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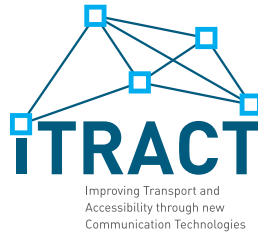
ITRACT – Report

Regional Development and Connectivity:
a Digital Perspective
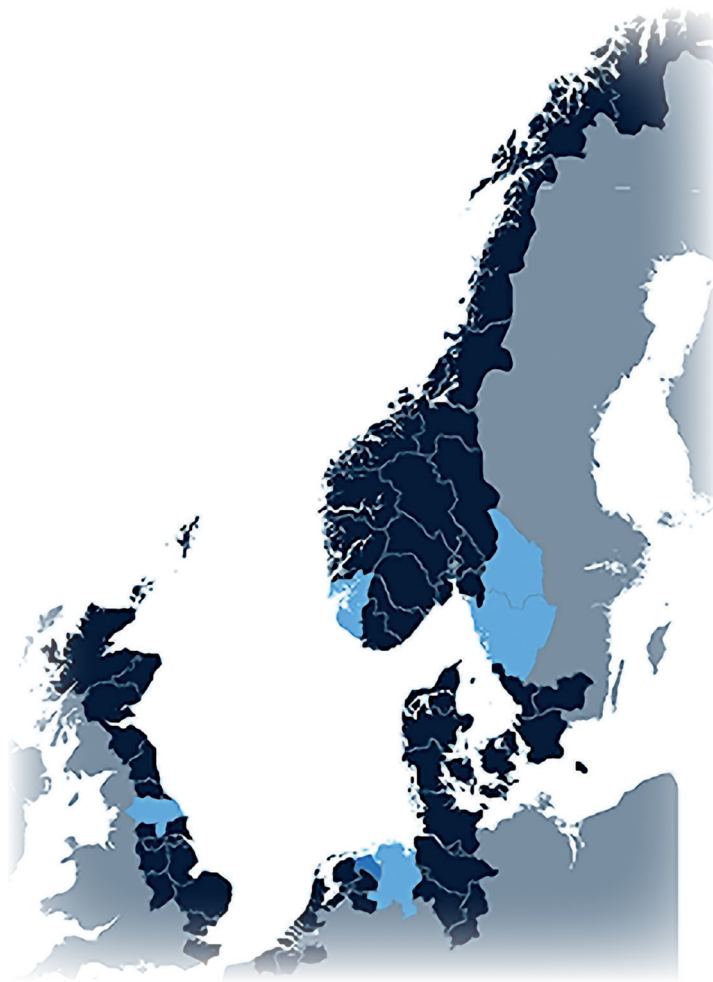
Work Package 6

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Executive Summary

Both connectivity and accessibility are important for regional development. Places and communities need to be connected in order to be part of the wider economy, and people need to have access to places, other communities and labour markets to fully participate in society. In contemporary society, not only physical connectivity and accessibility but also digital connectivity plays an important role in the economic and social potential of regions. The relationship between them is also an important issue.

This report discusses and assesses the role of physical and digital connectivity in the socioeconomic development of rural regions. In particular, we discuss issues concerning digital connectivity and rural development in remote rural areas within the North Sea Region.

ITRACT

ITRACT is the acronym for *Improving Transport and Accessibility through new Communication Technologies*. It is an EU Interreg IVB project in the North Sea Region. The participating regions are Groningen (NL), Ostfriesland (D), Rogaland (NO), Värmlands lan (S) and the Yorkshire Dales (UK). Within the project the partners developed pilot initiatives to test innovative mobility solutions. In these pilots, ICT applications were used with the aim of increasing connectivity and accessibility for people in remote rural regions.

The main goal of the ITRACT project was to improve the connectivity and accessibility of remote rural areas through ICT applications. To date, many remote rural regions have experienced problems regarding their connections to places and services inside and outside their region. Austerity measures imposed by governments are expected to further constrain transport service provision. ICT applications could compensate for this tendency to limit services, especially in rural regions.

Remote rural areas in Europe are regions in which various challenges coincide, such as the ageing of the population, declining numbers in the workforce, declining service provision due to economies of scale, and a lack of connectivity. A possible solution is to provide better digital connectivity to remote rural areas. Improvements in digital connectivity can promote rural resilience by empowering people and businesses, which stimulates economic development and social inclusion. However, the rural regions that are most in need of improved digital connectivity to overcome their isolation, are poorly served when it comes to digital connections.

The report summarizes the consequences of poor transport and poor connectivity. We conclude that rural regions are lagging behind in this respect. This results in an urban-rural digital divide, which makes the rural a less attractive place to live or do business. However, there is not only a digital divide between urban and rural areas, but also important inequalities between and within rural areas.

Mobility

There are several groups of people in rural areas who are to a certain extent dependent on public transport or community transport, including children and young adults who do not have a car or are not yet allowed to drive. In fact, this is a two-sided relationship, since students are often the largest group of customers for the public transport companies. Without them, the public transport system in many rural areas would collapse. However, there are other groups of people dependent on public transport who in general do not have a car at their disposal. The growing group of older people, in particular, often depend on public transport. Unlike students, this group is often less capable of using ICT applications. Furthermore, even if these older people do not travel themselves, those who visit them (relatives and friends) often do so using public transport.

Inequalities

The contemporary debate on digital inequalities concerns both material and social inequalities, such as differences in financial resources, capabilities, aspirations and social capital. Research and policies on digital social exclusion specifically focus on vulnerable groups: those who are already excluded in a social, economic or cultural sense. Examples of such groups are older people with little ICT-related experience, low-skilled people, non-Western migrants, people in poverty, the visually impaired and physically impaired. We learned that to help vulnerable people become digitally engaged and digitally included, applications should suit everyday routines and activities, and that a higher adoption rate is experienced when the ICT solutions are introduced to the people before they start using them.

A specific spatial inequality which is relevant here, occurs when people become mobile, using any kind of transport between different places. Digital machinery and applications depend very much on their location, leading to differences in productivity throughout a region. When people travel from one well connected place to another, they often pass through areas with low population densities and a poor quality of data infrastructure. Travelling through these 'not spots' is also a problem for public transport authorities who make use of bus-tracking devices that do not function without digital connections. Supplying passengers with real-time information, which is important in remote rural areas with only a few buses a day, is also hampered.

Economic development

Lack of connectivity, including digital, has important economic implications. It plays a role in doing business, has an effect on rural workers and students, and makes remote rural areas less competitive. There is evidence that low-quality digital connectivity hampers the development of business in the rural regions involved. Moreover, farming is affected by a lack of good internet connections. The maintenance of modern equipment is often carried out online, and communication with the government and semi-public services is often merely digital. However, it is not only farmers and rural businesses that are hampered in the development of services. People visiting rural industries, such as a potential client or for service purposes, also make use of digital connections to remain in contact with their office and databases. The tourism sector in remote rural areas is also increasingly dependent on sufficient digital connectivity. On the supply side, tourism-based businesses need good-quality internet connections to run their everyday business. On the demand side, visitors/customers of such businesses and attractions increasingly take into account the availability and quality of the internet connection when deciding on accommodation and leisure activities. Moreover, an important share of the regional income in rural areas stems from commuting. Commuters depend on good internet connections to stay in touch with their families when they are away, but also to be able to work from home, also known as telework or telecommuting.

Wellbeing and liveability

Health care in rural regions is under pressure in many ways. The lack of adequate rural transport makes health care facilities less accessible, while ageing rural populations will increase the demand. ICTs can help to counteract these negative developments. It can allow for distant medical consultations for patients, or for doctors to directly consult distant specialists. Both techniques are already in use in small populations living in remote areas.

High-speed, reliable internet connections are also vital for rural schools, requiring access to good-quality internet. Hard-copy textbooks are increasingly being replaced by digital educational material, and part of the teaching is done with online tools, making poor internet connectivity a threat to the viability of rural schools. Students living in rural areas also have their own problems regarding digital connectivity: uploading assignments and accessing the required information or e-books becomes problematic without good internet connections. These issues can have a detrimental effect on the level of wellbeing and the social prosperity of remote regions.

Conclusions

ITRACT was built on two pillars: 1) deploying ICTs in remote rural areas to address the mobility and connectivity of local people, 2) promoting the adoption of ICTs, by training people in remote rural areas to make use of new technologies for their own benefit and the benefit of the region, again with respect to mobility and connectivity.

The central learning outcome of ITRACT can be summarized as follows: promote future-ready digital connectivity in remote rural areas through projects such as ITRACT, and pay equal attention to the hard (technological) aspects and the soft (social) aspects of the provision of ICTs.

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1   Introduction

1.1 Digital connectivity

Both connectivity and accessibility are important for regional development. *Places and communities* need to be connected in order to be part of the wider economy, and *people* need to have access to places, other communities, and labour markets to fully participate in society. Being connected, that is, being able to travel to, within and between cities, villages and rural areas is a common part of people's everyday life, whether it is to get to a job, to get to a place of education, to visit family, visit a health care facility, or make a day (or longer) trip to a place for tourist purposes.

Accessibility of places, goods, services and information play a key role in providing opportunities for the economic and social development of regions. Furthermore, the degree of connectivity and accessibility affects people's quality of life. The effects of connectivity and accessibility have been studied by academics from many different disciplines, which has resulted in a large and still growing body of literature on the topic.

With the development of the digital information society, another dimension has been added to this line of research. In contemporary society, both the *physical connectivity and accessibility* of places, goods, services and information, and their *digital connectivity* are considered to play an increasingly important role in the economic and social potential of regions. In addition, the relationship between the two is an important issue.

This report discusses and assesses the role of physical and digital connectivity in the socioeconomic development of rural regions. In particular, we discuss issues concerning digital connectivity and rural development in remote rural areas within the North Sea Region. By doing this, the report will function as a basis for the analysis and evaluation of the ITRACT project (see also Section 1.2 below).

1.2 ITRACT project

1.2.1 Outline of the project

ITRACT (Improving Transport and Accessibility through new Communication Technologies) is an EU Interreg IVB project in the North Sea Region. The regions participating in the project are Groningen (NL), Ostfriesland (D), Rogaland (NO), Värmlands lan (S) and the Yorkshire Dales (UK). The project summary from the application is as follows:

A number of areas within the North Sea Region are located at a distance from the main economic agglomerations and lag behind in terms of socioeconomic development. Key elements are connectivity and accessibility. ITRACT aims to improve those capacities through the integration of innovative transport and communication infrastructure in order to create sustainable communities and to improve the attractiveness and economic potential of places. The project will focus on the development and use of novel ICT applications and brings together technology and social economic experts.

Within the project, the partners developed pilot initiatives to test innovative mobility solutions. In these pilots, ICT applications were used in order to increase connectivity and accessibility for people in remote rural regions. In order to deploy the above-mentioned 'novel ICT applications', people and places need to be provided with a comprehensive high-speed broadband internet connection, which serves both fixed and, more importantly, mobile devices. ICT applications can only function properly if sufficient fixed and mobile broadband is available, that is, if the digital connectivity of a region is sufficient.

In the case of ITRACT, people in remote rural areas, but also people visiting or traversing the rural space, need to be sufficiently digitally connected to make use of ICT applications and improve connectivity and accessibility. This report discusses issues of digital connectivity that arose during the ITRACT project, linking transport and mobility issues to telecommunications issues in the rural context. It discusses the opportunities and threats facing remote rural regions regarding their digital connectedness, or in fact lack of it

1.2.2 Goals of the project and relationship to the Gothenburg Strategy and Lisbon Agenda

The main goal of the ITRACT project was to increase the connectivity and accessibility of remote rural areas through ICT applications. To date, many remote rural regions have experienced problems regarding their connections to places and services outside the region and connection between places within the region. Some regions within the project are already facing limited transport service provision. Combined with austerity measures imposed by national and regional governments, which are expected to further constrain transport service provision, rural areas are facing a connectivity gap. ICT applications can be useful in filling this gap, especially in rural regions.

Ultimately, improved connectivity and accessibility is expected to foster economic growth. Furthermore, ITRACT aims to promote social inclusion in remote rural areas which face an ageing and declining population, by empowering specific target groups to gain access to education, cultural amenities, businesses, markets and health care.

The target groups for the project were chosen by the regional partners for their specific region. In this process the regional partners were assisted by a Toolbox created by Viktoria Swedish ICT. ITRACT also aims at protecting the environment of the remote rural areas by reducing CO_2 emissions through more efficient transport in these areas.

1.3 Outline and method

This report is based on two methods of research: a literature study and fieldwork.

1.3.1 Literature study

Firstly, we conducted a systematic review of the scientific literature on digital connectivity and digital inequality issues. The academic disciplines included were economics, geography, sociology and communications and telecommunications studies. The questions that the literature addresses and in which we are interested are:

- How do data infrastructure contexts differ across different regions?
- What material connectivity issues are prevalent in contemporary remote rural areas?
- What digital inclusion issues play a role in remote rural areas?
- What are the social and spatial effects of both the material and social issues?

1.3.2 Fieldwork: observations and interviews

Secondly, we conducted fieldwork in some of the ITRACT partner regions: Groningen (NL), March and April 2012; Yorkshire Dales (UK), July and November 2012; and Ostfriesland (D), March 2012. During these fieldwork trips, it was of specific interest to assess the quality of mobile and other broadband services in these regions, especially in relation to assisting in the provision of transport services and mobility generally.

In July 2012 in the Yorkshire Dales, interviews were conducted with several policymakers from governmental institutions and active volunteers involved in community initiatives. Furthermore, we used insights gained from related research projects on community broadband initiatives, both from interviews and meetings.

List of interviewees and meetings:

Interviews during fieldwork in the Yorkshire Dales (July 2012):

- Julie Barker, Head of Recreation, Tourism and Outreach at Yorkshire Dales National Park Authority
- Mark Allum, Recreation Manager at Yorkshire Dales National Park Authority
- Peter Stockton, Head of Sustainable Development at Yorkshire Dales National Park Authority
- Helen Flynn, Chair of DITA, Dales Integrated Transport Alliance
- Hugh Thornton, Director of DITA
- Ruth Annison and others, New Wensleydale Railway
- John Carr, Independent Public Mobility Consultant
- Richard Owens, North Yorkshire County Integrated Passenger Transport
- John Laking, North Yorkshire County Policy Development Manager

- Meetings 'Stichting Oldambt Verbindt'
- Interview with Mischa Bouwhuis, project manager at Cogas

1.3.3 Other activities in ITRACT

In addition to the research activities in Work Package 6 (Evaluation and Strategy Development) many activities in other Work Packages have been conducted by ITRACT partners. Data from both Work Package 3 and Work Package 5 is used in this report.

Work Package 3 provided us with a Toolbox that was used to define target groups for the project, determine the needs of these target groups, and ultimately conduct Service Innovation Workshops (SIWs) in order to create new ICT-based services and pilot activities. For more information on these sessions, we refer to the Best Practice Guide ITRACT WP3.

2 Connectivity in rural areas in the digital age

2.1 Transport and digital connectivity: potential, pitfalls and challenges

Remote rural areas in Europe are the regions in which various challenges coincide, including an ageing population, declining numbers in the workforce, declining service provision due to economies of scale, and a lack of connectivity (Woods, 2007; Haartsen and Venhorst, 2010). A key part of a possible solution is providing better digital connectivity to remote rural areas. According to Townsend et al. (2013), improvements in digital connectivity can promote rural resilience by empowering people and businesses, which stimulates economic development and social inclusion. However, these rural regions, which are most in need of improved digital connectivity to overcome the limited service provision, are poorly served when it comes to Next Generation Access networks (NGA) (see also LaRose et al., 2007, 2011). Rural areas are served last when it comes to deploying and adopting technological innovations such as new forms of digital connectivity, if they are served at all (Salemink et al., forthcoming). It should be noted that these technical innovations are especially promising for rural areas, where the physical availability of all kinds of services (rural shops, rural schools, care, public transport) is under pressure (e.g. Moseley and Owen, 2008). Pressure on rural services was found in all of the regions involved in ITRACT.

The potential, but also the associated problems, of improved digital connectivity becomes especially clear in the case of transport, in other words 'offline connectivity'. *Transport poverty* is a persistent and sometimes growing problem in remote rural areas (Gray et al., 2006; Shergold and Parkhurst, 2012; Milbourne and Doheny, 2012). Increasing car ownership undermines demand thresholds for public transport provision, resulting in a growing dependency on car mobility in rural communities (Gray et al., 2006: 96). Carless people, sometimes carless by choice but more often due to material hardship, are dependent either on others who own a car or on public transport. However, 'getting a lift' is not always possible for carless people, as they cannot offer a ride in return. At the same time, public transport provision is decreasing, with such circumstances leading to transport poverty and *transport-related social exclusion* (Shergold and Parkhurst, 2012).

Recently, the debate on transport provision and opportunities has shifted from 'moving people from A to B' to 'enabling connectivity between people and their destinations' (Osti, 2010; Urry, 2012; Kolodinsky et al., 2013). Enabling connectivity suggests that it is not always necessary to physically make a trip.

Instead, one should be able to connect to the required *person, institution, or service*. Velaga et al. (2012) recognized the potential of digital or virtual connectivity in this context, but due to a lack of digital connectivity in rural areas, people, businesses and institutions are restricted in developing their practices. For Velaga et al. (2013: 102), the rural space is where transport poverty meets the digital divide. It is not just the availability of connections that presents a problem. The people who are most vulnerable to, or already suffering from, transport poverty, are those experiencing material hardships and lacking essential digital skills (Owen et al., 2012), and are often limited in their abilities to use digital applications (Mariën and Van Audenhove, 2010; Hubers and Lyons, 2013). Digital progress is lacking most, precisely where it is most required.

Overall, developments related to transport and digital connectivity in rural areas can have a great impact on people and places (Jones and Lucas, 2012). With the consequences of transport deprivation becoming more clear through research, academia is now starting to also gain insight into the effects of a lack of digitalization in rural areas (Velaga et al., 2012; Townsend et al., 2013; Salemink et al., forthcoming). In the following sections we assess the consequences of a lack of 'offline' and digital connectivity, with a specific focus on the consequences for rural development. In this regard, we specifically take into account the lack of market developments, and the resulting lack of service provision, framed as 'the rural penalty' (Malecki, 2003). We discuss the causes of this penalty and assess the impact of the ITRACT approach in reducing or countering its negative consequences.

2.2 Material inequalities: serving the margins

2.2.1 Digital information society

In the current age of the information society and digitalization it is becoming ever more important for regions to be accessible and connected (Castells, 2000; Malecki, 2010), whether this concerns services, labour market areas, education, health care, or, in the case of digital connectivity, data infrastructure. In research on rural development, a distinction is made between accessible rural areas and remote rural areas, whereby the 'remote' serves as the opposite of 'accessible' (Stockdale and MacLeod, 2013: 81). The assumption derived from this suggests that remoteness is an indicator of inaccessibility. Although for this report we are not looking for proof of a conceptual dichotomy, we take into account that ITRACT concerns remote rural areas, and therefore the accessibility of the participating regions is presumed to be limited.

Connectivity and accessibility is no longer a case of having good transport opportunities. The connectivity and accessibility of a place or region also concerns the availability and quality of the data infrastructure. There is a large

body of literature in the economic, social, and communications and telecommunications sciences which states that remote rural areas have the poorest data infrastructure connections (Malecki, 2003, 2010; Cambini and Jiang, 2009; Holt and Galliagan, 2012; Townsend et al., 2013). The current situation is such that remote rural areas are the last recipients of data infrastructure developments, a situation which is similar to the expansion of road and rail infrastructure, utilities such as sewerage and electricity, and telecommunications technologies in the past, such as telephone lines (Malecki, 2003; Holt and Galliagan, 2012; Salemink et al., forthcoming).

2.2.2 Urban and rural: differences in developments between urban and rural areas

From a connectivity and accessibility perspective, remote rural areas are in the position of trying to catch up with leading, urban regions. The market situation and market formation in remote rural areas has its own mechanism, which explains the existence of digitally leading and lagging regions.

At the introductory phase of a new data infrastructure technology, which requires monetary investment, the technology is first made available in market areas which have a large mass of potential customers or users. Suppliers of the infrastructure first look for a sufficient threshold for the investment (Rogers, 2003; Sadowski et al., 2009; Cambini and Jiang, 2009). Suppliers want the reassurance of a certain sales volume before they actually invest in a place or region.[1] Suppliers of the technology, or infrastructure, also make the assumption that their investment will make money sooner in areas with many potential customers (metropolitan and urban areas) than they will in areas with fewer potential consumers, such as sparsely populated rural areas (Malecki, 2003). In the words of innovation diffusion theorists, urban areas have more potential for creating critical mass (Rogers, 2003).

New technologies are first introduced and adopted in metropolitan and urban areas, from which the technology spreads to suburban areas, then to rural areas close to the urban areas (also known as accessible rural), and eventually to the more remote rural areas. This sequence in the deployment of new technologies means that rural areas are always lagging behind in technological development. Rural areas can only try to 'catch up' with urban areas. Moreover, new technologies sometimes never reach the remote rural areas. The 'catching up' of rural areas in relation to urban areas, and sometimes an overall lack of data

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[1] In Dutch cases known from previous research (Salemink and Strijker, 2012), companies who supply fibre optics to the home want at least 60% of the households in a village to be subscribed to their project. If the project is in the countryside, with lower densities and greater distances, commercial suppliers want an even higher penetration rate beforehand, combined with higher financial contributions by the households.

infrastructure and ICT, results in an urban-rural digital divide. In urban areas there is high-speed data infrastructure available (also known as Next Generation Access or NGA), while in rural areas this is not available (Skerratt et al., 2012; Salemink and Strijker, 2012; European Commission, 2012; Ministry of Economic Affairs, Agriculture and Innovation, 2012). This is the case, for example, in the Netherlands, the United Kingdom and Germany in relation to the distribution of coaxial cables (cable TV and internet), as we found within the ITRACT project. In rural areas in these countries, outside the village envelope there is no internet available through coaxial cables because there is not sufficient market potential for the cable companies to supply the service. In Norway and Sweden, also partner countries in ITRACT, we observe similar market mechanisms, but public and other investment programmes have prevented the deep divide that occurred in other countries.

2.2.3   The rural context: differences in developments between and within rural areas

There is not only a material digital divide between urban and rural areas, but also between and within rural areas (Salemink and Strijker, 2012; Townsend et al., 2013; Salemink et al., forthcoming). The speed and quality of internet access varies greatly across rural areas. Fixed DSL connections lose speed and quality over distance. The further the actual connection is from the cabinet (local exchange), the more the speed drops for the user of that connection.

The speed and quality of mobile and broadband internet also varies greatly across rural areas. The quality of the signal drops as the user gets further away from the mast/antennas from which the signal is sent. Rural areas are served by less antenna capacity than urban areas, so there are more places in rural areas which are poorly served. Furthermore, mobile broadband coverage follows existing mobile phone coverage antennas. Policies for mobile phone coverage have been based largely around mobile phone usage along main roads, motorways and other major car routes. The further away from a major car route, the poorer the mobile phone and broadband signal (Skerratt et al., 2012; Salemink and Strijker, 2012).

The functioning of the market for telecommunications technologies to date has resulted in a lack of digitalization in remote rural areas. The data infrastructure which is required to keep up with the current pace of digital innovation is not or is insufficiently provided in rural areas.

2.2.4 Material inequalities in ITRACT

Material inequalities and differences in data infrastructure were topics at many of the ITRACT transnational partner meetings.[2] Due to insufficient digital connectivity, both fixed and mobile, in most of the participating regions, it was decided that the ICT applications should be usable in both a high-tech (using high-speed broadband internet) and a low-tech way (using minimum internet connections or even only SMS texting).

It is important to note that poor mobile internet quality is not only a problem for people living in rural areas and the companies serving them (see Sections 2.3.3 and 2.4), but also for people and services crossing the rural areas, moving from town to town. Many applications used in buses, trucks, trains and cars require an uninterrupted and stable data connection.

2.3 Social inequalities: empowering the margins

2.3.1 From digital divide to digital inequalities

Access to a good internet connection is not the only factor which plays a role in the digital inclusion of people. Accessibility and being included in digital society is not simply a 'have' or 'have not' dichotomy; although, at the start of the debate in the 1990s this was assumed through the introduction of the dichotomous interpretation of a digital divide (Gilbert, 2010; Helsper, 2012). Although the conceptual understanding has become more nuanced, the *digital divide* still serves as the academic and policy label for unequal digital connectivity provision.

A variety of disciplines, such as communications studies, sociology, cultural studies and different economic disciplines, have all contributed to the elaboration of a conceptual framework of *digital inequalities*. This offers a more nuanced understanding of why people are excluded from internet availability and usage to different extents (Anderson and Tracey, 2001; Warschauer, 2003; Selwyn, 2007; Mariën et al., 2010; Matzat and Sadowski, 2012; Gilbert, 2010; Helsper, 2012). Below, we discuss insights from this debate that are relevant for ITRACT and broader rural development issues.

2.3.2 Digital inequalities: material and social

The contemporary debate on digital inequalities is about both *material inequalities*, having a good physical connection or not (see Section 2.1), and *social inequalities*, such as differences in financial resources, capabilities, aspirations and social capital. In this debate, the different material and social

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factors are seen as resources which are available to an individual. Firstly, these resources can be available through a form of human capital, such as skills and knowledge. Secondly, resources can be available through social capital within networks, in which people share their knowledge, skills and experiences in order to help others (Gilbert, 2010; Mariën and Van Audenhove, 2010; Helsper, 2012). In the case of groups of people helping each other to make use of digital technologies, one could say that there is a specific form of social capital being employed: *digital social capital*. The resources available should help to overcome barriers which people can experience when it comes to adopting and effectively using ICTs.

Research and policy specifically focus on vulnerable groups: those already excluded in a social, economic or cultural sense (Gilbert, 2010; Helsper, 2012). It is assumed that some specific groups suffer from digital exclusion and will continue to do so in the future. Examples of such groups are older people with little ICT-related experience, low-skilled people, non-Western migrants, people in poverty, the visually impaired or the physically impaired. During the ITRACT project we also conducted an in-depth study of gypsies and travellers in the Netherlands to assess how the relationship between social and digital exclusion works in practice (see Salemink, forthcoming). From this research we know that to get people digitally engaged, and ultimately digitally included, applications should fit everyday routines and activities. ICT applications that make everyday life easier for people provide an incentive for adoption. Logically, usability and user-friendliness are issues affecting actual usage.

2.3.3 Digital inequalities in ITRACT

Introducing new ICTs into people's lives is expected to have a longer lasting effect if the use of the ICTs connects with people's *daily routines*. The ICT application needs to answer the needs of those concerned and fit into their daily practices (see also Mariën, 2013). In the ITRACT Service Innovation Workshops participants took the daily practices and routines of the target groups into account, to ensure that the pilot activities would suit these target groups. Viktoria Swedish ICT used the knowledge described above to create 'user personas' or 'profiles' of people, which were then used to determine the transport and mobility needs of target groups in that specific rural context.

In some cases, the partners in the ITRACT project recognized the difficulties some people might face when adopting and effectively using ICT applications for their own interest. Before people start using ITRACT applications they are offered training courses to teach and empower them, establishing the required basic skills and knowledge. Research on *e-inclusion initiatives* in Flanders shows that making people familiar with ICT applications before they start using them leads to a higher adoption rate (Mariën et al., 2010).

2.4 Spatial inequalities

Although spatial inequality is also implicitly present in the above, there are some specific spatial inequalities that are relevant for regional development in relation to digital connectivity. Rural areas, including remote rural areas, are characterized by low population density overall and thus low concentrations of inhabitants (Haartsen et al., 2003; Lichter and Brown, 2011), meaning that there is less market potential. The low density of people in remote rural areas has significant implications for digital connectivity. As described in Section 2.1, the degree of concentration of people and population density are key factors in the process of market formation. If more people live near each other in a certain place or region, there is more market potential (or more potential for creating critical mass), influencing the development of products and services.

However, within remote rural areas there are also differences in concentration and densities, leading to places having different market potentials and therefore different market formations. For example, within the ITRACT project we found that in larger villages and along main transport routes there is relatively good data infrastructure available, either fixed or mobile, but the further one gets from these, the more the quality of the connection drops. This can be considered the first specific spatial inequality which is relevant in regional development in relation to digital connectivity. People are subject to inequalities when it comes to data infrastructure in their *home or place of residence*.

The second specific spatial inequality of relevance occurs when *people become mobile*, using any kind of transport between different places. Here, there are two ways in which people can encounter difficulties with data infrastructure:

1. There are *differences between the places of destination* when it comes to the quality of data infrastructure, possibly creating a lack of potential to use the internet or related services. This means that the performance of digital machinery and applications depends on the location, leading to differences in productivity throughout a region.

2. When people travel through places with low population densities there can be even bigger problems regarding the quality of data infrastructure. People often travel through '*digital not spots*' in remote rural areas; places where there is little data infrastructure available, or none at all (Skerratt et al., 2010, 2012). Within the ITRACT project, this was the case, for example, in the Yorkshire Dales, UK, where several observations by one of the authors in July and November of 2012[3] showed that in the remote rural parts of the Dales, people either live in, or travel through these digital

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[3] Observations carried out by Koen Salemink during fieldwork in the Yorkshire Dales in July and November 2012, both on public and community transport services and in villages.

not spots. In some places, it is not even possible to get a mobile signal, let alone mobile broadband or a 3G/4G signal.[4]

Travelling through these not spots is also a problem for public and private transport authorities. Many of the public transport partners in the ITRACT project want to use bus-tracking devices so they are aware of the location of their buses at any moment in time. More importantly, the authorities want to give real-time information to their passengers on whether buses are on time, delayed or cancelled.[5] This real-time information is especially important in remote rural areas, where bus services are often scheduled for only a few times a day, or a few times a week. Real-time information for passengers can tell them whether a bus has just gone, is about to arrive, or is delayed or cancelled. By providing this real-time information, and thus better informing passengers, people can better decide on what to do in cases of timetable disruptions. However, in these remote rural areas it is more difficult to provide this information due to insufficient mobile data infrastructure.

The circumstances described above limit the potential to use ICT applications, particularly those requiring advanced technology, in remote rural areas. They also limit the goals of the ITRACT project. While people in the Yorkshire Dales experience problems with fixed and mobile digital connectivity, research in Groningen (Salemink and Strijker, 2012) and observations in the Ems-Jade region[6] show that mobile digital connectivity is limited in certain areas there as well, especially in remote places at greater distances from urban areas.

2.5 Rural issues for ICT adoption

In the preceding section we have shown that the rural space is poorly served when it comes to the provision of high-speed internet. In many peripheral rural regions, even the basic provision of some sort of internet connection or mobile phone signal is poor or non-existent. In general, adoption of new ICT solutions by the public can be described using Rogers' S-curve (Figure 2.1). However, while there is no reason to believe that this curve is not also applicable to rural users, it is

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[4] In interviews with Julie Barker and Peter Stockton of the Yorkshire Dales National Park Authority, the restrictions on the building of mobile internet masts in the National Park were repeatedly mentioned as one of the reasons for the lack of mobile digital connectivity in that area.

[5] These needs of the public transport authorities were established in Service Innovation Workshops held in four out of five participating regions.

[6] Observations carried out by Koen Salemink during a field trip to the Krummhörn region in March 2012.

questionable whether the assumed 100 percent penetration will ever be reached in remote rural areas.

In developed countries such as those found in the European North Sea Region, a large majority of rural inhabitants are culturally urbanized; they live in a rural environment but behave culturally as if they lived in an urban environment (Haartsen, Groote & Huigen, 2000). While the rural space may lag behind in material developments at first, at a later stage rural inhabitants will go through the same stages of adoption and innovation. This implies, however, that during the period that the new technology is not yet available in the rural environment, people there experience deep deprivation.
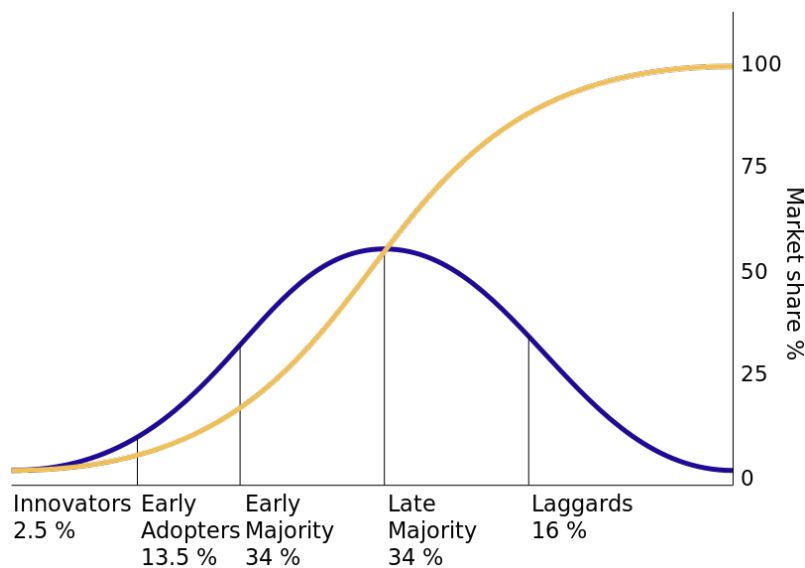
Figure 2.1: Rogers' S-curve (2004) on Adopter Categorization on the basis of Innovativeness (Source of image: Wikipedia)

3   Economic issues

In a recent report (Salemink and Strijker, 2012), we discussed the importance of high-quality digital connectivity for remote and other rural areas; both for businesses and people, in all the roles they may fulfil. The overall findings suggested that the quality of digital connectivity plays a role in doing business, has a positive effect on the work of rural workers and students, and helps make remote rural areas more competitive. Digital connectivity can also replace physical movement and transport, thereby reducing the rural carbon footprint (Hall and Woolvin, 2012).

Below, we discuss the important findings regarding the effect of digital connectivity on the rural economy in more detail.

3.1 Rural entrepreneurs

In analytical terms, the distinction between agricultural and other entrepreneurs is often conceptualized as a dichotomy. The category 'other' consists of a large variety of entrepreneurial activities, such as traditional industrial activities in a rural context (e.g. mining industries), new industrial activities (often relocated from an urban setting in search of a high-quality environment, or the producers of 'special components'), many forms of service industries (related to care, tourism [see Section 3.2], transport) and 'side-activities' (see Bosworth, 2010; Markantoni and Van Hoven, 2012). There is evidence that low-quality digital connectivity, both fixed and mobile, hampers business development in the rural regions involved (Skerratt et al., 2012; European Commission, 2012).

Moreover, farming is also affected by a lack of good internet connections. The maintenance of modern equipment is often carried out online (see Nieuwsuur item from 11 July 2013). However, even farmers who do not consider themselves entrepreneurs (those farming for a hobby), often cannot do without internet connections. Communication with the government and semi-public services is often merely digital.

However, there is a third category in this respect which is in need of good internet and telephone connections: people visiting rural industries as potential clients or as service providers. Their means of communication with their families and head offices is often digital. They often cannot do without such connections and their situation resembles that mentioned in Section 2.4: people moving from A to B through the rural area.

3.2 Rural tourism: hospitality industry

The tourism sector in remote rural areas is also increasingly dependent on the provision of sufficient digital connectivity. On the supply side, tourist businesses need good-quality internet connections to run their everyday business, for example for processing bookings and reservations, or the maintenance of a website. On the demand side, visitors/customers of tourist-based businesses and attractions increasingly take into account the availability and quality of internet connections when deciding on accommodation and leisure activities. A visit to a hotel today includes being able to check email, browse on the web for news or information on tourist attractions, and keeping those at home updated through Facebook, Twitter and Instagram. This is not just the case for people who use hotel accommodation for leisure or tourism. High-speed and reliable internet connections are crucial for business travellers. The potential of a remote rural area as a destination for conferences, international or other business meetings, and other overnight gatherings (MICE tourism: Meetings, Incentives, Conferences and Exhibitions), relies on how well the hotels can serve such visitors' needs for digital connectivity. While policymakers and businesses have assumed that remote rural areas, especially remote rural areas of natural beauty or with other aesthetic qualities, are good locations for gatherings 'away from everyday reality', a lack of digital connectivity is becoming a threat to the further developments of this sector.[7]

Although none of the ITRACT partners in the participating regions have defined a tourist 'user persona', the digital connectivity status of a region clearly would have impacts on this group as well. Whether people are day visitors to the region or visiting for a longer period, sufficient digital connectivity has become an important amenity for tourists.

3.3 Rural workers and students

An important share of regional income, especially in the more accessible regions, stems from commuting. Commuters depend on good internet connections to stay in touch with their families when they are away, but also to be able to work from home, also known as telework or telecommuting (Muhammad et al., 2007). Labour supply and skill development are important for economic development, but in areas with low population density and transport constraints, such as remote rural areas, both are often under pressure (Owen et al., 2012). High-quality digital connectivity, both fixed and mobile, can function to support infrastructure in professional training and education, with many professional training and

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[7] Observations from meetings of community broadband initiative 'Stichting Oldambt Verbindt'; insight from interviews with Mischa Bouwhuis from the cable company Cogas, responsible for market research; interview with Peter Stockton, Yorkshire Dales National Park Authority.

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education materials being provided through digital channels. Thereby, 'telecommuting' reduces the rural carbon footprint that is now high because of the great distances travelled by car. For students living in the rural environment, the situation is comparable, with one important addition: modern education partly depends on distance learning. Students must download materials and upload their results (of assignments, for example). From an educational perspective, a lack of good internet connections puts rural youth at a serious disadvantage.

For certain workers and students, both digital and physical connectivity are fundamental, the latter also in the form of public transport. Here the various elements of the ITRACT project really come together. Students and commuters: 1) need the internet to work from home, 2) want the internet on the bus or train in order to use their time efficiently, 3) need the internet to check timetables, and 4) the operators of public transport need internet connectivity, especially mobile, for efficient and effective service provision.

3.4 Rural competitiveness

Physical and digital connectivity affect all stakeholders in the rural environment. Citizens, businesses and governments all need to be connected in some way. When the connectivity of the rural is constrained, or under threat from austerity measures, there is a negative impact on both the business climate and the housing environment (Bosworth, 2010; Stockdale and MacLeod, 2013). In fact, connectivity constraints, both physical and digital, are a threat to the competitiveness of rural regions (see also Malecki, 2003; Skerratt et al., 2012). Access to markets, services, skilled labour and knowledge are essential within the contemporary information society and knowledge economy.

Rural areas are socially and economically most in need of improved physical and digital connectivity. To date, however, these rural regions have had little opportunity to actually benefit from such improvements. In order for regions to continue the process of *smart specialization*, they should have the opportunity to participate in European markets and find their niche or specialty within that European context, which may ultimately provide them with a socioeconomically sustainable future.

4 Wellbeing and quality of life issues

4.1 Service provision

4.1.1 Public and community transport

There are several categories of people related to the rural context, who are to a certain extent dependent on public transport or community transport. In most places, the largest group are children and young adults, who do not have or are not allowed to drive a car. They often use buses and trains to reach their school or university in nearby or even distant towns and cities, or to visit their parents on the weekend. In fact, this is a two-sided relationship, since students are often the largest group of customers for the public transport companies. Without them, the public transport system in many rural areas would collapse. For ITRACT, it is important to recognize that this group is to a large extent empowered and able to use ICT and its applications. This group even expects accurate digital information from their bus company and other service providers.

However, there are other groups of people who depend on public transport. In general terms, they are people who do not have a car at their disposal. The growing group of older people in particular often depends on public transport (Shergold and Parkhurst, 2012). Contrary to students, this group is often less capable of using ICT applications. Furthermore, even if older people do not travel themselves, those visiting them (relatives, friends) often use public transport to reach them.

A third group of users of public transport in the rural context are the incoming tourists. A key characteristic of this group is their seasonal and weather-dependent behaviour. Proper internet connections are a prerequisite for public transport bodies to match their services to this group.

In general, ICT-supported public transport can serve as a means to increase the quality of life for these groups. When mobility is made easier, people are potentially better connected.

4.1.2 Health care

Health care in rural regions is under pressure in many ways, including in developed economies (Steenbekkers et al., 2006). Increases in scale, alongside austerity measures, have tended to lead to the removal of health care facilities from rural areas. A lack of adequate rural transport can make these facilities even less accessible, while ageing rural populations will increase the demand. ICTs can help to counteract these negative developments, by facilitating remote medical

consultations for patients, or allowing doctors to directly consult distant specialists. Both techniques are already in use for small populations in remote areas, especially on islands (Steele and Lo, 2013). Such techniques require stable and high-quality internet connections. ICTs can also assist in monitoring patients in remote places and in situations with a lack of health care workers; but, again, stable internet connections are essential.

In general, ICT solutions can potentially increase the level of wellbeing of people in rural areas, even in situations where service provision is under pressure. For a more in-depth analysis of e-health provision and implementation in rural areas see Hage et al. (2013).

4.1.3   Education

High-speed and reliable internet connections are vital for rural schools. In some countries, even the central exams are taken using the internet. Schools need to have access to good-quality internet for this function. Furthermore, hard-copy textbooks are increasingly being replaced by digital educational material, and part of the teaching is done with online tools, such as online atlases and video tutorials. Poor internet connectivity is then a threat to rural schools, which are already under pressure due to issues concerning scale and quality. Students living in rural areas while attending schools in urban areas (often institutions for further or higher education) also have problems regarding digital connectivity (see Section 3.2) These issues are detrimental to the level of wellbeing and the social prosperity of peripheral regions.

4.1.4   Commercial activities

As already described in Section 3.2, rural businesses and all those related to them, such as the customers, service personnel, delivery services or the owners, strongly depend on good internet connections to do their work. For online banking, for example, both internet and telephone connections are vital, as the combination is used to create a safe and stable user environment. However, in many regions the combination is lacking, or inadequate at best. This hampers the economic performance of the regions, but it also threatens wellbeing in peripheral regions.

4.2   Countering the exclusion and isolation of people

4.2.1   Transport poverty

Growing car dependency and the importance of car ownership in rural areas may undermine the provision of services such as public and community transport, especially in times of austerity (Gray et al., 2006; Shergold and Parkhurst, 2012;

Velaga et al., 2012; Milbourne and Doheny, 2012). Improved digital connectivity may offer a solution to this problem. High-quality data infrastructure can 'transport' information and entertainment into remote rural homes. In addition, digital connectivity can replace physical transport, whether by car or public transport. Through the availability and, if successfully promoted, use of high-quality digital connectivity, certain groups of people who are now isolated in remote rural places, for example, due to transport poverty (Velaga et al., 2012; Milbourne and Doheny, 2012), can become better connected and gain greater access to broader society. However, before digital connectivity can fulfil this role, the data infrastructure in remote rural areas needs to be improved because current infrastructure is often insufficient.

4.2.2   Complexities of empowerment

Countering social and digital exclusion (Mariën and Van Audenhove, 2010) and involving communities in related processes (Skerratt and Steiner, 2013) have proven to be complex. In ITRACT's case, the public transport authorities involved have experienced difficulties in motivating people to participate in pilot tests. Although it was assumed that older people, the most prominent target group in the project, would have time to participate, it was quite difficult to actually involve them. Contemporary 'later life' involves volunteering, visiting family and friends, and adequate time for rest to allow participation in all kinds of activities (e.g. Lager et al., 2013). Learning how to use ICT applications does not automatically fit into such routines, unless the applications explicitly contribute to this goal.

5 Conclusions: Learning from ITRACT

ITRACT uses a common outline for digital agenda projects, which builds on two pillars:

1. Promoting the availability of ICTs, by deploying them in remote rural areas; in the case of ITRACT especially in relation to the mobility and connectivity of people.
2. Promoting the adoption of ICTs, by training people in remote rural areas, thereby assisting them, especially those digitally excluded, to make use of new technologies for their own benefit and for the benefit of the region, again in relation to mobility and connectivity.

Below we present our concluding thoughts regarding these two pillars.

5.1 Promoting digital connectivity

The first pillar – promoting the availability of ICT as a necessary means for using smart technical solutions for mobility-related problems – was addressed, as this report shows, by revealing the current shortcomings and their consequences. Our activities went far beyond the mobility questions. We showed that there is a need to convince the various actors in the field, such as policymakers, others with potential interest, and end users, that the ICT gap between urban and rural areas – or the digital divide – must be bridged. To achieve this, papers have to be written (e.g. Salemink et al., forthcoming) and presentations given (Salemink and Carr, 2013) to reveal the geographical extent of the underserved areas and spell out the social and economic consequences of 'not being connected'.

In this context, ITRACT has shown us that successfully addressing the persistent digital divide lies beyond the scope of the companies and institutions which were involved in the project. The market for telecommunications and the few oligopolistic companies that dominate this market continually affect businesses, public institutions, citizens' initiatives and individual citizens, while their role in overcoming the digital divide does not exceed that of being 'the elephant in the room'. All project partners somehow know the importance of the telecommunications companies, but at the same time there is an overwhelming acceptance or resignation to the notion that nothing can be expected from them (see also Salemink, 2014).

We revealed the consequences of a lack of innovation in the industrial, the service and agricultural sectors. In addition, we revealed the consequences for the

organization of health care, for the education sector and for ordinary people living in rural areas. However, the problem not only affects those living and working in rural areas. Anyone who visits rural areas (tourists, service personnel, relatives and friends) will be disconnected at some point. The back office, the bank, the hospital, the service department, the central computer, the server, the central payment registration – at some point they will not be reachable.

Another important group are those who travel through rural areas on their way from one well-served town to another. These people will also be disconnected at some point. The ITRACT project developed various ICT applications based on real-time information about the position of a public transportation vehicle. In underserved areas, however, real-time information is not available due to poor data infrastructure. The project very much relied on backbone digital infrastructure to deploy ICT applications and ensure they were available and of value to users.

In short, different markets and stakeholders are involved in providing infrastructure on the one hand, and services and products on the other. That is why we emphasize the necessity of high-speed broadband provision everywhere. This gives us the first pillar: ubiquitous digital connectivity is a prerequisite for innovative mobility.

5.2 Promoting the adoption of ICTs

The second pillar is about promoting the adoption of ICTs by people and businesses. The availability of broadband and related hardware is necessary, but it is not enough. People, whether private individuals or those in firms and institutions, have to be both *willing to* and *capable of* using new technologies to receive and send information. In this report we presented Rogers' S-curve, which is also applicable in the case of the adoption of new internet related technologies. In the case of ITRACT, we paid specific attention to vulnerable groups that might greatly benefit from using these technologies but are not yet using them and do not yet have the abilities and/or the willingness to do so. Therefore, a lot of effort was put into discovering who these people were, determining their specific needs and capabilities, testing the user-friendliness of apps, and providing training modules for those in vulnerable groups. Technological solutions will not work without the use of insights from the social sciences. Based on these ITRACT activities and a literature study, we found that people are often able to learn to use applications and to recognize their advantages once they are convinced of their necessity. In order to achieve this, however, learning and using the applications should fit into everyday routines. Moreover, their usage has to provide clear advantages for people, for example in relation to leisure activities, work, volunteering and other everyday practices.

5.3 Overall conclusion

Summarizing the overall project and combining the knowledge gained in relation to both pillars, we suggest that to be successful, future digital-agenda projects should:

Promote future-ready digital connectivity in the project area, in this case remote rural areas, and pay equal attention to the hard (technological) aspects and the soft (social) aspects of this.

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Presentations

Salemink, K., Carr, J. (2013) Sustaining access and connectivity in remote rural areas: transnational issues for ICT innovations in transport service provision. Local Sustainable Transport Fund National Conference, 3-4 December, Manchester, UK

Other Media

'Platteland wordt digitaal achterlijk gehouden', item in *Nieuwsuur*, 11 July 2013, NED2

ITRACT Meetings

Kick-off Meeting at Hanzehogeschool Groningen, NL, 19-20 January 2012

Transnational Partner and Stakeholders Meeting at Viktoria Institute Gothenburg, SE, 7-8 June 2012

Transnational Partner and Stakeholders Meeting at University of Stavanger, NO, 29-30 November 2012

Transnational Partner and Stakeholders Meeting at Skipton, UK, 5 June 2013

ITRACT Midterm Conference at Skipton, UK, 6-7 June 2013

Transnational Partner and Stakeholders Meeting at Karlstad, SE, 28-29 November 2013

Transnational Partner and Stakeholders Meeting at Oldenburg, DE, 22-23 May 2014

Transnational Partner and Stakeholders Meeting at Groningen, NL, 13-14 November 2014

Transnational Partner and Stakeholders Meeting and Final Conference at Groningen, NL, 4-5 February 2015
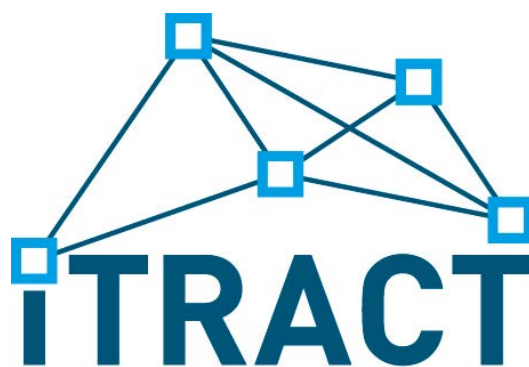
Other Events

Mainstreaming Smarter Travel, Local Sustainable Transport Fund in Manchester, UK, 3-4 December 2013, presented 'Sustaining access and connectivity in remote rural areas: transnational issues for ICT innovations in transport service provision', Koen Salemink and John Carr

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