A2.5, O.2: Long-term joint research strategy

Unified plan for enhanced research cooperation across the ECIU University member institutions

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Beneficiaries

- Aalborg University, Denmark
- Dublin City University, Ireland
- Kaunas University of Technology, Lithuania
- Linköping University, Sweden
- Tampereen Korkeakoulusäätiö sr, Finland
- Hamburg University of Technology, Germany
- Universidade de Aveiro, Portugal
- Universitat Autonoma de Barcelona, Spain
- University of Stavanger, Norway
- Universita degli Studi di Trento, Italy
- Institut National des Sciences Appliquées de Toulouse, France
- University of Twente, The Netherlands

Abstract

Challenge-based research (CBR) is doing research with partners from industry/business, education, government, civil society and citizens (societal partners), using the challenges they face in reality, with the objective of arriving at solutions to these challenges. Excellence and impact in CBR requires a shift in focus from individual research projects formulated around specific research questions to serial research programmes formulated around challenges. Setting up and completing such programmes depends on creating and nurturing experienced regional research networks: SMART Regions. In these networks, Universities work closely with their societal partners. Within ECIU University, these networks act as SMART European Regions by collaborating on shared challenges in the form of aligned or jointly created CBR-programmes. Implementing this joint strategy requires initiating CBR-projects and embedding these into programmes, and advocacy for impact-driven national and European research agendas. Commitment by and shared expectations amongst ECIU-members and their societal partners, as well as their ability to function as a single unit are key factors for successful implementation.

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Symbols, abbreviations and acronyms

AAU	Aalborg University, Denmark
DCU	Dublin City University, Ireland
EC	European Commission
ECIU	European Consortium of Innovative Universities
KTU	Kaunas University of Technology, Lithuania
LiU	Linköping University, Sweden
TAU	Tampereen Korkeakoulusäätiö sr, Finland
TUHH	Hamburg University of Technology, Germany
UA	Universidade de Aveiro, Portugal
UAB	Universitat Autonoma de Barcelona, Spain
UiS	University of Stavanger, Norway
UNITN	Universita degli Studi di Trento, Italy
UT	University of Twente, Netherlands

CBI	Challenge-based Innovation
CBL	Challenge-based Learning
CBR	Challenge-based Research
R&I	Research and Innovation
SDG 11	Sustainable Development Goal eleven
UN	United Nations

1 Introduction

The ECIU University is a network university built by a consortium of like-minded universities. One of its key activities in the near future will be to engage more structurally in joint European research and innovation programmes that match their local research agendas. These R&I efforts will have a signature challenge-based nature and will focus predominantly on topics related to UN SDG 11: Sustainable Cities and Communities.

To embark on this endeavour, a clear and shared definition is needed on what Challenge-based Research is according to the ECIU University, accompanied by a strategy and unified plan for enhanced research cooperation across the ECIU University member institutions. This document provides these features and can serve as the groundwork of future documents on the enhanced cooperation in research and innovation between member institutions.

1.1 History and status of this document

This document represents the V.2.0.0. version of deliverable 2.5, output #2 and is drafted under responsibility of the University of Twente. The 1.0.0. version was disseminated in MS PowerPoint format across the points of contact for Work Package 2 (Challenge-based Research) of all ECIU University member institutions. It was also presented orally to the WP2 Task Leaders and to the Vice Presidents for Research Expert Group. Prior to producing the 1.0.0. version, discussions were held with 5 member institutions (AAU, DCU, KTU, LiU, UAB) to generate input.

The current version of the document is intended for internal review, upon which a definitive version will be produced. Remarks and suggestions on the 1.0.0. version that were provided orally or in writing by the member institutions have been incorporated into the current version.

2 Objectives

This document seeks to offer a shared definition on what Challenge-based Research is according to the ECIU University, accompanied by a strategy and unified plan for enhanced research cooperation across the ECIU University member institutions. In doing so, it responds to the grant agreement between the ECIU University member institutions and the European Commission. This document is to be integrated into the outcomes of Work Package 5: Challenge-based Innovation.

Activity 2.5: Long-term joint research strategy

- O1: Joint policy document on ECIU University Smart Specialization Strategy (Month 3, completed)
- **O2: Unified plan for enhanced research cooperation across the ECIU University member institutions to be integrated into the outcomes of WP5 (Month 24, current document)**

3 Challenge-based research in the ECIU University

3.1 Basic definition

Within the ECIU University, we mean the following when referring to challenge-based research (CBR):

Challenge-based research (CBR) is doing research with partners from industry/business, education, government, civil society and citizens (societal partners), using the challenges they face in reality as a point of departure, with the objective of arriving at solutions to these challenges.

3.2 Characteristics of suitable challenges

In ECIUU, we approach challenges as problems that transcend a single research question as these present themselves in reality. We look for challenges that are suitable for scientific involvement which typically have three key characteristics, as explained in figure 3.1.

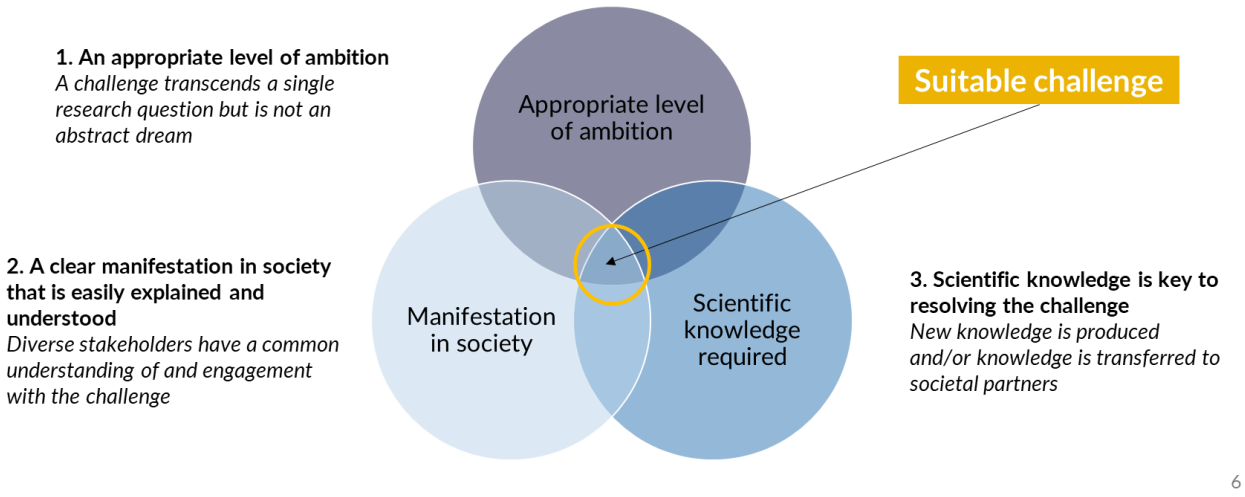

Figure 3.1. Characteristics of suitable challenges for CBR in the ECIU University

1. *Appropriate level of ambition*

The key shift in moving from generic forms of problem-based research towards challenge-based research is a shift in ambition levels. It is about tackling the big and complex problems we face in society, with the people that are affected by these. Such challenges need to be specific enough to organise a collaboration around, but are too big and multi-faceted to be resolved within a single research project. The consequence of this shift is a necessity to focus on serial research programmes, rather than whole-university research strategies or single research projects. This is further explained in Figure 3.2.

A clear manifestation in society

The ECIU University engages in challenge-based research primarily to increase our societal impact. This requires that the challenges we work on matter to stakeholders, that these are challenges they want to see resolved. As a consequence, the challenges that form the starting point of challenge-based research need to be problems as they are experienced in reality by the stakeholders. Scientific understandings of underlying concepts or root causes will likely introduce themselves during research projects. However, they are not the strategic focus of collaborations with partners from society because the relevance of resolving them is derived from, and only part of the solution to, the main challenge.

2. *Scientific knowledge is key*

Finally, as the ECIU University, we aim to contribute to forms of societal impact that fit the mission and purpose of a research University. Thus, a scientific endeavour is a necessary condition for the (parts of) challenges that ECIU University should engage with. It follows that a lack of (complete) knowledge around a challenge is a prerequisite for the types of challenges we engage with. Calls for proposals from research funders will naturally ask for a process of research as well.

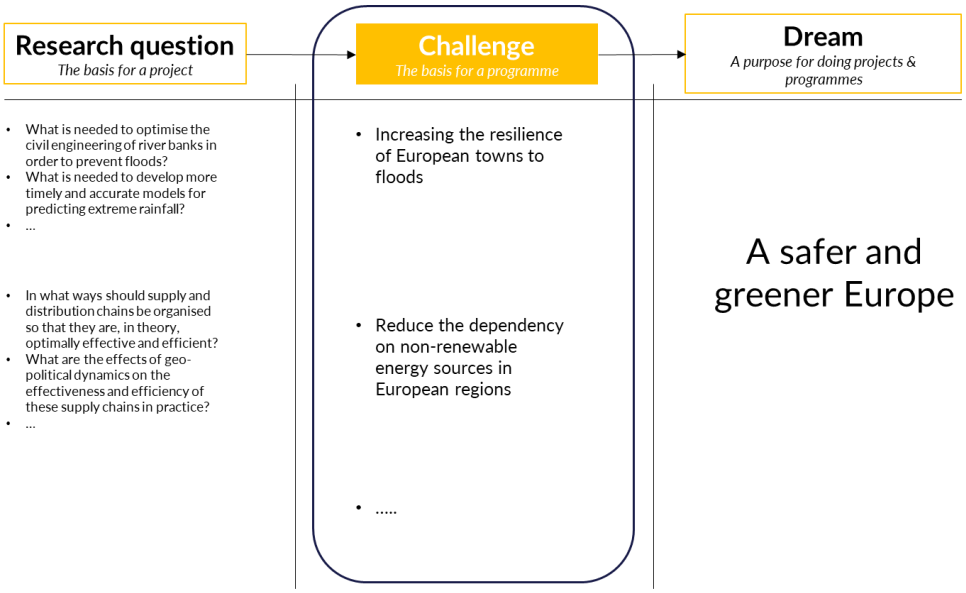

Figure 3.2. How challenges relate to research

3.3 CBR vs CBI and CBL

There are multiple ways in which Universities can use knowledge within a challenge-based approach. ECIU University focuses on challenge-based research, learning and innovation. Figure 3.3 is intended to pictorially illustrate the importance of the focus on the production of new knowledge that is at the heart of scientific research, and therefore challenge-based research within ECIU University. In practice, the distinctions between CBR, Challenge-based learning (CBL) and Challenge-based Innovation (CBI) are vague. Newly produced knowledge may subsequently or simultaneously be used for innovative or educational purposes, and these activities may in turn initiate or support the production of new knowledge and this is illustrated in Figure 3.3.

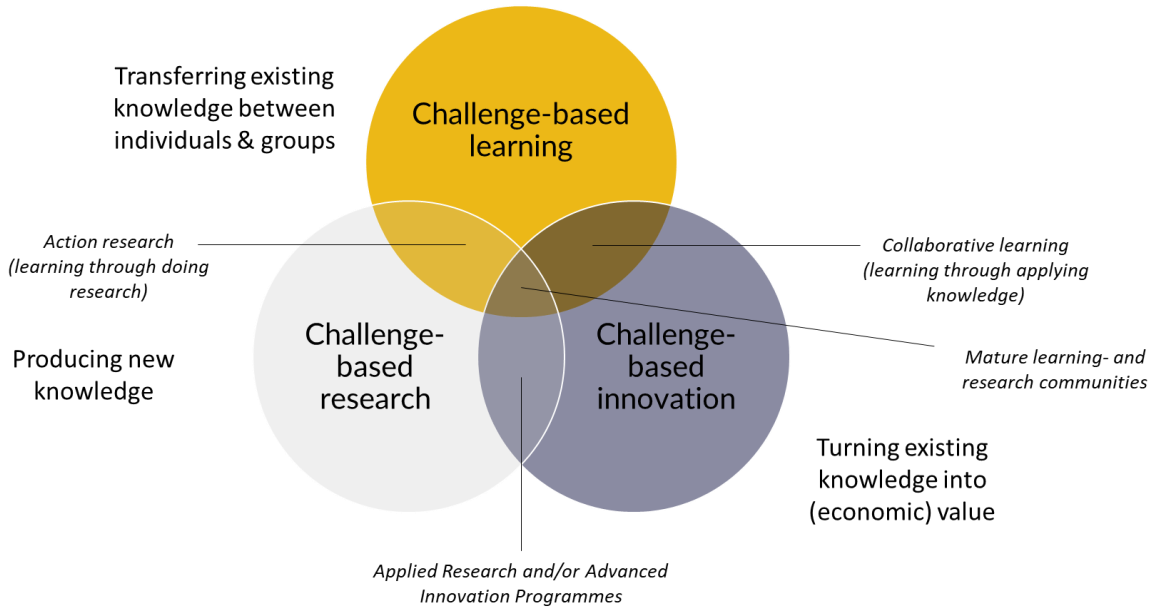

Figure 3.3. Challenge-based research is distinguished from learning & innovation through the role of knowledge

4 Towards joint challenge-based research programmes

4.1 A programmatic approach towards CBR

The key implication of the way challenges and CBR are conceptualised within the ECIU University is that the member institutions will work together on CBR in the form of joint CBR programmes. There are three main reasons for this.

1. Serial research programmes are the logical form for organising research endeavours around big, multi-faceted challenges
2. Programmes with multiple projects allow for flexibility in organising regional collaboration with societal stakeholders as well as European collaboration between ECIU partners
3. Multi-project research programmes allow for a structure under which innovative consortia and R&I-approaches can be formed and tried whilst connecting effectively with current European and national research funding systems and approaches

Figure 4.1 illustrates how a basic CBR programme is built up from a series of CBR projects.

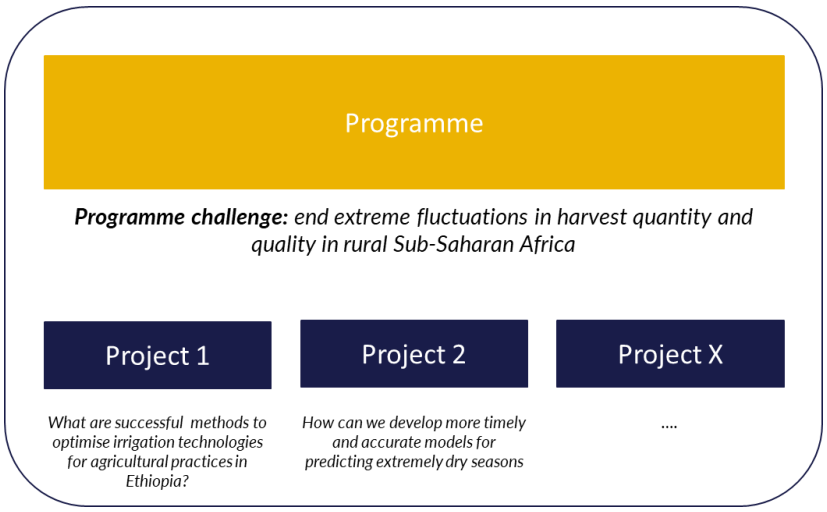

Figure 4.1. A CBR programme is built up from a series of CBR projects

4.2 What changes as a result of working challenge-based?

A shift towards (more) challenge-based research programmes and international collaboration as a network university looks seemingly simple on paper, but carries some important implications for how (some of the) research is organised and carried out at the member institutions.

1. **Regional multi-stakeholder ecosystems form around programmes, not just projects**

Single-project collaborations with societal stakeholders will have to develop into long-term, experienced networks that build trust and shared knowhow whilst working on larger-impact CBR-programmes. We label such networks **Smart Ecosystems** (see next section of this chapter).

2. **Research funding will be organised predominantly at the programme level**

Project results should coherently accumulate towards solutions to complex challenges and there should be room for trial and error. Larger funding bases are needed that are organised predominantly at the programme level and that come from multiple funding sources, including consortium partners.

3. **Regional consortia will become prepared to collaborate at a European level**

Increased trust, shared knowhow and robust funding helps regional networks to function as a unit, which equips them to collaborate effectively with other regional networks in Europe around shared challenges and projects. Smart Ecosystems thus become Smart European Ecosystems.

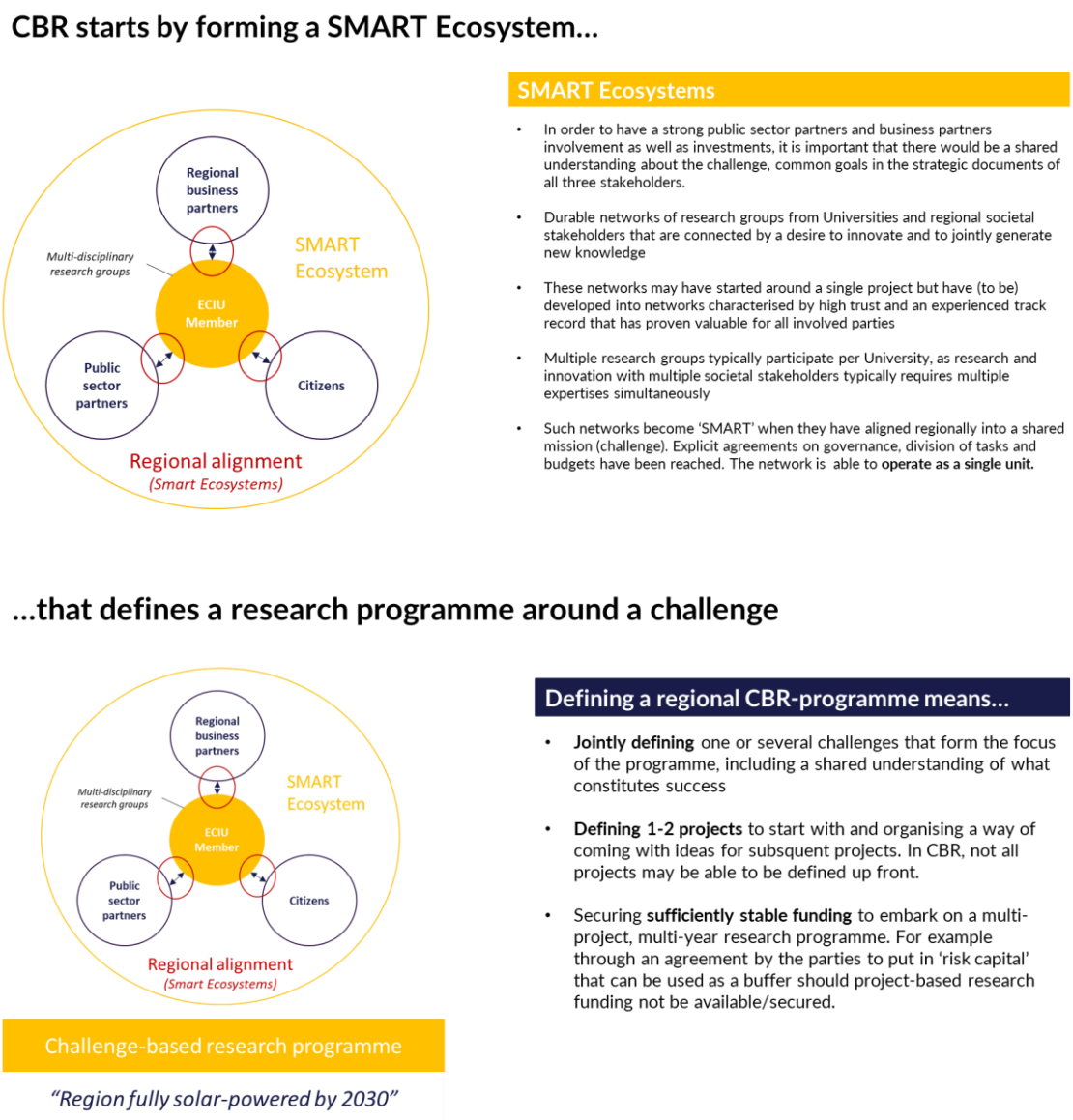

Figure 4.2. Smart Ecosystems define regional CBR programmes

4.3 Working together as Smart Ecosystems

Supported by the European Commission through a Horizon 2020 grant, the ECIU University is currently building the SMART-ER[1] virtual research institute. Within this institute, the member universities and their Smart Ecosystems will work together on challenges. This is done by aligning the research programmes of the regional Smart Ecosystems.

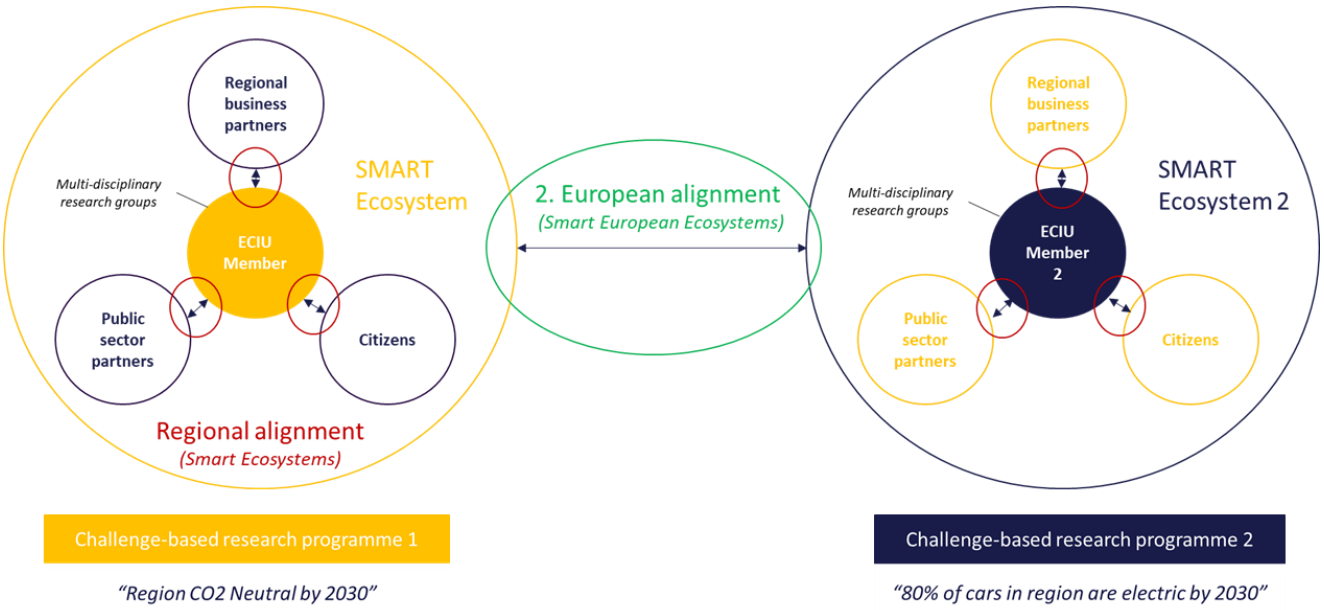

Figure 4.3. Aligning Smart Ecosystems into Smart European Ecosystems

While doing this, it is important that the regional ecosystems *as a whole* align their programmes, not just via their universities. Genuine buy-in from all stakeholders is a necessity for European CBR. ECIU members can however act as representatives of their ecosystems until their partners from society can find each other directly.

4.4 Aligning the CBR-programmes of the regional ecosystems: 2 options

Aligning CBR programmes across multiple ECIU members can essentially be done in two ways.

1. Defining and collaborating on joint CBR programmes in which multiple members' ecosystems participate
2. Aligning the separately executed CBR programmes of multiple members' ecosystems

This is illustrated by Figure 4.4.

[1] SMART-ER stands for Smart European Regions

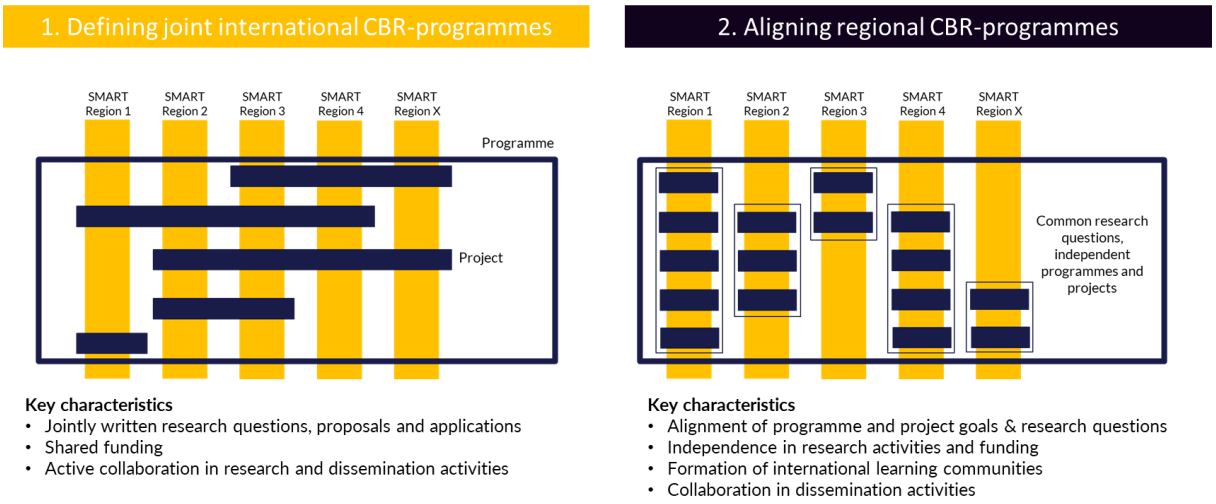

Figure 4.4. Aligning Smart Ecosystems around programmes: two main options

In practice, these options are not mutually exclusive. Some research groups from an ECIU member may engage with their own Smart Ecosystem in programmes jointly formulated with the Smart Ecosystems of other ECIU members. Other research groups from that same ECIU member may only want to engage in alignment of their independent research programme. What matters is that routes for increasing our collective impact at the European level are explored in ways that suit how our research groups work with their regional stakeholders.

5 Implementing this strategy

5.1 This strategy entails 4 key tasks

Implementing this joint research strategy will involve 4 key tasks that should become part of future endeavours by the consortium.

5.1.1 Setting up and nurturing SMART Ecosystems

Leads:

- *Research groups from ECIU members*
- *Business development and PR-departments from involved stakeholders*
- *Executives from involved stakeholders*

For most ECIU members, this task will require the most additional effort. Building up and maintaining a Smart ecosystem is a structural task, as projects and programmes may not always be up and running and the network should be maintained beyond these collaborations. This will require substantial investments from all partners in the network and structural involvement from business development and public relations departments.

Furthermore, the regional Smart ecosystems should develop into a network of Smart *European* Ecosystems. This will require direct exchange between network partners (industry, governments, citizens) from different regions and should be fostered to support development of new ideas around challenges. ECIU members may then develop into 'brokers' between their network partners. This will require continuous investments by all ecosystem partners which should facilitate the mobility of research staff between ECIU members.

5.1.2 Setting up challenge-based research programmes

Leads:

- *Research groups from ECIU members*
- *Executives from ECIU members*

This task will involve two steps:

1. Define and design multi-year multi-project research programmes around 1-2 challenges each with partners from a Smart Ecosystem
2. Define programmes jointly with ECIU partners or align locally defined programmes (alignment via coordinated objectives, outputs, dissemination)

Some key requirements are at play:

- CBR requires flexible funding so that programmes can respond to local and (inter)national dynamics that affect how a challenge can be resolved with research.
- This implies that grant-based funding for projects should be combined with own investments (by all SMART ecosystem partners, including in-kind) for programmes.
- Typically, this means that executives and governing bodies (from all partners) should also be involved.
- Organised commitment at all governance levels, between regional partners and ECIU partners is key for the success of CBR programmes.

5.1.3 Setting up challenge-based research projects

Leads:

- *Research groups from ECIU members*

This tasks brings CBR in practice within the ECIU University. As most member universities are used to participating in applied research and innovation programmes and/or collaborating intensively with stakeholders in society, this tasks likely represents the smallest change in the ways of working of the members.

Key activities include:

- Form a consortium with interested societal partners from the Smart Ecosystem
- Combine multiple funding streams to support the project to allow for flexibility
  - Investments from industry
  - Contracts with government partners
  - Grants from National/European funders
  - Buffer funds from CBR-programme investments
- Submit grant applications jointly with SMART Ecosystem partners
- Submitting project proposals with a number of ECIU partner will likely be an advantage for European funding

5.1.4 Provide input for (inter)national research agendas

To help strengthen the sustainability of a CBR approach across the ECIU University, it is important to stress continuously the importance of a challenge-based approach to national and European funders. ECIU members should therefore seek to engage in the following activities.

In Europe, as the ECIU University:

- Ensure adequate representation of ECIU as a consortium in relevant layers of European Higher Education and Science (funding policy)
- Focused lobby on European Commission's research agendas
- Vocalise the need for CBR and its impact potential for modern European societies
- Advocate for funding streams suitable for CBR:
  - Focus on societal impact
  - Flexible deliverables > suitable for unpredictable impact
  - Applications in consortium (Quadruple Helix)

Nationally, as individual members (but possibly in collaboration with fellow universities)

- Ensure adequate representation of your University in all relevant layers of Higher Education and Science (funding) Policy
  - Board/Executive level (general)
  - Advisory/assessment committees (specialist)
  - Policy making (bureaucrat)
- Vocalize the need for CBR and its impact potential for modern European societies
- Advocate for funding streams suitable for CBR:
  - Focus on societal impact
  - Flexible deliverables > suitable for unpredictable impact
  - Applications in consortium (Quad. Helix)

5.2 Key factors for successful implementation

Successful implementation of this joint long-term research strategy depends foremost on three success factors:

1. **Commitment at all levels of all participating organisations**

   Carrying out joint CBR-programmes means walking down a largely unknown and uncertain road. Societal impact at the level of grand challenges requires bold leadership at all levels of organisations. The success of CBR-programmes depends to a large extent on the commitment at all levels of all participating organisations, including a commitment to invest and experiment, and to accept initial failures.

2. **Explicit and shared expectations**

   Due to the complex nature of CBR at the European level, it is important that expectations on what constitutes success and what each party should contribute to that success are made explicit. These expectations should be shared by all parties involved.

3. **Smart ecosystems should be able to function as single units**

Whether working together on actual projects and programmes or merely aligning programmes strategically, challenge-based research at the European level is a complex task that requires extensive involvement of all parties involved in Smart Ecosystems, not just the Universities. Thus, liaising takes place between networks as a whole, not just Universities representing the networks.

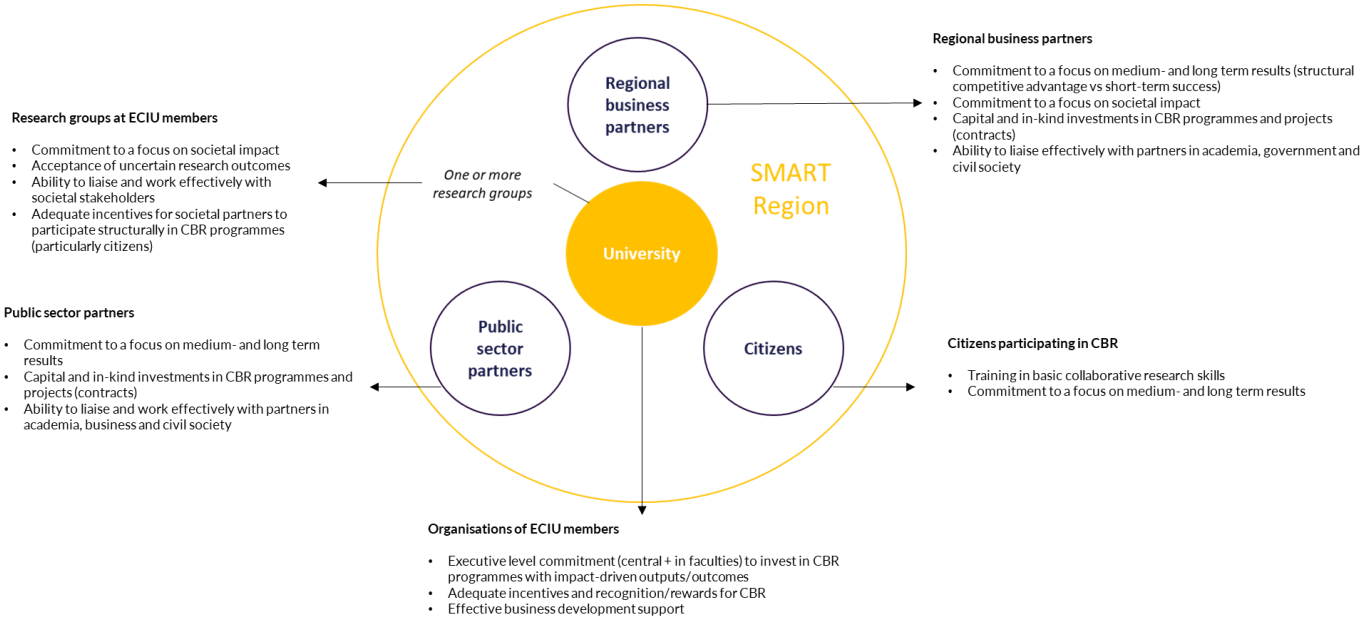

Figure 5.1. Key success factors per stakeholder group in a Smart ecosystem

When connecting the Smart Ecosystems of individual ECIU members, three main success factors are at play.

1. Adequate representation

To effectively work together, each network needs to function as a unit. It needs be represented adequately and with broad support, so that multi-network decision making leads to effective decisions that can actually be carried out in each participating network.

2. Goal alignment

All participating stakeholders of all participating networks should have an explicit and shared understanding of the goals of the collaboration.

3. Agreed collaborative terms

All participating networks agree on the formal collaborative terms, including decisions on formulating joint CBR programmes and/or merely aligning existing programmes.

Acknowledgements


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