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EUROPEAN UNION

Danube Transnational Programme
DanuBioValNet

Cluster Mapping Synthesis Report
Bio-Based Packaging

Cross-clustering partnership for boosting eco-innovation
by developing a joint bio-based value-added network for the Danube Region

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For further information about the DanuBioValNet project, you will find a short description at the end of the document. To learn more and to download additional resources please refer to the project website http://www.interreg-danube.eu/approved-projects/danubiovalnet.

The information is provided without assuming any legal responsibility for correctness or completeness. The data presented in the report are based on the information given by the project partners.

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INTRODUCTION

Bio-based packaging materials can be defined like „materials derived from renewable sources". In addition such materials recognised as biodegradable according to the standards outlined in related EU Standards can be also understood a bio-based materials[1].

By the 1970s petroleum-based materials, had to a large extent, replaced those materials derived from natural resources. But this trend is about to change again since recent developments are raising the prospects that natural based resources will be a major contributor to the production of industrial products. Significant steps forward have been made over the recent past in terms of new products, material and processes that will bring down costs and optimize performance of bio-based packaging materials. At the same time environmental concerns are high on the policy agenda of industrial countries and public debates are intensifying the interest in agricultural and forestry resources as alternative feedstocks. However, the biggest challenge remains the development of new markets and costs and performance competitive bio-based packaging materials. A high potental market for such materials is the food packaging, a highly comparative areas with increasing demands from the market side.

There are many national and multinational initiatives that further fuel the demand for new bio-based packaging material. Among others, compostability, which is a very appealing property when the packaging meets its end of useful like, is a key fuctional behaviour to successfully reach the goal of Circulare Economy.

In the following as short summary is give about the mostly used bio-based materials and their possible packaging applications. These include both relatively old materiasl s such as paper, board and wood as well as the much newer bio-based plastics.

Paper and board-based packaging is very popular, particularly among consumers. This is one reason why paper and board are among the most widely used packaging materials in the world, including in Europe. Paper and board are bio-based (in Europe from sustainably managed woods, with PEFC or FSC mark), recyclable, biodegradable and suitable for thermal recycling (incineration). Apart from its application in paper and board, wood is mainly used for transportation in the form of pallets and crates. The big advantage of wooden pallets is that they are sturdy, easy to repair and have a long life. Renewables can be used to make bio-based plastics that are identical to petrochemical plastics. Well-known examples are **bio-PE** and **bio-PET**. These bio-based plastics are also referred to as 'drop-in ' plastics. The advantage of both bio-PE and bio-PET is that these materials can be processed via the conventional recycling routes. The strong surge in the use of bio-based packaging is largely attributable to bio-PE and bio-PET. Other more recent bio-based plastics are **PLA (polylactic acid), starch** blends and **PHAs (Polyhydroxalkanoates)**. Besides being a chief component of paper, **cellulose** is also used to make products such as cellophane (film), viscose (fibres) and cellulose derivatives such as cellulose acetate. Cellophane is widely used as a packaging material for e.g. confectionery and floral bouquets.

THE CLUSTER MAPPING APPROACH

Clusters can be understood as regional concentrations of economic activities in related industries connected through local linkages and spill-overs, have long been known to be a feature of market economy[2]. Cluster organisations can help firms to better engage with other local actors within their cluster and to organise collective action to strengthen the local context. And they can reduce the transaction costs for firms, especially SMEs, in building linkages to firms and collaboration partners in other locations.

Clusters have a distinct geographic dimension, reflecting the dynamics of local spill-overs. They are also deeply embedded in a broader geographic context: they serve markets elsewhere and are connected to other clusters with complementary strengths in regional, interregional or global value chains. This mirrors the role of location for firms: while local conditions provide the unique context for building distinct capabilities and strategic positions, national and international linkages are critical to access other markets, suppliers, and collaboration partner.

Cluster mapping describes the process of measuring the presence of cluster actors in a given region across defined sector-specific value chains.

1) Claus J. Weber (eds), 2000, Bio-based Packaging Materials, The Royal Veterinary and Agricultural University, ISBN 87-90504-07-0
2) Christian Ketels (2017), Cluster Mapping as Tool for Development, Havard Business School, http://www.hbs.edu/faculty/Publication%20Files/Cluster%20Mapping%20as%20a%20Tool%20for%20Development%20_%20report_ISC%20WP%20version%2010-10-17_c46d2cf1-41ed-43c0-bfd8-932957a4ceda.pdf

Cluster mapping, especially in Emerging Industries like Bio-based packaging, is of high relevance to better understand the key competences of the cluster actors as well as to review to what extent the respective value chain is properly covered.

This report provides the first perspective on Bio-based Packaging clusters across the Danube Region. One key novelty is the introduction of firm-level data to supplement the statistical data from national and EU statistical offices. This firm-based data significantly increases the robustness of the data, especially in countries like Germany that collect regional data through samples rather than reporting by all firms. It also enables performance of individual firms to be tracked over time, gaining more granular insights into patterns of entrepreneurship.

The report is based on a new dataset that is compiled specifically for analysing detailed patterns of cluster evolution. The core of the dataset is the firm- and plant-level data sources from the Orbis Historical dataset supplied by Bureau van Dijk (June 2016 release). This dataset provides detailed data on the economic performance of firms. It allows to use data of firms' turnover, wage bill, capital, materials and employment[3] totalling more than 1 billion data points. The coverage is very good in most countries in Europe, and especially for larger limited liability companies, however significant gaps were still present.

In this report strong clusters are been identified by giving a "Cluster Star" for each region being identified to belong to the top 20 % of European regions in the following dimensions:
- **Specialisation**, measured by the relative size of regional employment in the Bio-based packaging sector reflected in its location quotient (LQ). This relative measure indicates how much stronger a region is in the Bio-based Packaging sector than would be expected given its overall size, compared to the average employment size in the Bio-based packaging sector across all regions
- **Absolute size**, measured by the number of employees and establishments. This measure is based on the observation that the number of linkages within a cluster is growing exponentially with the number of participants. Only when economic activity in the Bio-based Packaging sector moves beyond a threshold of critical mass do cluster effects become significant.
- **Productivity**, measured by the wages paid in a Bio-based packaging cluster (adjusted for local cost levels). This measure reflects not only what is being done in a region, but how well it is being done, influenced by the strength of cluster effects. Wages are also influenced by the structure of labour markets and other factors but are strongly correlated with productivity.
- **Dynamism**, measured by a simple average of measures on employment growth and the presence of fast-growing new firms (gazelles). This measure aims to capture whether a Bio-based packaging cluster continues to benefit from strong cluster effects in its development, or not. The cluster may be hindered in its growth because it has already reached a level where costs are greater than the benefits or other factors such as industry-specific growth trends[4].

The notion of regions is applied in this report by using data for specific administrative regions, generally at the so-called NUTS 2 level. For this report, 252 European regions have been regarded,[5] each with its own profile and economic performance. These regions are used as a pragmatic choice because they are likely to encompass the 'economically relevant' regions, there is data available, and in most cases there is some level of government that can take action for this specific region.

METHODOLOGY TO DEFINE THE COMPOSITION OF THE BIO-BASED PACKAGING SECTOR

The operationalisation of the Bio-based Packaging sector was developed within the DanuBioValNet project by an active involvement of the partners and cluster managers. This became necessary since the composition of this sector was unknown before. In a first step, the characteristic Value Chain for the Bio-based Packaging sector was been jointly developed with the partners (Figure 1). The first node can be "cultivation" in case the raw materials can be cultivated. Or, the node can be defined by "collected", in case the raw material has to be collected in the wild. However, all the following nodes of the Value Chain remain the same.

3) Employment is usually the only variable available on plant level, the rest are for the firm as a whole.
4) European Cluster Observatory 2016
5) The analysis covers all EU-28 countries (comprising 276 NUTS-2 regions) as well as Albania, Bosnia and Herzegovina, Iceland, FYROM, Kosovo (regarding the political status of which no claims are implied), Montenegro, Norway, Serbia, and Switzerland, by applying the NUTS (Nomenclature of Territorial Units for Statistics) standard for the subdivisions of countries for statistical purposes.

Figure 1: Value Chain for Bio-based Packaging Sector (source: DanuBioValNet)

In a next step, all partners and related cluster managers did a detailed mapping of their Bio-based Packaging cluster initiatives and clusters in their region according to the pre-defined Value Chain[6]. For this purpose the members of the identified cluster initiatives and clusters were grouped by project partners and cluster managers according to the specific nodes of the Bio-based Packaging Value Chain they operate in. In those cases, where no cluster initiatives existed, key cluster actors were identified and grouped.
In a third step, the specific NACE industry classifications[7] for all members or cluster actors were identified as part of the cluster mapping exercises,

that allowed to produce a reliable picture of the Bio-based Packaging industry. The Bio-based Packaging industry composition illustrated in Figure 2 is based on the intensive work of the project partners and related cluster managers and is based on more than 300 companies and their related NACE classifications identified. The size of the different boxes (NACE classifications) is proportional to number of enterprises. As Figure 2 illustrates the biggest share of enterprises (about 40 %) operate in the sector "Manufacture of plastic packaging goods" (NACE Code C22.22). 8 % of the enterprises deal with "Manufacture of corrugated paper and paperboard" (NACE Code 17.21).

Figure 2: Bio-based Packaging industry composition based on NACE industry classification 2008 (source: DanuBioValNet)
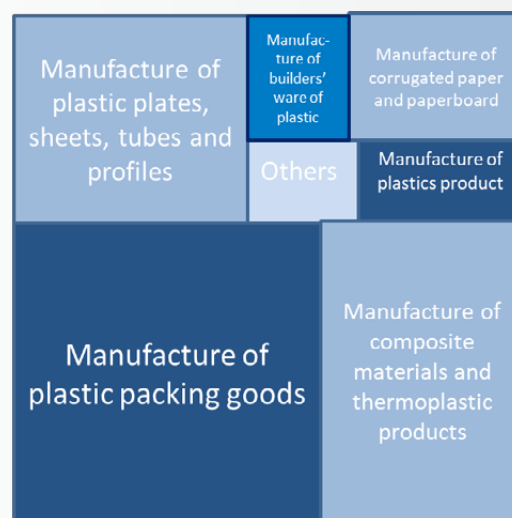
OVERVIEW

Within the Danube Region more than 450,000 employees have been working in the Bio-based Packaging industry in 2014, this equals a share of approximately 27 % of all related jobs in Europe. The share of respective firms in the Danube Region, compared to Europe as a whole, ranges at the same level (28 %). Thus, the Danube Region is well-positioned in terms of Bio-based Packaging, however, it does not play an outstanding role

like it does in the Bio-based packaging industry[8]. Nevertheless, above-average growth rates of nearly 10 % since 2008 regarding the number of operating firms in the Bio-based Packaging sector indicate an increasing importance. Contrary to these developments, employment in the Danube Region is regressive (-4,6 %) and, moreover, average wages display lower growth rates in the Danube Region than in Europe.

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6) Further details of the individucal cluster mapping exercises are given in the regional cluster mapping fact sheets available on the DabuBioValNet website (interreg-danube.eu/danubiovalnet)
7) according to NACE Rev. 2 2008; Eurostat – Methodologies and Working Papers (2008), ISSN 1977-0375
8) Meier zu Köcker, Gerd, Dermastia, Mateja (2017), Cluster Mapping Synthesis Report – Phytopharmaceutical Sector, http://www.interreg-danube.eu/approved-projects/danubiovalnet/outputs

Table 1: Basic facts on Bio-based Packaging industries in the Danube Region compared to Europe

	Danube Region[9]		Europe[10]	
	Level in 2014	Change since 2008	Level in 2014	Change since 2008
Employment	457,746	-4.6 %	1,711,734	-4.4 %
Establishments	38,844	9.7 %	136,383	5.7 %
Average Wage (EUR)	23,975	3.4 %	36,872	6.6 %
Gazelle Employment[11]	8,473	No data	24,264	No data

Approximately 40 % of the Danube regions have two or more Cluster Stars, which means they contain strong clusters in the Bio-based Packaging sector. 38 % of all European regions with 2 or more Cluster Stars are located in the Danube Region. As far as the rest of Europe is concerned, more than half of the regions do not have any Cluster Star, only 18 % have at least two stars.

Table 2: Comparison of Cluster Stars between the Danube Region and Europe.

Region	No Star	1 Star	2 Stars	3 Stars	4 Stars
Danube	14 (22.2 %)	24 (38.1 %)	10 (15.9 %)	15 (23.8 %)	0
Rest of Europe	135 (58.4 %)	55 (23.8 %)	27 (11.7 %)	13 (5.6 %)	1 (0.4 %)

Figure 3 profiles all European regions according to the Cluster Stars in the Bio-based Packaging industry. The strong regions are mainly concentrated in Eastern and South Eastern European countries, especially in the Czech Republic, Bosnia and Herzegovina, Bulgaria, Hungary and Poland. Besides, some parts of Germany and Northern Italy thrive in the Bio-based Packaging sector. The strongest region with four stars is Thüringen in Germany.

Figure 3. European top regions in Bio-based Packaging Industry (Cluster Stars, 2014)
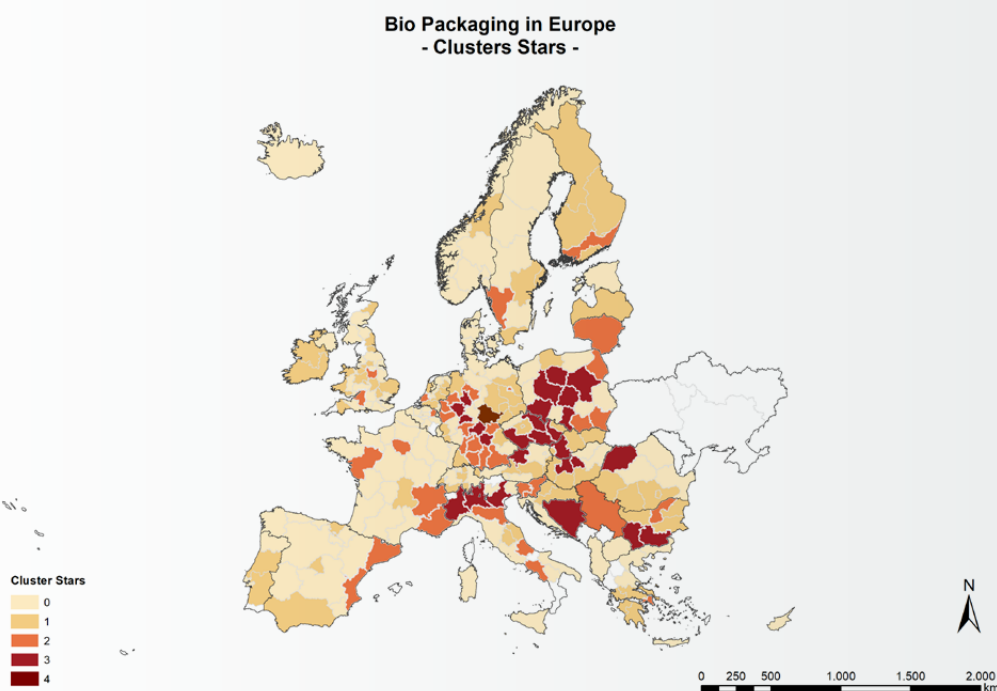
EMPLOYMENT

Figure 4 illustrates the employment pattern in the Bio-based Packaging Sector across Europe graphically. The respective numbers can be seen in Table 3 below. The pattern shows that Lombardia in Italy, with more than 60,000 workforces, is by far the leading region. Lombardy, together with two polish regions, Serbia[12] and Catalonia, form the Top 5 regions in terms of employment. They account for a share of 10.8 % of the overall number of Full Time Equivalents in Europe. With Serbia ranked fourth and Stuttgart ninth, two Danube Regions belong to the Top 15 European regions.

Figure 4: Leading European regions in Bio-based Packaging industry (Full Time Equivalents, 2014)
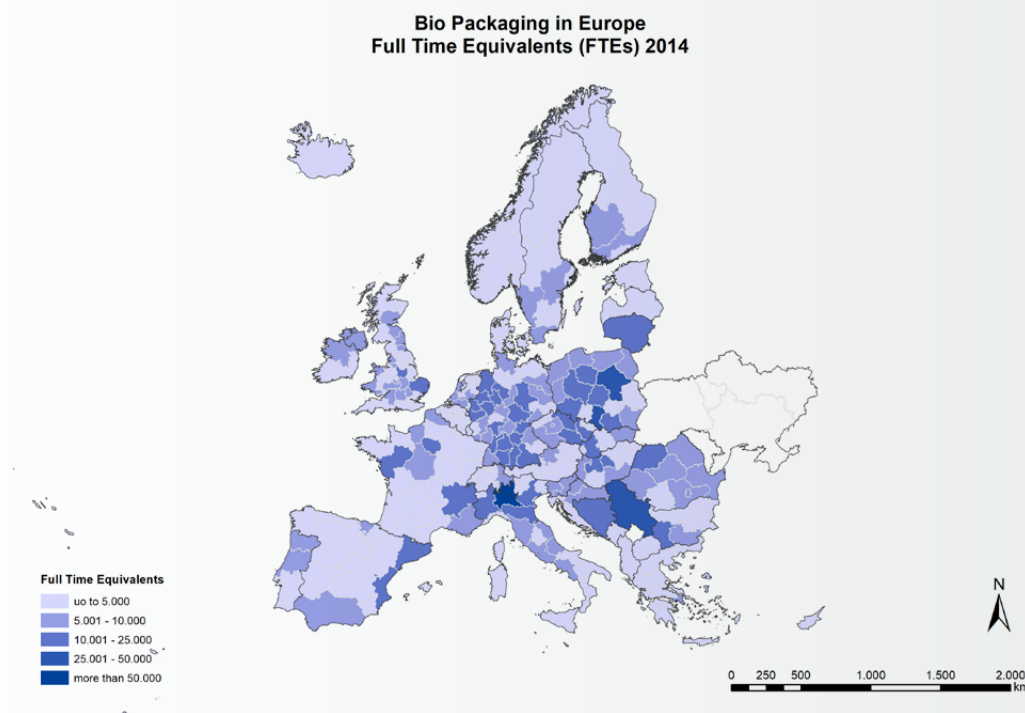
Table 3: Top 15 European regions with highest number of employment in the Bio-based Packaging sector (Full Time Equivalents, 2014)

NUTS	Region	Employment (FTE)	NUTS	Region	Employment (FTE)
ITC4	Lombardia	60,291	DE11	Stuttgart	20,360
PL22	Slaskie	34,468	DEA2	Köln	19,822
PL12	Mazowieckie	32,799	ITC1	Piemonte	18,520
RS11/12/21/22	Serbia[13]	32,2404	PL11	Lodzkie	18,043
ES51	Cataluña	24,358	PL41	Wielkopolskie	17,828
FR71	Rhône-Alpes	24,249	ITH5	Emilia-Romagna	17,766
ITH3	Veneto	23,793	DEA5	Arnsberg	17,491
FR10	Île de France	21,976			

12) Due to political inconsistencies with respect to the regional statistical subdivision of Serbia, the report mainly focuses on considering the country as a whole.
13) Due to statistical reason, all four Serbian regions are grouped together

ENTERPRISES

Comparing the enterprise pattern across Europe given in Figure 5 with the employment pattern in Figure 4 shown before, similar conclusions can be drawn. Many of the leading regions in terms of workforce in the Bio-based Packaging sector also occupy the strongest positions with respect to the number of operating firms.

Figure 5: Leading European regions in Bio-based Packaging industry (Enterprises, 2014)
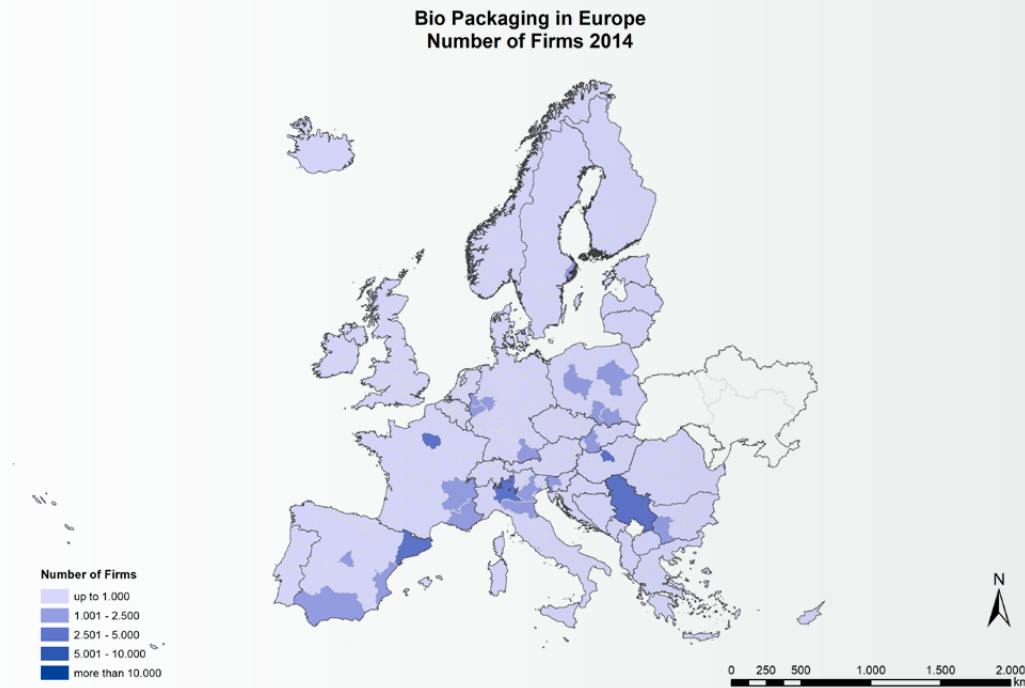
As shown in Table 4, Serbia, Lombardy and Catalonia can be identified as the Top 3 regions, followed by Kozep-Magyarorszag in Hungary and Île de France. Similar to the previous findings, 10.9 % of all companies operating in the Bio-based Packaging sector are located in the Top five regions in Europe. Strikingly, the Danube Region Kozep-Magyarorszag is not listed in the Top 15 regions for employment (see Table 3). According to Table 4, four Danube Regions are among the Top 15 european regions for enterprises in Bio-based Packaging industries, with Serbia at the top and Kozep-Magyarorszag ranked fourth.

Table 4: Top 15 European regions with highest number of enterprises operating in the Bio-based Packaging sector (Enterprises, 2014)

NUTS	Region	Enterprises	NUTS	Region	Enterprises
RS11/12/21/22	Serbia	3,250	ES30	Madrid	1,661
ITC4	Lombardia	3,096	PL22	Slaskie	1,604
ES51	Cataluña	3,092	SK02	Zapadne Slovensko	1,462
HU10	Kozep-Magyarorszag	2,787	DE21	Oberbayern	1,439
FR10	Île de France	2,687	SE11	Stockholm	1,340
PL12	Mazowieckie	2,432	PL41	Wielkopolskie	1297
FR71	Rhône-Alpes	1,939	ES61	Andalucía	1225
ES52	Valencia	1,927			

Firm-level data was used to also identify so-called 'Gazelles'[14]. Due to the novelty of this data source and differences in coverage across countries, the results have to be interpreted with caution. In particular, it seems likely that country-specific rules and regulations, for example on taxation, have an important influence on the presence of new business formation that is not directly linked to the overall dynamism of the economy. However, the reader might consider these data to be interesting.

Figure 6: Leading European regions in Bio-based Packaging industry (Gazelles, 2014)

Bio Packaging in Europe
Number of Gazelles 2014

Number of Gazelles
- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- more than 50

There are 749 Gazelles employing 24,264 workforces in the Bio-based Packaging Sector across the European regions. 272 of these Gazelles belong to the Danube Region (36 %). The respective share of employees in the Danube Region ranges at the same level (35 %). According to the pattern illustrated in Figure 6, a similar picture can be observed as for the enterprise and employment results discussed before. Serbia and Lombardy, but also Kozep-Magyarorszag and Catalonia feature a relatively high number of Gazelles in the Bio-based Packaging industry.

Table 5 shows that the number of Gazelles in the Danube Region is far above the ordinary, as 7 Danube Region can be found among the Top 15 regions in Europe. Notably, Hungary plays a crucial role here since the country is represented with three regions. This underlines the strong position of the Danube Region regarding young, growing enterprises in the Bio-based Packaging industry and furthermore indicates a promising future development.

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14) Gazelles are defined here as companies less than 5 years old that have grown their employment at least 10% annually over a period of three years
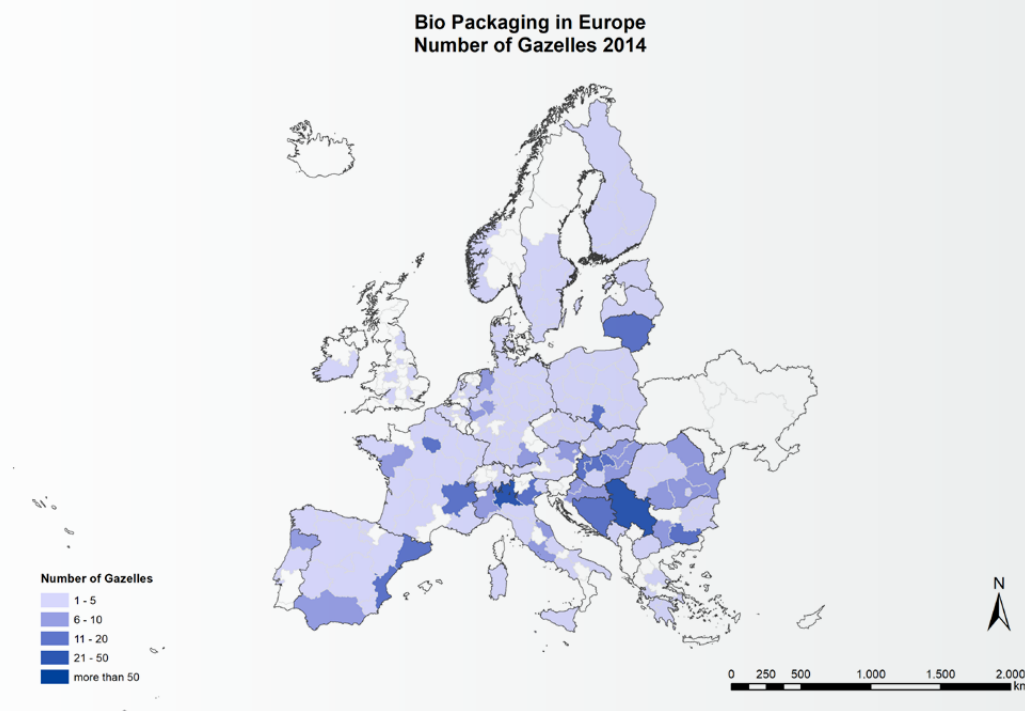
Table 5: Top 15 European regions with highest number of young enterprises operating in the Bio-based Packaging sector (Gazelles, 2014)

NUTS	Region	Enterprises	NUTS	Region	Enterprises
RS11/12/21/22[15]	Serbia	27	FR10	Île de France	14
ITC4	Lombardia	23	ITH3	Veneto	13
FR71	Rhône-Alpes	16	BA00	Bosnia and Herzegovina	13
HU10	Kozep-Magyarorszag	16	HU21	Kozep-Dunantul	12
ES52	Valencia	15	RS12	Vojvodina	12
LT00	Lietuva	15	HU22	Nyugat-Dunantul	12
ES51	Cataluña	15	PL22	Slaskie	11
BG42	Yuzhen tsentralen	14			

REGIONAL SPECIALISATION

Measuring regional specialisation of the Bio-based Packaging industry can provide interesting insights to what extent a region is stronger in this sector than would be expected given its overall size, compared to the average employment size in the Bio-based Packaging sector across all regions. Regional Specialisation can be measured by the Location Quotient (LQ). Figure 7 displays to what extent European regions are specialized in the Bio-based Packaging industry. It highlights that the Danube Region seems to be comparably strong in this regard. 45 Danube Regions reveal LQ values higher than 1, which means they are more specialized than others.

The data confirms the impressions given by Figure 7. The average LQ across the Danube Region is 1.44 and thus reasonably higher than the average European Regional Specialisation, which is slightly below 1.00.

Figure 7: Leading European regions in Bio-based Packaging industry (Specialisation, 2014)

Bio Packaging in Europe
Location Quotient 2014

Location Quotient
- up to 0,5
- 0,51 - 1,00
- 1,01 - 1,50
- 1,51 - 2,00
- more than 2,00
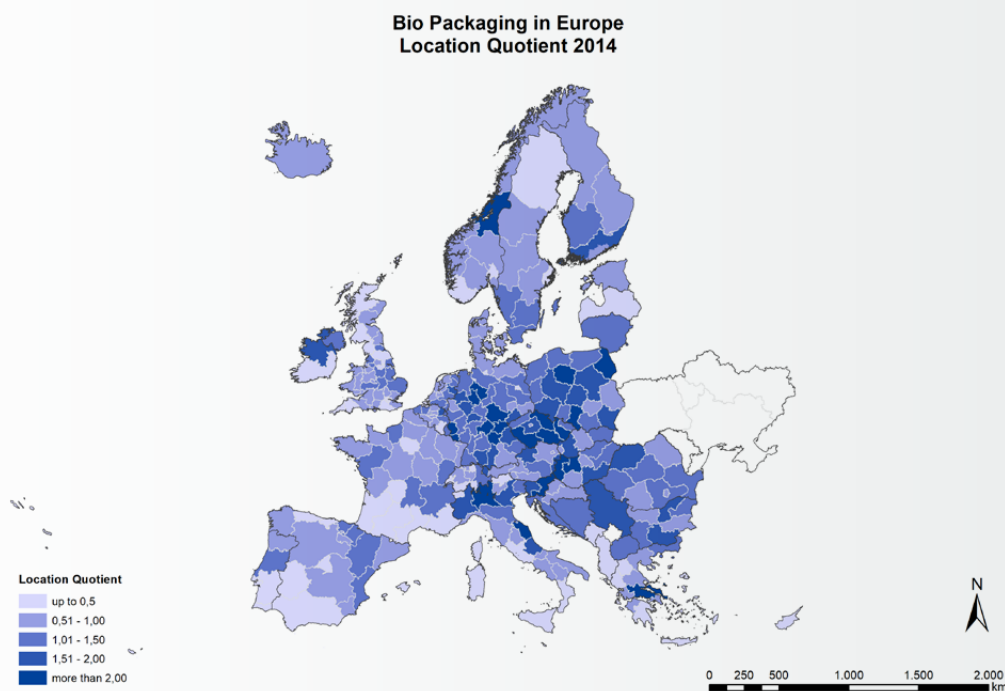
15) Due to statistical reason, all four Serbian regions are grouped together

A remarkable share of four out of the top 5 specialised regions in Europe is located within the Danube Region. Only Sterea Ellada in Greece (second place) lies outside the Danube Region. Considering the top 15 (Table 6), nine Danube Regions with a LQ value of more than 2.00 rank among the European top 15, which shows once again the importance of the Danube Region in the Bio-based Packaging market.

Table 6: Top European regions with highest level of Specialization in the Bio-based Packaging sector (Location Quotient, 2014)

NUTS	Region	Enterprises	NUTS	Region	Enterprises
HU21	Kozep-Dunantul	3,26	CZ03	Jihozapad	2.36
EL64	Sterea Ellada	3,04	DEA4	Detmold	2.34
SI03	Vzhodna Slovenija	3.01	PL34	Podlaskie	2.28
RS12	Vojvodina	2.73	DEB2	Trier	2.24
DE24	Oberfranken	2.72	DEG0	Thüringen	2.19
CZ07	Stredni Morava	2.55	PL61	Kujawsko-Pomorskie	2.18
RS21	Šumadija and Western Serbia	2.41	DE26	Unterfranken	2.16
HU22	Nyugat-Dunantul	2.37			

SUMMARY

The Bio-based sector is a comparable young and emerging industry. It provide around 1,7 million jobs all over Europe, whereas around 500.000 are located in the Danube Region. The report has shown that the Danube Region is on the way to become European hot spot. As shown in Appendix II, many of the most competitive regions are located in there. The number of Gazelles is, compared to other sectors like Phytopharmaceuticals or Eco-Construction, comparable low, but there is still a good growth dynamics in that region.

Table 7 (s. Appendix) provides more information about the strongest regions in this sector. There are many cluster initiatives in the field of Eco-Construction, many of them are well established and have a good critical mass. In Appendix II the most relevant cluster initiatives are listed.

THE DANUBIOVALNET PROJECT

The DanuBioValNet project is aiming at establishing bio-based industry networks across the Danube Region. The emerging transnational cooperation of clusters will foster bioeconomy and eco-innovations and lead to strengthening of the regional economies.

Consequently, with this project the partners pursue a strong strategic orientation beyond the immediate and medium-term economic objective of strengthening the regional economy. It is the strategic goal to establish cross-border strategic partnerships, particularly in developing regions, with the help of powerful cluster organisations. In this way, project results will be sustained beyond an immediate effect and the creation of strategic investments, especially in emerging industries such as the bio industry, will be enabled and facilitated. This will be achieved mainly by newly emerging or transforming value-added chains, which are increasingly being transnationally established and further developed as a result of the increasing internationalisation of value-added processes.

In this way, long-term economic effects are achieved, based on a network of agile clusters, which prepare the investment approaches in a targeted manner and implement them with high efficiency. One example of the present project is the establishment of bio-refineries in the regions, which can form a strategic technological backbone of a successful independent bio-industry.

The partners intend to develop and implement a long-term, industry-driven roadmap for such collaboration along the entire value chain based on cluster partnerships for these processes. With the project, a pilot function of the implementation is taken over and the prerequisite for creating a blueprint for similar and similar cross-national

cooperation, also in other industries, is created. For achieving these tasks, 17 project partners from 10 countries have joined forces. The project will pave the way from an economy based on fossil resources towards an economy using renewable resources. The striving of the partners to minimise greenhouse gases and resource-saving as well as resource-efficient utilisation of available biomass will result in synergistic effects. These effects will improve the sustainability, regional development through diversification of the local economy and will also positively affect the workforce.

The development of new bio-based value chains from primary production to consumer markets needs to be done by connecting enterprises from different regions and industries. But due to a missing holistic transnational approach, Danube actors in bio-based industry still operate disconnected and cannot properly benefit from the potential. Therefore, the aim of this project is to develop new methods, strategies and tools to connect enterprises transnationally.

Clusters as the strong representatives of a group of industries that are closely linked by common products, markets, technologies and interests are chosen to organise and bear the industry cooperation and creation of new value chains, because they are performant and sustainable partners and guarantee the upgradeability in the dimension industry, sciences and also politics.

One of the planned outputs of this project will be the development of a Joint Bio-based Industry Cluster Policy Strategy (JBCS) to describe the procedure and to make it actionable and reusable. Furthermore, a bundle of new methods and tools to support clusters for transnational working will be developed and joint into a strategy. They will be tested in three pilot actions where it is planned to create new bio-based value chains in the Danube Region.

The main target groups are on the one hand the policy – four Ministries are involved –, on the other hand clusters and their SMEs – nine cluster organisations are involved. The policy level will benefit from the JBCS, which can be used as a political framework.

The clusters and SMEs will benefit from the new innovative tools and methods developed for transnational cross-clustering. Successfully established new bio-based value chains in the pilot actions can motivate other clusters and SMEs to test this newly developed approach in the future.

The following partners commit to the implementation of the cluster partnership and transnational cooperation:

Role	Official Name in English	Acronym	Country
LP	BIOPRO Baden-Württemberg GmbH	BIOPRO	Germany
ERDF PP1	ClusterAgentur Baden-Württemberg	CA BW	Germany
ERDF PP2	Anteja ECG	ANT	Slovenia
ERDF PP3	PROUNION	PU	Slovakia
ERDF PP4	Romanian Cluster Association	CLUSTERO	Romania
ERDF PP5	Association of Business Clusters	ABC	Bulgaria
ERDF PP6	National Cluster Association – CZ	NCA	Czech Republic
ERDF PP7	Business Upper Austria – OÖ Wirtschaftsagentur GmbH – Upper Austrian Food Cluster	UAFC	Austria
ERDF PP8	Ministry of Economy	ME	Romania
ERDF PP9	Ministry of Economy, Entrepreneurship and Crafts	MEC	Croatia
ERDF PP10	Ministry of Education, Science and Sport	MIZS	Slovenia
ERDF PP11	Croatian Wood Cluster	CWC	Croatia
ERDF PP12	Institute for Economic Forecasting	IPE	Romania
ERDF PP13	Business Upper Austria – OÖ Wirtschaftsagentur GmbH – Cleantech-Cluster	BizUp	Austria
IPA PP1	Innovation Center of Faculty of Mechanical Engineering	ICME	Serbia
ASP1	Montenegro Vine Cluster	MVC	Montenegro
ASP2	Ministry of Economic Affairs, Labour and Housing Baden-Württemberg	WM	Germany

LP = Lead Partner, PP = Project Partner, IPA = Instrument for Pre-Accession, ASP = Associated Strategic Partner, ERDF = European Regional Development Fund

APPENDIX I

European top regions in Bio-based Packaging Industry (Cluster Stars, 2014)

NUTS	Region	Cluster Stars	Firms	Employment (FTE)	LQ	Avg. Wage	Gazelles	Gazelle FTE
DEG0	Thüringen	4	738	16,078	2.19	30,668	4	69
AT31	Oberösterreich	3	426	9,300	1.85	40,041	3	81
BA00	Bosnia and Herzegovina	3	985	10,019	1.17	7,797	13	290
BG41	Yugozapaden	3	1,140	13,190	1.25	11,219	8	169
BG42	Yuzhen tsentralen	3	711	8,421	1.75	6,219	14	325
CZ03	Jihozapad	3	576	9,973	2.36	16,863	1	10
CZ05	Severovychod	3	856	10,580	2.08	19,884	3	95
CZ06	Jihovychod	3	942	12,061	2.03	18,431	3	100
CZ07	Stredni Morava	3	718	10,324	2.55	16,490	1	22
DE25	Mittelfranken	3	473	13,727	2.11	53,118	2	47
DE26	Unterfranken	3	282	9,579	2.16	54,100	2	7
DE72	Gießen	3	242	4,900	1.55	42,829	1	2
DEA4	Detmold	3	697	15,557	2.34	41,000	4	149
DEA5	Arnsberg	3	1,022	17,491	1.54	49,992	6	415
DED2	Dresden	3	417	11,020	2.07	25,945	2	17
HU10	Kozep-Magyarorszag	3	2,787	12,870	0.84	20,249	16	239
HU21	Kozep-Dunantul	3	698	10,982	3.26	13,329	12	155
ITC1	Piemonte	3	915	18,520	1.75	38,954	9	722
ITC4	Lombardia	3	3,096	60,291	2.07	41,921	23	1,401
ITH3	Veneto	3	1,170	23,793	1.74	36,379	13	254
PL11	Lodzkie	3	985	18,043	1.89	10,643	3	48
PL12	Mazowieckie	3	2,432	32,799	1.67	22,615	5	113
PL22	Slaskie	3	1,604	34,468	2.04	24,539	11	904
PL41	Wielkopolskie	3	1,297	17,828	1.69	16,413	5	187
PL51	Dolnoslaskie	3	950	15,762	1.65	16,512	3	41
PL61	Kujawsko-Pomorskie	3	766	13,229	2.18	11,832	1	4
RO11	Nord-Vest	3	693	13,216	1.68	10,417	5	74
RS12	Vojvodina	3	985	10,843	2.73	14,436	12	244
SK02	Zapadne Slovensko	3	1,462	11,409	1.99	17,334	4	212
BE22	Limburg (BE)	2	254	3,190	1.52	62,243	3	9
BG32	Severen tsentralen	2	486	4,720	1.63	7,755	3	23
DE11	Stuttgart	2	929	20,360	1.26	59,980	5	64
DE12	Karlsruhe	2	788	12,400	1.20	49,556	2	55
DE14	Tübingen	2	502	10,098	1.65	52,986	3	29
DE21	Oberbayern	2	1,439	13,582	0.82	53,059	6	153
DE24	Oberfranken	2	349	10,012	2.72	47,818	3	91

NUTS	Region	Cluster Stars	Firms	Employment (FTE)	LQ	Avg. Wage	Gazelles	Gazelle FTE
DE27	Schwaben	2	464	10,791	1.79	51,078	5	370
DE30	Berlin	2	935	5,423	0.43	39,549	4	13
DE71	Darmstadt	2	965	14,587	1.07	54,309	0	0
DE92	Hannover	2	503	14,642	2.15	35,369	1	1
DEA1	Düsseldorf	2	1,005	10,767	0.63	53,832	1	55
DEA2	Köln	2	1,215	19,822	1.45	62,869	6	896
DEA3	Münster	2	574	12,916	1.65	65,089	5	312
EL30	Attiki	2	511	9,274	0.72	15,699	4	110
ES51	Cataluña	2	3,092	24,358	0.95	39,886	15	362
ES52	Valencia	2	1,927	15,586	1.18	36,122	15	244
FI1C	Southern Finland	2	342	6,239	1.53	43,022	2	2
FI20	Åland	2	9	694	1.88	45,137	0	0
FR10	Île de France	2	2,687	21,976	0.46	60,771	14	130
FR51	Pays de la Loire	2	825	10,570	1.09	43,988	6	212
FR71	Rhône-Alpes	2	1,939	24,249	1.39	47,499	16	428
FR82	Provence-Alpes-Côte d'Azur	2	1,008	6,294	0.46	54,121	4	47
ITF1	Abruzzo	2	238	5,272	1.62	43,767	1	6
ITF3	Campania	2	759	6,878	0.64	29,278	3	40
ITH5	Emilia-Romagna	2	1,053	17,766	1.38	37,916	5	171
LT00	Lietuva	2	817	12,108	1.07	18,741	15	450
NL33	Zuid-Holland	2	937	5,286	0.53	60,124	2	2
PL21	Malopolskie	2	1,109	14,702	1.49	14,684	3	62
PL32	Podkarpackie	2	481	9,273	1.55	12,394	2	46
PL34	Podlaskie	2	228	7,824	2.28	9,891	2	14
RS21	Šumadija and Western Serbia	2	970	8,814	2.41	9,954	5	88
SE23	Västsverige	2	983	9,341	1.22	49,281	4	53
SI03	Vzhodna Slovenija	2	809	8,569	3.01	27,766	0	0
SI04	Zahodna Slovenija	2	1,183	5,622	1.60	23,879	0	0
UKF1	Derbs and Notts	2	336	10,167	1.08	31,201	0	0
UKK1	Gloucs, Wilts and N Som	2	488	9,350	0.88	38,594	1	146

APPENDIX II

Cluster Initiatives in the Bio-based Packaging Sector

Name	Country	Number of cluster actors	Established
Plastics Cluster	Austria	>400	1999
INNONET Kunststoff Horb	Germany (BW)	>100	2004
Packaging Valley	Germany (BW)	48	2007
Plastic Cluster	Czech Republic	50	2006
Omnipack	Czech Republic	57	2005
Cluster of Chemical, Plastic and Rubber Industry	Croatia	24	2013
Slovak Plastic Cluster	Slovakia	29	2009
Plasttechnics Cluster Slovenia	Slovenia	68	*
Poly4EmI	Slovenia	7	2014

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