Ideally, inland waterway shipping is already involved or could potentially be integrated in the supply chain of the respective biomass raw materials.

3.1 Austria¹

AGRANA is an internationally oriented Austrian company which adds value to agricultural commodities to produce a wide range of industrial products for the processing sector. With around 8,600 personnel based at 54 production facilities located around the world, AGRANA maintains a global presence and generates consolidated revenues of almost € 2.6 billion (Agrana Annual Report, 2017).

Today, the group is:

- Leading supplier of sugar and isoglucose in Central, Eastern and South-Eastern Europe
- Major European manufacturer of custom starch products and bioethanol
- The world market leader in the Fruit segment for fruit preparations and the largest manufacturer of fruit juice concentrates in Europe

As an Austrian industrial group with an international focus, AGRANA's sugar and starch segments operate mainly in Europe and the operations of its fruit segment are global. The AGRANA plant in Pischelsdorf belongs to the Starch division and represents a biorefinery. The biorefinery commissioned in 2008 in Pischelsdorf represents AGRANA's most recent production site in Austria. An upstream wheat starch processing plant was added to the site in 2013. Top-quality foodstuffs and animal feeds, as well as products for technical industrial sectors, are produced at this bio-refinery, with almost zero waste. The Pischelsdorf facility annually processes more than 100,000 t of wheat starch, 23,500 t of wheat protein, 240,000 m³ of bioethanol, 120,000 t of biogenic CO₂, 190,000 t of the protein-rich animal feed ActiProt® (DDGS - Distillers' Dried Grains with Solubles) and 55,000 t of bran. The close integration of the wheat starch plant and the existing bioethanol factory enable the cereals processed to be utilised particularly efficiently.

¹ The information for this section was provided by the Head of Raw material, Procurement and Logistics of the AGRANA Stärke GmbH. A meeting took place on 12.03.2018 in Pischelsdorf. In addition, the Head of Raw material, Procurement and Logistics of the AGRANA Stärke GmbH provided relevant information by E-Mail. Mr. Schragen of the AGRANA Stärke GmbH. Furthermore, already publicly available information were used (see the annual report of the AGRANA group 2016/17 and the company's website <https://www.agrana.com/>).

AGRANA controls and manages the product value chain from the purchase of agricultural raw materials, e.g. to the production of the resulting intermediate goods for industrial customers (and end products for consumers in the case of the sugar segment).

In bioethanol production, AGRANA effectively applies its principle of completely utilising the agricultural raw materials employed, thus enhancing value-added through the optimal use of all residual components of raw materials in by-products. For supplying the biorefinery in Pischelsdorf and delivering goods, railway, vessels and trucks are used, making it a trimodal production site. Thus, the AGRANA plant in Pischelsdorf serves as one of the view examples along the Danube where a centralized large-scale production site of bioenergy carriers operates, utilizing all standard types of transport modes, including inland waterway systems. Moreover, especially regarding inbound logistics, the waterway plays a decisive role, given the fact that around 70% of the raw material processed is being imported from outside Austria, making the waterway an attractive carrier.

Railway, vessels and trucks are used for biomass and DDGS transport (dry bulk); railway and trucks for the transport of bioethanol (liquid bulk). Since the location has not the status of a harbour, bioethanol cannot be transported on vessels for the time being. Depending on markets, prices and the necessity of using all three types of transport modes, the quantities of incoming and outgoing goods between the transport types can vary. Regarding the past years the range of cargos transported by vessels was 20% - 40%, by railway 5% - 20% and by trucks 50% - 75%.

With this global market actor profile, AGRANA as a whole and the site in Pischelsdorf (ethanol segment in particular) act within the framework of a number of legislative and market-related influence factors. AGRANA continually monitors changes in the legal setting relevant to its businesses or to their employees that could lead to a risk situation, and takes risk management actions as necessary. Areas of law to which particular attention is devoted are anti-trust, food and environmental legislation, as well as data protection, anti-money laundering and anti-terrorism finance provisions.

Commodity Price Risks

AGRANA's business activities expose it to market price risk from purchases of commodities and the sale of finished products (i.e. ethanol). This is particularly true in the production of bioethanol, where the most important cost factors are the prices of the raw materials, corn and wheat. In 2016/17, the volatility of the European market for bioethanol was pronounced with the quotations ranging from 440 to 660 Euro per cubic metre FOB Rotterdam (FOB – "Free on Board"). Swing in the supply and demand relationship for EU bioethanol as well as declining attractiveness for imports led to unexpected price spikes. As a large-scale processor and thus large-scale buyer of feedstock, AGRANA can act differently in feedstock procurement as many other small-scale actors in the bioenergy market. Long-lasting, stable customer and supplier relationships, respectful treatment of all stakeholders are success factors to ensure the continual growth in the company's value and the sustainable management strategy. A further success factor is that AGRANA utilises the Group's strategic expertise across segment boundaries. This is especially true for agricultural grower contract management and raw material procurement, the knowledge of

customer requirements and markets, the opportunities for the development of inter-segment products, and synergies in logistics, purchasing, sales and finance

Regulatory framework

In late 2016, the European Commission published a proposal for the future form of the biofuels directive (RED II). In the RED II proposal, it is outlined that the share of advanced biofuels and biogas produced from feedstock as listed in the Annex of the proposal shall increase from at least 1.5% in 2021 to a minimum of 6.8% in 2030 (European Commission, 2017). However, according to the agreement in June 2018, the text that has been agreed foresees that the contribution of certain categories of biofuels, bioliquids and biomass fuels produced from food or feed crops, namely those with high indirect land-use change (ILUC) risk and for which a significant expansion of the production area into land with high carbon stock is observed, will be limited to the 2019 consumption levels. The purpose is to reduce the pressure on land and to avoid the extension of agricultural land into areas with high carbon stock such as forests, wetlands and peat land causing additional greenhouse gas emissions (General Secretariat of the Council, 2018). Hence, AGRANA tries to gradually convert its bioethanol plant in Pischelsdorf to use 2nd generation biomass as feedstock as it is currently mainly based on edible feedstock.

Austria incorporated the EU biofuels directive into its national legislation by amending the Austrian Ordinance on Automotive Fuels (Kraftstoffverordnung, 2018) to include an admixture obligation in November 2004. In line with the Austrian admixture obligation, 5.75% of the total energy content of all fuel used for transportation in Austria must be substituted by biofuel. In order to achieve the stipulated admixture targets, both biofuels, such as pure biodiesel and the environmentally friendly fuel Super Ethanol E85, and fuels such as diesel and petrol mixed with lower percentages of biofuels, are taken into account. The Austrian admixture obligation in the transport sector of 5.75% of the fuels' energy content is currently achieved due to more biodiesel being mixed with diesel. At the moment, this amounts to a concentration of 6.25% (energetic; 7% by volume) biodiesel in diesel fuel dispensed at filling stations in Austria. Given that there is no standard in Austria for a 5% (energetic) admixture concentration of bioethanol to petrol, only around 3.4% (energetic) bioethanol (5% by volume) is currently mixed with petrol. Hence, AGRANA currently exports around half of the bioethanol produced in Lower Austria, thereby giving away the potential CO₂ savings Austria could fully make use of itself, rather than having to purchase expensive emission rights on the global market.

Assessing the sustainability of bioethanol production

For the carbon footprint of bioethanol, however, the application of the EU energy allocation method is mandatory in documenting the energy consumption reductions from biogenic fuels targeted under the EU Renewable Energy Directive (2009/28/EC), which supports the use of energy from renewable resources. The carbon footprint of bioethanol is therefore reported on GRANA's website. Furthermore, analyses show that AGRANA bioethanol meets the EU's demand for reducing 50% greenhouse gas emissions over gasoline over its entire life cycle.

Although the transport of raw materials and products only represents a comparatively low share of mostly less than 10% of the carbon footprint of AGRANA products (depending on the Project co-funded by European Union funds (ERDF)

calculation method and country), the Group strives to make transport activities as sustainable as infrastructure and economics will allow.

Recommendations for improvement

Since the location in Pischelsdorf has not the status of a harbour, bioethanol cannot be transported on vessels for the time being. If this changes, the share of cargos transported by vessels could be increased.

Lessons learnt

- The business model is relying on export of products, since the domestic market is fully saturated and political framework conditions will likely not change in the near future in favour of increased domestic bioethanol demand. Every year, a total of around 250,000 m³ of bioethanol are produced at AGRANA's facility in Pischelsdorf – a quantity sufficient to cover all of Austria's domestic requirements were E10 to be introduced – exports of bioethanol would simply be lower.
- Only with a high degree of integration of the biorefinery value chain (incl. transport modes) and high-value co-products, this centralized concept of bioethanol production is economically viable.
- The availability of different transport opportunities including the inland waterway transport is a huge success factor for the total supply chain and the bioethanol business.

3.2 Croatia

The company Spačva d.d., which is one of the largest biomass processors of the country, was identified as a good practice example at regional level for Croatia. It is a private company, located in the eastern part of the country, in the city of Vinkovci. Currently, it employs around 850 workers making it one of the top employers in the County (and wider). Consisting of sawmill, parquet production, final products factory, veneer factory and bio-fuels factory with recent investments towards the bioenergy products strives to become the biggest pellet/briquette producer in the country within the next few years. It also uses biomass residues from the processes to fire two large furnaces producing the heat for the company needs on site. One of the key points is that, although depending strongly on the export of their bioenergy products, it has the largest share of both pellets and briquettes being placed on the national market. Being located within 20 km to the port of Vukovar on the Danube river, it seems a viable option to have the company's reach extended to the east/north of the continent by using alternate modes of transport (rail, waterway) which could prove to be more energy and environmentally efficient.

Currently active document mostly affecting the current and future endeavours in the Vukovar-Srijem County is the "Development Strategy of the Vukovar-Srijem County until the year 2020". The document prescribes various measures and strategical projects for the County regarding the economic development.

A strategic project of the Vukovar-Srijem County is the establishment a wood-technology centre, led by the County with the main partners being the Wood Cluster SLAVONSKI HRAST (Spačva d.d. is a member and founder), Carpenter Technical School in Vinkovci and Faculty of Forestry of the University of Zagreb. The project aims to increase the quality of business infrastructure in the region, increasing the number of products and services related to wood with the final aim of empowering the local enterprises (from small to medium), mostly by increasing the employment rate (Vukovarsko-srijemska županija, Razvojna strategija Vukovarsko-srijemske županije za razdoblje do 2020. godine, 2017).

One of the strategical goals of the County is also to implement a sustainable economy. A measures related to the operation of Spačva d.d. would be the ones aiming to enhance the processing flows mainly oriented towards the food and wood processing sectors (development of distribution sector, creating unique products, enhancement of processing activities..). The measures aim to increase the added value of every process related to the aforementioned sectors. Another measure constitutes the priority of strengthening the entrepreneurship in the County by increasing the networking abilities of the actors. One of the mechanisms is to encourage the formation of clusters and the analysis of their work and roles in the County's economy. Further, one of the County's priorities is the use of renewable energy sources and encouraging energy efficiency. Total estimate is that the production of high caloric and ecologically acceptable heating products (pellets and briquettes) from the secondary wood sources has a potential of over 15 mil. EUR of income and 150 new jobs, with the potential for the overall wood related industry to double the amount of employments (Ministarstvo regionalnog razvoja i fondova EU, 2017).

Spačva d.d. represents a good example of running a successful business in Croatia using available resources and building upon a long tradition to play an important role with modern market requirements.

Regulatory framework

Founded by the Vukovar Srijem County in 2007, Vukovar-Srijem County Development Agency Ltd. HRAST operates as 'one stop service centres', which assists foreign and domestic investors in establishing or expanding their businesses – at every stage of the process. The agency provides professional consulting services to companies interested in setting up business operations in the County, focusing on all issues that are relevant to select an appropriate location. In addition, detailed information about Croatia and particularly Vukovar-Srijem County as a business location are provided, and potential investors are approached proactively (Vukovar-Srijem County Development Agency, 2018).

On a smaller, local level, the city of Vinkovci, where the company Spačva d.d. still has no clear and available economic strategy with planned incentives. Upgrades to the company's business model could be made through joining the partnerships of European projects. Local wood cluster, mentioned earlier, Wood Cluster SLAVONSKI HRAST has been a part of several projects showing a possible way to both increase the company's visibility internationally and enhancing its business profile.

A good cooperation with local and national partners would be beneficial. The County has been closely working with the University of Zagreb (Faculty of Forestry) and there are some local actors who can assist in the enhancement process, e.g. College of Applied Sciences Lavoslav Ružička in Vukovar, Faculty of Agriculture, University of Osijek, Croatian Forest Research Institute - Centre for Lowland Forests.

On the national level, a document governing the future projects and strategies is the “Strategy of Regional Development of the Republic of Croatia until the end of the year 2020”. A major section of this document covers the enhancement of the competitiveness of the regional economies and employment, supporting the development of regional and local economy enhancing the infrastructure, making the encouraging business environment and strengthening the human potential and education related to the economic needs on the regional and local level. Nationally, Vukovar-Srijem county is placed as the last in the company density scale (number of companies per resident) and other economic development indicators (competitiveness level, development index, GDP) showing a significant potential for growth (Ministarstvo regionalnog razvoja i fondova EU, 2017). Increasing the competitiveness of companies in the County might also increase their interest of using alternative pathways for distributing their products.

The strategy provides a SWOT analysis on several topics (societal development, space and environment, economy and the system of regional management), and for this case, the most important conclusions come from the Space and Environment and Economy sections. In the first, as the weaknesses, the under-developed goods terminals, low level of education of stakeholders on the current trends in environmental protection (finally resulting in lacking of quality strategies and programmes for natural resources in Croatia), and non-satisfactory management of privately owned forest area, are mentioned. Most significantly, there seems to be inadequate cooperation among the agricultural, forestry and other sectors (regional development, tourism, water management, etc.) in the planning and execution of the department strategies and spatial management as well as attraction of the funds through projects (e.g. there is no large scale cross-sectoral projects comparable to rather popular rural tourism examples using a former, or still active agriculture area to provide various tourist activities). From the economic point of view, the weaknesses include a loose connection between science and economy, low incomes in the processing industries (including wood processing), low level of clustering and networks, companies choosing major cities for their base over rural areas (thus strengthening the local infrastructure) and finally low capacities and abilities in attracting foreign investments (both on the regional and local level). Additionally, it also mentions that the entrepreneurs do not use the incentive measures enough due to the demanding administrative procedures and conditions. Administration is another key element with its barriers towards private businesses with the non-systematic and uneven approach to different types of companies (small, medium, public, private). There is also an excessive tax load on the entrepreneurs and inappropriate incentives. One of the major obstacles in view of the implementation of the regional development strategies are the bureaucratic problems in the phase of obtaining the necessary approvals, permissions and certificates for starting an investment activity. Administrative inefficiency, coupled with insufficient and inappropriate available information on the open national, European and

international calls for (co)financing of projects lead finally to a low number of established goals of the development strategies (Ministarstvo regionalnog razvoja i fondova EU, 2017).

Low utilisation of the geographic position in respect to transport is also one of the main issues related to this project and this case study. Intermodal transport is fairly underdeveloped as well as an overall usage of water resources when it comes to inland waterways (rivers and channels). One of the thematic goals of the national operational plan is listed within the measures of the development of the public infrastructure aiming to promote the sustainable transport and elimination of bottlenecks in the key infrastructures of the transport network. This target promotes the support of multimodal transport space and improvement of the regional mobility by connecting the secondary and tertiary transport nodes to the TEN-T (European transport corridor) infrastructure (Ministarstvo regionalnog razvoja i fondova EU, 2017).

Apart from the above documents ("Strategy of Regional Development of the Republic of Croatia until the end of the year 2020", "Development Strategy of the Vukovar-Srijem County"), the Innovation Promotion Strategy 2014-2020 for Croatia foresees various grants to companies (regardless of size) which would encourage companies to make a form of an outreach from their current state. This could be done by changing the business model, implementing organisational or managing innovations, by implementing 'knowledge intensive services', marketing or packaging innovations, etc. (Ministarstvo gospodarstva, 2014).

Recommendations for improvement

Following already established plans on both national and regional level would be a good start, with increase of general mobility towards the modes of transport currently not used for bioenergy and raw material. There is an interest to extend the reach of the company by using the inland waterways which are readily available and geographically situated in the vicinity, but it might benefit with additional promotion on the national level to bring the topic into focus. Also, improvement of the current facilities situation at the ports would be desirable (conveyors, load/unload facilities, storages...)

Lessons learnt

While there is a drive and willingness to explore the new ways of running already established business procedures (in the light of the project, mainly regarding the transport), there is still some discomfort on an actual practical implementation. Larger companies, such as Spačva d.d., could be one of the drivers and pioneers in the area to start the process, but would need a push and help from the higher authorities and political actors on national and local levels, at least in a form of not restricting the process with additional legislative barriers.

3.3 Germany

For the depiction of a good practice example for the utilization of biomass and inland waterway navigation on regional level in the German Danube area, a region comprising the municipal entities Straubing (city) and Straubing-Bogen (administrative district) which brands as “Straubing - Region of Renewable Raw Materials” was selected. The BioCampus Straubing GmbH (BCG), a small public business development agency which is a subsidiary of the Port of Straubing, was given the mandate to manage the development of this model region, also by means of the regional branch cluster “Renewable Raw Materials” which it manages. As a long-term strategy, the political objective is to develop the region of Straubing into a model region for the sustainable use of biobased materials and energy. Several research, education and technology transfer institutions with Bavarian-wide scope have been settled in Straubing in this context. An important part in this development strategy plays the port area. It offers both access to biomass logistics and the important economic macro regions of the Danube and the Rhine area. Also, settling space and infrastructure for biomass-processing companies (energetic and chemical-material use) are available in the port area. By combining the geographical advantage of having access to the biomass-rich macro region of the Danube via the port and the concentration of research institutions, small, medium-sized and large companies working along the bioeconomy value chain in the region, the regional political actors in charge aim to create a unique site advantage and model region-profile for Straubing. The example selected here thus is characterized as a model region, rather than a biomass-processing company.

In order to exemplify the processing of biomass into bioenergy products and the involvement of inland waterway transport, two corporate cases are mentioned in this good practice example: firstly, the demonstration plant for lignocellulosic ethanol of the multinational chemical company Clariant and the large-capacity oil mill (for biodiesel production) of ADM Spyck GmbH, a subsidiary of a big multinational agri-company which uses the Danube as its major logistics axis for inbound feedstock supply. Both companies are located in the port area. The corporate decision of these companies to settle in Straubing were also influenced by the pro-active measures towards developing a model region for renewable resources and bioenergy, the concentration of well-known research and support entities for the bioeconomy sector, and the geographically beneficial location at the Danube.

The following section focusses on legal, political and administrative contextual conditions in which the region operates and how this framework impacts the development of the region as a whole.

Development and characteristics of the model region: research, corporate actors and Danube access

The regional cluster “Renewable Raw Materials” was founded in 2009 based on a regional political and management decision to initiate active business development and industrial settling activities in the field of renewable raw materials in the region of Straubing. The basis for this decision taken by the two regional government bodies was the growing accumulation of Bavarian technology transfer and research institutions working along the biomass value chain in Straubing. It started

in the early 2000s and was initiated on Bavarian state government level (C.A.R.M.E.N. e.V., Technology and Support Centre for Renewable Raw Materials, Campus Straubing for Biotechnology and Sustainability of the TU Munich, Fraunhofer BioCat, and Office of the Bioeconomy Expert Council Bavaria). Moreover, the administrative district of Straubing-Bogen became one of Germany's 25 bioenergy regions in 2009. One reason why the region received this substantial federal funding (2 project phases, 4 years, 410,000 € funding in total) to develop bioenergy structures on local and regional level from the German Federal Ministry for Agriculture (via the Agency for Renewable Resources, FNR) was the region's branding and commitment as "Region of Renewable Raw Materials". The project ended in late 2015 (Landkreis Straubing Bogen, 2015).

Against this politics-driven development and in order to reach the goal of establishing a functioning industrial landscape, the regionally led and publicly owned BioCampus Straubing GmbH (BCG) was given the mandate to work as a regional public business development agency along the value and supply chains of renewable raw materials in 2009. In this function, the BCG became the management body for the regional cluster "renewable raw materials". Its objective is to provide a thematic roof for companies, research bodies and other supporting institutions like associations working along the biomass value chain in the region of Straubing, but also to connect these actors with relevant stakeholders on Bavarian, federal and international/EU-wide level. The BioCampus Straubing GmbH is a subsidiary of the Zweckverband Hafen Straubing-Sand (ZVH), which is held by three public shareholders, namely the City of Straubing, administrative district of Straubing-Bogen and the municipality of Aiterhofen.

The ZVH is not only the mother organisation of the BioCampus, but the owner and managing entity of the Danube port in Straubing, as well. Like this, the BCG functions as an ideal connecting point between two profile strengths of the region: firstly, its objective is to support the development of bioeconomy structures in the region and it has a broad network into the regional, national and EU-bioeconomy community. Secondly, it is organized under the same roof as the Danube port, which according to the port of Straubing's marketing is the "Green Chemistry and Energy Port" and can enable access to biomass and end markets in the Danube region. In this double function, the BCG can be described as an entity that can perpetuate the development of innovative biobased supply chains along the Danube.

All measures taken by the BCG focus on supporting companies, research and other related institutions in transforming biomass resources into competitive biobased products in the energy and chemical sectors within the region. Thus, the existence of the mentioned research and education entities was a driving factor for the regional political actors to decide that this rather specific and narrow field of competence – the field of renewable raw materials – shall be actively supported on regional level to develop an economic profile for the region. The cluster management has been funded and financed by the regional entities via the Zweckverband. The BCG's cluster and regional management activities have been supported by Bavarian funds via a funding project, which was extended twice by the Bavarian Ministry for Food, Agriculture and Forestry. The total project funding received for the years 2009 to 2018 amounts to 400,000 €, which was backed by the same amount of co-funding by the ZVH. Also supported by Bavarian state funds, the BioCubator, an entrepreneurial centre with laboratory and offices spaces exclusively

Project co-funded by European Union funds (ERDF)

accessible for companies from bioenergy and bioeconomy sectors was built in the port of Straubing. It is managed by the ZVH; the BCG exercises supportive marketing activities.

In recent years, the financial and thematic commitment on Bavarian political level with regards to developing Straubing as the Bavarian core area for bioeconomy and industrial biotechnology has further increased, which has significant positive effects on the cluster management and the functioning of the region. The most important decisions include:

- Construction of NAWAREUM, a modern-type museum and educational experience centre for renewable raw materials, 25 Mio. €
- Construction of open access multi-purpose demonstration plant for industrial biotechnology processes on the basis of renewable raw materials, 20 Mio. €
- Establishment of expert council on bioeconomy for Bavaria with the aim of drafting political strategies and advisory texts for a functioning sustainable bioeconomy in Bavaria
- Straubing as official campus of the Technical University of Munich: TUM Campus Straubing for sustainability industrial biotechnology, offering eight Bachelor's and Master's degrees such as "Renewable Raw Materials", "Bioeconomy", and "Chemical Biotechnology" (Technical University Munich, Campus Straubing, 2018), > 50 Mio. €

For the region, these decisions and developments are invaluable as they shape profile and image. Therefore, the BCG and its networking partners use them as marketing tools when scouting companies to settle in the port of Straubing and to profit from both the Straubing cluster and the wider geographic access to the Danube region.

Regional strategy and profile development: factors influencing corporate decision making

One of the most visible indicators for success in regional development are newly settling companies. In the case of Straubing as region for renewable raw materials, these companies ideally work along the biomass value chain and have potential to use the port either for settling (BioCubator or plant settling) or for transshipment and logistics via the Danube. Two flagship settlings of corporate actors in the port have taken place in the last ten years: the ADM oil mill directly in the port (biodiesel intermediary product, biofuels first generation), and the Clariant demoplant for lignocellulosic ethanol (biofuels second generation) which is located in the port hinterland, next to the BioCubator. Both site decisions were influenced by the site's profile.

The ADM oil mill took over the Kampa biodiesel mill which went bankrupt in 2009. At that time, ADM was looking for a location along the German Danube and the Kampa site offered favourable conditions. However, also other Bavarian Danube ports were competing for the settling of the plant. Driven by the commitment to establish a model region for use of renewable raw materials, the actors of ZVH, BCG and the city and district of Straubing put strong efforts into making a case for Straubing, especially via favourable authorization conditions. Also, the acceptance in the neighbourhood for the new project was higher compared to other potential sites. The port location also offered ideal infrastructural conditions. ADM's corporate decision to settle in Straubing thus can be seen as a direct result of the proactive settling policies in the region, in Project co-funded by European Union funds (ERDF)

combination with the prime logistics infrastructure. Since operations in Straubing started, the ADM plant is one of the biggest oil mills of its kind in Southern Germany. It processes rape seed and GMO-free soy, exclusively from the Danube region. The rape oil is further processed to biodiesel in diesel refineries. The majority of the inbound logistics are facilitated via inland waterway transport; also parts of the residue products (meals) are leaving the port of Straubing by vessel. In that sense, the ADM plant in Straubing is offering sales and revenue options to farmers from the Danube region and adds to the European biofuel and protein market. In that sense, the plant can be seen as a key actor in the Danube region's bioeconomy as well as an important client of Danube logistics, which also makes it a key account of the port of Straubing and a flagship for the region.

The settling of the Clariant sunliquid® demo plant in 2012 can – besides suitable site advantages such as the availability of feedstock – be attributed to a substantial extent to the marketing activities of the ZVH and the BCG and their functioning political networks. The Bavarian government committed a substantial co-funding of the project under the condition that the plant will be erected in Straubing. The regional actors were strongly involved in the negotiations. Eventually, the Bavarian government as well as the German Federal Ministry for Research and Education co-founded the project (Chemietechnik.de, 2012). Since then, the plant has attracted numerous international visitors to Straubing, most of them clients of Clariant. Also, since the sunliquid® technology is one of the leading second generation biofuels technologies, Straubing as a site is visible in all of Clariant's corporate presentations on the topic. Therefore, the settling of the plant in the port is regarded as a flagship success for the profile of the region and, at the same time, is an outcome of the profile strategy. Moreover, just like in the case of ADM, the technology has an impact on the development of the Danube region as a leading player in biofuels production. In 2017, Clariant announced that it sold a process license to ENVIRAL in Slovakia as well as the construction of an industrial-scale plant in Craiova, Romania since Romania has enormous untapped straw potential (Clariant, 2017a, 2017b). Since Craiova is close to the Danube, interest in options of Danube logistics also was voiced.

These development steps which materialized in recent years are outcomes of political decisions taken in the 1990s. What started as a top-down approach on Bavarian state level has resulted in the accumulation of and cooperation between several relevant corporate and private actors, significant public and private investments, and the strategic integration of the location at the Danube and access to the Danube region into the now established profile as "Region of Renewable Raw Materials".

Political framework conditions on national and EU level

For the functioning of Straubing as a "Region of Renewable Raw Materials", mainly the local and regional administrative framework conditions as described above are decisive. However, also trends and tendencies regarding political strategies and directions on federal German and European level and the funding programmes that are developed on this basis play a role. They set the thematic boundaries and open windows of opportunity for the activities in the region, as the trend towards a biobased economy and energy policy frameworks is compatible with the region's strategy. Also, the development with regards to the political landscape for inland water navigation

plays a role – how this mode of transport will be integrated in the overall transport system in Germany and Europe will have an impact on the future performance of the region’s strategy as well as – from a corporate point of view – for the future of companies integrating the Danube in their logistics concept such as the ADM.

Moreover, the political decisions on these levels are the primarily decisive ones for the corporate activities of the two bioenergy examples of the Straubing case, the ADM and the Clariant. Since these two companies focus on the segment of biofuels for transport at their Straubing sites, their future success highly depends on the currently undecided legislative support schemes for biofuels on EU level and, consequently, the way this will evolve on federal German level.

Generally, a current upward trend in political support for the biobased economy on EU and German level in the last 10 years can be observed. In this context, the future utilisation of biobased/renewable raw materials is regarded in an integrated manner, for example in biorefinery concepts combining energetic and material use of biomass feedstock. A main indicator for this trend is the recent development of political strategies, communications and funding programmes covering the fields of research, innovation and sustainability in the context of bioeconomy, both on EU and German federal level.

All of these initiatives, funding programmes and concepts target different aspects of the complex topic of bioeconomy. They shape a supportive political context within which the region of Straubing and its profile can further develop, given its actors are skilful enough to exploit the opportunities opened by this trend. This situation is transferable to the Danube region as a whole, since many regions along the Danube have similar starting conditions as Straubing, although most have not reached a comparatively high accumulation of relevant research and corporate actors or receive similar political support. Nevertheless, developing strategies to utilize the starting conditions of strong biomass potential and port proximity can be seen as a model transferable to the entire Danube region. Based on this insight, the ENERGY BARGE project is working towards bringing actors from the Danube region together to strengthen the sustainable utilization of biomass for energetic and chemical-material purposes.

Moreover, Straubing’s strategy to develop the port as a biomass logistics hub and to integrate the biomass potential in the Danube macro-region fits into the European Union’s regional Strategy for the Danube Region. Several of the strategy’s priority areas are mirroring Straubing’s concept and strategy, most prominently Priority Area 1A “To improve mobility and intermodality of inland waterways”, Priority Area 2 “To encourage more sustainable energy” and Priority Area 8 “To support the competitiveness of enterprises” (Danube region, 2018).

Regarding the future viability of the two corporate bioenergy examples, the EU level legislative framework has the most significant influence. Both plants generally function within the supportive bioeconomy framework as described above. Clariant for example also is a full member of the BioBasedIndustry private-public partnership initiative and is partner in a currently EU-funded project (sunliquid, 2018, <https://www.sunliquid-project-fp7.eu/>). Regarding market viability, both depend on EU legislation for the utilization of biofuels: ADM is marketing its first-

generation biodiesel on the general market, and Clariant is aiming towards market readiness level with its second-generation bioethanol blends.

The most important and currently decisive legislative documents in this respect are:

- EU Renewable Energy Directive 2009/28/EC (European Commission, 2018c)
- EU Fuel Quality Directive 2009/30/EC (European Commission, 2018c)
- EU Directive to reduce indirect land use change for biofuels and bioliquids EU 2015/1513 (European Commission, 2018c)

This legislative framework sets the boundaries and regulations within which both the Clariant as well as the ADM can develop their business and market their products. The Renewable Energy Directive sets a mandatory goal for renewable transport fuels to amount to a share of 10% of the overall transport fuel consumption in all member states. However, this most important instrument is currently subject to a recast to set the stage for the time after 2020. The recast proposal was presented in 2016 and includes new sustainability regulations as well as emissions saving targets with a specific influence on transport biofuels as compared to conventional fuels. It outlines that the share of advanced biofuels and biogas produced from feedstock as listed in the Annex of the proposal, shall increase from at least 1.5% in 2021 to a minimum of 6.8% in 2030. Suitable sustainable feedstocks for advanced biofuels are e.g. cultivated algae, or residue material (European Commission, 2018c). This recast thus clearly favours second-generation biofuels over first-generation biofuels such as ADM's rape biodiesel and would mean significant market distortions for first-generation biodiesel in case the current proposal is eventually adopted and transferred into national law. Therefore, biofuel companies such as ADM have to look into new business models. Similar developments have been identified in other biofuel plants along the Danube in the course of the ENERGY BARGE project. Companies such as Clariant, which work towards second generation biofuels, on the contrary, will profit from the recast. The fact that Clariant now has broken ground on a large-scale lignocellulosic ethanol plant in Romania shows that they are convinced of their technology and the political framework and that the Danube region is the right location for the future of European advanced biofuels. They are conducting a pioneering investment now which might lure in other companies.

Thus, it can be stated that the biofuels industry in Europe and Germany continues to be subject to a volatile legislative landscape with U-turns which has an effect on the Danube region as well. The ENERGY BARGE project thus aims at highlighting this situation from a political point of view. In case political decisions lead to a decline in first generation biofuels due to sustainability reasons, the sector traditionally strong in the Danube region should be supported in transforming towards solutions with a higher performance according to the environmental standards the EU prescribes. Additionally, investments into advanced biofuel and bioenergy solutions such as the one conducted by Clariant in Romania should be observed and supported and efforts shall be made to integrate such first examples into a broader network of bioeconomy-related sites along the Danube region. Options to connect these sites and their feedstock and product streams could be assessed.

Recommendations for improvement

The Straubing case shows that a proactive development and marketing strategy towards the targeted utilization of given preconditions in the region - be they infrastructural, geographical, institutional or societal of nature – can be effective in order to shape an economic profile. In terms of establishing new supply chains for bioenergy and biomass use along the Danube, this approach is transferable to a number of regions with access to domestic or imported biomass supply and proximity to ports. In the Straubing case, mainly regional administrative frameworks and funding decisions on Bavarian level had a shaping influence. Moreover, national and EU legislation and framework conditions are generally in favour of the development of a European biobased economy, increased utilization of sustainable bioenergy and the economic development of the Danube region.

Corporate actors in such regions may in certain occasions be able to use the regional conditions to their favour. However, mostly, they are depending on EU legislation since they market their products on open markets and their products are subject to legislative regimes and regulations. Therefore, changes in favour or against these actors' markets, as in the case of first generation biofuels, might cause a loss of key accounts. Therefore, it should be recommended to the regional actors in Straubing to engage in monitoring of the political landscape, utilizing its networks to conduct political lobbying and to offer innovation support to its key accounts in case they are looking to diversify their portfolio. For the port operations, the same recommendation applies. It is of utmost importance to diversify the customer portfolio in the port of Straubing since dependence on single key accounts which in turn are prone to political disruptions poses a risky situation. Therefore, further targeted business development and scouting activities to attract additional industrial settlements in the port with interest to use the Danube as a logistics axis and the port as a hub for biomass processing are recommended. The bioeconomy sector here offers ideal options for scouting since the Danube region has potentials for feedstock supply as well as for the establishment of new value chains. Here, the new Clariant plant in Craiova could be an ideal pilot case to showcase how high value added biomass processing in the Southern Danube region can be connected with operations in the Northern part of the Danube and how ports can be involved in this.

Lessons learnt

When looking at the region of Straubing, it becomes apparent that the administrative framework conditions are shaping the way in which actors in such a region can operate. Most importantly, it can be learnt from this good practice example, that strategically combining and utilizing the given strengths of a region (in this case: infrastructure and geographical location along the Danube in combination with present institutions for the topic of bioeconomy) can help shaping a profile which attracts corporate actors and establishes added value and new supply chains in the region, while at the same time adding to the European biofuels market. In order to make this endeavour successful, a number of success factors were utilized in Straubing, which might also be of relevance for other regions aiming to develop in a similar direction. These are:

- Presence of dedicated research, support and education institutes

- Constant commitment of local, regional and state politics
- Stable influx of funds for several large-scale regional projects
- Cluster organisation with biomass-targeted regional marketing and branding
- Targeted regional development strategy combining the thematic and economic focus on renewable raw materials as regional profile with geographic location at the Danube / access to the macro-region Danube with high biomass potential
- Awareness activities targeted at broad public audience and cooperation with non-governmental organizations from the conservationist realm
- Possibility to involve a broad regional actor network for thematically targeted projects and access to individual networks of regional actors which span EU-wide and internationally (e.g. research network Technical University Munich, international research partners of the Technology and Support Centre Straubing) in the context of bioeconomy
- Access to port infrastructure and option to proactively market infrastructural conditions
- Successful settlement activities in the field of bioenergy in the region can create “pull effect” for further settlings
- Increasing relevance of an integrated view of utilisation of renewable raw materials in the conceptual framework of the bioeconomy as visible in political strategies
- Increase in accompanying funding programmes on federal and EU level for integrated use of biomass
- Growing awareness on necessity of sustainable alternatives to conventional fossil-based materials and fuels
- Relevance of economic and regional development of the Danube macro-region on EU level

Besides success factors, the case of Straubing also reveals a set of inhibiting factors on administrative level which need to be kept in mind when developing the Danube region towards integrated biomass-based value chains.

These include:

- Lack of (realised) new “flagship” projects up until today (e.g. lagging project development of multipurpose plant) flagships are of high importance and administrative procedures should not inhibit their development
- Complex actor structure leading to complex communication and information asymmetries and subsequent inefficiency and missing out on opportunities

- Volatile federal and EU legislation on biofuels and bioenergy leading to investment uncertainty and potential risk of corporate shut downs → focussing on a comparatively young economic field which depends on political regulations and support can be risky
- Ongoing public discourse on feedstock competition (“tank vs. plate”) regarding the utilization of biomass for energetic and chemical-material purposes

3.4 Hungary – Example 1

The good practice example depicts the present and future bioenergy production activities of the Hungarian district heating sector on two levels. One level is based on a nationwide survey among members of the Association of Hungarian District Heating Enterprises (MATASZSZ, n.a.). The second is the local level, which is based on expert interviews with the management of Bioenergy-Duna Ltd., a biomass-based energy producer located in the vicinity of River Danube (estimated distance to the nearest port in Mohács is 2.6 km) in the town of Mohács. The Mohacs district heating network is a relatively small one (total capacity 4,5 MW, it and it supplies 2,015 flats and 42 institutional consumers in Mohács), however as biomass-based energy producer one of the pioneers of the technology. The biomass-based power plant started its operation in 2013, with state of the art equipment. The raw material shipment is organised based on annual contracts and market conditions may change prices considerably as no long-term production or shipment arrangements are set for the safety and stability of biomass supply. Due to its ownership – indirectly owned by 100% of Mohács Municipality – it is classified as a large company. Otherwise it has a staff of 7 and an annual turnover of appr. 217 million HUF.

The intention of MATASZSZ is to foster the harmonisation of biomass supply of the existing and planned heat and combined heat and power plants operated by district heating companies in Hungary. This initiative can be a very good base for harmonised raw material supply and policy level strategic discussion on availability and competitive utilisation of biomass raw materials for electricity and heat production (including long term supply strategies, optimal transport, ideal location for new power plants etc.)

In case of the Bioenergy-Duna Ltd in the town of Mohács, the supply chain is currently based on road transports directly from the forests, in most cases without any transshipment. In the future, when new port capacities will be available in Mohács, waterway transport will probably gain a more important role for biomass transports as part of the woodchips used in the plant are imported entirely from Croatia, further supply possibilities may arise from abroad. Moreover, as the area of the neighbouring Gemenc forests in Hungary is partly located on an island in the Danube not far from Mohács, the new port can open alternative transport options for the utilisation of those biomass stocks.

Regulatory framework

The legal framework conditions of the case study with special regards to funding programmes and granting sources are presented to examine whether they are in line with the national and local policies and objectives. An operational legislative framework and a sustainable organisational-institutional background comprise several success factors, such as:

- leading actors (public and market players), inspiring central actors;
- well-defined regulations, strategies and goals;
- financial opportunities for developing the sector, funding programmes and awards;
- networking/clustering to reach/cover all stakeholders, define common goals, represent interests, launch knowledge transfer.

National, regional and local strategies and goals

The National Renewable Energy and Bioenergy Targets, based on the Renewable Energy Strategy directive 2009/28/EC, aims to reach a share of 14.65% RES in the final energy consumption by 2020 (IEA, 2011). This share has almost been achieved in Hungary, due to the high rate of firewood used in rural areas.

The main legislation on district heating services is Governmental declaration 157/2005 (VII. 15.) on execution of act 2005. XVIII. on district heating services (Korm. Rendelet, 2005 – applicable since 1 January 2017).

Regarding local legislation, 11/2006 (VI.6.) declaration on district heat supply by Municipality of Mohács has to be noted (Mohácsi ör., 2015). The declaration, beside the fix purchase prices, covers district heat consumers located in the territory of Mohács, fee-paying users, companies supplying them with district heat, and also the owners of district heating equipment, facilities.

As described above, the legislation of a biomass-based district heating system is very complex, and the preparatory phase of developments is time consuming and expensive. During the operation, administrative burden is considerable, and regulated heat prices for residential end users make developments without state aid not viable.

Funding programmes and awards

METÁR (Renewable Energy Support Scheme) exists since 1 January 2017. The system supports electricity production from renewable energy sources on a national level in Hungary. METÁR subsidies – except the “brown premium” subsidy (a specific subsidy available for biomass and biogas power plants to maintain the viability of biomass or biogas power plants, license with no tender is for a period of five years from the Hungarian Energy and Public Utility Regulatory Authority, HEA) and the household scale small power plants – may benefit from renewable electricity generation related to new investments in case the implementation has not yet begun by the time grants are requested. Combustible or waste incineration plants can only receive support for renewable energy sources. In this system, grants are provided mostly through tenders. The Minister of National Development is the decision maker in terms of publishing calls for

proposals. The organizer of the tenders is HEA (mekh.hu). New power plant units (excluding wind power) and demonstration projects with a capacity below 1 MW can request grants from HEA; afterwards HEA determines the duration of the grant's funding period.

According to METÁR's funding period policy a project receives financial support until the investment has returned. For instance, if a project recovers its investment and becomes profitable within eight years, in the frame of this system, the beneficiary receives grants for the given eight years.

The KEHOP Environmental and Energy Efficiency Operational Programme aims to support sustainable growth and contribute to the achievement of the Europe 2020 targets for smart, sustainable and inclusive growth. It improves flood protection, provides better waste and wastewater management services and quality drinking water to more inhabitants, helps protecting the natural habitat and species, and improves energy efficiency and the use of renewable energy sources. In the framework of the Programme two initiatives have been aiming to develop the district heating sector (in the framework of the SZÉCHENYI2020 Governmental Programme):

- Modernization of the district heating sector (identification number of the grant call: KEHOP 5.3.1-17)
- Supplying local demand for heat with renewable energy sources (identification number of the grant call: KEHOP 5.3.2-17)

These calls are still open, in KEHOP 5.3.2-17 the available funding for the subsidy was increased to 19.89 billion HUF in July 2018 and the funding is available until April 2019, while in KEHOP 5.3.1-17 the available funding for the subsidy was reduced to HUF 25.07 billion HUF in July 2018 and the call is open until May 2019.

The district heating supply system of Bioenergy-Duna Ltd. is constantly being developed and its comprehensive energy modernization was completed in 2013. The company has installed three hot-water boilers with a capacity of 4.5 MW and equipped with natural gas for modernization of the heat exchangers from KEHOP funding. In the future they plan to upgrade the boiler section of the heating plant and other eco- friendly biomass projects with the help of 'KEHOP' grant calls. Beside Bioenergy-Duna Ltd., all other owners/operators of district heating and renewable energy heating systems can apply for KEHOP funding, which is the most common and easily accessible way of funding these kinds of investments in Hungary.

Cluster organisations

MATASZSZ, the Hungarian Association of District Heating Enterprises is the current and continuously growing institute that includes the District Heating Company of Mohács as well. The Association covers service providers nation-wide and it plans on mapping these companies' supply chains as well.

The Association aims to increase renewable energy-based solutions and to increase the sharing of biomass-based energy when supplying.

Framework conditions of Danube logistics for biomass transport

The share of IWT lags behind other modes of transportation, road and even railway (KSH, 2016). There are several fees and taxes to charge shipping companies and cargo ports with on the Danube, which is a freely used international waterway.

In opposition to the EU directives regarding modal split in transportation in Hungary, the sharing of the eco-friendliest modes of transportation i.e. railway and IWT are decreasing while road transportation is growing. Investing in environment protection shall equally be facilitated by the state since it is a less profitable activity. In Hungary, there are no funding programmes either for the “greening” of the logistics sector and inland waterway transport in general, or specifically for the transportation of biomass raw materials and renewable energy sources. These factors make the sector less competitive. Therefore, also the case of Bioenergy Duna Ltd. is currently not using IWT as a logistics solution.

Lack of coherent strategies or incentives in the energy sector

Pricing policy and mandatory price cuts imposed by the Government on the utility companies in household utility costs are the Government’s short-term solutions for lowering Hungarian households’ expenses on public utility (Kocsis, 2014). In the framework of this energy policy, suppliers are obliged to provide their services on reduced prices, which preserve the current regime and wide range use of traditional gas and nuclear energy meanwhile investing in eco-innovative solutions, since launching and expanding renewable energy-based technologies are impossible for smaller service providers due to their low income. This is obviously environmentally and socio-economically unsustainable and ensures no space for the growth and development of biomass (nor solar, wind, etc.) energy markets.

Due to the characteristics of solid biomass raw materials regarding transportation, the most logical utilisation of biomass with energy purposes is to build service provision locally, close to the original locations of the renewable energy sources.

Recommendations for improvement

- Further prioritization of biomass-based energy production via price subsidy or tax system.
- Prioritization of waterway-based biomass supply with infrastructure developments both on the supply and end user side.
- Harmonisation of raw material availability and production based on long-term national level strategies, long term cooperation between forestry and district heating companies.

Lessons learnt

- Biomass based energy production is utilised only in peak seasons because of higher production costs and regulated prices.

- Due to its cost effectiveness (no transfer) and flexibility, road transport is in a better market position for biomass transport.
- For further technical developments district heating companies have only limited resources (most developments during the past few years were financed from EU Structural and Cohesion Funds).

3.5 Hungary – Example 2

The second good practice example from Hungary depicts the production activities and future opportunities of the Hungrana Starch and Isosugar Manufacturing and Trading Co. Ltd. with approximately 350 employees, which is one of the most significant corn processing companies in Europe. Hungrana process exclusively Hungarian GMO (genetically modified organism)-free corn, more than 1,000,000 t on a yearly basis. The Austrian Agrana Group and the American ADM company each own 50% of the company. The plant uses the so-called wet milling technology. During the process starches, alcohols, fodder products and sugars are produced. In the last few years, many developments have been made in the plant such as new Pharma2 plant for ultra-high purity organic ethanol as well as the commissioning of a new pelletizing unit for pelletized feed materials. Furthermore with the combustion of biomass raw materials in biomass boilers the company is able to replace more and more parts of the natural gas needs.

The Hungrana plant is located in the town of Szabadegyháza. The supply chain of the company is quite complex. Feed corn is transported by road or rail directly after harvesting (during the harvest period) or in dried form after storage. Port capacities are a part of the logistics chain regarding the company's export activities. The transport of various by-products (corn germ, corn gluten, pellet etc.) is carried out via waterways. The produced bioethanol is transported by rail or road to refineries or to export. In summary, the case of Hungrana presents a good practical example of professional processing of corn; this also shows how many different products are being produced beyond biofuel. The company also integrated the water transport mode into its logistics chain which is currently an alternative opportunity to fodder products and other raw materials.

Regulatory framework

According to the renewable energy action plan of Hungary and Res-Legal EU website, the first Renewable Energy Directive set a target of 10% of renewable energy sources in the transport sector, including first generation biofuels made from food crops. This directive was amended in 2015 and the contribution of conventional biofuels from October 2017 will be limited to 7% of energy consumption in land transport, a figure that will be lowered to 3.8% in 2030 under the latest Commission proposals. At the same time, the EU executive also set an obligation to raise the share of other 'low emissions fuels' such as renewable electricity and advanced biofuels in transport to 6.8% by 2030. This will have a significant effect on the Hungrana business model as the bioethanol production currently relies on corn, thus a first generation biomass. If the compulsory mixing ratio would be increased, it could also have positive effects on the prospects

of this industry. Without the current manufacturers, the country would export this valuable biomass material (maize) in unprocessed form and lose added value. Central European countries have long opposed the reduction of crop-based biofuels as this will hamper their chances of creating a new agricultural market. Hungary is among the ten largest bioethanol producing countries in the European Union. Hungrana Ltd. is operating the second largest bioethanol plant in Hungary. An important factor is to get to know the industry's positive impact, not only from the side of the bioenergy market but also from the valuable feed materials that are produced during the process. The National Protein Feed Program was announced at the end of 2017. The three-year research & development programme is being launched in the interests of fully replacing imported genetically manipulated soy in Hungarian animal feeds with domestic protein-based plants. In this R&D programme Hungrana will be organically involved.

As the company deals with the production of biofuel, this area is depicted in detail. Biofuels used for the purposes of reaching the EU emissions target must fulfil strict sustainability criteria in terms of the source and cultivation of the raw materials as well as in terms of the greenhouse gas reductions compared to fossil fuels; this compliance has to be established by means of a certification based on the ISCC Standard.

Currently, there is a target for biofuels, determined as the share of pure biofuels and biofuels added to conventional fuels in the total quantity of petrol placed in the market. The quota is set by a Government Decree. For plants put into operation before 5 October 2015, the use of biofuels has to result in 35% (until 2018: 50%) lower greenhouse gas (GHG) emission levels than if conventional fuels were used. For plants put into operation after the 5 October 2015, the use of biofuels has to result in 60% lower greenhouse gas (GHG) emission levels than if conventional fuels were used. Based on the ministry of agriculture's statement on the EURACTIV.com website gradually phase-out first generation biofuels by 2030 would have a "major" negative impact on Hungary's rural development through this, also for the biofuel market. Farmers will be unable to sell the raw materials they produce, the majority of which are purchased by the biofuel processing industry, parallel to which export revenues would also be significantly reduced, which would have a negative effect on the waterway transport in this case of processed agricultural crops (e.g. by-products of maize processing) and biofuels.

Bio-quota obligations §6 (3) Decree No. 279/2017):

- 01.09.2017 until 31.12.2018: 4.9%
- 01.01.2018 until 31.12.2020: 6.4%

for both petrol and diesel (§6 (4) Decree No. 279/2017).

Biofuels and hydrogen are eligible technologies. However, only certified biofuels satisfying specific sustainability criteria can be accounted into fulfilling the prescribed quota. The sustainability criteria for biofuels as well as the procedure for certification are regulated by law (§4 Decree No. 279/2017 and § 3 (1) Act No. CXVII of 2010). Likewise, biofuel profiting from tax reduction is not eligible (§ 5 (2) b) Act No. CXVII of 2010).

The quota is determined as the share of pure biofuels and biofuels added to conventional fuels in the total quantity of petrol placed in the market (§ 5 (1) Act No. CXVII of 2010). The quota fulfilment has to be accounted for by the fuel retailer on a yearly basis. (§ 6 (1) Decree No. 279/2017).

Recommendations for improvement

Hopefully to the organized National Protein Program, the replacement of large quantities of imported soybeans into the country could be realized with GMO-free protein crops grown in Hungary. Among other things, this would be an opportunity to increase the processing capacity of the national bioethanol plants.

According to CEO of Hungrana the so-called E10 (10% is the proportion of bioethanol) fuel could mean a further development path, which is being introduced in more and more European countries. From annual Hungarian maize production (8-9M tonnes), Hungrana buys nearly 1.2 million tonnes of maize, if the E10 is introduced, then this quantity could be increased. At the same time, they would also be able to produce high levels of feed with high protein content for livestock owners.

At a prospective government level, the so-called advanced or second generation biofuels, made from wastes and residues would also be eligible, but this should not come at the expense of crop-based first generation biofuels.

Lessons learnt

It can be stated in general, Hungary is one of the ten largest producers of bioethanol in the European Union. It is of particular importance to Hungary for all regulations, EU decisions, which affect the future of biofuels, as corn producers are a trustworthy market for the industry, since the corn industry is a secure market for maize producers.

The forthcoming renewable energy directive and the domestic regulations based on it would be important regulations. The change of the compulsory mixing rate for the engine gasoline will be a major issue both for the plant and the achievement of emission targets of the whole country.

3.6 Romania

The company Forest and Biomass Romania S.A., founded in 2008, which has invested over 15 million Euros in purchasing and managing agricultural and forest land, with a turnover in 2017 of over 5 million Euro (SME), has been identified as a good practice example from Romania. Currently, the company comprises an agricultural farm with 4,200 ha of arable land, of which 270 ha are cultivated with poplar plantations. From a forest area of 5,000 ha, about 20,000 m³ of wood are harvested annually. The company expertise covers both: managing agricultural/forested land and producing energy from biomass.

The company has conducted feasibility studies for the use of agricultural and forest biomass for the supply of thermal energy in the residential sector, small scale investments in cogeneration plants linked with residential heating systems, in order to use biomass resources from its own sources. The company is located in the West of Romania in Timis County. The agricultural and forest land is located within the Foeni and Giulmaz localities, very close to the border between Romania and Serbia, at a distance of about 100 km from the nearest port at the Danube.

The proximity to the Danube river and the volume of biomass production by the company (taking in consideration that the company will advance with the fulfilment of the investment), will create a potential new important stakeholder at the Romanian and Danube biomass market with a focus to both local market (Romania) and Central European market, where existing inland navigation infrastructure in the area can give a competitive advantage to the project.

Regulatory framework

At the end of 2016, the support scheme on new renewable energy projects has been ceased and no other legislation has been issued. However, for existing installations, which have been connected to the grid before that date, the scheme remains valid 15 years from the commissioning by the authority in charge, the National Regulatory Authority on Energy (NRAE).

Law 220/2008 stipulates the obligation for the producers of bioenergy to obtain Certificates of Origin (CO's) for biomass, which is used for energy production. The CO's are issued by the Ministry of Environment and Forests for biomass from forestry and related industries as well as for biomass from industrial and municipal waste. The Ministry of Agriculture and Rural Development issues certificates for biomass from agriculture and related industries.

Law 220/2008, aiming to support the generation of energy from renewable sources, including biomass, is currently facing some challenges. Currently, taking into account the different types of biomass and the obligation of the respective Ministries to issue the legislation for CO's allowance, mainly agricultural products can be supplied without complications, which apply also for agricultural residue materials. The selection criteria of biomass in this sector are unclear, set up by the Ministry of Agriculture and Rural Development, which nominates as energetic culture plants only corn, triticale, rye and sorghum (Order 46/2012 of Ministry of Agriculture and Rural Development, 2012).

Biomass projects already existing and operating in Romania are facing a series of difficulties due to the legal provisions on the matter, with heavy impact at their operational business. As to exemplify those mentioned above, the following aspects have to be taken into consideration:

- a) The support scheme on Green Certificates (GC) is currently dysfunctional as GC's flooding the market (average of 9,000,000 GC's) (OPCOM, Monthly report, 2017). The huge amount of GC's hold by the renewable energy producers have a negative impact on their cash flow as well as in the possibility of presenting a healthy business plan to be financed by banks on long-term basis.
- b) The restriction of the small-scale renewable energy projects (less than 3 MWel electric capacity installed) of concluding bilateral contracts with energy traders (Legex, 2017a). As long as the GC's

Day Ahead Market is overloaded, the small scale biomass producers must sell the energy at less than fair value, compared with the current OPCOM Market price in order to sell a part of GC's stock to the same trader as an energy package.

c) The procedure of issuing the CO's, which should allow a company that owns biomass to obtain the biomass certification, as well as to offer the possibility of those renewable biomass producers to prove the provenience of purchasing biomass (Order 1534/2016 of Ministry of Waters and Forests, 2016).

Order 1534/2016 has been issued by the Romanian Authorities as a countermeasure to illegal loggings, which has reached an unprecedented scale and limited the available amounts of biomass to produce renewable energy (Order 1534/2016 of Ministry of Waters and Forests, Art.1/Annex, 2016). In consequence, Forest and Biomass Romania S.A. is facing serious issues on performing their core business of fuelling the renewable energy production.

The GC's subsidies scheme was ceased by the end of 2017 (Law 220/2008, on establishing the system to promote the production of energy from renewable energy sources, 2018). After this date, the GC's are allocated and can be traded on an electronic platform named OPCOM only by the companies that were accredited before. After this date, new entrants on the electricity market do not receive any support from the scheme.

The new Emergency Government Ordinance (March 2017) converted the Green Certificate scheme from a mandatory quota (a quota that was established on a yearly basis and covered roughly 60-70% of the issued GC's – e.g. for 2017 it was 8.3%) into a fixed number of GC's to be purchased annually. Currently, this number amounts to approx. 14,600,000 GC's. The number of GC's, which is also subject to revisions every two years, should cover 100% of the issued GC's, so no producer should have unsold GC'S (Legex, 2017a).

In April 2017, the Romanian Government issued the Decision no. 216/2017 regarding the approval of the state aid scheme aimed at supporting investments on promoting the production of energy from less exploited renewable sources, namely biomass, biogas, geothermal energy (Legex, 2017b).

The state aid scheme established by GD 216/2017 aims to increase the installed capacity of electricity and heating energy from biomass, biogas and geothermal energy by 60 MW. The state aid scheme applies to investments related to the realisation and/or modernisation of the production capacities of electric and / or thermal energy from biomass, biogas and geothermal water.

In the case of Romania, the potential of using biomass for renewable energy is very little used due to the fact that Romania has achieved its renewable energy targets for 2020 (profit.ro, 2017). These targets have been reached already by over 60% as about 4 million homes are using firewood for heating purposes.

The huge consumption of firewood led to a shortage in this market segment, to very high prices of wood resources and to legislative measures to limit the use of wood resources in the production

of renewable energy from biomass. Practically, for the production of wood biomass energy, it does not qualify for support schemes except for the use of waste from primary wood processing, with only sawdust being used. The legislative and administrative framework for obtaining certificates of proven origin for the support schemes for the production of renewable energy from biomass is cumbersome and restrictive (Order 1534/2016 of Ministry of Waters and Forests, 2016).

The sector of biomass and thermal energy production is clearly underdeveloped in Romania, although there is a very high potential for mobilization of raw material stocks, both for agricultural and forest biomass. Due to current market conditions, in order to get a thermal energy project sustainable in Romania, State incentives are considered necessary. As currently there is not an active law for the support of biomass and bioenergy market, the whole biomass sector cannot reach its potential and this affects the availability of biomass raw material that could reach Central Europe with the use of inland navigation through the Danube river

3.7 Slovakia

The company INTECH SLOVAKIA - NÁRODNÁ ENERGETICKÁ has been identified as good practice example in terms of using biomass for energetic purposes in Slovakia. Narodna energeticka is the holding company with a group of 8 subsidiaries - companies, which produce, distribute and supply heat to municipal as well as industrial customers. The majority of the installed production capacity is based on biomass feedstock, including wooden chips, pellets, as well as straw and hay. The producing companies have high – level technical equipment as described more detailed in the part Utilization of support programmes. The company (as a group) is operating in SME segment, based on banking classification. Overall revenues reached approximately 13.6 mil. EUR in 2017 (non-consolidated figures) (Finstat, 2018).

Narodna Energeticka is operating heat production units in eight different sites, located nationwide across Slovakia, mainly in the region of Mid to South Slovakia. The respective locations of the sites are directly related to local biomass feedstock availability.

The company is involved not only in the generation of heat by operating boilers and production sites, but also – via the company INTECH SLOVAKIA – on management and supply of biomass feedstock to its own operational companies as well as to external customers. The bioenergy market thus represents the main market and basis for the business model.

Economy of energy production in Narodna Energeticka consists in to using the cheapest biomass feedstock, such as waste wooden chips and residuals. This is resulting into logistics applications, where road transportation, utilising preferably own handling and transportation fleet is used. The reason to select the Narodna Energeticka for this report as an example of good practice consists in following facts:

- Optimal attitude towards management of all subsidiary companies Investment in production sites to secure most effective performance considering both technical and economical parameters

- Optimization of biomass sources concerning both effectivity and price, mainly by combination of wooden chips and waste straw (for more details see the part Utilization of support programmes).
- Concern towards permanent development of all factors related to the increase of effectivity of energy production from biomass, demonstrated recently e.g. by establishing an experimental field for cultivation of fast growing plants as a source of biomass for energy production

Regulatory framework

The key national policies and strategies that concern the use of renewable sources of energy and/or biomass in particular, and are relevant to Intech Slovakia s.r.o., comprise the following aspects:

1. The Use of Biomass from Agriculture and Forestry (Rokovania, 2004) includes a programme for the utilisation of biomass from agriculture for heat production with the goal to save energy from traditional sources of heat production.
2. The National Action Plan for Renewable Sources of Energy (Rokovania, 2010) is a framework programme based on the Directive 2009/28/EC on the promotion of the use of energy from renewable sources, which sets the goal of increasing the use of renewable sources of energy from 6.7% in 2005 to 14% by 2020.
3. The Energy Policy of the Slovak Republic (Rokovania, 2014) and the Strategy of Energy Security in the Slovak Republic (Rokovania, 2008) both state that biomass has the largest potential to provide the largest contribution towards meeting the 14% target. Furthermore, biomass represents also an important potential for the development of regional and local economies.
4. The National Sustainable Development Strategy of the Slovak Republic (Rokovania, 2001).
5. The National Programme for the Utilisation of Wood Potential in the Slovak Republic (Rokovania, 2013) has a goal of increasing the utilisation of biomass from forests for energy production. The programme contains four objectives: (1) increase the level of biomass utilisation from forestry, (2) support sustainable increase of wood production for fuel (3) support the increase and effectiveness of energy production from wooden biomass, and (4) implement the strategy for production and utilisation of wooden biomass in Slovakia.

The set of national policies, plans and strategies above is outlining the main policy framework for the utilisation of renewable energy sources in real applications. These policies and strategies are then implemented in subsequent legislation, thus creating framework conditions that are crucial for the company as it regulates the overall pricing policy, including subsidies. For the company's business model, it is important to have a stable, transparent and long-term sustainable policy strategy, which consequently allows long-term investments into relevant assets.

Narodna Energeticka operates within a standard legal framework that is set by the following common legal instruments. However, the key legislative documents for the successful implementation of company's business model are discussed below.

The Act Nr. 309/2009 on support for renewable energy sources and combined power production in conjunction with the Act Nr. 656/2004 on power engineering and the Act Nr. 250/2012 on regulations in network industries (for all acts please refer to Slov-Lex, 2018), constitute a key piece of legislation that deeply affects Narodná Energetická's business. The document it defines legal basis for all commercial activities related to energy production, distribution, and using.

First of all, it defines the term biomass and specifically includes the list and description of sources of renewable energy. Further on, the act outlines support for energy production, including both electricity and heat, from renewable energy sources.

Among other things, the act guarantees preferential attachment and access to, and electricity distribution through the regional distribution grid. It also provides for Narodná Energetická to receive back pays on the electricity generated and for the grid operator to purchase electricity from Narodná Energetická at a loss. Finally, the act shifts the responsibility for correcting any abnormalities in electricity delivery to the regional distribution grid operator.

All of this makes it more stable for Narodná Energetická to operate. Better still, subsequent directives of the Regulatory Office for Network Industries, as the primary state authority for regulating network industries, offer additional benefits, including:

- Preferential access to the grid (for both, electricity and heat distribution).
- Long term purchasing contracts (10-15 years).
- Subsidized prices during the first year.
- Guaranteed prices and other conditions for the entire duration of the contracts.

Combined, these benefits are of key importance for future investing and make access to commercial (bank) financing much easier, because they guarantee stable demand for Národná Energetická's heat output. A stable and guaranteed income for the next 10-15 years substantially reduces the credit risk and allows Národná Energetická to borrow more money at better rates

The Act Nr. 657/2004 on heat energy production (Slov-Lex, 2018) regulates market conditions for thermal energy production and trading. The entire act is relevant for Narodná Energetická as being among the 5 biggest heat suppliers in Slovakia in the heat energy markets.

Of particular notice are the provisions for construction of heat generating units, which – if in excess of 10 MW – require a permission that signifies the project's accordance with the Energy Policy of the Slovak Republic. Such permission will be denied, however, if the new facility is likely to cause a decrease in heat demand from existing infrastructure and simultaneously increase the cost to the final consumer or cause inefficiencies in heat production and delivery.

The point of importance is also the provision that requires the heat producer to maintain a fixed level of heat production guarantees its quality and conform to the set pricing policy. This, in view of the changing availability of biomass (due to seasonality and weather conditions), might have both positive or negative impact on the economic performance of Narodná Energetická. For example, when weather conditions are not favourable during the growing season, the availability of biomass is negatively affected. This pushes the feedstock prices up and forces Národná energetická to look for alternative sources or accept higher prices. As a result, the costs of heat go up, which could result in operating losses for Národná Energetická.

In the event that Narodná Energetická might experience difficulties in sourcing sufficient quantities of biomass, the act makes provisions for situations when long-term unavailability of energy sources results in interruptions in heat production and/or delivery.

Other considerable legislation includes the Act Nr. 326/2005 on forests (Slov-Lex, 2018), which regulates forest management. It doesn't affect Narodná Energetická directly, but it does have significance for INTECH SLOVAKIA, a biomass processor and supplier to Narodná Energetická. Among other things, the act defines the terms energy forests and forest plantations and sets forth the conditions for wood harvesting thereon. This makes it easier for Narodná Energetická's suppliers to source appropriate amount of wood for processing into biomass when needed. A similar impact has the Act Nr. 220/2004 on the protection and management of agricultural land (Slov-Lex, 2018), which defines the term fast-growing woodlands grown on agricultural land. This is directly connected with the pilot project of Narodna energeticka, which is testing in the daughter company in Trebisov the production of bioenergy by burning of wood from the fast-growing tree paulownia. Energy forest plantations are a relatively new and underutilized source of biomass in Slovakia. However, if proven cost-effective, it could become a significant source of feedstock not only for Národná Energetická subsidiaries, but potentially all Energy Barge partners. This was also mentioned above when explaining the reasons why Narodna Energeticka was selected as positive example for good practice.

Utilisation of support programmes

Three subsidiaries of Narodna Energeticka took part in the project SINBIO (Sustainable Innovation in Bioenergy) in 2014-2015. The main objective of the project was to ensure sustainable heat production from local renewable sources (biomass) and support local economy of backward regions (Projekt BFB, 2016).

The attitude of Narodna energeticka related to good practices can be demonstrated on the abovementioned project SINBIO (Sustainable Innovation in Bioenergy) which is the biggest project in Slovakia supported from Norwegian funds for the period of December 2013 to April 2017 within the programme Green Innovations in Industry. The project was realised in four regions of central and eastern Slovakia and Narodna energeticka participated in the project via three subsidiary companies, namely Trebisovska energeticka, Poltarska energeticka and Tlmacska energeticka, where reconstructing of the whole heat production system by seven small gas heating plants resulted in a building up a new heating plant suitable to burn either wood chips or straw. In close cooperation with all partners, the overall heat demand will be covered by 75%

from straw and 25% from wood chips available from local producers in the region. The part of the plant contains also a gas boiler used as a backup for top-level occasional consumption. New boilers for biomass were installed also in Poltár and Tlmače (all locations covered by subsidiaries of Narodna Energeticka) with the total power of 12.5 MW. These boilers replaced the old systems of central heating, which was supplied originally by coal and gas. A side effect of all projects was the optimisation and increasing efficiency of the local heat distribution system.

4 Conclusions

This report has shown that there is still need for action at many levels – but also potentials -, so that the Danube is perceived as a sustainable, efficient, (trans)national waterway transport route. Local businesses must be strengthened in their efforts to produce alternative bioenergy and its raw materials. This includes building cooperation between different economic sectors (agriculture, forestry), full state support for bioenergy at local and European level. Flagship projects can help to show positive examples and encourage imitation. This applies for production as well as for transport.

A challenge for the Danube navigation is the competitive strength of road transport. Here, a transport is possible at any time, while the inland waterway transport is dependent on water levels and geographically favourably located ports. The Straubing region has shown that it is possible to combine the advantages of a region and thereby create a thriving bioeconomy. The connection of the industry to the harbour creates an efficient use of this transport route. This example could be transferred to other countries. Furthermore, increased competition among bioenergy companies could help to open up new transport routes to stand out from the majority. The environmental friendliness of ship transport offers a possibility here.

Modernisation and expansion of ports can help them to be perceived as bioenergy centres. However, this can only be done with the help of appropriate state support measures. Also, an expansion of the infrastructure located around the ports is essential to strengthen this branch of transport.

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Annex 1 Case selection criteria

Case selection criteria

Annex: Case selection criteria D.3.2.3						
Country:						
Name of Case:						
Name of project partner:						
Name of person in charge of case selection:						
				<i>indicate with an "X"</i>		
Thematic criteria	full match	partial match	no match	internal notes/comments		
1) Comparatively important role of biomass and/or bioenergy in regional and/or business strategy						
2) Easy to define as a "case" according to task description						
3) Existence of (at least partial) biomass supply chains on regional level						
4) Existence/utilization of biomass logistics (road, rail, water)						
Geographical criteria						
1) Proximity to Danube port < 100 km						
2) Case can be regionally limited						
Performance criteria						
1) Case can be considered as comparatively "high-performing" in comparison with other companies or regions with respect to well-functioning business and/or biomass utilization						
2) The case is in a sense using innovative approaches in it's regional and/or business strategy with respect to increasing the sustainable utilization of biomass						
3) The case could also be described as "good practice" example, meaning it's example can be used as a guiding example for other cases						
Organizational criteria						
1) Availability of reliable and easy-to-reach contact person(s) at the case						
2) Availability of access to reliable data and information on the case						
3) Willingness/consent of case-representatives to be covered in ENERGY BARGE						
SUM of "X":						

Annex 2 Case selection countries

Annex: Case selection criteria D.3.2.3

Country: AUSTRIA							
Name of Case: AGRANA- Ethanol production in Pischelsdorf							
Name of project partner: BE2020/viadonau							
Name of person in charge of case selection: Christa Dißauer							
					<i>indicate with an "X"</i>		
Thematic criteria	full match	partial match	no match	internal notes/comments			
1) Comparatively important role of biomass and/or bioenergy in regional and/or business strategy	x						
2) Easy to define as a "case" according to task description	x						
3) Existence of (at least partial) biomass supply chains on regional level	x						
4) Existence/utilization of biomass logistics (road, rail, water)	x						
Geographical criteria							
1) Proximity to Danube port < 100 km	x						
2) Case can be regionally limited							
Performance criteria							
1) Case can be considered as comparatively "high-performing" in comparison with other companies or regions with respect to well-functioning business and/or biomass utilization	x						
2) The case is in a sense using innovative approaches in it's regional and/or business strategy with respect to increasing the sustainable utilization of biomass		x					
3) The case could also be described as "good practice" example, meaning it's example can be used as a guiding example for other cases	x						
Organizational criteria							
1) Availability of reliable and easy-to-reach contact person(s) at the case	x						
2) Availability of access to reliable data and information on the case	x						
3) Willingness/consent of case-representatives to be covered in ENERGY BARGE	x						
SUM of "X":	10	1	0				

Annex: Case selection criteria D.3.2.3					
Country:	Croatia				
Name of Case:	Spačva				
Name of project partner:	SDEWES Centre				
Name of person in charge of case selection:	Iva Gavran				
<i>indicate with an "X"</i>					
Thematic criteria	full match	partial match	no match	internal notes/comments	
1) Comparatively important role of biomass and/or bioenergy in regional and/or business strategy	x				
2) Easy to define as a "case" according to task description	x				
3) Existence of (at least partial) biomass supply chains on regional level	x				
4) Existence/utilization of biomass logistics (road, rail, water)	x				
Geographical criteria					
1) Proximity to Danube port < 100 km	x				
2) Case can be regionally limited	x				
Performance criteria					
1) Case can be considered as comparatively "high-performing" in comparison with other companies or regions with respect to well-functioning business and/or biomass utilization		x			
2) The case is in a sense using innovative approaches in it's regional and/or business strategy with respect to increasing the sustainable utilization of biomass	x				
3) The case could also be described as "good practice" example, meaning it's example can be used as a guiding example for other cases		x			
Organizational criteria					
1) Availability of reliable and easy-to-reach contact person(s) at the case		x			
2) Availability of access to reliable data and information on the case		x			
3) Willingness/consent of case-representatives to be covered in ENERGY BARGE		x			
SUM of "X":	7	5			

Annex: Case selection criteria D.3.2.3				
Country: Germany				
Straubing - Region of Renewable Raw Materials, corporate examples: ADM oil mill & Clariant bioethanol demoplant				
Name of Case:				
Name of project partner: BioCampus Straubing GmbH				
Name of person in charge of case selection: Ann-Kathrin Kaufmann, Verena Dobler				
<i>indicate with an "X"</i>				
Thematic criteria	full match	partial match	no match	internal notes/comments
1) Comparatively important role of biomass and/or bioenergy in regional and/or business strategy	x			
2) Easy to define as a "case" according to task description		x		
3) Existence of (at least partial) biomass supply chains on regional level		x		
4) Existence/utilization of biomass logistics (road, rail, water)	x			
Geographical criteria				
1) Proximity to Danube port < 100 km	x			
2) Case can be regionally limited		x		
Performance criteria				
1) Case can be considered as comparatively "high-performing" in comparison with other companies or regions with respect to well-functioning business and/or biomass utilization	x			
2) The case is in a sense using innovative approaches in it's regional and/or business strategy with respect to increasing the sustainable utilization of biomass		x		
3) The case could also be described as "good practice" example, meaning it's example can be used as a guiding example for other cases		x		
Organizational criteria				
1) Availability of reliable and easy-to-reach contact person(s) at the case	x			
2) Availability of access to reliable data and information on the case		x		
3) Willingness/consent of case-representatives to be covered in ENERGY BARGE		x		
SUM of "X":	5	7		

Annex: Case selection criteria D.3.2.3				
Country:	Hungary			
Name of Case:	MATÁSZSZ,			
Name of project partner:	MAHART			
Name of person in charge of case selection:				
	<i>indicate with an "X"</i>			
Thematic criteria	full match	partial match	no match	internal notes/comments
1) Comparatively important role of biomass and/or bioenergy in regional and/or business strategy	X			
2) Easy to define as a "case" according to task description		X		
3) Existence of (at least partial) biomass supply chains on regional level		X		
4) Existence/utilization of biomass logistics (road, rail, water)		X		
Geographical criteria				
1) Proximity to Danube port < 100 km		X		
2) Case can be regionally limited	X			
Performance criteria				
1) Case can be considered as comparatively "high-performing" in comparison with other companies or regions with respect to well-functioning business and/or biomass utilization			X	
2) The case is in a sense using innovative approaches in it's regional and/or business strategy with respect to increasing the sustainable utilization of biomass		X		
3) The case could also be described as "good practice" example, meaning it's example can be used as a guiding example for other cases	X			
Organizational criteria				
1) Availability of reliable and easy-to-reach contact person(s) at the case	X			
2) Availability of access to reliable data and information on the case		X		
3) Willingness/consent of case-representatives to be covered in ENERGY BARGE	X			
SUM of "X":	5	6	1	

Annex: Case selection criteria D.3.2.3				
Country: Hungary				
Name of Case:	HUNGRANA			
Name of project partner:	NARIC			
Name of person in charge:	Tibor Vojtela			
<i>indicate with an "X"</i>				
Thematic criteria	full match	partial match	no match	internal notes/comments
1) Comparatively important role of biomass and/or bioenergy in regional and/or business strategy	x			
2) Easy to define as a "case" according to task description	x			
3) Existence of (at least partial) biomass supply chains on regional level	x	x		
4) Existence/utilization of biomass logistics (road, rail, water)	x			
Geographical criteria				
1) Proximity to Danube port < 100 km	x			
2) Case can be regionally limited	x			
Performance criteria				
1) Case can be considered as comparatively "high-performing" in comparison with other companies or regions with respect to well-functioning business and/or biomass utilization	x			
2) The case is in a sense using innovative approaches in it's regional and/or business strategy with respect to increasing the sustainable utilization of biomass		x		
3) The case could also be described as "good practice" example, meaning it's example can be used as a guiding example for other cases		x		
Organizational criteria				
1) Availability of reliable and easy-to-reach contact person(s) at the case		x		
2) Availability of access to reliable data and information on the case		x		
3) Willingness/consent of case-representatives to be covered in ENERGY BARGE	x			
SUM of "X":	8	5		

Annex: Case selection criteria D.3.2.3						
Country:	Roamnia					
Name of Case:	FBR Forest One					
Name of project partner:	Nostra Silva					
Name of person in charge of case selection:	Tobescu Constantin					
	<i>indicate with an "X"</i>					
Thematic criteria	full match	partial match	no match	internal notes/comments		
1) Comparatively important role of biomass and/or bioenergy in regional and/or business strategy	x					
2) Easy to define as a "case" according to task description	x					
3) Existence of (at least partial) biomass supply chains on regional level		x				
4) Existence/utilization of biomass logistics (road, rail, water)		x				
Geographical criteria						
1) Proximity to Danube port < 100 km	x					
2) Case can be regionally limited	x					
Performance criteria						
1) Case can be considered as comparatively "high-performing" in comparison with other companies or regions with respect to well-functioning business and/or biomass utilization	x					
2) The case is in a sense using innovative approaches in it's regional and/or business strategy with respect to increasing the sustainable utilization of biomass	x					
3) The case could also be described as "good practice" example, meaning it's example can be used as a guiding example for other cases	x					
Organizational criteria						
1) Availability of reliable and easy-to-reach contact person(s) at the case	x					
2) Availability of access to reliable data and information on the case	x					
3) Willingness/consent of case-representatives to be covered in ENERGY BARGE	x					
SUM of "X":	10	2				

Annex: Case selection criteria D.3.2.3						
Country:		Slovakia				
Name of Case:		Intech Energo				
Name of project partner:		ICARST				
Name of person in charge of case selection:		Ivan Chodak jr				
		indicate with an "X"				
Thematic criteria		full match	partial match	no match	internal notes/comments	
1) Comparatively important role of biomass and/or bioenergy in regional and/or business strategy		X				
2) Easy to define as a "case" according to task description		X				
3) Existence of (at least partial) biomass supply chains on regional level			X			
4) Existence/utilization of biomass logistics (road, rail, water)			X			
Geographical criteria						
1) Proximity to Danube port < 100 km			X			
2) Case can be regionally limited		X				
Performance criteria						
1) Case can be considered as comparatively "high-performing" in comparison with other companies or regions with respect to well-functioning business and/or biomass utilization		X				
2) The case is in a sense using innovative approaches in it's regional and/or business strategy with respect to increasing the sustainable utilization of biomass			X			
3) The case could also be described as "good pratice" example, meaning it's example can be used as a guiding example for other cases		X				
Organizational criteria						
1) Availability of reliable and easy-to-reach contact person(s) at the case			X			
2) Availability of access to reliable data and information on the case			X			
3) Willingness/consent of case-representatives to be covered in ENERGY BARGE			X			
SUM of "X":		5	7			

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