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Meeting the Challenges of Digitalisation: Implications for Regional and Rural Development

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EXECUTIVE SUMMARY

Digitalisation transforms societies and economies, affecting the way we live, work and relate to one another. This paper explores the regional development issues associated with digitalisation, and draws out how regions may be affected, with a particular focus on rural and remoter areas. Key issues are:

There are large disparities between countries. Of a range of selected European countries, the Digital Economy and Society Index (DESI) rankings are high in Sweden, Finland and Netherlands, followed closely by Switzerland and Norway, while Poland and Italy lag behind the EU average.

There continues to be an urban-rural divide in digitalisation. Digitalisation efforts have thus far prioritised urban areas. Many rural and remoter communities are actively seeking new opportunities, for instance in digital services to drive economic growth, but face difficulties due to inadequate infrastructure and skills. To create successful regions, for instance, the ENRD has called for action to be taken across the three pillars of digitalisation: digital infrastructure, digital services and digital literacy.

Digitalisation is high on the policy agendas. The European Commission has been particularly active in launching different strategies and initiatives to support the digitalisation process and to create a fully functioning EU Digital Single Market. A central EU initiative specifically targeted at digitalisation in rural areas is the EU Action for Smart Villages.

The theme features high as a target area for ESI funds, with the Thematic Objective 2 concerned with ICT. Digitalisation also features prominently in the proposals for the post-2020 programme period as the third of the five planned Priority Objectives ('a more connected Europe').

Countries and rural and remoter areas have different policy responses in place to tackle their digitalisation bottlenecks. There are no single best practices, but efforts need to continue across the different elements of digitalisation (including connectivity, service and skills development) and solutions must be tailored, innovative and well-coordinated.[1]

[1] This paper was originally prepared for the 39th Meeting of the European Regional Policy Research Consortium (EoRPA) held on Loch Lomondside on 30 September – 2 October 2018. It has been updated to reflect new research and policy contributions since the EoRPA meeting.

1. THE CHALLENGE AND OPPORTUNITY OF DIGITALISATION

1.1 Digitalisation transforming societies and economies

Digitalisation has transformed societies and economies across the world for the past 20 years and continues to do so at an ever faster speed. Technology breakthroughs in a number of fields, including robotics, artificial intelligence, big data, Internet of Things, mobile and blockchain technologies etc., are paving the way for the Fourth Industrial Revolution (4IR), with a range of new technologies blurring the lines between the physical, digital and biological worlds, and impacting all disciplines, economies and industries.[2] This will fundamentally alter the way we live, work and relate to one another. The opportunities include rising income levels and improved quality of life around the world, while at the same time there are risks associated with greater inequality, particularly in terms of the impacts and potential disruption to labour markets.[3]

Digitalisation can play a major role in improving efficiency and business processes, and it can result in new innovative products and services. It has been suggested that digitalisation of products and services can add more than €110 billion of annual revenue to the European economy. Together with globalisation, digitalisation can have major implications for future global production and trade. OECD research suggests that the increasing digitalisation of production in developed countries might have the potential to reorient global production back towards OECD countries.[4] However, while Europe is strong in a number of digital sectors, and has highly regarded research and technology institutes, many traditional sectors and SMEs are lagging behind.[5] **Digital technology evolves rapidly, but the adoption and use of the technology varies between different sectors and places. In addition, there are issues related to the inequality of skills and usage.**

Digitalisation does not have a standard definition. A number of current definitions approach digitalisation from different angles, serving different purposes. Some focus solely on economic growth and job creation, while others include broader societal factors. An example of a definition encompassing all the actors and highlighting the transformative aspect of digitalisation notes that: '*digitalisation is the transformation of all sectors of our economy, government and society based on the large-scale adoption of existing and emerging digital technologies'*.[6]

One way to look at digitalisation is to understand how it is measured. In the EU, the various indicators measuring the level and pace of digitalisation have been developed and refined to better capture the impacts. The Digital Economy and Society Index (DESI) was created in 2015 and has since provided regular updates on digital progress in Europe and the world. DESI categorises the performance of countries on the basis of five dimensions: connectivity; human capital; use of internet; integration of digital technology; and digital public services (see Annex 2). Each of these dimensions

[2] https://ec.europa.eu/digital-single-market/en/fourth-industrial-revolution

[3] https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/

[4] OECD (2017) *The Future of Global Value Chains: Business as usual or a new normal*, Working document of Directorate for Science, Technology and Innovation, Paris, 27 March 2017, https://www.oecd-ilibrary.org/science-and-technology/the-future-of-global-value-chains_d8da8760-en

[5] https://ec.europa.eu/digital-single-market/en/policies/digitising-european-industry

[6] Definition for the purposes of the study by Randall L, Berlina A, Teräs J and Rinne T (2018) Digitalisation as a tool for sustainable Nordic regional development: Preliminary literature and policy review. Discussion paper prepared for Nordic thematic group for innovative and resilient regions, January 2018, Stockholm.

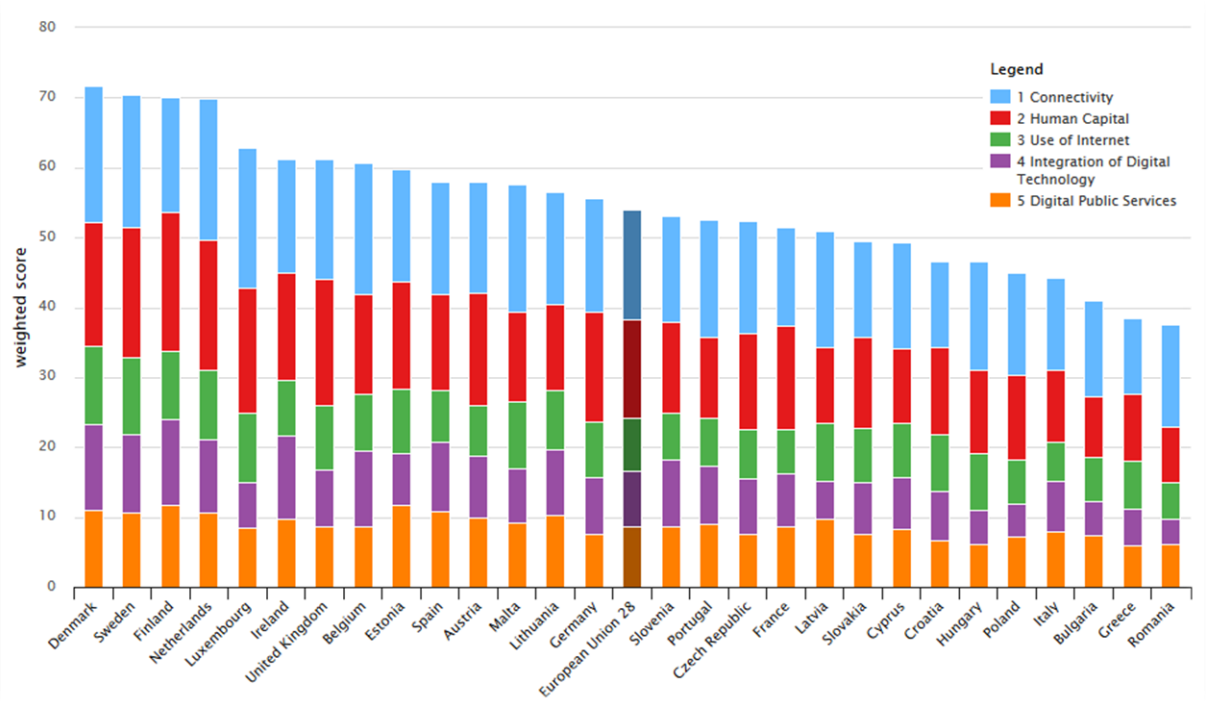
has specific implications (both opportunities and challenges) for policymakers concerned with regional development.

1.2 Territorial disparities of digitalisation

There continue to be large disparities in digitalisation between countries and regions. In spite of progress with digitalisation, there are still significant gaps between the most and least digitalised countries.

- In the EU Member States**, the Nordic countries** (Denmark, Sweden, Finland) **and the Netherlands lead the Digital Economy and Society Index** (DESI – see Figure 1). This is the case not only in Europe, but also globally, where the top four are ranked just behind South Korea, but ahead of Japan and the United States.
- Outside the EU, **Norway and Switzerland also perform very well, with both countries only slightly behind the top four and well above the EU28 average.**
- At the other end of the scale and despite improvements over recent years, several countries including **Poland, Italy, Bulgaria, Greece and Romania still lag behind the EU average**.[7]

Figure 1: Digital Economy and Society Index (DESI) 2018 ranking



Source: DESI 2018, https://ec.europa.eu/digital-single-market/en/desi

The ranking is different when looking at individual components of DESI (Figure 2), where some countries perform comparatively well in some areas, while underperforming in others. Portugal, for instance, is performing well in terms of connectivity (8th), but less so for human capital (22nd). Austria, by contrast, ranks relatively high for human capital (7th), but lags behind in the use of the internet (19th). This indicates that **different countries require different policy responses to tackle their digitalisation bottlenecks.**

[7] http://europa.eu/rapid/press-release_MEMO-18-3737_bg.htm

Figure 2: DESI performance of selected European countries

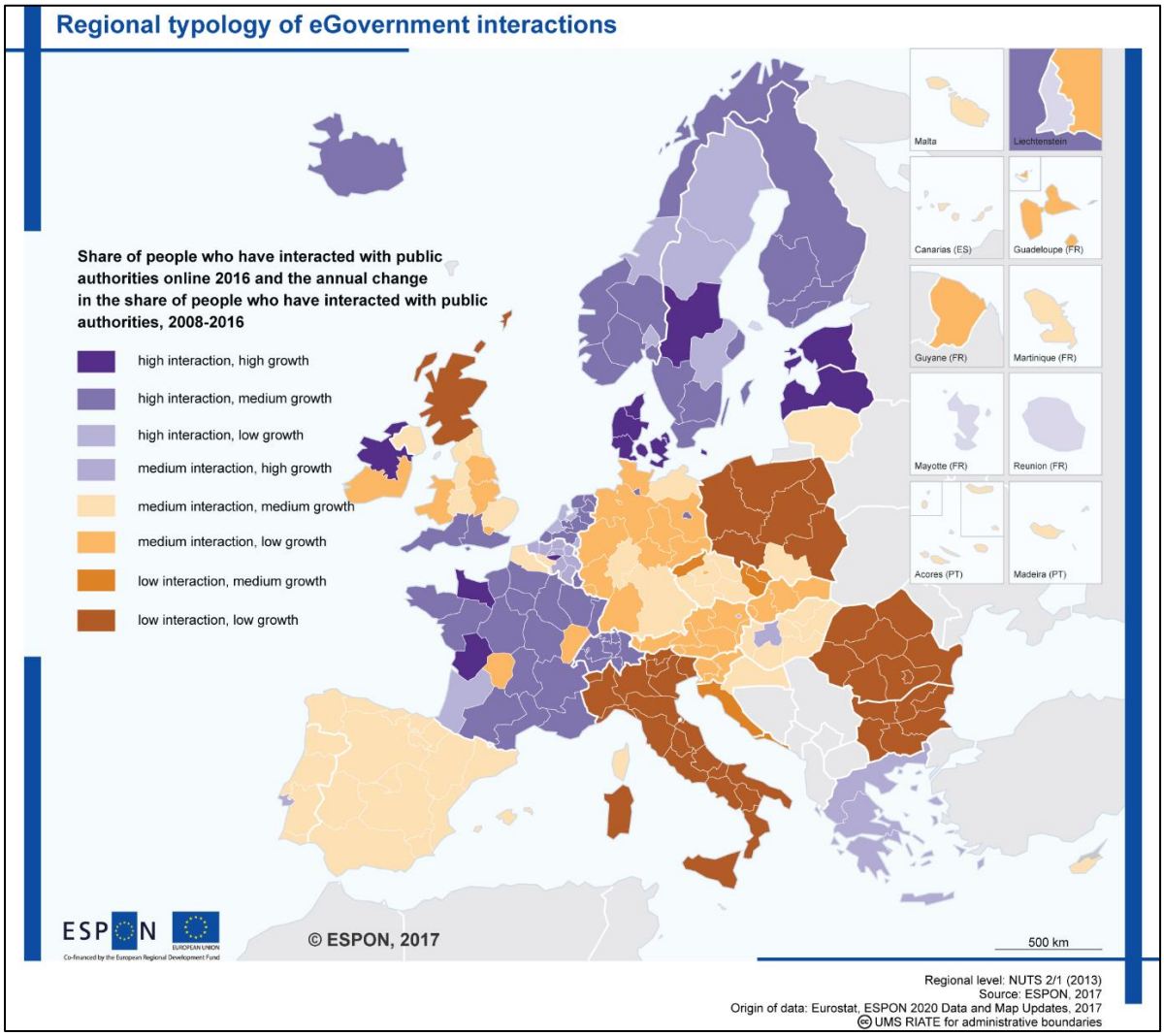
Country	Ranking					
	Overall	Connectivity	Human capital	Use of internet	Integration of digital technology	Digital public services
SE	**2**	4	3	2	4	5
FI	**3**	9	1	5	2	1
NL	**4**	1	2	3	6	6
UK	**7**	7	4	7	14	14
AT	**11**	17	7	19	10	8
DE	**14**	13	8	14	12	21
PT	**16**	8	22	21	11	12
FR	**18**	23	11	24	16	13
PL	**24**	21	20	25	27	24
IT	**25**	26	25	27	20	19

Source: DESI 2018, https://ec.europa.eu/digital-single-market/en/desi

One example of varying digitalisation performance concerns the degree of digital interaction between the citizens and public authorities. Looking at the national level, Figure 3 confirms some of the DESI findings, although France performs better than under the DESI dimensions relevant in this case, namely 'use of internet' and 'digital public services'. Turning to the regional (NUTS 2) level, the picture becomes more varied and significant disparities are visible in some countries, particularly in:

- the United Kingdom – north-south divide, with very low interaction in Scotland;
- Germany – high-performing city-States (Berlin, Bremen, Hamburg) versus underperforming remaining parts of the country; and
- France – high-performing overall, but individual regions behind (Franche-Comté and Limousin).

Figure 3: Share of individuals who used the internet for interaction with public authorities (2016)



Source: ESPON (2017b) *op. cit.*, p. 3, https://www.espon.eu/sites/default/files/attachments/ESPON%20Policy%20Brief%20on%20Digital%20Transition.pdf

Within countries, **there is a rural-urban divide**. Digitalisation is commonly associated with urban areas, with **cities featuring as the digital 'hot spots'**. Various initiatives, such as 'smart cities',[8] have made digitalisation in urban areas even more visible. Although specific (digitalisation) challenges continue to exist in urban areas, rural and peripheral areas are often at the other end of the spectrum,[9] for instance in terms of lacking appropriate fast and superfast (Next Generation Access) infrastructure, as well as the appropriate digital skills to use digitalisation opportunities.[10]

[8] Smart cities are places where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of the inhabitants and business (although the definition goes beyond the use of ICT, including better use of resources and lower emissions), https://ec.europa.eu/info/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_en#what-are-smart-cities

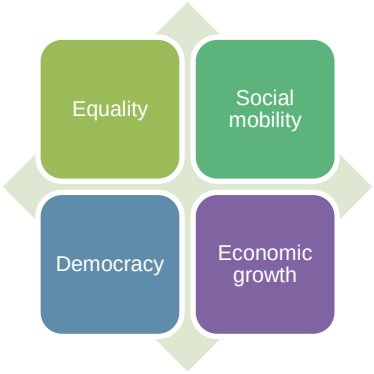
[9] For further information on the challenges facing peripheral regions, see for instance: Davies S and Michie R (2011) *Peripheral Regions: A Marginal Concern?*, EoRPA Paper 11/6 prepared for the 32nd meeting of the EoRPA Regional Policy Research Consortium at Ross Priory, Loch Lomondside, 2-4 October 2011.

[10] https://enrd.ec.europa.eu/sites/enrd/files/tg_rural-businesses_case-study_rural-digital-hub.pdf

Many rural and peripheral areas face specific difficulties, and they have consequently struggled to make the transition to a modern knowledge-based economy.[11] On the supply side, rural and peripheral areas lag behind, for instance, in terms of the provision of Next Generation Access (NGA) infrastructure.[12] Higher costs in some of the more peripheral rural areas due to longer distances and lower population densities can affect investment in new technologies (i.e. making it difficult for companies to achieve economies of scale or obtain a return on investment). Furthermore, where the development of technology is largely urban-led and designed without consideration for rural needs, the urban-rural digital divide is even further exacerbated. In Switzerland, for instance, research showed that a negative spatial impact of digitalisation is larger in rural areas, thereby potentially increasing disparities.[13] Although digital connectivity is increasingly regarded as an essential utility (in line with water and electricity), universal access across remote and rural areas has not been realised.[14]

On the demand side, many rural areas suffer from lack of skills and knowledge regarding digital technologies, which limits their possibilities for innovative service provision, business or customer use.[15] Therefore, rather than keeping on top of technological development, rural and peripheral areas are continuously in a situation of catching up with urban areas. Not keeping up with digital developments can lead to digital exclusion, lagging rural development, or economic decline (see also Figure 4).[16] While difficulties are particularly notable for rural and peripheral areas, some progress has taken place in recent years, most notably through initiatives such as the EU Action for Smart Villages, which was launched to overcome the digital divide between rural and urban areas and to develop the potential of digitalisation in rural areas (see Box 1).[17]

Figure 4: Why is closing the digital divide between urban and rural areas important?



Source: Adapted from https://enrd.ec.europa.eu/sites/enrd/files/s4_rural-businesses-factsheet_digital-hubs.pdf

[11] Nordregio (2017) *Inclusive Digitalization in the Baltic Sea Region, An Instrument for Growth and Development in Declining Rural Areas*, Nordregio Policy Brief 4, December 2017.

[12] ENRD (2017) ENRD Seminar on 'Revitalising Rural Areas through Business Innovation' Brussels, March 2017, https://enrd.ec.europa.eu/sites/enrd/files/s4_rural-businesses-factsheet_digital-hubs.pdf

[13] Willimann I and Käppeli S (2017) 'Digitalisierung trifft Land härter als Stadt', *Die Volkswirtschaft* 6/2017, pp. 50-52, http://dievolkswirtschaft.ch/content/uploads/2017/04/18_Willimann_Kaeppeli_DE.pdf

[14] Salemink K, Strijker D and Bosworth G (2015) 'Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas', *Journal of Rural Studies*, http://dx.doi.org/10.1016/j.jrurstud.2015.09.001

[15] ENRD (2017) *op. cit.*

[16] Salemink K, Strijker D and Bosworth G (2015) *op. cit.*

[17] European Commission (2016) *EU Action for Smart Villages*, https://ec.europa.eu/agriculture/sites/agriculture/files/rural-development-2014-2020/looking-ahead/rur-dev-small-villages_en.pdf

1.3 Why does digitalisation in rural and peripheral areas matter?

Many rural and peripheral areas are faced with social and economic challenges, including ageing, out-migration of young people, lower level of skills and dominance of traditional industries. In addition, they may have specific geographical bottlenecks affecting accessibility (e.g. long distances). The decline of rural areas has been referred to as 'inner peripheralisation'[18] by the European Commission, characterised by a growing divide and disconnectedness between rural and urban areas. The potential of digitalisation addressing these disadvantages has been widely acknowledged and, together with structural transformation, additional opportunities will become available through digitalisation.[19] For instance, the digital economy offers opportunities to rural and peripheral areas to overcome the 'tyranny of distance', such as e-education, e-health and e-business, etc. Many jobs have become independent of location and attractive peripheral areas (e.g. mountainous regions or islands) can offer remote alternatives to urban areas, provided these are digitally connected. The European Network for Rural Development (ENRD) talks about the three pillars in the rural digital divide, namely digital infrastructure, uptake of digital services, and digital literacy.

However, thus far **digitalisation in rural and peripheral areas has received considerably less attention by policymakers and decision-makers,** although **digitalisation has the potential to play a significant role in these areas not least in terms of services and employment opportunities.** As noted by the European Commissioner for Agriculture and Rural Development, Phil Hogan, '*the potential* [in rural areas] *will only be fulfilled if rural communities are given the full benefits of digitisation and connectivity'*.[20]

Those digital technology innovations that are available and have been successfully adopted are transforming the way that, for instance, public services are being delivered and how governments respond to citizens' needs. Results include simplified governance, increased efficiency, effectiveness and outreach,[21] and reduction of costs. As noted earlier, much of the experience is in the urban areas. However, the opportunities of addressing the specific economic and demographic challenges in rural and the more peripheral areas through digitalisation are significant (see Figure 5), although threats must also be acknowledged (e.g. small businesses failing to compete on a global scale in e-commerce). '**Inclusive digitalisation**', which is based on widespread access to high-quality mobile and broadband services, has been suggested as a potential antidote to the trend of 'inner peripheralisation'. It is viewed as an essential element for helping rural and peripheral regions to adapt to the modern knowledge-based economy and for promoting regional development and growth.[22]

[18] European Commission (2011) *Territorial Agenda of the European Union: Towards an Inclusive, Smart and Sustainable Europe of Diverse Regions*.

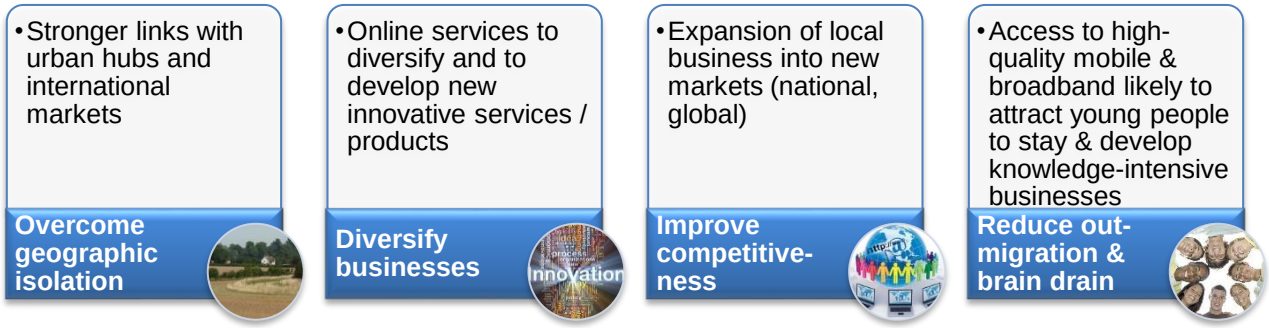
[19] Bachtler J, Oliveira Martins J, Wostner P and Zuber P (2017) *Towards Cohesion Policy 4.0*: *Structural Transformation* and *Inclusive Growth, Regional Studies Association*, http://www.regionalstudies.org/uploads/documents/RSA_Report_Web_22-6-17.pdf

[20] European Commission (2017) *Innovation and digitisation key for strong and sustainable rural areas*, news, 12 October 2017, https://ec.europa.eu/info/news/innovation-and-digitisation-key-strong-and-sustainable-rural-areas_en

[21] ESPON (2017a) *The territorial and urban dimensions of the digital transformation of public services*, Policy Brief.

[22] Nordregio (2017) *op. cit*.

Figure 5: Opportunities of digitalisation in rural and peripheral areas



Source: Adapted from Nordregio (2017) *Inclusive Digitalization in the Baltic Sea Region, An Instrument for Growth and Development in Declining Rural Areas*, Nordregio Policy Brief 4.

2. POLICY RESPONSES

Digitalisation has been a prominent topic on policy agendas for some time, as ICT is estimated to account for half of the productivity growth in the EU. The European Commission has been particularly active in recent years and has launched a number of different strategies and wider initiatives to support the digitalisation process and to create a fully functioning EU Digital Single Market (see Figure 6).[23]

Figure 6: Examples of digital strategies and initiatives in the EU

eHealth Action Plan 2012-20
- to address and remove barriers in order to benefit from an interoperable eHealth system

Digital Single Market Strategy for Europe of 2015
- to maximise the growth potential of the digital economy (businesses and citizens)

Skills Agenda for Europe of 2016
- to encourage sufficient digital skills

EU eGovernment Action Plan 2016-20
- to encourage the implementation of legislation and the uptake of online public services

EU Action for Smart Villages 2017
- to enhance digital technologies, innovation and the better use of knowledge

Digital Education Action Plan of 2018
- to support technology-use and digital competence development in education

WiFi4EU Initiative of 2018
- to allow free Wi-Fi connectivity for citizens and visitors in public spaces

Source: EPRC research.

In terms of financial support for digitalisation measures, the theme features prominently as a target area for ESI Funds. Of the 11 Thematic Objectives (TOs) to which Member States have had to target their investments, TO2 is concerned with ICT. Digitalisation also features prominently in the proposals for the post-2020 programme period as the third of the five planned Priority Objectives ('A more connected Europe'). Under TO2, Member States are asked to focus on:

a) extending broadband deployment and the roll-out of high-speed networks and supporting the adoption of emerging technologies and networks for the digital economy;
b) developing ICT products and services, e-commerce, and enhancing demand for ICT; and
c) strengthening ICT applications for e-government, e-learning, e-inclusion, e-culture and e-health.[24]

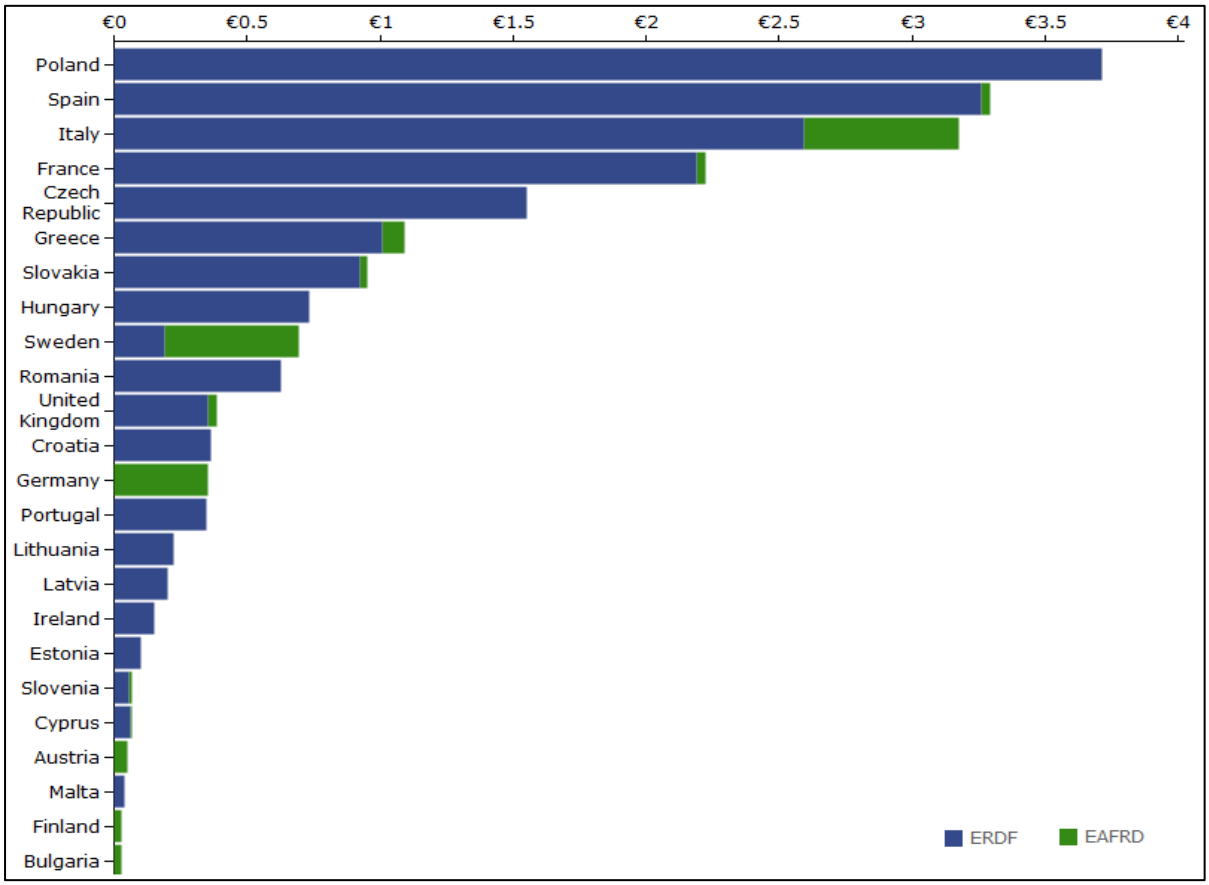
There are no compulsory minimum allocations to TO2; nevertheless, Member States have allocated a total of €18.7 billion (6.7 percent) from the European Regional Development Fund (ERDF) and €1.8 billion (1.2 percent) from the European Agricultural Fund for Rural Development (EAFRD) to TO2. Poland, Spain and Italy are leading the table in terms of absolute amounts, while Austria, Bulgaria, Finland and Germany have decided to only allocate EAFRD funding to TO2 (no ERDF). Looking at

[23] ESPON (2017a) *op. cit*.

[24] Art. 4 of ERDF Regulation 1301/2013.

shares of total funding made available by each country from ERDF and EAFRD, Sweden leads with 8.6 percent, followed by Spain (5.9 percent) and Cyprus (5.5 percent) (see Figure 7). A number of countries (e.g. Poland) have decided to implement a specific Operational Programme dedicated solely to investment in digitalisation.[25]

Figure 7: ERDF and EAFRD budgets allocated to TO2 ICT in 2014-20, by EU Member State



Source: European Commission, https://cohesiondata.ec.europa.eu/themes/2#

ICT investments under TO2 do not have to be infrastructural. In 2009, the ERDF funded preliminary studies in Tyrol (Austria), looking at the potential for fibre-optic networks, and supported the development of a masterplan 'Fibre to the home'. Also, Box 4 in Section 2.2 illustrates examples of ERDF-funded digitalisation measures in Puglia (Italy), again not necessarily infrastructural. EU-level support can play a particularly useful role in allowing European regions not only to develop, but also to share digitalisation solutions. Opportunities for this are provided both in the context of European Territorial Cooperation[26] and via Horizon 2020.[27]

[25] Operational Programme Digital Poland for 2014-2020, http://www.funduszeeuropejskie.gov.pl/media/1655/POPC_eng_1632015.pdf

[26] Two good practice examples are DANTE (Digital Agenda for New Tourism Approach in European Rural and Mountain Areas, http://www.interreg4c.eu/projects/project-details/index-project=176-digital-agenda-for-new-tourism-approach-in-european-rural-and-mountain-areas&.html), funded under Interreg 4C in 2012-14 and ERUDITE (Enhancing Rural and Urban Digital Innovation Territories, https://www.interregeurope.eu/erudite/) funded under Interreg Europe from 2016 to 2020.

[27] For instance, Smart Anything Everywhere (SAE), funded 2017-20, https://smartanythingeverywhere.eu

A central EU initiative specifically targeted at digitalisation in rural areas is the EU Action for Smart Villages. Launched in April 2017, it cuts across different policy areas, European Commission Directorate-Generals (AGRI, REGIO and MOVE) and funding sources (see Box 1).

Box 1: EU Action for Smart Villages

The EU Action for Smart Villages sets out a series of initiatives targeted at building 'smart villages for the future'. It entails enhancing traditional and new networks and services by means of digital and telecommunications technologies, innovation, and the better use of knowledge. In this, a key role is played by digital technologies, which should be used to support a better quality of life, a higher standard of living and better public services.[28] The European Commission sets out concrete actions (see Annex), and financial support for these actions is provided mainly from four sources: rural development under the Common Agricultural Policy (CAP); EU Cohesion policy; Horizon 2020; and the Connecting Europe Facility.

One of the actions funded under rural development is the **ENRD's thematic working group on Smart Villages**. Launched in September 2017 and working until July 2019, the working group is looking at ways to improve rural services through ICT tools and community-led actions and projects. It gathers good practice examples from rural areas across the EU and promotes exchange of experience.[29]

Turning to individual countries, digitalisation agendas remain predominantly national and targeted at urban areas. There have been calls for more consideration of the rural dimension in the various initiatives (including smart specialisation strategies), projects and regulations.[30] Policy responses naturally vary, not least in relation to the identified needs. Activities undertaken to promote digitalisation in rural and peripheral areas can broadly be aligned to the DESI dimensions (see Figure 2). Most measures appear to address an area's connectivity, its human capital or its digital public services. Switzerland instead, aims to implement a broad approach in the future, including interventions under a number of different headings (see Box 2).

[28] European Commission (2017) *EU Action for Smart Villages*, https://ec.europa.eu/agriculture/sites/agriculture/files/rural-development-2014-2020/looking-ahead/rur-dev-small-villages_en.pdf

[29] ENRD (2018b) *Collection of projects presented by TG members. Working document*, February 2018, https://enrd.ec.europa.eu/sites/enrd/files/tg_smart-villages_project-compilation.pdf; ENRD (2018c) *Digital and social innovation in rural services. Projects brochure*, June 2018, https://enrd.ec.europa.eu/sites/enrd/files/enrd_publications/publi-eafrd-brochure-07-en_2018-0.pdf

[30] Nordregio (2017) *Op. cit*.; Antikainen J, Honkaniemi T, Jolkkonen A, Kahila P, Kotilainen A, Kurvinen A, Lemponen V, Lundström N, Luoto I, Niemi T, Pyykkönen S, Rehunen A, Saukkonen P, Viinamäki O-P and Viinikka A (2017) Smart Countryside – maaseudun palveluiden kehittäminen ja monipuolistaminen digitalisaatiota ja kokeiluja hyödyntämällä, valtioneuvoston selivtys- ja tutkimustoiminnan julkaisuja 9/2017.

Box 2: Digitalisation the New Regional Policy (NRP) in Switzerland

In 2017-18, the Swiss State Secretariat for Economic Affairs (SECO) examined the effects of digitalisation on mountainous and rural areas. It distinguished between different types of territories: agglomerations and urban centres, peri-urban rural areas, alpine tourism centres and peripheral rural areas. The study identified the greatest opportunities for rural regions primarily in the establishment of new sales and marketing channels and the creation of networks.

For the further development of the digitalisation area of the NRP, the study recommends:

- digitalisation as a priority issue in the NRP;
- broader interpretation of export-oriented value-added systems;
- intensification cooperation between actors and regions;
- sensitisation of NRP target groups to challenges and solutions in digital transformation;
- recognition and use of digitalisation potential in public administration;
- consideration of measures for better accessibility with high-bandwidth networks;
- support for the development of regional data platforms; and
- measures to improve the supply of well-qualified workers in the targeted regions.

Source: SECO (2018) *Digitalisierung und Neue Regionalpolitik (NRP). Schlussbericht*, March 2018, https://regiosuisse.ch/sites/default/files/2018-03/Digitalisierung_und_NRP_Schlussbericht.pdf

The following examples show the state of play or priority attached to the various dimensions of digitalisation in rural and peripheral areas, with a particular focus on digital connectivity (Section 2.1), digital services (Section 2.2) and skills needed to exploit the opportunities of digitalisation (Section 2.3).

2.1 Investing in digital connectivity

High-speed broadband networks are one of the building blocks for the digital economy and one of the key enablers for digital transformation, including in underserved areas. Countries have various broadband plans and digital and innovation strategies in place to address digital connectivity (and other aspects of digitalisation), and the issues are also a key part of various regional-level development strategies. With respect to connectivity, the indicators vary, but they tend to include elements such as fixed and mobile broadband coverage (households, area, population), penetration, speed, etc. Given the rapid changes in technology, the targets set evolve over time.

In Europe, there are disparities with respect to network infrastructures for fixed and mobile broadband. These disparities are obvious between different countries, but also within national territories, with rural and peripheral areas often lagging behind. Basic broadband is now available to everyone in the EU, with 97 percent of households covered (including 90 percent of rural areas), with the remaining areas relying on satellite broadband access. However, **the divide exists for high-speed connections** between the North and South of Europe and between urban and rural areas, **and this divide is widening.**[31] A number of factors can inhibit the development of digital infrastructures, including higher costs,[32] but also those related to regulatory hurdles.[33]

[31] Shenglin B, Bosc R, Jiao J, Wenwei L, Simonelli F and Zhang R (2017) *Digital Infrastructure – Overcoming the digital divide in China and the European Union*, The Centre for European Policy Studies.

[32] OECD (2018) Bridging the rural digital divide, OECD digital economy papers, February 2018, No. 265.

[33] Shenglin B, Bosc R, Jiao J, Wenwei L, Simonelli F and Zhang R (2017) *op. cit*.

While the connectivity challenges are not solely an issue for rural and remote areas, they can have specific issues associated with their distance to core network facilities. **In the United Kingdom, poor broadband and mobile phone coverage are amongst the top three barriers that exist in rural areas**. While affordable housing remains the biggest challenge, a lack of investment in services, transport infrastructure and broadband and mobile are seen to contribute to growing social isolation, rural poverty, and rural (youth) out-migration.[34] In the Highlands and Islands (Scotland), many parts of the region struggle because of their distance from the local telephone exchange or as a result of limited technology available, particularly in some of the region's smallest exchanges. Access to services like ADSL2+, which can offer speeds of up to 20Mbps, 3G Mobile broadband and Ethernet services are limited.

Similarly, **Portugal has considerable regional disparities with regard to digital infrastructure,** with differences between regions. In rural areas, networks with a transmission speed of at least 30 Mbps are available only for less than half of households. In order to cover all rural areas with fast broadband, significant investment in rural areas has been underlined as an important priority for the Government.

Even in those areas that are relatively well connected, the importance of infrastructure investments is recognised in order to maintain future competitiveness. For instance, in Switzerland, in the canton of Graubünden, a peripheral and mountainous region, there are continuous investments into high-speed broadband with the aim of becoming one of the leading Swiss regions in terms of digital infrastructure.[35] Both the canton of Graubünden and the federal SECO have invested in a pilot project showcasing the opportunities that high-quality broadband infrastructure can provide in peripheral areas (see Box 3).

Nordic cities have been early adopters of ICT infrastructure and have been front-runners in the implementation of various smart city solutions. More generally, those countries share a long tradition of developing infrastructure to support the digitalisation of public services.[36] For instance, Sweden had the first fully automatic mobile network in 1981 and the first 4G network in 2009.[37] In similar vein, Finland declared in 2010 that broadband access is a legal right for every citizen.[38] However, even in the Nordic countries access to digital infrastructure depends to an extent on geography, and there continues to be a rural-urban divide with respect to digitalisation.[39] This is a particular challenge, given the substantial coverage of peripheral, rural and sparsely-populated areas in the countries. The need to promote digital access for the rural and peripheral regions is, however, well acknowledged. The increasing reliance on e-services, and especially public e-services in the remote areas, makes fast and secure connectivity an important issue. For instance, in Sweden the Government, private sector, and communities (local fibre networks playing an important role) have all been active in promoting and funding the rollout of broadband and fibre all over the country, including to sparsely populated rural areas. Consequently, the

[34] Skerrat S (2018) *Recharging Rural, Creating sustainable communities to 2030 and beyond*.

[35] https://www.gr.ch/DE/Medien/Mitteilungen/MMStaka/2018/Seiten/2018042501.aspx

[36] Randall L, Berlina A, Teräs, J and Rinne T (2018) *op. cit*.

[37] Warrenstein A, Lind F, Sundström O and Deutscher S.A (2016) *Capturing the Data Center Opportunity – How Sweden can become a global front-runner in digital infrastructure*, The Boston Consulting Group.

[38] Finland makes broadband a legal right, BBC news https://www.bbc.co.uk/news/10461048 Switzerland was the first country in 2008 to include broadband as part of the universal services, followed by Spain, Finland, Belgium and Sweden.

[39] Randall L, Berlina A, Teräs, J and Rinne T (2018) *op. cit*.

country has one of the highest broadband-penetration rates in the world. At the same time, there are calls to continue such investment in order to maintain competitiveness.[40]

Box 3: 'Mia Engiadina': a digital hub in the mountains (Switzerland)

Since 2015, the Swiss New Regional Policy (NRP) has been supporting strategy-building processes around the issue of digitalisation in mountainous areas in the canton of Graubünden. A total of CHF 1.14 million (€1 million), with federal and cantonal contributions under the NRP of €365,000 (€324,000), was invested in the development of an operative concept for the 'Mia Engiadina' innovation centre in the Lower Engadine. In line with NRP principles, infrastructural investments were not co-funded by the NRP. Mia Engiadina is centred on a fast fibre-optic network, which is used to make new forms of working possible in a remote mountainous region. The project aims to connect all villages of the Lower Engadine to the fibre-optic network and to create several 'mountain hubs' in the region. Mountain hubs are co-working spaces offering retreats for 'digital nomads', and the first of these has been set up in the village of Scuol in August 2016.

Sources: https://www.miaengiadina.ch/ and http://www.switzerland.alpine-space.eu/nationals/ch/brochure-nrp/brochure-nrp-de.pdf

In Germany, the focus on infrastructure stems from the digitalisation strategies that exist at the federal and *Land* levels.[41] The German national industrial strategy approach 'Industrie 4.0'[42] depends on networking and broad linkages, and this in turn depends on high-quality broadband infrastructure. In Lower Saxony, the main issue is one of network expansion, rather than encouraging citizens to be aware of possibilities and to invest in training and capacities. The expectations are that more digital services would develop if the infrastructure was better. As in many other countries, the insufficient infrastructure mainly seen in rural areas is not exclusive to remote areas. There are also villages near agglomerations with poor broadband speeds and connection. As investment in this area is not profitable for the private sector, there is a need for public funding, either in the form of aid to firms to invest or directly in public infrastructure. A key domestic funding source at federal level is the Regional Joint Task (GRW), with eligibility gradually expanding over a number of years, most recently in 2016.[43]

Across the countries, there is a strong desire to exploit the possibilities that new technologies offer. An important condition for this is, however, that **rural and peripheral areas have reliable, high-speed digital infrastructure in place.** There is no best way to expand broadband access, because technologies evolve (as do the demands for these technologies) and because countries have different circumstances.[44] However, public intervention that supports the deployment of digital infrastructures suited for future needs is required. In this respect, it has been noted for instance that economic operators should be encouraged to bridge the geographical gaps by deploying their networks in low-density areas, where costs may be high and return on investments low.[45]

[40] Warrenstein A, Lind F, Sundström O and Deutscher S.A (2016) *op. cit*.

[41] https://www.mw.niedersachsen.de/startseite/digitalisierung/niedersachsen-werden-teil-des-masterplans-digitalisierung--163539.html

[42] https://www.plattform-i40.de/I40/Navigation/EN/Home/home.html

[43] For more information on GRW and general eligibility criteria, see EoRPA instrument fiche on Germany's Regional Joint Task (GRW).

[44] OECD (2018) *Bridging the rural digital divide*, OECD digital economy papers, February 2018, No. 265.

[45] Shenglin B, Bosc R, Jiao J, Wenwei L, Simonelli F and Zhang R (2017) *op. cit*.

2.2 Promoting digital services

Digitalisation of services, especially public services, can bring a number of benefits, notably in terms of enabling public administration, individuals and businesses to streamline administrative procedures and reduce red tape. Digitalised public services can also bring added value to the economy, through transparency and public data-sharing policies that allow businesses to develop innovative services in sectors such as healthcare, transport and energy.[46]

The Nordic countries and their cities in particular rank highly in digital service provision.[47] However, the role of digital services in rural areas has also been prioritised. For instance, in Finland, digitalisation is a Government priority, and digitalisation (especially digital services) in rural areas is recognised as an important means to address demographic challenges and maintain a living countryside. A Government-commissioned study on 'Smart Countryside'[48] was carried out in 2016 to explore how to develop and diversify rural services through digitalisation and experimentation. The study found that although there was interest in the use of digital services, there is a gap between the will and the skill among the people and businesses. The study recommended various awareness-raising and capacity-building measures to promote digitalisation and to prevent digital exclusion. Furthermore, it encouraged digital experiments in the fields of social and healthcare services and remote working and studying. The results of the study have been used to inform a number of programmes, including RDP, the national strategy for broadband, and the new Government resolution of 9 November 2017 to promote digitalisation in rural areas.[49]

Other countries are catching up in terms of digital service provision. Box 4 and Box 5 illustrate examples of interventions funded by ERDF in Italy and by domestic *Land*-level support in Germany.

Box 4: Digital services: ERDF-funded interventions in Puglia (Italy)

The peripheral Italian region of Puglia has allocated over €190 million of its ERDF funding to TO2, which is the highest allocation of all the Italian regions. It has implemented a number of innovative projects under this heading, including measures to improve digital services. *Puglia Log-in* is financed by €20.8 million under TO2 and €4.7 million under TO11 (Administrative capacity). Its objective is to improve the accessibility and usage of digital public services. A broad range of public services will be integrated into a regional online portal that will become a unique and easy access channel to digital services related to areas such as health, tourism, agri-food, economic development, environment and cultural heritage management. Another example, albeit focused on towns, is *Pacts for the City*, which aims to connect and disseminate advanced digital contents, applications and services in the provincial capitals of the Puglia Region. TO2 interventions have been developed in a participatory way, involving the wider partnership of the programme. This has been recognised as a strength of the Puglia approach.

Source: Comitato di pilotaggio (2018) *Monitoraggio sull'attuazione degli obiettivi tematici 11 e 2 nei POR e nei PON, Rapporto 2017*, http://www.ot11ot2.it/comitato-di-pilotaggio/monitoraggio/monitoraggio-sull%E2%80%99attuazione-degli-obiettivi-tematici-11-e-2-2017

[46] *Ibid.*

[47] ESPON (2017a) *op. cit*.

[48] Antikainen et al (2017) *op. cit*.

[49] ENRD, Smart Countryside study Finland, https://enrd.ec.europa.eu/sites/enrd/files/tg_smart-villages_case-study_fi.pdf

Box 5: Digital services: 'Digital Villages' in Rhineland-Palatinate (Germany)

Rhineland-Palatinate aims to identify digital solutions for people living in sparsely populated areas. The *Land*'s Ministry of Internal Affairs and Sports and the German Fraunhofer Institute for Experimental Software Engineering are implementing a project on digitising the supply of goods, communication, mobility and e-government. With a budget of €4.5 million, the project runs between 2015 and 2019 in a selected number of pilot villages in two test regions. Examples of services include:

- A local online marketplace (*BestellBar*) and mobile app based on a voluntary delivery service (*LieferBar*) making use of volunteers who deliver parcels to customers when travelling on required routes, thereby earning credit to be used on other parts of the system.
- A local news portal (*DorfNews*) and mobile app (*DorfFunk*), enabling the municipalities to inform residents quickly and automatically, integrating existing news sources from the web and social media.

The project uses the living-lab approach. This allows the use of early prototypes of solutions, which has proved beneficial, as it gives users the opportunity to provide feedback that can be used for the improvement of solutions.

Sources: https://www.digitale-doerfer.de and https://enrd.ec.europa.eu/sites/enrd/files/tg_smart-villages_case-study_de.pdf

Digital services offer significant potential for policy intervention, particularly public services. In comparison to infrastructural investments they are less complex and also require less long-term planning than the improvement of human capital and skills. There are many successful examples of projects implemented at different spatial levels and which address a variety of services tailored to the specific needs of the territory covered. Most importantly, while remote areas may experience above-average benefits from the introduction of digital services, digital services are in fact attractive for all types of regions, whether rural or urban.

2.3 Human capital and digital competence

Digital literacy[50] is an essential element for exploiting the opportunities provided by digitalisation, and in terms of fostering inclusion. [51]

There is an ever-increasing need for more IT engineers and specialists on the labour market to meet the future demand of businesses. The evolving technology is also significantly changing the nature of work and has a major impact on labour markets. The skills shortage is evident in many parts of Europe.[52]

At the European level, the European Commission has put in place a strategy to address training, skills and other support needs, the 'New Skills Agenda for Europe'. Furthermore, the Commission has launched a Digital Skills and Jobs Coalition to address the digital skills shortage in Europe. Member States and other organisations in turn are invited to set up their respective coalitions (national or

[50] Digital literacy is the knowledge, skills and behaviours that enable people to understand and use digital systems, tools and applications, and to process digital information.

[51] OECD (2018) *Bridging the rural digital divide*, OECD digital economy papers, February 2018, No. 265.

[52] Shenglin B, Bosc R, Jiao J, Wenwei L, Simonelli F and Zhang R (2017) *op. cit*.

regional) and develop skills strategies and to adopt targets that will be monitored through the European Digital Progress Report.[53] There are 23 such coalitions covering 17 countries.[54]

While the skills challenge is common to most geographical areas, the concentration of digital skills is less dense in the rural and remote areas (which in some instances can be linked to connectivity issues).

Rural and peripheral regions have supported the take-up and application of digitalisation in a range of ways. For instance, the issue of digital skills is underlined in Switzerland, where a number of studies[55] have looked at challenges and solutions concerning the canton of Graubünden and come to conclusions which, according to the authors, can be transferred to Switzerland as whole. They argue that the provision of digital infrastructure in Switzerland, including rural areas, is very good, with only limited gaps, and that the main digitalisation bottleneck is education and training. The suggested policy focus on capacities to make use of existing infrastructure instead of improving the technical aspects confirms findings of an earlier Swiss study from 2012.[56]

In Sweden, the Government has strengthened its regional digitalisation work through its decision to establish regional digitalisation coordinators in the counties during 2018-20.[57] In the counties, such as Norrbotten in the northern Sweden, this allows more support to be provided to the digitalisation of businesses. The task of the digital coordinators is to contribute to the coordination and cooperation between relevant actors and to promote digitalisation in the regional growth work. This is important not only in terms of boosting the overall potential of digitalisation and investments, but also in terms of addressing the lack of knowledge and expertise in the area.[58]

Fostering capacity-building in digitalisation is vital for rural businesses (especially those in traditional industries), as well as for those that may lack skills in order to avoid digital exclusion. For rural businesses, learning from ICT experts can improve talent in rural areas in terms of developing effective e-business models, whether through established forms of collaboration or through networking events. Similarly, learning from urban hubs can be useful as a basis for capacity-building but also in terms of establishing links.[59] For instance, urban areas might want to access rural assets (organic food, nature tourism).

[53] https://ec.europa.eu/digital-single-market/en/blog/digital-skills-and-jobs-coalition-grows-strength

[54] https://ec.europa.eu/digital-single-market/en/national-local-coalitions

[55] Hauser U, Toggenburger L, Bigger B and Capol C (2017) *Breitband und Digitale Transformation: Breitbanderschliessung im Kanton Graubünden*, November 2017, https://www.gr.ch/DE/institutionen/verwaltung/dvs/ds/Projekte/breitband/Documents/Breitband%20und%20Digitale%20Transformation_Breitbanderschliessung.pdf; Moser P (2018) *Breitbanderschliessung und andere strategische Aktionsfelder: Werkstattbericht zur digitalen Transformation in Graubünden*, presentation, 8 May 2018.

[56] von Stokar T, Vettori A, Zandonella R and Schultheiss A (2012) *Breitbandnutzung von kleinen Unternehmen*, Zurich, December 2012, https://www.infras.ch/media/filer_public/af/88/af88a2b5-0326-482d-8181-2fa62fac4855/2378a_breitbandnutzung_von_kleinen_unternehmen.pdf

[57] https://www.regeringen.se/pressmeddelanden/2018/07/regeringen-genomfor-insatser-for-att-starka-arbetet-med-digitalisering-pa-regional-niva/

[58] https://www.norrbotten.se/sv/Om-Region-Norrbotten/Press/Pressmeddelanden-2018/Norrbottens-digitalisering-starks/

[59] Nordregio (2017) *op. cit.*; Antikainen et al (2017) *op. cit*.

3. CONCLUSIONS

Digitalisation can support regions in terms of facilitating better use of resources, allowing better services, and providing new opportunities for people and businesses. Although digitalisation is something for all types of regions, it can play a particularly important role in addressing some of the specific challenges facing rural and remoter regions in order to improve their regional attractiveness and competitiveness.

While digitalisation is firmly embedded in the policy agendas across the European countries, there are wide differences between countries. The Digital Economy and Society Index (DESI) rankings, for example, are high in Sweden, Finland and the Netherlands, followed closely by Switzerland and Norway, while Poland and Italy lag behind EU average.

Digitalisation efforts have also thus far prioritised urban areas. Many rural and remoter communities are actively seeking new opportunities, for instance in digital services to drive economic growth, but face difficulties due to inadequate infrastructure and skills. To create successful regions, for instance, the ENRD has called for action to be taken across the three pillars of digitalisation: digital infrastructure, digital services and digital literacy.

There have been and continue to be many different individual initiatives related to digitalisation to respond to the challenges facing rural and remoter areas. A central EU initiative, which integrates different policy areas and is specifically targeted at digitalisation in rural areas, is the EU Action for Smart Villages. A key element is that addressing the challenges and embracing the opportunities of digitalisation requires approaches that are: tailored to the region's needs, innovative, and well-coordinated across the different actors and levels of public administration.[60]

[60] Randall L, Berlina A, Teräs, J and Rinne T (2018) *op. cit*.

ANNEX 1: DESI DIMENSIONS

Dimension	Description
Connectivity	The Connectivity dimension measures the deployment of broadband infrastructure and its quality. Access to fast broadband-enabled services is a necessary condition for competitiveness.
Human capital	The Human Capital dimension measures the skills needed to take advantage of the possibilities offered by a digital society. Such skills go from basic user skills that enable individuals to interact online and consume digital goods and services, to advanced skills that empower the workforce to take advantage of technology for enhanced productivity and economic growth.
Use of Internet	The Use of Internet dimension accounts for the variety of activities performed by citizens already online. Such activities range from consumption of online content (videos, music, games, etc.) to modern communication activities or online shopping and banking.
Integration of digital technology	The Integration of Digital Technology dimension measures the digitisation of businesses and their exploitation of the online sales channel. By adopting digital technology businesses can enhance efficiency, reduce costs and better engage customers, collaborators and business partners. Furthermore, the Internet as a sales outlet offers access to wider markets and potential for growth.
Digital public services	The Digital Public Services dimension measures the digitisation of public services, and focuses in particular on eGovernment. Modernisation and digitisation of public services can lead to efficiency gains for the public administration, citizens and businesses alike as well as to the delivery of better services for the citizen.

Source: European Commission (2018) *International Digital Economy and Society Index (I-DESI)*, https://publications.europa.eu/en/publication-detail/-/publication/2feb6564-f9a7-11e7-b8f5-01aa75ed71a1/language-en

ANNEX 2: EU-LEVEL ACTIONS TO PROMOTE SMART VILLAGES

Action	Implementation	Timing
Thematic working group on Smart Rural Businesses	ENRD	2016-17
Thematic working group on Smart Villages	ENRD	2017-19
Workshop on access to data and data platforms	EIP-AGRI	April 2017
Seminar on new data-driven business development	EIP-AGRI	June 2017
Conference on innovation in agriculture and rural development	Portuguese Ministry of Agriculture and DG AGRI	October 2017
Pilot project on Smart Eco-Social Villages	DG AGRI	2017-18
LEADER/CLLD	Member States and regions	2014-20
Smart specialisation platform agri-food	DGs REGIO, AGRI, JRC, RTD and regions	2014-20
Broadband Competence Offices (BCO)	DGs AGRI, REGIO and CNECT	2016-20
Digital Innovation Hubs (DIH)	DGs CNECT and RTD	2014-20
Pilot Project 'Smart Rural Transport Areas' (SMARTA)	DG MOVE	From 2016
Internet of Things	DGs AGRI and CNECT (Horizon 2020)	2017-20
More efficient and smarter door-to-door logistics	DG MOVE (Horizon 2020)	2016-17
Business models for modern rural economies	DG AGRI (Horizon 2020)	2016-17
Future calls under the 'rural renaissance' header	DG AGRI (Horizon 2020)	2018-20
Data-driven bioeconomy	DG CNECT (Horizon 2020)	2017-19

Source: Adapted from European Commission (2017) *EU Action for Smart Villages*.

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UNION EUROPÉENNE

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