Interreg
Danube Transnational Programme
ENERGY BARGE

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Building a Green Energy and Logistics Belt

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Transnational Energy Security Strategy

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Introduction

The Danube stretches over more than 2,800 km from the Black Sea into southern Germany (see Figure 1). On its way it flows through 10 different countries and extends through its tributaries into a total of 19 countries. Of these countries, 14 have developed the joint EU Strategy for the Danube Region (EUSDR) and 7 are represented in the ENERGY BARGE project.

Starting in January 2017, the ENERGY BARGE project set out to promote the sustainable use of green energy produced from biomass and thereby increase energy security and efficiency in the Danube region. Central to this goal was exploring the role that inland waterway transport could play to fulfil this mission. The strategic framework of the project was set by the Renewable Energy Directive 2009/28/EC, the EU2020 climate goals and the EU Strategy for the Danube Region (EUSDR).

To contribute to the EUSDR, this document targets to synthesise the results and experiences of the ENERGY BARGE project into a strategy for the contribution of green energy from biomass in conjunction with inland waterway logistics to overall energy security in the Danube region.

Figure 1: Map of the Danube Region showing the Danube river (blue), its ports (blue icons) and biomass potentials (red and yellow icons) *(Source: http://www.interreg-danube.eu/approved-projects/energy-barge).*

Recommendations on Biomass Production for Energetic Use

Solutions on European level are required for a secure and reliable energy supply, competitiveness and climate protection in the frame of the energy transition to increase the shares of renewable energies. By adopting the 2030 climate and energy framework and the legislative packages to ensure that the Energy Union will be achieved, the European Union set the basis for the implementation of the energy transition. The European Union set the target to reduce the greenhouse gas emissions within the EU by 40% compared to the level of 1990. Further, the share of renewable energies in final energy consumption shall be increased to 32% by 2030.[1]

The utilisation of biomass to generate energy plays a significant role in the European Union and is estimated to further increase by 2030. A frequently discussed topic in this context is the assurance of a sustainable supply of biomass resources. The European Commission indicated the need for an improved biomass policy in order to ensure a resource efficient utilisation of biomass and to contribute to the target to reduce the overall greenhouse gas emissions. Bogaert et al. (2017) transferred the general strategic objectives of the European Commission to the following specific operational objectives:[2]

1. Ensure that the utilisation of bioenergy contributes to the mitigation of climate change;
2. Avoid direct and indirect land use change;
3. Minimise impact on biodiversity;
4. Prevent distortion of the biomass market;
5. Prevent trade barriers of biomass for energetic use.

The success of bioenergy highly depends on the availability of suitable biomasses in sufficient volumes and at competitive prices. The upgrading of residues, co-products and waste from agriculture to solid biofuels will be important in the upcoming years since it is seen to have a high potential for the future extension of the biomass base. A sustainable use of the biomass potentials requires the optimisation of processes as well as technologies and the integration of cascading utilisation paths and the development of an efficient bioeconomy. The establishment of sustainable supply and value chains and the cooperation of all actors along the value chain are of high importance.[3]

The introduction of a carbon pricing system, which takes environmental externalities caused by fossil fuels into account, is to be considered. Carbon pricing would internalise these costs and make fossil fuels more expensive. This could partly compensate the higher capital requirements of bioenergy systems in comparison to fossil fuel systems. Such measures should also comprise a

[1] BMWi (Bundesministerium für Wirtschaft und Energie), (2018). Europäische und internationale Energiepolitik. [online] Available at: https://www.bmwi.de/Redaktion/DE/Artikel/Energie/europaeische-energiepolitik.html [Accessed 03.12.2018].

[2] Bogaert, S., L. Pelkmans, E. van den Heuvel, N. Devriendt, S. De Regel, R. Hoefnagels, M. Jungiger, G. Resch, L. Liebmann, U. Mantau, C. Nathani, P. Hellmüller, P. Gentili, A. D'Antoni, D. Colozza & A. Hernández, (2017). Sustainable and optimal use of biomass for energy in the EU beyond 2020. [online] Available at: https://ec.europa.eu/energy/sites/ener/files/documents/biosustain_report_final.pdf [Accessed 29.11.2018].

[3] Biermayr, P., Dißauer, C., Eberl, M., Enigl, M., Fechner, H., Fischer, L., Leonhartsberger, K., Maringer, F., Moidl, S., Schmidl, C., Strasser, C., Weiss, W., Wonisch, P., Wopienka, E., (2018). Innovative Energietechnologien in Österreich Marktentwicklung 2017 -Biomasse, Photovoltaik, Solarthermie, Wärmepumpen und Windkraft Federal Ministry for Transport, Innovation and Technology, Report No.04/2018, Vienna.

reduction of barriers in the taxation and broader regulatory systems. At present, the taxation and regulatory framework conditions are decreasing the competitiveness of renewable low carbon technologies.[4] [5]

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 and local level. Lempe et al. (2018) also describe the importance of cities and local authorities to promote the utilisation of renewable energy sources in addition to incentives by national and regional governments.[6] This is particularly important, since almost two thirds of the global energy demand is accounted for by cities. The imposition of reliable policy and regulatory framework conditions for renewable energies on local level is of high relevance to gain the confidence of investors. This implies also to set up long-term policies from 10 to 15 years to stimulate investments in renewable energy plants.[7]

Furthermore, local and regional authorities should actively promote the benefits of bioenergy towards their citizens to improve the public acceptance and reduce potential reservations. Among other things, this comprises to point out the social benefits that an increased utilisation of bioenergy could imply for a region, e.g. by increasing the degree of processing of biomass raw materials and thus create new jobs and keep a higher share of the added value in the region itself.[8] During several ENERGY BARGE workshops, concerns were expressed by external participants that it needs to be avoided to only transport raw materials to Western European countries, but rather to keep further processing steps in the respective countries. This would also increase the transport worthiness of the respective biomass products to consider inland waterway shipping as a competitive means of transport.

The establishment of regional clusters to promote 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 of 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 energy could also be supported through the settlement of research and

[4] Agentur für Erneuerbare Energien, (2018). EEG zeigt Wirkung. [online] Available at: https://www.unendlich-viel-energie.de/erneuerbare-energien-sind-bereits-konkurrenzfaehig [Accessed 06.12.2018].

[5] Lempe, F., S. Kruse & B. Kerckow, (2018). Report on barriers to bioenergy deployment and recent developments. ETIP Bioenergy-SABS Deliverable D3.1 / Date 19.11.2018 / Version 1.

[6] ibid.

[7] ibid.

[8] ibid.

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 the 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 side.

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.

Mission

The mission of this strategy is to enable the mobilisation of the vast potential of biomass for energy production in the Danube region. To achieve this target, the ports along the Danube must be expanded to centralised biomass logistics and production hubs. The shift of the transport of biomass for energy production from road to the Danube waterway will be central to this endeavour.

Vision

If these efforts are successful, more and more biomass-processing and trading companies such as oil mills, biofuel plants, saw mills with pellet production or agricultural traders, as well as their clients in up- and downstream supply chains will settle in close proximity to the waterway. This way, the majority of inbound, and potentially outbound logistics will be shifted on inland vessels without pre- or end-haulage via road or rail. In turn, these companies benefit from comparatively low transport costs and reduced environmental impact of their logistics.

Danube ports will become prime locations for the processing and production of bio-based goods and energy as well as for trading companies. Further ports will specialise in agricultural and forestry goods and thus can make use of a broad variety of handling facilities suitable for biomass feedstock and bioenergy products. This will create bioenergy clusters and subsequently improve supply chains.

Shipping companies are able to invest in dedicated vessels for specific biofuel types as market demand would increase and higher volumes could be achieved.

Strategic Measures

To actively fulfil the mission and see the ENERGY BARGE vision materialise, there are several strategic measures to be implemented. Throughout the completion of the different ENERGY BARGE activities, it became clear that acquiring accurate, reliable and current data is a difficult feat. Therefore, governmental bodies need to act as information providers to ensure a level

playing field for businesses active in the bioenergy and logistics sectors. Doing this will also be beneficial to new actors planning their market entry in these sectors. The datasets need to be harmonised on the EU level regarding their collection methods and presentation. They should provide information on biomass potentials (technical and sustainable availability), types of biomass, quantities and qualities of biomass, spatial data on biomass availability and feedstock flows (including transport modes used and seasonality).

Upon the inception of incentive programmes that provide subsidies, grants or loans for logistics infrastructure, environmental impacts need to be considered. Over longer distances, inland waterway transport tends to be more favourable in terms of greenhouse gas emissions per weight unit – especially when compared to road transport. This should be recognised and rewarded by official institutions in order to actively promote a modal shift and increase the competitiveness of inland waterway transport. Infrastructure investments deemed necessary in the Danube region by the ENERGY BARGE consortium include investments in interim storage capacities, transhipment capacities, lightering capacities and ensuring product safety. Another possibility to achieve this would be to apply this principle by granting tax cuts or exemptions to companies using inland waterway transport in order to increase demand for inland waterway transport. Moreover, ports are industrial sites with a high and continuous energy demand. Incentive programmes specifically targeting renewable energy sources to satisfy the energy demand of ports would increase the attractiveness of ports as sites for actors from the bioenergy value chain.

The harmonisation and simplification of administrative requirements for inland waterway transport on a transnational level would also increase the attractiveness of this mode of transportation. Progress in this area has already been made by establishing the working group "Administrative Processes" within PA 1a "Inland Waterways" of the EUSDR. In the frame of this working group three different border control forms could be standardised into one single form – the Danube Navigation Standard Form (DAVID). This is a first important step to overcoming barriers and the Danube riparian countries are well advised to keep up and increase these efforts.

Currently, the inconsistent fairway maintenance across the Danube riparian countries poses another impediment to the reliability and attractiveness of inland waterway transport. It is recommended that the Danube riparian nations work jointly towards standardised fairway maintenance standards to ensure the reliable navigability of the Danube. This is important for (potential) users of inland waterway transport services, as it allows them to count on guaranteed delivery times. Considering the bioenergy sector, this is especially important, as energy producers rely on a consistent supply of biomass feedstock. On the transnational level headway in this matter could be made with the EUSDR project FAIRway Danube. Governmental bodies of the Danube region need to double down on projects and efforts like this and act upon their recommendations.

Like in many other professions, a lack of skilled workers also characterises the inland waterway logistics sector. To remedy this situation, training programmes need to be harmonised on a transnational level and especially regions and municipalities with Danube ports need to work

towards making the different professions needed for inland waterway navigation attractive again. This could be facilitated through information campaigns but also through funded internship programmes. Also related to the issue of proper training and education is agreeing on a common language to be used along the Danube. Currently, German, Russian and English are used to communicate on different sections of the Danube. To ease communication and hence make Danube logistics more efficient, a common language should be chosen to be used along the whole river.

One of the reasons that inland waterway transport can be economically more viable is that large quantities can be transported at once. This is especially true for biomass but also for its derivatives. In order to process these quantities, ports need to be able to store, load, unload and tranship these goods in the required amounts. If they possess these capabilities the only challenge that remains is to find customers for their services. As any further transport away or to the port would further drive up the price of resources and produced goods, the best solution would be to locate companies from the bioenergy sector directly at the port. This would secure the demand for inland waterway logistics services and the Danube could truly manifest its role as a stream of energy. Hence, the ENERGY BARGE consortium recommends establishing bioenergy clusters directly on the sites of Danube ports. These clusters incorporate actors from the bioenergy and logistics sectors and consist of commercial businesses, sector and business associations and research and development institutions. To be successful, the support of local, regional and (sub-) national authorities is needed for these clusters. A successful example of this is the region of Straubing, which was able to establish itself as a region of renewable resources. The following section will illustrate this.

The Case of Straubing, Germany

The region is shaped by the agricultural “Gäuboden” area and the “Bavarian Forest” as a vast resource for biomass. It is home to about 144,000 inhabitants and has direct inland waterway access via the Danube port in Straubing-Sand. Since the early 2000s, the region’s motto “Straubing – Region of Renewable Raw Materials” is actively supported by public and private actors as well as academia. The port in turn has specialised in biomass handling and freight in recent years. The main goal of the initiative is to depict the entire value chain of renewable raw materials and bioeconomy in the region. The region combines the geographical advantage of having access to the macro region of the Danube, which has vast biomass resources, via the port of Straubing and the concentration of research institutions and enterprises of various sizes working along the bioeconomy value chain. All actors aim to create Straubing’s model character.

The regional cluster “Renewable Raw Materials” was founded in 2008 based on a regional political and management decision to initiate active business development and industrial settling activities in the field of renewable raw materials. The BioCampus Straubing GmbH (BCG), a publicly held small agency and subsidiary of the port of Straubing (ZVH) took over the cluster management on behalf of its shareholders. 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 late 1990s and was initiated on Bavarian state government level by settling C.A.R.M.E.N. e.V. (market

information and consumer consulting) and the Technology and Support Centre for Renewable Raw Materials (applied research and project funding) in the city. In recent years, additional institutions like a campus of the Technical University Munich, a Fraunhofer project group on bio-catalysis and the office of the Bavarian Expert Council on Bioeconomy have settled in Straubing. Through active support from the region's actors, two major corporate settlings from the bioenergy sector were successfully completed in the port area, which led to a significant push for waterside biomass transhipment. Due to its efforts, the administrative district of Straubing-Bogen became one out of 25 German bioenergy regions in 2009. Along with this came 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. Since then further enterprises were settled on the site of the port of Straubing (ADM oil mill and Clariant sunliquid® demoplant for lignocellulosic ethanol).

Clearly, the bioenergy region activities took place in a period where bioenergy was largely supported by state funding, but the activities aimed towards attracting these funds to the region and have created significant added value effects.[9] According to the Bavarian Energy Atlas, the region (city and administrative district) together now generate approx. 350,000 MWh/a in biobased electricity and heat, including public, industrial and household appliances (only those receiving funding).[10] Among these facilities is one of the biggest Bavarian biogas plants (10 MW capacity, biomethane). Additionally, the region is working strongly towards solar renewable energy, aiming towards a secure renewables mix.

In 2009, ADM was looking for a location along the German Danube. Driven by common conviction, ZVH, BCG and the city and district of Straubing cooperated strongly to make the case for Straubing. ADM's corporate decision to settle in Straubing can be seen as a direct result of the proactive settling policies in the region. The favourable logistics infrastructure in Straubing only made the choice easier. The ADM plant has since become one of the biggest oil mills of its kind in Germany. It processes rape seed mainly from the Danube region. The rape oil is further processed to biodiesel in refineries. The majority of the inbound logistics is facilitated via inland waterway transport. Residue materials are also shipped in part via inland waterway transport.

Like ADM, the Clariant sunliquid® demo plant settled in the port of Straubing due to similar reasons in 2012. To further support the decision, the Bavarian government committed a substantial co-funding under the condition that the plant will be built in Straubing. Since the sunliquid® technology is one of the leading second generation biofuels technologies, Straubing as a site has gained international visibility. This in turn may attract further businesses. 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

[9] BMEL, Bundesministerium für Ernährung und Landwirtschaft. (2018). Nutzen und Bedeutung der Bioenergie. [online] Available at: https://www.bmel.de/DE/Landwirtschaft/Nachwachsende-Rohstoffe/Bioenergie/_texte/Bioenergie.html [Accessed: 09.05.2019].

[10] Energieatlas Bayern, (2019). Biomasse. [online] Available at: https://geoportal.bayern.de/energieatlas-karten/?wicket-crypt=I55LFN6jXkQ [Accessed: 09.05.2019].

plant in Craiova, Romania since Romania has an enormous untapped supply of straw.[11] [12] Since Craiova is close to the Danube, interest in logistics solutions using the Danube was also voiced. All of these accomplishments would not have been possible without the region of Straubing and its specific business development structures.

Furthermore, active business and start-up support from BCG could lead two important start-ups working towards energy security (maxbiogas GmbH, Micropyros GmbH) to settle in the region. These start-ups particularly contribute to energy storage and process efficiency innovation.

It can be concluded that proactive and joint efforts of several actors towards shaping a region to use more biobased resources can contribute to increased independence from fossil fuels. This happens not only on a regional, but on a broader level, as the impacts of regional measures shape the situation at the national and European level. At the same time, it can create jobs and added value as well as a public reputation. In the case of Straubing, the following influencing factors can be derived: For larger-scale processes requiring high quantities of biomass, suitable logistics infrastructure like ports can make a difference. Generally, biomass availability, both regionally/domestically and imported, has to be ensured. Additionally, further advantages are political support, expert information for potential public and private users/investors of biobased energy and products as well as existence of research and development know-how. Favourable accompanying conditions such as availability of state or EU funds are helpful and a time frame of approximately ten years to generate noticeable success is realistic.

A mix of measures for several target groups brought about by stringent management and actor cooperation thus is required. Looking at the Danube region and its prerequisites, the Straubing model could function as a blueprint for other regions along the Danube to tap their biomass potential and contribute to increased energy security on a larger scale.

[11] Clariant, (2017a). Clariant and Enviral announce first license agreement on sunliquid® cellulosic ethanol technology [online] Available at: https://www.clariant.com/en/Corporate/News/2017/09/Clariant-and-Enviral-announce-first-license-agreement-on-sunliquid-cellulosic-ethanol-technology [Accessed: 01.06.2018].

[12] Clariant, (2017b). Clariant to build flagship sunliquid® cellulosic ethanol plant in Romania [online] Available at: https://www.clariant.com/en/Corporate/News/2017/10/Clariant-to-build-flagship-sunliquid-cellulosic-ethanol-plant-in-Romania [Accessed: 01.06.2018].

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