CONNECTING REMOTE AREAS

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CORA diagnostic survey results

Results and guiding measures

university of groningen
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Interreg North Sea Region
CORA
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EUROPEAN UNION

University of Groningen

Christina Rundel MSc
Dr Koen Salemink
Prof. Dirk Strijker

c.t.rundel@rug.nl

Diagnostic survey results related to infrastructure, digital skills and services

1 Introduction

1.1 Research approach

To obtain more information about the situation in the ten pilot regions of the CORA project, a survey concept was developed. An online survey was designed on that basis, partly with open questions and partly containing multiple-choice options.

The survey consisted of two parts: in the first part, the pilot regions provided us with information on digital infrastructure issues. The second part concentrated on digital skills and services. In addition, there were also some questions specifically focused on rural digital hubs. We defined rural digital hubs as 'A physical space, which can be fixed or mobile, focused on digital connectivity, digital skill development and/or emergent technologies […]'.[1]

The survey was distributed on 19 March 2018 and all the answers were received by 1 May 2018. Further questions arose in some cases when analysing the survey results, based on the responses provided by the regions. Three additional interviews were thus conducted directly after the analysis. One was conducted over the telephone, one was face-to-face and the third via Skype. Some minor questions were asked and answered by email.

1.2 Background information

The regions which participated in the survey are abbreviated in this text as set out in the following table:

[1] Based on previous work by the University of Lincoln.

Abbreviations: Aalborg (**Aal**), Hedmark (**Hed**), Hüttener Berge (**Hue**), Lincolnshire (**Lin**), Middelfart (**Mid**), Norddjurs (**Nor**), Oldambt (**Old**), Syddjurs (**Syd**), Värmland (**Vae**), Vejle (**Vej**)

Table 1 Participating regions and their abbreviations

Abbreviation	Region/participant	Country
Aal	Aalborg	Denmark (DK)
Hed	Hedmark	Norway (NO)
Hue	Hüttener Berge	Germany (DE)
Lin	Lincolnshire	United Kingdom (UK)
Mid	Middelfart	Denmark (DK)
Nor	Norddjurs	Denmark (DK)
Old	Oldambt	The Netherlands (NL)
Syd	Syddjurs	Denmark (DK)
Vae	Värmland	Sweden (SE)
Vej	Vejle	Denmark (DK)

Some of the questions could not been answered by all the participants because the information was not available. These participants are thus simply omitted from the relevant graphs, tables and text. This is because some of the participants who completed the questionnaire had specific roles, for example a member of the library staff. No public authority participated from Aalborg and one academic participant responded to the questionnaire.

2 Survey results – digital infrastructure

2.1 Magnitude assessment

The study participants were first interviewed about the characteristics of their regions. The rural population represented between 15% to 100% of the overall population, depending on the region. The definition of rural also varied, which needs to be borne in mind when comparing the data. For example, Woods (2005)[2] lists how different countries differ in the maximum population they consider defines a rural settlement.

[2] Woods, M. (2005) Rural geography – Processes, responses and experiences in rural restructuring.

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The proportion of households and businesses in the regions with an NGA connection also varied. This figure ranged from 3% to almost 100% for private households, and from 5% to almost 100% for businesses. Nevertheless, these values only provide an initial evaluation. A few regions also mentioned the difference between rural and non-rural locations or only had data available for data connections of 500Mbit/s. The Oldambt region related their answer to the availability of fibre connections. Data on businesses was not available for two regions.

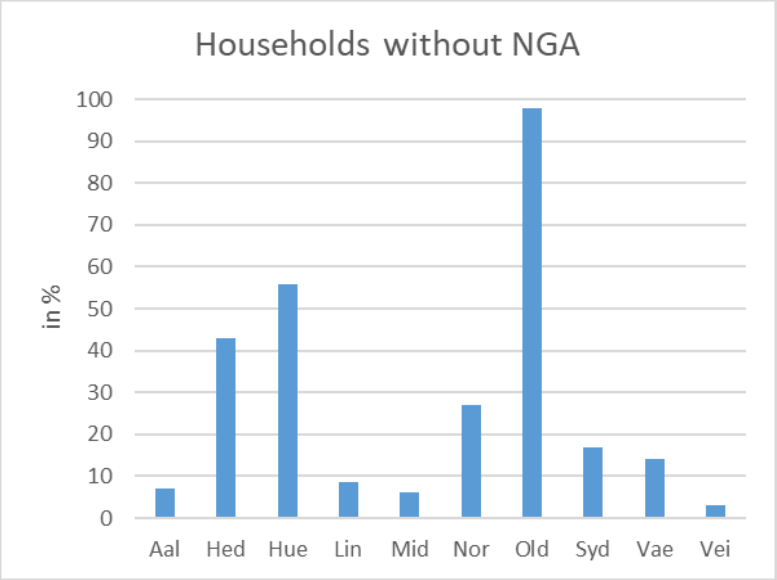

Figure 2 Households in regions (%) without NGA

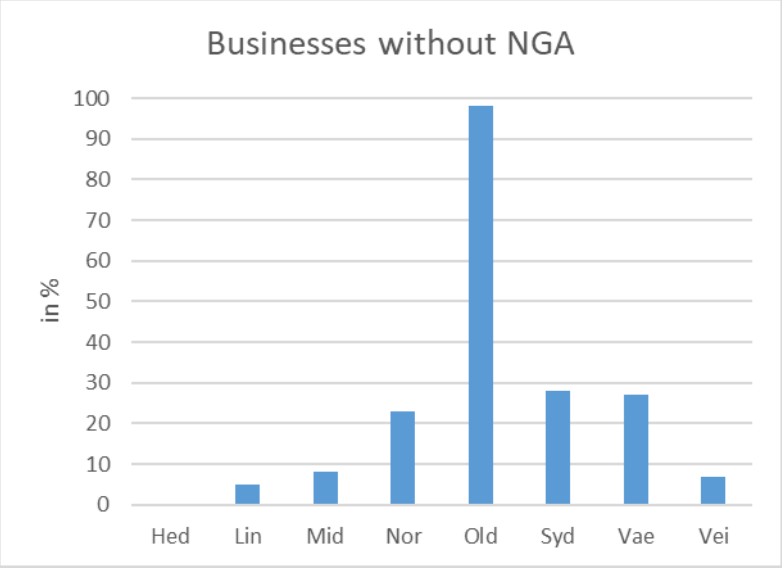

Figure 1 Businesses in regions (%) without NGA

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We also investigated whether studies had been conducted on potential users to obtain an overview of the demand from citizens and the private sector. Some regions indicated that these had partly been performed by public authorities or broadband initiatives, while others had not conducted any or they had been carried out by actors from the commercial sector.

2.2 Governance and policy framework

In this section, we will introduce the outcomes related to the governance and policy framework. Before we do that, we will explain the special case of the Dutch Oldambt region, to enable better understanding of their responses. They were very active in striving to achieve better connectivity within the area, along with a number of residents, and had established a broadband initiative. However, the province of Groningen intervened at a certain point and took over responsibility for the broadband connectivity in the region. More information can, for example, be found in the paper by Salemink and Strijker (2018)[3].

Focusing on the regional policy frameworks, we asked whether the regions had specific goals regarding internet access. Here, the regions most commonly mentioned that they followed national or regional plans. A digital plan had recently been launched in the Netherlands, so it was not mentioned in the survey. This is indicated in brackets in the table.

Table 2 Policy instruments in place

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
EU plan									x	
National plan	x	x		x	x	x	(x)	x		x
Regional plan		x	x	x		x	x	x		
Regional extra: Municipal strategies									x	

When we enquired more specifically into the goals set, many mentioned pursuing an increase in the deployment of fibre technologies, internet access for everyone and improvement in mobile coverage. These goals were reported as sometimes having been presented as technology neutral.

[3] Salemink K. & Strijker D. (2018), The participation society and its inability to correct the failure of market players to deliver adequate service levels in rural areas, Telecommunications Policy.

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Table 3 Regional goals

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
Improve internet access with fibre technologies			x	x	x	x	x	x	x	x
Internet access for everyone		x	x	x		x	x	x	x	
Improve mobile coverage		x			x	x	x	x	x	x
Installing WiFi hotspots			x			x		x		x
Improving internet access with copper technologies	x									
Regional extra: technology neutrality	x	x							x	

Looking at the actions taken in the regions to extend NGA shows that it was often decided to support communities, community initiatives or even to found a community initiative or interest group. Subsidies for market players and national funding were mentioned a few times.

Table 4 Actions taken in regions to extend NGA

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
Subsidies for market players	x		x	x					x	
Interest group/community initiative was founded	x			x	x	x	x	x		x
Supporting communities/ already existing community initiatives	x		x	x	x	x	x	x		x
Regional extra: national broadband fund (partly supported by municipal initiatives)		x			x	x		x		x
Regional extra: deployment by consumer-owned local/regional utility companies	x									

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How local communities were involved in the NGA extension process was also analysed. The regions adopted various strategies: some mentioned direct involvement, for example local citizens' groups applying for the national broadband fund and establishing community-driven services (e.g. also wireless). Broadband initiatives were mentioned, or citizens working together to create sufficient demand for market players to deploy fibre. Indirectly, communities were included through public meetings or opportunities to bring in suggestions. Moreover, respondents also reported the performance of scoping surveys, information events for local communities and the allocation of resources to promote NGA in the regions.

2.3 Finance/business models

The following table depicts which stakeholders were involved in the NGA extension:

Table 5 Stakeholder involvement in NGA extension

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
EU				x					x	
National government	x	x		x	x	x		x	x	x
Regional government		x		x		x		x	x	
Local government	x	x	x	x	x	x	x	x	x	x
Other or neighbouring local/regional governments			x	x		x		x		
Citizens' groups	x			x	x	x	x	x	x	x
Businesses	x			x	x	x	x	x	x	x
Various providers	x		x	x	x	x		x	x	x
Regional extras: education institutions, care organizations, housing corporations							x			

During the interview session, Syddjurs pointed out that it was an advantage to have the various stakeholders involved, since they could also act as public champions. However, they also mentioned that having more stakeholders required more resources and time. For Oldambt it is worth mentioning that the World Bank showed interest in the poor internet connectivity situation.[4]

NGA extensions were typically led by local communities/municipalities, but were sometimes initiated by national government. Providers were also often mentioned, while the regional government and care and education institutions were mentioned once as leaders.

The cooperation between the stakeholders involved was arranged formally in six cases, while four regions reported a rather informal arrangement.

[4] DVHN (2015), see http://www.dvhn.nl/groningen/Actie-Wereldbank-voor-snel-internet-21067343.html

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A more detailed overview of the organization of the NGA extension is presented in Table 6:

Table 6 Organization of NGA extension

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
Publicly run municipal network model			x	x					x	
Privately run municipal network model				x						
Community broadband model	x						x		x	
Operator subsidy model		x			x		x	x		x
Combination of publicly and privately run				x						

It is apparent that various models were applied, with the operator subsidy model being the most common. A number of other arrangements were also listed: in the Swedish region, the municipalities are involved in market-complementary measures. In Syddjurs and Norddjurs, passive infrastructure is provided by the municipalities, which could then be used by private businesses. Aalborg mentioned that, generally, where public institutions supported a process, it was mainly through coordination and creating demand from public institutions (e.g. school, health, etc.).

The projects were financed from various sources. The most commonly involved were the citizens and providers, but national government and businesses were also mentioned. The share of the contribution thus varied among the regions, and throughout the project phases. There was no information available in this respect concerning the project in Oldambt, as it had not yet been started, not even at the provincial level.

Table 7 Partners financing the NGA extension project

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
EU			x	x					x	
National government	x	x	x	x					x	x
Regional government		x		x					x	
Local government		x	x	x					x	x
Business	x				x	x		x	x	x
Citizens	x	x			x	x		x	x	x
Providers	x	x		x	x	x		x	x	

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Various measures were introduced by the participants to minimize the cost of broadband deployment. Multi-purpose trenches and using empty pipework or combining the roll out with other infrastructure were mentioned, and volunteers helped keep the costs down (e.g. by assisting with the digging), also by helping as members of broadband initiatives (e.g. via marketing, signing land contracts). One local government authority supported deployment by connecting its own buildings to increase demand. Another emphasized that the citizens' groups were able to choose the broadband providers' cheapest offer. The participant from Aalborg explained that the main way to keep costs down was by ensuring that demand and penetration were high enough. Two other regions emphasized the importance of considering the geography and the distribution of locations carefully, or even to conduct extensive mapping. The Swedish region also added that regular meetings were held between the municipal broadband coordinators and the managing authority for the broadband extension to exchange information about the details of different funding schemes. This resulted in a cost-efficient roll out.

Most regions declared that their measures were successful. The participant from Aalborg reported that sometimes cost minimization measures slowed down the deployment process and caused the deployment to be quite unstructured (i.e. skipping communities with insufficient numbers of interested customers).

2.4 Supportive regulation

Funding schemes and digital plans were the most common policy strategy used according to the participants, but shareholder constructions were also used. The Danish regions emphasized that the broadband fund was part of the national 2020 plan. One region mentioned demand subsidies.

Table 8 Policy strategies applied

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
Digital plans		x		x		x		x	x	
Demand subsidies							x			
Funding schemes	x		x	x		x		x	x	
Shareholder constructions			x			x		x		
Regional extras: broadband fund part of 2020 plan					x	x		x		x

Few of the participating regions mentioned stakeholders not supporting the NGA extension initiatives. Only one region had had a bad experience with the extension plans and reported

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several stakeholders not supporting the initiative. One region also mentioned the regional government in this respect.

Similarly, regions were asked whether they had any experience with unsuccessful applications for NGA extension projects. Most reported none, but some were reported. A delay caused by provincial intervention was mentioned once, as was a national funding call which encountered difficulty in attracting interest because it included a requirement for open networks, which made it unattractive for many providers. Unattractive EU funding schemes were also mentioned. One region mentioned as a problem that some citizens and businesses in the area were not interested in having a 100Mbit/s connection.

2.5 General issues regarding the NGA extension

In this chapter we analyse the barriers affecting the broadband extension in the regions more closely. Thereby, the approach is partly inspired by Salemink and Strijker (2016)[5]. Altogether, various issues were listed.

The participants were first asked whether they had experienced any obstacles in the planning or initiating phases: One mentioned receiving little support from regional government, another that it encountered reluctant national policymakers and the monopoly position of the large market players. One region emphasized that communicating with a very broad range of stakeholders, such as citizens (elderly, families and young people), owners of summer houses, businesses in various industries and broadband providers was a big challenge. Old people were particularly hard to convince that the costs of a connection were worth bearing, and providers that they should connect unattractive rural areas (see e.g. the report by Atenekom[6] and the dissertation by Hage 2015[7]). These preparations were generally described as very time-consuming, also by a second region. They particularly emphasized the struggle to establish contact with landowners and that the public authorities lacked adequate staff resources.

One region identified the many different kinds of permits, consultations and notifications needed, as obstacles to many broadband initiatives, which are often run by volunteers. Similarly, another region pointed out that the Rural Development Programme, the Regional Development Programme and their funding rules caused delays, and their application processes and regulations were difficult and time-consuming. Insufficient commercial incentives for operators (too few potential customers) and a lack of funding for very rural areas were also discussed. Another region mentioned that the demand for connections varied. Finally, regions mentioned increased demand for construction companies leading to higher prices, commercial actors' communications with households being poor, and uncertainty about the right technology to use (broadband initiatives struggled to decide whether to invest in FTTH or wireless technology).

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[5] Salemink, K. & Strijker, D. (2016), Rural broadband initiatives in the Netherlands as a training ground for neo-endogenous development, Local Economy: The Journal of the Local Economy Policy.
[6] Atenekom (2014), Study on National Broadband Plans in the EU-28.
[7] Hage, M. (2015), How can online communication enhance older adult's social connectivity? Implementation and adoption issues

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A few strategies were suggested in response to being asked about how some of the issues were resolved. Syddjurs, which had difficulties with many hard-to-reach summer houses, contacted their owners through their private email addresses. The Hüttener Berge region established a broadband competence centre, which brought stakeholders together. Värmland emphasized the importance of simpler and quicker permit processes.

The interviewees made a few remarks about the implementation or construction phase. One had difficulties with a lack of trained engineers in terms of laying empty conduits. Financing was also an issue because only a few shared the costs. It was therefore an issue that all citizens should be connected, because connections to households were especially expensive in the countryside. One region found that the commercial actors communicated badly with households and that applying for permits was complicated and time-consuming.

Almost no problems were reported for the operation and uptake phases, except for one region, who commented that demand was sometimes lower than expected, for example that cheap, slow cable connections were preferred over FTTH.

When considering the physical barriers encountered in the extension projects, we note that the Swedish and Norwegian regions plan to establish a cross-border NGA connection.

Several physical barriers were listed by the regions. The Oldambt region noted long cable distances and private landownership. Hills or mountainous regions, large forests and long coastlines were reported as obstacles by Lincolnshire, Syddjurs, Norddjurs, Hüttener Berge and Värmland. Stony soil was noted as a problem (Hüttener Berge), as were lakes and rivers, which required the laying of submarine cables in one instance (Värmland). Finally, bridges also needed to be crossed, while archaeological sites and frozen ground (Värmland) as well as a national park area (Syddjurs) complicated the extension process. Lincolnshire added that the spread of housing became a problem.

Participants were also asked whether there were target groups which were hard to reach and unlikely to participate in the broadband extension project. As previously mentioned, older people were the most commonly named, but also lower income households. People with a disability, refugees and less literate or illiterate people were all mentioned by two regions. Three regions found that small businesses (and in one case, a caravan park) did not recognize the potential value of digitalization. Information on this point was not available for two of the Danish regions, Vejle and Middelfart.

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Table 9 Hard-to-reach target groups

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
Refugees		x							x	
People with a disability		x							x	
Older people	x	x	x	x		x	x	x	x	
Low income households	x	x					x		x	
Less literate or illiterate people		x							x	
Businesses and small businesses				x		x		x		
Caravan parks				x						

Based on these results, the participants were also asked whether they made efforts to contact these groups and how. An overview is presented in the following table.

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Table 10 Strategies for reaching citizens

Region	Target groups hard to reach	Strategy and recommendations, where available	Strategy for choosing deployment phase (based on Salemink & Strijker 2016)
Syddjurs & Norddjurs	Older people, small businesses	Meetings, participating in and organizing local events, using a bus, writing articles in local business periodicals	Campaigning and building demand
Hedmark	Older people, people with a disability, refugees, low income households, less literate or illiterate people	Using young people/ proxy users as mentors for elderly people, developing a strategy	Campaigning and building demand
Lincolnshire	Older people, businesses and caravan parks	Individuals with limited skills were supported by a national initiative	Campaigning and building demand
Hüttener Berge	Older people	Public events (e.g. restaurants/taverns), bulk mail and individual contact proved effective	Campaigning and building demand
Oldambt	Older people, low income households	Communication strategy which adopts different target groups, local champions	Campaigning and building demand
Värmland	Refugees, people with a disability, older people, low income households, less literate or illiterate people	Using local broadband coordinators as intermediaries, regular meetings with them, commercial contractors and property owners in rural areas	Campaigning and building demand

Finally, some of the participants were subsequently asked in interviews about the kind of training they desired regarding NGA extensions. One sought advice and sales training, another wanted to collaborate with others to design training programmes for citizens and businesses in the area. The latter sought to strengthen their competence in using digital tools, but therefore also needed support on how to improve skills in rural areas, including in terms of funding. One region particularly wanted to learn how to train older people and considered mobile training as

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well as training in village halls. Finally, one survey participant desired a unified digital strategy for the county council because it would otherwise be difficult to promote and integrate digital aims completely.

2.6 Future-proof technologies

The following internet access technologies are already adequately provided in the regions:

Table 11 Internet access technologies provided in regions

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
Digital subscriber line	x			x	x	x	x	x	x	x
Cable (coax) modem	x			x	x	x		x	x	
Fibre	x	x	x	x	x	x		x	x	
Wireless	x	x	x	x		x		x		
Satellite				x		x		x	x	
Broadband over power lines		x			x					

The prevalence of FTTx connection installation in the regions is presented in the table below. The numbers indicate how many regions provided a response.

Table 12 FTTx connection prevalence

	Least common	Less common	More common	Most common
Fibre is unavailable	5 (Vej, Aal, Syd, Nor, Mid)	2 (Vae, Hed)	1 (Lin)	2 (Old, Hue)
Fibre to the curb/cabinet	1 (Vae)	4 (Old, Vej, Aal, Hed)	1 (Hue)	4 (Mid, Syd, Nor, Lin)
Fibre to the home	1 (Old)	3 (Hue, Lin, Hed)	4 (Mid, Vej, Syd, Nor)	2 (Aal, Vae)
Fibre to the building	2 (Old, Hue)	1 (Lin)	7 (Mid, Vej, Aal, Syd, Nor, Vae, Hed)	

FTTx technology use is clearly mixed: fibre remains unavailable in some regions.

Whether and how the design of the cable system is publicly available is indicated here (Aalborg did not have this information):

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Table 13 Availability of cable system data

	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
The existing cable system is publicly available					x	x	x		
There is a map, drawing or schema of the cable system available		x			x		x		
The cable system is made partly or completely available by a government institution at local level		x						x	x
…at regional level		x						x	
…at national level					x		x	x	
Cabinet locations are published by the utility companies				x				(x) partly	x
Regional extras: commercial systems/data is considered commercially sensitive and is not publicly available	x		x						
Regional extras: national web service for information about cables, etc. available								x	

Information about the cable system is usually made partly or completely available, although not in two regions (Hedmark and Lincolnshire), where the data is considered commercially sensitive.

We also asked the participants about their relationships with the various service providers and network owners and the extent to which they were informed about their coverage and pricing. One region indicated that they had no structured contact with them. According to the participant from Aalborg, there was a central database in Denmark with prices and coverage. Four regions from Denmark, Germany and Sweden also described the connection as good and that they were informed about coverage and pricing. Värmland even emphasized that the collaboration was excellent and made a difference. The regional broadband coordinator from the Norwegian region arranged meetings with the municipalities planning fibre investments before the public procurement process, thus enabling interested service providers to participate and present offers (including the level of coverage) individually for the municipalities. The British region

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explained that they were also well connected with the various providers in the region. They also conducted annual open market reviews and were fairly well informed about prices and alternative offers.

We received the following responses regarding experience with different installation methods:

Table 14 Experience with different installation methods

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
Blown fibre	x	x		x		x		x	x	
Aerial installation		x		x		x		x	x	
Installation in cable trays	x			x		x		x	x	
Installation in conduits	x	x		x		x		x		
Do not know			x		x		x			x

It is apparent that, leaving aside the regions which were uninformed about the details of installation, a number of installation methods were used.

Cable system monitoring differs from region to region, as can be seen in Table 15:

Table 15 Cable system monitoring

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
By private companies		x		x			x		x	
By public institutions			x						x	
By public-private partnership						x		x	x	
Information not available	x				x					x

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The following table shows that different technology is currently used in NGA extension projects:

Table 16 Technology used in current NGA extensions

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
FTTH		x	x	x		x		x	x	
FTTC			x	x		x		x		
Wireless MAN (fixed wireless installation)	x			x		x		x		
Coax cable	x			x		x		x		
Additions by regions: Not specified in the funding policies, local solutions vary										x

Most of the regions said that they had not decided which technology should be used in the extension projects, as it is legally complicated for governments to state a preference regarding internet technologies. Three regions specifically indicated that this was a solely market-driven decision. The Lincolnshire and Hüttener Berge regions nevertheless decided themselves. The German region explained that they decided to use FTTx technologies because they could achieve the highest rates of connectivity. The British region's decision was based primarily on cost: FTTC, FTTP, wireless and mobile solutions were combined.

Finally, we asked the participants about their long-term strategy for internet access technology. Three Danish regions referred to their national and local digital plans, while the academic Danish participant emphasized that this was mainly market driven, with local demand helping to drive the development. The Swedish region also highlighted the fact that this was market driven and the strategy is technology independent. The same was true of the Norwegian region. The region from the Netherlands aimed for 95% FTTH coverage, with the remaining 5% presumably being too rural, meaning that wireless connections were considered. The British region sought to achieve as close to 100% coverage as possible, but no comprehensive digital strategy was available. The German region planned to extend FTTH to all households and companies.

It is worth mentioning here that Ofcom, the communications regulator in the UK, is in charge of promoting the interests of citizens and consumers with respect to communication. This includes securing high-speed services such as broadband.[8] Thus, they enforce transparency and monitor whether the big market players deliver what they promise.

[8] For more information see https://www.ofcom.org.uk/about-ofcom/what-is-ofcom.

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3 Survey results – digital hubs

Since digital hubs are an important topic within the CORA project, the survey took a closer look at them as well. About half of the participant regions reported having a digital hub: Lincolnshire, Middelfart, Norddjurs, Syddjurs, Värmland and Vejle.

All kinds of hub types were mentioned, but the most common was internet access points. ICT training and business networking spaces, as well as a technology demonstration and material production spaces were also mentioned.

Table 17 Type of rural digital hub

	Lin	Mid	Nor	Syd	Vae	Vej
Internet Access Points		x	x	x	x	x
ICT training spaces	x				x	x
Business networking spaces	x				x	x
Technology demonstration and material production spaces	x					x

The regions provided the following additional information about the digital hubs in place:

Table 18 More detailed hub descriptions

Region	Hub description
Vejle (DK)	Free internet access in Vejle public library (WiFi and PCs); a fablab targeting technology-interested citizens, entrepreneurs and small businesses for prototyping new products (focus on creative businesses); 10 schools with fablabs (focus on design thinking); office communities for entrepreneurs and microbusinesses; Greentech Center for environmental enterprises
Syddjurs/Norddjurs(DK)	Local libraries
Middelfart (DK)	Internet Access Points in town hall and in public libraries in different towns
Värmland (SE)	Internet Access Points at all local libraries; ICT training spaces in three municipalities; joint organization for ICT companies in the region to create growth in the ICT field
Lincolnshire (UK)	Horncastle Hub providing technical support and equipment for prototyping; Designblok Hub providing technical support for designing/prototyping; MoCap Hub providing professional movement analytics and filming

The digital hubs were mostly developed by local government and citizens' groups, but also by businesses and one by a university. The digital hubs similarly usually involved local government, citizens' groups and businesses, but the EU, regional government, commercial providers, university and other government bodies were also mentioned. Finally, the financing

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was also usually provided by local government, but could include national government, the EU or other government bodies.

Most of the regions expressed interest in developing new digital hubs, including to supply areas lacking in good coverage and rural areas, to provide everyone with access to the internet and to enhance digital skills. One region reported planning to establish a VR centre, while another region expressed uncertainty about the success of a digital hub where NGA access was soon to be provided. Another region wished to concentrate on its existing hubs, rather than start new ones.

4 Survey results – digital skills and services

4.1 Status quo

Not every region had information on the current service uptake. For the ones which had, NGA uptake ranged between 50% and 97%, FTTx between 32% and 67%, and basic broadband between 85% and 95%.

Since if and to what extent the uptake varies among different age or socioeconomic groups is also interesting, in the interviews, the regions were asked about whether any statistical information on this was available. Most responded in the negative or reported that only national statistics were available. The UK region stated that the demographic factors (age, income and education) rather than geographic location proved most important.

The regions interviewed were also asked to evaluate the level of digital literacy in the rural area. Four reported mainly basic internet skills, while the rest reported above basic level, meaning that citizens there are familiar with various online interactions.

The extent of local authorities' awareness of existing and future needs regarding access to and use of superfast internet services in the region is also interesting. All the regions responded on this point by emphasizing that their awareness is high, although two survey participants in Denmark also mentioned that they lacked a common strategy within the municipality (e.g. to share experience). Oldambt also indicated a local policy document that targeted this issue, and one region in Denmark mentioned having a strategy in place.

Another question concerned the status of digitally enabled enterprises. Some had no information available, while the regions from Denmark responded that Danish enterprises are required to conduct almost all communications with public authorities online, e.g. tax declarations. Thus, all Danish enterprises should be digitally enabled. Two ICT groups are based in the Norwegian region that was interviewed, and in the UK region, the digital sector represents around 2% of businesses and is growing. According to the Lincolnshire survey participants, the definition of digitally enabled businesses is one where IT contributes to the whole business (innovation, staff and worker practices).

We also asked about the digital public services currently provided to rural citizens in the regions studied. All the Danish regions mentioned that every Danish citizen needs to conduct all written communication with public authorities through digital platforms unless they have received an

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exemption. The same counts for the regions surveyed in Norway and Sweden: many national services are available digitally, for instance taxes or pensions. The region in the UK reported that the majority of government-run public services are available online, though offline methods remain available. Regional services are also available online (e.g. to apply, book, report and pay for council services). Each district offers some public services online. The German region recently passed a regional digital plan, according to which, every citizen has the right to a personal profile offering a central customizable portal with different regional services combined. Furthermore, they stated that each city is establishing its own digital plan. According to the Oldambt region, national services in the Netherlands can be found online, and local applications are also available, such as for citizens to lodge complaints online and make digital appointments, etc.

Regarding the question of whether a participatory process was in place for a demand analysis of developing digital services for local communities, some respondents provided no answer or were unaware of any at that time. The region in Norway mentioned that training activities were being planned for elderly people. The region in the UK responded that each district council maintained feedback processes and town hall events, where residents and businesses could engage with officials and request digital services. They also reported the availability of technology hubs and a platform for individuals to participate and learn about existing services in the area. The region in Germany reported on the availability of a focus group on the digital plan open to citizens.

Some regions speculated that the use of public digital services in rural areas is not precisely known. Hedmark estimated that use is probably relatively low because more elderly people live in the region. Värmland replied that where the conditions for use are met – meaning that people have a connection and are digitally aware – most services, public and commercial, will be used. The regions in Denmark agreed that the use of many digital services is mandatory and their use is widespread, including in rural areas, though the level of digital fluency might vary by geographic location. Lincolnshire also explained that the services are used across the county and that no statistics are available regarding offline services use.

On the question of which types of digital services are currently provided to enterprises in the region, most responded that interactions with public authorities are often conducted online (Denmark and Sweden). The Norwegian region mentioned that tax returns are submitted online, while in the Netherlands there is also a digital business portal available, for example to send messages to officials. The UK region is very active in this regard: Lincolnshire Technology Hubs specifically target business support and development, and the region provides technology training events and a 'Digital Tech Health Check' (online tool for businesses). Nationally, 'Creative England' provides tech support.

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4.2 Challenges

The most regions felt that the main barriers to improving the level of uptake in rural areas was a lack of knowledge and skills, but some also mentioned affordability issues and the low level of service provision. One region also mentioned that some small areas without any access remained to be incorporated.

Table 19 Main barriers to uptake in rural areas

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
Lack of knowledge/skills	x	x	x	x	x	x	x	x	x	x
Affordability		x			x		x		x	x
Low level of service provision			x	x						

The regions also identified the main barriers to local enterprises using the established superfast internet connectivity or requesting superfast internet connectivity. Some still struggle with the availability (mentioned by Germany, Denmark, the Netherlands and Sweden), but insufficient demand and the costly investment needed to achieve connection were also mentioned by the Danish regions. The region from the UK added that there is also a lack of knowledge about recent changes in broadband availability.

According to the regions interviewed, there are several main barriers for local communities in terms of digital skills. Hedmark mentioned a significant lack of awareness. Lincolnshire and Hüttener Berge emphasized a lack of governance structures, which first need to be established. Some Danish regions mentioned that technological advances are overwhelming for some and that long travel distances to hubs where digital services training is provided are an issue for rural inhabitants. Värmland mentioned various difficulties for local communities. Not only was digital exclusion due to a lack of skills a problem, but also a lack of digital devices and connections. Furthermore, the lack of accessibility for people with a disability and elderly people was mentioned, with some indicating a need for specially staffed locations for these groups to receive help and training. Nevertheless, one can not automatically assume that this is the general attitude of elderly people, as Hage (2015) points out. She shows that older people are often reluctant towards new digital technologies.

Focusing on the main barriers to local authorities developing digital public services further in rural areas, the regions provided the following responses: Värmland mentioned a lack of awareness of the potential of such technologies, while Lincolnshire emphasized a lack of county council policies and of imagination about how the services could be offered, as well as resource and capacity limitations. Two regions from Denmark stated that the authorities did not feel responsible for this task or that they did not know precisely which services and skills needed to be developed in rural areas. Värmland also claimed that awareness of the problem

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of digital exclusion was lacking. Legal barriers were mentioned by one Danish and the German region: in Germany, digital requests and claims are not legally binding.

The main bottlenecks for local communities in using digital public services were generally felt to be their complexity and a lack of knowledge, but also trust, connectivity and the need for maintenance. Aalborg had no information on this point.

Table 20 Main bottlenecks for using digital public services

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
Complexity		x	x		x	x	x	x	x	x
Lack of knowledge		x	x		x	x	x	x	x	x
Trust		x							x	
Regional extras: Connection									x	
Regional extras: Maintenance, effort, etc.				x						

4.3 Existing future plans

The regions then explained what they had planned for improving the level of internet uptake in rural areas. Some mentioned their regional and national plans or strategies (Denmark, Germany and the Netherlands), Aalborg also suggested that, in general, some municipalities are more active than others. Värmland presented a plan to enhance the awareness of municipalities of the need to overcome digital exclusion due to lack of skills or interest. The British region presented a plan to advertise the availability of broadband, and the use of digital hubs and business support advisors.

The regions also mentioned some plans to improve digital skill levels in rural areas. Some mentioned their national and regional digital plans (Denmark and Germany), others mentioned concrete projects: Oldambt plans special courses on the services and applications available and plans to create an information centre. Middelfart mentioned that they offer courses in digital skills in public libraries. Speaking generally, Vejle pointed out that the improvement of digital skills in rural areas is mostly in the hands of local public institutions such as libraries and schools. Lincolnshire reported measures such as advertising the availability of broadband and the use of digital hubs and business support advisors. Värmland plans to establish a project to improve digital competences in the elderly, people with disabilities and newcomers to the area.

The regions reported various plans to improve the conditions for enterprises to use digital opportunities in rural areas. Some again mentioned the regional and national digital plan, Vejle mentioned that it has a green tech centre, a large part of which is located in rural areas. Moreover, they maintain a branch office in one village. Värmland offers a joint support organization for ICT companies in the region, while one region intends to introduce special courses and an information centre.

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Lincolnshire described various measures: they support the use of technology hubs, and the Greater Lincolnshire local enterprise partnership attempts to drive economic growth and implement strategies which include the improvement of digital opportunities across the region. They also offer a marketing toolkit for small businesses.

The regions were asked if they also provided 'lighthouse' or pilot initiatives to enhance digital skills and the use of digital services. A number were mentioned: a home automation project, projects in public schools, digital learning hubs in rural areas to facilitate learning and community building, and fablab schools. Syddjurs offers every citizen online access to all the documents from cases in which they were involved, through secure access to the digital document and case management applications. Värmland plans a programme to improve the digital competences of the elderly, people with a disability and newcomers to the area. In parallel, they are continuing with a project which focuses on the support of digitization processes and digital competence development for local libraries and staff. Technology hubs, a new digital health check tool for businesses and a 'Risual Digital Academy', which will offer businesses the opportunity to train existing staff and take on Digital Apprentices, were also mentioned as pilots by Lincolnshire.

Finally, most of the interviewees pointed out that they had training priorities, mostly for local residents and authorities, but also for enterprises in the area.

Table 21 Training priorities

	Aal	Hed	Hue	Lin	Mid	Nor	Old	Syd	Vae	Vej
Local authorities	x	x	x	x		x		x	x	
Local citizens	x	x	x	x	x	x	x	x	x	x
Enterprises				x		x	x	x	x	

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5 Region and country-specific characteristics

In this chapter, we will indicate some region and country-specific characteristics identifiable in the survey results. We cannot guarantee that these results are comprehensive, as they merely reflect the responses obtained from the survey.

We also identified seven general categories, to which we assigned each of the specific characteristics identified, with the aim of comparing the regions. The categories were:

(1) Policy-related
(2) Financial matters
(3) Organization
(4) Skills in the region
(5) Skill training
(6) Digital services-related
(7) Challenges

Denmark
- Regional and national plans play an important role, although merely market-driven approach (1) - National broadband funding for rural areas available and local citizens' groups are able to make use of it, but with limitations (2, 3) - Many stakeholders involved in NGA extension (3) - Operator subsidy model and partly privately-run municipal network model in use, also community broadband model (2) - Target: businesses and citizens, especially older people (4) - Make use of digital hubs and libraries play often an important role in rural areas to secure internet access and assistance; also plan for more hubs (5) - The citizens' relevant skills are evaluated as above basic level compared to some other regions in other countries (4) - Citizens and businesses are digital by default with respect to digital public services (6)

United Kingdom
- Local initiatives are active in broadband deployment (3) - National and regional plans in place (1) - Have a combination of publicly and privately-run municipal networks in place (2) - Have trouble especially with reaching elderly and businesses regarding broadband adoption (4, 7) - Focus on digital hubs, which are concentrated on SMEs (5) - The cable system plan is not publicly available (3, 7) - The majority of regional and local public services are found online (6) - Offer training especially for businesses, but also citizens (5)

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Norway
- Broadband deployment is planned by the public authorities (national to local level) (3) - Regional and national plans in place (1) - Concentrate on mobile coverage improvement instead of fibre connections (1, 3) - Municipalities apply for national and regional funds for fibre (2) - Many stakeholders are involved in extension projects (3) - Operator subsidy model in place (2) - Lack of funding for very rural locations (7) - Struggle to reach certain social groups (e.g. not only older people, but also refugees, people with a disability, etc.) and training for the elderly is planned (4, 5, 7) - Cable system plan is not publicly available (3, 7) - National digital services are in place for citizens (6)

Germany
- Regional plan in place (1) - Deployment is carried out by a broadband initiative of various communities (3) - Publicly run municipal network model in place (2) - Experienced some initial resistance at the regional government level (7) - Struggle to reach older people in particular (4, 7) - Decided to implement only fibre deployment (1, 3) - Project was financed by the EU, national and local levels (2) - Focus on a modular digital platform at regional/local level for citizens (6)

The Netherlands
- A regional plan is in place, and a digital plan since 3 July 2018 (1) - NGA extension failed at local level due to regional intervention (7) - Community broadband model and operator subsidy model planned (2) - Encountered particular difficulties with reaching older people (4, 7) - Seem demotivated to continue participating in projects (e.g. by creating local champions to inform citizens), since the regional intervention (7) - Plans mostly to deploy FTTH, although locations considered to be too remote should be connected via mobile solutions (1, 3)

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Sweden
- EU plan and municipal strategies used to set own goals (1) - Broadband initiatives in place (3) - Stakeholder involvement is from the national to the citizen level (3) - The municipalities and broadband initiatives are both involved in implementing national strategy (1, 3) - Therefore, a publicly run municipal network model and community broadband model are both in use (2) - Many stakeholders were hard to reach (e.g. older people and people with a disability, etc.) (4) - Hubs are in place, thereby targeting businesses and citizens (5) - Most public services are available digitally, also for businesses (6)

Based solely on this analysis and on the survey results, the following diagram offers a first indication of whether the regions studied (and the countries they are from) focused more on businesses or citizens. We also estimated whether they experienced project governance as more top-down or bottom-up. Since all governance levels are somehow involved in an extension, many respondents provided a somewhat mixed picture in this respect. Moreover, most countries had a focus on both businesses and citizens. Nevertheless, the efforts were mostly more citizen-oriented, except for the UK region.

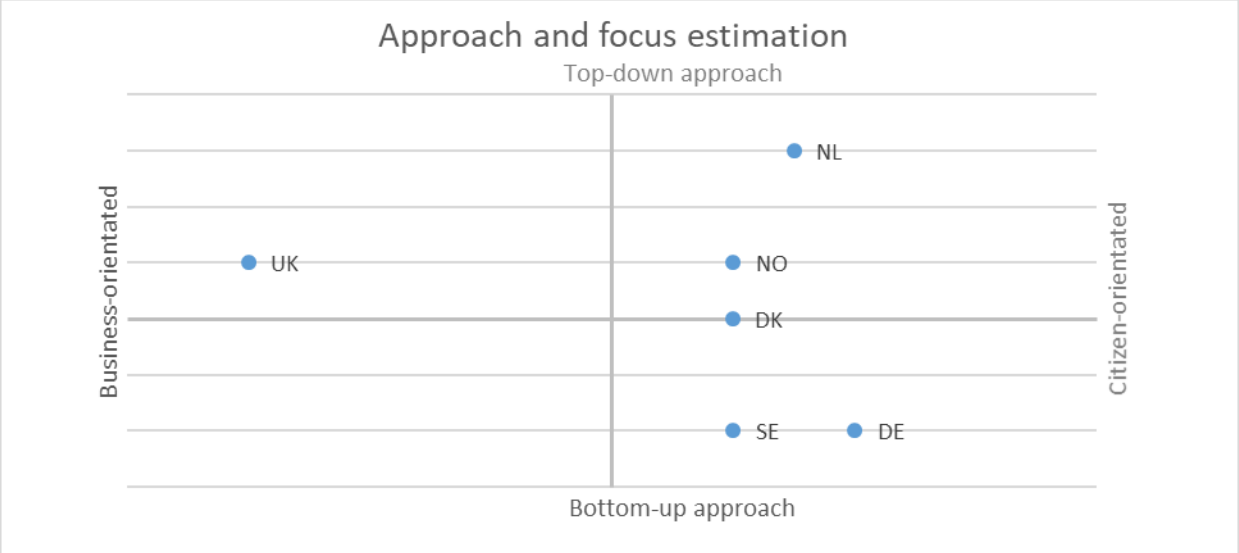

Figure 3 Approach and focus estimation

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6 Ideas

In this chapter, we would like to elaborate on some of the most outstanding ideas presented by the regions already mentioned in the previous chapters. This could provide inspiration for others.

LINCOLNSHIRE, UK:

- Onlincolnshire project by the local council, which is a platform for individuals to participate and learn about existing services in the area
- The council provides 'Business Support Advisors' who support businesses to engage with digital services
- Digital Tech Health Check (online tool for businesses); at national level, Creative England provides tech support
- Local champions (basic support), charity promoting digital skills and superfast broadband
- Risual Digital Academy offers businesses training for existing staff and support to take on Digital Apprentices
- Individuals with limited digital skills were supported by Go ON UK (national level initiative)
- Three hubs for prototyping

➔ A combination of various services to inform and assist businesses and citizens

- The council carefully considered geography and the distribution of locations across the county, resulting in the best value for money while maximizing overall coverage
- For more remote areas, FTTP was deployed, with wireless and mobile solutions for the most remote

MIDDELFART, DK:

- Middelfart supported the extension of NGA by connecting local public institutions with NGA
- It conducted digitalization projects at schools

SYDDJURS, DK:

- All Syddjurs municipality residents have digital access to every document and case they are involved in through the municipality's website

VEJLE, DK:

- Established two digital learning hubs in rural areas to facilitate learning and community building; also established fablab schools

HEDMARK (NO) AND AALBORG (DK):

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- Volunteers supported the digging work for deployment

HEDMARK, NO:

- Young people were encouraged to serve as mentors for the elderly

VÄRMLAND, SE:

- The region mapped the costs extensively to determine where direct public funding was most needed
- The managing authority for broadband extension met regularly with municipal broadband coordinators to provide information about the various funding schemes and their terms; they were able to exchange experiences
- Each municipality maintains a broadband coordinator who functions as an intermediary, providing support and holding regular meetings in rural areas
- The region is poised to start a project addressing the lack of digital competence in the elderly, people with a disability and newcomers to the area

OLDAMBT, NL:

- Were busy working out a communication strategy for different target groups
- A digital business portal is available to send messages to state authorities
- Home automation project will be implemented in a few months (from the time of writing)

HÜTTENER BERGE, DE:

- Addressing citizens in person proved most effective
- Will soon provide every citizen with a personal profile linked to a central customizable portal combining different regional services; every city designs a digital plan for itself

VEJLE, MIDDELFART, SYDDJURS AND NORDDJURS (DK) AND VÄRMLAND (SE):

- Use libraries as internet access points and specify some other initiatives such as fablabs, Greentech centres for mainly rural businesses, office communities and an ICT training space

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7 Common challenges and recommendations

Common challenges for the regions, already mentioned above, are summarized in the table below:

Table 22 Common challenges

Challenge	Regions which mention this
Arrangement of NGA extension process was complicated and time-consuming, e.g. applying for permits	Syd, Nor, Vae
Communication with households was difficult or too poor	Syd, Nor, Vae
Too little demand	Syd, Nor, Hed, Aal
Issues with other levels of public governance	Hue, Old
Strong position of big market players	Old, Aal
Broadband initiative experienced difficulties	Old, Vae, Aal
Hills or mountains/ distance complicated extension	Lin, Vae, Hue, Syd, Nor
Forests or coastlines complicated extension	Lin, Vae, Hue, Syd, Nor
Older people hard to reach	Old, Aal, Syd, Nor, Hue, Vae, Lin, Hed
Low income households hard to reach	Old, Aal, Vae, Hed
Refugees, people with a disability, less literate or illiterate persons hard to reach	Vae, Hed
Smaller businesses and caravan parks hard to reach	Lin, Syd, Nor
General lack of skills and knowledge among citizens	All
General affordability an issue	Old, Mid, Vej, Vae, Hed
Main barriers for businesses: high investment costs	Old, Mid, Vej, Syd, Nor
General availability remains a problem for businesses	Aal, Hue, Vae

One of the key conclusions is that public institutions struggle to reach and provide citizens with adequate digital skills training. This not only applies to citizens, but also to businesses, and especially to specific social target groups. To a certain extent, local authorities seemed to struggle with the development and provision of local digital services. Nevertheless, the results showed that a mix of formal strategies and various practical measures seems to work well regarding both infrastructure and skills development.

Recommendations are listed below:

INFRASTRUCTURE

Technology

- The best technology to use in extension projects depends on the circumstances

Organization

- All important stakeholders should be involved in NGA extension projects (i.e. government, market and civil society). Effective communication between stakeholders is crucial

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- One region demonstrated how important it is to consider and integrate local broadband initiatives so that the national and regional participants will cooperate. In the example, the actors struggled with the higher level government and due to that, the initiative failed.

Finance

- Various business models can be applied, with the best fit depending on the circumstances (e.g. policy framework and local demand)
- There are various options for reducing the costs; nevertheless, structural deployment should be ensured

Policy-related

- The survey indicates that funding schemes and digital plans were crucial political instruments for achieving deployment

Hard-to-reach citizens

- Special measures are needed to ensure older people, small businesses and low-income households are interested and actually see the benefit to connect. Approaching them directly through events has proved to be a good measure; local champions, 'kitchen table conversations' and other strategies were mentioned in this report
- The various stakeholder groups should be informed properly before the extension, to ensure high broadband uptake

Challenges

- Most problems occurred at the initiating and planning phases. Since it is a big task to cooperate with and inform many stakeholders, one has to make sure that the task is not 'too big' for local government, meaning that sufficient resources should be allocated and the support from regional and national governments is also sufficient. Furthermore, broadband initiatives should not be 'left alone' and instead should be integrated into the process. A clear division of roles is needed.

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DIGITAL SKILLS

Challenges

- Local government bodies are often not aware of the digital skills training needs of different social groups
- This seems also to be true for SMEs and digitally enabled enterprises

Training possibilities

- Rural digital hubs can be used to support digital skills training
- A good example of how to support businesses is provided by Lincolnshire, UK
- Training can be partly or wholly carried out by local public institutions already in place (e.g. schools)

General remarks

- Local demands should be considered at all times, and communication plans should be developed on that basis: this means general training principles can be applied (e.g. by national strategies), but should then be adapted to local needs
- Training requirements: authorities and citizens, but also businesses
- Training programmes and training plans were particularly sought by the survey participants

DIGITAL SERVICES

- At national level, digital services are often available, but only partly at regional and local levels → make sure that people do not reinvent the wheel, close cooperation with other communities and also with regional and national authorities is highly recommended. By ensuring that everyone offers more or less the same services, the same opportunities are still provided for all citizens.
- Nonetheless, it remains important to have offline methods available and safeguard adequate information and training regarding the digital services offered
- Assistance is needed (e.g. common principles/plans which can be adapted) to further develop digital services at the local level
- Legal barriers should be addressed nationally

APPLICABLE TO MORE THAN ONE OF THE MAIN CATEGORIES

- Studies are needed to capture public support for broadband extension and to obtain an overview of how many people lack adequate digital skills and connections → training needs (e.g. for older people and SMEs) can also be mapped in this process
- Existing strategies, for example in the form of digital plans, should be coherent – local, regional and national approaches should enhance each other
- Infrastructure and skills development need to go hand-in-hand

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