Capitalisation report
BRIDGES innovation maps

BRIDGES project 2nd semester deliverable

Contributions

1. *Criteria for the innovation maps, PP3 LuVo PL, PP1 KE FI*
2. *Innovation maps: PP2 RCK/PP1 KE FI, PP3 LuVo PL, PP4 HURC FI, PP5 ANKO GR, PP6 SVDC SI, PP7 PBN HU.*
3. *Formulation of the 2nd readings, regional inputs: PP2 RCK FI, PP3 LuVo PL, PP5 ANKO GR, PP6 SVDC SI, PP7 PBN HU; coordination: PP9 CERTH GR; facilitation: PP4 HURC FI, PP8 CEI Burgos ES, PP1 KE FI.*
4. *Capitalisation report, Innovation maps summary & insights: PP1 KE FI.*

KE thanks all the partners for their cooperation, contributions and comments that helped make this report better; and PP9 CERTH, for the detailed, comprehensive and essential feedback to this report.

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Overview

The purpose of this capitalisation report is, above all, to provide a solid basis of data and methodologies to facilitate decision making in relation to the action plans of the BRIDGES project regional partners.

The report smmarises the six innovation maps, makes recommendations for the regional action plans prioritising types of technological connectivity between less and more advanced innovation regions, and draws conclusions regarding technological connectivities beyond locational proximities.

Introduction

The objective of the BRIDGES project is to improve the effectiveness of RIS3 implementation by addressing structural challenges, in this case mismatches between the knowledge and productive bases of non-innovation leader regions. The project argument is that such challenges can be remedied by strategically and operationally linking RIS3 priority industries in less advanced regions with the knowledge base available in another region, as a way towards faster and upscale growth while, at the same time, enhancing the embeddedness of the missing knowledge through good practice transfer on at least three fronts: innovation infrastructures, methodologies for research/university to industry partnerships, and funding approaches.

Linking productive and knowledge/technology bases across EU borders requires, in the first place, that i) advanced regions are willing to share knowledge with the rest of the regions and look at the conditions under which this would be probable and ii) less advanced regions have the understanding, absorptiveness capacity, and willingness to invest in R&D outside their ESIF programme area.

To address these preconditions we brought together six regions, one innovation advanced region and five less advanced, sharing three types of proximities: production base proximities (even if at very different levels of competitiveness –biobased industries as RIS3 theme), technological

proximities (at least a common understanding of), and relational proximities (Basile 2011[1], the EU-wide application of the ESIF and and the RIS3 strategies); in addition, the research strategy of the innovation advanced region, includes internationalisation of its research outputs (Uusimaa, FI[2]) among its objectives. The profile of the BRIDGES partnership is outlined in Table 1.

Table 1 Key information of the BRIDGES project regions

Region	Area(km^2)	Population	Income (€/capita)	IUS [3] (2014 or 2015)
Kainuu, FI	22,687	75,324[4]	27,468	Innovation follower
Lubelskie, PL	25,122	2,139,726	10,172	Modest innovator
Helsinki-Uusimaa, FI	9,097	1,620,261[5]	47, 830	Innovation leader
Western Macedonia, GR	9,451	291,731	18,100	Modest innovator
Goriška, SI	8,061	971,995	21,399	Moderate innovator
Western Transdanubia, HU	11,209	997,939	16,920[6]	Moderate innovator

To be able to implement these objectives, the BRIDGES approved proposal turns to two sources: 1) the notion of technological connectivity and critical mass as discussed in the RIS3 literature[7],

[1] Roberto Basile, Roberta Capello, and Andrea Caragliu, 2011. Interregional Knowledge Spillovers and Economic Growth: The Role of Relational Proximity. Retrieved from Research Gate on 9.4.2017.

[2] FIRI the Finnish research infrastructure committee), AKA (Academy of Finland), MINEDU (Ministry of Education), 2014. Finland's strategy and roadmap for research infrastructures 2014-2020. Page 3, stressing quality of research, impact, and internationalisation.

[3] IUS = Innovation Union Scoreboard

[4] http://www.stat.fi/tup/suoluk/suoluk_vaesto_en.html

[5] http://www.stat.fi/tup/suoluk/suoluk_vaesto_en.html

[6] Data 2011, https://www.ksh.hu/docs/eng/xftp/idoszaki/gdpter/egdpter11.pdf, page 9

[7] Foray D., David P.A., Hall B., Bronwyn H., 2009, *Smart Specialisation – e Concept*. Brussels.

Foray D., Goddard J., Beldarrain X.G., Landabaso M., McCann P., Morgan K., Nauwelaers C., Ortega-Argilés R. and Mulatero F., 2012, *Guide to Research and Innovation Strategies for Smart Specialisations (ris 3)*. Luxemburg: European Union.

Foray D., Goenega X., 2013, *e Goals of Smart Specialisation*. Seville (Spain): Euroean Commission.

Donato Iacobucci, Enrico Guzzini, 2015. Relatedness and connectivity in technological domains: missing links in S3 design and implementation; European Planning Studies Volume 24, 2016 – Issue 8: Regional Innovation Strstegies 3(RIS3): From Concept to Applications, http://dx.doi.org/10.1080/09654313.2016.1170108 .

Donato Iacobucci, Enrico Guzzini, 2016. La 'Smart Specialization Strategy' delle regioni italiane e le relazioni fra ambiti tecnologici, Sciennze Regionali / Italian Journal of Regional Science Vol. 15 / n. 3, 2016, shared by the author 15.4.2017.

Ruslan Rakhmatullin European Commission, DG JRC, IPTS, Smart Specialisation Platform, 2014. Triple/Quadruple Helix in the context of Smart Specialisation, 29-30 May 2014 Guildford, UK.

and 2)the provisions of Article 70 of the CPR "by promoting interregional actions BRIDGES invests in the potential of Article 2 of the European Territorial Cooperation (ETC) 1299/2013 stipulating that «...the ERDF may also support the sharing of facilities and human resources, and all types of infrastructure across borders in all regions» & of Articles 70.2 and 96.d of the CPR[8] (CPR-Regulation (EU) No 1303/2013), that foresee using ESIF beyond the programme areas for up to 15%[9]". Reference to article 70 of the CPR is in fact part of the innovative character of the project: "It… (2) systematically explores ecosystem options to address critical structural & mass challenges of imperfect regional innovation systems, especially present in diversification regions. It thus also activates article 70.2 of the CPR, a new provision…[10]". In the project plan, Article 70 of the CPR is processed through the interregional working group 2 (IWG2[11]) and in one of the components of the foreseen regional action plans (AC3[12]). This has been the starting point of the project.

The target indicators of the linkages were self defined and are part of the BRIDGES project deliverables, 'numbers of enterprises cooperating with research institutions' except for the innovation advanced region that defiend the indicator as 'number of research institutions cooperating with businesses outside Uusimaa', Table 2.

Table 2 Self defined indicator per project partner

Number of enterprises cooperating with research institutions, Kainuu, FI	30
Number of enterprises cooperating with research institutions, Lubelskie, PL	60
Number of research institutions cooperating with businesses outside Uusimaa, Uusimaa, FI	5
Number of enterprises cooperating with research institutions, Western Macedonia, GR	40
Number of enterprises cooperating with research institutions, Goriška, SI	40
Number of enterprises cooperating with research institutions, Western Trandanubia, HU	60

[8] REGULATION (EU) No 1303/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 December 2013), page 378 Article 70 Eligibility of operations depending on location, §2 and page 415 Annex 1, COORDINATION AND SYNERGIES BETWEEN ESI FUNDS AND OTHER UNION POLICIES AND INSTRUMENTS.

[9] Part C.2, §2 of the approved BRIDGES AF

[10] Part C.6.3 Innovative character, §1.

[11] D1.Phase 1, semester 1: "IWG2 set up: to bring together regional authorities/MAs/IBs to identify, screen and finally activate synergies among the partner areas, especially between research and RIS3 economies, facilitated by e.g. interregional innovation vouchers. IWG2 refers to article 70.2 of the CPR. IWG2 is coordinated by PP 9 & 10; members are PP2, PP3, PP4, and SK from PP5, 6,7".

[12] D1, Phase 1, Semester 4: "AC3: Inter-regional innovation co-operations, activation of Article 70.2 of the CPR & research2industry framework partnerships. (ensured by IWG2 activities)"

According to the project plan, these indicators will be reached during Phase 2 and beyond, by implementing the action plans formulated and approved (by ESIF managing authorities (MAs) and / or intermediate bodies (IBs)) during Phase 1. The action plans include also funding provisions, i.e the partner regios have committed to minimal levels of financing of the action plans. The total commitments in the BRIDGES project are 3 600 000€, with highest contribution 900 000€ by Lubleksie and lowest by Uusimaa 150 000€, reflecting the different needs but also the dramatic differences in available structural funds for the respective partner regions.

To achieve these results, BRIDGES applies eight tools: i) the innovation maps; ii) good practice identification and transfer; iii) involvement of regional stakeholder groups (RSKs -which include also representatives of MAs and IBs); iv) interregional policy learning (IPL); v) mediation between the advanced and less advanced regions through additional activities facilitated by the advisory team; vi) external peer review; vii) endorsed action plans; and viii) implemented and monitored action plans. If successful, the results of the project will enable[13]:

- The implementation of a framework for research / universities and businesses interactions, focusing on technological connectivity, between advanced and less advanced regions.
- Rationalisation and clarification of the funding of such interactions, modelling transferrable win-win types of cooperations between advanced and less advanced regions.
- Strengthening of industry-related expertise in the regions.
- Strengthening of the integration of peripheral regions into the knowledge – based economy by strengthening the technological connectivity to knowledge centres.
- Contributions to economies of scale and commercialisation of research of the advanced innovation region.

The BRIDGES project regional partners have all RIS3 strategies which include bioeconomy industries. For these industries to speed up their innovation and growth potential, regions should encourage (inter alia) those segments of the industries that have the highest potential to absorb innovation and invest in it. BRIDGES project focuses on this type of businesses. We expect to identify, within the BRIDGES partnership, some 130 businesses in total (0), depending on the size of the regional economies and the regional population. The regional maps were planned to reveal the level and type of innovation that can be best absorbed by the regions.

[13] Mark Boden (lead author) et al, 2017. Increasing the effectiveness of RIS3 implementation through university-to-industry interactions; woking document submitted to the UIIN 2017 confeerence, Dublin June 7th and 8th 2017, page 5.

http://www.interregeurope.eu/bridges/

The innovation absorption potential of these companies is analysed, based on the reports produced in each region, by the Bio-based economy expert, matched to research options that can lead to investments, proposed, discussed and agreed with each one of the regional partners. This processs will clarify 1) what type of innovations to prioritise in the region and therefre 2) what type of projects should be generated and 3) which one(s) of these projects whould be seleced to be part of the field & policy impact of the action plans.

Why the innovation maps

The issue of firms' innovation absorptiveness capacity is equivalent to the discussion on firms' absorptiveness capacity of external information. The issue has been disucssed since 1950s, and the connection to innovation since the late 1980s. The term 'absorptive capacity' was introduced in 1990 by Cohen and Levinthal[14]: "The ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities. We label this capability a firm's absorptive capacity and suggest that it is largely a function of the firm's level of prior related knowledge". Absorptive capacity is related to the knowledge spillover theory (knowledge spillovers can happen iff a firm can appreciate / grasp good practices, successful patterns of other firms).

Knowledge spillover and innovation absorptiveness literature stress cumulativeness of knowledge as a value and precondition of absorptive capacity. Thus, cumulative absorptive capacities are used to explain technology transfer among nations (interregional parnershps are such examples) and the success of strategic alliances for innovation[15]. Maximising knowledge spillover results (in terms of technological connectivity and good practice transfer) requires understanding the absorptiveness capacity of the BRIDGES prioject regions' RIS3 industries included into the proejct ("RIS3 sub-industries") matched with the relevant research availability of the innovation advanced region. Measurements of innovation potential include, patents by businesses and patent families, IPR, resources devoted to research and development, technology balance of payments and international trade in R&D-intensive industries[16]. In the BRIDGES project, the criteria for mapping

[14] Wesley M. Cohen; Daniel A. Levinthal (1990) Absorptive Capacity: A New Perspective on Learning and Innovation, Administrative Science Quarterly, Vol. 35, No. 1, Special Issue: Technology, Organizations, and Innovation. (Mar.,1990), p.128-152, p.129. http://links.jstor.org/sici?sici=0001-8392%28199003%2935%3A1%3C128%3AACANPO%3E2.0.CO%3B2-5 .

[15] Vega-Jurado, J., Gutierrez-Gracia, A. and Fernandez-de-Lucio, I. (2008) Analysing the determinants of firm's absorptive capacity: beyond R&D. R&D Management 38, 4, 392-405.

Narula, R. (2002) Understanding Absorptive Capacities in an "Innovation Systems" Context: Consequences for Economic and Employment Growth. DRUID Working Paper nr. 04-02.

[16] Oslo Manual (OECD/Eurostat, 2005) and https://www.innovationpolicyplatform.org/content/patent-data-performance-firms-regions-and-countries?topic-filters=12243 .

innovation absorptivnss capacity potential, are partially inspired by these parametres, but also take into account that often businesses do not patent or IPR their innovations. Thus, to map these actors, six criteria were agreed, five for identifying the innovation absorptiveness capacity of RIS3 sub-industries and one for mapping the related research availabiltiy in the innovation advanced region.

The criteria of the innovation maps

Innovation absorptiveness capacity potential PP2/1, PP3, PP5, PP6, PP7

Bio-economy businesses that have received public support (as appliers or part of a partnership) for innovative products development and which have invested for the product development during the last 3 years. (Input & performance indicator)

Bio-economy businesses that have utilised advanced research services (e.g. material research measurements) during the last 3 years; single, short term cooperation. (Output indicator)

Bio-economy businesses that have been developing products through Research2Business innovation partnerships during the last 3 years; long term, comprehensive cooperation. (Output indicator)

Bio-economy businesses that have applied for patents (biotechnology) and /or IPR during the last 3 years. (Output indicator)

Bio-economy businesses that have applied for Phase 1 SME or Phase 2 SME Instrument (TRL 6 and higher). (Performance indicator)

Research potential, PP4

Mapping research infrastructures specialising in bio-based industries, associated technology transfer offices, and intrerntionalisation interests

Connectivity potential

$\int f$((PPi (i=1/2,3,5,6,7) $\bigcap$ PP4) * connectivity options (schemes, funding))

Timetable

Definition of and agreement on the mapping criteria & drawing of the innovation maps, required the first two semesters of the BRIDGES project operation, 9.2.2016 – 31.3.2017. The process was completed by the end of the 2nd semester (31.3.2017); six innovation mapping reports were delivered: Kainuu,FI (PP2/PP1), Lubelskie,PL (PP3), Uusimaa,FI (PP4), Western Macedonia,GR (PP5), Goritza,SI (PP6) and Western Transdanubia,HU (PP7).

Innovation maps summary and insights

The discussion in this sesction is organised in two parts: comparative summary of the innovation maps of the BRIDGES regions, and Insights & recommendations. At the end of this section (an dpart of the project) there is available all the background informaiton needed to proceed to the "2nd reading of regional potential and interregional technological connectivities" of Kainuu/Lubelskie/Western Macedonia/Goriška /Western Transdanubia, and based on the result of these readings ti proceed to collaborative concepts with Uusumaa research resources.

The *comparative* section is organised into five (5) sections (tables & comments), summarising innovation absorptiveness capacity (Table 3), knowledge bases (Table 4), methodologies and processes (Table 5), RIS3 funding state of play (Table 6) and suggestions (Table 7).

- Tables 3 refers to the identified industries through NACE codes. NACE references were requested to possibly identify possible related variety patterns based on statistical proximities[17], opened up in Table 8.
- Table 7 summarises the suggestions made by each partner's expert who wrote the capitalisation report, except for the case of PP6 Goriška, where the suggestions are coming from PP9 CERTH.

[17] ANSELIN L. (1988) Spatial Econometrics: methods and models. Kluwer, Dordrecht.

BRESCHI S., LISSONI F. and MALERBA F. (2003) Knowledge-relatedness in firm technological diversification. Research Policy 32, 69-87.

DISSART J. C. (2003) Regional economic diversity and regional economic stability: research results and agenda. *International Regional Science Review* **26**, 423-446.

FELDMAN M. P. and AUDRETSCH D. B. (1999) Innovation in cities: Science-based diversity, specialization and localized competition. *European Economic Review* **43**, 409-429.

JACOBS J. (1969) *The Economy of Cities*. Vintage, New York JACQUEMIN A. P. and BERRY C. H. (1979) Entropy measure of diversification and corporate growth. Journal of Industrial Economics 27, 359-369.

JAFFE A. B. (1986) Technological opportunity and spillovers of R&D. *American Economic Review* **76**, 984-1001.

KOEN FRENKEN, FRANK VAN OORT and THIJS VERBURG, 2005. Related Variety, Unrelated Variety and Regional Economic Growth, Regional Studies, Vol. 41.5, pp. 685–697, July 2007.

Castaldi, C., Frenken, K., & Los, B.,2013. Related variety, unrelated variety and technological breakthroughs : an analysis of U.S. state-level patenting. (ECIS working paper series; Vol. 201303). Eindhoven: Technische Universiteit Eindhoven.

Matthias Brachert, Alexander Kubis, Mirko Titze, 2013. Related Variety, Unrelated Variety and Regional Functions: A spatial panel approach; Papers in Evolutionary Economic Geography # 13.01.

- Each one of Tables 4, 5,6,7 is organised so as to both include information from the innovation maps as well as to include a column for comments. The *Comments* columns are critical appraisals of the situation in the regions. they have been filled in followign discussions with the partners, towards identifying gaps –especially in their knowledhe and methodological bases. All references to individual regions have been discussed and approved by the relevant partners.

- The *insights* section is about understanding better the inovation maps, their implications especially in relation to technological connectivity and the 2nd reading.

Summary and comparisons

RIS3 sub industries

This section summarises the direct findings from the innovation mapping criteria.

Table 3 RIS3 sub industries & research potential

Innovation map questions	Regions and industries (NACE codes, industries by name can be found in Tables 1 and 9).
RIS3 sub-industries	
(1) Bio-based economy businesses that have received public support	**Kainuu** Industries: 74 C73, 94 ENERGYP, 21 C21, 19 C20; 1) Forest berries and other non-wood forest plants. Enrichment of ingredients from berries (e.g. lingonberry, cloudberry and bilberry) and side streams from berry industry. (2) Forest biofuels (forest chips, bio-oil, bioethanol). (3) Refining forest biomass for pulp and bioproducts (Bio-product factory). (4) Wood Constructions. Number of businesses: 4.
	Lubelskie[18] Industries 01.11, 10.39, 10.41, 10.51, 10.71, 10.73, 10.89, 11.05, 20.15, 21.10, 21.20, 35.30, 43.22, 46.22, 46.31, 46.75, 47.21, 72.11 Number of businesses: 28.
	Western Macedonia Industries: (10.39) (10.51) (10.61) (10.72) (10.84) (10.86) (11.02) (21.20) Number of businesses: 13
	G**oritza/Goriška** Industries: 1.21, 3.12, 10.11, 10.13, 10.52, 10.71 Number of businesses: 6
	Western Transdanubia Industries: 02.XX - Forestry and logging, 16. XX - Manufacture of wood and of products of wood and cork**,** except furniture; manufacture, 31.XX - Manufacture of furniture Number of businesses: 4

[18] Comment on R2 ROP 2014-2020: Excellent provisions for modernisation & renewal of the economy.

Table 3 RIS3 sub industries & research potential

Innovation map questions	Regions and industries (NACE codes, industries by name can be found in Tables 1 and 9).
(2) Bio-based economy businesses that have utilised advanced research services	**Kainuu** Industries: 74 C73, 94 ENERGYP, 21 C21, 19 C20; (1) Forest berries and plants, (2) forest biofuels, (3) Bioproduct factory, (4) Wood Constructions. Number of businesses: 4
	Lubelskie Industries: 10.71, 10.73, 20.15, 28,30, 41.20, 71.11, 81.30 Number of businesses: 8
	Western Macedonia Industries: 10.39, 10.51, 10.61, 10.72, 10.84, 10.86, 11.02, 21.20. Number of businesses: 14
	Goritza/ Goriška Industries: 1.3, 1.61, 10.13, 10.32 Number of businesses: 5
	Western Transdanubia Industries: 02.XX - Forestry and logging (1); 16. XX - Manufacture of wood and of products of wood and cork, except furniture; manufacture (1); 31.XX - Manufacture of furniture (2). Number of businesses: 4
(3) Bio-based economy businesses that have been developing products through Research2Business innovation partnerships during the last 3 years; long term, comprehensive cooperation.	**Kainuu** Industries: 74 C73, 94 ENERGYP; (1) Forest berries and plants; (2) forest biofuels. Number of businesses: 2
	Lubelskie Industries**:** 10.71, 10.73, 20.15, 28,30, 41.20, 71.11, 81.30, 01.11, 10.39, 10.41, 10.51, 10.71, 10.73, 10.89, 11.05, 20.15, 21.10, 21.20, 35.30, 43.22, 46.22, 46.31, 46.75, 47.21, 72.11 Number of businesses: 26
	Western Macedonia Industries 10.39, 10.51, 10.61, 10.72, 10.84, 10.86, 11.02, 21.20. Number of businesses: 10
	Goritza/ Goriška Industries: 10.32, 10.51, 10.52,10.71, 10.89 Number of businesses: 6
	Western Transdanubia Industries: 02.XX - Forestry and logging (1); 16. XX - Manufacture of wood and of products of wood and cork, except furniture; manufacture (1). Number of businesses: 2
(4) Bio-based economy businesses that have applied for patents (biotechnology) and /or IPR during the last 3 years.	**Kainuu** Industries: 74 C73 (1) Forest berries and plants. Number of businesses: 1
	Lubelskie Industries: 10.73, 20.15, 20.59, 21.20, 25,12, 25.62, 28.30, 28.92, 28.93, 28.99, 35.11, 43.99, 46.90, 58.19, 71.12, 72.11

Table 3 RIS3 sub industries & research potential

Innovation map questions	Regions and industries (NACE codes, industries by name can be found in Tables 1 and 9).
	Number of businesses: 20
	Western Macedonia Industries: 10.39, 10.51, 10.61, 10.72, 10.84, 10.86, 11.02, 21.20, 21.20. Number of businesses: 9
	Goritza/ Goriška Industries: 10.13, 10.13, 10.32, 10.51, 10.71, 10.73, 10.85. Number of businesses: 9
	Western Transdanubia Industries: 16.XX - Manufacture of wood and of products of wood and cork, except furniture; manufacture (Sopron, 1); 31.XX - Manufacture of furniture (Sopron, 2). Number of businesses: 3
(5) Bio-based economy businesses that have applied for Phase 1 SME or Phase 2 SME Instrument (TRL 6 and higher).	**Kainuu** Industries: no applications
	Lubelskie Industries: 10.30, 10.71, 28.93, 72.11 Number of businesses: 4
	Western Macedonia Industries: 10.XX, .XX Number of businesses: 7 (4 Phase 1, 3 Phae 2)
	Goritza/ Goriška Industries:no applications
	Western Transdanubia Industries: no applications
Research availability	
Mapping research infrastructures specialising in bio-based industries, associated technology transfer offices, and intrerntionalisation interests	Uusimaa Seven research institutes were identified in the mapping of Helsinki-Uusimaa: 1)VTT Technical Research Centre of Finland, 2)Aalto University, 3)Geological Survey of Finland (GTK), 4)University of Helsinki, 5)Finnish Environment Institute SYKE, 6)National Resources Institute Finland (LUKE), 7) Finnish Meteorological Institute; through their designated technology transfer offices connectiong to less developed regions

Table 3 insights

The number of businesses available for reaserach-to-business innovation – based interactions is relatively small, i.e. research-to-business are necessary but they do not quarrantee wider renewal of the regional economies. Therefore it was essential to look deeper into each region, into modernisation and renewal aspects.

Matching research potential is sufficient.

Knowledge base

The knowledge bases of the partner regions were mapped as part of the context of the RIS3 sub industries of the innovation maps.

Table 4 Knowledge base

Region	Knowledge and research resources	Comments
Kainuu	• Research • CEMIS (Centre for Measurement and Information Systems); contract based measurement and information systems research and training center; joint operation among VTT, Universities iof Jyväskylä and Oulu, KAMK (Kajaani university of applied sciences); basically a project-based organisation. • The Unit of Measurement Technology (MITY, University of Oulu); MITY consists of the two research groups: Cleantech and Health & wellbeing. There are some 50 professionals with multi-disciplinary education and expertise. The aim of the cleantech group is to develop novel applications of measurement technologies for real-time environmental monitoring, mining industry, forest industry and bioeconomy. • VTT MIKES-Kajaani • Natural Resources Institute Finland (LUKE) has three research stations in Kainuu. In Sotkamo Luke is focused on production biogas from agricultural waste materials, In Paltamo Luke is focused on fish farming and in Puolanka, where seeds of trees are stored in order to preserve genetic diversity of forest trees.	Research services good but mostly focusig on measurement technology, i..e narrow segment. Mismatches between local productive and knowledge base. Reearch units sell services outside the region (good thing). Linkages between research services and RIS3 industries need improvement.
Lubelskie	Education and research • Universities: Maria Curie-Skłodowska University, Medical University, the University of Life Sciences, the John Paul II Catholic University of Lublin, the Lublin University of Technology • Research Institutes: The Institute of Agrophysics of the Polish Academy of Sciences, the Institute of Soil Science and Plant cultivation- State Research Institute, the Institute of New Chemical Synthesis, the Institute of Rural Health, Lublin Science and Technology Park , the Puławski Science and Technology Park, • NATIONAL LEVEL: The Institute of Agrophysics of the Polish Academy of Sciences, the Institute of Rural Health, the Institute of Soil Science and Plant cultivation- State Research Institute, the National Veterinary Institute, the Institute of New Chemical Synthesis, the Biological Threats Identification and Countermeasure Centre of the Military Institute of Hygiene and Epidemiology in Warsaw, The Research	Strong knowledge base, the connectivty between knowledge and industry needs to be addressed concretely and systematically.

Table 4 Knowledge base

Region	Knowledge and research resources	Comments
	Institute of Horticulture – Apiculture Division in Puławy, Division of the Institute of Horticulture in Skierniewice, Lublin Science and Technology Park.	
Uusimaa	Education and research • Seven research institutes were identified in the mapping of Helsinki-Uusimaa: 1)VTT Technical Research Centre of Finland, 2)Aalto University, 3)Geological Survey of Finland (GTK), 4)University of Helsinki, 5)Finnish Environment Institute SYKE, 6)National Resources Institute Finland (LUKE), 7) Finnish Meteorological Institute; through their designated technology transfer offices connectiong to less developed regions. • VTT: Department of Bioeconomy; Aalto University: Department of Bioproducts and Biosystems, Department of Built Environment; University of Helsinki: Department of Food and Environmental Sciences, Department of Agricultural Sciences, Department of Forest Sciences, Department of Biosciences, Department of Environmental Sciences; LUKE: Boreal Green Bioeconomy, Blue Bioeconomy, Innovative Food System.	Good knowledge resources, good connectivity, good methods
Western Macedonia	Education and research • The University of Western Macedonia (www.uowm.gr), founded in 2003, the Technological Education Institute Western Macedonia (www.teiwm.gr) since 1976 with its research branch Technological Research Centre (TRC,www.ktedm.gr) and the Institute for Solid Fuels Technology and Applications (http://www.lignite.gr) , one of the five institutes of the National Centre for Research and Technology Hellas (CERTH), are the main regional research performers. • Greece's universities and research institutes focus heavily on providing assistance to the food and beverage industry. A number of highly specialized research centers such as the University of Thessaly, the Food Industrial Research & Technological Development Company (ETAT), the Institute of Agro biotechnology and the Institute of Aquaculture, assist manufacturers and processors in developing innovative solutions to meet the needs of today's marketplace.	The innovation management chain is missing as a function and as a conviction, and as a result the resoruces are not really valorised for RIS3 and overall.
Goriška	Education and research • National level: fresh water aquaculture; salt water aquaculture: university of Goriška Goriška, 4 year old, relevant stakeholder, not yet fully mature.	The aquaculture approach that is prioritised is challenging, and not suffiicently addressed in

Table 4 Knowledge base

Region	Knowledge and research resources	Comments
		the exisiting knowledge base (marble trout is very hard to deal with).
Western Transdanubia	Education and research • Within the traditional educational system, on secondary level, there are 4 institutions, which are explicitly dedicated to the wood and furniture industry. Among these 2 are located in Western Hungary, one in Szombathely and another in Sopron. Beyond them there are also specialized, thematic curricula in many further secondary schools. • On higher education the University of West Hungary, located in Sopron, is the only training institutions purely for the industry. It also has technology transfer institute, innovation office, basic and applied research centers. The advantage of having one institution is that the indus-trial players have very strong connection to the institution and with each other. The disad-vantage is the lack of competition on national level. • Another key player in the educational sector is the Moholy-Nagy University of Art and Design, which is focusing on the artistic education. It has a synergetic, complementary profile to the previous university, which has stronger focus on the engineering and scientific fields. This lat-ter is located in Budapest. • Two higher institutions in Hungary (University of West Hungary and the University of Art and Design; also a technology transfer insittute and innovation office); vocational education on the furnture industry exist in the region.	Applicability of research as methodology is important to be dissmeinated; the national and regionalknowledge resources are high quality. Additionally, the possibility to specialise on one segment of the industry, e.g. also through value chain networking patterns.

Table 4, Insights

- All regions have good knowledge bases at regional and/ or national level or both; but not always in the exact specialisation segment foreseen in the project. Therefore, when projects improving technological connectivity are planned, they should be encouraged to include actors from the regions' knowledge bases when relevant.
- Sometimes very specialised, or advanced / state of the art types of knowledge and research are missing. This is taken into account when discusisng interregional connectivity options.
- Research infrastructures are not as widely present as knowledge bases. This is "natural" in a sense. Because advanced research infrastructures cost a lot while continuously evolving towards new solutions and services, it is not possible or even reasonable to try replicating state of the art infrastructures in each and every region. Thus, interregional technological connectivity appears to be a structural rather than "just" a conjectural issue of regional development.

- PP4 resources are sufficient (e.g. VTT: Department of Bioeconomy; Aalto University: Department of Bioproducts and Biosystems, Department of Built Environment; University of Helsinki: Department of Food and Environmental Sciences, Department of Agricultural Sciences, Department of Forest Sciences, Department of Biosciences, Department of Environmental Sciences; LUKE: Boreal Green Bioeconomy, Blue Bioeconomy, Innovative Food System) for the possible cooperations.
- Cross cutting issue (for most of the regions): the interaction between knowledge & research communities with the economy; how to "articulate the tiple helix dialogues".

Methodologies, processes, connectivity: the function of the regional triple helix

The 'methodological base' of the regions is about connectivity practices and the overall triple helix function. It corresponds, to the three good practice theme of the BRIDGES project (GP theme 1 industry-led centres of competence, GP theme 2 Research-to-indutry, GP theme 3 Multilevel synergies.

The methodoligcal bases of the regions are mapped in terms of types of activities, content of connectivity actions and they are understood as part of the enabling factors of the context of the RIS3 sub industries included in the innovation maps. They are assessed in terms of eight types of interactions (interactions), some of them coming from regional innovation systems literature, some from epeiria (through the early stages of the project), some from recent policy developments: 1: Programme–based (strategic, systemic type of interactions); 2: Access to research services; 3: KET applications; 4: TRL improvement / Certifications; 5: Innovation management chain (5.1 R&D council (from idea to technological research concept), 5.2 Proof of concept, 5.3 Prototype, 5.4 Scaling up, 5.5 Business plan, 5.6 Branded marketing); 6: Availability of constant renewal services (upstreaming and downstreaming, Annex I of the CPR[19]); 7: Commercialisation of research; 8: Facilitation services for direct research to business cooperations (e.g. H2020 projects…).

- Type 1 of interactions was not foreseen, their relevance resulted from the policy review discussions with the partners early in the project (February – June 2016) and cofnirmed through the innovation map analysis and discussion with each partner.
- Types 2 and 5 are innovation management activities, closely linked to research infrastrcutures, research servces and industrial expertise, basically serving knowledge and

[19] CPR= Common Provisions Regulation Regulation (EU) No 1303/2013 of the European Parliament and of the Council of 17 December 2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund and repealing Council Regulation (EC) No 1083/2006.

technology transfer. A comparison between the RIS and the European Service Innovation Scoreboard (ESIS) shows that less innovative regions would perform better if service innovation activities would be better captured.[20]

- Types 3 and 4 are 'mainstream' knowledge intensive business services (KIBS) closely linked to new knowledge and research, as well as industrial specialisation expertise.

- Type 6 is a new category, coming from Annex I of the CPR provisions. It is propoing ways to bridge cohesion and innovation funds through concrete actions. 'Upstreaming' actions refer to initwitives, projects, preparing businesses and regions to join H2020 proposals; 'donwstreaning' actions refer to taking results from H2020 projects, adapting and adopting them regionally. None of the regions (not even the innovaiton advanced one) have adopted yet this tool.

- Type 7 Commercialisation of research is an obvious research-to-business activity. In this case, the interest is more in measures promoting this activity across the EU. One of the BRIDGES project partners proposes such a good practice and which is an original initiative of the German Governement, organised at bilateral base, and one of the cooperation chemes is Germany/Finland.

- Type 8 is about innovation support services, "matching" research/ universities/ businesses across the EU towards interregional project cooperation (H2020, and so on). There are many networks across the EU trying to support such efforts. However, they are mostly demand – based, i.e. weaker regions miss opportunities and research actors miss opportunities from emergin from weaker regions. Consideration of Type 8 cooperations was the starting point of the BRIDGES project.

Table 5 Function of the regional triple helix

Region	Resources	Comments
Kainuu	**Innovation services** • Innovation services of University of Oulu • Innovation services of University of Jyväskylä • VENTURE service of Technical research centre of Finland (VTT) • Business Development –team of CEMIS (CBD) • Kainuun Etu Oy.	Connectivity provisions at regional (not binding) and national levels available, and there is a trend for increasing interactions and the possibility for them to be instituionalied. Good practice (Kantola) on knowledge-based industry renewal available. Good practice (ZIM) on cross border

[20] Measuring regional Innovation: Prof. Hugo Hollanders stresses the role of benchmarking and indicators in designing and monitoring efficient regional policies. http://www.wire2014.eu/03-06-14-measuring-regional-innovation-hugo-hollanders-streses-the-role-of-benchmarking-and-indicators-in-designing-and-monitoring-efficient-regional-policies/.

Table 5 Function of the regional triple helix

Region	Resources	Comments
		internationalisation of research. Need to qualify, specialise and systematise innovation services.
Lubelskie	• Collaborations with other regions in the area of the bioeconomy; Lubelskie Voivodeship takes part in the S3 platform and in the Bioregions Platform. It has also signed the Letter of Intent between several voivodeships in Poland and with Bio-Based Industries Joint Undertaking and Bio-Based Industry Consortium. • Innovation activity faces challenges; resources are predominantly dedicated to the improvement of inovation; steps should be taken to strengthen this activity. • 11 innovation centres in the Lublin region in 2014. These centres include: 4 technology transfer centres, 2 business incubators, 2 academic business incubators and 3 technology parks. The Lublin Park Science-Technology and The Puławy Science-Technology Park are ones of the most developed type of innovation and entrepreneurship centres in the region. • Barriers include: (1) insufficiently qualified personnel with no practical experience in the development and support of innovative entrepreneurship, and (2) slight interest of entrepreneurs in the services offered by these institutions. Also, RIS presents the following ones: low demand for innovation, poor supply of innovations (relatively low level of development of the science sector), inefficient system for research and innovation support and system for knowledge and technology transfer.	Connectivity provisions exist, for regional, national and even interregional levels in the partner ESIF 2014-2020 (also in the good praxtice contributions) Needs strategy for involving businesses. Needs strategy for modernisation as a comprehensive cycle of actions. Needs to qualify, specialise and systematise innovation services.
Uusimaa	• Numerous technology transfer offices and related projects within the universitirs and the research institutions. One of them is HIS (Helsinki University Innovation Services) is a BRIDGES good prsacitce as a result of the systematic way it deals with innovation production and then the commercialisation approach and support. HIS covers entire spectrum of the University of Helsinki i.e. life sciences, social sciences and physical sciences. • Aalto Innovation Services • LUKE (in the sense that it connects research with the	A well functioning regional innovation system. Good practice, research-to-business available (Helainki Univrsity researh services). Good practice in coherently orchestrating resoruces for RIS3 implementation.

Table 5 Function of the regional triple helix

Region	Resources	Comments
	needs of business and providng policy consuttation to the ministry) • VTT is also taking care of IPR and commercialization, e.g. by licencing and via VTT Ventures Ltd that manages spin-offs. VTT´s IPR team is resposible of the management of inventions, patents and licences in order to commercialize research. VTT Ventures Ltd manages VTT based spin-offs by investing in the new ventures at the seed phase.	
Western Macedonia	• Department of Rural Economy of Western Macedonia Region: Farmers, breeders and SME's in food sector get assistance and information on the utilization of EU funding and the implementation of national and regional legislation • Planning Directorate of Region of Western Macedonia: SME's get assistance and information on the utilization of EU funding (www.pdm.gov.gr). • Managing Authority of ROP 2014 – 2020 (www.pepdym.gr) • Chambers of Commerce and Industry (Kozani, Kastoria, Florina, Grevena): Chambers enhance and promote business initiatives for their members (SMEs) • Economic Chamber – Department of Western Macedonia: The Chamber for economy enhances and promotes business initiatives on behalf of its members • ANKO SA – Development Agency of Western Macedonia (www.anko.gr): SMEs in food sector get assistance and information on the utilization of EU funding in rural areas.	Backbone of a regional innovation system exists even if not comprehensive. Connectivity within the localised triple helix and beyond (national, interregional) needs to be understood, made relevant to the region, and explored. Missing a regional innovation management chain; this might be a priority to introduce. PP5 could benefot from good practice OPIRIS (contributed by PP9), focusing on smart farming.
Goriška	• Triple helix actor university is that of Nova Goriška. However, a lot of knowledge comes from Ljubljana, especially when it regards more demanding, knowledge intensive sectors. • Quality of tirple helix operation depends on the sector: Tirple helix works in some sectors, but not always; sometimes it is public sector driven, sometimes market driven (after an initial development phase, results need to be confiremd by the market) • National level agency is taking care of innovation, in the sense that they decide the allocation of subsidies.	Experience and appreciation of interregional connectivity through Interreg A strand (Italy). Partner is interested in centres of competence for aquacuture induatry (marble trout).

http://www.interregeurope.eu/bridges/

Table 5 Function of the regional triple helix

Region	Resources	Comments
Western Transdanubia	• Technology transfer and innovation office: Moholy-Nagy University. • Industrial platforms: The Hungarian Federation of Forestry and Wood Industries is a platform of the forest management companies, forest management suppliers and wood trading businesses. The National Carpenters' Association has 300 individual members, mostly Hungarian micro- and small businesses. It focuses on consultation, fair organizations and a thematic journal is also prepared for the members. The Hungarian Furniture Association is concentrating mostly on design and human resource development of its members. With its wide membership pool this association is working strongly on the public relations of the furniture industry. The Pannon Wood and Furniture Cluster is concentrating on project generation of the individual members, and liaising the industry with the education.	National/ regional innovation management system backbone ok; needs updated actions and exchanges; to adopt an integrated approach. Strong possibiltiy for cross fertilisation between the industrial paltforms and the universities. Experience in cross border cooperation trhough innovation vouchers (good practice). Partner is interested in centres of competence for the furniture industry.

Table 5 insights

- The most challenging of all, appears to be the initiation of effective & coherent triple helix exchanges, in five out of 6 regions, and especially exchanges dealing with knowledge transfer and technological connectivity. Technological connectivity, i.e. the localised (or regionalised) triple helix, is not always sufficiently evolved to fully benefit regions, it requires clarification and updating, in terms of at least the eight types of technological connectivity cited at the beginning of this section, and of which fragments are observed in most regions. Institutionally, regions have good endowments, are at good starting points; however operationally and governance- wise, there are challenges.
- Models (good practices) of research/university-to-business/industry connectivity applied for industrial specialisation and modernisation need to be adopted. Among the contributed good practices there are examples from within the project (Helsinki University Innovation Services, Kantola cluster) as well as beyond the project (from Germany, the Netherlands, Spain, Switzerland,…).
- Interregional technological connectivity activities & experiences exist: two regions have experience with innovation vouchers with cross border eligibility (2 GP contributions, GP theme 3 multilevel synergies); one region foresees innovation vouchers with interregional eligibility in their ESIF 2014-2020 (1 GP contribution, GP theme 3 multilevel synergies); one region has been involved in interregional access to research services schemes through two consecutive BSR Interreg projects, aiming at strengthening specialisation at macro-regional level (1 GP contribution, GP theme 2 research/university-to-industry).
- In some regions there is cross fertilisation potential between industries and innovations, and it should be encouraged.

http://www.interregeurope.eu/bridges/

- The Innovation advanced region has better connectivty practices, therefore, methodologically, relevant GPs might be suitable to adopt by other regions.

RIS3 funding and financing

RIS3 funding is discussed from three pioints of view: funding sources; funding progress; interregionality (i.e. provisions to implement RIS3 parametre of connectivty towards critical mass).

Table 6 RIS3 funding and financing references

Suggestions	Comments
Kainuu RIS3 funding: In principle, RIS3 is funded by 1) the ESIF 2014-2020 (TO1 - Strengthening research, technological development and innovation and TO3 Enhancing the competitiveness of SMEs, agriculture (Rural Development Fund) and fisheries and aquafarming (EMFF); but also from national resources, and 2) Aiko funding (Regional innovations and experimentations funding. State of play of the RIS3 implementation: RIS3 calls have started but not distinct visibility, RIS3 is part of the project evaluation criteria.	Technological connectivity week; more than ESIF funds are often used for RIS3 implementation.
Lubelskie RIS3 funding: ESIF 2014-2020 is dedicated to RIS3 implementation directly under the first thematic objective (TO1). Although some actions will also be undertaken within the other priority axes in the ROP State of play of the RIS3 implementation:ESIF 2014-2020 is fully funding RIS3 implementation.. The first calls under the ROP have already been finished and the projects have been started but they are at the initial stage. That is why the effects will be evaluated at a later stage.	Polish NOP & ROP:s 2014-2020 among the best well designed provisions for supporting innovation and technological connectivity, including at interregional level. RIS3 calls have started.
Uusimaa RIS3 funding: In principle, RIS3 is funded by 1) the ESIF 2014-2020 (TO1 - Strengthening research, technological development and innovation and TO3 Enhancing the competitiveness of SMEs, agriculture (Rural Development Fund) and fisheries and aquafarming (EMFF); but also from national resources 2) Aiko funding (Regional innovations and experimentations funding) and 3) Makera funding (Regional development funding) State of play of the RIS3 implementation: RIS3 calls have started but not distinct visibility, RIS3 is part of the project evaluation criteria.	ESIF does not suffice for RIS3 implementation and additional funding and financing schemes are needed. Have there been
Western Macedonia RIS3 funding: ROP 2014-2020 State of play of the RIS3 implementation: RIS3 calls have not started yet.	RIS3 has good provisions, including technological interregional connectivity; these provisions need to be adopted, considered by the MA of the region.

Table 6 RIS3 funding and financing references

Suggestions	Comments
Goriška RIS3 funding: All the funding that comes from the ESIF prioritises the RIS3 industries, both at national and at regional levels. Funding is centralised However, there is the option of the LAG mechanism allowing funding decisions to be made locally. State of play of the RIS3 implementation: RIS3 calls = ESIF calls have stared since 2 years. There are special targeted calls aiming at connecting research to business.	It would be possible to have interregional calls, provided there is justification for this. Cross border cooperation with the University of Udine a very encouraging background (and mayeb a good impact of Interreg A programmes).
Western Transdanubia RIS3 funding: 1) HU has a nartional RIS3; 2) funding from TO1: *Descriptions: Advanced technologies in the vehicle and other machine industries; Capabilities:* 1. Manufacturing and Industry; 2. Machinery and equipment; *Target markets*: 1. Manufacturing and Industry; 2. Motor vehicles and other transport equipments; *EU priorities*: 1. Key Enabling Technologies (KETs); 2. Advanced manufacturing systems. State of play of the RIS3 implementation: Provisions in projects exist.	There is possibilty for cross fertilisation with technologies that re also prioritised, e.g. special material, advanced materials, etc. Therefore, cross fertilisation strategy document might be needed.

Table 6 insights

- In general, RIS3 implementation is part of the ESIF implementation, i.e. no special clals, only additional provisions. These provisions refer for the most part to RIS3 prioritised industries but not to cross cutting issues such as KET applications, or commercialisation of research, or TRL improvement (with some exceptions in one or two regions). It implies, in the action plans, one aspect to consider would be to include such provisions in the forthcoming ESIF /RIS3 calls.
- RIS3 is meant to be funded by the structutal funds. However, in some regions, the structural funds are rather small. A question is, then, how can a policy be implemented effectively if there are no suitable funds. At the moment there do not appear formal approaches combining national innovation funds with cohesion funding.
- In some member states there are good practices both in the ESIF and at national level promoting new business ideas from research. Such good practices could be transferred and adopted by the other regions.

Suggestions included in the innovation maps

All innovation map reports (except one) include suggestions and recommendations from the expetts who wrote the approved RIS3 document. These suggestuons should be taken ionti accoutn when dicusisng the BRIDGES 2nd readings and actions plans, and this si why there is brief discussion in Table 7.

Table 7 Suggestions

Suggestions	Comments

Table 7 Suggestions

Suggestions	Comments
Kainuu "It clearly seems that the most promising innovation potential in Kainuu are (1) Bioethanol production (2) Wood construction in Kantola business park (3) Modern pulp mill (Bio product factory) (4) Concentration and utilization of valuable components of biomasses such as berries and their industrial side streams.	Critical mass issues not addressed Lack of investors not taken into account. Region made and circulated within the RSK additional questions to get working insights into the business situation. EDP evolving. Cntacts top TEKES (zim & BBI (bio based industries) support the gradual formulation of the regional action plan.
Lubelskie	
• Three businesses available for EUREKA cooperation, however one more can qualify: NexBio Sp. z o.o., biotechnology eneterprise that creates innovative solutions for agri-food industry. It is a start-up, established in 2015, that won the second edition of Chivas The Venture competition and was qualified to the world final. The firm provides molecular tests (DNA analysis) which enable identification of organisms present in agri-food products and measurement of their quantity.	Agree the RIS3 sub industry focus, to be able to proceed with connectivty issues.
• Ranks high in the country's production of herbs, the enterprises of the herb industry should also be considered as businesses with development potential (Herbapol and Krautex), however they met only third criterion.	The partner benefit from Saffronomics GP?
• National leader in cultivation of soft fruits (raspberries - 75% of domestic production, currants - 32% of domestic production, strawberries - 18% of domestic production) the absence of enterprises representing this sector in the results of mapping is thought-provoking. Among selected businesses there are firms that process and preserve the fruits (Agram, Chłodnia Mors, Herbapol).	Increase the engagement of stakeholders and improve insights of the consumer segment and projected demand.
• National leader in hop cultivation (83% of domestic production), so the beer industry has a great development potential. The leader of beer industry in Lubelskie is Perła S.A., however it met only one of selected measurement indicators of BRIDGES project.	
• The Lubelskie Voivodeship takes 3rd place in Poland regarding the number of licensed organic farms. However, these entities seem to be not active in applying for public financial support and not in undertaking collaboration on R&D activities.	Very nice idea to focus on beer
• As a part of producer groups there are the pre-recognized ones who consist of fruit and vegetables producers. In most cases, they do not have the technical equipment and have no experience in administration, management and conduct of fruit and vegetables sale produced by its members. These groups must obtain legal personality, which is a prerequisite for bringing the group to a full recognition of the common market organization for fruit and vegetables. Currently, 33 groups of fruit and vegetables producers	Introduce guidance services for organic farms to access funding

Table 7 Suggestions

Suggestions	Comments
operate in Lubelskie Voivodeship, which gives them the 3rd place in the country. • Measures to increasie the engagement and improving consumers' awareness.	Needs comprehensive actions.
Uusimaa n/a	Research institutions have expressed interest in cooperating with, e.g. Helsinki University; LUKE National funding organisation (TEKES) has encoutaged cooperation BRIDGES cases-cooperation through EUREKA processes.
Western Macedonia • Policies for regional innovation should be based on the priorities defined by previous projects such as RIS, RIS+, K-Clusters, which still remain relevant. The strategy should include a long-term vision for the region with measures of diversification but also of technological modernization of existing companies. • Support to existing clusters should be the central element of the RIS3 of Western Macedonia. However, clustering should be organized from a bottom-up perspective, as emerging networks among companies. • As the region does not have significant RDTI infrastructures, platform mechanisms could be considered as a solution for offering market and technology intelligence, incubation of new companies, export advice and support etc. • Innovation actions and initiatives should be carefully selected with respect to criteria of (1) sustainability in the long run and mainly after the initial support period; (2) creation of capabilities and know how in the region; (3) offering integrated solutions to technology-production-market-funding; (4) leading to high leverage of private investments; (5) involving a large number of beneficiaries; and (6) contribution to development goals of competitiveness and employment. At the same report Regional stakeholders highlighted the following issues: • Creation of sustainable research infrastructures • Targeted actions supporting entrepreneurship and business clusters • Collaboration of research and production organizations • Creation of a pool of innovation ideas – Transfer of solutions from other regions • Ongoing measurement of innovation policy impact and ongoing measurement of innovation policy impact and adjustment	Path renewal of relevant traditional clusters; RIS3 acknowledges lack of RDTI infrastructures; some renewal aspects ("precision agriculture" can benefit from the OPIRIS GP); industry renewal needs comprehensive + concretised approach and cam be linked to BRIDGES; RIS3 calls are delayed.

Table 7 Suggestions

Suggestions	Comments
• Mapping of investment and resources in networks and applications • Opening of networks to private investors • Use of local funds for innovation • Use of modern marketing practices to promote local products and clusters • Support to existing clusters should be the central element of the RIS3 of Western Macedonia. However, clustering should be organized from a bottom-up perspective, as emerging networks among companies. • As the region does not have significant RDTI infrastructures, platform mechanisms could be considered as a solution for offering market and technology intelligence, incubation of new companies, export advice and support etc. • Using the European Cluster Observatory rating system, the sectors in West Macedonia with the highest combined scores for size, specialization and focus are: - Leather products with 3 stars; - farming & animal husbandry with 2 stars and - Oil & gas, agricultural products, processed food, construction with 1 star. - Furthermore, in the Region of West Macedonia there is one mature cluster, the Metal-manu (metal products clusters) and an emerging one, the Bio-energy and Environment of Western Macedonia, named "Clube" cluster. According to the approved by EC Strategy, the RIS3 priorities comprise a mix of sectors and subsectors as follows: • Energy / RES – District Heating • Integrated waste management • Traditional sectors of Agricultural Development and Manufacturing **a**. Manufacturing – Standardization of characteristic agricultural products **b.** Fur farming - leather products **c.** Agri-food, drinks / beverages, metal constructions **Tourism** The RIS3 Strategy is funded under Thematic Objectives 1 – 4 of the ROP 2014 – 2020 (see above), including also Thematic Objective 8 for the promotion of self-employment and entrepreneurship with emphasis in RIS3 priority sectors. **Winery and viticulture** Support of the winery and viticulture sector (creation of integrated	

Table 7 Suggestions

Suggestions	Comments
information system of innovative techniques *for Precision Agriculture in the zones of grapes cultivation,* provision – by implementing innovative measurements – of superior quality first raw materials etc.). (1) Networking and Development of wine – tourism (genotyping of local vine varieties, production of high quality sparkling wines, identification of appropriate viticulture techniques etc.) (2) Creation of Insects Observatory (development of strategies and methods for plant-protection in the zones of grapes cultivation etc.) **Agri-food** (1) Creation of an exemplar for demonstration innovative agro-farm (operating in parallel as agro-touristic centre for networking and promotion of agro-tourism products etc.). (2) Creation of Community Co-operative Enterprise on local sectors of employment (i.e. beekeeping) (3) Improvement of cultivation techniques (i.e. exploitation of Sideritis – type of tea, exploitation of herbs and cosmetic plants etc.).	
Goriška • The new model / approach in the agri-food sector is not to increase the production but rather to increase the final outcome. • Product certification. This is essential for increasing sales, for exporting products and for achieving a higher price for the same products. • Using wastes or pruning for crops for energy production. This can add an extra income to the farmer / owner of the industry • Closer collaboration with research institutes and educational organisation will help the relevant industries to adopt some level of innovation their production chain. • Involvement in national and European projects, especially in those ones that targeted to SMEs.	
Western Transdanubia Győr-Moson Sorpon County: • special materials, advanced materials, modern materials technologies • metal fabrication other than machine industry • building industry (building materials technologies) • textile industry • wood and furniture industry • logistics Vas County: • special materials, advanced materials, modern materials,	The renewal of the furniture industry is linked to cross fertilisation with new technologies, e.g. special materials, advanced materials, etc. Therefore, cross fertilisation strategy document might be needed. Interegional connectivity on centres of cometence deaign with these issues.

Table 7 Suggestions

Suggestions	Comments
technologies • electronics and semiconductor technology • logistics • cultural and creative industry Zala County • special materials, advanced, materials, modern materials, technologies • modern packaging technologies • chemical industry (e.g. rubber and plastics industry, production of intermediates, fertilizers and cosmetics) • wood and furniture industry • logistics • cultural and creative industry	

Table 7 insights

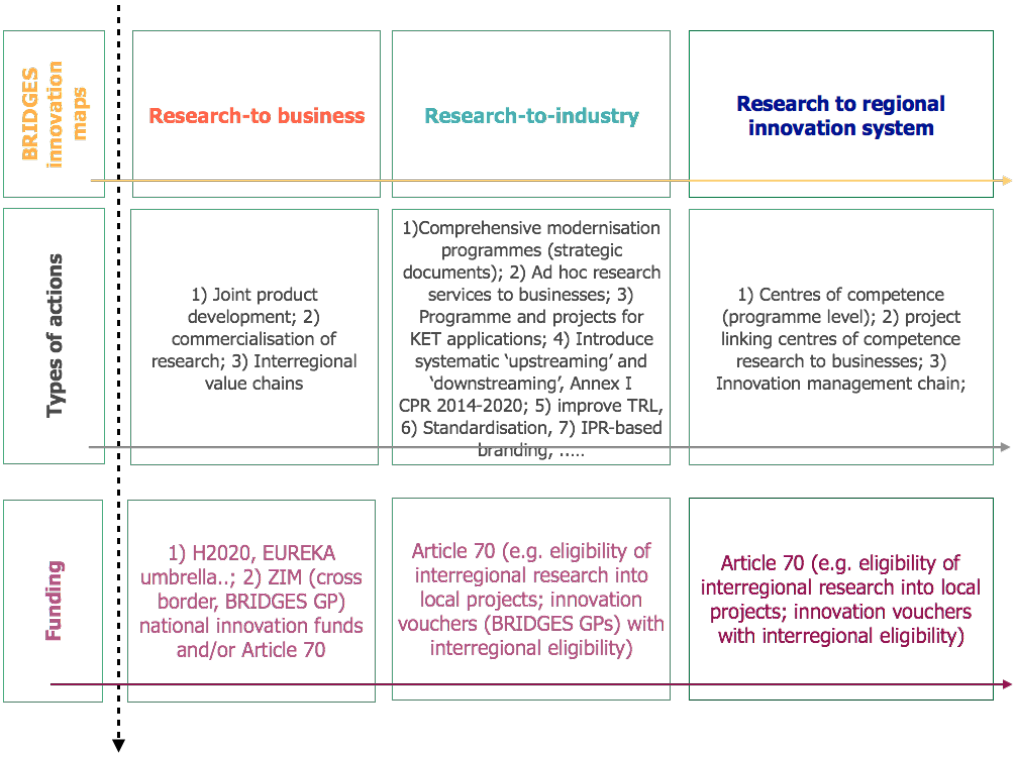
- Three out of five innovation maps benefit from detailed suggestions. However, when it comes to industry modernisation or industry renewal, there is need for strenghtened EDP (entrepreneurial discovery process). The findings could be part of the action plans, prioritising related investments.
- With two exceptions, suggestions do not refer to cluster priorities and very little to improvement of regional innovation systems.
- Regions with renewal priorties can benefit from cross fertilisation of pre-existing industries, fragments of which remain as specialisation priorities in the regions, e.g. furntiture*special materials. The interregional connectivity, in such a case, could address the concept generation, the materials side, and / or the furniture side.

Conclusions and recommendations

The report summarises the six innovation maps, makes recommendations for the regional action plans prioritising types of technological connectivity between less and more advanced innovation regions, and draws conclusions regarding technological connectivities beyond locational proximities. The innovation maps indicate that while the number of innovation performing businesses is not as extensive as anticipated, RIS3 industries indicate strong potential for renewal and/or modernisation, and in one case, also diversification. Gaps in the regional innovation systems, lack of critical mass, and mismatches between productive and knowledge bases are sometimes present, too. RIS3 industries' potential will be explored in the partner action plans. In the process, knowledge base gaps will be addressed through targeted partnerships and innovation management gaps through good practice transfer.

Connectivity priorities

The findings of the innovation mapping exercise can be summarised in the Figure below:



This figure indicates that the innovation maps resulted in a wider range of connectivity options (needs/potential) than initially foreseen. The BRIDGES project's initial objective was to identify and support cooperation under column 1 research-to-business, as a way to incure positive change in the less advanced regions. However, the innovation maps revealed that while the *research-to-business* options were rather the exception than the rule (see Table 3 insights), more fields of connectivity needs appeared, relating to *reasearch-to-industry* and *research-to-regional innovation systems*.

Research-to-industry connectivity needs are about knowledge transfers, knowledge applications in cases of industrial renewal and –especially, modernisation situations. Industrial modernisation is not an exhaustively defined term, as it may refer to product improvement, process improvement, sustainability improvement, etc. Out of the six BRIDGES regions, four focus on industrial modernisation, two on industrial renewal, and two on industrial diversification (some regions preferred more than one priorities). However, industrial modernisation was not defined in depth in the patner regions and the process of related entrepreneurial discovery (EDP) was not completed. To formulate the action plans, however, it will be necessary to decide concrete activities. Thus, it might require adopting the PDL approach (Project Development Lab, Boden 2016), and include the required expertise in this process regardless of location (local, national or internaitonal), as a way to avoid localised lock-ins, which is common in peripheral areas.

A similar approach could be applied to the industry renewal partner region. For example, such expertise might refer to extensive knowledge of industrial trends, research trends, and / or benchmarking methodologies. We have realised the need for industrial expertise, often missing in lagging areas. In principle, we propose to institutionalise the PDL approach as part of the formulation of strategic documents for the RIS3 sub industries.

In the case of diversification regions, one path to consider might be building on/ expanding the economic base of the industries of the most performing businesses and strengthen the relevant knowledge-connectivity system[21].

[21] ANSELIN L. (1988) Spatial Econometrics: methods and models. Kluwer, Dordrecht.

BRESCHI S., LISSONI F. and MALERBA F. (2003) Knowledge-relatedness in firm technological diversification. Research Policy 32, 69-87.

Castaldi, C., Frenken, K., & Los, B.,2013. Related variety, unrelated variety and technological breakthroughs: an analysis of U.S. state-level patenting. (ECIS working paper series; Vol. 201303). Eindhoven: Technische Universiteit Eindhoven.

DISSART J. C. (2003) Regional economic diversity and regional economic stability: research results and agenda. *International Regional Science Review* **26**, 423-446.

Research-to-regional innovation systems connectivity needs are about the function of regional triple (and quadruple) helices. There is a nominal tirple helix in all the regions, which however, does not always work either because of knowledge mismatches (i.e. the knowledge and productiver bases are not demonstrating effetive complementarities), or because the localised triple helix is not functioning, is only partially meaningful, or even because the needed specialisation is missing also from national level. Four out of five regions confirm these observations, as they are interested to develop industry-led centres of competence with project generation linkages to businesses, i.e. to improve the function of their innovation system adopting regionalised (rather than localised) solutions.

Another "gap" –in most regions, is the lack of the institutions and functions of innovation management chains. Innovation maps and further discussions with the partners showed that the lower the related variety in a region, the higher the need for awareness & understanding of the need for innovation management processes and expertise. In general, the parametres of critical mass and connectivity, so strong in the RIS3 literature (and with acknowledged challenges[22]), are

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JAFFE A. B. (1986) Technological opportunity and spillovers of R&D. *American Economic Review* **76**, 984-1001.

KOEN FRENKEN, FRANK VAN OORT and THIJS VERBURG, 2005. Related Variety, Unrelated Variety and Regional Economic Growth, Regional Studies, Vol. 41.5, pp. 685–697, July 2007.

Maria Lindquist, 2012. Regional innovation strategies in Sweden; Nordregio 2012.

Matthias Brachert, Alexander Kubis, Mirko Titze, 2013. Related Variety, Unrelated Variety and Regional Functions: A spatial panel approach; Papers in Evolutionary Economic Geography # 13.01.

[22] EC, 2102. Guide to Research and Innovation Strategies for Smart Specialisations (RIS3).

Donato Iacobucci & Enrico Guzzini, 2016.Relatedness and connectivity in technological domains: missing links in S3 design and implementation; European Planning Studies, Volume 24, 2016 - Issue 8 Regional innovation strategies (RIS3): From concept to applications, pages 1511-1526. http://dx.doi.org/10.1080/09654313.2016.1170108.

Rafael Rodríguez-Clemente. INVOLVEMENT OF A RESEARCH ORGANISATION IN THE DEVELOPMENT OF THE RIS3: THE EXPERIENCE OF CSIC IN SPAIN.

Charles, D. and Ciampi-Stancova, K, (2014). Research and Technology Organisations and Smart Specialisation. S3 Policy Brief Series, No 15/2015. European Commision, Joint Research Centre, Institute for Prospective Technological Studies, Spain.

Evangelista R., Meliciani V. and Vezzani A. (2015). The Specialisation of EU Regions in Fast Growing and Key Enabling Technologies. JRC Technical Report, EUR 27524 EN; doi:10.2791/844794.

Ruslan Rakhmatullin, 2014. Triple/Quadruple Helix in the context of Smart Specialisation; 29-30 May 2014, Guiford, UK.

usually not addressed in sufficient depth in the RIS3 suggestions. This might risk endangering the feasibility of the suggestions, as some local pre-conditions might be absent[23].

On the other hand, the innovation map of the more advanced region showed that the research and knowledge bases of PP4 have the potential to address all specialisation and technological connectivity needs of PP2,3,5,6 and 7 (Table 4 and Table 5 insights).

Excellence in the connectivity options

The BRIDGES project promised to promote excellence-based interregional cooperation as a way of improving the RIS3 implementation performance of the less innovation-advanced regions. The mapping of the innovation absoprtiveness capacity of the RIS3 sub industries and their environment, indicate that intreregional connectivity needs /potential can be grouped into nto two categories: innovation management and excellence-based. As explained above, both of these categories appear essential for the regions and so they are accepted as potential action plan objectives, i.e. we have expanded the range of "eligible" connectivity, while we have also agreed the types of interregional connectivity to promote: interregional connectivity recommendations come from the gaps identified in the knowledge and methodological bases and discussed in the *Column sections* in Tables 4,5,6,and 7[24].

- Excellence-based connectivity, in this case, means industry-led (issues prioritised by industry) excellent science activities and the eventual access of their results to the market; they are reflected on Types 1,7 and 8 of connectivity (Table 5 section). Three out of five regions wish to set up centres of competence (part also of the BRIDGES good practice theme 1). Competence centres are centres of high quality collaborative research. The precondition we have set in the BRIDGES project is that the approach will be planned so that the results of the collaborative research will be applicable to the prioritised industries in the regions through foreseen (in the action plans) project and investment generation. Therefore there will be two programmes, collaborative research projects, and transfer of knowledge to businesses projects. Interregional connectivity in this case, is related to missing knowledge and research resources on regional and national levels, and availability of such resources in the innovation advanced region.
- Innovation management needs are research/university-to-business/industry/region interactions that improve the quality & embeddendness of triple helix processes and ensure

[23] Roberta Capello & Henning Kroll, 2016. From theory to practice in smart specialization strategy: emerging limits and possible future trajectories; European Planning Studies, Volume 24, 2016 - Issue 8: Regional Innovation Strategies 3 (RIS3): From Concept to Applications, Pages 1393-1406. http://dx.doi.org/10.1080/09654313.2016.1156058.

[24] Nevertheless, during the project, it would be interesting and useful to also consider connectivity actions based on opportunities, i.e. not to close gaps but to maximise performances.

access to research results. They are about complementarity of innovation management at interregional level is a certain knowledge source is not available locally or if research commercialisation needs can benefit from interregional solutions, e.g. through access to larger markets; they are reflected on Types 2,3,4,5 and 6 of connectivity (Table 5 section).

Project resources and funding suggestions for connectivity improvement

The purpose of the innovation maps are to form bases for the action plans of the regions. They are expected to bring together the most performing parts of the partner regions' economic base with trechnological connectivity needs (pages 12-33 of this document), facilitated by the project good practices, and funding options.

The project good practices are summarised and analysed elsewhere. For the purpose of this document, it is reminded that there are three types (themes) of good practices: Good Practice (GP) theme 1 industry-led centres of competence, GP theme2 research-to-business solutions (*'innovation partnerships'* in the project jargon) and GP theme3 multi-level synergies, demonstrating cross-broder/interregional innovation partnerships and / or combination of funds. Table 8 below summarises how the GP themes & contributions reflect the eight types of connectivities.

Table 8 BRIDGES good practice themes & technological connectivities

Types of technologial connectivity	**Good practice themes and contributions**		
	Industry-led centres of competence	**Research-to-business innovation partnerships**	**Multi-level synrgies**
Type 1 Programme based	**x**		
Type 2 Access to research services		**x**	
Type 3 KET applications		**x**	
Type 4 TRL improvement / certification		**x**	
Type 5 Innovation management chain	**x**	**x**	**x**
Type 6 Constant renewal services		**x**	
Type 7 Commercialisation of research, cross border		**x**	**x**
Type 8 Direct research to business cooperations		**x**	**.x**

Regarding funding options, the focus is on ESIF, but also on national and regional funds. BRIDGES project deals with bridging mismatches between the productive and knowledge bases of PP2,3,5,6 and 7, and proposing interregional solutions through collaboration with research institutions in PP4 area, innovation advanced region. For this purpose, as mentioned elsewhere in

this document (page 7), BRIDGES project in principle relies on article 70 of the CPR. Confirming to the provisions of artcile 70, interregional spending is foreseen only when regional and/or national resources cannot provide the required excellence and/ or innovation resources towards, for example, industry modernisation. We have identified reasons for this: 1) the RIS3 is like a significant external push to the economy which seeks to upscale itself, while, at the same time, the knowledge base did not have the time (or resources) to do the same; 2) in some cases, there is discrepancy between the economic and knowledge bases asa result of, for example, of massive delocalisation. In such cases, the knowledge base might be more advanced than the current economic base, and might be even be serving clients outside the region. Thus, the region is exporting advanced research services while at the same time it needs to import corresponding services for the new indsutries that are developing. In fact, to of our good practice ocntributions are related to these phenomena[25]; 3) we have become aware that excellence (and through its applications industry, too), is currently so fast diversifying, that it is hardly possible for a region to be self sufficient in research services and research infrastructures. We have explored this phenomenon through one of our good practices[26]; 4)we note that innovation advanced countries promote interregional win-win types of cooperation beyond any EC-related interregional cooperation. Once again, one of our good practices points to this direction[27],[28].

Activation of article 70 requires explicit acknowledgement by MAs &/or IBs. This can be done at project level (for examples, partners 2 and 7 plan a joint innovation call) and at programme level. For the latter case, the forthcoming period, with the foreseen mid term revision the ESIF programmes, is an opportunity for arctilce 70 activation. Taking the preceding discussion into account, we have compiled Table 8 summarising the state of play of these issues (March 2017).

Table 9 Project resources, activity, and funding suggestions

Connectivity type	Types of actions	Project resources (good practices)	Possible funding
Type 1 Programme based	Centre of competence & associated business application projects; 3 regions have indicated committed interest in this	Industry –led centres of competence in Spain, Germany, Netherlands, Swtizerland; Helsinki university innovation services; Kantola cluster.	This activity belongs, to ESIF Thematic Objective 1 (innovation and research, and infrastructures) and Thematic Objective 3 (ioprovement of the

[25] KANTOLA and CEMIS, both by PP2.

[26] Baltic TRAM project, contributed by PP1.

[27] ZIM, good practice for interregional partnerships for the commercialisation of research, Germany/Finland, contributed by PP1.

[28] Similar considerations are also the focus take up by the Horizon 2020 programme called WIDESPREAD/ TEAMING.

http://www.interregeurope.eu/bridges/

Table 9 Project resources, activity, and funding suggestions

Connectivity type	Types of actions	Project resources (good practices)	Possible funding
			competitiveness of SMEs). The required action is to allow eligibility of non-programme area actors to be part of regional multi actor projects. Non programme area actors are research institutions with expertise missing at regional and national levels from the implementation regions.
Type 2 Access to research services	2.1) Screening of needs & awareness raising 2.2) actual access to research services missing locallly/nationally, through innovation vouchers with interregional eligibiltiy. BRIDGES project proposes such solutions in some of the good practice contributions in GP theme 3. Application of Article 70 of the CPR and / or national innovation funds.	Methodology: Baltic TRAM project (access of SMEs in the periphery to analytical research infrastrcutrs and macro.-regional base of funding). Funding: ESIF provisions in Poland; experience with innovation vouchers and cross border innovation vouchers from Slovenia and Hungary respectively.	2.1) Local structural funds, local consultant; innovation intermediary. 2.2) Through generalised application of innovation vouchers to seek research services at national level, including interegional eligibilty where the naitonal level is not sufficient.
Type 3 KET applicatio ns	3.1) screening of needs & awareness raising:local consultants; 3.2) actual KET application projects	Funding: ESIF provisions in Poland; experience with innovation vouchers and cross border innovation vouchers from Slovenia and Hungary respectively.	3.1 Local / national expertise 3.2 As above, any lacking expettise could be axceesed add hoc through innovation vouchers
Type 4 TRL improvement / certification	Systematic way to address these issues needed in five out of six regions	Methodology & funding: ESIF 2014-2020 Poland	National funds, national innovation funds, ESIF 2014-2020; interegional connectivity not required.
Type 5 Innovation management chain	5.1 R&D council, 5.2 Proof of concept, 5.3 Prototype, 5.4 Scaling up, 5.5 Business plan, 5.6 Branded marketing	Helsinki University Innovation Services; TEKES programme for proof of concept	National funds, national innovation funds, ESIF 2014-2020; interegional connectivity, in principle, not required, but good to not exlcude it, allow for innovation vouchers with interregional eligibility

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Table 9 Project resources, activity, and funding suggestions

Connectivity type	Types of actions	Project resources (good practices)	Possible funding
Type 6 Constant renewal services	Upstreaming and downstreaming (Annex I of the CPR):	No GPs	National funds, national innovation funds, ESIF 2014-2020; interegional connectivity not required
Type 7 Commercialisation of research, cross border	7.1) Awareness raising 7.2) Cross border, interregional	Methodology and funding: ZIM programme (considered as GP also in the VINNOVA 2009[29])	7.1: National funds, national innovation funds, ESIF 2014-2020; interegional connectivity not required. 7.2: Bilaterally earmarked national and /or ESIF funds
Type 8 Direct research to business cooperations	8.1) regular awareness raising within the partner areas and 8.2) support project preparation actions.	EEN certified intermediary (CEEI Burgos, good practice from Spain). AIKO funding in Finland. Reference outside the project programme area: Cross-border Collaboration Vouchers – IntertradeIreland[30].	8.1 Task of regional innovation intermediary & linkages to EEN is relevant. 8.2 Small, bilaterally earmarked funds for setting up such partnership –based options. Can national and / or ESIF funds.

[29] VINNOVA, 2009. FIGHT THE CRISIS WITH RESEARCH AND INNOVATION? Additional public investment in research and innovation for sustainable recovery from the crisis; page 26. Also: http://www.zim-bmwi.de

[30] http://www.intertradeireland.com, InterTradeIreland helps SMEs across the island by offering practical cross-border business funding, intelligence and contacts; also: US-Ireland R&D Partnership, http://www.intertradeireland.com/randd/how_it_works/.