iWATERMAP Joined Assessment Methodology

Interreg Europe project iWATERMAP

Version: 0.1
This is version 1, made in semester 1 of the iWATERMAP project. It will be regularly updated throughout the project lifetime.

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Content

Introduction

This Joint Assessment Methodology forms part of the Interreg Europe project Water Technology Innovation Roadmaps (iWATERMAP), which initiated 1st June 2018 with partners from Latvia, Southern-Moravia, Nord-Est Romania, Crete, Murcia, Northern-Portugal and the province of Friesland.

The self-assessment clearly shows the organic growth of regional innovation ecosystems. In each case there is a different organisation who is acting as the lead protagonist for the development of critical mass for water technology research and innovation within the region. In most regions only

one of the triple helix partners is directly involved. The organisations are very aware of the water technology related projects within their own sphere of influence. Universities report on university projects, clusters on clusters related projects and governments about projects involving public actors. Except for the lead partner region Friesland, none of the other regions has a direct helicopter view of the water technology related projects and activities within the region. This is a logic consequence of not having a central organisation which has an official mandate to act as primary interlocutor for this emerging sector within the region. Despite that limitation, the regions were able to sketch a picture of the known activities, projects and endeavours within their region dedicated to the development of the regional research and innovation ecosystem supporting the development, introduction and education in water technology. This picture will be used as the current state of affairs, to assess areas of interest to develop further, which will multiply the impact within the region and increase the critical mass development. The picture will show areas that are already well addressed and areas lagging behind, this will be a GAP analysis[1], which is highly useful for:

- Providing input for the Water Technology Innovation Roadmaps
- Finetuning the Operational Programmes of ERDF;
- Supporting the design of related programmes, such as regional and national research and innovation policies;
- Involving the regional public and private actors more effectively;
- Gaining a head start for European projects;
- Introducing breakthrough technology within the region and enhancing future growth with the right supporting factors in place (demonstration projects, education, skills development, brain train, brain retain and brain gain).

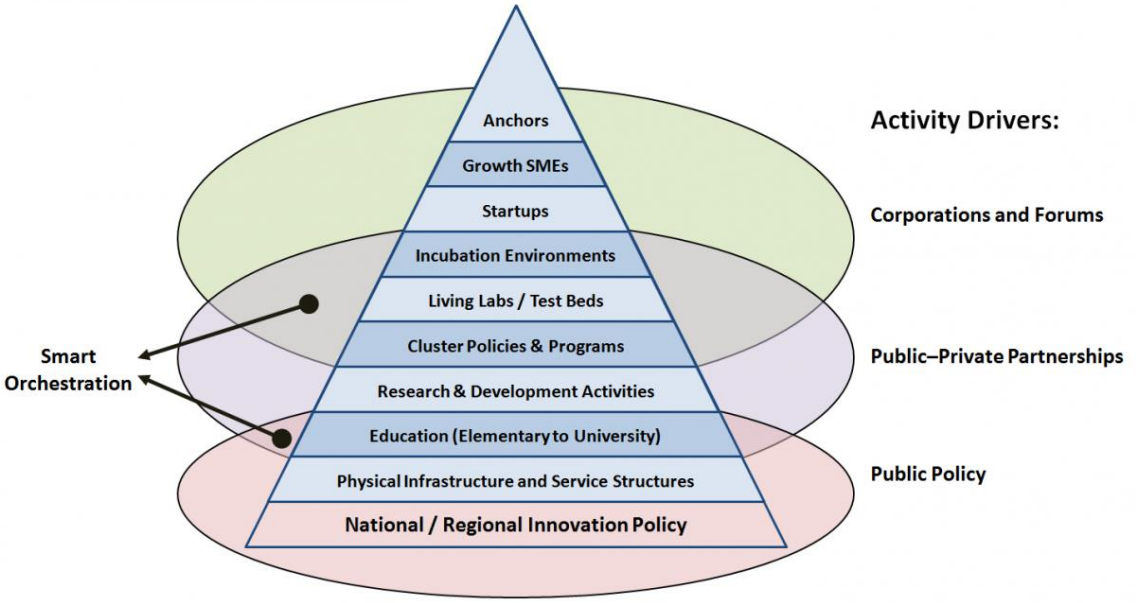
iWATERMAP will be running for 5 years, in a pre-defined planning of 3 plus 2 years. It will support regions to improve their Operational Programmes and related policy documents to improve the support of the regional innovation ecosystem. It will also result in three different Roadmaps:

1. General critical mass innovation ecosystem in the sector;
2. Human Resources;
3. Internationalisation roadmap.

The Joint Assessment Methodology report is a deliverable of the iWATERMAP project, which is scheduled to be produced during the first reporting period, with a deadline on XX March 2019.

The following innovation hub framework (Launonen-Viitanen, 2011) introduces a comprehensive approach to regional innovation ecosystem development, advocating coordinated planning and implementation of the key ecosystem elements and close interplay among the key innovation actors. The framework guides regional planners, political decision makers, and core-hub organizations to address ecosystem development from a unified cross-sectoral point of view – as a complete regional master planning challenge to connect both public and private sector interests for joint innovation actions. If managed properly, these collaborative actions can lead to mutually reinforcing arrangements for parallel innovation processes, and they can facilitate the efficient distribution of best-practice know-how throughout the ecosystem.

[1] Analysis highlighting what is currently missing and what the regional innovation ecosystem can develop with the right policies, programmes and incentives.



Jukka Viitanen, 2016 in "Profiling Regional Innovation Ecosystems as Functional Collaborative Systems"

The framework illustrates the key regional innovation ecosystem elements that are necessary for building up a successful regional innovation hub (Figure 1). Each element (layer or driver) represents a significant development task of its own, but only in combination can they produce an ecosystem that can truly rise to the globalization challenge and take its place in the value network context. Accordingly, the core management organizations should be able to plan, organize, manage, and further develop the regional ecosystem as a complete set of interconnected elements where interplay and complementarities between the layers give the ecosystem its soul and strength.

Chapter 1: Critical Mass Development, 5 Stages

RIS3: A glimpse of the future

The process of defining research and innovation strategies for smart specialisation (RIS3) invites regions to strengthen research, innovation and business development in specific economic sectors. Specialisation will require choices. More funds to some key areas and less to others, while maintaining an open mind for possible emerging sectors. In the 60's applying RIS3 in The Netherlands[2], Belgium[3] and the UK[4] might have urged governments to invest in the coal mining industry. With the knowledge of today, that would have been a mistake.

[2] https://www.demijnen.nl/actueel/artikel/mijnbouw-nederland

[3] https://www.demijnen.nl/actueel/artikel/buitenlandse-arbeiders-de-steenkolenmijnen-van-luik-en-nederlands-limburg

[4] https://www.theguardian.com/business/ng-interactive/2015/dec/18/the-demise-of-uk-deep-coal-mining-decades-of-decline

RIS3 is about opportunities. Spotting and nurturing them and at the same time, allowing for a bottom-up process. To sketch a picture of what RIS3 could potentially offer the critical mass report has the ambition to show a path into the future. What stages in RIS3 maturity can be identified and how to support these developments with the right policies and instruments?

This report shows five different stages, with varying levels of industry and academia cooperation, cross-border cooperation, cross-cluster fertilization and multidisciplinary research. Regions which support emerging industries can evolve into innovation ecosystems with a unique critical mass.

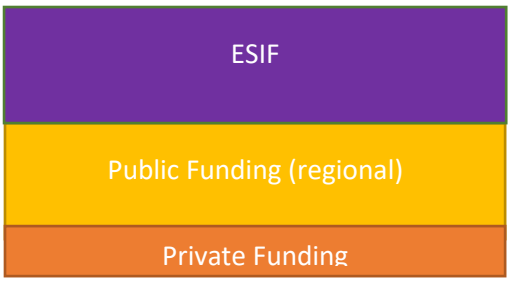
This critical mass allows a region to punch above its own weight. The innovation ecosystem will attract companies and research institutes from beyond the region, first at national level, followed by European level and ultimately global level. The innovation ecosystem can form the bridge between various funding programmes and funding sources, it can provide the financial sustainability of promising projects and supporting the valorisation of research results.

The RIS3 process needs to link up the actors of a human capital roadmap, supporting brain gain and domestic brain retain & train. Eventually the key driver for growth is people with the right skills, talent and knowledge, although patents and funding sources will offer the opportunity for growth, people are needed to deliver the growth. Critical mass regions are able to attract talent far and wide, with the right reputation the region even can compete for talent even on a global level.

Regions with critical mass can create the right conditions for the scientific, business and investment community to team up on a pan-European level, even more importantly, it allows Europe as a whole to become a key player on the global level. European competitiveness, growth and jobs will be greatly enhanced by the development of critical mass in regions. Regions connected to regions with much higher critical mass also benefit. Their scientific institutes can participate in cutting edge research projects and their companies can co-create knowledge, technologies and patents. Regions with a highly developed critical mass level enhance the competitiveness of connected companies throughout Europe and form the seeds for spin-offs and start-ups across Europe.

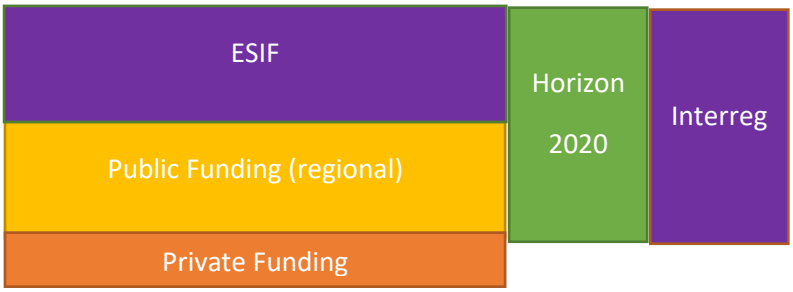
Below you find a description of the 5 stages of development. Acquiring European critical mass is a bottom-up process and has many challenges on the road. It is hard to predict how many regions will succeed and in which economic sectors they will become active. For regions that started with RIS3 from scratch in 2014 it would already be a sufficient challenge to reach stage 1 or 2 by 2020. This is not a problem, it is not a competition with a finish line in 2020. This is an ongoing process, with a very dynamic nature. Regions embracing emerging industries today can be the winners of tomorrow.

Stage 1: Getting started: Joining up in the region



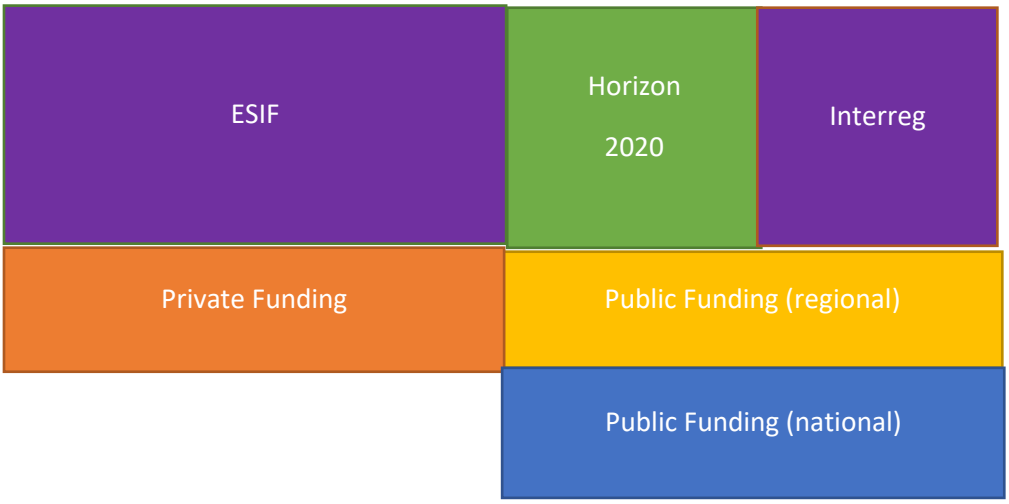
- Initial steps in Industry – Academia cooperation;
- Bottom-Up process;
- Entrepreneurial discovery process (EDP);
- Regionally important sectors and emerging sectors, reflecting regional strengths and potential;
- The right mind-set is required for success in this stage, even more important than financing;
- First European Structural and Investment Funds (ESIF) are allocated to RIS3 topic to support the science, innovation, business and/ or business development;
- BSc and MSc students perform traineeship in RIS3 industries/ companies.

Stage 2: Joining up outside the region



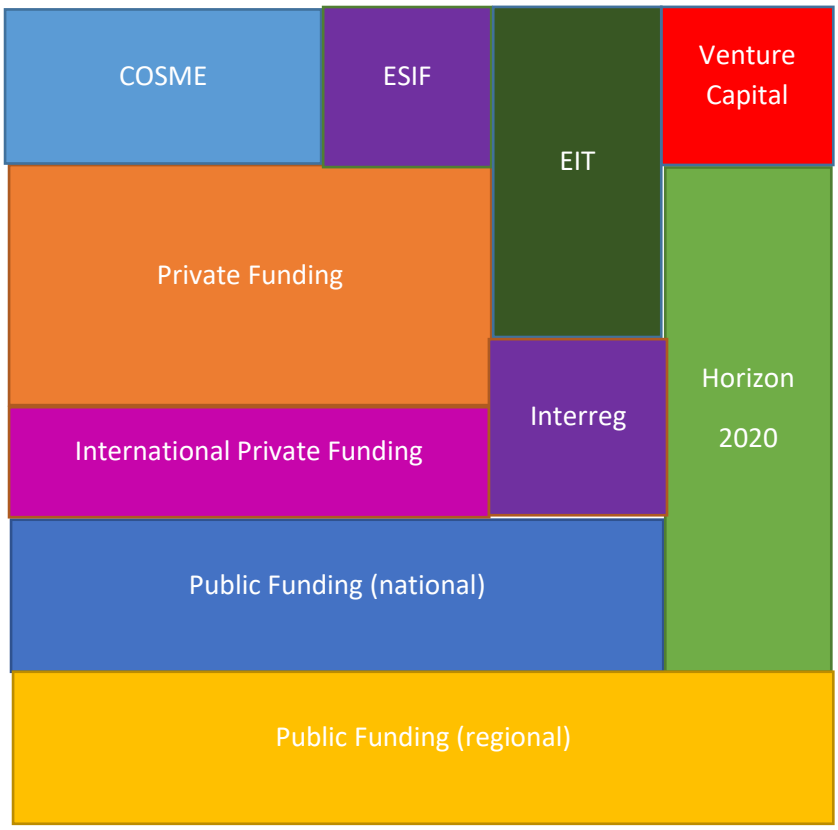
- Well-developed Industry – Academia cooperation;
- Branching out beyond the regional domain;
- Participating in Interreg projects;
- Participating in Horizon2020 (H2020) projects;
- Establishing Public-Private Partnerships (PPP);
- Participating in science, innovation and demonstration projects (ESIF and Interreg);
- Research institutes/universities attract talent related to RIS3 topic;
- New products and services developed in RIS3 sector;
- First start-ups developed in RIS3 sector;
- Region concentrates funding sources on specific economic sector or societal challenge to enhance critical mass.

Stage 3: Enhanced collaboration (more business involvement and expanding national and European cooperation)



- Winning regional, national & European awards;
- Coordinating H2020 projects;
- Coordinating science, innovation and demonstration projects (ESIF and Interreg);
- Establishing a Centre of Excellence (PPP in which industry is committed long-term and pays at least 25% in cash for pre-competitive research projects);
- Forecasting the skills needs within the sector. Establishing strategic cooperation between Vocational Education and Training (VET) Schools and companies active in the RIS3 sector. Education profiles and traineeships optimised; Develop dedicated Master track in line with RIS3 topic and attract foreign talent to participate in excellent 2-year master education programmes;
- Develop special training programmes for post-graduates, which include skills training for entrepreneurship and industry-academia cooperation;
- High interest of BSc and MSc students to perform thesis or traineeship in RIS3 region;
- Dedicated research programme and high amount of PhDs active in RIS3 topic;
- Cooperation with knowledge institutes, universities and companies, from other regions and other member states;
- Increasing amount of start-ups active in RIS3 topic;
- Connecting with other clusters, regionally, nationally and European wide;
- Region and member state concentrate funding on a specific societal challenge within the region, enhancing critical mass and creating attractive conditions for international cooperation;
- Increased interest in scale-ups

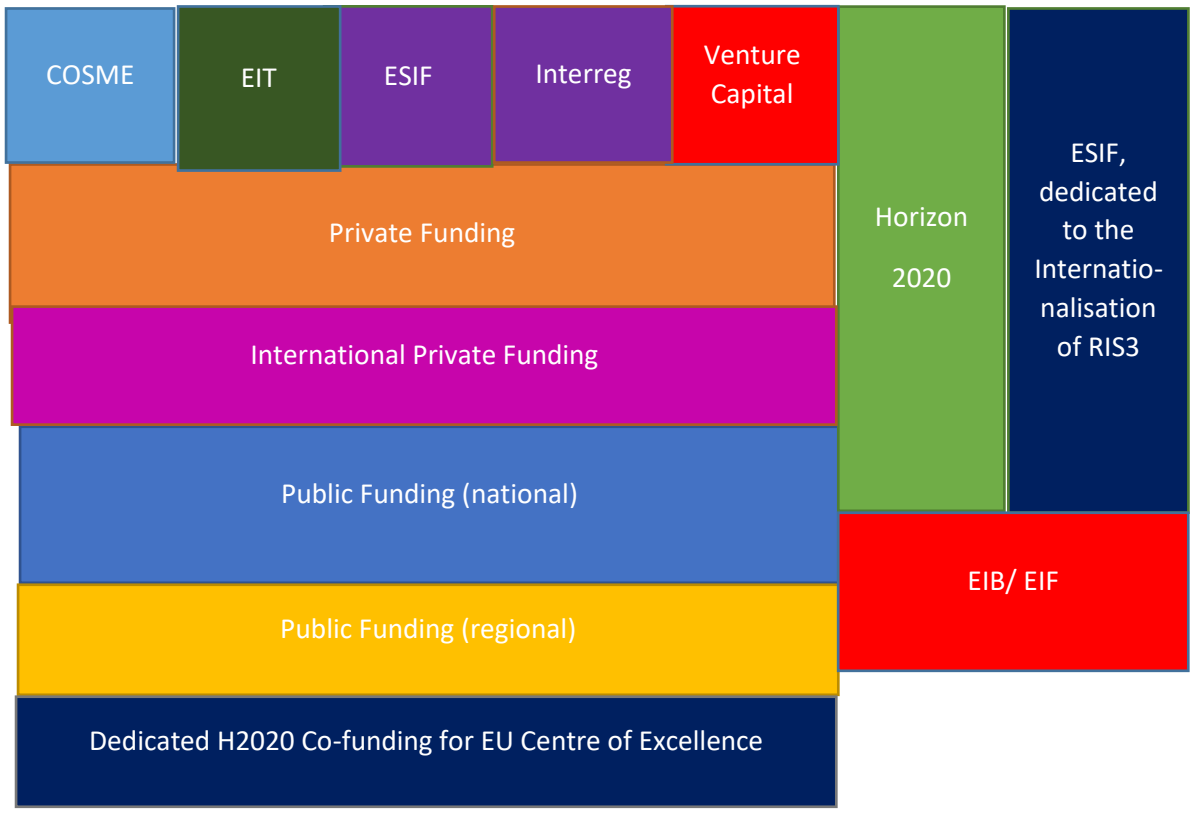
Stage 4: Advanced cooperation: Intensive cooperation on a European level



- Region and national member state concentrate significant resources on RIS3 topic. Centre of Excellence evolves into European Centre of Excellence, which reduces the fragmentation of research investments in the sector and multiplies the impact by concentrating the innovation power of more companies and universities in one location;
- Aim for the establishment of Centers of Vocational Excellence, which support innovation, such as product development and technology validation activities, work in a more international setting, provide training in entrepreneurship and forecast market needs, and links up VET education and training with universities of applied sciences, master students and PHDs;
- Platforms of Centers of Vocational Excellence support the strategic positioning of VET as European tool for innovation. VET schools linked to this platform define curricula, which can be introduced on national level, offering other VET schools the opportunity to benefit from state-of-the-art education and training profiles, further improving the reputation and reliability of VET schools.
- The higher concentration of critical mass allows for even more high-risk research and innovation, starting with the lowest TRL levels and leading towards TRL6 within the research programme with international participants. → The region becomes the most important source of breakthrough technologies in the chosen RIS3 sector;
- Novel technologies enhance the competitiveness of the region, the member state and the European Union. New products and services find their way easily within the Global Value Chain. Offering unique products and services well beyond state-of-the-art;

- European Centre of Excellence coordinates MSCA Co-Fund project, attracting even more European and global talent and creating more visibility of the research institute;
- European Centre of Excellence has a pan-European influence on the research agenda of the RIS3 sector;
- Establishing cooperation with other fields of science (multidisciplinary cooperation) and executing this research within the RIS3 region: widening the science input. Attracting companies from other economic sectors to participate in RDI in the RIS3 region, further breaking silos and fostering more cross-sectoral innovation;
- Europeanisation and internationalisation further enhanced, innovative companies from all over Europe and the world connect to the innovation ecosystem and participate jointly in high-risk research;
- Region develops support instruments for start-ups from the region itself and for other start-ups located anywhere within the EU, where possible in cooperation with EIT KICs;
- Region has forecasted a high jobs growth within the region and initiates a dedicated programme for primary and secondary education to enhance student awareness and trigger the interest of young pupils for RIS3 sector (e.g. for specific type of STEM education programme);
- Unique ecosystem is recognised within Europe and the world, talent is attracted easily;
- Global Investment community eager to attend annual meetings to meet with start-ups, learn about new patents and offer funding opportunities.

Stage 5: Join regional Pan-European Initiatives: corner stone for European competitiveness with global outreach



- European Centre of Excellence gains worldwide reputation for best in the field of the chosen RIS3 sector. Companies, investors, universities and talent are keen to work within this European Innovation ecosystem;
- Critical mass of science and business intelligence provides crucial insight into the future market potential of research outcomes and breakthrough technologies;
- EIB establishes a dedicated investment fund for technology transfer and to support start-ups, located within the region with critical mass, most likely close to the European Centre of Excellence. In addition to investments towards spin-offs, start-ups and tech-transfer within the region itself, the investments fund also invests in spin-offs, start-ups and tech-transfer located in other European regions directly or indirectly connected to the innovation ecosystem.
- Companies active in the innovation ecosystem of the critical mass region start to develop demonstration projects close to end-users located in other regions with unique needs (e.g. an environmental challenge not present in region of origin). Solving societal challenges and offering possibilities for joined ventures.
- Region connects successful education programmes for primary and secondary education to other EU regions, through instruments such as KICs and ESIF/ESF.
- Successful regions with critical mass, hosting European Centres of Excellence cooperate with lagging regions to develop specific programmes to counter brain drain, by offering the right conditions for successful PhD students to return to their region of origin. This would be complementary to goals of ERA Chair, only cheaper and more effective. These PhDs know the language and culture and might be more effective in changing the paradigm than external experts.
- Together with European universities and companies, who are a long-term partner of the innovation ecosystem, dedicated programmes are developed, which enhance the use of patents and the development of spin-offs companies, further boosting growth and jobs beyond the region of origin (with high critical mass).
- Critical mass regions continue to feed the innovation pipeline with new ideas by linking up with new research institutes and companies, as well as academics and fresh talent.
  The European Centre of Excellence develops these new ideas with low TRL levels into proven technologies.
- Life Long Learning applied to the whole education cycle, from age 10 to 30 and beyond. Integrating all levels: primary and secondary education, VET, BSc, MSc, PhD, MBA and adult learning, all connected to the RIS3 topic. The entire innovation ecosystem, start-ups and growing SMEs offer plenty of career opportunities.
- The European Centre of Excellence acts as one of the most important sources for innovative breakthrough technologies. It guarantees Europe's leading position regarding a specific sector (e.g. emerging industry). It has become a corner stone for European competitiveness.

Critical Mass Assessment Methodology

Focusing on critical mass in innovation ecosystems is a fairly new approach. Innovation policy documents are increasingly using the term Critical Mass, although there is generally no description or definition of the concept itself, it is used as a self-evident necessity. iWATERMAP underlines this philosophy, but wishes to go one step further in attempting to paint a picture of critical mass within innovation ecosystems, using a series of overlapping questions and tables to trigger the partner region to have a holistic view on initiatives, projects and activities within their region. Firstly, an overview of critical mass development is important to create more self-awareness. Secondly, it is useful to assess the GAPs in knowledge, policy and supporting programmes and infrastructure. Thirdly, it is essential to shape more effective and efficient research and innovation policies. The 3 roadmaps that will be delivered through the iWATERMAP project will sketch the regional needs in the medium and long term.

Self-Assessment Critical Mass

a. List of questions

- What is the RIS3 topic?
- What are regional challenges in this field (goals/ challenges)?
- How long is the region active in this field?
- Which programmes have been supporting this development?
- Are there active or concluded research projects in the region (period 2014-2020)?
- Is education actively involved to create new talent in this field?
- Has ERDF supported this development?
- Has Interreg supported this development?
- Has H2020 supported this development?
- Is industry involved? Are clusters involved? Which sectors?

b. Tables

Projects (Regional/ National/ EU/ Global/ Private/ Other)

	Topic:	Goals:
Regional projects		
National projects		
European projects		
Other project types		

Triple Helix

	Organisations:	Projects/ Initiatives/ Programmes:
Research		
Industry		
Regional Government/ National government		

Knowledge Triangle

	Organisations:	Projects/ Initiatives/ Programmes:
Education		
Research		
Innovation		

Critical Mass Self-Assessment per region

The partner regions have all created a self-assessment, consisting of a paper and a powerpoint presentation. These have been presented on September 25th during the iWATERMAP kick-off meeting in Leeuwarden.

Considering the nature of this report and the amount of pages foreseen, it was decided not to include these regional self-assessment in this report. They are available upon request.

The next chapter titled "Critical Mass Expert Feedback" consists of expert feedback on the aforementioned powerpoint and paper. The Feedback is very thorough and concise and therefore excellent material to include in this report.

Critical Mass Expert Feedback

iWATERMAP lead partner Wetsus contracted an external expert, Miranda Ebbekink -about whom more info can be found in Appendix 1, to support the analysis of the critical mass assessment and to provide feedback on the various regional self-assessment reports of the critical mass development.

In the paragraphs below the feedback is indicated per partner region, Friesland is not included in this list. The experience of Friesland was already included in the base description of the various critical mass development stages.

Northern region, Portugal

- Internationalization seems to be one of the main priorities – how many projects address this and how (via policy learning or actual value chain integration?). Do you have any experiences to share (e.g. MIT Portugal; Startup Braga)?
- Water is considered to be a non-technological resource in the ROP and RIS3 documents, an interdisciplinary area ('groundwork'), even though the region has acquired impressive critical mass in this field, both in research as well as start-ups/spin-offs, etc. – the question is how to update the strategy, who initiates this change ('change agent')? Try to come up with pragmatic ways to ensure strategic learning and timely updates of niches. And make sure that civic entrepreneurs are included.
- Ensure technology transfer: few PhD's are integrated into private companies due to high salary demands, but especially low innovation culture in most company players in the water sector. Universities do offer spin-out courses to PhDs (Idealab, BIP). Try to investigate where

the hindrances in the innovation ecosystem actually lie (e.g. lack of seed money, discrepancy between research interests and regional market demands, poor innovation culture) and try to address those. CoLAB and Summer Innovation Campus seem to be excellent examples.

- Professionalize mechanisms for continuous learning, monitoring and reflexivity (e.g. gather overall data on water technology/Agrifood/environmental biotechnology-related patents/start-ups/spin-outs/cluster-specific employment rates, continuity in project consortia etc.). Make sure to establish indicators – both quantitative and qualitative ones, the latter aimed at monitoring 'soft' aspects (e.g. trust levels, established cluster identity, entrepreneurialism etc.).
- UNorte: inter-university collaboration = great! Any niche-specific coordinative efforts? Aqua Xperience and ExpoBiotec are great examples of niche-specific outreach programs. How well is the educational system integrated? Consider investing in inter-institutional collaboration and alignment of market demand and educational profiles. Make sure to also address issues of lifelong learning, meaning to not only link up similar educational levels (i.e. interuniversity collaboration), but different ones as well (e.g. high-schools and vocational schools) – to the likes of CIV Water in Leeuwarden.
- When trying to self-assess your critical mass, make sure to use a regional lens.

Region of Crete

- Coordinative efforts are still fragile. Efforts are underway to start industry communications. Many of them are SMEs with low levels of knowledge intensity (mainly problem owners, not solution providers). Data is being gathered. A cluster organization has not yet been formed. Companies are not lead partners in the listed projects (many of the projects relate to policy learning, including developing governmental decision tools). Also, critical mass in water technology research has not been achieved yet. Building a cluster, almost from scratch, is very difficult. In building a cluster it is crucial to investigate symbiotic interdependencies and set collaborative expectations and norms. Try to establish consortia of similarly minded companies willing to grow into solution providers. Also, look outside: learning from established clusters in similar fields is a good strategy, the same goes for trying to cooperate with them (i.e. borrowed size).
- The Entrepreneurial Discovery Process was started by the regional government in December 2016. A call for projects has not gone out yet, due to internal re-organizations at the ERDF Managing Agency and the needed co-funding rate (difficult to achieve in an economic crisis). The RIS3-strategy was a 'hand-me-down' in which water technology (the same goes for marine biology) was not explicitly specified as a RIS3-priority – the question is how to update the strategy, who initiates this change ('change agent')? Concerns were already shared but not yet acted upon. The EDP also was an 'isolated' effort: external competitors were not looked at -> implication for competitive advantage. Regarding the specific RIS3-priorities: 'the environmental complex' – does the region have specific knowhow on this, or already an established track record? Isn't this a challenge faced by multiple regions? Do you have a competitive advantage in this field (evidence-based priority setting)? The knowledge complex: are not we talking about 'the basics here' – I do not think this qualifies as a niche / RIS3 priority. Was any comparison done with other regions during the EDP? Is ICT missing in the presentation (the SWOT mentions it)? And the green technologies mentioned on slide 8: are these actualized or aspirational – can the knowledge ecosystem already supply these technologies? And why wasn't construction chosen as a niche: trained human capital + possible cross-over – e.g. building environmentally certified constructions. Try to come up

with pragmatic ways to ensure strategic learning and timely updates of niches. And make sure that civic entrepreneurs are included.

- Valorization is a significant challenge. Funding (seed money, venture capital) is needed. Look into blending as a way to increase funds.
- Involvement of education: at this moment, systemic coordination between educational levels has not been established (although there used to be a Crete-wide school energy conservation program). Consider investing in inter-institutional collaboration and alignment of market demand and educational profiles. Make sure to also address issues of lifelong learning, meaning to not only link up similar educational levels (i.e. interuniversity collaboration), but different ones as well (e.g. high-schools and vocational schools) – to the likes of CIV Water in Leeuwarden. And investigate whether possible shortages warrant niche-specific programs.
- When trying to self-assess your critical mass, make sure to use a regional lens.

South Moravian Region, Czech Republic

- The RIS3-strategy was developed by the RDA. It did not include water technology, although the region does have critical mass in the field (apparently there was a 'big profit-bias' as multinationals were better networked) – the question is how to update the strategy, who initiates this change ('change agent')? Concerns have been shared but not yet acted upon. CREA (the cluster organization) has been excluded from modifying the RIS3-strategy. The National Cluster Association could prove to be instrumental in ameliorating cluster organizations' strategic position. Meanwhile, a decision was made to use an alternative: the JMK Strategy 2020, developed by the regional government that did include water technology. Try to come up with pragmatic ways to ensure strategic learning and timely updates of niches (even before the planned update in 2021) – the efforts to form teams is a great start. And make sure that civic entrepreneurs are included herein. Also, the EDP for the JMK Strategy 2020 was an 'isolated' effort: external competitors were not looked at -> implication for competitive advantage.
- Follow-up: many projects were listed, many of them of the applied science kind. Professionalize mechanisms for continuous learning, monitoring and reflexivity (e.g. gather overall data on water technology-related patents/start-ups/spin-outs/cluster-specific employment rates, continuity in project consortia etc.). Make sure to establish indicators – both quantitative and qualitative ones, the latter aimed at monitoring 'soft' aspects (e.g. trust levels, established cluster identity, entrepreneurialism etc.).
- Some of the members involved in CREA come from neighboring regions – this is a great indicator of cluster maturity. Internationalization ambitions have mentioned as well (application outside Brno region). Aim for collaboration between clusters to achieve this goal. Interesting new niches, as well as cross-overs might be discovered. How could clusters better cooperate with one another?
- The RIS3 lists interconnectivity between business and academia as a partial goal. To CREA it is a main goal. SMEs especially have a hard time getting connected to academia. What explains this divergence? What kind of mechanisms are put in place to ameliorate this?
- The region seemingly invests in continuous learning (which is great!) and niche-specific ("biological camps" – to combat student shortages?). There are not, however, any coordinative efforts underway to align educational levels and specific institutions (to the likes of CEW, CIV)? Aim to link up similar educational levels (i.e. interuniversity collaboration), but different ones as well (e.g. high-schools and vocational schools).

- When trying to self-assess your critical mass, make sure to use a regional lens.

Region of Murcia, Spain

- All technology centers are started and funded by private companies. They have special rates for SMEs. Each university also has its own technology transfer center. And FUEM helps companies find their way to fundamental research. How well-integrated is this innovation ecosystem? You have shared that there is some mutual awareness of content of research. However, it would be wise to invest in more robust coordinative mechanisms. Employ civic entrepreneurs to raise awareness of this issue.
- RIS3 as an open document: professionalize mechanisms for continuous learning, monitoring and reflexivity (e.g. gather overall data on water technology-related patents/start-ups/spin-outs/cluster-specific employment rates, continuity in project consortia etc.). Make sure to establish indicators – both quantitative and qualitative ones, the latter aimed at monitoring 'soft' aspects (e.g. trust levels, established cluster identity, entrepreneurialism etc.).
- Try to come up with more pragmatic ways to ensure strategic learning and timely updates of niches. Can the Economic & Social Council perhaps play a role in an ongoing Entrepreneurial Discovery Process? The same goes for technology centers' project meetings. And committees established by the General Directorate of Water. Ensure that any participatory processes include civic entrepreneurs. Also, use these mechanisms to further specify RIS3-priorities – they currently seem quite broadly defined. Also, did the EDP specify any cross-overs between niches?
- Involvement of education: any niche-specific programs at the primary, secondary and high-school level of education? Any projects focused on stimulating lifelong learning? Also, consider investing in inter-institutional collaboration and alignment of market demand and educational profiles. You assert that there is no shortage of students due to excellent career opportunities in the sector, but do students (as a 'delivered product') meet market demand?
- When trying to self-assess your critical mass, make sure to use a regional lens.

Latvia

- Faculties do multidisciplinary research in these fields, as does the water research laboratory. Indicative of established critical mass (internal viewpoint) – external competitors seemingly not looked at -> actual or aspirational competitive advantage? Also, are there any mechanisms in place to update the RIS3-strategy? Try to come up with more pragmatic ways to ensure strategic learning and timely updates of niches. Also, make sure to specify and share lessons learned in the RIS-update.
- You shared that systemic and planned inter-institutional coordination is a learning goal. Education is currently *not* actively involved. How can this be explained? Is there a lack of symbiotic interdependency? Efforts are seemingly underway to change this (this year a memorandum of understanding was reached with one school with similar specializations) – who initiated this change ('change agent'), on what grounds? Do these initiators qualify as civic entrepreneurs? Make sure to also address issues of lifelong learning, meaning to not only link up similar educational levels (i.e. interuniversity collaboration), but different ones as well (e.g. high-schools and vocational schools) – to the likes of CIV Water in Leeuwarden. Especially considering that, contrary to some other regions, Latvia can expect a shortage of talent in these specific fields due to its ageing workforce. Also, coming spring a detailed

analysis will be performed to assess the innovation ecosystem and its missing elements. Be sure to include civic entrepreneurs in this assessment.

- Several clusters have been formed in the region. Each one has its own strategy, programs and projects. How could these clusters better cooperate with one another (e.g. actively search for cross-overs)? Include not only similar clusters from other regions, but also dis similar clusters from the own region. Also, your presentation shows a list of non-members who do not feel that their interests are sufficiently addressed. Are there active efforts underway to involve them, how? In doing so it is important to achieve a balance in optimal cognitive distance (similarity in innovation goals).
- Internationalization seems to be one of the main priorities – how many projects address this and how (policy learning or actual value chain integration)? Do you have any experiences to share?
- Institutional entrepreneurship is needed: you listed low investment in science by government -> is there a real risk of 'cathedrals in the desert'? Find and utilize civic entrepreneurs to establish direct communications with funding agencies and improve upon interinstitutional collaboration.
- Follow-up on projects: professionalize mechanisms for continuous learning, monitoring and reflexivity (e.g. gather overall data on water technology-related patents/start-ups/spin-outs/cluster-specific employment rates, continuity in project consortia etc.). The master thesis you mentioned is a first step in the right direction. Make sure to establish indicators – both quantitative and qualitative ones, the latter aimed at monitoring 'soft' aspects (e.g. trust levels, established cluster identity etc.).
- When trying to self-assess your critical mass, make sure to use a regional lens.

North-East RDA, Romania

- Beware of the importance of institutional alignment: the RDA shows some overlap with cluster management (i.e. mission = to develop communication channels; to set up common goals/objectives/initiatives; to engage in a facilitator role). However, clusters benefit from having their own dedicated cluster management staff. My advice would be to very clearly delineate between the RDA's responsibilities and authorities and those of cluster management organizations.
- Follow-up on projects: professionalize mechanisms for continuous learning, monitoring and reflexivity (e.g. gather overall data on water technology-related patents/start-ups/spin-outs/cluster-specific employment rates, continuity in project consortia etc.). Make sure to establish indicators – both quantitative and qualitative ones, the latter aimed at monitoring 'soft' aspects (e.g. trust levels, established cluster identity etc.).
- Prevent over-specialization: to get funding, projects have to be related to the specified niches. Focus in funding is crucial, however, beware of interesting projects being glanced over that might actually be indicative of a new regional priority 'in -the-making'. Mono-culture could trigger a cluster life cycle downgrade. The RIS-update was a great way to discover new niches and possible cross-overs between niches (as the matrix of smart specialization domains demonstrates). However, it was also a lengthy process. Try to come up with more pragmatic ways to ensure strategic learning and timely updates of niches. Also, make sure to specify and share lessons learned in the RIS-update. And RIS3-priorities found via established critical mass (internal viewpoint) – external competitors not looked at -> actual or aspirational competitive advantage?
- Institutional entrepreneurship is needed: you experienced some delays in the RIS3-proces due to lack of authoritative power in regards to funding (the management authority had to

give the green light). Find and utilize civic entrepreneurs to establish direct communications with funding agencies and improve upon the now limited interinstitutional collaboration. Also, great to see active efforts regarding launching customership (i.e. green procurement). Any experiences to share? Lessons learned? Finally, lots of projects are related to policy learning 'across borders' – also institutional ones. Be sure to embed those lessons learned in the policy culture in general.

- Coordinative efforts are still fragile. Change in the innovation culture is needed. Build-up of trust is especially relevant. Openness regarding one's self-interest can foster trust (it allows stakeholders to establish symbiotic dependencies) if collaborative expectations and norms have been verbalized and aligned. Also, aim for collaboration between clusters. Not only similar clusters from other regions, but also dissimilar clusters from the own region. Interesting new niches, as well as cross-overs might be discovered. How could clusters better cooperate with one another?
- Involvement of education – low technology transfer, how is this addressed by the RDA? Any projects focused on stimulating lifelong learning?
- When trying to self-assess your critical mass, make sure to use a regional lens.

Conclusions

The combination of questions and tables can be improved and perfected, nevertheless for the purpose of this analysis has worked successfully and effectively.

Critical Mass, current state of play			
	Education	Research	Business
Friesland			
Latvia			
Southern-Moravia			
Nord-Est			
Crete			
Murcia			
Norte			

Appendix

Miranda Ebbekink

Miranda Ebbekink works for the consultancy Lysias Advies as cluster expert. She also works as researchers at Radboud University in Nijmegen, where her research focuses on cluster stakeholders' collective policy action aimed at cluster reinforcement, and specifically on the political-institutional, organizational and knowledge management aspects thereof. It introduces the innovative framework of cluster governance and its core elements: civic entrepreneurs, strategic intelligence, institutional entrepreneurship, cluster identity, personal proximity, policy leverage and strategic coupling.

Table of KPIs per stage:

KPIs	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Cooperation with international academia	0%	0%	10%	25%	>40%
Cooperation with international companies	0%	0%	5%	15%	>25%
% of international EU funding, obtained from competition (Interreg & H2020)	1%	2%	4%	6%	10%
Scientific reputation= relative impact * (times) amount of papers/ year in international peer reviewed journals	1	10	40	75	90
Attracting foreign talent, % scientists under age 35 from another contry	0%	1%	10%	25%	50%

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