Towards a Smart Southern Region

SMART REGION

FRAMEWORK FOR THE

SOUTHERN REGIONAL

ASSEMBLY

Report 2: International Approaches to, and Good Practice in, the development of Smart Regions

Tionól Réigiúnach an Deiscirt
Southern Regional Assembly

Smart Region Framework
For the Southern Regional Assembly

Report 2: International Approaches to, and Good Practice in, the development of Smart Regions

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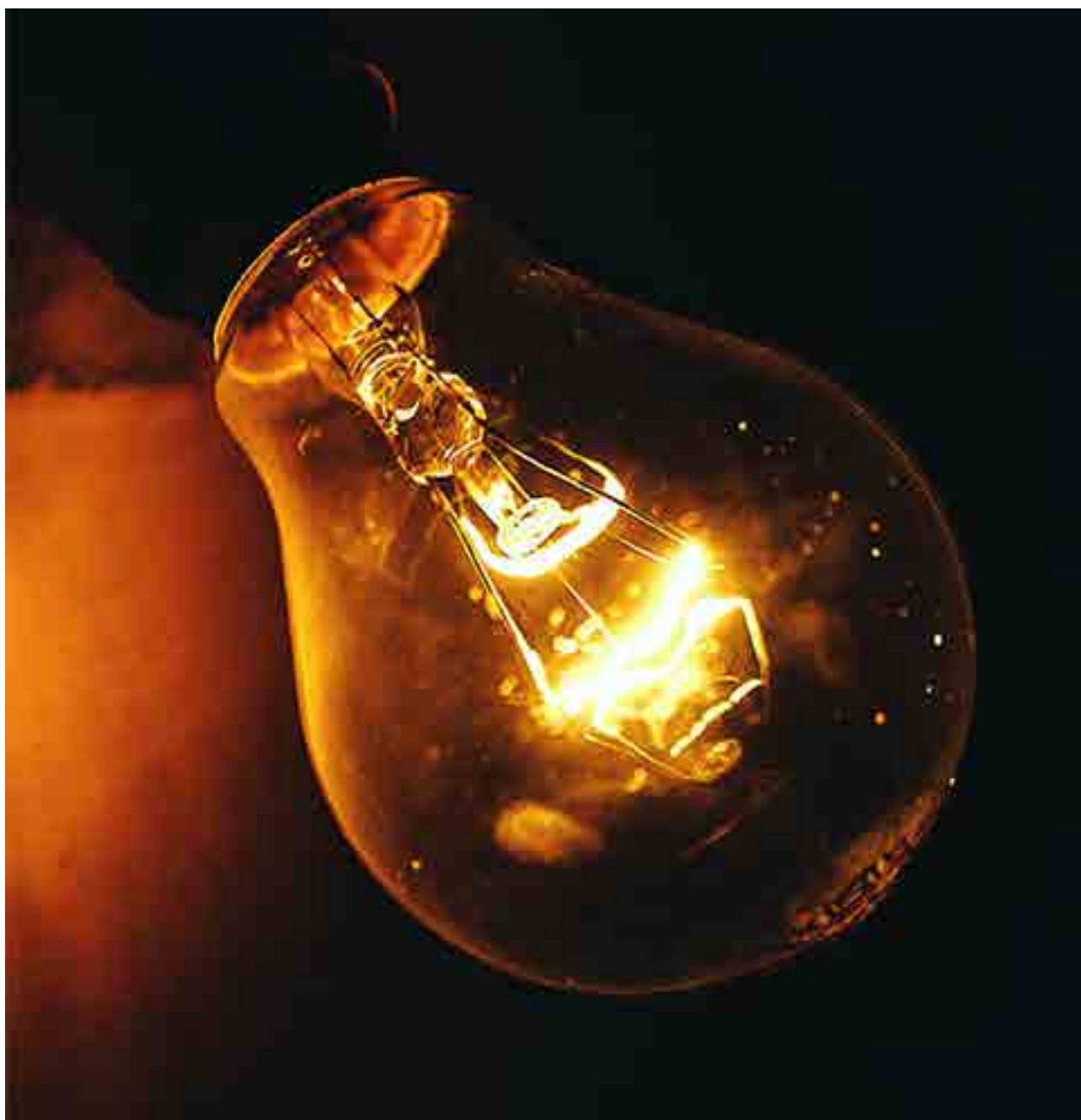
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COHES3ION
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ICLRD
International Centre for Local and
Regional Development

Acknowledgements

Abbreviations

AI	Artificial Intelligence
AIRO	All Island Research Observatory
APT	Advanced Public Transport
ARENA2036	Active Research Environment for the Next Generation of Automobile
ASU	Arizona State University
AV	Autonomous Vehicles
AWS	Amazon Web Services
AZiDP	Arizona Institute for Digital Progress
BMBF	German Federal Ministry of Education and Research
BT	British Telecom
CAV	Connected and Autonomous Vehicles
CCR	Cardiff Capital Region
CCRCD	Cardiff Capital Region City Deal
CIPR	Centre for Innovation Policy Research
CLLD	Community-Led Local Development
ECIU	European Consortium of Universities
ELAt	Eindhoven-Leuven-Aachen Triangle
ERDF	European Regional Development Fund
ESF	European Social Fund
EU	European Union
g-local	Interconnection of global and local issues
GPEC	Greater Phoenix Economic Council
ICC	Intelligent Cities Challenge
ICLRD	International Centre for Local and Regional Development
ICT	Information and Communication Technologies
IoT	Internet of Things
ISEDO	Ireland South East Development Office
IT	Information Technology
IWA	Institute of Welsh Affairs
KIBS	Knowledge-Intensive Business Services
LCCC	Limerick City and County Council
ML	Machine Learning
MRDH	Metropolitan Region Rotterdam and The Hague
MRE	Metropoolregio Eindhoven
MTU	Munster Technological University
MU	Maynooth University
NPF	National Planning Framework
PEI	Partnership for Economic Innovation
R&D	Research and Development
R&I	Research and Innovation
RNE	Roadmap Next Economy
RPO	Regional Policy Objective
RSES	Regional Spatial and Economic Strategy
RTA	Regional Transport Authority
S3	Smart Specialisation Strategy

SBIR	Small Business Innovation Research
SDGs	Sustainable Development Goals
SMEs	Small and Medium Enterprises
SMT	Smart Mapping Tool
SR	Southern Region
SRA	Southern Regional Assembly
SSR	Smart Southern Region
TUS	Technological University Shannon
TUSE	Technological University of the South East
UCC	University College Cork
UK	United Kingdom
UL	University of Limerick
UN	United Nations
WP	Work Package

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Executive Summary

There is a growing recognition of the value in expanding the concept of 'smart places' beyond the realm of the city to include a broader regional dimension. While the narrative surrounding smart regions is still evolving, there is growing evidence to suggest that any smart region framework must be embedded in 'place', be informed by the presence of smart cities and/or smart towns and adopt a set of key priorities that address real-life challenges and opportunities. A core objective of the Regional Spatial and Economic Strategy (RSES) adopted by the Southern Regional Assembly (SRA) in January 2020 is to enable the sustainable, inclusive, and resilient growth of the Southern Region (SR). It recognises that smart specialisation, as one component, is a pathway to smart cities – and by extension, that smart regions are competitive, innovative, and productive regional economies. The Assembly contends that key to achieving this vision is for all locations, urban and rural, to collaborate on smart region initiatives. Within the RSES, Regional Policy Objective (RPO) 134, focused on Smart Cities and Smart Region,

> **"** *seeks to build on Smart Cities and Smart Region Initiatives in Cork, Limerick and Waterford, such as the All Ireland Smart Cities Forum, and seek to extend such initiatives to towns, villages and rural areas to support a Smart Region (SRA, 2020: 157).*

In March 2021, Maynooth University (MU) together with its research partner, the International Centre for Local and Regional Development (ICLRD), were appointed by the SRA to provide a smart region definition and framework to facilitate smart cities driving a smart region. The GIS expertise required to support the delivery of this programme was provided by Limerick City and County Council (LCCC). At the core of the output of this research programme is (a) defining a smart region generally, and as it applies to the SR, and (b) the development of a smart region maturity framework. Together, this will enable the region, and all those within it, to:

1. Understand what a smart region is;
2. Describe their own level of maturity;
3. Set plans for improvement; and
4. Measure improvement.

Defining a Smart Southern Region

In defining a smart region as it would apply to the SR, the analysis of literature, policy and perspectives shared by a range of regional stakeholders – as captured in Report 1 of this series, Smart Region Consultation – clearly illustrates that an emphasis must be posited on; namely: (1) place and place-making; (2) people via engagement and subsidiarity; (3) collaboration and co-design; (4) connectedness of infrastructure and policy in support of sustainability and quality of life; (5) data, technology and innovation in support of resilience; and (6) good governance

An initial bespoke smart region definition for a **Smart Southern Region** was presented at the end of Report 1:

> **"** *A smart region working in collaboration, leveraging technology and open data to co-create vibrant, sustainable and liveable cities, towns and communities.*

This emerging definition will be reflected upon at the end of this document, considering international approaches to a smart region, and will be further refined in Report 3, following analysis of the smart region maturity model that has emerged for the SR.

A Literature Synopsis

There is growing awareness of the concepts of the 'smart city', 'smart village' and, increasingly, the 'smart region' – largely due to the infiltration of digital technologies into everyday life, including service provision. In the 1990s and early 2000s, technology was viewed as playing a key role in improving quality of life, and cities were quick to adopt the 'smart' label. It was quickly recognised, however, that this technology-driven approach to smartness was flawed, and that the emphasis needed to be on addressing place-based challenges through, first and foremostly, a citizen centric model. The smart city concept is increasingly emerging as an international trend in urban development[i] and place management. Smart technologies, for example, such as data analytics and cybersecurity, underpin a city's infrastructure "including transport and utilities, which ultimately serve its social and economic goals" (EY, 2016: 6). Unsurprisingly then, that being 'smart' is considered an integral component of being both sustainable and resilient.

Implementing smart initiatives, irrespective of scale, is a complex process – involving a multifarious set of challenges and associated risks, and a diverse range of stakeholders. In tandem with the emergence of literature defining a smart region in terms of its scale, vision, objectives and policies, stakeholders and governance, and the role of technology and digitisation, a series of smart city maturity models were being tabled, considering many of the elements that are integral to a smart region. The most seminal of these is Giffinger et al's concept model of a smart city which identifies six constitutive characteristics of cities that can be measured by a set of indicators and speak to the 'certain ability of a city' to qualify as 'smart' (2007: 10). These range from a smart economy to smart governance, to smart mobility and smart living.

Other models focused on the enabling factors of smart cities/places. Nam and Pardo' s model (2011) for example considers the intersections between technology and network infrastructure, social capital – largely defined by the learning city and the creative city – and institutional factors such as governance and regulation. Others still, like CITYkeys (Bosch et al, 2017) evaluates the success of smart city projects and measure the possibility of replicating these initiatives in other contexts. Models like CITYkeys increasingly recognise the growing interrelationships between concepts such as 'smart, 'sustainable' and 'resilient'.

Just as the process of implementing smart initiatives can be complex, the models that can be used to measure, monitor and mainstream their success (or not) can run from a relatively straightforward analysis based on a key set of indicators to comparing how the same set of indicators can be used to measure smart city innovations while also ensuring that the city meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects.

There is no one right model; with city/regional administrations needing to have a clear rationale on what they wish to measure – and why. Only then, should a model be piloted.

The Netherlands

The Netherlands model of smart regions places a strong emphasis on the opportunities that can accrue from a city/county specialism (the potential of 'place') and of working together to achieve shared goals and priorities (collaboration and partnership). This good practice model of cities and places collaborating as networks ties well with key policy objectives of the RSES, namely: RPO 6: Collaboration between Metropolitan Areas, and RPOs 28-30: Networks as Regional Drivers for Collaboration and Growth.

The expected growth in the metropolitan region surrounding Rotterdam and The Hague (MRDH), part of the Randstad Conurbation, has resulted in a strong emphasis being placed on smart sustainability. Of particular interest to the SR is the emphasis placed on the development of a regional energy strategy and a growing agenda in the areas of circular economy, net-zero carbon and active travel. This is particularly informative for RPO 90: Regional Decarbonisation, and RPO 98: Regional Renewable Energy Strategy under the current RSES. The Metropolitan Region, involving 23 municipalities, operates as a voluntary partnership in the form of a municipal regulation with, in some key sectors, statutory tasks e.g, transport and traffic management. This is a strong example of multi-level governance in practice, a core focus of the COHES3ION Project under which this work programme is being undertaken.

In Eindhoven, the *Brainport 2020 Strategy*, is focused on developing the city as a sustainable, technologically innovative, and economically successful place for all its citizens. This smart region is at the heart of an ambitious Dutch knowledge

policy agenda and has a strategic focus on investing in technology innovation and value chains across high technology systems. Involving a collaboration of 21 local municipalities on a voluntary basis, it is worth noting that the day-to-day management is run by a regional government agency, Metropoolregio Eindhoven (MRE), which works to four regional living environment themes: Economy, Mobility, Transition Rural Areas, and Energy Transition. Indeed, future mobility is a key specialism of Eindhoven under the Netherlands Smart Strategy; with the inter-agency collaborative model being relevant for RPOs 160 and 161 on Smart Mobility under the RSES, and emerging links to S3 and regional specialism in the Connected and Autonomous Vehicle (CAV) sector and Future Mobility Ireland campus.

The task-focused model of smart regions employed by the Netherlands is creating vibrant cities and smart regions, working extensively to the quadruple helix model of collaboration and engagement, and co-creating solutions with meaningful societal impact. Importantly, the Netherlands approach is technology-enabled rather than technology-driven.

Finland

The overall objective of the smart agenda in Finland is to support sustainable urban development that, at a local and regional level, tackles the global challenges of climate change, ageing population, a growing digital divide and technological disruption. Indeed, the concepts of 'smart' and 'sustainable' are very strongly intertwined in Finland's smart journey and resulting programmes. Collaboration is a core concept underpinning Finland's commitment to building smart and sustainable regions and nurturing innovative ecosystems. A key tool used by the Finns' is the concept of agile piloting; a co-creation method whereby companies develop their products and services in close collaboration with residents and city government. A key output is the sharing platform, where cities share their learning and innovations with other interested cities – placing a strong emphasis on 'open platforms', 'open data' and 'open participation'.

The 6Aika – or the Six City Strategy – places a central focus on co-creation and agile development across the Finnish cities of Helsinki, Espoo, Tampere, Vantaa, Oulu, and Turku. With the strapline of "Making Cities Smarter Together", implementation of the strategy has been via projects involving, as appropriate, city government, businesses, R&D organisations, and citizens (i.e., the Quadruple helix model). Funded through a mix of ERDF and ESF monies, the themes of the projects have ranged from smart mobility, smart learning environments, health and wellbeing, circular economy, and energy efficiency – reflective of Giffinger et al's characteristics and factors of a smart city as outlined in Chapter 2 (see Figure 2.2.). Projects have been selected through open calls and involved participants from at least two of the six cities; with cities co-designing and co-producing the resulting projects. Such collaboration has been critical in the creation of economies of scale.

In the Helsinki-Uusimaa Smart Region, its governance model and integrated development approach are of particular interest to the SR. Similar to the functions of the SRA, the tasks of the Helsinki-Uusimaa Regional Council include regional planning and the promotion of local and regional interests in general. In addition, it is responsible for articulating common regional needs, long-term development goals and the right conditions for sustainable development. Its governance structures are like those emerging within the SR to oversee the implementation of the RSES. Under the banner of the 'Citizen City' – a key focus of the new EU territorial cohesion programme – the Regional Council brings together both companies and communities to create agile, user-focused services and solutions in areas such as transportation, housing, urban planning, and healthcare.

There is strong alignment between the co-designed and co-produced smart and sustainable programmes in Finland's smart regions and the three pillars that underpin the RSES. The success of its smart region models stems from a strong social agenda and the emphasis placed on collaboration and co-creation in the design of city services and solutions to localised challenges through 'City as a Service' – harnessing the potentiality of digitalisation and open data.

Greater Phoenix

Taking a place-based approach to the future socio-economic development of the Greater Phoenix Smart Region, the municipalities within The Connective recognised that the challenges faced by its cities and towns were largely the same and did not stop at municipal/administrative borders. Addressing these challenges requires collaborative action and the leveraging of technology – hence the establishment of the multi-disciplinary consortium that is The Connective. To achieve its goal of becoming a smart region, the founding partners of The Connective identified several key foundational elements

to its' smart region framework: (1) taking a place-based approach, (2) a commitment to engagement, (3) building a strong collaborative partnership, (4) adopting a regional identity that is based on connectedness – whether through physical infrastructure, digital infrastructure or culture and heritage, (5) harnessing a willingness to work with data and new technologies in addressing local/regional challenges and opportunities, and (6) establishing governance arrangements that suit the needs of the consortium or collective.

The Connective believes that building a smart region is more than creating smart programmes. Rather it is about making life better for everyone who lives and works within the region – socially, economically, and environmentally. In addition to its emphasis on adopting a place-based approach, other key aspects of the Greater Phoenix Smart Region of interest to the SR is its approach to bringing together a diverse range of stakeholders and ensuring their multi-annual buy-in to the ideal of the 'smart region' as 'One Region' speaking with a singular voice on the most pertinent challenges to be addressed – leveraging data and technology. In addition, and whilst still at an early stage in its evolution, The Connective is already leading to a number of regional initiatives centred on the concept of the 'Smart Living Lab' - focusing on improving the ability of communities to leverage IoT and other technologies to advance the region's overall economic, social, and cultural health. Importantly, the partners have all recognised the importance of academia and universities across the region in supporting the co-creation and co-production of solutions to localised challenges. Across the SR, there are opportunities to create a Smart City Academy, like that in ASU, in collaboration with existing universities – University of Limerick (UL) and University College Cork (UCC) – and the emerging technological universities, Technological University Shannon (TUS), Munster Technological University (MTU) and Technological University of the South East (TUSE). The Connective further highlights good practice in alignment of digital roadmaps. This is of particular interest to the SR as each of its constituent local authorities prepare and adopt digital strategies (RPO 183: Digital Strategies).

Smart Baden-Württemberg

The German region of Baden-Württemberg –including cities such as Stuttgart and Tübingen as well as the rural Black Forest – is, like the SR, facing issues around tightening budgets, growing pressures on services, changing consumer patterns and behaviours and, since the advent of the global coronavirus pandemic, changing working and commuting patterns. Whilst local authorities across Ireland are in the process of adopting – or have adopted – their local digital strategies, Smart Baden-Württemberg's journey began with the publication of a regional digital strategy in 2017; an aspirational document with objectives in the areas of future mobility, digitalisation in the economy, digital education, digital health, digital start-ups, and R&I. Its direction of travel is the result of an active stakeholder engagement process; with delivery of priority actions decentralised to local communities. As a regional strategy, it has identified common needs across the region, and pulled together shared priorities. Such an approach is particularly informative to the delivery of RPO 183: Digital Strategies; with analysis required into the extent to which the ten digital strategies covering this region demonstrate a regional coherence or call for collaborative partnerships and joint projects between groupings of councils. Such an overview will articulate the potential merits of having a regional digital strategy to co-ordinate the efforts of the local authorities in enabling the smart region. Any regional digital strategy could, in turn, be aligned to regional enterprise plans, and smart specialisation and/or innovation strategies.

The use of a challenge programme across cities and villages to operationalise the strategy and ensure limited resources are used to encourage digital competency and collaboration via short-term, well-defined lighthouse projects have proven to be an effective approach in promoting the smart agenda while also delivering 'quick wins' for the communities themselves. Such a mechanism in the SR could ensure local buy-in, and ownership, of effective smart programmes of work.

With an above average number of research institutes within its boundaries, together with one of the highest industrial densities in Germany, the region is developing a world-wide reputation as leaders in AI, machine learning (ML) and future mobility. The SR also has a rich tapestry of research centres with proven success in research funding, both nationally and at EU level. Greater effort is required by all parties to embed these centres into the smart region journey – both as drivers and enablers.

Cardiff Capital Region

Similar to the SR, the CCR represents ten local authorities, has a population of 1.5million and is home to a range of competitive business clusters with significant international and indigenous businesses across sectors such as: financial services; creative and digital industries; advanced manufacturing; life sciences; energy; and energy supply. The smart

region of Cardiff Capital Region is overseen by a cabinet consisting of the leader from each local authority – somewhat like the Ireland South East Development Office (ISEDO) which works with leaders of the major regional industries as well as the Chief Executives of the Councils of the five counties in the South East (Carlow, Kilkenny, Tipperary, Waterford and Wexford). Interestingly, despite the number of sub-committees and advisory boards established to oversee implementation of the City Deal and the emerging smart region, there was no single figurehead or leader to drive the agenda forward. There was also a lack of political incentive to work regionally. These challenges are relatable to SRA as it explores options and mechanisms for building a Smart Southern Region (SSR).

Having been borne out of the negotiated City Deal between the UK Government and local authority leaders, the absence of civil society from the process and resulting governance arrangements very quickly became an obvious omission, and key criticism, that needed to be redressed – and is a key learning point for any grouping of stakeholders building a structure around an emerging smart region.

The research published by the IWA in 2018 proposed six steps to accelerate the introduction of smart technological approaches, and to move the CCR toward becoming a smart region. These provide an important steer to the SSR as it commences its journey – and indeed reiterates points raised in the previous examples highlighted. They include, for example, the need to appoint a Digital Futures Champion to lead the region's digital strategy; to deliver a regional digital strategy; to place an emphasis on tackling regional challenges and establish a challenge fund in support of this; and to ensure solutions are co-created – ideally operating to the quadruple helix model. With respect to the challenge fund, £10m has been set aside to 'g-local' issues – using a place-based approach – in the areas of accelerating decarbonisation, improving regional health and wellbeing, and supporting, enhancing, and transforming communities.

The CCRCD has a further 15 years to run. A key objective of *Our Smart Region* is to inform its future focus and delivery, placing a greater emphasis on "how digital tools can provide new solutions to long-standing challenges that are not going away" (IWA, 2018: 1); thus, recognising the transformative possibilities of the City Deal while reducing the shortcomings of its initial years. As with many of the international smart region examples profiled in this report, technology is viewed as a key enabler of solutions to benefit society, the missing.. economy and infrastructure/connectivity. Its core objectives of Inform, Inspire and Catalyse are replicable within the SSR – speaking to the critical juncture held by the SRA between national policy and local action.

Conclusion

As is well documented, cities globally are bearing the brunt of the impact of global trends like climate change, the depletion of natural resources and loss of biodiversity, changing demographics, digitalisation, and the fourth industrial revolution, and are under pressure to find solutions to these challenges.

Notwithstanding the exemplars that exist within the SR, there are a number of lessons that can be drawn from the international examples. All examples involve high levels of engagement, be that at a citizen level or at university/industry level as in Eindhoven. This suggests that building a region involves including those who live in the region. The next two lessons can be described as different levels of focus. In all regions a focal point was defined. In the cases of Cardiff and the Finnish regions the focal point is a regional team made up of representatives of their LAs. In the case of Phoenix and the Netherlands, there is a wider voluntary stakeholder assembly. Also in Wales a separate focal point is an office of the Digital Champion.

The second focus element is that of defining a societal issue or large project to coalesce around, such as the aging population focus of the Helsinki region, the Living lab focus of the Greater Phoenix area and the citizen engagement focus of Baden-Württemberg. It is interesting to note how some of the regions used challenges to progress change, a methodology already tested in Ireland by Enterprise Ireland with their Small Business Innovation Research (SBIR) programme[ii], and a method with great potential in the development of a smart region. Lastly, two regions also use specialisation as an identity, a means of coalescing and attracting investment. For Baden-Württemberg it is artificial intelligence (AI) and for Eindhoven it is, more generally, advanced technology.

A final key lesson is the importance of funding to support these place-based transformative actions!

Chapter 1: Introduction

There is a growing recognition of the value in expanding the concept of 'smart places' beyond the realm of the city to include a broader regional dimension. While the narrative surrounding smart regions is still evolving, case studies to date (see Chapters 3 to 7) highlight the importance of any smart region framework being firmly embedded in 'place' and having a strong territorial grounding. Often, the emergence of a smart region framework is strongly shaped and informed by the presence of smart cities and the key priorities they address through a 'smart' programme. As the economic, social, and environmental ecosystems of metropolitan urban areas come under cumulative stress, technology is increasingly being used as a solution to these issues and their impact on 'place'.

Global trends such as urbanisation[1], climate change, biodiversity loss, digitalisation, mobility and changing demographics are dramatically transforming society, presenting both socio-economic and environmental challenges. At the level of the city, these challenges "include a rapid and rampant process of economic growth and restructuring that often leaves some places as 'winners' and others as 'losers', the continuing pressures of urbanisation and demographic change, the call for the development of sustainable forms of urban transportation and infrastructure, the need to provide more secure and affordable homes, and the rising tide of local accountability as communities seek greater involvement and participation in local decision-making" (Strange, 2018: 13). The impact of such trends also has implications for sustainable and effective regional development as promoted, in the case of Ireland, through the National Planning Framework

(NPF) – *Ireland 2040*, and the three Regional Spatial and Economic Strategies (RSES) of the Regional Assemblies. To become more stable and sustainable, there is a growing need to adopt local and regional solutions to these global challenges.

The concept of a smart city, and increasingly a smart region, has become intertwined with that of sustainable development, with digitalisation, big data, and Internet of Things (IoT) playing a strong role (Joshi *et al*, 2016). This is encapsulated within the United Nations Sustainable Development Goals (SDGs) where Goal 11 focuses on "Make cities inclusive, safe, resilient and sustainable". Over the past decade, the concept of "smart" has evolved to mean sustainable and liveable places (Joshi *et al*, 2016). A McKinsey Global Institute Report published in 2018 argues that "As cities get smarter, they are becoming more liveable and more responsive", with municipal leaders realising "that smart-city strategies start with people, not technology" (Woetzel *et al*, 2018).

As smart cities enter this new phase of thinking, it is timely to begin thinking about – and planning for – smart regions. While what we know about smart regions is largely based upon our understanding of smart cities, the evolving nature of the underpinning principles of smart cities to include placemaking, quality of life, liveability, and citizen engagement ensure that future strategies for smart regions will be based on smart sustainable policies and integrated decision-making with a variety of stakeholders.

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1 *The 21st Century is already being defined as the urban age (Soja and Kanai, 2010). In 2018, it was estimated that 55% of the world's population lived in urban areas; by 2050, this is expected to increase to 68% (UN DESA, 2018) and by 2100 to 85% (European Commission, 2019).*

1.1. Purpose of Report

In March 2021, Maynooth University (MU) together with its research partner, the International Centre for Local and Regional Development (ICLRD), were appointed by the Southern Regional Assembly (SRA) to provide a smart region definition and framework to facilitate smart cities driving a smart region. GIS expertise was provided by Limerick City and County Council (see Annex 1 for research team details). Established in 2015, the SRA is committed to developing a region that is economically strong, inclusive, connected, climate-resilient and sustainable and, as part of this work programme will consider the role of smart initiatives in contributing to this vision. In the context of the rest of Ireland, the Southern Region (SR) represents over 40% of Ireland's total landmass and one third of the national population. With three of the country's five cities – Cork, Limerick, and Waterford – and a network of large towns, the region has a strong urban structure.

The SR, made up of ten local authority areas (see Figure 1.1.), has a strong established baseline in smart city initiatives – drawing on innovations in the metropolitan areas of Waterford, Cork, and Limerick. The last 3-4 years has given rise to a growing number of smart town programmes; some of which are emerging as exemplars for the rest of Ireland. Extending these initiatives to the other towns, villages and rural areas across the Region is key to building a 'Smart and Sustainable Southern Region'.

A core objective of the Regional Spatial and Economic Strategy (RSES) adopted by the SRA in January 2020 is to enable the sustainable, inclusive, and resilient growth of the SR. It recognises that smart specialisation, as one component, is a pathway to smart cities – and by extension, that smart regions are competitive, innovative, and productive regional economies. The Assembly contends that key to achieving this vision is for all locations, urban and rural, to collaborate on smart region initiatives. Within the RSES, Regional Policy Objective (RPO) 134, focused on Smart Cities and Smart Region,

> " *seeks to build on Smart Cities and Smart Region Initiatives in Cork, Limerick and Waterford, such as the All Ireland Smart Cities Forum, and seek to extend such initiatives to towns, villages and rural areas to support a Smart Region (SRA, 2020: 157).*

In addition to supporting the SRA in the delivery of its regional priorities, this research programme also contributes to the Interreg Europe-funded COHES3ION Project[iii]. This inter-regional project, to which SRA is a partner, is focused on improving the performance and impact in terms of delivery of innovation by Research and Innovation (R&I) actors of Smart Specialisation Strategy (S3) and linked European Regional Development Fund (ERDF) Regional Operational Programmes. Of relevance to this work programme is COHES3ION's focus on the identification of smart priorities – those complementarities and synergies between different levels of territory, in terms of priority or niche opportunities, allowing for further specialisation of specific territories across a range of scales, including the region.

Figure 1.1. The Southern Regional Assembly Area

(Source: http://www.southernassembly.ie/the-assembly, accessed 12 June 2021).

A key focus of the new Territorial Cohesion policy (2021-27) is 'A Smarter Europe' with a strong emphasis on innovative, digitalisation & smart economic transformation building on place-based strengths & potentials. This requires a strengthened interconnectedness between regional socio-economic development, environmental management and spatial planning practice and policy. There is a growing recognition that every type of region is facing industrial transition – because of changes to traditional manufacturing, digitalisation and technological advancements, climate change and, more recently, COVID-19 and its impact on retail trends – and thus have distinct needs.

Meeting these needs over the next decade will require greater collaboration via the quadruple helix model or, as referred to in the RSES, Eolas Comhroinnte Obair le Cheile

/ Shared Knowledge Working Together[2]. The Quadruple helix model involves a collaborative partnership between academia, community, public agencies, and the private sector to harness local and regional opportunities and endogenous assets in a smart and sustainable manner that not only diversifies the local/regional asset base and nurtures industry and technology clusters, but which also creates places that are adaptable with a strong transversal skills-base (Creamer, Connolly & Riveria, 2021).

At the core of the output of this research programme is (a) defining a smart region generally, how the smart region applies to the SR, and (b) the development of a smart region maturity framework. Together, this will enable the region, and its sub-regions, to:

1. Understand what a smart region is;
2. Describe their own level of maturity;
3. Set plans for improvement; and
4. Measure improvement.

1.2. Defining Smart Regions

While there is no unique definition of a smart region, smart regions as a concept play a key role in developing new growth dynamics, based on bottom-up entrepreneurship and innovation. The rapid development of digital technologies is resulting in terms such as 'smart cities', 'smart society' and 'smart regions' becoming more and more popular in the modern changing world (Bauer et al, 2019). As contended by Ó Brolcháin *et al*, "Smart regions are the logical extension of the smart city concept" (2018: 1); recognising that cities do not exist in isolation and that for a region to become 'smarter' it needs to consider the opportunities, benefits and challenges that smart technologies can offer. Increasingly, such regions are a mechanism for examining the spatial interlinkages between urban and rural areas and demonstrating their capacity to transform societies in priority areas such as energy transition, digital growth, circular economy, agri-food, or industrial modernisation. At their core is a smart city with a key role to play in both enabling and driving a smart region.

For the purposes of this work programme, we began with a general definition of a smart region proposed by Matern *et al* which argues that cities cannot be examined in isolation of their diverse surrounds and that the transition from a region to a smart region is enabled by societal innovation, whereby diverse urban-rural areas

> " *are spatially reframed by digital technologies and the respective social practices in a variety of fields (citizenship, governance, economy, environment, mobility, infrastructure) on a discursive, implemental and regulative level. The concept of smart regions follows a relational and social constructivist understanding of spaces and emphasises an integrated approach towards the social (re)construction of smart regions by actors and their networks (2020: 2064).*

The value of this as a general working definition, and a starting point for defining a smart region as it applies to the SR, is that while it acknowledges the driving role played by cities in the evolution of smart places, it recognises that innovation and 'smartness' can also emanate from rural areas and the entrepreneurialism of community.

impossible

1.2.1. Defining a Smart Southern Region

In defining a smart region as it would apply to the SR, the analysis of literature, policy and perspectives shared by a range of regional stakeholders – as captured in Report 1 of this series, Smart Region Consultation – clearly illustrates that an emphasis must be posited on; namely: (1) place and place-making; (2) people via engagement and subsidiarity; (3) collaboration and co-design; (4) connectedness of infrastructure and policy in support of sustainability and quality of life; (5) data, technology and innovation in support of resilience; and (6) good governance (see Figure 1.2.).

Figure 1.2. The Key Dimensions of a Smart Region for the Southern Region of Ireland
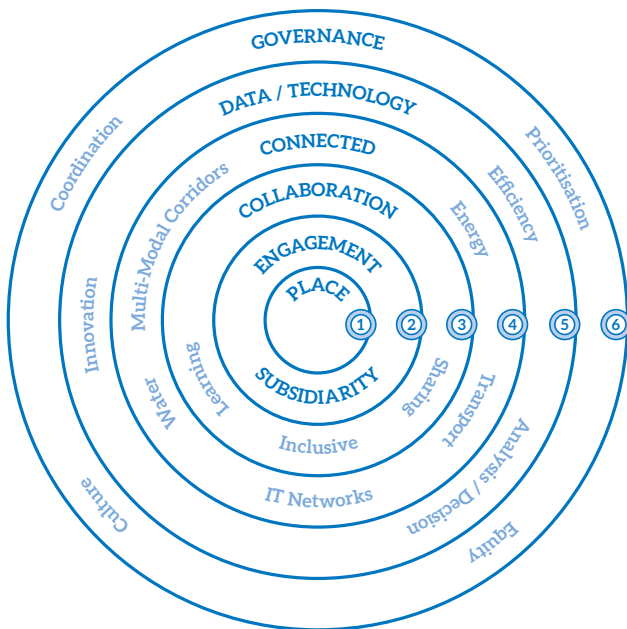
(Source: Authors – Maynooth University and ICLRD)

What is most significant about this emerging model is the focus on 'place' and the widely held belief that any smart region must be grounded in a geographic or territorial context, with the core objective of improving quality of life and liveability of place using a sustainable and citizen-centric approach. Technology and digitisation, in its many forms, is a tool – and enabler – in achieving these goals; and should only be deployed (either in pilot or mainstream) in this context where the value added has been both researched and developed.

An initial bespoke smart region definition for a Smart Southern Region was presented at the end of Report 1:

> 66 *A smart region working in collaboration, leveraging technology and open data to co-create vibrant, sustainable and liveable cities, towns and communities.*

This emerging definition will be reflected upon at the end of this document, considering international approaches to a smart region, and will be further refined in Report 3, following analysis of the smart region maturity model that has emerged for the SR.

1.3. Report Methodology

A three-phase methodology was adopted to deliver this programme of work, incorporating both primary and secondary research.

Work Package (WP) 1 – Smart Region Consultation

1

This work package involved a mixed methods approach, utilising both primary and secondary/desk-based research. Via semi-structured interviews, a broad range of regional stakeholders were consulted on what constitutes a smart region, and current initiatives under way that would lend to future branding of the SR as a smart region. Interviewees included representatives of Local Government, Higher and Further Education Bodies (incl. research centres), business/industry representative bodies, semi-state bodies and community groups (See Annex 2 for details). As part of this WP, the identification of smart initiatives and actions at various scales and driven by a diverse range of stakeholders across the region's Local Authorities commenced. This data gathering involved drawing from resources such as the emerging digital strategies, EU programmes such as the EU's Intelligent Cities Challenge (ICC) in which Cork City was a recent successful applicant, third level smart innovation programmes, and initiatives supported under the Smart Towns and Villages programmes at an EU and national level. The identification and analysis of smart initiatives was undertaken undertaken using the key concepts of the smart city as outlined in Figure 1.3. below.

Work Package (WP) 2 – Smart Regions Good Practice Research

2

This work package considered the workings of different smart regions in practice; with a particular focus being placed on governance arrangements, stakeholders involved, thematic focus, and its place-based impacts. Examples of smart regions across Europe and elsewhere to be considered as part of this phase were identified via the interviews as part of WP 1, and through an international literature review. The resulting report identified the common themes, and transferable learnings and actions that have the potential to develop and brand the Southern Region's proposition as a Smart Region.

Figure 1.3. Smart City Concepts
(Source: RSES for the Southern Region, 2020: 156).

Work Package 3 – A Framework Report to Assist Stakeholder Initiatives in Pursuit of a Smart Region

3

Building on the findings and key learnings from WP 1 and 2, this work stream and resulting report defines what a smart region is in the context of the SR, and the core principles both underpinning and nurturing its growth. At the core of this work package was the development of a Smart Region Maturity Framework which will aid the SSR and its sub-regions in: (1) Understanding what a smart region is; (2) Describing their own level of maturity; (3) Setting plans for improvement; and (4) Measuring improvement.

A second core component of this WP was to develop a baseline Smart Mapping Tool, a cloud-based tool that will capture smart activity across the region. With the support of Limerick City and County Council, the research team captured the details of several diverse smart activities and mapped these. Every effort was made to align these to the strategic regional priorities of the RSES for the SR. Over time, there is the potential to add images, videos, and PDFs to this tool to improve its interactivity. The intention is to embed the smart mapping tool on the SRA website – thus providing the public and regional stakeholders with a means to interactively track the progress of smart initiatives across the region. All data collected by the smart mapping tool can also be exported in a variety of formats at any stage for use in SRA internal GIS systems or shared with other organisations.

Across the three core Work Packages, consideration will be given to what are the key issues generally impacting the success of delivery of a smart region, and more specifically the SR achieving its objective of becoming a smart region.

1.4. This Report

The core outputs across the three work packages are:

- **Report 1:** Providing a synopsis of the regional consultations and perceptions of what is a smart region, and the endogenous potential upon which the SR can build and brand itself as a smart region;
- **Report 2:** An understanding of smart regions based on an analysis of the focus and operations of smart regions across Europe and elsewhere, and a literature and policy analysis;
- **Workshop:** Undertaking a smart regional maturity framework exercise as part of WP 3, which will be reviewed through a validation workshop with a number of key regional stakeholders (including interviewees), a draft framework will be developed. This will identify the main pillars of a smart region;
- **Report 3:** Presenting a final smart region framework for the SR; and
- **The Smart Mapping Tool (SMT):** A regularly updated GIS mapping tool to catalogue smart assets and projects across the region.

This document represents *Report 2 – International Approaches to, and Good Practice in, the development of Smart Regions.* It considers the different models of smart region as applied across Europe and elsewhere, and the guiding principles informing these models. To the extent possible, it places a focus on governance arrangements, the key stakeholders involved, the thematic driver(s) behind the development and branding of a smart region, and its place-based impacts. This report focuses on the following smart regions:

- **Netherlands:** The Metropolitan Region Rotterdam and The Hague (MRDH) and Eindhoven 'Brainport';
- **Finland:** The 6 Aika Strategy and the Helsinki-Uusimaa Region;
- **USA:** The Greater Phoenix Smart Region;
- **Germany:** Smart Baden-Württemberg; and
- **Wales:** The Cardiff Capital Region.

CHAPTER 2: SMART REGION MODELS – A LITERATURE SYNOPSIS

There is growing awareness of the concepts of the 'smart city' and 'smart village' – largely due to the infiltration of digital technologies into everyday life, including service provision. In the 1990s and early 2000s, technology was viewed as playing a key role in improving quality of life, and cities were quick to adopt the 'smart' label. It was quickly recognised, however, that this technology driven approach to smartness was flawed, and that the emphasis needed to be on addressing place-based challenges through a citizen centric model, first and foremostly. As argued by Markkula and Kune, while hard and soft infrastructure have a role to play, the 'smartness' comes from

> *the capacity (of individuals, organisations and regions) to understand and process knowledge, create new knowledge, and translate this knowledge into practice (2015: 8).*

The smart city concept is increasingly emerging as an international trend in urban development[iv] and place management. Smart technologies, for example, such as data analytics and cybersecurity, underpin a city's infrastructure "including transport and utilities, which ultimately serve its social and economic goals" (EY, 2016: 6). Unsurprisingly then, that being 'smart' is considered an integral component of being both sustainable and resilient.

From a review of the literature, it is clear that while smart cities are growing in number, smart regions are only beginning to emerge (Ó Brolcháin *et al.*, 2018); and those smart regions that do exist have been informed – if not

actually driven – by the presence of a smart city. This will be examined in Chapters 3 to 7. So, what is a 'smart city'? This is increasingly problematic to answer. There is no one unique or standardised answer to this question. It means different things to different people, depending on the scenario under consideration, the discipline from which they come, the organisation or sector within which they work, etc. As argued by Townsend, "It may take its place alongside the handful of international cognates – vaguely evocative terms like "sustainability" and "globalization" – that no one bothers to translate because there's no consensus about what they actually mean" while at the same time recognising that "The broad view is important" and that "there really is something going on here" (2014: 15). What is clear is that it means more – and entails more – than just employing technology to solve a problem.

2.1. The Evolution of the Smart City

The malleable concept of a smart city has evolved significantly since its initial adoption in urban management parlance in the mid-2000s as "on the one hand, new and repurposed technologies started to be more systematically targeted at urban issues and activities as potential new market opportunities and, on the other, city administrations seeking greater efficiencies and more effective answers to urban problems started to turn to potential technical solutions and to formulate and adopt smart city agendas and initiatives" (Kitchin, 2016: 2). This is not to say cities were not using technologies prior to this – they were. The past decade, however, has represented a significant step-change in the use of ICTs in the management of cities – with the concept now closely aligned to how "advances in technology and data could allow us to plan and run our

cities better" (Future Cities Catapult, 2017: 4); a perspective strongly echoed by the European Commission[3] [v].

While smart cities initially emerged as a marketing concept from global technology companies that saw an opportunity to sell digital transformation and new technology into big city systems, today's smart city goes far beyond digital technologies and the use of information and communication technologies (ICT) for better resource use and less emissions. Rather, it has come to embrace a more interactive and responsive city administration (smart governance), active engagement with citizens (smart people), meeting the needs of an ageing population (smart health), smarter urban transport networks (smart mobility), upgraded water supply and waste disposal facilities and more efficient ways to light and heat buildings (smart infrastructure).

Similarly, as the focus turns to smart regions, it is increasingly recognised that "a smart region now is something more than just big data, technological connections and efficiency; it is also creating interpersonal relations between a region and its people" (Bauer *et al*, 2019: 1). How a smart region is defined very much depends on the 'lens' through which it is being examined. For this study, a socio-spatial perspective is being adopted – considering it in terms of the geography it covers and the societal innovation and benefits that accrue.

2.2. Smart Cities Driving a Smart Region

As a relatively new concept, there is very little literature to draw from as we try to better understand the concept of the smart region, particularly at the scale of what is being proposed for the Southern Region of Ireland. According to Matern et al, "What we know about smart regions is largely based upon debates on smart cities" (2020: 2061). While there are flaws with this approach, it is valuable research such as this that will lead to proper conceptualisations of a smart region emerging.

As noted by Kitchin et al (2018), "Regardless of whether cities have formulated and are implementing smart city visions, missions and policies, all cities of scale utilise a number of smart city technologies (e.g., intelligent transport systems, urban control rooms, smart grids, sensor networks, building management systems, urban informatics) to manage city services and infrastructures and to govern urban life" (p.1). The same could therefore be argued of smart regions. Like the concept of the 'smart city', there remains a fuzziness in the definition of what is a 'smart region' – let alone any consensus around an optimum scale or its governance. Current research and analysis on smart regions are largely couched in

economics, with a strong emphasis on growth, innovation, and policy strategies (Matern et al, 2020; Calzada, 2013); a position deliberated upon in this Report as the concept of the smart region is considered in the context of innovation ecosystems/arcs of innovation and the 'Smart Region as a Service' model. This explains the strong association that exists between the concept of smart regions and smart specialisation. O'Brolchain et al (2018) outline how the concept of the smart region is emerging because of the EU's programme for research and innovation strategies for smart specialisation (RIS3). As the focus shifts towards the potential of the smart region in regional development policy and practice, in building on each region's strengths and potentiality – which inevitably still involves a strong economic component – a number of scenarios have been tabled to define, refine, and explain this evolving concept.

At its simplest Kodym and Unucka (2017) define a smart region as one that employs modern technology to save time and money of people who live there[vi].

Misra and Ojo (2020) contend that a smart region, in principle, means the inclusion of smart cities (urban) alongside non-urban or rural areas as an integral part of the strategic interventions. They argue that e-governance, given the key role it has played over the years in bridging the digital-divide between urban and rural areas, is an integral component of the smart region.

Other commentators, including Aalto et al (2016) believe that the concept of a smart region is morphing away from a largely singular focus on big data, industry clusters and technological connections to also building "interpersonal relations between a region and its people" (Bauer *et al*, 2019: 1).

Similarly, Parada (2017; quoted in Matern *et al*, 2020) asserts that the creation of smart regions requires a 'sufficient degree' of social and institutional density, that people and their active engagement is central to the process.

Others still have considered the concept of a smart region from a specific issue or challenge; for example, wildfire risk management (Tedim et al, 2016; quoted in Matern *et al*, 2020) and land consumption and sustainability (Garcia-Ayllon, 2018; quoted in Matern *et al*, 2020).

Taking this a step further, Sutriadi (2018) explains a smart region as an innovation of sustainable planning at the regional level that promotes knowledge-based development through human capital and the willingness of citizens to adapt to changing economic, societal, and environmental circumstances to achieve harmonisation between development and environmental conservation/management. Strong spatial planning policy at all levels of the planning system is thus central to the success of the smart region.

The concept of smart regions has also been explored from a sectoral perspective. In 2019, the European Consortium of Universities (ECIU) developed a white paper on smart regions, arguing that low-urbanised regions face numerous challenges – different to smart cities – and in response, identified four key topics for smart regions[vii]. These are specific areas in need of technological solutions, and where digitalisation has a role to play; namely: Energy and sustainability; Circular economy; Transport and mobility; and Resilient communities. Delivery requires both human capital and a commitment to co-creation. The ECIU believes that the university should be at the centre of the process, not least given their role in civic engagement and the promotion of societal development and well-being.

2.2.1. A Scalar Challenge?

In considering the role of smart cities driving a smart region, there is also an argument that consideration should also be given to the role of smart villages. In some respects, the smart villages movement has leap-frogged the growth of smart regions – and indeed, the smart city initiative – by very early-on placing a strong emphasis on the inclusion of community-led local development (CLLD) principles in its smart programmes. This may be attributable to scale, and its operating to a more clearly defined spatial area. Across the EU, the emergence of the smart villages is closely associated with the *Cork 2.0 Declaration for a Better Life in Rural Areas (2016)*, which highlighted the need to overcome the digital divide between rural and urban areas through improved connectivity and digitalisation. The concept gained further traction in 2017 because of the European Commission's publication, *EU Action for Smart Villages*. This defined smart villages as 'those (local communities) that use digital technologies and innovations in their daily life, thus improving its quality, improving the standard of public services, and ensuring better use of resources''[viii]. More recently, the *Bled Declaration* (2018) called for further action to digitalise rural areas by means of smart villages and enhanced access to broadband.

(Source: EY, 2016: 7)

Implementing smart initiatives, irrespective of scale, is a complex process – involving a multifarious set of challenges and associated tasks, a diverse range of stakeholders, and politics. Figure 2.1. highlights how 'smart' cuts across all aspects of urban development, reiterating that technology is but one – albeit very important – component that sits alongside data analytics, planning, and governance. It draws out the multi-dimension and cross-sectoral focus and inter-agency aspects of smart programmes, and the multiple stakeholders involved. While the EY Smart Cities Framework was developed with smart cities in mind, it is equally applicable to smart towns and villages, and to smart regions.

2.3. The Principles of the Smart Region

At its most ideological, the smart region is centred on a geographic area ('place') and brought to life through a collaborative ecosystem based on the quadruple helix model i.e., involving government/ public sector, industry/ business, academia, and citizens. There is a growing appreciation for the value of participatory processes and active ('smart') citizenship – with an increasing propensity towards co-creation of new knowledge based on their own areas of expertise and lived experiences (Markkula and Kune, 2015: 9).

Based on the literature review of smart regions, an analysis of EU policy and programmes and, importantly for this work programme, the perspectives of a diverse range of regional stakeholders, several key principles inform a smart region, and specifically, a Smart Southern Region (SSR):

1. **'Place':** Communities of place, their endogenous asset-base and the inter-relationships between urban centres and surroundings hinterlands will inform a smart region's direction of travel;

2. **Engagement & Subsidiarity:** The values of people, and how this both informs how, and leads to the co-creation of, smarter and more sustainable places, is central to the process of developing a smart region;
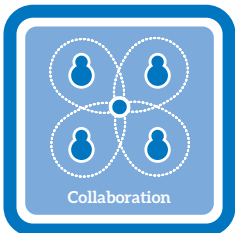
3. **Collaboration:** Working collaboratively through co-creation processes in the co-design of solutions and services that address local/regional need;

4. **Connectivity:** There is a dual focus to connectivity – (a) connecting places and ensuring the necessary infrastructure and support services and utilities are in-situ to support the development of place, and (b) connectivity, coherence, and alignment of policies on a cross-sectoral basis, particularly as they relate to climate and environment – the global challenges of our time;

5. **Data and Technology:** The role of data and technology in building a smart region must be facilitated to enhance efficiency of service provision and generate innovation while also ensuring that clear guidelines are put in place around ethics and its enabling role; and
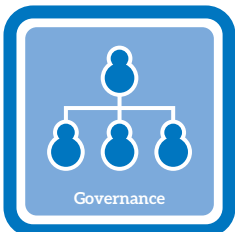
6. **Governance:** There is a key role for regional assemblies as facilitators of change; ensuring effective multi-disciplinary collaboration is undertaken in both the co-production and co-implementation of the smart region.

As argued by Matern et al (2020), smart regions ought to be understood as relational phenomena that are neither purely urban nor rural. As a result, a perspective that artificially separates smart cities and smart regions is inadequate as it dismisses the diversity and heterogeneity of smart regions.

Irrespective of the scale, what is undeniable is that policies for smart (resilient and sustainable) places should focus on understanding the evolving challenges and needs,

> *anticipating demands and risks; and then using technology to provide some effective and affordable solutions (EY, 2016: 6).*

2.4. Review of Smart City Models

The following review is a snapshot of the literature relating to smart city models as the smart region is a nascent concept with little literature support currently. Most of smart region literature discusses regions as either smart city extensions (e.g., Meijer and Thaens, 2018), or as the basis for clustering technology-based firms (e.g., Couchman et al., 2008; Kogut-Jaworska and Ociepa-Kicinska, 2020; Kostygova et al 2019; Lopes and Farinha, 2018). The review of smart city models acknowledges that considering regions as city extension, while ignoring obvious and important considerations based on a geographic dispersion, is a practical step at this time. The maturity of the smart city concept offers an indication of many of the elements that will ultimately be incorporated into smart region models.

This review covers the seminal concept model of a smart city by Giffinger at al., (2007) and follows this by referencing some more action-orientated models that have been developed since. It also references the convergence of smart cites and sustainable cities, and reference studies that have compared models in each domain.

The purpose of city models is to enable information on a complex phenomenon, such as the dynamic urban environment, to be simplified into a form that is relatively easy to use and understand. The three main functions of indicators are quantification, simplification, and communication (Huovila et al., 2019). When periodically evaluated and monitored, they show trends and change in the measured phenomenon. City indicators, thus, assist cities in setting targets and monitoring their performance over time. In the context of smart cities, models form the basis of digital or smart-city strategies. In general, the city is assumed to own the strategy, with strategies covering internal city authority capability development and/or city-wide support of a multi-agency action. Smart city strategies typically deal with the exploitation of ICT and smartness and is, therefore, understood to denote an enhanced urban technological infrastructure through means of digitalisation. In the context of urban planning, Giffinger et al. (2007, p. 10) characterise the smart city to mean a 'certain ability of a city' to qualify as 'smart'. In their study on medium-sized European smart cities, they identify six constitutive characteristics of such cities: a smart economy, smart people, smart governance, smart mobility, a smart environment, and smart living.

The smart city model by Giffinger et al. (2007) is the most cited model to date. It proposes that smart cities have certain characteristics, made up of factors, which can be measured by a set of indicators (see Figure 2.2.). The characteristics were presented as those suggested by literature up to that point. However, as they were used to rank and publish medium-sized European cities, it became a reference point

and over time, it has now become one of a few standards. The indicators for each factor are a set of readily available statistics which provide an understanding of the health of the 'smart' factor in any given city. To explain, Table 2.1. is a description of the indicators used in the Giffinger and colleagues model for Smart Environment.

Figure 2.2. Characteristics and Factors of a Smart City

(Source: Giffinger et al., 2007)

Table 2.1. Indicators for a Smart Environment

(Source: Giffinger et al., 2007)

Nam and Prado (2011) were one of the first to address enabling factors of smart cities, *"what makes cities smart,"* and proposed a framework connecting conceptual variants of the smart city label, key elements for being a smart city, and strategic principles for making a city smart. The conceptual model they developed was based on three sets of factors: technology; human; and institutional, as depicted in Figure 2.3.

Within the Nam and Pardo model, key to the smart city concept is a ubiquitous/pervasive computing infrastructure built on a network infrastructure (fibre optic channels and wi-fi networks), public access points (wireless hotpots, kiosks), and service-oriented information systems. It is this that enables mobile, virtual, and ubiquitous technologies. Smart-people is characterised by an affinity to life-long learning, social and ethnic plurality, flexibility, creativity, cosmopolitanism or open-mindedness, and participation in public life. Importantly, this includes social inclusion in public services, soft infrastructure (knowledge networks, voluntary organisations, crime-free environments), urban diversity and cultural mix, social/human/relational capital, and knowledge base such as educational institutions and R&D capacities.

Figure 2.3. Fundamental Components of Smart Cities

Figure 1. Fundamental Components of Smart City

(Source: Nam and Pardo, 2011)

From an institutional perspective, it is necessary to establish an administrative environment (initiatives, structure, and engagement) supportive of the smart city. The central spirit of governance is a citizen-centric, citizen-driven approach. The consideration of stakeholders (i.e., end-users, groups of end-users, IT experts, policy/service domain experts, and public managers) is critical. This can be built from top down or bottom up, but active involvement from every sector of the community is essential. Successful initiatives are the result of a coalition of business, education, government, and individual citizens (i.e., the quadruple helix model).

Shortly after this paper, the same authors with colleagues (Chourabi et al., 2012) developed the model, digging deeper

into the components of a smart city. In this paper, they assert that there are eight success factors of smart city initiatives:

1. Management and organisation;
2. Technology;
3. Governance;
4. Policy context;
5. Economy;
6. People and communities;
7. Built infrastructure; and
8. Natural environment.

Their model is depicted in Figure 2.4.

Figure 2.4. Smart City Initiative Framework

(Source: Chourabi et al., 2012)

Their claim is that the factors provide a basis for comparing how cities are envisioning their smart initiatives, implementing shared services, and the related challenges. This set of factors can also support understanding of the relative success of different smart city initiatives implemented in different contexts and for different purposes. Similarly, this framework could help to disentangle the actual impact on types of variables (organisational, technical, contextual) on the success of smart city initiatives.

Within the last ten years, one significant model emanated from the European Union research framework [Horizon 2020] titled CITYkeys (Bosch et al., 2017). It proposes an assessment method and a set of indicators to evaluate the success of smart city projects and the possibility to replicate the (successful) projects in other contexts. Figure 2.5 depicts the CITYkeys indicator framework.

Figure 2.5. The CITYkeys Indicator Framework

People	Planet	Prosperity	Governance	Propagation
• Health	• Energy & mitigation	• Employment	• Organisation	• Scalability
• Safety	• Materials, water and land	• Equity	• Community involvement	• Replicability
• Access to (other) services	• Climate resilience	• Green economy	• Multi-level governance	
• Education	• Pollution & waste	• Economic performance		
• Diversity & social cohesion	• Ecosystem	• Innovation		
• Quality of housing and the built environment		• Attractiveness & competitiveness		

(Source: Bosch et al., 2017).

During the last ten years, the concepts of smartness and stainability have been interlinked and reflected in city models (e.g., ITU, UNECE et al., 2017). Recently, Ahvenniemi et al. (2017) and Huovila et al. (2019) compared the indicators of some of the primary smart sustainable city models which included:

- The International Standards Organisation sustainable development of communities;
- UN-Habitat sustainable development goal + monitoring framework;
- European Telecommunications Standards Institute; and
- ITU Telecommunication Standardisation Sector.

Figure 2.6 depicts this comparison. In this we can observe the strong similarity in model components and the relative strength of each component in smart and sustainable models. In this work, it is asserted that smart sustainable cities consist of two parts. Firstly, smart characteristics of a city relate to innovations – using ICT and technology or citizen engagement – with the aim of improving quality of life, efficiency of urban operations and services, and competitiveness. Secondly, sustainable characteristics are those that ensure that the city meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects. The indicators that are derived from this are:

Smart City

- (Hard) tangible assets, such as technology and hard (physical) infrastructure. Examples of hard infrastructure include ICT, transport, water, waste, and energy; and
- (Soft) assets such as social, cultural, and human capital, well-being, knowledge, policy, governance, participation, innovation, economy, inclusion and equity.

Sustainable City

(Based on the triple bottom line of sustainability, generally accepted in the development of indicator systems for urban sustainability)

- People (social sustainability);
- Planet (environmental sustainability); and
- Prosperity (economic sustainability).

Figure 2.6. Comparison of Indicators used in Smart Sustainable City Models
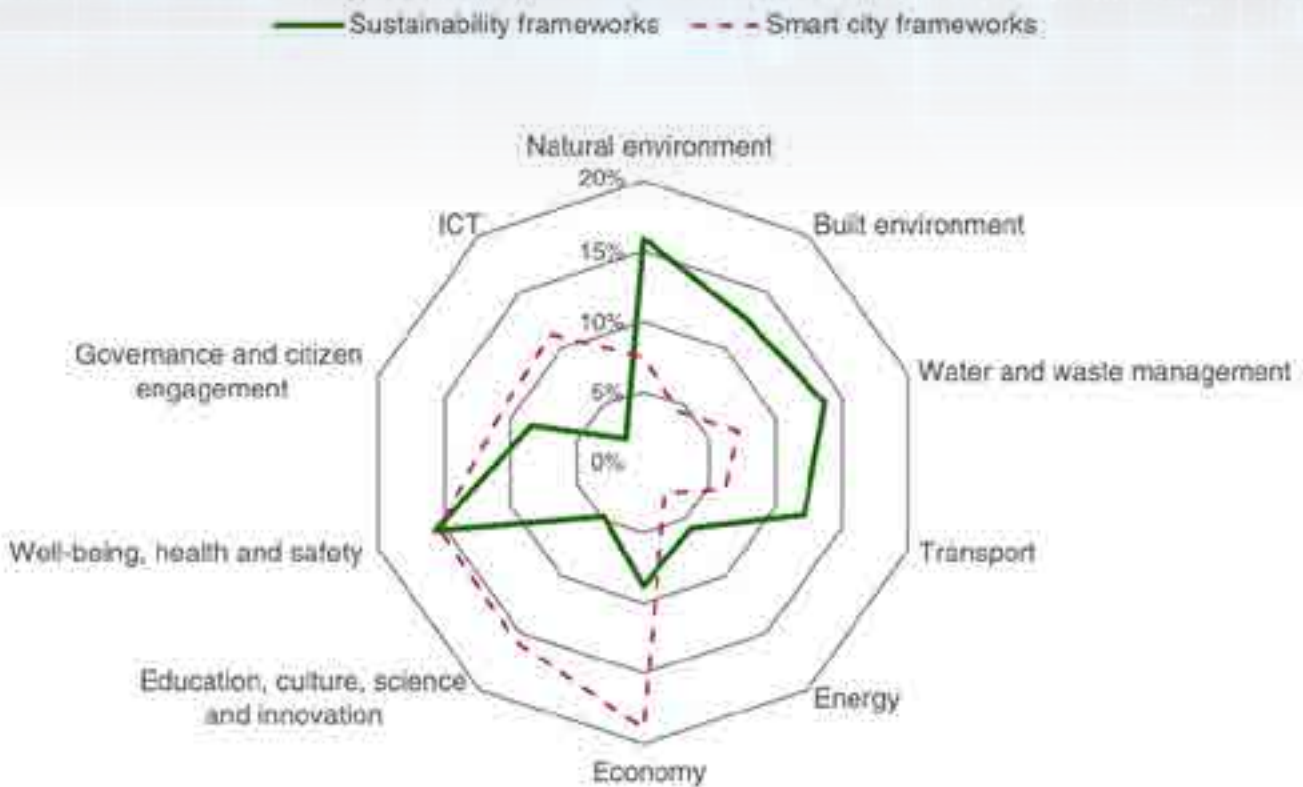
2.5. Building an Indicator Framework for the Southern Region

As the SR defines its 'smart region' priorities and associated factors of success, it will be critical that these can be measured and monitored over time. Reflecting on these various smart city models and indicator frameworks, and drawing on feedback from the SRA, the Regional Monitor initiative may be an already existing tool that could be utilised in the identification of key characteristics and indicators to be measured as a barometer of the success of the SSR. The Regional Monitor, as currently configured, is a consistent set of indicators to help measure progress on the RSES implementation across the three assembly areas; with many of the themes overlapping with Smart City indicators. The Regional Monitor is also reflective of the RSES for the Southern Region's three pillars for a Creative & Innovative, Liveable and Green Region. As the Monitor is strengthened and evolves over time, with access to new data and indicators, there is certain opportunity for all three Regional Assemblies to take guidance from these good practice models of Smart City/Smart Region indicators and build a comprehensive indicator framework for Smart Regions.

CHAPTER 3: THE NETHERLANDS - "TOGETHER CITIES ARE STRONGER"ix.

The *NL Smart City Strategy: The future of living* was published in March 2017 following a co-creation process involving local government, industry representatives and scientists. In designing the strategy, the emphasis was placed on having a consolidated vision of what is a smart city and, from this, the adoption of a bottom-up approach to smart places, with concrete actions and objectives. While the document is a national smart city strategy, a noted precondition for success is "Regional Collaboration in which cities operate as a network", recognising that

> *Metropolitan regions will be the engine to drive the new economy. This will lead to strong competition between European regions. Our small country is a unified network of cities comprising influential metropolitan regions (2017: 9)*

During the earlier phase of this research programme, involving consultation with over 40 regional stakeholders drawing from local government, state agencies, academia, community and the business sector, the approach adopted by the Netherlands, whereby a city 'specialises' in a specific aspect of 'smart' (for example, smart mobility in Eindhoven) or an association of cities facilitate experiments working on innovative solutions to urban challenges which can be replicated by other citiesx, was identified as an approach that could work in Ireland. Indeed, stakeholders highlighted several city/county specialisms already well developed, and which any smart

region concept could build on; for example, smart mobility in Clare and Limerick, and smart energy in Tipperary. Such opportunities are reflected in the SR's priorities for smart specialisation.

Acknowledging that knowledge and experience are not always shared naturally, the Netherlands approach, it is argued, will through the "Smart City collective",

> *create connections between cities, companies and the research sector, operating non-hierarchically, taking a distributed approach (2017: 11).*

3.1. The Smart City Collective

As is well documented, cities globally are bearing the brunt of the impact of global trends such as climate change, the depletion of natural resources and loss of biodiversity, changing demographics, digitalisation, and the fourth industrial revolution, and are under pressure to find solutions to these challenges. In coming together to develop their smart city strategy, the national government recorded the need for Dutch cities to focus on their regional strengths to sustainably improve the quality of life in their cities, especially through the use of digital technologies. Significantly, the strategy aimed to develop "a "smart" country - instead of 380 different smart citiesxii.

A core focus of the strategy is on cybersecurity, data protection, interoperability (the interplay of different

technologies or systems), hyper-connectivity, digital open-source-infrastructure, finance, and standardisation[xii]. The Netherlands Smart City Strategy offers cities and their stakeholders an integrated approach, and set of tools, to address complex issues together, while not expecting each city to come up with its own solutions and operate in isolation or competition (see Figure 3.1). The approach being adopted ensures, in principle, that "cities are committed to one another's outcomes" (2017: 55), with a weight being attached to the potential for replication of good practices and building on the successes of others in different contexts from the outset.

Figure 3.1. The Netherlands Smart City Strategy – Towards an Integrated Approach
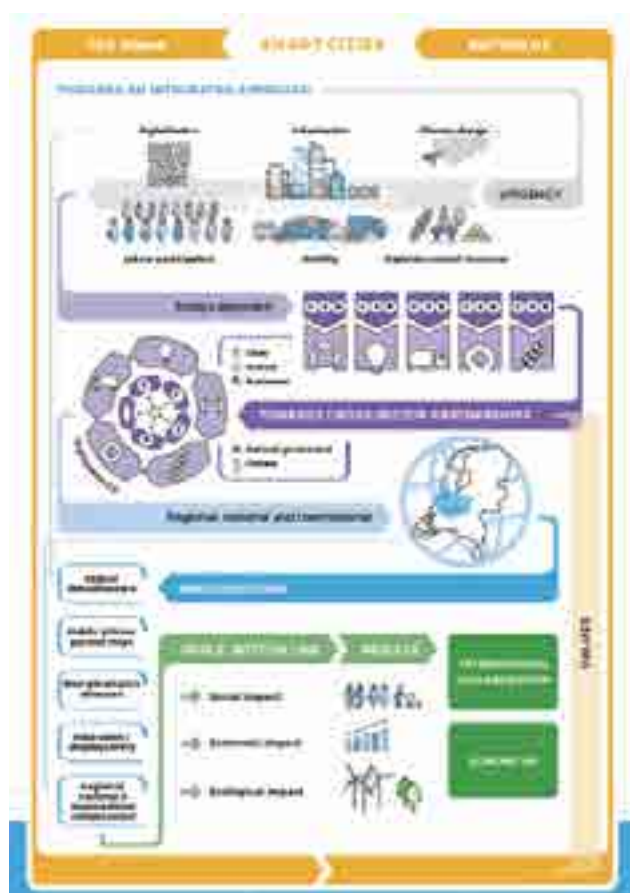
(Source: Dutch Government, 2017: 13)

The implementation of the strategy generally is being driven by the five largest cities in the Netherlands (also known as the G5), with each city also having their own area of focus:

- **Amsterdam:** Circularity;
- **Rotterdam:** Sustainability (resilience & energy transition);
- **The Hague:** Safety & Security;
- **Utrecht:** Healthy Urban Living; and
- **Eindhoven:** Smart Mobility.

But the strategy is not just in the ownership of the larger cities. In terms of design and implementation, 32 medium to larger cities are also playing a leading role. Effectively, it operates to a model of a 'network of networks' – an approach to smart region building also evident within the RSES of the SR. Key Regional Policy Objectives (RPOs) in this regard include: RPO 6 Collaboration Between Metropolitan Areas, RPO 28 Collaboration/Partnership, RPO 29 Rural Settlement Networks and RPO 30 Inter Urban Networks as Regional Drivers of Collaboration and Growth. Initiatives such as the Kerry Knowledge Triangle actively encourages network to network building, with opportunities in-play for local authorities across the region to build on axis such as Galway-Shannon-Ennis-Limerick and Limerick-Tipperary-Waterford. **The value of the 'network of networks' model was also highlighted by regional stakeholders in the consultation process as outlined in Report 1.**

3.2. Case Study 1: Metropolitan Area MRDH

As outlined in the Smart City Strategy, twenty-three municipalities across the cities of Rotterdam and The Hague have formed the Metropolitan Region MRDH (Metropolitan Region Rotterdam The Hague), a polycentric metropolitan network that came together in 2015 to form a governmental network organisation. The MRDH has a population of nearly 2.4 million people and provides 1.3 million jobs (13.5% of the Dutch population work here). The aim of the partnership is to strengthen the region's economic position.

Over the coming decades, it is expected that an additional 400,000 people will settle in this region. That will require more employment, additional business space and another 240,000 new homes in the southern part of the Randstad conurbation. Such growth is supported by the international accessibility and connectivity of the region – served as it is by the Mainport, HSL, Rotterdam, The Hague Airport, and nearby Schiphol Airport. The area is also served by an extensive network of cycle routes, with current commitments - in light of expected growth – to develop a high-quality and innovative public transport system[xiii]. This investment will not only support a sustainably driven modal shift but will also significantly reduce CO_2 emissions. Within the Metropolitan Region, each town and village – many historic in character - retain their own identity. It offers residents and visitors a diverse natural environment – including sea, beaches, and peatlands. The Metropolitan Region is also home to several European universities, and research centres.

In response to the changes being faced by cities and regions, the long-term strategy for this Metropolitan Region is 'The Roadmap Next Economy (RNE)' which lays the basis for the transformation of the regional economy.

A core objective is to establish an attractive climate for businesses, investors, and talent. In creating these 'right conditions' a two-pronged approach has been adopted:

1. Digitalisation of the economy – a new digital and internet infrastructure that is faster, more flexible, and more secure; thus, supporting new business models and the generation of a smart and flexible energy network; and
2. Transition to a clean energy supply – shifting away from fossil fuels in favour of clean, renewable energy sources including solar, wind and tidal energy, hydrogen, and carbon capture and storage.

Recognising that economic and technological advancements are essential in the transition to new economies, and keeping pace with the fourth industrial revolution, digitisation and automation are viewed as key to strengthening the competitive power of businesses, and the wider Metropolitan Region. Regional campuses and field labs are being established in areas such as smart manufacturing industry, energy and climate, health care technology, and agri-food.

3.2.1. The Power in Partnership

In terms of governance, the 23 municipalities have entered a voluntary partnership in the form of a municipal regulation. Together, the municipalities form the administration of the Metropolitan Region Rotterdam The Hague (MRDH). Mayors, deputy mayors and councillors all play a role. All participating municipalities are supported by a compact network organisation, which connects the knowledge and capacity of the 23 municipalities and other partners. Every four years, the board adopts a regional strategic agenda from which the regional issues are tackled.

The government has granted the MRDH the status of a transport authority. This gives the region statutory tasks relating to traffic and transport. The Metropolitan Region works closely together in this with the province of South Holland. It is also the direct recipient of government funding for regional traffic and transport. The MRDH thus directs regional and urban public transport in all 23 municipalities.

3.2.2. 'Smart' Sustainability

A core challenge for this region is to plan effectively and sustainably for the population growth – and associated development – that is expected over the coming decades. Inevitably, digitalisation and technology will play a key role in that sustainable agenda – from green growth and green transformation to energy transition and moving to net-zero carbon, from smarter use of resources to the re-use of materials, to reducing commute times and ensuring that new homes and workplaces are optimally linked-up

with cycle paths and high-quality public transport. There have been a few examples to date where, across the 23 municipalities, regional stakeholders have come together to take a region-wide response to key issues impacting on the economic transition of the region:

- For the transition to sustainable energy, the 23 municipalities have joined with the province of South Holland and the four water boards to draw up a Regional Energy Strategy. Other stakeholders included the Port Authority, Greenport West-Holland, energy and network operators and regionally based housing associations.
- *Regional Implementation Agenda for Traffic Safety 2025* was published in July 2020 and discusses the goals and measures required to reduce risks in traffic.

Digital accessibility is important for economic innovation and growth; with 5G and fast Internet a requirement for autonomous vehicles, drones, AI, and applications in environmental monitoring, health care and industry. The role of education in upskilling and retraining in response to technological advancements and digitalisation is also high on the agenda.

Recognising the region's strengths in horticulture, the MRDH has provided financial supports as part of 'The Roadmap Next Economy' to support horticulture companies in their digitalisation journeys and in building cyber resilience. Following a request from the Municipality of Delft, the Digiwerkplaats Haaglanden and The Hague University of Applied Sciences received money from the MRDH to set up courses for horticultural companies that will strengthen their knowledge and skills in the field of digitisation and cyber resilience – thus increasing the digital resilience of entrepreneurs in the regional horticultural chain, and lead to new revenue streams being developed[xiv].

For further information on the smart region, MRDH, see *https://mrdh.nl/power-partnership*

3.3. Case Study 2: Eindhoven 'BrainPort'

The city of Eindhoven is one of the three economic engines of The Netherlands. The *Brainport 2020* Strategy, developed jointly by knowledge, business and public partners across the city and region, identified key ambitions in developing Eindhoven "as a sustainable, technologically innovative, inclusive, safe and economically successful city for all its citizens"[xv]. Closely aligned to *Europe 2020: A European strategy for smart, sustainable and inclusive growth*[xvi], *Brainport 2020 – Top Economy, Smart Society* was published in 2009 as a regional economic strategy that aimed to build a smart and sustainable economy, within an inclusive society. Following years of unprecedented

growth, a new Strategy, Brainport Next Generation was published in 2015 – building on the successes of today to address the challenges of tomorrow.

The Brainport region - Greater Eindhoven – was declared the "world's smartest region" by the Intelligent Community Forum in 2011 (Meijer and Thaens, 2018). Eindhoven-Brainport has successfully developed into a centre for knowledge-intensive industry. However this was not always the case. The Brainport region has underwent a considerable transformation over the last 20 years,

From being a region that faced declining industrial growth and a rise in unemployment rates, it has transformed into an international high tech hotspot in a global network with innovative companies, research institutions[xvii].

The term 'Brainport' refers to the city region surrounding the city of Eindhoven in the Netherlands. The title of Brainport was bestowed on the region to reflect its position as a critical area for economic development, following similar status given to the port area of Rotterdam and the seaport of Amsterdam. The region is an area of 1,460 square kilometres (similar to County Wexford) with 780,000 inhabitants, and home to 35,000 companies employing 330,000 people.

The innovation system of Brainport is, to a large extent, 'business-driven', powered initially by entrepreneurial leadership and strong collaboration between industry, knowledge institutes and government in the triple helix model. There is a strong emphasis on working together with employers and institutes for professional education. Increasingly, there is growing participative involvement of civic society (Van der Zee, 2013). This smart region is at the heart of an ambitious Dutch knowledge policy agenda and has a strategic focus on investing in technology innovation and value chains across high technology systems (Horlings, 2014). The area is part of a larger cooperation structure of three complementary ecosystems with a strong knowledge base and technological industry, known as the 'Eindhoven-Leuven-Aachen triangle' (ELAt4)[xviii].

The region can be characterised on two levels: the collaboration of the 21 local municipalities that make up the area; and secondly, the triple helix cooperation between multiple stakeholders. The cooperation between the municipalities takes place on a voluntary basis. The day-to-day management is run by a regional government

agency, Metropoolregio Eindhoven (MRE), which works to four regional living environment themes; namely:

1. **Economy:** strengthening the basic economy and jointly investing in knowledge, infrastructure, and attractiveness of the region;
2. **Mobility:** making sure that the region is easily accessible, regionally, nationally, and internationally;
3. **Transition rural area:** tackling the current major challenges in rural areas together, and helping companies with the necessary transitions;
4. **Energy transition:** making the region more sustainable, offering residents and businesses an energy-neutral living environment, and providing them with sustainable energy options.

The triple helix cooperation is centred on Foundation Eindhoven Brainport, who own the trademark "Brainport Eindhoven". This is a close partnership of companies, knowledge institutions and the 21 municipalities, whose aforementioned strategy (see Figure 3.2.) is operationalised by the development company, Brainport Development. Brainport Next Generation has meant moving away from the Triple Helix model to a Multi Helix model which involves citizens, customers, consumers, investors, designers, artists, and corporations, and focuses on the connections between technology, design, and social innovation[xix].

The motto for the region is "a region where it is good to work, reside and live." Its goal is to rank among the top 5 in Europe, and the top 10 in the world, when it comes to economic strength and growth.

4 The Eindhoven, Leuven, Aachen Technology Triangle (ELAt) connects three of Europe's most important centres of population and economic activity: the Flemish urban network, the Ruhr valley, and the Dutch Randstad. ELAt aims at promoting a knowledge economy via cross-border and interregional cooperation. In addition to the three cities, the partners in the ELAt project are two regional public authorities (the Eindhoven Regional Government (SRE) and AGIT, the regional development agency of the Aachen region) and one university (KU Leuven Research & Development - LRD).

Figure 3.2. The Foundation Eindhoven Brainport Strategy

1 INNOVATION, TECHNOLOGY AND ENTREPRENEURSHIP

Task 1:
Develop key enabling technologies: the technologies of the future

Task 2:
New technology-market combinations for societal challenges

Task 3:
Support SMEs, startups and scale-ups

Task 4:
Funding for startups and scale-ups

2 TALENT: THE FUEL FOR OUR TECHNOLOGICAL ENGINE

Task 5:
Innovative education for all pupils and students in Brainport

Task 6:
Everyone in Brainport abides by the principles of Lifelong Learning

Task 7:
A well-balanced labor market: the right people in the right jobs

3 LIVING ENVIRONMENT AND BUSINESS CLIMATE

Task 8:
Invest in joint amenities and accessibility

Task 9:
The triple helix as driving force for widespread prosperity

Task 10:
Instruments to support public-private ecosystems

3.3.1. Foundation Eindhoven Brainport Cooperation

Brainport Industries is both a physical place and a supply chain for advanced, precise, and intelligent high-tech equipment. It has resulted in the co-location of numerous firms in one location, in a spirit of open innovation that enables knowledge flow. Its strengths lie in its deep-seated commitments to:

- **Building Strong Public-Private Partnerships** that are built on trust, leverage, and proximity; where local and international companies are closely intertwined with an extensive network of local cooperation partners. They benefit from each other's equipment, services, personnel, and knowledge;
- **Preserving and cultivating technology leadership** where the innovation ecosystem is a breeding ground for new technologies and industry. It is argued that it is vital that companies are agile; that they can switch between different application areas and constantly develop new applications for these technologies. In this way, they contribute to solutions for social issues, such as the energy transition and climate objectives;
- **Linking knowledge to industrialisation and earning capacity** meaning that companies collaborate intensively with knowledge and educational institutions. This strengthens competitiveness, and pays off in job growth in the manufacturing industry; and
- **Making smart use of globalisation** is viewed as a success factor of the Brainport Eindhoven ecosystem, particularly given its international perspective and strong focus on export. This results in a hybrid region: that is, a broad network of local suppliers and customers that have an intensive connection with other regions in the Netherlands, and far beyond.

3.3.2. Innovation from Municipality Cooperation

Like Brainport, Eindhoven is in its 'next generation' of development. This combines "(ICT) technology, (open) data and design thinking to create a vibrant city", working to the quadruple helix model of collaboration and engagement "to co-create solutions with meaningful societal impact" and which *"are technology-enabled rather than technology-driven"* [emphasis original] (Municipality of Eindhoven, 2016: 8).

As noted in Section 3.1., under the Netherlands Smart City Strategy, Eindhoven's specialism is in smart mobility. Unlike Ireland, one remit for the local authorities in the Netherlands is managing local transport. Focusing on the core goal of improving accessibility within and across the region, and tackling the problems of congestion, air quality and health, the MRE commissioned an environmentally friendly transport system which resulted in the innovative Phileas Advanced Public Transport (APT). The project was initiated in 1998 to retain and further support knowledge and expertise in the fields of technology and innovation in the region and create jobs. It highlights what can be achieved when the problems of an area are linked to the strengths of its regional automotive, electronic, and design-oriented industries and knowledge hubs[xx]. The resulting APT is a semi-automated bus on a network of dedicated lanes, offering a low-cost service with a high level of information to the travellers, and connecting new spatial developments by this public transport network. Developed by companies within the Eindhoven area, the infrastructure is not only much cheaper because of less maintenance, it is also 'cleaner'. Visually, there are no rails and overhead lines. The significant innovative feature of the bus is the recharging of the battery by means of electromagnetic induction which means that the battery can be made much smaller, and thus less heavy and environmentally damaging.

In their 'smart region' development, Eindhoven Brainport have tailored their own place-based policies. It has in the past two decades emerged as a 'Top Technology Region' and capital of industrial design and has become a cornerstone of the Dutch economy. As an innovative high-tech region, Brainport is responsible for significant private investment in R&D and generates over 35% of all patents registered in the Netherlands each year. Through addressing Eindhoven's social issues of today and tomorrow with all stakeholders in the city via local testbeds, Brainport is developing solutions to worldwide problems in the areas of energy, mobility, and health[xxi].

3.4. Key Reflections

The Netherlands model of smart regions places a strong emphasis on the opportunities that can accrue from a city/county specialism (the potential of 'place') and of working together to achieve shared goals and priorities (collaboration and partnership). This good practice model of cities and places collaborating as networks ties well with key policy objectives of the RSES; namely RPO 6: Collaboration between Metropolitan Areas, and RPOs 28-30: Networks as Regional Drivers for Collaboration and Growth.

The expected growth in the metropolitan region surrounding Rotterdam and The Hague, part of the Randstad Conurbation, has resulted in a strong emphasis being placed on smart sustainability. Of particular interest to the SR is the emphasis placed on the development of a regional energy strategy and a growing agenda in the areas of circular economy, net-zero carbon and active travel. This is particularly informative for RPO 90: Regional Decarbonisation, and RPO 98: Regional Renewable Energy Strategy under the current RSES. The Metropolitan Region, involving 23 municipalities, operates as a voluntary partnership in the form of a municipal regulation with, in some key sectors, statutory tasks e.g., transport and traffic management. This is a strong example of multi-level governance in practice, a core focus of the COHES3ION Project under which this work programme is being undertaken.

In Eindhoven, the *Brainport 2020 Strategy*, is focused on developing the city as a sustainable, technologically innovative, and economically successful place for all its citizens. This smart region is at the heart of an ambitious Dutch knowledge policy agenda and has a strategic focus on investing in technology innovation and value chains across high technology systems. Involving a collaboration of 21 local municipalities on a voluntary basis, it is worth noting that the day-to-day management is run by a regional government agency, Metropoolregio Eindhoven (MRE), which works to four regional living environment themes: Economy, Mobility, Transition rural areas, and Energy transition. Indeed, future mobility is a key specialism of Eindhoven under the Netherlands Smart Strategy; with the inter-agency collaborative model being relevant for RPOs 160 and 161 on Smart Mobility under the RSES, and emerging links to S3 and regional specialism in the Connected and Autonomous Vehicle (CAV) sector and Future Mobility Ireland campus.

The task-focused model of smart regions employed by the Netherlands is creating vibrant cities and smart regions, working extensively to the quadruple helix model of collaboration and engagement, and co-creating solutions with meaningful societal impact. Importantly, the Netherlands approach is technology-enabled rather than technology-driven.

CHAPTER 4: FINLAND – INNOVATIVE ECOSYSTEMS BASED ON REGIONAL STRENGTHS

Finland's smart region programmes, as outlined below, recognise that a city cannot solve all problems by itself; that solutions need to be developed together with other key stakeholders – citizens, business, and the research community. A key tool used by the Finns' is the concept of agile piloting; a co-creation method whereby companies develop their products and services in close collaboration with residents and city government. A key output is the sharing platform, where cities share their learning and innovations with other interested cities – placing a strong emphasis on 'open platforms', 'open data' and 'open participation'. Indeed, the Finnish smart city/region model could be said to have three essential elements:

- Customer centred cooperation;
- Opening and utilising data; and
- Developing services in real urban environments.

One of the major themes emerging in the smart city narrative is the development of the carbon-neutral city – a goal also being pursued by Waterford City. This is strongly evident in Finland's smart regions. The overall objective of the smart agenda in Finland is to support sustainable urban development that, at a local and regional level, tackles the global challenges of climate change, ageing population, a growing digital divide and technological disruption. Collaboration is a core concept underpinning Finland's commitment to building smart regions and nurturing innovative ecosystems. Collaboration happens at many levels – with target groups, at district level and between cities.

4.1. Case Study 1: 6Aika

Since 2014, 6Aika – or the Six City Strategy – has defined an era of co-creation and agile development across the Finnish cities of Helsinki, Espoo, Tampere, Vantaa, Oulu, and Turku (see Figure 4.1.). *6Aika - Open and Smart Services 2014-2020* is a joint urban development strategy of the largest cities in Finland with a core focus on sustainable growth and job creation. It represents an approach whereby the six cities work towards the same goals, such as carbon neutrality, at the same time; recognising that each has its own specific challenges, strengths, and objectives. 6Aika goals include:

- Boosting Finland's competitiveness and productivity of the public sector;
- Developing new service innovations; and
- Promoting business and employment.

With the strapline of "Making Cities Smarter Together", implementation of the strategy has been via projects involving, as appropriate, city government, businesses, R&D organisations, and citizens (i.e., the Quadruple Helix model). To date, around 60 projects have been launched, funded through a mix of European Regional Development Fund (ERDF) and European Social Fund (ESF) monies. The themes of the projects have ranged from smart mobility, smart learning environments[5], health and wellbeing, circular economy, and energy efficiency. Projects have been selected through open calls, and all projects involved participants from at least two of the six cities; with cities co-designing and co-producing the resulting projects. Such

5 *The Smart Learning Environments of the Future project aimed to improve the business opportunities of companies developing learning and learning environment products, services and technologies via co-creation and pilots with pupils, students and teachers. It provided companies with an opportunity to gain valuable user experience in a facilitated manner and test their products and services in the educational institutions of Finland's largest cities. For further details see https://6aika.fi/en/project/results-smart-learning-environments-of-the-future/*

collaboration has been critical in the creation of economies of scale. Learnings and experiences are more broadly shared – involving all six cities and their respective networks; with successful solutions reproduced for use in others.

Figure 4.1. The Six Cities Comprising 6AIKA

(Source: https://ec.europa.eu/regional_policy/en/ information/videos/what-has-cohesion-policy-ever-done-in-finland-watch-6aika)

4.1.1. The Cities in the Innovation Ecosystem

The approach adopted by 6Aika – with city government steering the strategy, determining the focus of calls for projects, engaging with potential applicants, and jointly selecting projects – has strengthened cooperation between the city and its business community. Local governments have become "facilitators for new solutions and active partners in companies' product and service development" (6Aika, 2021:7). Companies, meanwhile, through the project calls have been able "to test the attractiveness and functionality of new or updated products, services and operating models in urban environments" while also gaining insights into how local government works (6Aika, 2021:10). Residents, in turn, have an opportunity to provide feedback on the solutions being tested.

Such processes of co-creation, and 'agile piloting', result in the promotion of resilience and sustainable urban development.

Through the resulting innovation ecosystem, many of the challenges facing growth sectors and/or sectors undergoing economic restructuring, particularly in skills and training, have not only been identified but become the focus of many projects. 6Aika has been attributed as providing "an agile response to the needs of the labour

market" leading to, for example, closer cooperation between employers/industry and the education sector (6Aika, 2021:12).

In the city of Espoo, its engagement with 6Aika has been driven by a commitment to adopting a model of 'City as a Service' – an approach also adopted in Greater Phoenix (see Chapter 5). Through this model, a strong social agenda formed the foundation stones of the Six City Strategy; including youth unemployment, social exclusion, the impacts of climate change and the future of the service sector post-COVID. Key challenges included the ability of the community "to solve problems, develop talents, share skills in a new way and create new business models" (6Aika, 2021:17). Through the City as a Service model, Espoo provides services in a networked fashion with its partners, drawing on the City's existing resources and making best use of digitalisation and open data. Under the banner of Espoo Innovation Garden (recently rebranded as Enter Espoo), a culture of collaboration and co-creation is actively promoted in the design of city services and solutions to localised challenges. At the heart of Espoo Innovation Garden, which is owned 100% by the City of Espoo, is the Keilaniemi-Otaniemi-Tapiola area, the biggest innovation community in Northern Europe. It is both a physical place in Espoo as well as a collaboration platform and an active community of students, talents, and innovators. It is an ecosystem of start-ups, scaleups, growth companies and large international corporates, R&D centres, and Aalto University[xxii]. Its innovation ecosystem is broad ranging from health and ageing societies to Industry 4.0, from biotech and food to circular economy, and from creative industries to education and learning[xxiii].

Espoo's engagement and priorities with 6Aika is very closely aligned to its own city strategy, The Espoo Story[xxiv]. This is the same for all six cities – aligning local and regional priorities has not only been key to the success of 6Aika but has strengthened the participatory theme of Espoo's development strategy and contributed significantly to its goal of being the most sustainable city in Europe by 2030[xxv].

4.1.2. The Cities as 'Experimentation Platforms'

Through the process of engagement and collaboration via their active participation in 6Aika, the cities have adopted a new development culture and seize opportunities as they arise. The cities effectively put themselves forward as experimentation platforms for new products and services to create world-class reference sites. All six cities had a shared commitment to:

- Open innovation platforms;
- Open data and interfaces; and
- Open participation and customership.

As core principles driving the smart agenda of all six cities, this led to the creation of new know-how, and businesses and jobs by utilising openness, digitalisation, and partnerships[xxvi]. At the outset, all six cities were involved in large-scale 'spearhead projects' in cooperation with companies and other key stakeholders to create the preconditions for carrying out innovation activities and subsequent pilots.

Open Innovation Platforms, for example, have led to the development of new services in real-life environments, meeting the needs of citizens while Open Data and Interfaces has increased the use of open data and facilitated its standardisation and sharing.

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Figure 4.2. The Framework for 6Aika

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Greatly aided by their involvement in the Six City Strategy, Tampere has emerged as one of Finland's most notable smart cities. It has built a network that allows city residents, companies and research institutions to pilot and develop smart city solutions[xxvii]. Engaging the community and promoting digital participation has been a particular focus of Tampere's work programme under 6Aika. With the aim of digitising the services of the city by 2025 so that it can offer more modern services that can be used - regardless of place and time – the programme involves both extensive transition initiatives and agile experiments. Through agile experiments, the city can seek ideas from businesses to solve its predetermined needs. The aim is to find trailblazer solutions that are globally scalable. As a concept, it offers companies an easy and fast channel for

tapping into the city's needs and for testing and developing their own solutions in a real urban environment while the city, in turn, receives useful information on new digital solutions for optimising its operations and finding cost savings[xxviii]. Examples to date have included:

- Info screens that advised citizens in real time about changes in walking and cycling routes caused by tramway development; and
- Proactive water infrastructure maintenance to enable more efficient usage of pump operations to deal with wastewater and storm run-off.

Committed also to increasing vitality, the city is also using participatory budgeting[6] as part of its ongoing commitment to building citizen engagement in planning. Carbon neutrality and building a circular economy are also core objectives; with a new sustainable and smart neighbourhood of 25,000 people planned in the historical factory community of Hiedanranta. As part of this initiative, Innovative Hiedanranta is a platform for development that aims to create a Co2 negative district that produces more than it consumes. The district is investing in sustainable transport and logistics, a smart energy system, the circular economy, and a green and blue infrastructure; all with the aim of improving the lives of citizens through smart and sustainable solution[xxix].

While 6Aika is a joint strategy to which each city has entered a shared agreement – committing to the whole timeframe - each city has been able to decide how to locally organise and share their resources. There have also been oversight processes in place throughout the Strategy's timeframe to measure progress. For example, progress reports are presented to city management and politicians on a regular basis. As the 6Aika draws to a close, with all projects to be completed by 2022, the six cities have avoided "competing with each other" in favour of "sharing their resources, innovations, and good practices" (6Aika, 2021: 22). The cities acknowledge that, while there are no immediate plans for 6Aika-Mark 2, they remain committed to learning from each other, and collaborating when feasible and right to do so; that no city can solve all its problems – or harness its opportunities - single-handed.

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4.2. Case Study 2: The Helsinki-Uusimaa Region[7]

The Helsinki-Uusimaa Region lies at the heart of northern Europe. Situated on the south coast of Finland, the Region consists of 26 municipalities, including the Finnish capital city Helsinki, and is home to around 1.7 million inhabitants (see Figure 4.3.). This represents about a third of the country's total population. The Region contains the Capital Region of Finland – that is the cities of Helsinki, Espoo, Vantaa and Kauniainen – as well as a number of very small municipalities with around 2,000 inhabitants. This creates a unique opportunity to test and pilot smart and digital solutions for different sized cities and municipalities[xxx].

Figure 4.3. The Helsinki-Uusimaa Region

(Source: https://www.uudenmaanliitto.fi/en/helsinki-uusimaa_region/helsinki-uusimaa_region_facts)

The Region is one of the fastest growing areas in Europe. Like the Southern Region (SR), it has identified its rich cultural climate, dynamic learning and knowledge economy and green landscapes as being key assets in the Region's future sustainable growth. Unlike the SR area, it has a strong regional and social identity, and it is being developed as one integrated area[xxxi].

4.2.1. An Integrated Development Approach

This model of integrated development is being led by the Helsinki-Uusimaa Regional Council, a joint regional authority that is mandated by law and operates according to the principles of local self-government. Its members, serving fixed terms, are drawn from the municipalities in the region, and it is from these municipalities that it also receives its funding. Its governance arrangements are highlighted in Figure 4.4. The tasks of the Helsinki-Uusimaa Regional Council include regional and land-use planning and the promotion of local and regional interests in general. It is responsible for articulating common regional needs, long-term development goals and the right conditions for sustainable development[xxxii]. To support sustained wellbeing and economic growth in the Region, the Council works in close cooperation with member municipalities, the government, the business sector, universities, and research institutions, as well as with civic organisations; further speaking to the importance of the quadruple helix model in smart region engagement and collaboration.

Figure 4.4. The Organisation of the Helsinki-Uusimaa Regional Council

(Source: https://www.uudenmaanliitto.fi/en/regional_council/organization)

The Helsinki-Uusimaa Regional Council is responsible for the preparation of development plans for its own region, in cooperation with municipalities and other public and private actors. These plans cover such themes as housing, infrastructure, public services, environment, education, and economic and employment opportunities to name but a few; with the resulting plans including the long-term Regional Strategic Plan, a four-year Regional Programme,

and the Regional Land Use Plan. The Implementation Plan, updated annually, includes indicative funding and actors for the actions contained within these plans[xxxiii].

4.2.2. The Helsinki-Uusimaa Region as a 'Smart Region'

The Helsinki-Uusimaa Region defines a smart region as

> " *a place that leverages the power of IT to improve the life quality for its inhabitants, economic development and sustainable use of natural resources (2017: 9[xxxiv]).*

As is the case in many countries world-wide, globalisation, climate change, digitalisation and demographic changes are informing the transformation of both the Region's economy and work; with new and disruptive technologies and smart specialisation playing a key role. The Helsinki-Uusimaa Regional Programme 2.0, published in 2018, identifies the Region's strengths in smart specialisation as 'Urban Cleantech', 'Health & Wellness', 'Digitalising Industry', and 'Citizen City'[8]. In delivery of its regional programme, the Region

> " *will be shaped into a region where smart solutions are tested in real-life environments. The region invests in a model where it is being developed in cooperation between the public, research and private sectors, while also working together with regional inhabitants (Helsinki-Uusimaa Regional Council, 2018: 16).*

Under the banner of the 'Citizen City' the Regional Council builds on the active citizenship programmes already at play locally to bring together both companies and communities to create agile, user-focused services and solutions in areas such as transportation, housing, urban planning, and healthcare.

The Helsinki Smart Region, as a microcosm, highlights the smart expertise in Helsinki-Uusimaa. For example, the Helsinki Smart Region is a major operator in the development of clean technology – placing particular focus on new service models. Operating to the quadruple

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8 In Helsinki-Uusimaa, the 'citizen city' reflects the commitment of the citizens to actively and creatively work together with companies and city government to develop agile, user-focused services and solutions in areas such as transportation, urban planning, housing and healthcare. The region, for example, is a world leader in making data public and using it to create new businesses. It represents the coming together of significant technologies with social innovations. Examples of Citizen City projects can be reviewed at: https://helsinkismart.fi/cases/?_cases_theme=citizens-city#acf-cases-listing

helix model of collaboration, this smart region is co-creating smart innovations and test-labs. Facilitated by the Helsinki-Uusimaa Regional Council, there is a growing case for the 'smart region' moniker to be replaced with 'sustainable region'. Sustainability has, in Helsinki – but also across the wider region - moved from concept to guiding principle; a shift being largely driven and informed by the UN Sustainable Development Goals (SDGs). One such goal is "An inclusive, safe, resilient and sustainable city"; the achievement of which undoubtedly requires "the adoption of Information and Communication Technologies (ICT) enabled innovations that support to ensure a sustainable future for cities" (Rodrigues & Franco, 2019).

By way of example, the area of Kalasatama in Helsinki is a 430-acre neighbourhood previously used as docklands and now undergoing a master-planned regeneration that is committed to giving residents more free time. The area, already home to 5,000 people (expected to rise to between 25,000-30,000) is experimenting with smart building technologies, geothermal heating, and wastewater heat recovery (Townsend, 2020). Kalasatama has become a global model in smart urban construction and agile experimentation[xxxv]. Buildings are being connected to a network of pneumatic tubes that bring recycled products from home to a central collection point. In skyscrapers, elevators can be pre-called to a particular floor via a SmartApp. Connectivity is central to the design of the neighbourhood – thus reducing the need for private cars – and parking spaces for same. Public digital data for 21 buildings in the area (to date) is being collected and circulated – including data on water usage and heating (Townsend, 2020). Every aspect of the regeneration of this – and other – neighbourhoods is couched in the City's ambition to be carbon neutral by 2035. This requires significant changes to how we design, build, and use the built environment. Smart solutions and learnings from Katasatama are now being taken forward in other regeneration areas across the Helsinki Smart Region.

4.3. Key Reflections

The overall objective of the smart agenda in Finland is to support sustainable urban development that, at a local and regional level, tackles the global challenges of climate change, ageing population, a growing digital divide and technological disruption. Indeed, the concepts of 'smart' and 'sustainable' are very strongly intertwined in Finland's smart journey and resulting programmes. Collaboration is a core concept underpinning Finland's commitment to building smart and sustainable regions and nurturing innovative ecosystems. A key tool used by the Finns' is the concept of agile piloting; a co-creation method whereby companies develop their products and services in close collaboration with residents and city government. A key output is the sharing platform, where cities share their learning and innovations with other interested cities –

placing a strong emphasis on 'open platforms', 'open data' and 'open participation'.

The 6Aika – or the Six City Strategy – places a central focus on co-creation and agile development across the Finnish cities of Helsinki, Espoo, Tampere, Vantaa, Oulu, and Turku. With the strapline of "Making Cities Smarter Together", implementation of the strategy has been via projects involving, as appropriate, city government, businesses, R&D organisations, and citizens (i.e., the Quadruple helix model). Funded through a mix of ERDF and ESF monies, the themes of the projects have ranged from smart mobility, smart learning environments, health and wellbeing, circular economy, and energy efficiency – reflective of Giffinger et al's characteristics and factors of a smart city as outlined in Chapter 2 (see Figure 2.2.). Projects have been selected through open calls and involved participants from at least two of the six cities; with cities co-designing and co-producing the resulting projects. Such collaboration has been critical in the creation of economies of scale.

In the Helsinki-Uusimaa Smart Region, its governance model and integrated development approach are of particular interest to the SR. Similar to the functions of the SRA, the tasks of the Helsinki-Uusimaa Regional Council include regional planning and the promotion of local and regional interests in general. In addition, it is responsible for articulating common regional needs, long-term development goals and the right conditions for sustainable development. Its governance structures are like those emerging within the SR to oversee the implementation of the RSES. Under the banner of the 'Citizen City' – a key focus of the new EU territorial cohesion programme – the Regional Council brings together both companies and communities to create agile, user-focused services and solutions in areas such as transportation, housing, urban planning, and healthcare.

Key take-aways for the SR include:

- Importantly, both Finnish examples of a smart region in action adopted as a core principle the need to intentionally avoid cities competing with each other; instead opting to share resources, innovations, and good practices. This approach brings valuable insights to the SSR on RPO 6 Collaboration Between Metropolitan Areas and its objective to establish a collaborative intra-regional partnership approach between the region's metropolitan areas of Cork, Limerick Shannon, and Waterford and a similar inter-regional approach with the Galway Metropolitan Area in the Northern and Western Region (2020: 87);
- Both regions, but Helsinki-Uusimaa in particular, highlighted the importance of branding and nurturing a strong regional and social identity; with resulting plans and strategies covering a single integrated area; and
- Both smart regions are in the process of building 'Demonstrator Villages' of smart programmes at work, as called for by stakeholders in the SR (see Report 1). In Tampere under 6Aika, Innovative Hiedanranta is being developed as a Co2 negative district - investing in sustainable transport and logistics, a smart energy system, the circular economy, and a green and blue infrastructure; while in Helsinki, the area of Kalasatama is a 430-acre neighbourhood previously used as docklands and now undergoing a master-planned regeneration that is experimenting with smart building technologies, geothermal heating, and wastewater heat recovery.

CHAPTER 5: GREATER PHOENIX SMART REGION – LEVERAGING TECHNOLOGY TO TRANSFORM COMMUNITY

In November 2019, Greater Phoenix's Smart Region Consortium, The Connective, was officially launched. Over two years in development, The Connective is a multi-disciplinary consortium between the public sector, academia, industry, and civic bodies. Following the quadruple helix model, it involves specifically the Greater Phoenix Economic Council (GPEC), Arizona State University (ASU), Maricopa Association of Governments, the Partnership for Economic Innovation (PEI) and the Arizona Institute for Digital Progress (AZiDP), together with 22 Greater Phoenix cities and towns (see Figure 5.1.). Its objective is to drive the creation, advancement, and adoption of smart city technologies, rooted in connectivity, mobility, equity, and sustainability, within Greater Phoenix communities.

Figure 5.1. The Greater Phoenix Smart Region

(Source: https://www.technologymovers.net/phoenix.html).

With a long-term vision of becoming the nation's largest smart region, a more immediate objective is to

> *elevate the region's competitiveness and enhance the reputation of Greater Phoenix as a preeminent market where companies can test, develop and deploy technology at scale while providing our residents with a technologically advanced lifestyle opportunity[xxxvi].*

Prior to this, cities in the wider region tended not to collaborate with each other – operating more to a model of competition. Yet, the challenges faced by many of these cities were the same and did not stop at municipal borders. Taking a place-based approach to the future socio-economic development of the region, The Connective is viewed as a tool to solve this fragmented approach to good urban management. It involves both a holistic and collaborative approach to the myriad of challenges facing cities and towns in the Greater Phoenix Area by ensuring that "groups are working together" and "leveraging technology"[xxxvii]. It is widely viewed as "the first major regional effort in the United States to engage communities across such a broad range of municipalities in co-designing and co-investing in our smart and connected futures"[xxxviii]. Of equal importance, according to the Greater Phoenix Economic Council (GPEC) was the fact that it also "allow(s) cities to think bigger"[xxxix]. In October 2020, the European Commission selected Greater Phoenix and The Connective to become a mentor to European cities as part of the Intelligent Cities Challenge (ICC); an initiative that brings together 136 cities, including Cork City in the Southern Region, to achieve intelligent, socially responsible, and sustainable growth through advanced technologies (see Report 1 of this research for further details). This selection makes Greater Phoenix the first mentor region from the United States chosen to work with EU cities. Over the next two years, each mentor city will be paired with communities facing similar challenges to collaboratively work together to find sustainable solutions using innovative smart city technology[xl].

The Connective has five core goals, all mutually re-enforcing:

1. To improve quality of life;
2. To drive equality;
3. To enhance revenue;
4. To promote sustainability and resilience; and
5. To support economic competitiveness[xli].

Achieving these goals requires a number of key foundational elements to the smart region framework: (1) a place-based approach, (2) a commitment to engagement, (3) a strong collaborative partnership, (4) a regional identity that is based on connectedness – whether through physical infrastructure, digital infrastructure or culture and heritage, (5) a willingness to work with data and new technologies in addressing local/regional challenges and opportunities, and (6) governance arrangements that suit the particular needs of the consortium or collective. These 6 foundation stones for the Greater Phoenix Smart Region have also been identified as integral to any smart region initiative in the SR.

5.1. One Region, Many Partners

The Connective is a fluid partnership centred on a 'network of networks'. It has no formal strategy in place. Rather, since its launch, members of The Connective have been engaging with different towns and cities in the Greater Phoenix Region to get an understanding of the issues they are facing, and the role of technology and digitalisation in their solutions. As appropriate, public-private, and public-private-academic partnerships will be established to work on solutions and ensure a societal impact.

The Connective already has over 22 partners signed up to work with it on pursuing a solutions approach to problem solving that leads "to the creation of implementable, interconnected, affordable, and interoperable services that enhance the quality of life for the citizens and businesses"[xlii] locally. Partners include Dell, Cox, Alteryx, Mastercard, Sprint and The Salt River Project. Industry partners are required to formally commit to The Connective for a minimum of three years.

At the community level, partners are requested to make a pledge to support The Connective for multiple years to enable multi-year, community-driven research projects. Each Consortium member will have representation on the Smart Region Leadership Council. Communities also have the option to participate as an observer at no financial cost. While this option means less benefits in terms of access to training programmes or voting privileges, it strengthens regional relationships, opportunities for collaboration and sharing of best practice.

The Connective is funded through a mix of public, private, university and grant funding. Multi-annual commitments from partners enables multi-annual research and training programmes to be rolled out; with these programmes, in turn, supported by testing of solutions, data management and regional branding.

5.2. The Region as a Living Lab

The Connective believes that building a smart region is more than creating smart programmes. Rather it is about making life better for everyone who lives and works within the region – socially, economically, and environmentally. Whilst still at an early stage in its evolution, the consortium is already leading to several regional initiatives centred on the concept of the 'Smart Living Lab'. The Maricopa Association of Governments works closely with member communities to identify challenges or opportunities that they believe can be addressed through technology. ASU will serve as the research and testbed centre, particularly through the Center for Smart Cities and Regions established in support of this smart region initiative. Again, reflective of the community-driven approach to building smart regions that informs the work of The Connective, the Center's work will focus on improving the ability of communities to "leverage the IoT and other new technologies to advance the overall economic, social and cultural health"[xliii] in the Greater Phoenix Region. Industry partners then collaborate to develop proposed solutions as appropriate, and 'test' these in-situ. Monitoring of the impacts and outcomes of the solutions trialled is collected and analysed by the Maricopa Association so that lessons can be shared and, where appropriate, solutions scaled-up. In addition to promoting peer-to-peer learning within the Greater Phoenix Region, The Connective also produces progress reports on its successes and failure to share with other cities engaging in the smart agenda. Currently such sharing is taking place with Columbus, Ohio and Kansas City, Missouri[xliv].

Cox Connected Environments Collaboratory: Cox and Arizona State University (ASU) have jointly launched the Cox Connected Environments Collaboratory, an incubation space at ASU that will cultivate a smart region ecosystem while addressing the need for a consistent, powerful network on campus and beyond to fully capitalise on the potential of these smart region initiatives. Students, faculty, and staff will develop Internet of Things (IoT) solutions to problems facing the optimisation of buildings for sustainability, providing new learning experiences in virtual and augmented reality, infrastructure modelling, privacy and security, sustainability, and more[xlv].

Smart City Academy[9]: The Center for Smart Cities and Regions in ASU has developed an educational programme around smart and connected cities. The Smart City Academy supports individuals and organisations to develop, implement and manage smart city endeavours effectively.

Smart City Cloud Innovation Center (CIC)[10]: In 2019, Arizona State University (ASU) launched the Smart City Cloud Innovation Center (CIC) powered by Amazon Web Services (AWS)[xlvi]. This initiative focuses on building smarter communities in the Phoenix metropolitan area by using the AWS Cloud to solve pressing community and regional challenges, with a specific focus on artificial intelligence and machine learning. The center is designed as part of a long-term collaboration between ASU and AWS to improve digital experiences for smart city designers, expand technology alternatives while minimising costs, spur economic and workforce development, and facilitate sharing public sector solutions within the region.

Data Analytics: Alteryx and ASU are teaming up to use the former's data analytics platform to effectively use data to solve smart region challenges. This partnership will give students, faculty and staff members in ASU an edge on tackling real-world business issues and driving social impact[xlvii].

9 See https://ifis.asu.edu/content/cscr-initiatives

10 See https://smartchallenges.asu.edu/

5.3. Smart Regions as a Service

Within the USA, the Greater Phoenix Smart Region consists of a clustering of a number of large and economically comparable cities – Phoenix, Tempe, and Glendale to name but three. By developing this smart region using a 'Smart Region as a Service' approach, local government, industry, and academic research institutes are empowered to collaboratively design, develop and deploy new innovative technology-based solutions to everyday issues, and break out of a deepening silo-based model of service delivery[xlviii].

Arizona is already a well-established 'lab' for autonomous vehicles (AV), and through The Connective several Urban iLabs[11] will be established to design the cities of the future in "a living city environment". In partnership with the Arizona Institute for Digital Progress (AZiDP) and ASU, the 'Smart Region as a Service' platform enables 22 jurisdictions to create a new culture of collaboration, utilise the power of smart city technologies and align digital roadmaps. In taking a bottom-up approach and linking the smart agenda to public service provision and offering solutions to community challenges and opportunities, the 'Smart Region as a Service' will resonate with people, and engage them further in the digitalisation transition – thus building digital inclusion and digital skills.

COVID-19 Economic Modelling Project: The Connective is part of Mastercard's City Possible™ initiative[12], a new model for urban innovation and development in which a global network of cities, businesses, academics, and communities work together to make the world's cities more inclusive and sustainable. In April 2020, as the Greater Phoenix Region deals with the outfall of COVID-19 on its regional economy, Mastercard entered into an agreement with The Connective to provide free access to weekly spending data through its Mastercard Retail Location Insights portal. Through this partnership, local governments are gaining access to resources they otherwise wouldn't have.

> *Our ability to access Mastercard data on retail spending within the region, and the state, across multiple categories on a weekly cadence provides an additional tool to help our cities and towns with their budgeting process[xlix].*

This spend data covers sectors such as dining, groceries, apparel, fuel, and accommodations; can identify whether consumers are domestic or international; and pinpoints information by precise location, down to the city block. Historical data is also provided for context and year-over-year comparisons. Analysis of this data is taking place through a partnership involving the Maricopa Association of Governments, the Arizona Commerce Authority and other industry and public-sector partners under the banner of the 'COVID-19 Economic Modelling Project'. It is hoped that by triangulating this data with geospatial data and other datasets as relevant, it will result in the public sector making better, evidence-informed decisions on future development and investments.

For further details on The Connective, see *https://www.greaterphxconnective.com/*

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11 *The Arizona Urban iLabs are a key structural networked component of The Connective. The Urban iLabs are intended to foster collaborations across professions and stakeholders. These "innovation sandboxes", located throughout the region, will create a "living lab environment" where solutions can be tested and scaled, as well as provide the member communities with IoT infrastructure, such as a place to test beacons and sensors (https://www.govtech.com/products/phoenix-partnership-promises-to-further-regional-smart-cities-work.html).*

12 *Smart Dublin was one of the founding members of City Possible, a global network for urban co-development. As part of this network, Smart Dublin formed a three-year partnership with Mastercard in November 2017 focusing on data analytics; developing and testing an Economic Development Platform to better understand the impact of specific events (St Patrick's Day) or weather on spending patterns in specific neighbourhoods. The resulting data feeds into policy decisions on the local retail and planning outcomes.*

5.4. Key Reflections

Taking a place-based approach to the future socio-economic development of the region, the municipalities within The Connective recognised that the challenges faced by its cities and towns were largely the same and did not stop at municipal/administrative borders. Addressing these challenges requires collaborative action and the leveraging of technology. To achieve its goal of becoming a smart region, the founding partners of The Connective identified a number of key foundational elements to its' smart region framework: (1) taking a place-based approach, (2) a commitment to engagement, (3) building a strong collaborative partnership, (4) adopting a regional identity that is based on connectedness – whether through physical infrastructure, digital infrastructure or culture and heritage, (5) harnessing a willingness to work with data and new technologies in addressing local/regional challenges and opportunities, and (6) establishing governance arrangements that suit the particular needs of the consortium or collective.

The Connective believes that building a smart region is more than creating smart programmes. Rather it is about making life better for everyone who lives and works within the region – socially, economically, and environmentally. In addition to its emphasis on adopting a place-based approach, other key aspects of the Greater Phoenix Smart Region of interest to the SR is its approach to bringing together a diverse range of stakeholders and ensuring their multi-annual buy-in to ideal of the 'smart region' as 'One Region' speaking with a singular voice on the most pertinent challenges to be addressed – leveraging data and technology. In addition, and whilst still at an early stage in its evolution, The Connective is already leading to a number of regional initiatives centred on the concept of the 'Smart Living Lab' - focusing on improving the ability of communities to leverage IoT and other technologies to advance the region's overall economic, social, and cultural health. Importantly, the partners have all recognised the importance of academia and universities across the region in supporting the co-creation and co-production of solutions to localised challenges. Across the SR, there are opportunities to create a Smart City Academy, similar to that in ASU, in collaboration with existing universities – University of Limerick (UL) and University College Cork (UCC) – and the emerging technological universities, Technological University Shannon (TUS), Munster Technological University (MTU) and Technological University of the South East (TUSE). The Connective further highlights good practice in alignment of digital roadmaps. This is of particular interest to the SR as each of its constituent local authorities prepare and adopt digital strategies (RPO 183: Digital Strategies).
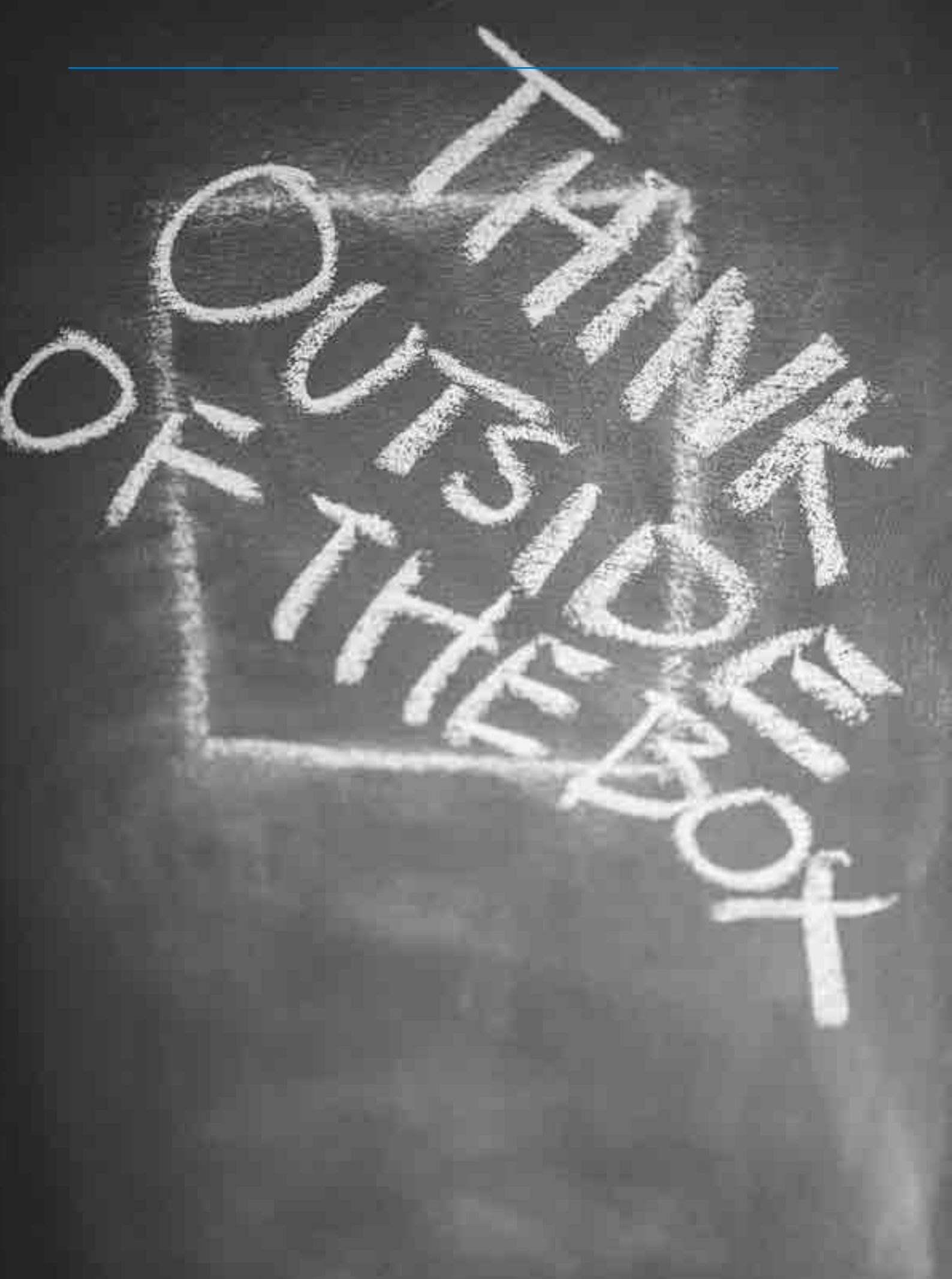
CHAPTER 6: SMART BADEN-WÜRTTEM-BERG, GERMANY

The southwest German state of Baden-Württemberg – an area that includes the city of Stuttgart as well as the rural Black Forest – is facing many of the same issues being experienced right across Europe – including Ireland: tightening budgets, growing pressures on services, changing consumer patterns and behaviours and, since the advent of the global coronavirus pandemic, changing working and commuting patterns.

While these issues grow in significance, the region finds itself at a very early stage in its digital transformation. In late 2016, Baden-Württemberg decided to launch a multi-disciplinary digitalisation strategy called digital@bw[1] (see Figure 6.1.). This was in direct response to a lack of digital investment across Germany at this time. The resulting digital strategy for the region was published in 2017. This is a forward-looking aspirational document, intended to guide future work. It's stated objectives are: mobility for the future (e.g., automated driving & simple public transport); digital start-ups (e.g. build ecosystems); digitisation in the economy (e.g., knowledge transfer in agriculture and forestry); digital education in young people (e.g., preparing teachers); Digital health (e.g., promote health preservation and adopt technology); Administration (e.g., pioneer digitalisation in local authorities); Research (e.g., create Science Data Centres - centres for data availability); Internet; Sustainable and Energy Transition – exploiting digital technology to achieve goals; and Data Security – ensuring high standards.

Figure 6.1. The Baden-Württemberg Digital Strategy, digital@bw

The digital strategy is broad representing the collective input of all twelve sub-regions[13] in the Baden-Württemberg region. While the digital strategy exists, and takes a regional perspective, there is no regional framework for implementation. This means that activity is mainly decentralised, and decisions are taken locally.

While not explicit in its digital strategy, Baden-Württemberg has a long proud history of citizen

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13 The region of Baden-Württemberg is made of 12 sub-regions and 1,101 communities. The region includes nine large cities with 100,000 inhabitants. The 12 sub-regions are responsible for several functions including economic development and planning (incl. infrastructure, fibre, etc.)

engagement. One major mechanism for operationalising the digital strategy is through a challenge programme, 'Digitale Zukunftskommune @ bw' to fund a series of city and district digital initiatives that would benefit from a share of €800,000 euros. As a result, four cities and a network of districts are being turned into digital future communes, while 50 other municipalities will be supported on their journey into the digital age.

> " *The state government relies on the creative power of the local communities to increase the acceptance of the citizens for one of the biggest social changes of our time. This is an essential key to success[li].*

6.1. Building Digital Futures: A Place-Based Approach

As mentioned above the practical implementation of the regional digital strategy is through a challenge process. To date, a large focus has been on supporting individual municipalities develop their own digital strategy – most of which are complete and published. Following that, a number of lighthouse projects have been initiated. These include the original challenge which was based on digital communities (see vignette below) and a more recent digital village challenge with a focus on how to preserve the future viability of the villages. Together, these demonstrate the region's commitment to citizen engagement.

The Future Communities Challenge

The Future Communities Challenge was launched by the Baden-Württemberg regional government to encourage the development of digital competency and collaboration. Upon selection of winners from state-wide submissions, the state chose to fund five lighthouses of digitisation. The winning cities and networks of cities received a share of €880,000 euros for the implementation of extensive digitisation projects. In parallel, the cities and networks of cities were provided support in developing comprehensive digitisation strategies that emphasised engagement with civil society, research institutes and businesses. In a second phase, the state selected digitisation projects from the developed strategies, and have committed €7.6 million euros to their development.

In parallel with this support, the state funded accompanying scientific research in support of the successful submissions, and in support of scaling the successful submissions. One result of the research is the Digital Cook Book developed by Fraunhofer IAO, a support for municipalities in the development of their own strategies.

Digital strategies and projects can be found at *https://www.digital-bw.de/digitalisierungsstrategien-bw*

Table 6.1. highlights some of the sample projects supported by the Future Communities Challenge

The success of the process has been attributed to its decentralised – or bottom-up – approach. The projects also deliver 'quick wins' for the communities concerned; with lighthouse projects intended to be short-term, well defined, measurable projects which can be transferred once successful.

Table 6.1. Sample of Projects Supported by the Future Communities Challenge

Area	Project
Aalen	Introduction of an app as a marketing measure in destination management
11 municipalities	RegioENERGIE develops a sustainable basic structure for long-term, continuous digital development of the region. These are used to build solutions for a wide variety of areas such as administration, energy and citizen interaction and combine them into a meaningful overall picture.
Weingarten	Recommendation for strategic school IT planning
Zollernalbkreis	Strong together through networking! A citizen app is intended to bundle the various applications and information

Despite its digital transition being only a few years old, Baden-Württemberg leads the Smart City Index[14] – as noted in a press release from the regional government in October 2020,

> *Württemberg's cities are once again at the top of the Bitkom e.V. Smart City Index. With Karlsruhe, Stuttgart, Heidelberg, Freiburg, Ulm and Mannheim, six are among the top 20, and all in all, the cities of Baden-Württemberg do above average.*

6.2. A Collaborative Approach to a Smart Region

With respect to large service providers, there are over 100 utility companies in the Baden-Württemberg region. Most of these are local and, many have been in existence for decades and generations. Therefore, the relationships with municipalities and regional government have grown over some time. In some cases, the utility companies are embedded in the oversight of service plans and future roadmaps. In other cases, the interaction is much more open and loose. The strength of these collaborative partnerships is central to the effective delivery of the stated objectives of *digital@bw* – not least its overall objective of achieving balanced and sustainable development and supporting an energy transition.

6.3. Building the Ecosystem

Over the decades, Baden-Württemberg has become a popular headquarters for tech start-ups and small and medium-sized enterprises (SMEs). The region is swiftly becoming one of Europe's leading investment and innovation centres, with more than 5,000 foreign companies having already based themselves there. This is especially the case in sectors focusing on artificial intelligence (AI) and future mobility. Research institutes are highly valued and in many cases are embedded in the development of digital strategies and participate in municipality oversight boards. The Baden-Württemberg region has an above average list of institutes within its boundaries. A particular role for these institutes is facilitating access to research funding, both nationally and from within the EU. They place a particular emphasis on funding through the European Regional Development Fund (ERDF) which, more recently, stresses smart regional development.

In addition, Baden-Württemberg excels in research and development, being home to several universities and research centres with a strong focus on Research and Innovation (R&I). Against this backdrop, the region offers "not only an ideal ecosystem for aspiring firms, but also a strong industry base with an exciting mix of SMEs and multinationals – all of which are potential clients"[lii].

6.3.1. Cyber Valley

Baden-Württemberg's Cyber Valley lies between the cities of Stuttgart and Tübingen; cities with a strong heritage in research, education, and innovation. The region also has the highest industrial density in Germany[liii]. Together with the Max Planck Society, the universities of Stuttgart and Tübingen, and the companies Amazon, BMW, Bosch, Daimler, IAV, Porsche and ZF Friedrichshafen, launched "Cyber Valley" as a research centre for intelligent systems. Unique in Europe, it already ranks among the top research centres worldwide – largely due to its research excellence and networks with global companies. Collectively, the research community within the Centre explore machine learning, computer vision and robotics; with a specific interest in processing information faster and more reliably, as well as developing intelligent software for self-driven vehicles and smarter traffic-guidance systems[liv].

The ambition is to further expand the Cyber Valley as a centre of excellence for technology and entrepreneurship, making it the nucleus for AI breakthrough innovations in Germany and Europe. The Centre aims to:

- Further expand state-wide cutting-edge research through personnel and infrastructure; and
- Foster cooperation and networking in top-level research at national and European level, for example at the Machine Learning Competence Centre, and promote cooperation with other enterprises, such as Industry-on-Campus, to promote entrepreneurship in an even more targeted way to become an outstanding platform for AI start-ups[lv]

6.3.2. ARENA2036

The Active Research Environment for the Next Generation of Automobile (ARENA2036) programme, located in the region, continues to revolutionise the automotive industry. It is one of nine research campi of the funding initiative "Research Campus – Public-Private Partnership for Innovations" in Germany. ARENA2036 is supported by the Federal Ministry of Education and Research (BMBF) and is run as a registered association with members from science and industry; with partners active in various disciplines – from the automotive industry, aerospace

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14 *This index is an annual German activity by Bitkom, a German Digital Association.*

technology, textile, and materials research to industrial science[lvi].

Set up on the campus of the University of Stuttgart as a factory of the future, ARENA2036 allows onsite testing of research findings from the manufacturing and development sectors. In particular, it focuses on integrated lightweight and innovative manufacturing technology, and benefits from close links to start-up Autobahn[lvii], a business accelerator for start-up companies working on hardware or software-based mobility solutions. In 2036, the programme will celebrate the 150th anniversary of the invention of the automobile in Baden-Württemberg by Karl Benz.

The goals and priorities of the Digital Strategy have been strengthened more recently with the publication in 2020 of the region's innovation strategy. Building on existing strengths and technological advancements – both sustainable and disruptive innovations, this strategy identifies future growth areas for Baden-Württemberg: namely, digitisation, artificial intelligence and Industry 4.0, sustainable mobility, healthcare, resource efficiency and the energy transition, as well as sustainable bioeconomy. It involves decoupling growth and resource consumption, expanding the circular economy and pursuing a programme of consistent climate protection[lviii]- recognising the need to ensure that any pathway of direction addresses global challenges and aligns with the UN's Sustainable Development Goals (SDGs).

6.4. Ongoing Challenges

While five years into its Smart Baden-Württemberg journey, there are still several challenges to be overcome:

Scaling projects: Progress to date has been based on building proof of concepts. The next phase will endeavour to scale these projects to provide greater societal impact. Issues such as funding and procurement rules hamper this goal.

Aligning data: Projects are mainly data driven. There still is the challenge of aligning data, in both broad and narrow senses, so that the data is reliable, timely and safe. Issues also arise as Europe is coming to terms with data laws, affecting digitalisation of processes.

Culture: As with public bodies the world over, the pace to become more open and agile, with a culture of sharing, and easily developing new collaborations affects the adoption of new technology.

6.5. Key Reflections

The German region of Baden-Württemberg –including cities such as Stuttgart and Tübingen as well as the rural Black Forest – is, like the SR, facing issues around tightening budgets, growing pressures on services, changing consumer patterns and behaviours and, since the advent of the global coronavirus pandemic, changing working and commuting patterns. Whilst local authorities across Ireland are in the process of adopting – or have adopted – their local digital strategies, Smart Baden-Württemberg's journey began with the publication of a regional digital strategy in 2017; an aspirational document with objectives in the areas of future mobility, digitalisation in the economy, digital education, digital health, digital start-ups, and R&I. Its direction of travel is the result of an active stakeholder engagement process; with delivery of priority actions decentralised to local communities.

As a regional strategy, it has identified common needs across the region, and pulled together shared priorities. Such an approach is particularly informative to the delivery of RPO 183: Digital Strategies; with analysis required into the extent to which the ten digital strategies covering this region demonstrate a regional coherence or call for collaborative partnerships and joint projects between groupings of councils. Such an overview will articulate the potential merits of having a regional digital strategy to co-ordinate the efforts of the local authorities in enabling the smart region. Any regional digital strategy could, in turn, be aligned to regional enterprise plans, and smart specialisation and/or innovation strategies.

The use of a challenge programme across cities and villages to operationalise the strategy and ensure limited resources are used to encourage digital competency and collaboration via short-term, well-defined lighthouse projects has proven to be an effective approach in promoting the smart agenda while also delivering 'quick wins' for the communities themselves. Such a mechanism in the SR could ensure local buy-in, and ownership, of effective smart programmes of work.

With an above average number of research institutes within its boundaries, together with one of the highest industrial densities in Germany, the region is developing a world-wide reputation as leaders in AI, machine learning (ML) and future mobility. The SR also has a rich tapestry of research centres with proven success in research funding, both nationally and at EU level. Greater effort is required by all parties to embed these centres into the smart region journey – both as drivers and enablers.

CHAPTER 7: CARDIFF CAPITAL REGION, WALES

In 2018, the Institute of Welsh Affairs (IWA) launched Our Smart Region: using smart technology in the Cardiff Capital Region to improve public services, infrastructure, and the economy. As a project, the aim of the IWA smart region was

> ❝ *to produce practical short to medium term recommendations and secure commitment to using smart technology to maximise the positive impact of the Cardiff Capital Region City Deal for the people who live and work in the region (IWA, 2018: 9).*

The project had three core objectives:

1. **Inform:** to understand and capture smart activity already happening within the Cardiff Capital Region (CCR);
2. **Inspire:** to collate and present inspiring examples from smart cities and regions around the world; and
3. **Catalyse:** to generate collective commitment to action to build a smart region in CCR and other regions of Wales.

The CCR was established in 2015 as part of a regional proposal to the UK Government City Deal funding, an initiative to promote economic growth while shifting control of decision making to local authorities. The

CCR represents ten local authorities: namely, Blaenau Gwent; Bridgend; Caerphilly; Cardiff; Merthyr Tydfil; Monmouthshire; Newport; Rhondda Cynon Taff; Torfaen; and Vale of Glamorgan (see Figure 7.1.). The area is 2840 Km (smaller than County Clare, larger than County Wexford) with a population of 1.5million. It is the largest city-region in Wales and accounts for approximately 50% of the total economic output of the Welsh economy and 49% of total employment[lix]. The area is home to a range of competitive business clusters with significant international and indigenous businesses across sectors such as: financial services; creative and digital industries; advanced manufacturing; life sciences; energy; and energy supply. Like many second-tier cities, its economy is centred on service activities (Waite, 2015).

The resulting Cardiff Capital Region City Deal (CCRCD), signed in 2016, was negotiated between local authority leaders and the UK Government with little public consultation. Valued at £1.2 billion with a timeline of 20 years, the City Deal has a strong emphasis on transport infrastructure and connectivity – recognising the proximity of Cardiff Capital Region to both Swansea City Region and Bristol City region - digital infrastructure, improving skills and employment, delivering enterprise growth and strategic planning for future housing and regeneration (Beel, 2018).

The CCR is overseen by a cabinet consisting of the leader from each local authority. It is responsible for the leadership, vision, and strategic direction for the CCR. It has also become the ultimate decision-making body for the City Deal, responsible for overseeing and coordinating the councils' obligations in respect of this substantial funding

and the associated autonomy. The CCR governance sub-committees include:

- **Regional Transport Authority -** the CCR Regional Transport Authority (RTA) comprises members from the 10 local authorities. It is responsible for co-ordinating transport planning and investment across the region and for advising the CCR Cabinet on recommended strategies to achieve transport objectives;
- **Joint Scrutiny Committee -** responsible for the monitoring of the City Deal project activity and for making recommendations to the regional cabinet; and
- **CSC Foundry Board -** CSC (Compound Semiconductor Centre) Foundry Board is responsible for ensuring the CSC project delivers its planned objectives. The project involves an agreement between the CCRCD and IQE plc, a large commercial manufacturer of semiconductor wafers, a regional anchor for high-end production of compound semiconductors.

Figure 7.1. The Cardiff Capital Region

(Source: Cardiff Capital Region[ix])

It also has several advisory boards, namely:

- **Economic Growth Partnership -** responsible for advising on matters of Economic Policy Development, and for providing strategic foresight and thought leadership. It is chaired by an external industry expert;
- **Investment Panel -** responsible for providing advice and guidance on all City Deal investment proposals;
- **Business Council -** responsible for ensuring that the voice of business is at the heart of CCR's strategy and decision making, chaired by an external industry expert;
- **Skills Partnership -** responsible for identifying regional priorities for skills investment led by the needs of industry. It brings together a wide range of stakeholders, including businesses; industry bodies; higher and further education institutions; training providers; schools; local authorities and the Welsh Government; and
- **Programme Board -** a review and consultation board responsible for providing local authority perspectives and made up of the Chief Executives of each of the Local Authorities plus nominated City Deal representatives.

From the outset, the focus of the Cardiff Capital Region was on economic growth, particularly within the metropolitan centre of Cardiff. A key criticism of the City Deal, and its associated governance structures, was that civil society "was positioned outside of the representational regime but is also expected to play along in terms of engaging with the neoliberal growth model" (Beel, 2018: 323).

Yet, the CCR and the networks and relationships developed in implementing the City Deal have been integral to setting up the Cardiff Smart Region.

7.1. 'Our Smart Region'

Shortly after its conception, and to ensure it was not wholly focused on the delivery of the City Deal, the CCR initiated a smart city programme. The Institute of Welsh Affairs (IWA) was commissioned to produce practical short- to medium-term recommendations and secure a commitment to using smart technology. The process of identifying recommendations included a collaboration with academia, Welsh public bodies with a remit for skills and the economy and many technology companies. These collaborators which included Arup, British Telecom (BT), Microsoft, Centrica, Cardiff University, The Open University, Y Lab, Next Generation Data, The Wales Co-operative Centre, and The Valleys Taskforce, co-funded the commission.

This work identified four key challenges to be overcome in delivering a smart region; many linked back to the recognised deficiencies with the City Deal process and governance arrangements. These included;

1. The CCRCD (Cardiff Capital Region City Deal) is a partnership of 12 different governmental bodies (10 local authorities, Welsh Government and UK Government) plus funding from the EU specifically for the Metro. Amidst this complexity, there is no single figurehead or leader to drive the agenda forward. There is also a lack of political incentive to work regionally;
2. There is no formal mechanism for external engagement with the region's stakeholders, including businesses, academic institutions, and citizens. The CCRCD website is rarely updated. There are some advisory groups (see above) mandated by the City Deal conditions; however, there is limited evidence of their active engagement in developing priorities;
3. There is plenty of good work to celebrate already across the region, but at present initiatives are fragmented with no formal means of joining up activities to amplify their impact and creating a shared culture of innovation; and
4. There is a wealth of evidence available from public bodies and other institutions about the features and needs of the region. However, this has not been collated and analysed to inform a shared assessment of priorities that can be easily communicated publicly.

To address these challenges, Our Smart Region was published in 2018 and went to public consultation. It proposed six steps to accelerate the introduction of smart technological approaches, and to move the CCR toward becoming a smart region.

1. Appoint a Digital Futures Champion to lead the region's digital strategy;
2. Create a clear, meaningful, and motivating Vision Statement;
3. Deliver a regional digital strategy that makes open, transparent communication a priority;
4. Build an Innovation Hub to co-create digital solutions that tackle regional challenges;
5. Launch a Challenge Fund to encourage innovation and ideas from communities, businesses, and organisations across the region, stimulating cross-sector collaboration; and
6. Build a Digital Skills and Employment Platform to up-skill the regional workforce.

7.2. The 'Arc of Innovation'

As recorded in Our Smart Region (2018), there are a number of 'smart' innovations under way across the CCR:

- Cardiff's SmartPark App, which provides real time information on available car parking. The system of SmartSpots that supports this app has the potential to support a Cardiff Internet of Things (IoT) network;
- A tech community group, Thethingsnetwork, is working to establish a free-to-use LoRaWAN in the Cardiff Urban Area, which will allow sensors and other devices deployed anywhere in the area to connect to the internet; and
- Cardiff University trialled use of social media analytics to carry out live community impact assessments during the NATO Summit. In future, geolocation analytics like this could allow police to monitor crowds in certain areas during large-scale events to obtain real time information, such as the size of crowds, their mood and where they are going (p.12).

However, these initiatives are small in scale and fragmented, and there is no current system in place to join them up or for them to feed into a region-wide plan for smart systems and solutions (IWA, 2018: 12).

As part solution, the CCR has an aspiration to extend the "arc of innovation" that stretches from Cambridge through the South-East Midlands and along the M4 corridor to take in Oxfordshire and Gloucestershire into the CCR. Capitalising on the research strengths of the Region's three universities, the CCR will designate an "Innovation District" that helps to:

- Create and nurture new high growth businesses;
- Increase investment in research and development; and
- Provide the skills that businesses need now and in the future.

As part of its innovation journey, the CCR have been looking to international practice to broaden their understanding of a smart region, and the value of operating to the quadruple helix – particularly in taking a citizen centric approach – and taking a place-based approach that plays to an area's strengths. As a result, under Our Smart Region, it is proposed that Monmouthshire become a 5G rural integrated testbed (5GRIT) site. 5G technology will be trialled across rural areas on schemes addressing smart agriculture, tourism and increasing internet speeds in poorly connected communities. This will be done using shared spectrum used by television and a mix of local internet service providers (ISPs) and self-provision (IWA, 2018: 39).

7.3. The Cardiff Capital Region Challenge Fund

The CCR have launched a £10 million Challenge Fund aimed at re-building local wealth through bringing innovative solutions to tackling some of the region's most urgent societal problems. Working in partnership with Cardiff University's Centre for Innovation Policy Research (CIPR) and YLab[15], the fund will invite public sector bodies to partner with private companies and the third sector to develop and test new ways of improving services for people in the area.

> The Challenge Fund will galvanise the collaboration between Cardiff University researchers and the CCR on local economic development...as we jointly strive to find solutions to key societal challenges[lxi].
>
> Gill Bristow, Professor of Economic Geography at Cardiff University

Three key challenge themes have been identified:

- Accelerating decarbonisation;
- Improving regional health and wellbeing; and
- Supporting, enhancing, and transforming communities.

Last April, this aspiration became reality when CCR announced its first Innovation Challenge Fund, open to any business able to demonstrate rapid simulation technology solutions for healthcare training. The £400k contract funding is available to competitive bids from any enterprise capable of delivering innovative, impactful tracheostomy training for Cardiff and Vale University Health Board: transforming the current training into a highly engaging learning experience that overcomes the restrictions caused by social distancing, lack of training facilities and the need for self-isolation.

The CCR Challenge Fund invites applications from public sector organisations to partner with private companies to develop and test new ways of improving services for people in the area.

7.4. Key Reflections

Like the SR, the CCR represents ten local authorities, has a population of 1.5million and is home to a range of competitive business clusters with significant international and indigenous businesses across sectors such as: financial services; creative and digital industries; advanced manufacturing; life sciences; energy; and energy supply. The smart region of Cardiff Capital Region is overseen by a cabinet consisting of the leader from each local authority – somewhat similar to the Ireland South East Development Office (ISEDO)[16] which works with leaders of the major regional industries as well as the Chief Executives of the Councils of the five counties in the South East (Carlow, Kilkenny, Tipperary, Waterford, and Wexford). Interestingly, despite the number of sub-committees and advisory boards established to oversee implementation of the City Deal and the emerging smart region, there was no single figurehead or leader to drive the agenda forward. There was also a lack of political incentive to work regionally. These challenges are relatable to the SRA as it explores options and mechanisms for building a SSR.

Having been borne out of the negotiated City Deal between the UK Government and local authority leaders, the absence of civil society from the process and resulting governance arrangements very quickly became an obvious omission, and key criticism, that needed to be redressed – and is a key learning point for any grouping of stakeholders building a structure around an emerging smart region.

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15 YLab is the Public Services Innovation Lab for Wales, a partnership between Cardiff University and Nesta. For further details see https://ylab.wales/we-are-y-lab

16 https://irelandsoutheast.com/

The research published by the IWA in 2018 proposed six steps to accelerate the introduction of smart technological approaches, and to move the CCR toward becoming a smart region. These provide an important steer to the SSR as it commences its journey – and indeed reiterates points raised in the previous examples highlighted. They include, for example, the need to appoint a Digital Futures Champion to lead the region's digital strategy; to deliver a regional digital strategy; to place an emphasis on tackling regional challenges and establish a challenge fund in support of this; and to ensure solutions are co-created – ideally operating to the quadruple helix model. With respect to the challenge fund, £10m has been set aside to 'g-local' issues – using a place-based approach – in the areas of accelerating decarbonisation, improving regional health and wellbeing, and supporting, enhancing and transforming communities.

The CCRCD has a further 15 years to run. A key objective of Our Smart Region is to inform its future focus and delivery, placing a greater emphasis on "how digital tools can provide new solutions to long-standing challenges that are not going away" (IWA, 2018: 1); thus, recognising the transformative possibilities of the City Deal while reducing the shortcomings of its initial years. As with many of the international smart region examples profiled in this report, technology is viewed as a key enabler of solutions to benefit society, the economy and infrastructure/connectivity. Its core objectives of Inform, Inspire and Catalyse are replicable within the SSR – speaking to the critical juncture held by the SRA between national policy and local action.
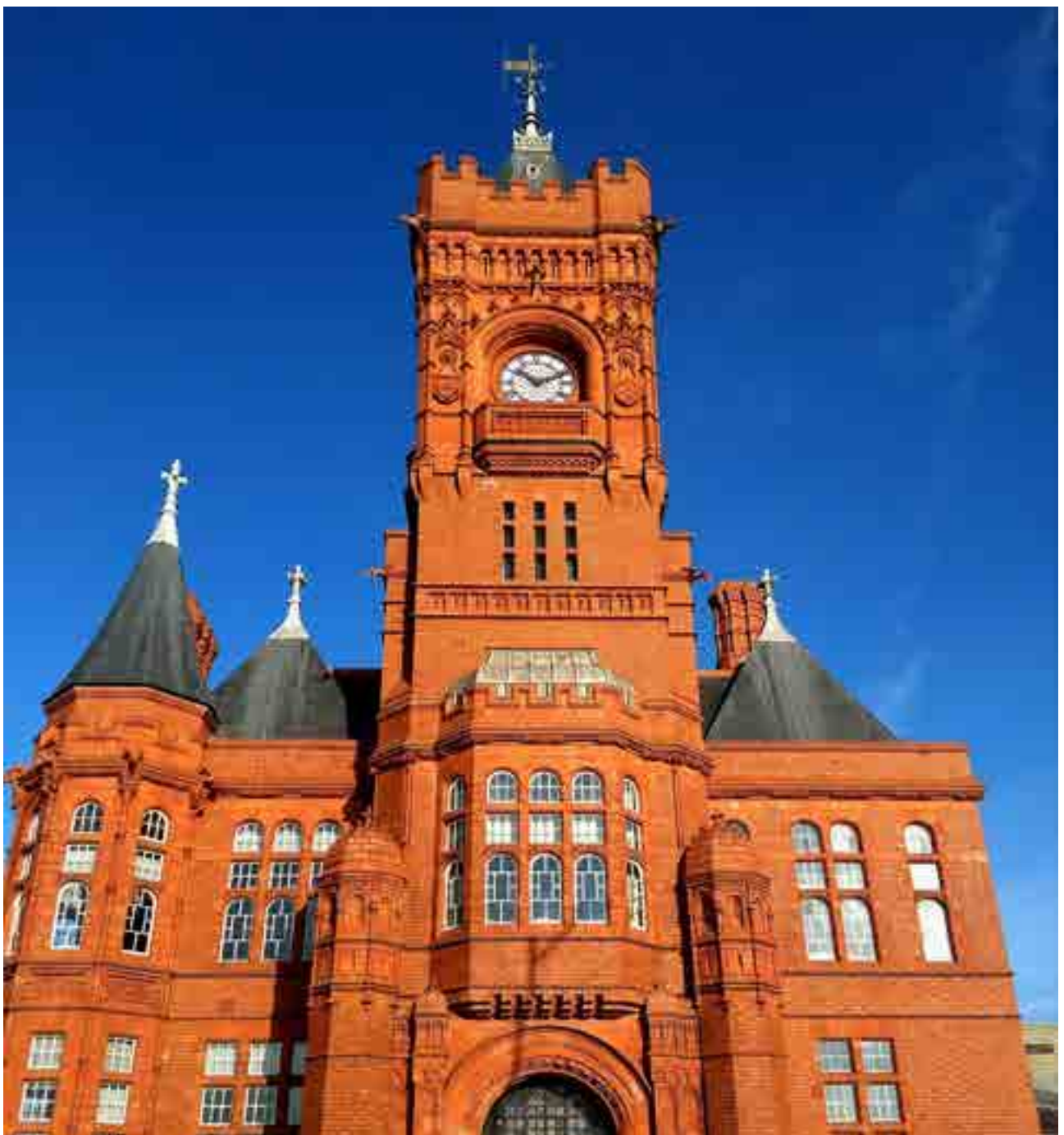
CHAPTER 8: REFLECTIONS – BUILDING ON SMART CITIES BUILDING A SMART REGION

EU Cohesion Policy 2021–27 has committed a significant portion of its budget to promoting a Smarter Europe through Smart Specialisation Strategies (S3) and regional prioritisation in innovative sectors or technologies (European Commission, 2018). Central to this is the adoption of a bottom-up approach to reveal what a region does best in terms of its endowments in science and technology (Foray, David and Hall, 2009); with regional innovation specificities being taken forward through place-based and place-sensitive policies (Barca at al, 2012). A place-based policy is defined as

> " *a long-term strategy aimed at tackling persistent underutilization of potential and reducing persistent social exclusion in specific places through external interventions and multilevel governance (Barca, 2009, p. vii).*

Such an approach acknowledges 'place' "as a key, constituent part of policymaking" whereby regions pursue a strategy "that allows them to capture – in a sustainable way – a part of the value they help create and co-create with other entities" (Bailey et al, 2018: 1521). It represents a shift away from homogenous and spatially blind regional policy[17] in favour of a new place-based approach that builds upon a region's existing advantages and capabilities (Barca et al, 2012) and new knowledge derived from collaborative networks (Bailey et al, 2018).

Global trends such as urbanisation, climate change, biodiversity loss, digitalisation, mobility and changing demographics are dramatically transforming society, presenting both socio-economic and environmental challenges. These challenges are 'playing out' at the level of our regions, cities, towns, and villages. In response, there is a growing need to adopt local and regional solutions to these global challenges.

A McKinsey Global Institute Report published in 2018 argues that "As cities get smarter, they are becoming more liveable and more responsive", with municipal leaders realising "that smart-city strategies start with people, not technology" (Woetzel et al, 2018). As smart cities enter this new phase of thinking, it is timely to begin thinking about – and planning for – smart regions. As the narrative around a Smarter Europe grows, the term 'smart region' is increasingly becoming part of the urban management toolkit; yet, like the notion of a 'smart city', it remains a fuzzy concept. While there is no unique definition of a smart region, smart regions as a concept play a key role in developing new place-based growth dynamics, centred on bottom-up entrepreneurship and innovation. Importantly, however, it is increasingly recognised that "a smart region now is something more than just big data, technological connections, and efficiency; it is also creating interpersonal relations between a region and its people" (Bauer et al, 2019: 1).

This report has focused on seven emerging smart regions across five countries, each being informed by its respective regional priorities (in terms of both opportunities and challenges). It considers different models of smart

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regions as applied across Europe and elsewhere, and the region-specific guiding principles informing these place-based models. While at various stages in their respective journeys, the remainder of this chapter considers key learnings emanating from these smart regions for the SSR.

8.1. Defining a 'Smart Region'

As outlined in Chapter 2, there are many emerging definitions of a 'smart region' and 'smart region' models upon which any such regional growth model could be built. All seven smart regions as outlined utilise a number of smart city technologies to manage city services and/or provide solutions to local challenges. All are couched in economics – in terms of economic growth and reginal innovation; thus, explaining the strong association that exists between smart regions and smart specialisation. Across the SR, key sectors have been identified for smart specialisation growth; these include: Agri-Food, Bioeconomy, High-tech Manufacturing, Life Sciences, Blue-growth Industries, Energy, International Financial Services, ICT and Digital Industries and Tourism (Regional Approach for development of a Smart Specialisation Strategy in the Southern Region, Bable Consultancy, 2021). Building on these opportunities requires a "clear vision for the regional smart specialisation approach together with the local innovation ecosystem to align with the implementation of the Regional Spatial and Economic Strategy and the Smart Region work being carried out" and a collaborative governance model to be established (Bable, 2021: 83).

In terms of key characteristics of a smart region, the examples as outlined put forward the following:

- The role of 'place' – and need for any smart region to be spatially defined;
- The value of engagement and collaboration – recognising the importance of citizens and placing people to the fore of the process – with it being increasingly necessary to operate to the quadruple helix model (or multi-helix model);
- Building smart and sustainable connectivity;
- Enabling societal innovation through open data, digitalisation, and technology; and
- Governance as a building block of the smart region.

For the Smart Southern Region, an initial bespoke smart region definition was presented at the end of Report 1:

> " *A smart region working in collaboration, leveraging technology and open data to co-create vibrant, sustainable and liveable cities, towns and communities.*

This emerging definition will be further refined in Report 3, considering international approaches to a smart region, and repeated reference to core characteristics of a smart region, namely:

- The power of IT – developing, testing, and deploying;
- Improving life quality;
- Secure and long-term commitment;
- Achieving positive impacts;
- Sustainable use of natural resources; and
- Smart solutions tested in real-life scenarios.

8.2. The Role of 'Place'

As a concept, the starting point for a smart region is a metropolitan area, and its broader functional area – informed by not only economic connections but also social, cultural, and environmental inter-relationships. Across each of the smart region profiles, they are grounded in a defined territorial context, with a strong sense of place and identity. For many of the smart regions, building resilience through smart and sustainable urban development – and subsequent management – is central to why they embark on this journey, and why they put themselves forward as 'living labs'. As in Greater Phoenix, there is a growing acknowledgement that the challenges faced by cities and towns within a region are often the same, and do not stop at municipal borders. Adopting a placed-based approach to the future socio-economic development of a region is, in response, an effective tool to solve this fragmented approach to good urban management.

In Finland, the regeneration of Kalasatama (Helsinki) is, in many ways, the 'demonstrator town' highlighted by regional stakeholders in the SR area as being necessary to promote the concept of the 'smart region'. The tangible showcase of what a smart place looks like, how it functions and how it can contribute to quality of life and future sustainability is increasingly acknowledged as being critical to bringing such vague and 'fuzzy' concepts such as 'smart regions' to life. In Kalasatama, city government, developers and residents are experimenting with smart building technologies, geothermal heating, and wastewater heat recovery – such experimentation being a vital role played by the smart region.

The Smart Mapping Tool currently being developed by the SRA will play a critical role in capturing, for the first time, smart activity across the region. As a cloud-based tool open to all regional stakeholders, it has the potential to build partnerships across cities and towns with shared priorities – as well as inspire ideas for new smart regional activities that speak to local and regional needs and contribute to meeting the goals of the RSES.

8.2. The Value of Engagement and Collaboration

In addition to having a strong territorial dimension, the smart region is also built on effective engagement and collaboration. While writing about smart cities, Mark and Anya (2019) note that "Many of the projects utilised a collaborative public-private model to facilitate both the business development side and the citizen-engagement sides of the smart city" and that "A bottom-up approach is clearly the most effective way to ensure that a smart city works and is used by its citizens".

The same is true of smart regions. The examples of smart regions highlight that more effective collaboration is achieved when the quadruple helix model of engagement is adopted; ensuring that the public sector, private sector, academia and citizens/community and voluntary sector are equally represented at the table. The cases as highlighted demonstrate that where this was not the case at the outset, governance arrangements relatively quickly had to adapt and restructure to ensure a balance between top-down and bottom-up approaches, and that 'communities in place' were involved not only in the identification of the challenge but also in the solutions to be taken forward.

Networks have a clear role to play in the success or not of a smart region. In Greater Phoenix, where there is no formal strategy, the partnership is centred on a 'network of networks'. In the Netherlands, where a formal strategy is in place, the country is identified as a 'unified network of cities'. Such networks, as argued by the Netherlands strategy, offers cities and their stakeholders an integrated approach, and set of tools, to address complex issues together, while not expecting each city to come up with its own solutions and operate in isolation or competition. During the consultation phase with regional stakeholders in the SR area, the smart region was visualised by many as "being a dynamic network of networks that change with evolving priorities" (Report 1, p. 38). This brings with it the benefits of scale, and cross-pollination and sharing of ideas and solutions to local/regional issues.

Finland's 6Aika – or Six City Strategy – is reflective of the Netherlands Smart City Strategy in that both define an era of co-creation and agile development/piloting across the countries' main cities. The strapline of the 6Aika is

"Making Cities Smarter Together', with cities co-designing and co-producing projects ranging from smart mobility, smart health, circular economy, and smart energy. Through collaborative partnerships, local government become facilitators of new solutions, companies can test the attractiveness and functionality of new or updated products and services, and residents have the opportunity to provide feedback on the solutions being tested. Such processes of co-creation and agile piloting is leading to more sustainable urban development.

In Smart Baden-Württemberg, the smart region is built on well-established collaborative relationships that have grown over time. In some cases, the utility companies, both private and public, are embedded in the co-production and implementation of future roadmaps. Research centres are highly valued and embedded within the digital strategies which emphasise digital competency and collaboration that contribute to the vitality of place. While the role of research centres in supporting a smart city/region in Ireland – similar to the Cork Smart Gateway – is still a relatively new phenomenon, it is undoubtedly a positive development. This is particularly so when its work is in direct response to local issues and identified need.

From the good practice examples, the critical role of engagement and collaboration between places - cities and towns coming together in networks to collaborate on projects – was highlighted throughout; with cities choosing not to compete in favour of sharing resources, innovations, and good practices. Such an approach would be critical to the success of the SSR – and, in striving for regional parity, one the SRA would support. Many of the RPOs within the RSES support such collaborations via networks, especially across the three cities and metropolitan areas of Cork, Limerick, and Waterford (namely,

RPO 6, RPOs 28-30 and RPOs 133-134). The emerging Smart Region Framework (Report 3) is a potential platform from which to encourage enhanced collaborative action at local authority level.

8.3. Building Smart and Sustainable Connectivity

As cities bear the brunt of global trends such as climate change, the depletion of natural resources and loss of biodiversity, changing demographics and the fourth industrial revolution, it not surprising to see goals such as carbon neutrality increasingly taking centre stage in smart region programmes. In Finland, under the 6Aika programme, the city of Tampere is planning a new sustainable and smart neighbourhood of 25,000 people that will be CO2 negative. Under 'Innovative Hiedanranta', the district will be served by a sustainable transport and logistics network, a smart energy system, and green and blue infrastructure. Achieving such connectivity is highly

dependent on working in active partnership with the relevant utility providers.

The degree to which a 'smart region' can inform or influence its connectivity is largely determined by the range of functions devolved to the local or regional government, and the degree of subsidiarity in operation. The strongest outline of this presented in this report is in the Netherlands – in both MRDH and Eindhoven-Brainport. In the Metropolitan Region MRDH, where it is expected an additional 400,000 people will live over the coming decades, connectivity is integral to the success of this smart region. In this context, the government granted the Region the status of transport authority; and with this comes funding for regional traffic management and transport across all 23 municipalities that form the Metropolitan Region. For example, in July 2002, the *Regional Implementation Agenda for Traffic Safety 2025* was published.

In Eindhoven-Brainport, an environmentally friendly transport system has been commissioned that builds on the strengths of the region in automotive, electronics and design-orientated industries. The resulting Phileas Advanced Public Transport (APT) is semi-automated and connects new spatial developments at low-cost. It also uses clean-tech – thus making it less damaging for the environment. This model is now being rolled-out elsewhere across the Netherlands – reflecting one of the primary objectives of the Netherlands Smart City Strategy, that of replicating innovation solutions in other cities.

In Germany's industrial heartland, Baden-Württemberg's Cyber Valley has become a leading research centre for intelligent systems, including machine learning, robotics, autonomous vehicles, and smarter traffic-guidance systems. Such innovations do not only benefit this smart region but are being expanded to include research centres and other enterprises, via Industry-on-Campus, to promote entrepreneurship across Europe.

In building smart and sustainable connected spaces, urban and rural areas are being given the tools to play to their respective strengths and remove any sense of peripherality or 'lagging region'. A strong infrastructural base, representative of a multi-dimensional mix of human, social, utility, and entrepreneurial capital that are merged, coordinated and integrated through ICT, gives regions a strong baseline on which to build services. The importance of smart mobility and integrated connectivity was also highlighted in the SR consultation – not least in terms of the need to "build on the positives of technology" and the core role such integration (in both service design and implementation) plays in tackling social, economic, and environmental problems. It is also an integral component of the SR's ambition to promote the 10-minute town (RPO 176), currently being piloted in Ennis and Tralee.

The 10-minute town pilots are trialling improvements to connectivity with essential services, and public transport linkages between rural and larger metropolitan centres.

8.4. Enabling Societal Innovation – The Role of Data and Technology

As the economic, social, and environmental ecosystems of metropolitan urban areas come under cumulative stress, technology is increasingly being used as a solution to these issues and their impact on 'place'. The concept of a smart city has become intertwined with that of sustainable development, with digitalisation, big data, and Internet of Things (IoT) playing a strong role (Joshi et al, 2016).

In Greater Phoenix, the Connective has engaged with the Mastercard City Possible Initiative to assist it in mapping weekly spending data. This 'COVID-19 Economic Modelling Project', involving multiple partners, is aiding the city to understand the impacts of coronavirus on the region's economy. It is hoped that by triangulating this data with geospatial data and other data-sets as relevant, it will result in the public sector making better, evidence-informed decisions on future development and investments.

In Finland, under 6Aika, cities are effectively putting themselves forward as experimentation platforms for new products and services to create world-class reference sites. Under the Six City strategy, all cities have a shared commitment to Open innovation platforms; Open data; and Open participation. As core principles, this focus has led to the creation of new knowledge and techniques, as well as businesses and jobs, by utilising openness, digitalisation, and participation.

In the Helsinki-Uusimaa Region, open data is playing a key role in the regeneration of the Kalasatama district. To date, 21 buildings have signed up to be part of the public digital data portal which is collecting data on, for example, water usage and heating.

It is very clear from the sketches of each smart region, technology and open data are viewed as enablers rather than drivers of change. From discussions with regional stakeholders in the SR area, this same viewpoint is held. Data – its collection, collation, analysis, and visualisation – forms the basis for evidence-based problem solving and innovation. Increasingly, as data sets mature, the data is being used to measure performance and impact. As increasing amounts of data becomes available, there are challenges around its publication in a reliable and continuous manner. There is also the question of being 'data rich but insight poor'. The current initiative by the three Irish Regional Assemblies to build a Regional Monitor to oversee the progress of the regional strategies, in collaboration with the All Island Research Observatory[18]

18 *https://airo.maynoothuniversity.ie/*

(AIRO), could – with improved sources and frequency of data – evolve to include a set of indicators that monitor the performance of smart cities, smart towns and villages, and smart regions. The CITYkeys Indicator Framework highlighted in Chapter 2 provides an indicative list of indicators for consideration in any performance monitor.

8.5. Governance – A Building Block of the Smart Region

Each of the 'smart regions' as profiled operate a regional innovation governance structure, often influenced in their design by "institutional proximity between the public and the private sectors" and have "designed and implemented place-based policies to address specific weaknesses" (Morrison and Doussineau, 2019: 111) in, or the complete absence of, a regional innovation strategy that reflects the region's endogenous strengths and asset-base. The governance arrangements largely involve the private sector, the public sector, higher education institutions and/or civil society – operating to the triple or quadruple helix model of engagement and collaboration; with the quadruple helix and civil society increasingly being to the fore. The more successful of the smart regions have a flexibility – or high degree of autonomy – in their governance design that enables them to respond to local or regional challenges and opportunities as they arise – while negating political influence (Morrison and Doussineau, 2019).

Of the case studies profiled in this report, Cardiff Capital Region (CCR), followed by Helsinki-Uusimaa Region have the 'heaviest' governance structures. The CCR has an overall governing cabinet, a series of governance sub-committees and several advisory boards. This is not only reflective of its focus on economic growth but also its embeddedness within the Cardiff Capital Region City Deal and associated responsibilities in overseeing and coordinating this substantial funding, and the associated autonomy that comes with City Deal programmes. With shortcomings immediately evident in this weighty governance approach, CCR has been proactive in building place-based leadership and establishing mechanisms for external engagement with the region's stakeholders – including academia and civil society. Through the smart region initiative, a concerted effort is being made to 'join-the-dots' – not only in governance terms but across the wide range of activities underway, thus amplifying their impact, and creating a shared culture of innovation.

Espoo's experience of 6Aika demonstrates the value – and necessity – of having its engagement and priorities under 6Aika closely aligned to its own city strategy, The Espoo Story. Aligning local and regional priorities across strategies was not essential to the success of both 6Aika and The Espoo Story but has strengthened the participatory theme of Espoo's development strategy.

Throughout the Smart Southern Region consultation process, the importance of good governance as a building block for a smart region was highlighted repeatedly. In particular, the crucial role of the local authority was noted in terms of understanding the wider policy context, knowing the societal challenges where open data, technology and digitalisation can have a role in solving, and having the relationships already in place (whether formal or informal, structured or ad-hoc) with the diverse range of stakeholders that have proven to be critical to any smart region programme – not least civil society.

As strongly evidenced both in these short sketches, and the SRA regional conversations, a summary of the expected outcomes from a strong governance structure includes ensuring:

- Clarity of purpose;
- Aligning objectives;
- A broad inclusive participation;
- A forum of equals; and
- Equality in benefits.

There are good governance structures already in place across the SR, these operate to various sub-region and local level – for example, the Strategic Planning Areas, Regional Enterprise Plans areas and Local Authority Areas. However, to achieve the scale of delivery and impact proposed in this document it is strongly recommended that a smart region initiative covers the entirety of the Southern Region.

Any progression of a smart region concept for the SR should be aligned to the RSES and its implementation structure. There are many parallels between the focus of smart region actions as highlighted in the stakeholder consultation process and the regional policy objectives (RPOs) of the RSES. There are a number of ways to think about the smart region concept and where it would most comfortably 'fit' within the current regional pillars (see Figure 8.1).

Figure 8.1. Locating the Smart Region within the Current Pillars

Scenario 2:

Scenario 1:
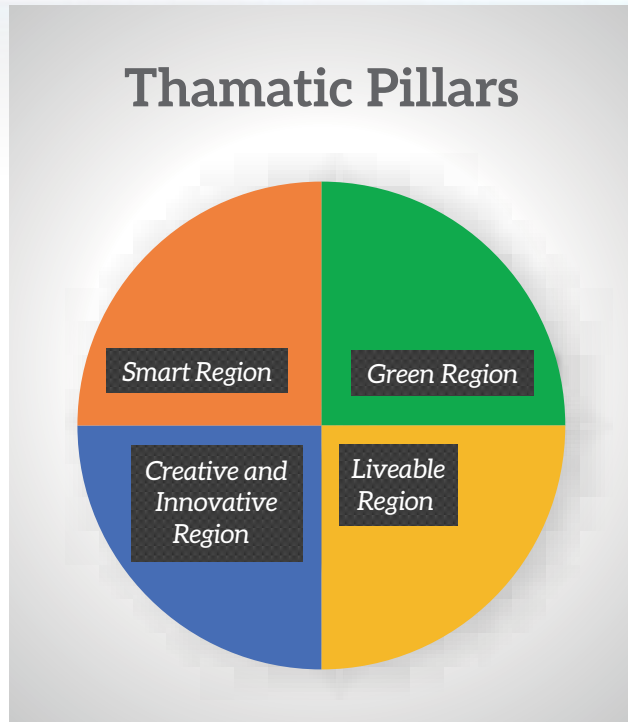
Smart Region

Smart Region

Scenario 2 is the more appropriate model; with the smart region playing a key enabling role in delivery of the RSES's three thematic pillars. The good practices highlighted in this report show the positives of different cities collaborating on smart projects across a region; collectively, they drive a smart region and nurture S3 growth. They have demonstrated the potential for the region's three metropolitan cities - Cork, Limerick, and Waterford - to collaborate and lead-out on the delivery of the SSR.

The timely and coordinated delivery of the RPOs within the RSES lay the foundations for the SSR. The case studies as profiled in Chapters 3-7 show the value of taking a whole of region approach to the co-design and implementation of a smart agenda. Building on the findings of Report 1, this analysis of smart region programmes elsewhere clearly illustrates the need to operate to the quadruple helix model of engagement and collaborative partnership. Together, both reports leave us in no doubt that a technology-enabled and task-focused model of smart region, operating to scale, is critical to co-creating solutions with meaningful societal impact.

8.6. Moving to a Smart Southern Region

In advance of the RSES delivery board structure getting up and running, the regional level leadership being demonstrated by the SRA in advancing themes such as the S3, the 10 Minute Cities and Towns framework, the Learning Region, and the preparation of the Sustainable Mobility Implementation Plan and the Regional Decarbonisation Plan, illustrates the capability of the Assembly to advance the smart region. The role of the SRA as a managing authority for the 2021-2027 Regional Operational Programme - where Smart Cities and Smart Regions are a key theme - offers a significant opportunity for progressing the SSR. But the SRA cannot advance the smart region on their own. It requires working in collaborative partnership. The examples of international smart regions highlighted in this report point to an initial number of strategic actions; namely:

1. When finalised, the vision statement for the SSR must be 'socialised' and achieve the buy-in of all regional stakeholders. It must be embedded within emerging plans such as the Regional Enterprise Plan and the Sustainable Mobility Implementation Plan and feed into the policies and practices of regional S3 and the 10 minute town and city concept;

2. As each local authority adopts its digital strategy, there is a need to understand how stated action points inter-relate with each other and contribute to the development of the smart region. This can be achieved by the SRA undertaking an analysis of the digital strategies and draw out this potentiality and/or convening a working group of digital officers to facilitate collaborative action, knowledge transfer and generation of economies of scale. This will be critical to ensuring cities collaborate – rather than compete – with each other;

3. Recognising the importance of academia and universities to progressing the smart region, and with several universities, technological universities and research centres within the SR, the Assembly should consider developing an innovation hub/academy to support the co-creation and co-production of solutions to localised challenges. Within the hub/academy, there will be opportunities for regional specialisms in renewable energies, Connected and Autonomous Vehicle (CAV), Future Mobility and advanced manufacturing and robotics, for example, to emerge;

4. The smart region must be couched in 'place'; building a regional identity and responding to local/regional needs. The community needs to be actively engaged in identifying the challenges – but also in co-creating the solutions. There is a critical role for the SRA in creating the right citizen engagement spaces where local issues/needs can be tabled, ideas generated and potential solutions explored. Such spaces could take the form of regional iLabs (building on Limerick's new Citizen Observatory) – operated on a roadshow basis;

5. As the Regional Monitor is finalised to measure the performance of the RSES, the scope of the Monitor should be expanded to include the development of a set of indicators to measure the progress of the smart region. The SRA will play a core role in the effective reporting of progress and ensure that the data gathered is utilised to inform future action and collaboration.

A core role for the SRA in driving the SSR will be to Inform, Inspire, Catalyse and Monitor – utilising the critical juncture it holds between European and national policy and local action.

ANNEX 1: The Research Team

Office of Engagement and Innovation, Maynooth University

The Office of Engagement and Innovation was created to build and maintain a strategic research and innovation partnerships with a range of external institutions, including enterprise, public sector, and civic organisations. The goals of the Office are (a) to facilitate the smooth participation of Maynooth University staff members in external collaborations and projects such bodies through the development of strategic partnerships, including research, education, and contracts and (b) to ensure effective supports in place for staff to collaborate and partner with a diverse range of external agencies.

The International Centre for Local and Regional Development (ICLRD)

The International Centre for Local and Regional Development (ICLRD) is a North-South-U.S. partnership. It was formally established in 2006 to explore and expand the contribution that spatial planning and the development of physical, social, and economic infrastructure can make to peace and reconciliation on the island of Ireland, and elsewhere. The ICLRD has developed out of a unique collaboration between academics and spatial planning specialists, with current partners including the National Institute for Regional and Spatial Analysis (NIRSA) at Maynooth University, the Belfast School of Architecture and the Built Environment at Ulster University and the National Center for Smart Growth at University of Maryland.

A central objective of the ICLRD is to strengthen the policy and operational linkages between central, regional, and local policy makers and among officials and practitioners involved in spatial planning and social and economic development across the island of Ireland. It does this through action research, policy advice and publications; professional facilitation and education and capacity building programmes that assist local governments and communities to translate policy into 'on the ground' action; and active outreach and networking that includes conferences, workshops and international co-operation and exchanges to identify best practices. Further information on the work of the ICLRD is available at *www.iclrd.org*

School of Business, Maynooth University

The School of Business is home to a vibrant international community of research-active faculty. Broadly speaking, our research seeks to offer insights into the drivers of performance and analyses the impact of the interactions among different agents operating within the world of business – from individuals within organisations, to groups in organisations, organisations as a whole, to their ecosystems, markets, and regulation. We believe that business is about solving problems and that rarely, if ever, does the solution come from one person or one disciplinary perspective. Therefore, our faculty approaches these research themes for different perspectives and engages in conversations and collaborations across different functional disciplines, e.g., Management, Management Information Systems, Human Resource Management & Organisational Behaviour, International Business, Marketing, Strategy and Innovation, Finance and Accounting. Further information on the School is available at: *https://www.maynoothuniversity.ie/school-business/our-research*

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