ECIU University Long-term Joint Research Strategy

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Contents

Executive summary

European low-urbanised regions face numerous challenges, of which many are directly related to the pressure of declining social, economic, and environmental well-being. Policies are gradually being adopted in which specific indigenous activities are supported that can stimulate local economic growth, a shift from a needs-based approach to an assets-based approach. Aligned with this shift is increasing support of bottom-up initiatives instead of a strong focus on top-down, government-led approaches. Digitalisation can often play a key role in addressing these challenges and opportunities, leading to what we coin smart regions. *Such regions bear similarities with smart cities, yet where problems and opportunities may be similar, low-urbanised regions need different approaches if only because of differences between the distribution of communities in terms of space and demographic dimensions.*

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The European Consortium of Universities (ECIU) aim for a joint long-term research on smart regions, building on the rapid development of digital infrastructures across Europe. This is inevitable for a unified, strong, smart and competitive Europe, and to achieve the UN Sustainable Development Goals, such as affordable and clean energy and sustainable communities.

The ECIU partners have identified four distinct themes that require specific attention.

- Energy and sustainability
- Circular economy
- Transport and mobility
- Resilient communities

Clearly, digital transformations to low-urbanised areas require efforts from many stakeholders. The ECIU partners distinguish two cross-cutting concerns that will need to be addressed to make these transformations successful.

- Human capital
- Co-creation, including interdisciplinarity

In summary, many problems that cities are confronted with also hold for more rural regions, yet the required solutions may be rather different. Strategic decisions that ECIU partners and others should take include:

1. **Put the university at the core** of regional processes especially when those universities have an explicit role in boosting social-economic well-being.
2. Promote and actively work in an **interdisciplinary** manner. Co-creation is important, and having researchers, companies, administration and citizens collaborate is necessary to allow for real social innovation.
3. **Build trust** among stakeholders before working on and defining regional processes.
4. **Invest in talent**; Low-urbanised regions necessarily need to rely more on qualifying individuals instead of competing on attracting talents.
5. Include the **international connectedness** of regions.
6. **Invest in synergies between education, research and funding**, so that various policies can reinforce each other.

Background

Many European regions are characterised by a mixture of a few dozen urban spaces dispersed across an otherwise rural environment: **rurban regions**. For example, the Twente and Achterhoek region in The Netherlands is home to over 1 million people in 26 municipalities, over an area of some 3000 km^2 with an average population density of 340 people/km^2. In contrast, the city of Amsterdam has a population density of more than 5000 inhabitants/km^2 with a comparable total population of 850,000. The differences between these two forms of human settlement are tremendous, yet in both cases we see that digitalisation plays an important role in the space of solutions for a myriad of problems, generally leading to the notion of "smartness". In particular, Smart-City developments are discussed in depth in Europe, if only looking at the Joint Programme Initiative Urban Europe. This stategy document is a starting point for Smart Rurban policies, as European rurban areas offer many opportunities and are key to European competitiveness.

We use the term **rurban region** to designate a region that is characterised as being a cluster of municipalities, consisting of clearly identifiable urbanised areas (i.e. villages or cities) jointly dispersed across a rural environment governed by those municipalities.

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Rurban areas face numerous **challenges**. Many of these are directly related to the pressure of declining social, economic, and environmental well-being. We see younger people migrate to larger cities, within or outside a specific rural area. Likewise, there are often mobility issues that may hinder the accessibility to an entire area but also the accessibility within a rural region. In these cases, smaller villages can easily become relatively isolated. Another issue is that shared facilities may be difficult to maintain, whether shops, health centres, meeting places such as cafes and restaurants, sports centres, or other facilities. At the same time, there is a growing trend toward the need for self-sustainability due to the fact that local government is increasingly reducing involvement in controlling the environment in which its citizens live.

Large, dense cities are facing many problems such as pollution, sustainability, security, and social wellness. Rural-urban regions can be an alternative that offers better opportunities to people throughout Europe. Large cities and rurban regions have different characteristics and, therefore, they face different problems, but certain complementarity can be found that help both areas.

For a long time, the approach to face these challenges was to provide support to sustain a certain quality of living. More recently, it has been recognised that a more effective approach is to support a variety of indigenous activities to stimulate local economic growth. In other words, there is a **shift from a needs-based approach to an assets-based approach**. Aligned with this shift is increasing support of bottom-up initiatives instead of a strong focus on top-down, government-led approaches.

Smart regions

In the case of rurban regions, one can argue that digitalisation has primarily concentrated on building a digital infrastructure, i.e. a high-speed network connecting even the most remote locations to the internet. The advantages are clear: digital connectivity facilitates online activities and services, in turn allowing a region to better exploit its strengths and create sustainability. However, much more than digital connectivity is needed. Moreover, the differences between high-urbanised cities and low-urbanised regions are numerous and solutions under the umbrella of smart cities are not necessarily applicable to regions. For example, where mobility in cities may be hindered by congestion, mobility in rurban regions may be easily hindered by lack of appropriate transportation. As ECIU, we need to work much more actively toward solutions for a **smart region**.

> Following Caragliu et al., we denote a region to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and high quality of life, with a wise management of natural resources, through participatory governance.[1]

The problems of rurban regions are not new, yet the question arises whether they are receiving the right attention. **The problems are often complex and no easy solutions exist.** Many problems require specific research, research often similar to that of smart cities, but tailored to operate in very different spaces. Smart regions are not the same as smart cities, yet at the same time, their differences should not lead to a dichotomy in approaches toward solutions. In this light, we expand on the view as given by Caragliu et al. in the sense that having infrastructure alone is not enough. We need to decide on *what* is being done with that infrastructure, and *how* to do this. We should work on a European (research) agenda for smart region scenarios; an addition to the existing Smart City Agenda's (including the JPI Urban).

[1] Caragliu et al. (2011) Smart cities in Europe, Journal of Urban Technology, 18:2, pp-pp

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Beyond digitalisation

Digitalisation is neither an end, nor a product in itself, but rather a **means** of allowing and giving people access to what they need: markets, goods, social interactions, information, education and support, health services. All the elements required to provide healthy and sustainable living and enable people to live full lives. Digitalisation is the prerequisite for future supply and maintenance chains of service functions aimed at creating the conditions for survival and future occupancy, thereby preserving viable and resilient societies. Therefore, digitalisation intersects through a complex set of systems, each of which is influenced by opportunities and challenges. Systems of systems that enable service functions for residents and markets are highly characterised by competence areas that integrate energy, smart and circular economy, mobility and transport in order to develop and maintain sustainable resilient communities.

Despite these opportunities, there are rising **concerns about the process of digitalisation**. Firstly we often see that local government is delegating digitalisation to large, third parties leading to terminologies such as Google-fication, Airbnb-fication and Uber-fication. In effect, digitalisation is in the hands of large technology companies, which leads to the question of who is in control. Secondly, it is now increasingly being recognised that successful digitalisation requires strong participation from the people for whom the digitalisation is taking place. Moving from a technology push, we are now facing a technology-embedding phase in which civilians directly participate in the design and implementation of digital solutions. Nevertheless, it remains an open question how this co-creation should take place and how it can best be facilitated.

Obviously, digitalisation is much more than just realising a high-speed infrastructure, even though the availability of an “information highway” is a clear requirement for supporting any kind of smart-service provisioning. More important is coming up with the services that make use of that infrastructure. These services should be in line with an assets-based approach toward stimulating economic growth and competition.

Outline

As explained above, common problems and opportunities for rurban regions are addressed in this document. We identified four key topics for smart regions - specific areas in need of technological solutions, and explain the role digitalisation can play:

- Energy and sustainability,
- Smart and circular economy,
- Mobility and transport,
- Resilient communities.

Furthermore, the ECIU strategy includes two cross-cutting issues that describe the execution strategies of the agenda and are interlinked:

- Human capital,
- Co-creation.

This document concludes by linking the above issues to the existing European Smart Specialisation Strategies and providing recommendations for enhancing policies to strengthen smart regions.

Energy and sustainability

Energy presents a fundamental challenge shared by cities and regions across Europe as well as globally, characterised by the ‘trilemma’ of seeking to achieve **secure supply**, **affordability**, and **environmental**

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sustainability. Tackling this trilemma involves maximising efficiency across the system, from the generation of clean energy to power buildings and transportation, the storage and distribution of energy when and where it is needed, and the smart consumption by end-users.

It has been recognised that rural areas in the EU require special attention when it comes to the energy transition[2]. The FREE initiative (Future of Rural Energy in Europe) identified many problems for rural areas, mainly boiling down to the fact that communities in rural areas need to rely much more on highly polluting liquid and fossil energy sources.

A **challenge** for more remote and rural regions is **improving the energy efficiency and fuel type** used within buildings (ibid). While designing new buildings in cities to have the latest technologies for smart heating and cooling is becoming the norm, there are existing buildings in regional settings that require significant upgrading to improve their energy performance. A typical example is greenhouses, which generally require significant energy while their energy waste can also be very high. Programmes to improve the efficiency of existing buildings should be coupled with assisting the transition to cleaner fuels (e.g. connecting to gas instead of oil) and using innovative (digital) technologies to control how these upgraded systems operate.

Advances in renewable energy technologies, storage systems and smart metering have implications and advantages for rurban areas as well as cities. Digitalisation plays a central role to address these challenges. It provides the means of measuring energy production and consumption and controlling flows of energy across macro- and microgrids. At the same, digitalisation offers us the means to build smart grids and to develop new decentralised services for energy management thus allowing new parties to enter the market.

There are **opportunities** to **increase energy generation** in rurban areas by making use of the spatial and geographical resources available. Traditionally, at the smart-city level, innovation has focussed on smart consumption (for example energy-efficient buildings and decarbonised transport options). However, at the regional level, there are opportunities to revolutionise production, distribution and consumption. Approaches should work with the assets of each region. For example, regions that are well-positioned to capture energy (wind, sun, hydropower, biofuel from crops or waste) or locations that are positioned close to areas of great demand (industrial hubs, adjacent cities) can develop smart infrastructure accordingly. However, simply fast-forwarding into new solutions can also raise concerns:

- What is the trade-off between using valuable land for agriculture versus energy generation?
- Wind turbines and solar fields have visually and audible effects on rural landscapes and rural life
- The current infrastructure hinders efficient transportation of energy to urban areas

A key **opportunity** for rurban areas is to use smart systems to **decentralise energy supply** and take back the ownership of localised energy production, for example through ground source heat pumps (GSHP), wind power or solar. This can enable more remote locations to secure their own clean energy supply. At the same time, rural areas offer great opportunities for solving energy and sustainability problems.

- Rural areas are key to transitioning to renewable energy sources, including space-demanding technologies such as photovoltaics and wind turbines.
- Rural areas offer great opportunities for testing and experimenting with various micro-grid energy infrastructures. These can, at the same time, solve some of the rural energy problems.

[2] See also OECD (2012), Linking Renewable Energy to Rural Development, OECD Green Growth Studies, OECD Publishing. http://dx.doi.org/10/1787/9789264180444-en

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- The rural areas are central to expanding renewable energy production, but it also requires better rural-to-urban electricity infrastructures - and this, in turn, is a prerequisite for sustainable smart cities.
- Local co-ownership is important since rural areas will have to live adjacent to the sites of energy production, but also in order to stimulate local economic development.

An example of such community energy innovation at a local scale is 'Project SCENe' (Sustainable Community Energy Networks), a new housing scheme on a post-industrial site where renewable energy technology (solar panels) and storage (Europe's largest community-owned battery) are built into the scheme from the outset (https://www.projectscene.uk/). In addition, technology within the new homes enables residents to understand their energy production and usage in detail, empowering individuals to make informed decisions. The data collected is available via a "community energy hub" on-site, where residents can share knowledge and build a sense of community and shared empowerment. Other opportunities are associated with regions where agriculture is a core sector – for example through utilising agricultural waste for energy production.

Smart circular economy

The effects of human consumption on communities and the environment have become increasingly apparent over the last several decades. **Sustainability** is not confined to a single industry, community, or geographical region. Consequently, countries, cities and separate regions are slowly beginning to prioritise the idea of implementing sustainable practices in their development plans.

The linear model of "produce, use, dispose" is wasteful by design and unsustainable. In contrast, a circular model is conceptualised as a cycle of value preservation and resource optimisation, presenting sustainable alternatives for eliminating waste. A circular economy keeps pollution and waste out of the system, maintains products and materials in use, and regenerates natural resources.

Numerous cities are looking to reduce their ecological footprint. The idea of transitioning from a linear economy to a circular economy to achieve sustainability has become widely publicised in the last few years and this policy is one of the EU priorities, exemplified by their **Circular Economy Package**, legislation which became effective in June 2018.

Realising a circular economy poses a **challenge** for any actor. A transition requires adapting to the specific situation of each city and region, utilising its inherent qualities and strengths. Cities and regions have different policies to support the transition to a circular economy that operate with different times scales, but also differ in their foci and their urgency. As a result, achieving a circular economy will generally require intergovernmental cooperation, which may require special attention in the case of rurban regions where municipalities operate more independently.

A circular rurban region embeds the principles of a circular economy across all its functions, establishing a regional system that is regenerative and restorative by design, with a strong interaction between the urbanised and surrounding rural areas. A major challenge for rurban regions will be to identify the quantities and quality of the resource flow at a regional level while identifying and evaluating potential solutions that will contribute to a sustainable, biodiverse environment. We believe that digitalisation for measuring, monitoring and supporting these resource flows is essential.

Digital technology has enabled a fundamental shift in the way the economy functions, offering possibilities for radical virtualisation, de-materialisation and greater transparency of product use and material flows. At the same time it creates new ways of operating and participating in the economy for producers and users. Through the collection and analysis of data on materials, people and external conditions, digital technology has the potential to identify the challenges of resource flows in regions,

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outline the key areas of structural waste, and inform more effective decision-making on how to address these challenges and provide systemic solutions.

For this purpose, cities and regions need clear, transparent rules that **gradually raise standards**. Systems for enforcing those rules and monitoring overall progress are required. This includes removing regulatory barriers within and across countries and phasing out incentives for unsustainable resource use.

Mobility and transport

Effective transport and mobility is an integral part of achieving sustainable development across all scales, from city networks to **rurban** to national to international networks. Technological innovations are already delivering improvements to transport service delivery, user experience and environmental performance across various transport modes (road-based, rail, aerospace, active travel), but this is only the beginning. The world of transport will transform dramatically over the coming decade as new technology, such as decarbonised power sources, mobile communications, AI and big data radically transform the way that transport outcomes can be delivered.

Prioritising R&D, manufacturing and deployment of new technologies to make transport systems more accessible, less polluting and more efficient in rurban areas has the potential to improve the health and economic outcomes in rurban communities. The European's current and new Cohesion Policy reflects the importance of the subject. It has "a more Connected Europe, with strategic transport and digital networks" as one of its main objectives. In this respect, having a population spread across a larger region than is the case for urbanised areas may be an asset, provided high-quality and diverse (digital) connectivity can be guaranteed. Such connectivity essentially enables high quality-of-life, which is often a reason for people to stay in, or move to rurban regions.

Flexibility in scheduling transportation and sharing of the means for transportation are key issues, united in a decentralised yet networked fashion. New forms of shared and decentralised transportation that ensure coverage and flexibility is a key challenge.

To come up with real solutions, it is important to understand user behaviour. An accelerated transition to intelligent mobility is reliant on collective behaviour change as well as technological innovation, and much work has to test urban citizens' perceptions of new technologies such as driverless vehicles. E-commerce is changing the consumption behaviour and is at the same time stressing the urban logistics system with more frequent and flexible deliveries, while it is an opportunity to make urban citizens less dependent on car ownership. Thus, these new logistic services must be planned with a systems approach where freight and passenger transport systems are designed together to meet the sustainable requirements. Similar research investigating the perceptions, drivers and barriers to mobility shift amongst regional citizens is needed to inform policy and technology delivery.

There are various rurban specific transport and mobility **challenges** and **opportunities**.

- Accessibility and connectivity within and between regions is challenging to achieve, as population density makes running services and infrastructure more expensive per capita. Unlike cities where congestion may hinder mobility, rurban regions may be hindered by lack of appropriate transportation.
- Rurban manufacturers and firms face higher transport costs (to deliver and receive products) due to greater distances than city-based firms and can struggle to recruit necessary staff to move/travel to out-of-town locations.
- Regions situated in centralised areas between urban centres may have opportunities to exploit their location, for example as regional freight/logistics/manufacturing hubs with associated emerging growth .

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- Smart integrated transport can unlock potential new land use and productivity in regional areas, just as transit-oriented-development (TODs) works in urban planning strategies.
- Rurban regions that have better connections and integration with main urban centres enjoy greater growth due to 'positive spillovers'; disconnected regions can miss out. For example, Nuremberg-Furth in Germany has benefited from the formal agglomeration of business and transport hubs through smart systems that unite cities with the wider region. This is also an important observation in light of the fact that we should avoid a city-rurban dichotomy.

Some of these challenges can be addressed by intelligent mobility and smart transport solutions and opportunities. For example, the trend toward electrification of vehicles in order to reduce emissions is well underway. However, the lower population densities in rurban areas make them seem less attractive for a massive rollout of charging stations in comparison to urbanised areas. On the other hand, one can expect that more than in cities, private transportation means will be crucial for the connectivity among people in rurban areas. Digitalisation can play a crucial role in assisting the timely charging of vehicles.

Combined with autonomous vehicle technology, we may be looking at an important contribution to solving transportation in rurban areas in which traditional public transport has been partly replaced by a fleet of shared autonomous vehicles. Likewise, where large-scale (urban) public transport networks are not viable, more flexible, demand-responsive, safe and energy-efficient transport services like car share or mini-bus services can offer an alternative. Smart user apps are an essential part of making these systems work for operators and users. Obviously, without advanced digitalisation, smart networking, and real-time monitoring, such transportation is not possible.

As another example, a number of technologies support intelligent mobility innovations across different modes. GPS systems have the potential to improve efficiency by re-routing freight runs on roads, rail, and within ports with real-time data. For example, avoiding roadworks or determining delivery routes to reduce the number of kilometres driven without a load. Vehicle-to-vehicle and vehicle-to-infrastructure connectivity have the potential to provide information to network operators and users in real-time and optimise fleet and network management. Regions with up-to-date transport hubs can alleviate pressure on urban centres by providing important freight and manufacturing infrastructure to regional firms and mobility to regional populations. Across all transport modes, smart fleet management and scheduling systems can improve operational efficiency and user-friendliness/communications.

In general, smart transport and mobility overlap with energy supply, smart buildings, metering and land management. A holistic approach that links up policies, research and implementation across these different sectors is necessary to fully realise the benefits.

Resilient communities

Social capital is important to make communities resilient. European urban areas can learn lessons from this. It is clear that rural and rurban areas face demographic challenges. It has been recognised that although a high-quality digital infrastructure and capacity is a must for achieving resilience in rural areas, equally important is that such an infrastructure carries vital services. There is still no clear understanding of which services are useful and needed, and specifically those that lead to resilient rurban communities. Yet there are great opportunities to improve community resilience through self-sustained digitalisation. These include services for alternative forms of transportation and mobility, services that expand the delivery ranges of local shops, specialised e-health services, and advanced privacy-aware social-media services. Likewise, the digital government facilitated by online services strongly supports the resiliency of rural communities, improves quality-of-life and reduces road traffic. In the wider context, the role of digitalisation in resilience planning in rurban communities to mitigate

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the impact of climate change is becoming of increasing importance. In general, all services for the other pillars can help improve resilience if they exploit locality.

Cross-cutting Issues

Human capital

A key challenge for EU regions is to attract and retain talent to contribute to social-economic growth and sustainability. As well as offering attractive conditions for regional business development, digitalisation plays a key role in realising a human-capital agenda for rurban areas.

The challenges that accompany digitalisation concerning the education and qualification of the future workforce will be quite different across high and low-density urban areas. Low-density regions will need to devise development approaches to deal with the migration flows of young talent to cities and the risks that it bears for the ability to retain a qualified workforce to enable a sustainable and innovative business ecosystem. This challenge goes beyond the discussion about talent attraction and retention as lower density areas, by definition, will always attract fewer people and less talent than higher density locations. The case for Smart Regions is the need to develop a vision to qualify its individuals with a scope of competencies that are tightly aligned with the characteristics of the regional production ecosystem. The business demographics of low-density regions are very different from high-density centres. For example, issues such as company size, and the level of specialisation of companies' products and services delivered, among others.

Typically, HEIs that offer a combination of 24/7 distant-learning facilities, relatively short certificate-based programs instead of rigid multi-year curricula, and local businesses that offer myriad career-development plans (even *between* companies) will have an advantage over traditional educational institutes. Clearly, digitalisation plays a profound role here, if only to always ensure up-to-date information provisioning and easy decision-making support.

The ECIU University will be a very important pioneer for flexible, challenge-based learning and research programmes. Particularly because of the initial focus on Sustainable Development Goal 11 (cities and communities). Innovative education and research models are key for smart regional development.

It is important to ensure that regions offer attractive educational programs aligned with the strengths and needs of regional businesses and institutions. Various challenges and opportunities lie ahead:

- Fostering the dialogue between programs of distinct regions that share similar smart specialisations would help identify and disseminate best practices across regions thus increasing their effectiveness, as well as build a network of relationships for knowledge exchange and benchmark.
- Strengthening the link between education and qualifications offered to researchers would foster the retention of talented people who otherwise would seek opportunities in urbanised areas.
- Increasing the participation of local actors (companies) would: (1) benefit those actors by having access to knowledge-intensive institutions; (2) benefit students by having a deeper understanding of the local industry and industry at large; and (3) benefit the region by facilitating a better alignment between the region and the skills developed in the educational programs.

Clearly, success can be achieved only if there is a strong collaboration between many different players, which brings us to the following cross-cutting issue.

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Co-creation and interdisciplinarity

In order to make possible sustainable progress of our societies towards higher standards in wellness redistribution, social equity and diversity respect, a strong social-innovation approach should be taken. Social innovation means new ways to detect social problems and new ways to propose solutions to those problems. Social innovation addresses social needs in any area: health, education, community relationships and governance, working conditions, etc. A key point in both problem detection and solution proposal is to engage all stakeholders in the process. This implies open democracy, transparency, education, shared decision-making, exchange of ideas and values, shifts in roles and relationships, etc.

We believe that co-creation and innovation are the ways to use technology in an efficient and practical way for the purpose of social progress, while at the same time ensuring that the right technology is embedded in the right way in society. The embedded (technological) solutions we propose in this agenda simply require open and multi-directional collaboration between societal, governmental, educational and technological partners.

The 4th-helix approach, where researchers, companies, administration and citizens join to collaborate, is necessary to allow real social innovation. Even a fifth component, non-governmental organisations, a form of civil society organisation, can be included in the equation to structure the action in the territory.

The living-lab approach as a methodology for innovation and co-creation, when used in a facility such as a fab lab where many stakeholders are involved, is an effective tool to clarify and further develop new visions regarding social problems and to propose innovative solutions. Furthermore, a network of living labs in a region under a common strategy can make a territory strong to maintain and improve local culture and living standards. In this case, every living lab in a region will be different; some more urban, others more rural, some more cultural, others more economical, whereas the joint view will reflect societal diversity and different sectors and interests.

Realising the agenda as laid down so far requires addressing several transversal issues: human capital, citizen-centric approaches, intelligent leadership, co-creation and innovation. Equally important is that participants are trained to operate in multidisciplinary teams, and, indeed, across different educational and societal backgrounds and levels.

Smart Regions and the EU Smart Specialisation Strategies

The European Smart Specialisation Strategies aims to boost growth and jobs in Europe, by enabling each region to identify and develop its own competitive advantages. Therefore, Smart Specialisation Strategies are crucial for the development of Smart Regions in Europe.

In Annex I, we have made an overview of the overlap between ECIU's Smart Specialisation Strategies and the four pillars of this Smart Regions agenda. The Smart Specialisation Strategies of the regions were defined through local discovery processes. Our four focus areas (energy and sustainability, smart and circular economy, mobility and transport, resilient communities) were defined at a central level, by answering the question: What are the general development opportunities for rurban regions?

When comparing the two outcomes, there is a nice overlap. This overlap exists mostly in the areas of energy and circular economy, and it grants universities and regions the possibility to further strengthen their collaborations in these specific fields.

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Recommendations

To get the most out of (the future) Smart Specialisation Strategies, and thereby the development of Europe's regions, we have the following recommendations. From the many discussions that have led to this strategy document, we have arrived at the following recommendations for strengthening European Smart Regions. Note that because (rurban) regions vary a lot, the recommended strategy, stakeholder involvement and impact will differ.

1. **Put the university at the core** of regional processes, including those for smart specialisations, especially when those universities have an explicit role in boosting social-economic welfare. Universities have different ways to contribute to regional development. In rural regions, universities face increased expectations to take leadership outside academia due to the lack of other knowledge institutions[3]. The university also has an important role because traditional industries have declined and transformation is needed. Unlocking innovative potential can rest on factors such as networks, human capital and new knowledge. Therefore, universities provide important guidance for regional development strategies[4].
2. Use processes such as those for Smart Specialisation Strategies as a means to promote and actively work in an **interdisciplinary** manner. Co-creation is important, for example through the introduction of fab-labs and design thinking. Letting researchers, companies, administration and citizens collaborate is necessary to achieve real social innovation.
3. **Build trust** among stakeholders before working on and defining regional processes. This also means explicitly considering the regional dimension. Active coalitions of regional stakeholders are at the heart of contemporary regional economic development policies. To overcome the challenges inherent in partnerships and the tension that may arise between stakeholders, it is vital to identify and understand these tensions and to understand how these can affect regional development[5].
4. **Invest in talent**, as talent is one of the most important drivers of public-private collaborations. This is closely connected to human capital. Lower density regions necessarily need to rely more on qualifying individuals rather than on competing on attracting talents. Therefore, it is necessary to make sure that regions offer attractive educational programs aligned with its smart specialisation strategy. Another opportunity lies in the pilot of the ECIU University, the first challenge-based university on a European scale that is focused on UN SDG 11 (cities and communities). This university will offer flexible education and invest in talent development to solve real-life challenges.
5. Include the external connectedness of regions, the **international dimension**. A sustained flow of global knowledge to stimulate innovation and growth is needed to continue the development of European regions. Universities are recognised as potential agents to perform such a role[6].

[3] Maria Salomaa (2019) Third mission and regional context: assessing universities' entrepreneurial architecture in rural regions, Regional Studies, Regional Science, 6:1, 233-249, DOI: 10.1080/21681376.2019.1586574

[4] Liliana Fonseca (2019) Designing regional development? Exploring the University of Aveiro's role in the innovation policy process, Regional Studies, Regional Science, 6:1, 186-202, DOI 10.1080/21681376.2019.1584050

[5] Lisa Nieth (2019) Understanding the strategic 'black hole' in regional innovation coalitions: reflections from the Twente region, eastern Netherlands, Regional Studies, Regional Science, 6:1, 203-216, DOI 10.1050/21681376.2019.1578259.

[6] Kwadwo Atta-Owusu (2019) Oasis in the desert? Bridging academics' collaboration activities as a conduit for global knowledge flows to peripheral regions, Regional Studies, Regional Science, 6:1 265-280, DOI: 10.1080/21681376.2019.1590230

6. **Invest in synergies between education, research and funding**, so that various policies can reinforce each other.

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Annex I - ECIUs Smart Specialisation Strategies

The Smart Specialisation Strategies of the ECIU regions were defined through local discovery processes. The priorities that were chosen could be out of date and do not necessarily cover the expertise of the university that is based in the region.

The above-mentioned four focus areas (energy and sustainability, smart and circular economy, mobility and transport, resilient communities) were defined at a central level, by answering the question: What are the general development opportunities for rurban regions?

The table below shows the overlap between the Smart Specialisation Strategies of the ECIU regions, and the focus areas of the ECIU Smart Regions Agenda.

University (Region)	**Matches between the Smart Specialisation Strategies and pillars of the ECIU Smart Regions' Agenda**				
	Energy and Sustainability	Smart and Circular economy	Mobility and transport	Resilient communities	Overall matches
Denmark (Aalborg University)	Energy and climate	Water, bio and environmental solutions, The food industry		Health and welfare solutions	ICT and digital growth
Ireland (Dublin City University)	Marine Renewable Energy	Sustainable Food Production & Processing / Food for Health		Connected Health & Independent Living	Future Networks & Communications, Smart Grids & Smart Cities Digital Platforms, Content & Applications
Hamburg (Hamburg University of Technology)	Renewable energy		Logistics		
Lithuania (Kaunas University of Technology)	Energy and sustainable environment	Agricultural innovations and food technologies	Transport, logistics and ICT	An inclusive and creative society	
Östergötland (Linköping University)	Business models and arenas for sustainable systems solutions, e.g. energy	Business models and arenas for sustainable systems and solutions, e.g. bio-based circular economy and waste, Biogas research centre	Effective transport and logistics, Autonomous vehicles	Geopolitics, Models for environment and climate adaptation, climate engineering	ICT and digital inclusiveness, Vivable societies, AI, Co-operative model between university areas and smart specialisation areas (EDGE)
Pirkanmaa region				Social innovation for global co-	ICT, Smart Cities

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University (Region)	Matches between the Smart Specialisation Strategies and pillars of the ECIU Smart Regions' Agenda				
	Energy and Sustainability	Smart and Circular economy	Mobility and transport	Resilient communities	Overall matches
(Tampere University)				learning and investment	
Catalonia (Universitat Autònoma de Barcelona)	Energy and Natural Resources/ Climate Change	Agri-food industry	Industries based on sustainable mobility	Cybersecurity	Circular economy, Smart Living Labs
Portugal University of Aveiro	Energy Blue growth - Ecosystems and renewable energy resources	Agro-food	Transport, Mobility and Logistics	Tourism - Application of ICTs and diversification of services	ICT
Norway (University of Stavanger)	Energy	Food	Maritime / Marine	Tourism	
Trento Province (University of Trento)	Energy and environment	Agri-food		Quality of life	
East-Netherlands (University of Twente)	Energy and environmental technology	Biobased economy (EMT) Agro and Food			Digitalisation