EUROPEAN
COMMISSION

Brussels, 26.3.2013
SWD(2013) 73 final

Part 1

COMMISSION STAFF WORKING DOCUMENT

Impact Assessment

Accompanying the document

Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on measures to reduce the cost of deploying high-speed electronic communications networks

{COM(2013) 147 final}
{SWD(2013) 74 final}

COMMISSION STAFF WORKING DOCUMENT

Impact Assessment

Accompanying the document

Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on measures to reduce the cost of deploying high-speed electronic communications networks

Table of Contents

Table of Figures

1. PROCEDURAL ISSUES AND CONSULTATION OF THIRD PARTIES

1.1. Introduction

The Digital Agenda for Europe[1], one of the flagship initiatives of the Europe 2020 Strategy, underlines the importance of broadband connectivity for European growth and innovation and for social inclusion and employment. The Digital Agenda sets ambitious coverage and speed targets and requires Member States to take measures, including legal provisions, to facilitate broadband investment.

The 2012 Spring Council has asked for steps to be taken at EU level to achieve costs savings in the deployment of high-speed broadband networks, as part of the efforts to complete the Digital Single Market by 2015.

This impact assessment accompanies a legislative proposal that would, if adopted by the Council and European Parliament, render the deployment of high-speed broadband networks[2] less expensive and more efficient. It would do so by ensuring improved access to suitable physical infrastructure, more opportunities for cooperation in civil engineering works, streamlined permit granting procedures for rolling out broadband networks, and more buildings ready for high-speed broadband.

The Single Market Act II includes this initiative as one of its 12 key actions[3].

1.2. Involvement of other directorate generals

DG Connect set up on 1 March 2012 an inter-service steering group including the following services: Secretariat General, Legal Service, DG Competition, DG Economic and Financial Affairs, DG Energy, DG Enterprise, DG Environment, DG Internal Market, DG Mobility and Transport and DG Regional Policy. The IASG held five meetings between March and September 2012.

1.3. Consultation and expertise

1.3.1. Stakeholder consultation

In preparation of this impact assessment, the Commission services held a public consultation from 27 April to 20 July 2012. The Commission invited stakeholders to give their views on five sets of questions, covering the entire chain of network deployment, from the planning phase to the connection of end-users. Over a hundred written replies were submitted by

---

1 COM(2010)245 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Digital Agenda for Europe.

2 The high-speed broadband networks and NGA (next generation access) networks are considered to be synonyms in the text. Any references to studies or documents concerning NGA remain valid to high-speed broadband networks/infrastructure.

3 Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions, COM(2012)573 of 3.10.2012, Key Action 9.

different types of stakeholders from 26 countries across the EU and EFTA. The largest categories of respondents were electronic communications providers (27) and their trade associations (14), as well as public bodies - both central (22) and local authorities (9). Six National Regulatory Authorities (NRAs) responded. Other utilities (7) provided their input mainly via trade associations. Equipment manufacturers (5) and engineering and ICT trade associations (6) also replied. In general terms, the respondents favourably received the Commission's initiative to address civil engineering costs for broadband roll-out. A majority of them confirmed existing problems in the rollout process as well as the potential for cost reduction, thereby supporting the mandate for the Commission to act. The public consultation was an opportunity to collect feedback on the efficiency of different existing practices applicable in some Member States, regions or municipalities. Several solutions were proposed, some very ambitious and some more moderate. A report on the outcome of the public consultation can be found in Annex I, whereas references to the specific ideas provided in the consultation are made throughout the document. An Internet discussion platform for crowdsourcing ideas was also set up in the margin of the public consultation, which allowed for exchange of ideas and interaction between the interested stakeholders.

The Commission services have maintained regular contacts with major stakeholders, both public and private, across the sectors concerned. The views expressed in the framework of these consultations have been incorporated throughout the entire report.

1.3.2. Studies and other information sources

The Commission services have commissioned two studies and had recourse to a number of information sources, for the preparation of the impact assessment. More specifically, Deloitte prepared a study on cost reduction practices with regard to broadband physical infrastructure rollout[4] and Analysys Mason elaborated a study to support this impact assessment[5]. Annex III builds on the study prepared by Deloitte, as further cross-checked with other sources, whereas the study prepared by Analysys Mason forms part of Annex IV. In addition, a more extensive study carried out by Analysys Mason on the costs and benefits of broadband was used to support the analysis of impacts[6].

Furthermore, the Commission services drew upon additional information sources, studies and national best practices (e.g. DE, FR, LT, IT, PT, NL, PL, ES, SE, SI, UK). The complete list of these sources can be found in the bibliography. Detailed information was also collected by the responsible Commission services via the National Regulatory Authorities.

1.3.3. Dedicated events

The Commission services have discussed possible actions to facilitate and reduce the cost of NGA networks' deployment on various occasions, notably in the meetings of the Digital Agenda Europe High Level Group held on 17 January and 4 December 2012, in several meetings of the Communications Committee and in the Smart Grids Task Force. Furthermore, a session in one of the workshops of the 2012 Digital Agenda Assembly, held

[4] Framework Contract n° SMART 2007/0035
[5] Framework Contract n° SMART 2012/0013
[6] Framework Contract n° SMART 2010/0033

on 21-22 June 2012, was dedicated to finding ways at EU level to make the rollout of high-speed broadband easier and less expensive.

1.3.4. Exchange of best practices

The Commission services have drawn from the extensive experience of the Member States, in order to design the different policy options and assess their impact. Best practices, as well as obstacles were discussed in different *fora*, including the High Level Group of Electronic Communications and the DAE High Level Group.

1.4. Opinion of the Impact Assessment Board

The draft Impact Assessment was presented to the Impact Assessment Board on 7 November 2012. The Board examined it and delivered its first opinion on 9 November and its final opinion on 4 January 2013. In response to the recommendations of the Board, the document was revised introducing the following main changes:

- The problem definition (Chapter 2) was completed with an overview of the broadband situation across the different Member States as compared to Europe's global competitors (Section 2.1.2), with an overview of the current regulatory framework (Sections 2.4.1 through 2.4.4 and Annex VI) and with an analysis of the problems and entry barriers holding back the rollout (Sections 2.1.3 – 2.3); furthermore, the analysis of the baseline scenario was reinforced with developing the outlook for each of the inefficiencies (Section 2.6) and impact analysis of good practices (Section 5.4) and a more transparent account was given of the issues selected to be tackled by this initiative (Section 2.4);

- The subsidiarity arguments in Section 2.7 were strengthened to clarify why EU action is needed against the background of possible measures at Member State level and of the possibilities offered by the current regulatory framework;

- The policy options in Chapter 4 were better defined in terms of their content rather than instruments and it was explained how those address the totality of the problems identified;

- The analysis of the impacts in Chapter 5 was deepened, including, among others, cost and benefits of some existing good practices, quantification of expected costs savings and assessment of administrative burdens and social impacts and other costs and benefits of the different options (see in particular Sections 5.2 - 5.3 and Annexes VII – IX);

- The comparison of options in Chapter 6 was re-written in a more synthetic and clearer way;

- The different views of the stakeholders were better reflected throughout the entire report;

2. PROBLEM DEFINITION

2.1. Policy context

2.1.1. The importance of broadband

The achievement of Europe 2020 objectives of smart, sustainable and inclusive growth will very much depend on the availability and widespread use of the broadband. A high quality digital infrastructure underpins virtually all sectors of a modern and innovative economy and is of strategic importance to social and territorial cohesion. It is the backbone of the Digital Single Market, a major and still to a large extent untapped source of growth, and a key factor for EU's competitiveness.

Numerous international studies demonstrate the benefits of broadband for the society[7]. First, it is highly important for competitiveness and innovation and has a clear impact on GDP growth. Second, it is also a net job creator, an enabler of major societal and governmental reforms, as well as a transformational factor – reducing for example the isolation of regions, including Outermost Regions. Finally, broadband has proven to bring significant benefits for the environment. The general economic, social and environmental impacts linked to broadband access are illustrated in detail in Section 5.3.

More generally, living in a connected society changes the economic, entrepreneurial and social environment. A high quality digital infrastructure is a key enabler of economic and social changes and a condition for next generation technologies, services and applications to develop. In fact, it is considered by experts as essential for the 21st century's society as the rail was for the 19th century and electricity for the 20th century.[8]

Acknowledging the importance of broadband rollout, Member States have endorsed the ambitious broadband targets set in the Digital Agenda for Europe. These targets are as follows: 100% broadband coverage by 2013 for all Europeans and increased speeds of 30MBps for all, with at least 50% of the European households subscribing to Internet connections above 100MBps by 2020. DAE targets were set just shortly after the reform of the regulatory framework (2009).

Following the adoption of the Digital Agenda, the Commission issued **a first package of measures aimed at stimulating investment in high-speed Internet in 2010**. As part of the package, the objective of the Broadband Communication[9] was to assist the actions of national and local authorities in enhancing rollout. The Next Generation Access Recommendation[10] was aimed at providing regulatory guidance to national regulators, while the Radio Spectrum

---

7 *The Impact of Broadband on the Economy: Research to Date and Policy Issues* April 2012, ITU; this study in particular summarized different evidence generated by the different bodies of theory regarding the economic impact of broadband. See: http://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_Impact-of-Broadband-on-the-Economy.pdf

8 McKinsey Global Institute 2011.

9 COM(2010)472 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: European Broadband: investing in digitally driven growth.

10 C(2010) 6223/3 Commission recommendation on regulated access to Next Generation Access Networks

Policy Programme (RSPP)[11] aimed to improve the coordination and management of spectrum and hence facilitate, among others, the development of wireless broadband.

2.1.2. Broadband in Europe and in the world - a need to step up efforts to roll out high-speed internet

Although basic Internet connections are available to a great majority of European households (95.7%), the EU is currently only halfway towards its goal of 30Mbps access for all by 2020[12].

Great differences exist within the EU as regards the coverage of high-speed broadband. As can be seen in the figure below, some Member States such as the Netherlands or Malta are close to 100%, while others such as Greece and Cyprus are under 10%[13]:

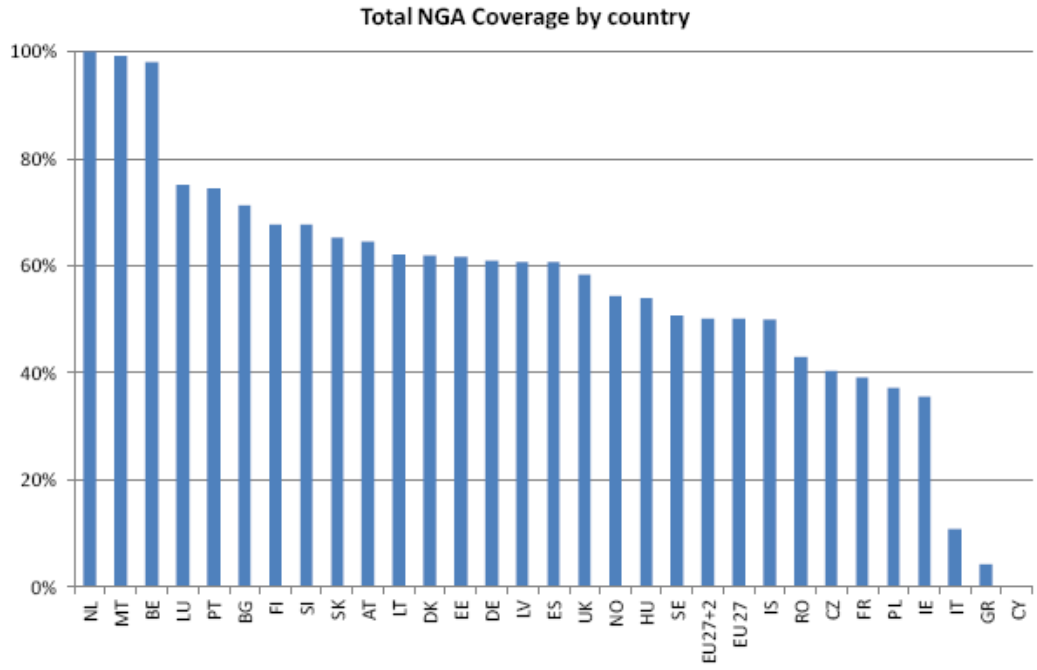


Figure 1 - Total NGA coverage by country in the EU. Source: Broadband Coverage in Europe in 2011, Point Topic for the European Commission

Moreover, out of 105 million European homes with access to high-speed broadband, only 5 million are in the rural areas (12% of the total rural homes in Europe) leading to an increasing isolation of these areas. 35 million homes in rural areas are still waiting for high-speed connectivity, and bringing it to them is likely to require the most considerable effort and investment.

---

11 http://ec.europa.eu/information_society/activities/broadband/wireless/index_en.htm

12 https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/KKAH12001ENN-PDFWEB_1.pdf Chart 1, p. 8

13 http://ec.europa.eu/digital-agenda/en/news/study-broadband-coverage-2011

Thus, the digital divide becomes increasingly important in the context of high-speed broadband, as citizens are not only deprived of access to information, as it is the case with basic broadband, but also of an entire range of Internet-based digital services available only on high-speed connections, such as eHealth, eEducation, or eGovernment.

From an international perspective, investments in high-speed broadband are taking place more quickly in parts of Asia and in the United States, leading to significantly better coverage (see figure 2) and higher speeds. In the US, high-speed networks now pass more than 80% of homes, a figure that quadrupled in three years. Japan and South Korea were at 86.5% and, respectively, 68% already in 2009[14]. In addition, there is a very strong growth in coverage of high-speed broadband in Russia and China[15].

Take-up of high-speed broadband in Europe is generally also rather low, as compared to other important world economies. South Korea, with 20.6% of subscriptions per 100 inhabitants, has the highest take-up of fibre worldwide, i.e. double that of Sweden (9.7%), the best in the EU (as of December 2011)[16]. Japan has the second highest fibre take-up at 17.2%. The high take-up in Asia may be related to the relatively inexpensive high-speed connections, attractive content offerings and the growing use of multiple connected devices.[17]

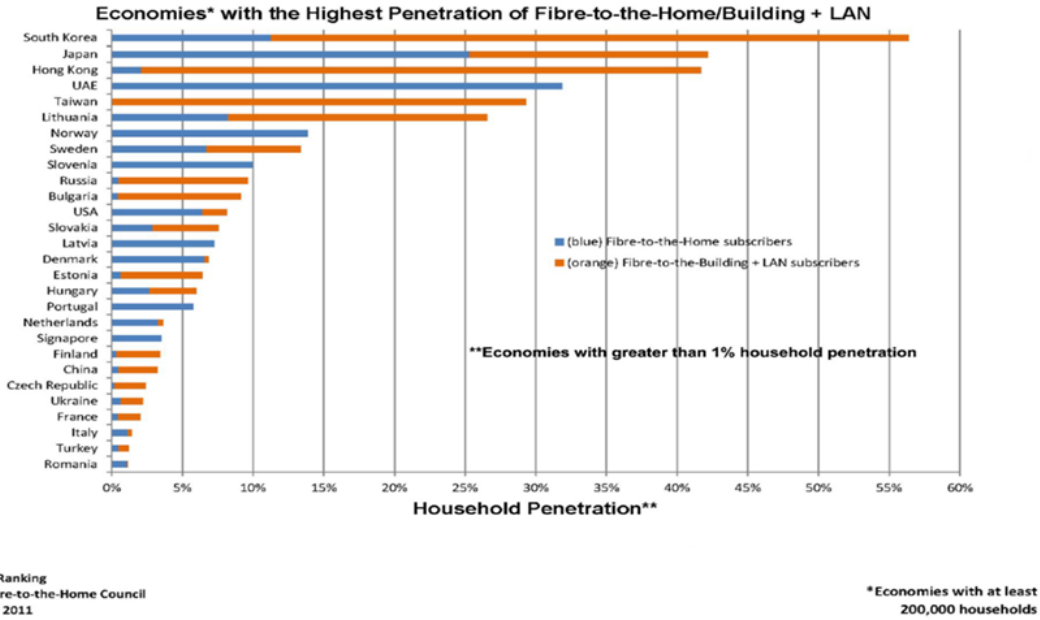


Figure 2 - Economies with Highest Penetration of FTTH/FTTB. Source: FTTH Council

According to experts[18], it could cost more than 200 billion EUR to bring high-speed broadband to all Europeans in line with the Digital Agenda targets. While investments in the

14 http://www.oecd.org/internet/broadbandandtelecom/oecdbroadbandportal.htm

15 http://www.ftthcouncil.eu/documents/Reports/Market_Data_December_2011.pdf

16 See OECD Fixed and wireless broadband subscriptions per 100 inhabitants (December 2011), http://www.oecd.org/internet/broadbandandtelecom/oecdbroadbandportal.htm

17 See OECD prices in December 2011 http://www.oecd.org/internet/broadbandandtelecom/oecdbroadbandportal.htm#prices

18 A review of recent studies indicates that between € 38bn and € 58bn would be needed to achieve the 30 Mbps coverage for all by 2020 (using a mix of VDSL and next generation wireless) and between €

telecom sector **amount to** 12.4% of the total revenues of 256 billion EUR throughout the EU in 2010[19] – only a limited share of these are in next generation networks.

2.1.3. Factors holding back high-speed broadband rollout

- Several factors explain why investments are not occurring in Europe as fast as they do in other parts of the world.

- Operators typically point to a lack of demand. Moreover, the traditional telecommunications eco-system has changed as the boundaries between IT, telecom, broadcasting, and other media are constantly blurring. The convergence of services means that the all Internet-relevant industries need to adapt and rethink their strategies, so that value keeps flowing sustainably across the Internet value chain. In this context, creation of successful European content offers could significantly contribute, among others, to bigger demand for high-speed broadband.

- Lack of demand is often linked to a lack of awareness concerning the benefits of broadband and a lack of e-skills. In this regard, differences between Member States are significant: 54% of Romanian citizens versus 5% in Sweden have never used the Internet. Only 43% of EU population claim to have medium or high Internet skills.[20]

- On the other hand, regions where telecom operators historically profited from well-developed networks tend to be slower in their shift towards high-speed broadband, as compared to areas where electronic communications networks were relatively under-developed and which leapt forward.

- The high costs of rolling out networks and the uncertainty concerning future income and returns on investment are often quoted as factors deterring investment, in particular in a climate of financial restraint. This is particularly relevant in rural and sparsely populated areas, where rollout necessarily involves higher costs.

2.1.4. New measures to stimulate high-speed broadband

The analysis above shows that Europe needs to step up its efforts to stimulate high-speed broadband rollout. A recent study[21] shows that without public intervention, by 2020, 94% of the households would be covered with connections of at least 30 Mbps, and only 50% would be covered with connections of 100Mbps, with a take up of 26% significantly below the DAE targets.

In this context, the Commission is taking the following actions:

181bn and € 268bn to provide sufficient coverage so that 50% of households are on 100 Mbps services" source: Tech4I2 and Analysys Mason (2012)

19 http://ec.europa.eu/information_society/digitalagenda/scoreboard/docs/2012/scoreboard_broadband_markets.pdf.

20 Digital Agenda Scoreboard 2012

21 Analysys Mason Tech4i2 "The socio-economic impact of bandwidth" (SMART 2010/0033)

First, the Commission is striving to ensure a predictable and consistent regulatory framework, which enhances competition while providing the right incentives to investors.

Second, the Commission is proposing measures to foster demand, and in particular to stimulate demand for high bandwidth.

Third, the Commission is taking various measures within the framework of the Radio Spectrum Policy Programme, in an effort to ensure that sufficient spectrum is available for the further development of mobile broadband, recognising the increasing use of wireless Internet.

Fourth, the Commission is taking initiatives to ensure that, at EU level, appropriate funding is available for the rollout in areas that are underserved. While in the densely populated 'black' areas operators are ready to invest and the market will deliver on its own, in the 'grey' and 'white' areas support is needed. For the latter, structural funds and public funding within the frames of the revised Guidelines for Broadband State Aid will contribute to this objective.

The initiative discussed in this Impact Assessment, aimed at reducing the cost of deploying high-speed electronic communications networks complements the efforts described above. It follows a call from the **2012 Spring European Council,** which underlined the importance of broadband and asked for additional steps to be taken to achieve costs savings as part of efforts to complete the Digital Single Market by 2015[22].

2.2. Scope of the initiative

This initiative looks at ways to **facilitate and reduce the cost of rolling out high-speed electronic communications networks**. It is estimated by several studies (OECD 2008, WIK 2008, Francisco Caio 2008, Analysys Mason 2008[23]) that up to 80% of the costs of deploying new networks are civil engineering costs. While these costs differ in function of the technology used, similar figures have been advanced by most respondents to the public consultation[24]. The same studies, echoed by feedback from stakeholders, show that a major part of these costs can be attributed to inefficiencies in the rollout process. Some of these **inefficiencies can be eliminated and thus costs could be significantly reduced** by implementing simple measures, such as a more intensive use of existing physical infrastructure, cooperation with utility companies, and improved coordination of all the actors involved in network rollout.

The current electronic communications regulatory framework contains certain tools which the National Regulatory Authorities can use to make the rollout of networks more efficient. For example, NRAs can impose companies to share their infrastructure under a well-defined set of circumstances, including in-house wiring, under Article 12 of the Framework Directive. According to the same article, the NRAs can also request providers of electronic

22 http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/128520.pdf .

23 http://www.oecd-ilibrary.org/docserver/download/5kz83r71zt9n.pdf?expires=1354706494&id=id&accname=guest&checksum=ABF880A53E2CCF52CD3972CBDE6AAD64

24 http://ec.europa.eu/information_society/policy/ecomm/library/public_consult/cost_reduction_hsi/index_en.htm

communication networks to provide information on their physical infrastructure. Finally, Article 11 of the Framework Directive imposes a set of standards for granting rights of way. These provisions are described in detail in Annex VI. However, the provisions are mostly optional (NRAs are to decide whether or not to use the powers granted to them by Article 12), as well as limited in their scope and reach. These limitations are discussed extensively in Sections 2.4.1 through 2.4.4.

Some Member States (e.g. France, Lithuania, Germany, the Netherlands or Portugal), aware of the opportunities, started introducing more far reaching cost reduction measures going beyond the current regulatory framework. Promoting such measures at EU level would allow **scaling them up, for greater efficiency gains** and at the same time to ensure **positive effects for the Single Market**. Such measures were not promoted at an earlier phase at EU level due to the lack of experience in implementing them. At the same time, the imperative of reaching the ambitious broadband targets of the Digital Agenda only appeared after the review of the regulatory framework for electronic communications currently in force, as signalised in section 2.1.1 above.

This initiative is complementary to other actions undertaken to facilitate the development of infrastructures in Europe, such as the Inspire Directive[25] or the Broadband State Aid Guidelines as is explained in greater detail in Chapters 4 and 5.

2.3. Problem definition

The problem addressed by this initiative derives from the presence of a bottleneck in electronic communications access networks, typically between the distribution frame and the network termination point, which reaches end users, associated with economic inefficiencies. This terminating part of the network, also called "local loop" or "last mile" may not have been rolled out or often has more limited speed capacity than the core network and is economically difficult to duplicate or replace, in particular in semi-urban and rural areas where distances are longer and population density is lower. An important inefficiency in the rollout process is related to the presence of high sunk costs generated by civil engineering works – e.g. digging, ducting etc., associated with heavy administrative burdens for undertakings involved in that process.

This specific problem is one of the factors affecting investments in broadband infrastructure, as discussed in Section 2.1, conditioning the digital divide among Europeans, on the functioning of the Digital Single Market, and on EU's competitiveness.

In order to propose solutions to bring down costs and raise efficiency, it is essential to understand the main cost components and drivers of cost sensitivities in the deployment of electronic communications networks. It is equally important to understand the main administrative bottlenecks.

Both the overall costs and the cost components of rolling out networks vary greatly in function of the technology deployed. The main cost components for a Fibre-to-the-Premise connection consist of the costs of ducting, the cost of installing the fibre, the costs of the in-

[25] Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007, establishing an infrastructure for spatial information in the European Community (INSPIRE), OJ L.108/1, 25.4.2007.

house wiring and the cost of consumer premise equipment. For mobile broadband, the costs are typically split into physical infrastructure, base station and microwave backhaul, on the one hand, and customer premises equipment, on the other hand. Despite the great variation in cost items, the costs of civil works (ducting and physical infrastructure) form the dominant component in both cases. It fact it is widely agreed that **civil engineering works constitute the dominant part in overall network deployment costs**[26], regardless of the technology used, with estimates as high as 80% for certain technologies.

There is significant variation in deployment costs per region and Member State given a number of country or region-specific factors which make deployment more or less inefficient. Whereas the cost of active equipment is relatively fixed, the other main cost elements are variable and depend, mainly on (1) **labour rates**, (2) **topography** of the concerned areas, (3) **pre-existing network infrastructure**, such as cables that could be upgraded or ducts that could be reused, including inside buildings (4) **population density**, (5) **average size of multi-unit dwellings** (MUDs) and (6) **legislation** imposing certain technical specifications **for civil engineering works** (such as the depth at which cables should be buried or visual rules for antennae installations).

The screening process analysing the cost drivers that can lead to inefficiencies demonstrated that some of the underlying causes of the high costs of civil engineering works in the context of network rollout cannot be tackled through an EU legislative initiative, such as national labour rates, topography, population density and average size of multi-unit dwellings. Nor can norms related to certain digging techniques be imposed at EU level, due to the technological bias they carry along.

On the other hand, the EU can ensure that the most efficient use is made of pre-existing passive network infrastructure. Yet, the use or co-deployment of pre-existing infrastructure, such as ducts, towers or poles, or to co-deploy, is often blocked or undermined by a variety of reasons. For example, lack of information is an important constraint. Indeed, access to detailed and valid information on the route, location and size of these civil engineering infrastructures is essential for letting operators prepare their deployments by taking into account availability of the existing passive infrastructure. If there is no information on its route, a duct "does not exist".

Where bottlenecks exist in the utilisation of pre-existing infrastructure or of other relatively simple solutions to cut costs (such as co-deployment), they are considered inefficiencies in the rollout process and therefore treated as underlying causes.

In order to ensure a complete picture of the inefficiencies in the deployment process that can be tackled through an EU initiative, the public consultation has specifically addressed these questions to stakeholders. Various inefficiencies and bottlenecks have been reported by several stakeholders as entry barriers, related to different stages of the deployment chain, holding back the rollout of high speed broadband. Respondents referred in particular to:

(1) The lack of transparent information on available infrastructure, which lead to unintentional duplication of networks and damages, leads to additional costs in terms of more

[26] Analysys Mason, 2008, Analysys Mason 2012, WIK, 2008

expensive deployment due to difficulty to negotiate sharing arrangements without proper knowledge of existing physical infrastructure suitable for deployment;

(2) The fact that specific procedures for infrastructure sharing, in particular across utilities or coordination of civil works are missing leads to additional costs, e.g. duplication of civil works and permits.

(3) Administrative obstacles related to receiving permits from authorities or property owners. The number and length of uncoordinated and unclear permit granting procedures in the Member States and sometimes even within Member States, regions or municipalities, leads to additional costs due to delays, lack of transparency and sometimes even abuses;

(4) The poor in-house equipment for receiving high-speed broadband networks at home contributes to inefficiencies of investments, e.g. leading to retrofitting which implies higher cost if compared to pre-equipment of buildings.

While some stakeholders tend to insist more on certain issues (e.g. companies deploying fixed networks on duct sharing and wireless operators on administrative permits), it is widely agreed that all these are relevant problems areas regardless of the technology deployed (see for more detail Annex I on the main outcomes of the public consultation).

Finally, in order to make sure that the screening process was complete and coherent, the inefficiencies identified by stakeholders and compared with the key cost components for deploying electronic communications networks, have been also cross-checked with the main steps involved in deploying a network.

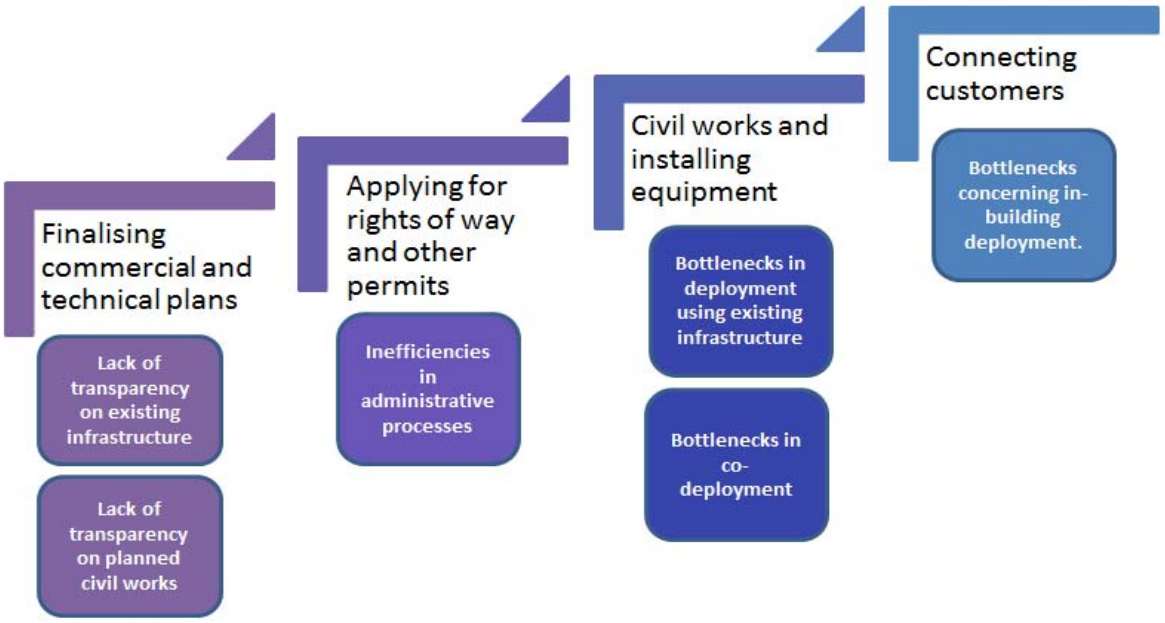


Figure 3 - Simplified steps involved in a typical network rollout, involving a mix between self-digging, co-deployment, and utilisation of existing physical infrastructure

The figure above illustrates that the problem areas are related to the typical steps and processes involved in deploying networks. It is based on the assumption that a company would like to deploy in a most efficient way (using existing ducts and/or co-deploying, if possible), but that at the same time a certain proportion of self-digging will remain necessary.

As each problem area is linked to a specific step in the rollout process, tackling these problems areas together will result in a set of coherent and mutually reinforcing actions. It is therefore essential that any solution proposed to respond to the problem of the high costs and complicated procedures covers all such areas. As an illustration, Analysys Mason (2012) estimates that if measures were taken to address the identified set of problem areas, the potential Capex savings to operators are in the range of 20–30% of total investment costs[27].

This initiative tackles the four main areas which were identified as clear underlying factors and which could potentially be addressed through EU legislation: (1) **inefficiencies or bottlenecks concerning the use of existing physical infrastructure** (such as, for example, ducts, conduits, manholes, cabinets, poles, masts, antennae installations, towers and other supporting constructions), (2) **bottlenecks related to co-deployment**, (3) **inefficiencies regarding administrative permit granting**, and, finally (4) **bottlenecks concerning in-building deployment**.

[27] The estimation is based on the following assumptions: 25% of the deployment is in existing ducts, saving 75% in Capex for this part, 10% of the deployment connects the network to new housing developments, and co-deployment with other operators/utility companies is used, saving 15–60%, and 5% of the deployment connects the network to pre-wired MDUs, saving 20–60%. In addition, there will also be social, environmental, and economic benefits.

2.4. Underlying causes of the identified problem

This section examines in more detail the four areas where the highest inefficiencies and bottlenecks are encountered, focusing on the *underlying causes* of the identified problem. These correspond to areas which lead to unnecessary costs that could be tackled by an EU initiative.

2.4.1. Persistent barriers to use existing physical infrastructures suitable for broadband rollout

When deploying networks, undertakings may greatly reduce cost by using existing physical infrastructures suitable for broadband rollout. **Using existing physical infrastructure as opposed to building from scratch can bring significant cost savings of up to 75%**[28] of civil engineering works in case of shared only deployment. Based on a series of reasonable assumptions, for instance that deploying a network will always involve some self-digging, Analysys Mason estimated these savings on the initial cost for broadband deployment (i.e. CAPEX) as **ranging from 29 to 58%**[29] **of the total costs**. While savings are expected to vary greatly in function of several factors, e.g. the existence of ducts, their availability, the technical state they are in, their topography, or their specifications, in general the potential for costs reduction is widely recognised by industry (see Annex I).

The current regulatory framework for electronic communications provides the tools for NRAs to impose access to ducts belonging to telecom companies. This is generally applied to companies with significant market power (SMP), as recommended by the NGA Recommendation[30], but can also be applicable to telecom companies which do not have SMP under certain well-defined conditions (the so-called symmetric obligations regarding facility sharing[31]). The same regulatory framework also empowers the NRAs to request information concerning the ducts or other physical infrastructure of telecom companies, and to set up infrastructure inventories.

---

28 Enhancing Next Generation Access Growth in Europe (Engage group), consisting of 12 partners from 10 European countries that estimated that the initial cost of network deployment in Western Europe using existing ducts ranges from EUR20 to EUR25 per metre, rather than an average of EUR 80–100 per metre for deployments that require digging, thus resulting in a 75% cost saving.

29 Analysis Mason Research (2012), PIA versus self-build in the final third: digging into the cost.

30 For example, instead of a greenfield investment, where civil engineering works can take the costs very high, alternative operators can use the existing infrastructure (such as ducts) of incumbent operators to deploy their networks.

31 Art.12 of Framework Directive.

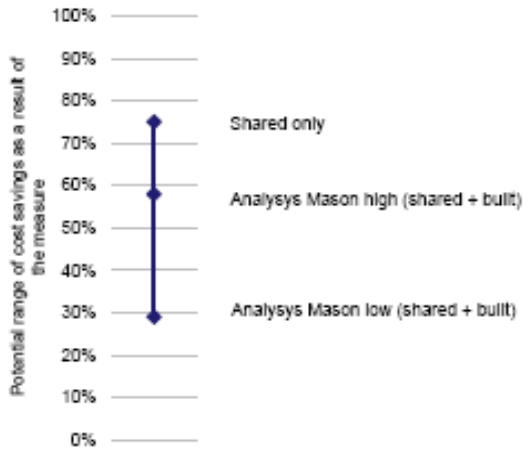


Figure 4 - Range of potential cost savings in network rollout resulting from using existing physical infrastructure (Source: Analysys Mason 2012)

Yet, this potential for savings is not properly capitalised. The provisions described above are not always applied or are not implemented consistently throughout the EU (see Section 2.6 for details). Some of this varied implementation of the current provisions can be explained by the different national circumstances (e.g. whether ducts are present). Still, studies and feedback from industry show that, even under similar circumstances, conditions for duct access vary greatly, which particularly affects cross-country operators and forms a serious barrier to the deployment of broadband networks beyond the national borders and subsequently to the provision of pan-European services and the functioning of the digital single market more generally.

Access to infrastructure belonging to other utilities (such as electricity poles or sewerage pipes) is a strongly underused solution to bring down costs. A rare example is the one of a French alternative operator that has used the sewerage network in Paris to deploy fibre. Reggefiber, the largest Dutch passive FTTH infrastructure owner is also considering making use of sewerage networks to deploy in the last mile in rural areas, and estimating savings between 20% and 25%**.** In France, aerial power lines of the transport network have been used to install optical fibre with more than 18,000 km of power lines of high and very high voltage equipped with optical fibres at the end of 2011. As reported by the Danish Energy Association, trench sharing between power line and fibre ducts has lowered the deployment costs of FTTH infrastructure, and stimulated infrastructure-based competition.

While the different technical specifications and increased security concerns might render, in the opinion of some telecoms operators, these solutions slightly more complicated and costly than the sharing of infrastructure inside the telecoms world, the size of the utility networks greatly expands the real choice of companies willing to expand their own networks through a mix of sharing and self-build.

Despite these advantages, this kind of cross-utility cooperation is not covered by EU law. Only a small minority of NRAs have the expertise as well as the legal tools to deal with transparency and access to infrastructure obligations across sectors (France, Germany, Lithuania, Portugal). In most cases, there is no legal basis facilitating such cooperation across

utilities, making it difficult to come to commercial agreements on sharing risks and costs and to find a suitable arbitration mechanism in case of conflicts. Moreover, regulation in certain Member States discourages utility companies to cooperate with telecom operators (for example, where the profits of energy companies are regulated).

Creating legal grounds for such cooperation on a voluntarily basis is, therefore, likely to bring benefits in terms of coverage, especially where telecom incumbent infrastructure is not available or where restrictions to self-deployment apply.

It can be noted also that some provisions concerning transparency of information on existing and new physical infrastructures, as well as on access to these infrastructures may be envisaged by the current draft *EU Guidelines for the application of state aid rules in relation to the rapid deployment of broadband networks*. These guidelines are expected to increase transparency, but only partially (for infrastructure benefiting from state aid).

In conclusion, there are several bottlenecks or barriers that prevent the sharing of infrastructure from happening at full potential: (1) **limited transparency** as concerns existing physical infrastructure suitable for broadband rollout, (2) inconsistently applied regulation or lack of appropriate **legal basis / institutional framework**, (3) **commercial issues** (lack of business interest) or anti-competitive behaviour, and (4) **technical** unfeasibility.

2.4.2. Barriers to cooperation in civil engineering works

Coordination of civil engineering works can greatly reduce the costs of investment. Not only telecom companies can cooperate with each other in order to share costs. In principle, such cooperation is possible across sectors, and it can easily involve both private actors and public companies. For example, when undertaking road maintenance works, or when repairing water pipes, telecom companies could profit from these civil engineering works and lay ducts or networks at the same time. The incremental costs of laying ducts, while civil engineering works are already undertaken, are generally considered to be marginal[32]. In addition, coordination of works reduces nuisance to citizens.

Analysys Mason (2012) estimates the **potential savings from co-ordinating civil engineering works when the project is shared between two parties at 50% of the civil engineering works cost, or up to 40% of the total costs.** Furthermore, if more than two operators were to be involved, the civil engineering works per operator decrease further, producing savings up to 53% for three players. More conservative estimates, corrected for the fact that the actual network deployment plans rarely coincide entirely, range between 15% and 30% of total cost savings[33].

[32] Tech4I2 and Analysys Mason (2012).

[33] Möglichkeiten des effizienten Einsatzes vorhandener geeigneter öffentlicher und privater Infrastrukturen für den Ausbau von Hochleistungsnetzen, Dr. H. Giger et al, 2011

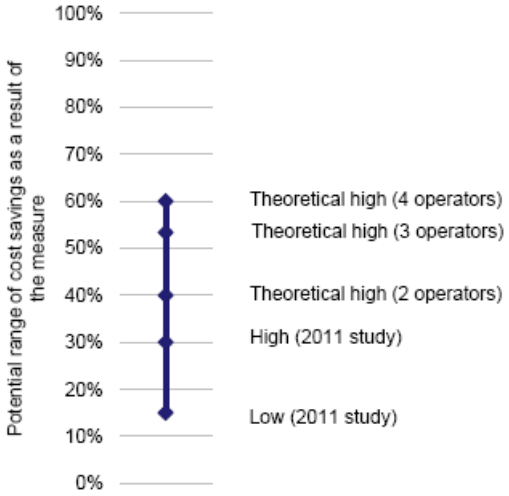


Figure 5 - Range of potential cost savings in network rollout resulting from coordinating civil engineering works (Source: Analysys Mason 2012)

The regulatory framework foresees that Member States may require telecom operators to take measures to facilitate the coordination of public works, in certain pre-defined circumstances (Art. 12.2 of the Framework Directive - see Annex VI). In addition, coordination of public works is currently required by several national infrastructure / civil engineering laws. A few Member States (e.g. Finland, Slovenia, France and the Netherlands) have well run mechanisms of informing telecom companies of planned public works and allowing them time to file requests for deploying networks at the same time.

Yet, such **cooperation seldom occurs in practice**. Rare examples include the co-deployment of LTE in the north of Sweden by two mobile operators or a more organised co-deployment involving several local authorities in Finland. These cases are however an exception rather than the rule.

When asked what lies behind this fact, most companies refer to the lack of transparency regarding planned works of other parties, together with the non-matching time horizons as important factors deterring co-deployment. The information on planned investments of other operators, utilities or public authorities is most often not widely / publicly available, or it becomes available once it is too late to plan and organise co-deployment. Companies are moreover reluctant to share their plans concerning network deployment, as they consider it commercially sensitive information (e.g. other operators might be able to move faster). On the other hand, some of the companies fear coordination of civil works could imply the risk of additional administrative burden related to the need for modification of building permits, increase of fees, delays from the need to await the replies to the call for coordination.

When it comes to co-deployment across utilities, the difference in time horizons for investments is an even greater issue: certain utility companies deploy at a slower pace than telecoms, due to security reasons, or because of the different pace of technological progress-related infrastructure obsolesce across sectors. Moreover, utility companies have often no business interest in co-deployment, nor a history or culture of cooperating with telecom operators. Just like in the case of infrastructure sharing across utilities, co-deployment might

be hampered by the lack of rules regarding cost and risk sharing, or the lack of an appropriate institutional framework (e.g. a competent dispute settlement body). These barriers are affecting cross-border operators to an even greater extent, in particular the lack of transparency and the lack of a suitable legal framework.

In conclusion, it seems that the most important barriers to co-deployment are: (1) the **lack of transparency** concerning planned works, (2) the long and non-matching **time horizons** involved in planning and executing works, where discrepancies are even higher across sectors; (3) **commercial considerations** (scepticism to reveal commercial plans or lack of business interest), (4) the **lack of an appropriate legal / institutional framework**, especially as regards cross sector cooperation, and finally (5) **technical incompatibilities.**

2.4.3. Burdensome administrative procedures

Companies most often describe the administrative procedures and processes necessary to start rolling-out networks as burdensome and costly. The companies refer to **a lack of transparency** as regards the conditions for obtaining the necessary permits, to the high number of authorities involved in the process of granting permits, and a **great diversity of applicable rules, requirements and procedures**, with no coordination vis-à-vis other authorities and permits. In most cases, no single information point exists concerning all the necessary permits, specific planning rules applicable locally, etc. These problems have been long reported. In OECD publication 'Public rights of way for fibre deployment to the home' of 2008, the onerous procedures related to permit granting have been identified as one of the obstacles in faster broadband rollout[34]. Evidence gathered by the GSM Association [35] shows that some of the procedures can be very **lengthy**: in case of base stations planning permissions in Europe typical timescales are higher than 20 months in several Member States, with a tendency for these delays to increase rather than decrease over time. As raised in the OECD study, access to rights of way and ducts is crucial for new entrants in order to compete effectively in local markets and to foster facilities competition. As confirmed in the public consultations, problems occur because municipalities in some countries consider access to rights of way as a revenue opportunity, resulting in fees which can be over and above the costs incurred or in unreasonable conditions for granting rights of way.

[34] http://www.oecd-ilibrary.org/docserver/download/5kz83r71zt9n.pdf?expires=1354706775&id=id&accname=guest&checksum=E86E9A498C17A651E7CC6943C10E9FBA

[35] http://www.gsma.com/gsmaeurope/gsma-europe-report-on-base-station-planning-permission-in-europe/.

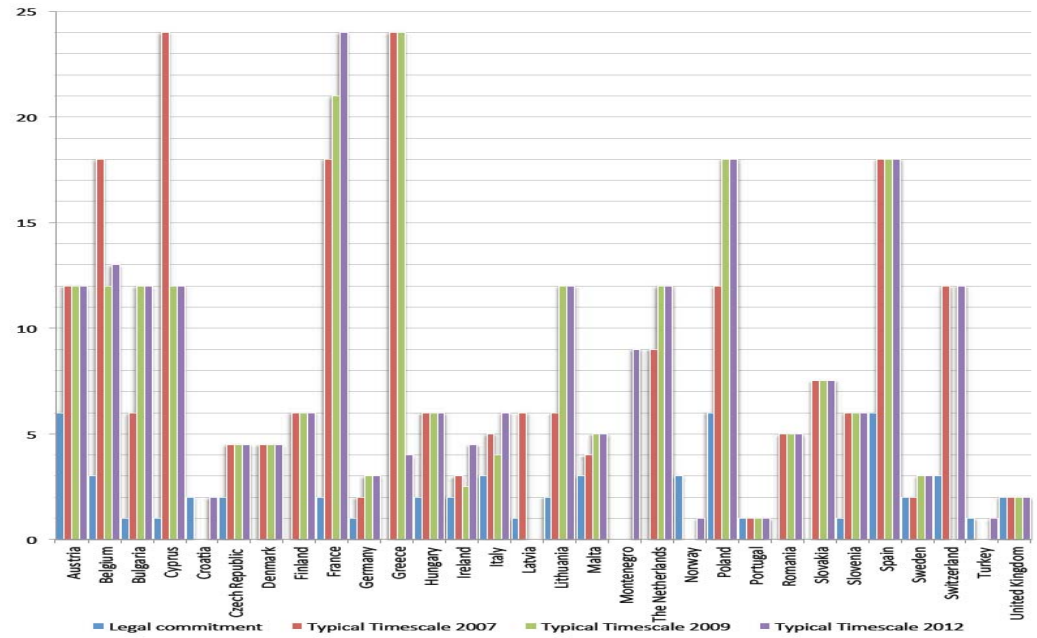


Figure 6 - Comparison between legal commitments and typical timescales for issuing base station planning permissions across Europe (Source: GSM Association)

The current regulatory framework foresees (under Article 11 of the Framework Directive - see Annex VI) a limit of six months for the granting of rights of way, and offers general guarantees with respect to the transparency of the process. However, besides rights of way, several other permits and administrative processes are necessary to rollout electronic communications networks and these latter are not covered by the current regulatory framework for electronic communications.

Few best practices however do exist. For example certain municipalities from the Netherlands or from Finland (Tampere) take an active coordination role regarding all necessary permits besides rights of way. In some countries, such as the Netherlands, rights of way are free of charge. A recent Greek law has also established a "one-stop-shop" for obtaining all the necessary permits to roll out a radio-network. Exemptions exist for certain categories of antennae and base stations e.g. in Greece and in the Netherlands. In Italy requests for certain permits are deemed as approved when no explicit decision is taken within a given deadline ("tacit approval").

Yet, surveys and feedback from industry show that such examples are an exception rather than the rule (see results of the public consultation). Operators consistently refer to permit granting as one of the important problem areas in network development. Such delays and lack of transparency severely affect the growth and competitive dynamics in the electronic communications markets and in the wider ecosystem (e.g. equipment manufacturers).

These problems are all the more severe for companies rolling out across borders that apply for permits not just in various Member States, but also with all the various regional and local governments.

In conclusion, the most common problems quoted in relation to permit granting are (1) the high number of different, **uncoordinated rules and procedures**, (2) the **lack of transparency** of these rules and procedures, (3) the **long delays** and, in some cases, (4) the **unreasonable conditions**, including fees, attached to rights of way.

2.4.4. High barriers to deploy in-house equipment in existing buildings

Connecting customers at their premises, which normally requires deploying in-building equipment is a very **expensive and cumbersome process**. An operator willing to install or upgrade the wiring in an existing multi-apartment building would typically need to bear the high costs related to the vertical and horizontal wiring, connect this wiring to its terminating segment or to the terminating segment of another operator (which sometimes requires works on the common ground belonging to the building), and thus to obtain permission from each and every individual owner of the building. Similarly, in the case of wireless networks, the costs of installing equipment (in a visually acceptable way) would have to be borne and permissions would be required from all owners.

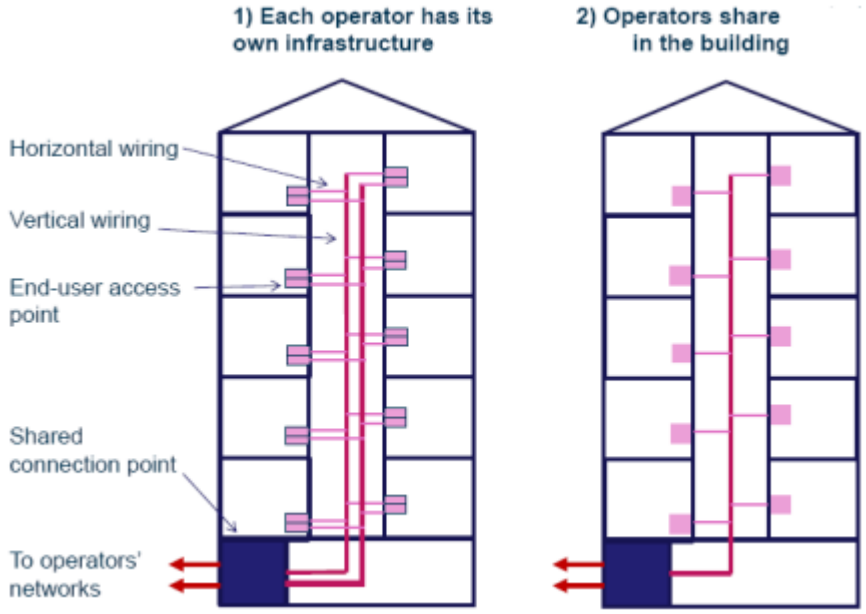


Figure 7 – Illustration of possible solutions for in-building wiring of MDUs (Source: Based on Analysys Mason 2012)

In order to guarantee a comprehensive approach to facilitating the rollout of high-speed broadband, it is therefore essential to tackle the issue of in-house equipment. This is an area where the (unnecessary) duplication of works leads to high inefficiencies as well as inconveniences for owners.

The current regulatory framework foresees that NRAs can impose obligations related to the sharing of in house wiring in cases where the duplication of such infrastructure would be economically inefficient or physically impracticable (see Annex VI).

A few NRAs have used this possibility and included mandated access to in-house wiring under SMP regulation, but these measures are in general considered to have limited impact.

Other Member States have looked for ways to address these difficulties beyond the telecoms regulatory framework: in France, Spain, Poland and Portugal there are regulatory requirements of different character to deploy high-speed broadband ready wiring in new buildings. In addition, there are obligations on operators reaching existing buildings regarding the sharing of costs and, respectively, access. In the United Kingdom, the government issued guidelines for property developers for next-generation broadband networks in new buildings. Indeed, the savings resulting from equipping new buildings with next generation access, as compared to "retro-fitting" existing buildings are estimated to potentially go as high as 60%.

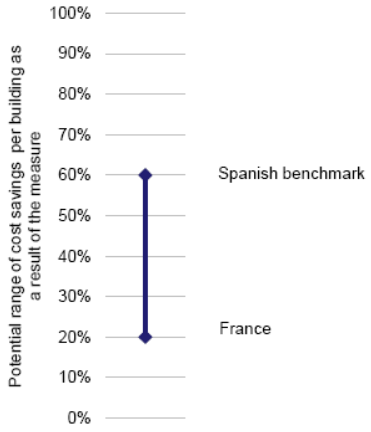


Figure 8 - Range of potential cost savings in network rollout resulting from equipping new buildings with NGA access, as compared to retro-fitting (Source: Analysys Mason 2012)

Nevertheless, in general, the practices concerning in-building equipment remain scarce and lack harmonisation, including as regards standardisation. Operators widely agree that this area represents one of the most problematic and difficult ones in the context of network deployment, as well as one where solutions cannot spread easily. The underlying causes in this area can be summarised as follows: (1) **high costs** of equipping existing buildings (2) cumbersome procedures related to working inside buildings and **deploying the terminating segment** on common grounds (mainly delays and difficulties to obtain owners' consent), (3) inconsistent application or **lack of regulation** tackling the inefficiencies associated with duplicating in-building infrastructure and (4) **lack of standardisation** in this area.

2.5. The main stakeholders involved

The following stakeholders may be particularly affected by the Initiative to Reduce Cost of Rolling-Out High Speed Communication Infrastructure in Europe:

- Telecom operators, utility companies, physical infrastructure owners, municipalities, communities, private funds, entrepreneurs, or any other companies seeking to roll-out broadband networks or being asked for access to their existing or to be deployed network. They should benefit most from the cost reduction measures in their deployment efforts.

- Public authorities (such as local, town planning, environmental, archaeological, and others) dealing with granting rights of way and other permits at national or local level.

Streamlining permit granting procedures as well as the establishment of new coordination and transparency mechanisms for infrastructure access and civil engineering works will add to the administrative burden of certain authorities;

– Contractors of the operators and municipalities, e.g. companies executing different elements of civil engineering works. The increased efficiencies in the rollout process will change the pattern of demand for civil engineering works companies; in the medium and long term, an increased rollout of high-speed networks is expected due to the savings created, to the profit of civil engineering works companies;

– Manufacturers of the equipment and technologies related to broadband deployment; Increased rollout and duct sharing, in particular cross-utilities, will increase the demand for new solutions and will trigger innovations;

– Housing industry: Construction companies and housing developers will have to follow new requirements concerning in-house equipment, which on the other hand, brings will increase value;

– EU citizens and businesses: As concerns direct effects, more access to physical infrastructure and a better coordination of civil engineering works will imply less digging, leading to reduced public nuisance; indirectly, increased broadband rollout has positive effects on employment, e-inclusion, access to public services, general comfort of life.

2.6. How would the situation evolve if no further EU action were undertaken

As signalised in Section 2.3, some measures have been introduced in several Member States, at national, regional or local level, however not in a consistent nor coherent manner. In some Member States measures are evolving to best address the encountered issues. Before proposing any initiative in this area, it is, therefore, necessary to check to what extent the identified inefficiencies could be addressed without the EU action. Screening local, regional, and national initiatives is also necessary in order to ensure that any proposal would not lead to lowering the effectiveness of existing standards in the extent concerning measures to facilitate and stimulate broadband rollout.

A study[36] was commissioned to verify the existence, the nature and the maturity of measures of this kind throughout the EU. In addition, the inputs to the public consultation (mostly from the NRAs) provided information on specific measures. The overall analysis of the results from these and other sources is presented in Annex III – Analysis of Baseline scenario and confirms that cost reduction initiatives have been launched or are currently being planned or implemented in different EU Member States. The assessment can be summarised as follows, in the view of the identified inefficiencies:

Inefficiencies or bottlenecks concerning the use of existing physical infrastructure

[36] Deloitte Tech4i2 "Study on cost-reduction practices with regard to broadband infrastructure rollout" 13/09/2012. Part of Study leading to an Impact assessment on the structuring and financing of broadband infrastructure projects, the financing gaps and identification of financing models for project promoters and the choice of EU policy. (SMART 2007/0035)

As regards the transparency aspect, the number of EU Member States has implemented a local or central physical infrastructure atlas or infrastructure registry or is currently working on introducing such solutions (AT, BE, CY, CZ, DE, DK, EE, FI, FR, IT, LT, LU, NL, PL, PT, RO, SI, ES, SE, UK). Very few have developed an advanced open-access and digital infrastructure atlas, including not just telecom ducts but also other utilities and all physical infrastructures suitable for broadband roll out (DE, PT). The purpose of these atlases/registries and platforms also differs. In the case of many of them, the main purpose is to avoid damages at the time of carrying out civil works (NL, DK, FI, SE). Some of the initiatives seem to have been developed with a view to implementing the Inspire Directive (e.g. CZ, BE), whereas the initiatives in PT, DE and one of three mapping initiatives in SE are aimed at infrastructure sharing and co-deployment. For example in practice the German initiative entails that information on infrastructure location is provided to Bundesnetzagentur (NRA) in electronic form, using standard file formats. All data is collected from the infrastructure owners themselves, rather than from new ground surveys, and is done on a voluntary basis. It is envisaged that infrastructure owners will in future be mandated to provide information via a web application. The project aims to cover the entire Federal Republic of Germany. As of May 2012 501 infrastructure owners were participating in the scheme, 91 parties had requested to use the database and overall 71 497km2 of area had been mapped, covering a population of 3.5 million. In comparison, the Portuguese NRA decided in 2009 to implement a Centralised Information System, a central infrastructure atlas aimed at reducing the cost of deploying new electronic communications equipment. Providing and regularly updating information is mandatory for all organisations that own or operate infrastructure suitable for accommodating electronic communication infrastructure (including roads, railways, water and gas infrastructure). This requirement applies to local authorities, state-owned companies, utility companies, electronic communications companies, and any other bodies that may own relevant infrastructure. It extends further to the incumbent, Portugal Telecom, which must provide information on available space within its ducts. While different authorities (NRA, local authorities, Ministry) can be involved in infrastructure mapping and at different levels (central/local), most of the activity is in the hands of national authorities.

Overall, there is a positive trend of development, yet limited mostly to mapping of telecoms infrastructure. As already mentioned in section 2.4.1 the *EU Guidelines for the application of state aid rules* in relation to the rapid deployment of broadband networks may help to establish some EU wide rules concerning transparency of information on existing and new physical infrastructures, as well as on access on these infrastructures to the extent that the concerned infrastructure benefits from state aid.

Yet, even with further positive development of this trend the impact of business as usual measures over the three years would not be significant enough to address inefficiencies sufficiently in view of the DAE targets. For example, the existing mapping exercises hardly provides to operators interested in deployment a right to perform surveys on the spot which are crucial in the absence of reliable data on infrastructure. Moreover, the mapping of the physical infrastructure of other utilities as enhanced by the Inspire Directive, does not necessarily address transparency deficiencies, given that Inspire does not provide an EU wide right for operators to access available information. This means that bottlenecks resulting from little transparency would persist in many cases.

As regards the access conditions to the existing infrastructure, a majority of EU NRAs have imposed access obligations on operators with significant market power, setting pricing rules for ducts access. Symmetric obligations concerning ducts access on operators (FR, LT, MT, NL, PT) have been imposed by the minority of the NRAs, including those few that have imposed access obligations across sectors (FR, DE, LT, PT). For instance in Lithuania, FTTH coverage reached circa 60% of households at the end of 2011 and FFTH connections accounted for 50% of all broadband connections. The exact costs savings are unknown at this stage, however; the NRA considers that without having adopted access measures, the deployment of high-speed network would have been much more limited. In Portugal extensive legislation exists providing that all existing ducts suitable for the provision of electronic communications network must be made available to operators. Also in this case exact data on costs savings are missing but the NRA considers that the implementation of this measure has led to infrastructure competition bringing benefits to end users. Germany has put in place legislation to oblige public utility companies to provide access to their infrastructure upon request. Since July 2012 the same applies to all owners of relevant infrastructure, including private utility companies. Any related disputes would be subject to an arbitration process. Overall, decisions on granting access obligations are in hands of NRAs. In practice the authorities rarely adopt symmetric obligations and in many cases the legal basis for cooperation across utilities is missing. In other cases the legislative obstacles discouraging utility companies to cooperate with telecom operators persist (e.g. some utility companies have to respect the principle of 'charges cover cost', therefore if exploiting their physical infrastructure would result in a reduction of their costs, this reduction should be reflected in their charges, decreasing their business interest in sharing opportunities). The current trend of development is not likely to lead to a significant impact over the next three years.

Barriers to cooperation in civil engineering works

Coordination of civil engineering works initiatives are emerging at local level (e.g. BE, DK, FI, LU, SE, NL). In FI utility companies, municipalities and telecom companies regularly meet to share their plans and discuss cooperation options. Such cooperation occurs as formalised practice (e.g. BE, DK, DE) or ad hoc. In other Member States (FR, LV, MT, PL, PT, SI, ES,) national law provides for some elements of coordination of civil works, in particular in case of works carried out on public roads (MT, PL, UK). In France both operators carrying out installation or maintenance projects of significant length are obliged to announce their plans to the local authorities. At the same time the local authorities are required by law to inform operators of their intention to launch civil works. PT imposed, in 2009, on public sector companies and electronic communication companies an obligation to make planned works public, including on the national centralised mapping system to facilitate sharing. The notice must contain in particular information on the characteristics of intervention, the time needed for execution of works, charges and other conditions to be observed, as well as a deadline for joining the work and contact point for further clarifications. In addition to that, preclusive provisions are included affecting future interventions in the area covered by the notification. The notice must be given by the respective promoting entities no less than 20 days prior to the start of works, whereas a deadline for joining the project is set for not less than 15 days. In the opinion of some stakeholders, the existing transparency mechanisms are not always effective, among others due to the short time period between the announcement and the beginning of works. Despite the number of these positive examples and also the legal basis in the EU law allowing to

Member States to require telecom operators to take measures to facilitate coordination of public works in specific circumstances (Art. 12.2 of the Framework Directive), the trend of development is not significantly positive, as there are little signs of scaling-up these local mechanisms of coordination over the next three years and in practice they rarely lead to co-deployment, especially across utilities.

Inefficiencies regarding administrative permit granting

Different examples of legislation streamlining permit granting process are emerging in some Member States. For instance, in Greece a 'one stop shop' approach was adopted recently. The one stop shop acts as a contact point dispatching requests to the competent authorities and verifying the strict respect of deadlines. Exemptions have also been made for small antennas and low emission sites. Some Member States have in place laws limiting the powers of local authorities to deny rights of way for telecoms operators wishing to deploy electronic communications networks (AT, NL, PL, PT). Some others plan to adopt relevant legislations or guidelines (CZ, IE, UK). Few local initiatives are also present (NL, FI cities). Some Member States have also streamlined the process of receiving permissions from private owners (NL, PL). Further developments in this regard depend on the willingness of authorities and/or political determination to adopt specific laws. These developments are not sufficient to establish a positive trend for the future. The existing legal basis in the regulatory framework (Art. 11 of the Framework Directive) does not guarantee either that the identified inefficiencies in permit granting would be addressed in the perspective of next three years. Besides rights of way, several other permits and administrative processes are necessary to rollout electronic communications networks and these latter are neither covered by the current regulatory framework nor by the identified practices.

Bottlenecks concerning in-building deployment

Several NRAs made use of the powers to mandate access to existing in-house installations under the SMP regulation obliging dominant operators have to open their in-house equipment to other operators. A number of Member States developed specific legislation concerning in-house installations: FR, ES, LT, PL and PT. In some Member States the efficiency of the measures has been put into question (e.g. CZ, LU, LV, MT). In IE, IT, and UK the authorities chose a soft law approach adopting guidelines or promoting standards (AT, FI and DE to some extent). The number of initiatives and their strengths in some aspects allows establishing a positive trend. Under the current regulatory framework the NRAs can impose obligations related to the sharing of in house wiring in cases where the duplication of such infrastructure would be economically inefficient or physically impracticable (see Annex VI). Yet, the pace of take-up of these best practices seems to be limited and there is no guarantee of addressing all the identified inefficiencies in a comprehensive way across the EU within the reference of period of three years. In particular, the spontaneous development of national legislation in this regard does not guarantee equal chances of telecoms operators across the EU in terms of the right to negotiate and to access existing in-building physical infrastructure. The scope and character of obligations on operators could also differ, putting in some cases technological neutrality at risk.

As shown in Section 2.3**, it is essential to take action across all the relevant areas** corresponding to the steps in the rollout process in order to maximise the effects. As results from the available information only a few Member States have some measures in all these

fields (DE, FR, PT, in some extent IT). However, the results of the public consultation demonstrate a general perception that none of the Member States has in fact taken measures effectively addressing all the identified problem areas. As further explained in Section 4.1 the simple fact that some measure is in place does not guarantee that the identified bottlenecks and inefficiencies are sufficiently addressed. In addition, in many Member States, next to measures in some areas obstacles in others are not tackled. For example in the Netherlands, on one hand there is effective information on the physical infrastructure for the purpose of avoiding damages and on the other hand there are regulatory restrictions[37] on energy companies which reduce their business interest in cross-sector cooperation. Finally, in many Member States more efforts to date have been limited (e.g. BU, SK, CY). Overall even where measures are present across several Member States, they are usually implemented in different ways e.g. duct mapping and access to ducts are imposed either on telecom and/or non-telecom operators.

Taking into account that decision powers and responsibilities for the adoption of specific measures are located differently across the Member States (local authorities, NRAs, central authorities), prospects for a more consistent, holistic and orchestrated approach among Member States to all identified inefficiencies and bottlenecks persistent to the whole investments process, remain limited.

The first legal measures in this area appeared in the late nineties (e.g. ES first generation in-house wiring regulation of 1998). Yet until now the approaches among Member States have not converged. While in some Member States national legislation is further evolving, in others the adopted general legal basis is little used. The emulation of best practice is limited also. For example in the area of mapping, the DE project could be considered as successful or well advanced. However, Member States have not generally adopted a similar approach and the most common trend appears to be mapping for the purpose of avoiding damages (BE, NL, SE, DK). In general, there is limited consistency between national approaches or processes and the dynamic in the emulation of best practice is not satisfactory. Overall, despite a number of actions across the EU, initiatives remain too limited and scattered which does not allow to effectively overcome described entry barriers limiting broadband deployment.

Even with the continuous support from the Commission side, e.g. exchanges of best practice, it is highly improbable that such measures will spread throughout the EU at a sufficient pace and scale to ensure real efficiency gains in the network deployment process and to trigger investments in support of the Digital Agenda targets.

Moreover, the 2009 review of the regulatory framework for electronic communications which vested NRAs with new powers with a view to encourage co-location and sharing of networks elements has not ensured the development a coherent European approach addressing all steps in the investment process. Although the revised Regulatory Framework has only been implemented as of recent (transposition date of 25 May 2011) and, therefore, has not yet been fully tested. It is important to recall some of its limitations. First, regulating operators asymmetrically constrains the scope of such measures to operators with significant market power. Secondly, the possibility of intervention under Article 12 of the Framework Directive,

[37] Utility companies have to respect the principle 'charges cover cost', therefore if any form of exploitation of their physical infrastructure would result in a reduction of their costs, this reduction should be passed on to the consumers – users, which reduces their business interest in such measures

as enhanced in the review is restricted. NRAs may only impose certain obligations on electronic communications network providers concerning facilities sharing, coordination of public works, and request of information in view of setting up inventories and access to the terminating segment including in-house wiring. The scope of measures is limited by the specific criteria of Article 11 of the Framework Directive which limits the range of issues related to procedures for the granting of rights of way. The regulatory framework cannot apply to non-telecoms physical infrastructure. Third, dispute settlement under the framework does not cover other sectors such as utilities. Finally, when it comes to in-house equipment, NRAs can only impose obligations regarding the existing wiring and are not required to act on new buildings, thereby foregoing an important opportunity to achieve savings. Generally, despite being vested with tools, NRAs are not able to effectively and comprehensively address the identified problem areas and the framework leaves significant room for variation in the way provisions can be implemented. Moreover, the application of the existing tools is not mandated by the current regulatory framework, but only allowed/left to the discretion of Member States/NRAs. For these reasons the existing electronic communications framework will not be sufficient to address all identified bottlenecks and inefficiencies in the rollout process, and it will not prevent the emerging patchwork of measures in the EU.

Other EU initiatives could likely contribute to address some of the identified inefficiencies and bottlenecks. For instance Structural Funds may co-finance mapping projects. Similarly in the future mapping could be financed from the proposed Connecting European Facility. However, generally co-financing possibilities using EU funds may not apply to the same extent to all Member States, and concern specific projects having limited possibility to holistically tackle the inefficiencies and bottlenecks in all identified areas requiring intervention. In addition the Inspire Directive already activated a process of transparency in relation to part of the relevant physical infrastructure[38]. However, given the architecture of the Inspire Directive, the operators are not in a position to directly benefit from the available information to deploy broadband.

It appears from the analysis above that current European instruments do not sufficiently and adequately address the problem of the high costs and burden related to rolling out networks. This might be explained by the adoption of the review of the Telecoms Regulatory Framework at the time when the DAE targets of broadband penetration and take-up were less clearly and explicitly spelled out. The explicit steer given at the highest EU level in the year 2010 on the Digital Agenda for Europe put high on the agenda the importance of consistent measures enabling broadband deployment in line with the ambitious EU targets.

Yet, not all Member States have moved ahead adopting measures going beyond the current regulatory framework for electronic communications. Infrastructure sharing across sectors is, for example, only mandated in LT, PT, DE. In contrast, cross-sector infrastructure sharing measures are constrained in a number of MS, due to legislative or regulatory obstacles. The tools available and level of Member State activity are not uniform across the problem areas. The legal and regulatory framework in the EU and across the Member States is currently conducive to a significant variety when it comes to measures facilitating and reducing the cost of broadband rollout. Overall, current trends do not assure sufficient progress in meeting

[38] Utility and governmental services are included in Annex III of the Inspire Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007, establishing an infrastructure for spatial information in the European Community, OJ L.108/1, 25.4.2007

the DAE targets, neither the existing practices have managed to set high standards which could be put at risk by the considered measures.

2.7. Right of EU to act

2.7.1. Single Market perspective and subsidiarity

According to the 2010 report on the Single Market[39], telecommunications services and infrastructures in the EU are still highly fragmented along national borders. A more recent report on the cost of non-Europe[40] has shown that the untapped potential of the Single Market corresponds to a yearly amount of 0.9% GDP, or 110 billion euros. A significant fraction of this potential can be found at the level of network infrastructures: different regulatory approaches to network rollout increase the cost of access to national markets, prevent the exploitation of economies of scale at services and equipment level and hinder the development of innovative services which could emerge on very high-speed networks running in a seamless fashion across borders.

High-speed broadband infrastructure is the backbone of the Digital Single Market. As recalled in the Single Market Act II Communication[41], a 10% increase in broadband penetration can result in a 1-1.5% increase in the GDP annually and 1.5% labour productivity gains[42]. Member States cannot afford to leave citizens and businesses outside the footprint of such infrastructures and have subscribed to the broadband targets of the Digital Agenda for Europe. These goals will only be achieved if the infrastructure deployment costs are lowered and if Member States adapt their national policies to this effect across the EU. At the Spring 2012 European Council, Heads of State and Government have called themselves for action at EU level to provide better broadband coverage in order to complete the Digital Single Market, including specifically by 'reducing the cost of high speed broadband infrastructure'.

Modifying legal and practical arrangements across the various infrastructure deployment steps can lead to significant cost reductions. As indicated above, barriers can be lowered by e.g. allowing for more intensive usage of existing physical infrastructures, more cooperation on planned civil works, removing obstacles to high-speed-ready in-house equipment.

Some Member States noticed that opportunities and started adopting specific cost reduction measures both at national and local level. The implementation or decision powers in this regard often belong to local authorities. Yet, the fact that civil works are performed at the local level is not in itself undermining the case for EU action to reduce costs related to such works. In the past the EU undertook several initiatives aimed at problems with a local connotation which included both Directives (see individual energy consumption metering in the Energy Efficiency Directive 2012/27/EU) and Regulations e.g. enabling network developments (see gas network capacity sharing and transparency requirements in Regulation 715/2009/EC; unbundling of the local access telecom network in Regulation 2887/2000/EC on the unbundling of the local loop).

---

39 A new Strategy for the Single Market, report by Mario Monti to the President of the European Commission, 9 May 2010

40 Steps towards a truly Internal Market for e-communications in the run-up to 2020, Ecorys, TU Delft and TNO, released on February 2012

41 COM (2012) 573

42 Booz and Company, Maximising the impact of Digitalisation, 2012

Under the subsidiarity principle, which main purpose is to bring decision-making within the Union as close to the citizen as possible, the Union is entitled to act if a problem cannot be adequately settled by the Member States acting on their own. On the other hand, if the action of the Union does not give prospects for more effective solution, the national authorities are expected to act individually. Therefore, it is crucial to verify whether the possible action by the Union would provide added value, compared to individual actions by Member States.

First, the extensive research has shown that the available measures are scarce and scattered[43]. In fact, several Member States have taken no measure in this field, nor they have concrete plans as regards such actions. When present across Member States, the measures differ greatly, sometimes even from region to region and from municipality to municipality. As such, the existing initiatives do not seem to be holistic, whereas it is essential to take action across the whole rollout process, across sectors, in order to achieve a coherent and significant impact ("*a 90% bridge is not a bridge*"). In the absence of common rules on transparency concerning existing infrastructures and planned civil works, without proper coordination mechanisms among the different local, regional and national levels, within and across public network industries, the costs of deployment are not stable and the economies of scale cannot be properly exploited. This means a significant untapped potential regarding measures to reduce the cost of broadband rollout and facilitate it.

The uneven playground impedes the development of the Single Market. According to a research work conducted by Copenhagen Economics, "the Digital economy can potentially provide a major boost to the EU productivity and growth" and they estimate that at least 4% additional GDP (EU 27) can be gained in the longer term (between 2010 and 2020) by stimulating further adoption of ICT and digital services through the creation of a digital single market. Moreover, with large parts of the EU not being connected to high-speed broadband infrastructure due to excessive costs of rollout, the Digital Single Market will remain incomplete. Citizens and consumers in those areas will not benefit from digital services and providers will not be able to distribute their content/applications affecting the wider eco-system.

In the view of the current dynamics of regulatory development it is very likely that this emerging patchwork of rules at national and sub-national levels will persist or accentuate and, as such, will increase the fragmentation of the Single Market. This fragmentation will impede the further development and growth of European companies - be them telecom companies, equipment manufacturers, or civil engineering companies - with consequences for European competitiveness[44]. Such fragmentation constitutes an obstacle for companies wanting to reach economies of scale at European level in the face of increasingly global competition.

---

[43] See 2.6 and Annex III, which are based on repeated dedicated contacts with the Member States via the desk officers, on in-house questionnaires, on several studies out of which one specifically dedicated to this topic, done by Deloitte, and on the results of the public consultations.

[44] While deployment of broadband networks remains "a local affair", the telecommunications business is a global one. In fact, 78% of the European mobile subscriptions belong to four operators (Vodafone, Telefonica, T-Mobile/DT, and Orange/FT). These are also the companies that "matter" globally: they are quoted among largest telecom players worldwide, both in terms of revenues and of brand value. It is therefore essential for a company to benefit of scale so that it can deliver and compete in this environment.

For instance, significant local presence and resources need to be spent on acquiring information on rights of way in each community, as well as on all other relevant permits, on acquiring information on available infrastructures suitable for broadband rollout (if any), on negotiating access and/or co-deployment and on subsequently designing detailed rollout projects. In fact, the diversity of rules in these areas is so great that it makes little sense to plan network rollout at European level. Rather, investment plans need to be adapted to local rules and works have to be subcontracted separately, in function of the solution chosen for each small area. Indeed, the great majority of respondents in the public consultation expressed that administrative permits necessary to rollout networks represent a significant source of uncertainty and a time and resource consuming process. The fact that local presence needs to be ensured in every municipality throughout very long periods (starting before rollout plans are defined through the completion of the projects) puts resource constraints on companies willing to roll across regions and countries. The lack of transparency on rights of way also prevents proper planning across borders. Pan-European providers have in particular expressed frustrations and inability to compete globally due to the variety of rules in acquiring access to existing infrastructure and making co-deployment arrangements.

Moreover, it appears that the Regulatory framework as revised in 2009 will not be sufficient for achieving significant cost reductions throughout the entire EU in the short and medium term (see Section 2.6). Even with continuous support from the Commission side, it is highly improbable that such measures will spread through the entire Union at a sufficient pace and scale to ensure real cost sensitivities in the network deployment process and to trigger more investments in support of reaching the Digital Agenda targets by 2020.

Therefore, it can be argued that the current patchwork of rules creates barriers to invest cross-border, thereby amounting to obstructions to the freedom to provide electronic communications services and networks, as guaranteed under the existing EU legislation and thus have a direct effect on the functioning of the internal market[45].

In contrast, measures at EU level would allow more efficient planning and investment processes (and thus economies of scale) for telecom players. Moreover, such economies of scale and associated savings would go beyond the telecom sector and would spread to other industries as well (e.g. equipment manufacturers could have an EU market for technical solutions enabling cross-utility cooperation; civil engineering works companies could benefits from cross-border works).

Measures at EU level would also ensure equal treatment and non-discrimination of undertakings as well as of investors, in line with "those objectives and tasks closely linked to the subject-matter"[46] of several instruments already provided for in the EU law, in particular concerning the electronic communications sector[47] but also concerning other sectors (e.g. utility companies seeking to make profit from their physical infrastructure, synergies in setting up smart grids).

---

45 See also Cases C-434/02 *Arnold André* [2004] ECR I-0000, paragraph 30, and Case C-210/03 *Swedish Match* [2004] ECR I-0000, paragraph 29; see also, to that effect, *Germany* v *Parliament and Council*, paragraph 95, and Case C-491/01 *British American Tobacco (Investments) and Imperial Tobacco* [2002] ECR I-11453, paragraph 60.

46 See Case C-217/04 paragraph 47.

47 See for example Recital 8 of the Better Regulation Directive 2009/140/EC, Recital 22 of the Framework Directive, Recital 1 and 4 of Regulation 2887/2000/EC.

In addition, specific subsidiarity safeguards are possible. For example, the decision about the most competent bodies to be appointed to perform tasks related to permit granting, transparency functions, civil works coordination and dispute resolution could be left to Member States. With regard to permit granting, the procedural autonomy of the Member States to allocate competences internally will have to be observed. It is also possible to provide exemptions for categories of buildings subject to considered obligations related to high-speed broadband ready in-house equipment.

In this light EU action concerning costs reduction measures seems to provide added value comparing to scare and scattered national practices and as such to be in the interest of the EU citizens, while respecting the subsidiarity principle.

2.7.2. Proportionality

In order to comply with the proportionality principle, action should be limited to what is necessary to achieve the objectives identified. As a result, **cost reduction measures, in particular those related to national administrations and procedures, should however strictly focus on increasing coordination and transparency, and on harmonising (minimal) conditions enabling the relevant stakeholders to exploit synergies and reduce inefficiencies in the rollout, rather than on shifting competences** from local level to national or European level. Also, while the measures proposed would aim at reducing barriers to access to physical infrastructures, they should not impair ownership rights and should preserve commercial negotiation, as much as possible.

For this reason **the initiative should aim at removing barriers and at providing the relevant stakeholders with the minimum tools needed to fully exploit the potential synergies,** without imposing specific business models and leaving open the possibility to adopt more detailed provisions. Therefore the initiative will only marginally affect on-going initiatives in Member States.

In contrast, it will allow Member States to build on their current measures and select the organisation which better suits their particularities, without necessarily imposing further costs. Furthermore, the initiative will build on and, respectively, complement existing obligations at EU level, in particular the INSPIRE Directive and the State Aid Guidelines. The synergies between these measures can bring costs down and positively impact the proportionality of the initiative.

The proportionality and subsidiarity of each of the proposed policy options will be further tested separately, in Chapter 6, in view of its particular objective.

2.7.3. Legal basis

Under these circumstances and in view of the objective of improving the conditions for the establishment and functioning of the internal market, the European Union has a legal basis to act pursuant to Article 114(1) of the TFEU[48]. Accordingly, as confirmed by the case law, this Article confers on the EU legislature discretion, depending on the general context and the specific circumstances of the matter to be harmonised, as regards the harmonisation

[48] See case C-66/04 paragraph 44 and case C-217/04 paragraph 42.

technique most appropriate for achieving the desired result, in particular in fields which are characterised by complex technical features[49].

3. OBJECTIVES

3.1. Specific and general objectives

The **specific objective** of this initiative is to remove the bottlenecks and reduce the inefficiencies described in Section 2.2, thereby reducing the costs of rolling out high speed broadband infrastructure. At the same time, acting in this area at EU level will also tackle the emerging patchwork of practices, which would otherwise create further barriers in the Digital Single Market and hinder the achievement of sufficient scale for exploiting the full cost reduction potential.

To quantify this objective, a figure of 25% savings on CAPEX investment is proposed. This is based on a relatively conservative estimate provided by Analysys Mason for "a typical Member State", in the context of integrated cost reduction solutions. In comparison, as it results from the public consultations, the measures implemented under the baseline scenario are widely considered as insufficient. Yet, there is no comprehensive and reliable data to that effect, as national authorities do not perform relevant analysis. Building on the high costs of broadband rollout which are reported to deter from investments, **this initiative aims at proposing a coherent and systematic set of measures in order to reduce the costs of rolling out high-speed broadband networks by 25%.**

This specific objective must be seen within the **general objective of stimulating broadband investment and rollout** throughout the EU, in line with the Digital Agenda targets. No indicator for the general objective of stimulating broadband rollout is proposed, as its achievement would depend on a significant number of measures and factors outside the scope of this initiative. Nevertheless, any proposal should be equally checked against the general objective of stimulating broadband investment, too. As Figure 9 recalls and as argued in Sections 2.1 and 5.2, broadband investment is a pre-condition for a deepened Single Market and a reduced digital divide in Europe and has significant impacts on growth and jobs and on EU's competitiveness.

As explained in Section 2.2, while not all cost drivers can be tackled through an EU initiative, there are four main problem areas which are clear underlying factors: inefficiencies related to the use of existing physical infrastructure, bottlenecks related to co-deployment, bottlenecks regarding permit granting, and, finally inefficiencies concerning in-building deployment.

As mentioned in Chapter 2, each of these problem areas is related to a step in the rollout process (see figure 3). In order to achieve significant results**, it is therefore essential** that these areas are tackled simultaneously, **that the corresponding operational objectives are pursued altogether,** although they are distinct. The **operational objectives** of the initiative are described below.

[49] See Case C-66/04 paragraph 45 and Case C-217/04 paragraph 43.

3.2. Operational objectives

3.2.1. Increasing the use of existing physical infrastructure suitable for broadband rollout

Several bottlenecks and inefficiencies have been identified regarding the current regime of access to physical infrastructure suitable for broadband rollout: (1) limited transparency as concerns existing physical infrastructure suitable for broadband rollout, (2) inconsistently applied regulation or lack of appropriate legal basis / institutional framework, (3) commercial issues (lack of business interest) or anti-competitive behaviour, and (4) technical unfeasibility.

A first operational objective of this initiative is then to **facilitate and increase the use of existing physical infrastructure suitable for broadband rollout.** In order for this objective to be achieved, all the identified bottlenecks which can be tackled through an EU initiative should be covered, thus with the exception of the technical limitations. Therefore this objective can be further separated into two sub-objectives: **achieving more transparency** concerning the available infrastructure suitable for broadband rollout and achieving a more **consistent and effective regulatory regime** concerning access to this infrastructure **regardless of its owner and purpose**.

In order to reach the intended overall savings aimed at, 25% of the deployment is assumed to take place in pre-existing ducts. Therefore, measures in this area would aim at a situation where, throughout the EU, **at least 25% of the deployment takes place in pre-existing infrastructure.**

3.2.2. Increasing cooperation in civil engineering projects throughout the EU

The main barriers to cooperation in civil engineering works identified have to do with (1) the lack of transparency concerning planned works, (2) the long and non-matching time horizons, (3) commercial considerations (scepticism to reveal commercial plans or lack of business interest), (4) the lack of legal certainty, especially as regards cross sector cooperation, and finally (5) technical incompatibilities.

It follows that the second operational objective of this initiative is therefore to **increase cooperation in civil engineering projects** through the EU, in particular by ensuring transparency, while providing a reasonable time to react, and by providing increased legal certainty for cross-industry / cross-utility cooperation.

In order to reach the overall savings targeted, measures in this area would aim at a situation where, throughout the EU, **at least 10% of the high-speeds networks are set up in co-deployment.**

In addition, special attention should be given to ensuring that public works are used as much as possible, taking into consideration the subsidiarity and proportionality principles and state aid rules.

3.2.3. Streamlining administrative procedures related to network rollout throughout the EU

The most common problems quoted in relation to permit granting are (1) the high number of different, uncoordinated rules and procedures, (2) the lack of transparency on these rules and procedures, (3) the long delays and, in some cases, (4) the unreasonable conditions, including fees, attached to rights of way and other permits needed to deploy physical infrastructure.

It then follows that the third operational objective is **to streamline the administrative procedures related to network rollout throughout the EU**, mainly by increasing the transparency and coordination of the permit granting processes, while ensuring the enforcement of deadlines as well as minimum standards as regards "reasonable conditions".

Since this objective is of a rather qualitative nature, no quantitative indicator is proposed for achieving it. Progress in this area will be ensured through analysing qualitative indicators such as fair and timely decisions on applications, transparent and reasonable conditions to permits.

3.2.4. Increasing the provision of buildings with open high-speed broadband-ready infrastructure throughout the EU

Deploying high-speed broadband infrastructure inside buildings has been identified as being a bottleneck in the rollout process mainly due to (1) the high costs of equipping existing buildings (2) cumbersome procedures related to working inside buildings and deploying the terminating segment on common grounds (mainly delays and difficulties to obtain owners' consent), (3) inconsistent application or lack of regulation tackling the inefficiencies associated with duplicating in-building infrastructure, and (4) lack of standardisation in this area.

The fourth and final operational objective of this initiative is therefore to **increase the provision of buildings with open high-speed broadband-ready infrastructure** throughout the EU **and ensure access to the terminating segment,** so as to reduce the costs and burdens associated with connecting customers.

In order to reach the intended overall savings, 5% of the deployment is assumed to reach high-speed broadband ready multi-unit dwellings. Therefore, measures in this area would aim at a situation where, throughout the EU, **at least 5% of the newly deployed networks reach multi-unit dwellings which are high-speed broadband ready.**

The figure below summarises the relationships between the context, the defined problem and underlying factors, on the one hand, and the general, specific and operational objectives, on the other hand.

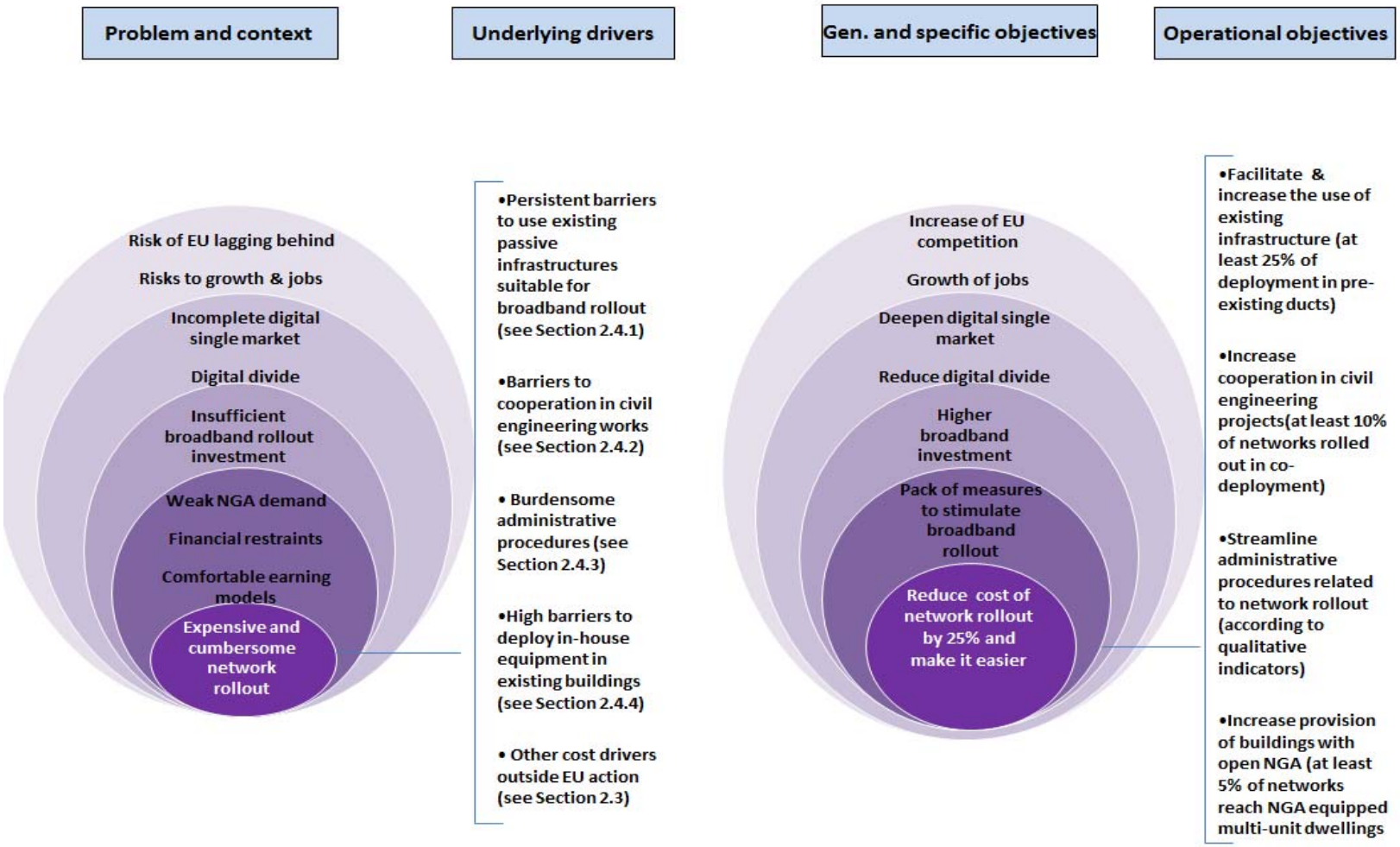


Figure 9 - Problem Definition and Objectives

4. POLICY OPTIONS

This chapter presents the policy options proposed to address the objectives of (1) increasing the use of existing physical infrastructure suitable for broadband rollout, (2) increasing cooperation in civil engineering works, (3) streamlining the permit granting procedures needed for broadband rollout and (4) increasing the existence of and facilitating access to high-speed broadband-ready buildings . All these operational objectives should contribute to the specific objective of facilitating the broadband rollout and reducing the costs of this process, in the context of the efforts undertaken by the Commission to stimulate it. Therefore, all the proposed policy options will be tested against these wider objectives.

Four broad policy options are presented, comprising measures in each of the four areas of action identified in Section 2.3, dealing with underlying causes. As underlined above, it is essential that all **policy options cover each of the problem areas** so that each policy option offers comprehensive solutions covering the entire process of network rollout (see Figure 3 from Section 2.3).

When defining the contents of each policy option, different solutions for tackling each of the identified problems were considered. The selection of solutions took place as follows.

First, **a wide range of solutions was collected during the consultation process**, mainly based on best practices encountered in Member States and in third countries, as well as on proposals made by stakeholders during the public consultation.

Second, these **solutions were then pre-screened against their potential to reduce the costs of broadband rollout in the first place, as well as considering the subsidiarity and proportionality principle and** other EU policy objectives such as competition and technological neutrality[50]. Remaining solutions were **tested for effectiveness *vis-à-vis* the operational, specific, and general objectives of the initiative, as well as the main impacts[51]**.

Annex V presents a non-exhaustive list of the most important policy options which were discarded, *prima facie,* on the basis of the above-mentioned criteria[52].

Finally, these pre-selected solutions were combined in **packages** so as to **address the totality of problem areas in a coherent and mutually reinforcing way from the conception phase until final realisation**. The logic of linking the envisaged solutions the way they are presented below has to do with their **scale and scope**. The scale and scope of the proposed measures increase with every policy option. Passing from Option 2 to Option 3 represents for example a major increase in both scale and scope, since Option 3 would affect a larger number of stakeholders, i.e. not only telecom operators but also other utilities, and would

[50] E.g. imposing technical solutions such as micro-trenching were discarded at this stage already because of the need to ensure technological neutrality.

[51] E.g. delaying deployment permits for companies that were offered the chance to co-deploy / to use existing infrastructure but refused was discarded at that stage as being potentially counter-competitive and against the general objective of the initiative.

[52] E.g. restrictions to public works in order to "force" co-deployment or mandating specific business models such as infrastructure clearing houses

grant rights and obligations to actors deploying broadband and other owners of infrastructure. Similarly, Option 4 is expected to affect yet more stakeholders; for instance all houses would have to be equipped with high-speed ready infrastructure; also the scale of intervention is wider (e.g. coordination of civil engineering works is in some cases made mandatory depending on the option, while there is a significant difference in the degree of harmonisation within the different options).

The public consultation generally confirmed the demand for solutions exploiting savings potential. While stakeholders did not agree in the assessment of possible measures, status quo solutions were rarely considered. Some of the stakeholders supported 'soft law' solutions, which could be adopted either under option 1 or 2, but rather as an addition to more ambitious solutions. Some of the considered solutions raised questions or indeed concerns from some stakeholders, but this did not lead to rejecting the need of measures. The critical voices have been included in the description of specific options, where relevant, to demonstrate how they were addressed.

In a nutshell, the policy option packages can be described as follows:

Option 1	***Business as usual***	**Monitoring and exchange of best practices, including guidance:** this option is in fact building on the baseline scenario.
Option 2	***Promote efficiency gains within the telecom sector***	**Promoting savings / cost reduction within the telecom sector:** this option promotes a more intensive, coherent and harmonised application of the existing provisions and tools of the telecoms regulatory framework.
Option 3 (3a +3b)	***Enable efficiency gains across sectors***	**Unlocking the potential of cross-sector cooperation to achieve higher savings and efficiency gains:** this option would propose more holistic and more ambitious cost reduction measures throughout the EU, applicable to non-telecom players too. Two further sub-options are presented, differentiated in function of the instruments to be adopted (sub-options 3a and 3b).
Option 4	***Mandate efficiency gains across the EU***	**Mandating cost reduction measures throughout the EU and across sectors:** this option groups the most ambitious cost reduction solutions proposed in terms of both scale and scope, while striving at the same time for the highest degree of uniformity throughout the EU.

4.1. Option 1 – "Business as usual"

Monitoring and exchange of best practices, including guidance

Figure 9 illustrates the relation between the proposed actions and the operational objectives.

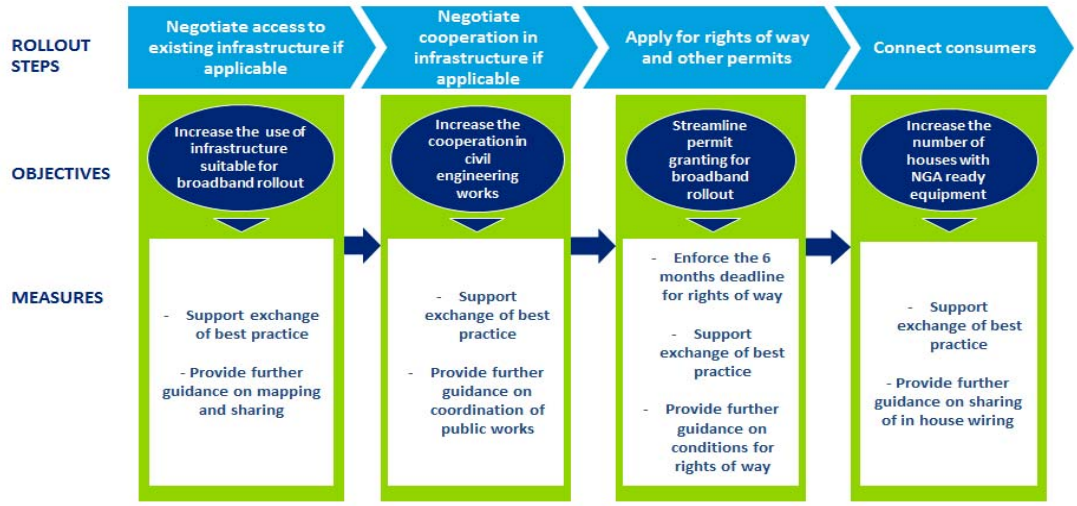


Figure 10 - Option 1: Business as usual

Under this option, the Commission would **proceed doing business as usual and monitor measures taken at national level**, since such measures are not entirely new and best practices are already emerging.

Specific actions envisaged would include supporting exchange of best practices and providing further guidance based on the existing provisions of the regulatory framework for electronic communications and emerging best practices in the analysis of the baseline scenario (Section 2.6).

To address persistent barriers to use existing physical infrastructures suitable for broadband rollout, barriers to cooperation in civil engineering works and high barriers to deploy in-house equipment in existing buildings, guidance documents would focus on practicalities of potential infrastructure inventories, of facility sharing, sharing of in-house wiring, and on best practices in the coordination of civil engineering works (based on Art. 12 of the Framework Directive). Furthermore, to partially address burdensome administrative procedures, guidance could cover practicalities concerning transparency and monitoring of the 6 months deadline for rights of way (based on Art 11 of the Framework Directive). In addition, the guidelines could also take into account best practices already existing in Member States. The Commission would also continue to support exchange of best practices in various fora (e.g. The Digital Agenda Assembly, the High Level Group on Electronic Communications, etc.).

Under this Option, Member States would retain full discretion as to whether or not to use any of the powers given by the regulatory framework (which however are limited to the electronic communications sector, e.g. they do not enable NRAs to take measures imposing sharing of infrastructure and coordination of civil works across utilities and other infrastructure owners). They would moreover remain free to decide whether they want to follow any of the Commission guidelines. Finally, only compliance with the time limit of 6 months for granting rights of way could be tackled through enforcement action, including infringement proceedings. Further guidance on infrastructure sharing could be given on a case by case

basis through the so called "Art. 7 procedure"[53] where the Commission and BEREC are assessing remedies (as for example on SMP obligations ensuring access to ducts of the incumbents or possibly on symmetric sharing obligations) proposed by the NRAs following market analysis and are ensuring their consistent application in conformity with the regulatory framework.

The role of the Commission would complement processes that are already taking place, as indicated in Section 2.6 above. More details on the existing practices can be found in Annex III. In particular, point 1 of Annex III presents a general overview of existing measures differentiating between existing practices that could be considered best in class (marked in blue) and all other existing or planned measures (marked in yellow). The best practices have been identified on the basis of the feedback from the public consultation, and from the results of the studies, in particular the study of Analysys Mason. The identified best practices should be considered as relative, i.e. in comparison to other existing measures; against this background best practices seem to be the most efficient, where the objectives, as identified in Section 3, are best ensured. As the data on all related costs of implementation of these measures are not complete, the costs factor has not been decisive in identifying the best practices.

4.2. Option 2 – Promote efficiency gains within the electronic communications sector

Promoting savings / cost reduction within the electronic communications sector

Under this Option, the Commission promotes a more intensive, coherent and harmonised application of the existing provisions and tools of the regulatory framework for electronic communications with a view to reduce the costs of broadband rollout and facilitate its deployment.

[53] Based on Art.7, 7a and 7b of the Framework Directive

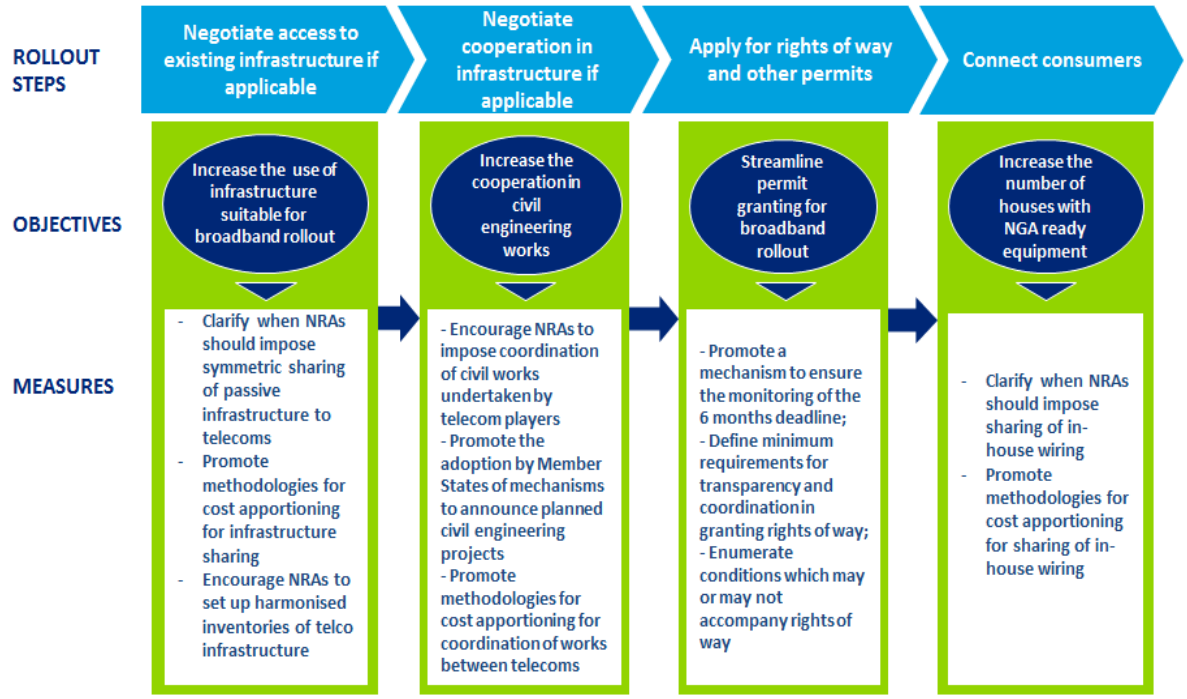


Figure 11 - Option 2: Promoting measures to reduce the costs of broadband rollout

In order to increase **sharing of existing infrastructure and coordination of civil works, and based on the powers granted by Art. 12 Framework Directive to NRAs,** the Commission would:

- Identify cases where NRAs should impose symmetric sharing of physical infrastructure of electronic communications providers (e.g. opening of ducts belonging to all providers of electronic communication networks regardless of their market position for access by competitors), within the limits of the specific public interest objectives listed in the Directive.
- Encourage NRAs to set up inventories of electronic communications physical infrastructure and to harmonise specific features of those inventories, where implemented; Member States or NRAs could be guided to seek convergence and render interoperable these inventories with metadata created following the Inspire Directive, in order to facilitate use of physical infrastructure.
- Encourage NRAs to impose coordination of civil works undertaken by electronic communications players, within the limits of the specific public interest objectives listed in the Directive.
- Promote the adoption by Member States of mandatory mechanisms concerning the early announcement of planned civil engineering projects for undertakings providing electronic communications networks (including the timeframe and possibilities for negotiations);
- Promote methodologies for cost apportioning for physical infrastructure sharing (including for deployment, maintenance and damages cost) and coordination of works between electronic communications undertakings, as this issue emerged as a critical success facture, as well as a major potential pitfall during the public consultation (see

French example on defining detailed rules on apportioning of costs and standard contracts for co-deployment and sharing agreements).

In order to streamline permit granting for broadband rollout**, and based on provisions of Art. 11 Framework Directive,** the Commission would:

- Promote a mechanism to ensure the monitoring of the 6 months deadline, by *inter alia* benchmarking between Member States and between Municipalities or regions within Member States;
- Define minimum requirements for transparency and coordination in granting rights of way;
- Promote the electronic submission of requests for rights of way as well as the electronic publication of the decisions for benchmarking purposes;
- Enumerate conditions which may, or may not accompany rights of way, with a view to ensuring a non-discriminatory regime and recommend Member States to publish permits in order to ensure transparency and non-discrimination.

In order to increase **the number of houses with high-speed ready equipment, and based on the powers granted by Art. 12 to NRAs,** the Commission would:

- Clarify cases and conditions under which in-house infrastructure should be shared.
- Actively promote equipment of buildings with high-speed ready physical infrastructure.
- Incentivise Member States to include in-house equipment in their broadband plans.

Please refer to Figure 9 for the relation between these actions and the operational objectives.

In order to ensure strong, coherent and mutually reinforcing results, a **single instrument** is proposed under this option. Building on the idea that all the problem areas need to be tackled to maximise effectiveness, the Commission would issue a **Recommendation on cost reduction measures, under Article 19**[54] **of the Framework Directive**, setting up implementation details concerning Articles 11 and 12 of the Framework Directive.

A Recommendation under Article 19 of the Framework Directive has the benefit that the National Regulatory Authorities have the underlying powers to implement it, conferred by the current regulatory framework. The major disadvantage of this instrument is that the powers are limited in several ways (to rights of way *sensu stricto*, to sharing of in-house infrastructure only, etc.). Alternatively, a Commission Recommendation pursuant to Articles 288 and 292 of the TFEU could provide guidance concerning new building project and other elements not included in the scope of the regulatory framework, e.g. permits other than rights

[54] According to Article 19(1) of the Framework Directive, the Commission is empowered to issue a recommendation following an advisory procedure in the context of the Communications Committee when it finds that divergences in the implementation of the regulatory task specified in the Directives may create a barrier to the internal market. Article 19(3)a of the Framework Directive also envisages the possibility to adopt decisions where inconsistent application of Article 15 and 16 creates a barrier to the internal market. Unlike the measure proposed in this policy option, however, this decision could only deal with asymmetric measures imposed on SMP operators.

of way, and could extend the scope of this initiative to the physical infrastructure of non-telecom operators. Yet the effectiveness of such an instrument could be put into question, given that the NRAs do not have the necessary legal powers to implement it.

Adopting a Recommendation under Article 19 is beyond doubt a more ambitious option than continuing with business as usual, although it is limited to electronic communications providers and current regulatory tools. It would indeed promote a more intensive and coherent application of those existing tools/provisions throughout the EU. Nevertheless, once a Recommendation is adopted, the Member State might still deviate from it, albeit by providing a reasoned justification.

4.3. Option 3 – Enable efficiency gains across sectors

Unlocking the potential of cross-sector cooperation to achieve higher savings and efficiency gains

Under this option, the Commission would **propose measures to unlock the potential of cooperation across sectors on physical infrastructures and to ensure the spreading of more ambitious cost reduction solutions across the EU.**

Concretely, the following measures would be proposed:

- **'Addressing persistent barriers to use existing physical infrastructures suitable for broadband rollout'**

A general right to offer and to use the existing physical infrastructures suitable for the deployment of broadband under fair terms and conditions, regardless of whether they are owned or used by electronic communications network providers; This general right to use would be different from the existing obligations imposed under the regulatory framework, that will continue to apply where appropriate[55]. This option would have broader scope by imposing an obligation on non-SMP operators and on other utilities, while favouring commercial negotiation, in order to accommodate the concerns expressed in the public consultation. Such a right would remove regulatory barriers preventing any utility from negotiating the commercial exploitation of their infrastructure by sharing it with electronic communications network providers. Under this option, access should be granted under fair terms and conditions subject to justified reasons for refusal based on the unsuitability of the infrastructure, security and availability reasons, or the availability of alternative physical access solutions by the infrastructure owner, where commercial negotiation fails. A **dispute settlement mechanism** would be also envisaged, in order to provide for the possibility to review any refusal. The setting of cost oriented prices is not envisaged, but can be imposed e.g. by SMP regulation on incumbent telecom operators. By default, the existing dispute settlement body in the telecom sector could play this role. Solutions relying on similar premises exist already in Lithuania and Portugal. Germany is developing relevant legislation.

A right to access transparent information regarding existing physical infrastructures suitable for broadband rollout, regardless of their owner (e.g. telecom or non-telecom operators, private or public undertakings); Information would be provided on a "need to

[55] Including duct sharing, as envisaged by the NGA Recommendation, *cit.*, points 13-17.

know" basis, in order to respond to security concerns, as raised by some stakeholders in public consultations. Ideally, this would translate into a right of electronic communications network providers to access information **on available physical infrastructure through a single information point.** Information would regard ownership, geographical references of the physical infrastructures as well as their main characteristics. In addition, an obligation for public sector bodies holding such information to make it available to the single information point within a certain period of time will ensure the availability of the information. This obligation would be coupled with an obligation of network providers to provide such information on request from the single information point, as well as with a right of EC network providers to have access to on-site visits for more detailed surveys under reasonable terms and conditions would be granted on request. As a safety net, in case information is not available at the single information point, a direct right would be recognised to electronic communications providers to access information of any network operator, under proportionate, non-discriminatory and transparent terms. Resolution of disputes regarding in-site surveys or access to information would be entrusted to a dispute settlement body, by default, the NRA. Organisational modalities of the access to this infrastructure would be left to Member States taking into account concerns of some stakeholders in the public consultations. In particular, Member States could build on existing initiatives, if any. This measure builds on the experiences of Germany and other Member States that have already addressed these issues to some extent (BE, CZ, DK, FI, FR, IT, LU, NL, PL, PT, RO, SI, SE, UK).

The details of the **approaches proposed to mapping are further described in Sub-options 3a and 3b**.

- **'Addressing barriers to coordination of civil works'**

Specific rights and obligations aiming at enabling an increased coordination of civil engineering works, regardless of whether the party undertaking works is an electronic communications network provider, a local authority or any other utility; More concretely, such measure would **entail a right to negotiate co-ordination of civil engineering works coupled with a right to access information on planned investments implying civil works**. In order to promote a forward looking planning of civil engineering works, the possibility of notifying multiannual or annual infrastructure deployment would be given to the network providers. Organisational elements would be left to Member States, so to allow for the most efficient use of existing structures with a view to keeping the costs low and avoiding administrative complexity, as expressed in the public consultation. For example, in some Member States the coordination of civil works is linked with the inventory of physical infrastructure (FR, PT). In practice, when a company would intend to deploy in a certain area, it would enquire whether other parties might have similar plans, which could lead to a mutually advantageous situation and potential savings. Such a system would respond to concerns related to sharing strategically sensitive information, and thus minimise cases where companies are "free riding". The other solution to avoid "free riding" is to make sure that an access seeker who wants to use infrastructure resulting from civil works to which he could have contributed (but refused to), is granted access at a price which reflects the delay in investment and the reduced risk.

With **specific regard to civil works financed with public means**, additional measures facilitating co-deployment would be provided. In particular, the transparency obligation

would be coupled with an obligation imposed on undertakings deploying infrastructure financed by public means to **accept, on a transparent and non-discriminatory basis, timely co-deployment requests from any potential undertaking** that intends to deploy physical infrastructure suitable for high-speed electronic communications networks, provided that this does not entail additional costs for the public operator, and without prejudice to state aid rules[56]. **Dispute settlement** would be triggered in case of failure of negotiations only in the case of works financed with public funds.

- **'Addressing burdensome administrative procedures'**

Increased transparency and timeliness as regards permit granting procedures, coupled with safeguards aimed to ensure non-discriminatory, transparent, objectively justified, and proportionate requirements and/or conditions; Ideally, each Member State would appoint an authority, which would act as a point of contact between the competent (decision-making) authorities and providers and would facilitate coordination among the authorities concerned in the permit granting process. In practice, this "single information point" could provide any information concerning the conditions and procedures applicable to the deployment of civil engineering works, including applicable exemptions, centralise requests for permits and dispatch them to the competent authorities. The information point would provide tools to monitor the permit granting procedures and the applicable deadlines. Legally, electronic communications network providers would be recognised a direct right to a timely permit granting decision, while any condition attached to it should be based on objective, transparent, non-discriminatory and proportionate criteria. In particular, conditions and fees imposed should be linked to the impact of civil engineering works to be authorised, their application should be adequately reasoned and the criteria for the determination of conditions and fees of permits should be defined in advance, including any exemption of categories of works or infrastructures from the scope of specific permit procedures. Yet, the authority would not have the right to overrule decisions of other competent authorities. Greece has recently introduced legislation going in this direction.

As the solution proposed above could be implemented with **different degrees of ambition**, the concrete proposals to reach the objective of streamlining administrative procedures involved in permit granting are **further developed in Sub-options 3a and 3b.**

- **'Addressing high barriers to deploy in-house equipment in existing buildings' (2.4.4.)**

An obligation to provide **new buildings as well as old buildings that undergo major renovation works with high-speed-ready in-building physical infrastructure (e.g. sufficient space in mini ducts)**, while ensuring technological neutrality, and an obligation to provide new or majorly renovated multi-dwelling buildings with a concentration point located in or outside the building. This is based on the analysis that such works would entail marginal costs when a building is raised or majorly renovated, compared to retro fitting. This would allow an easy and cheap laying or upgrading of cabling later on, covering vertical

[56] From a state aid perspective, see Community Guidelines for the application of State aid rules in relation to rapid deployment of broadband networks ("Broadband Guidelines"), OJ C 235, 30.9.2009, p.7 (currently under review), as applied in e.g. state aid cases N 383/2009 – Germany – Amendment of the State aid broadband scheme N 150/2008 – Broadband in the rural areas of Saxony and SA.34732 – Italy - BULGAS – FIBERSAR –NGA Sardegna (not yet published).

wiring. Furthermore, a right for every electronic communications network operator to terminate its network to the concentration point would be foreseen. In order to reach the subscriber, a right for electronic communication operators to negotiate **access** to the in-building equipment, where it exists, and to the private premise, in the absence of any infrastructure, should also be foreseen.

The right for any public electronic communications networks provider to terminate its network to a private premise at its own costs would be subject to the agreement of the subscriber, provided that it minimises the impact on private property, for example, when possible, by reusing existing physical infrastructure available in the building or ensuring full restoration of the affected areas.

This Option would not mandate specific technology, as it would be hard to defend it from the point of view of technological neutrality and might also raise competition concerns, as expressed by many stakeholders in public consultations. In addition, it should be possible for Member States to exempt certain categories of buildings from such obligations, with a view to adapting costs of this measure to their geographic, demographic and town planning specificities. For proportionality reasons, this measure does not provide for financing arrangements, as it is the case in the UK guidelines which encourage for sharing costs between the housing and the telecom sector. The financing models can be different and the Member States should have a liberty to choose which of them should be promoted. This measure builds mostly on the experience of such Member States as ES, FR, PT.

While the lack of standards in this area is acknowledged to be a problematic issue, the establishment of standards is a medium to long term process and therefore should take place in parallel and complementary to this initiative, answering the suggestions of many stakeholders in public consultations.

Sub-options 3a and 3b

The nature of the measures envisaged under this Option, in particular the establishment of specific rights and corresponding obligations pleads for resorting to legally binding instruments, if only to create tools to act, legal certainty and predictability for the various parties involved.

In fact, these measures can be best enacted through a Regulation under Article 114 TFEU. Indeed, they aim at removing regulatory barriers that may prevent the creation of a market for physical infrastructures reaching beyond telecom actors and at enabling negotiations among the concerned stakeholders in view of exploiting the cost saving potential stemming from better coordination and cooperation. In this regard, the creation of directly applicable rights and obligations for all the undertakings concerned, as opposed to a Directive that requires Member States to create such rights appears to be better suited to pursue this objective. There are many evidences that providers need to be granted directly applicable rights, which they could invoke before the national courts, not only against Member States, but also against other individuals, such as owners of infrastructure. In addition, contrary to a Directive, which would imply granting additional time for transposition by Member States, and which would allow a significant degree of differentiation in the implementation of the measures, the regulation will rapidly install the basic conditions for network deployment throughout the EU. Thus, only a Regulation could ensure consistent and fast implementation of these cost reduction/facilitation measures across

Europe and would be the only choice suitable to reach in time the Europe 2020 targets[57]..At the same time, the provision to be included in the Regulation would maintain the necessary flexibility for Member States as to the organisational measures to be adopted in order to supplement the rights provided for in EU law, in line with the subsidiarity principle (see also below Chapter 6).

It is however acknowledged that the proposals related to the transparency **of existing physical infrastructure** and to **the single point of contact for permits** could be implemented through different instruments, **equally compliant with the proportionality and subsidiarity principles:**

(A) Either through a fully coherent binding measure, which would however **abstain from prescribing the implementation details of the above mentioned solutions**, so as to leave enough leeway to Member States to accommodate their national institutions and administrative procedures.

(B) Or through a Recommendation describing in detail the desired implementation details, but granting the option to Member States to deviate from those.

Therefore Option 3 is further broken down into **Option 3a**, tackling all the issues through a regulation, and **Option 3b**, combining a regulation with a complementing recommendation when it comes to transparency of existing infrastructure and streamlining administrative procedures related to permit granting.

In practice, when it comes to **transparency of existing physical infrastructures**, Option 3a would enshrine the objective of establishing single information points in a regulation, and would establish minimum requirements and standards for such an instrument. In practice, the regulation would establish all rights and corresponding obligations which are necessary in order to ensure the availability of information on existing physical infrastructure and the possibility for providers deploying broadband to access it. In this respect, the regulation would build on current exercises and pre-existing information in Member States, in order to minimize administrative burden. Option 3b would entail directly applicable rights to information on available infrastructure, reinforced by a right to on-site visits, granted through a regulation, plus a recommendation on establishing single information points. The recommendation would allow organising the publication of information on existing infrastructure, as well as access to it, by recommending Member States to set-up mapping data-bases. While the level of detail of information to be included in the database would be left to the Member States, certain requirements of the mapping exercise would build on the existing obligations and standards in order to ensure interoperability and to avoid duplication of other transparency systems as imposed by the INSPIRE Directive.

[57] The adoption of a Directive has been excluded on the basis of need to provide directly applicable rights and obligations to enable commercial negotiation concerning physical infrastructure suitable for broadband and some common basic rights in the permit granting procedure across Europe, without the need of additional transposing rules by Member States. The adoption of a Regulation would also be more in line with the need for a timely intervention in view of the Digital Agenda objectives. The adoption of a Decision of the European Parliament and of the Council has been excluded because it would impose directly applicable obligations on Member States, but it would not provide rights and obligation for the generality of operators concerned.

With respect to **streamlining administrative procedures**, Option 3a would entail the right of network operators to receive, through a single information point, transparent information on all administrative procedures involved in permit granting, plus a right to transparent, proportionate, non-discriminatory and reasonable conditions or requirements, both granted through a regulation. In addition, it would entail the obligation for Member States to appoint a single information point responsible for monitoring the permit granting process (by default, the NRA). Option 3b would encourage a recommendation on setting up such single access points and would go even further by recommending that Member States establish a single point receiving requests for permits electronically and dispatching them to the competent authorities. Member States would be invited to establish tacit approval of requests which are not handled within the legal deadlines and to exempt categories of civil engineering works. Such measures should be without prejudice to specific deadlines or procedural obligations laid down at national or EU level, applicable to the permit granting procedure.

As far as mandated access to physical infrastructure, coordination of civil works and in-house equipment are concerned, Options 3a and 3b are quasi-identical. This is because a non-binding instrument would not be effective in implementing the solutions proposed regarding rights and obligations on **mandated access to physical infrastructure, coordination of civil works and in-house equipment**. For these problem areas, binding measures are needed to implement the proposed solutions.

These combinations of instruments in sub-options are illustrated below:

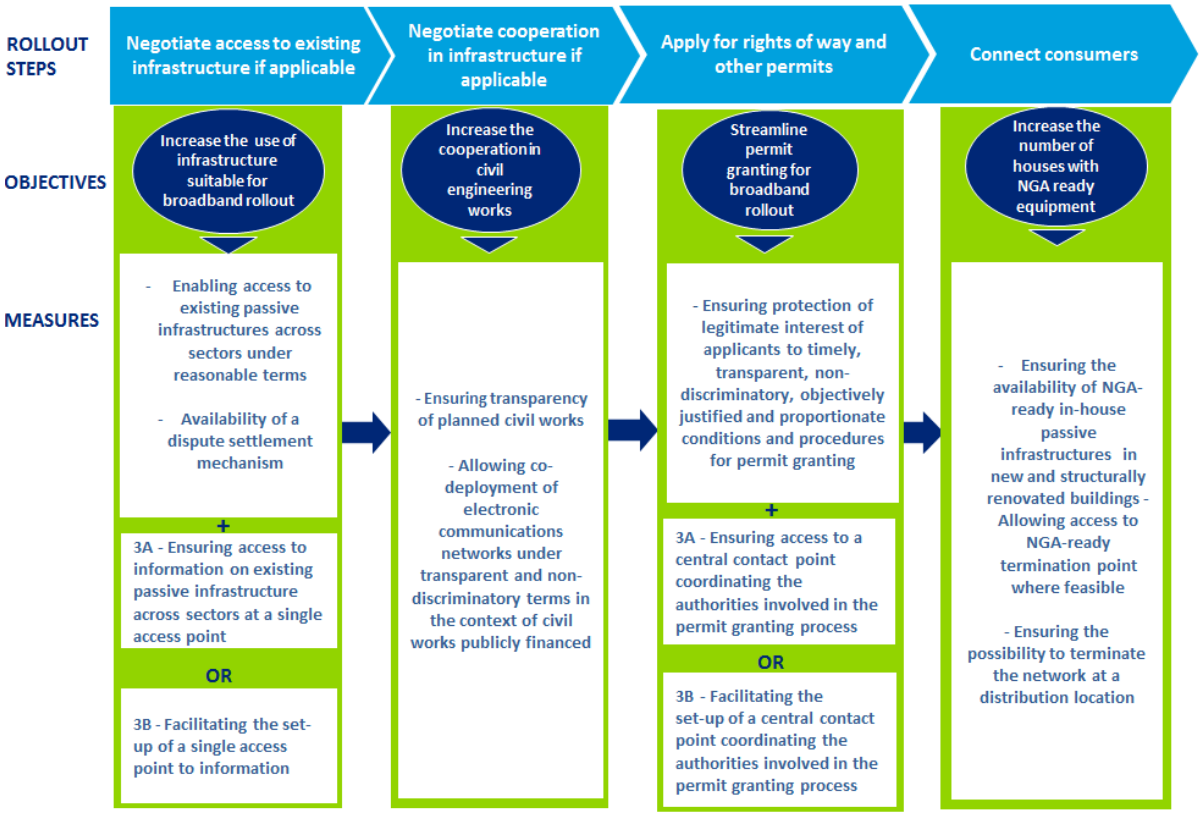


Figure 12 - Option 3: Enabling the utilisation of the existing regulatory framework to reduce the cost of broadband rollout

It should be noted that **a recommendation under Sub-option 3b as concerns transparency and the single information point would not be effective unless the basic underlying rights** are granted concerning access to information on existing infrastructures and non-discriminatory, transparent, and objective and proportionate permit granting procedures.

At the same time, Option 3a (regulation only) grants a large degree of flexibility to Member States as to the organisational and implementation modalities. Also, undertakings would keep a high degree of freedom: use of existing physical infrastructures being left to commercial negotiation, coordination of civil works becoming a real option but not an obligation, etc. Finally, some of these measures would be complementary to and could mutually reinforce some elements taken into account in the assessment of broadband State aid (such as mapping, transparency of planning projects, use and access to the physical infrastructure).

4.4. Option 4 – Mandate efficiency gains

Mandating cost reduction measures throughout the EU and across sectors

This option groups the most ambitious cost reduction solutions proposed in terms of both scale and scope, while striving at the same time for the highest degree of uniformity throughout the EU. Concretely, this option puts together solutions considered to have the highest impact on reducing the cost of network deployment and facilitating it.

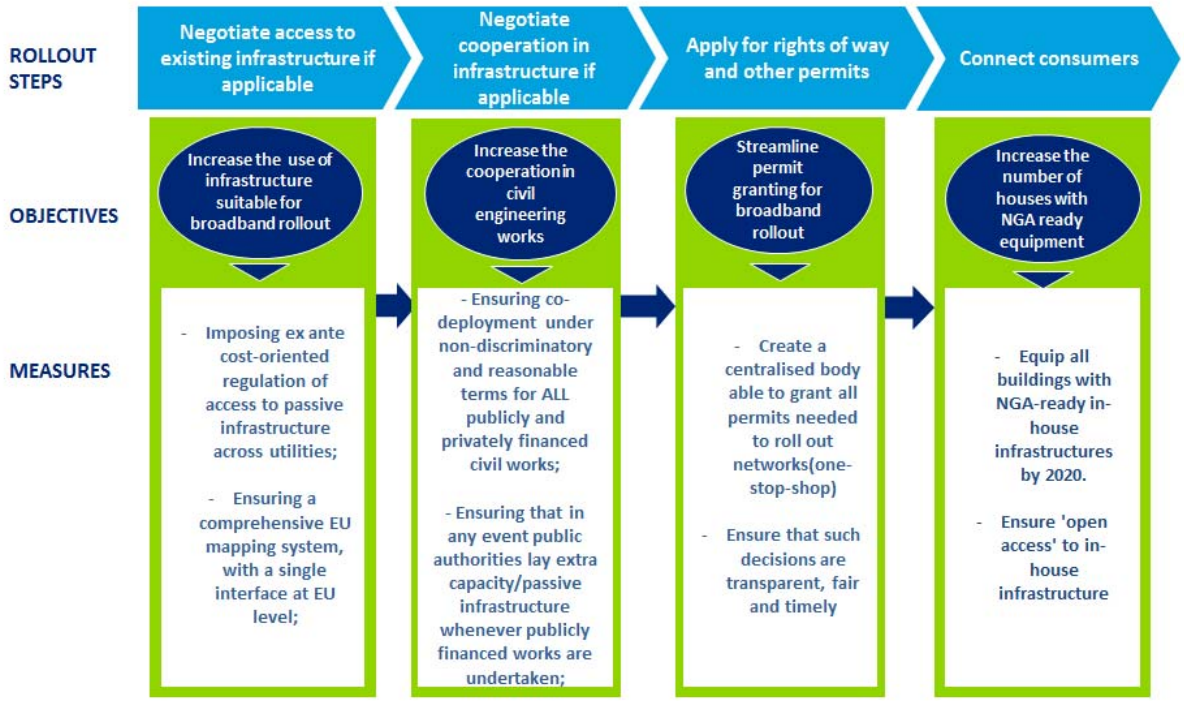


Figure 13 - Option 4: Mandating the full exploitation of the existing regulatory framework to reduce the cost of broadband rollout

More precisely, such measures could entail:

- **'Addressing persistent barriers to use existing physical infrastructures suitable for high-speed electronic communications networks'**

Granting a right to **use existing physical infrastructures suitable for the deployment of high-speed electronic communications networks at cost orientation;** National authorities would be mandated to define *ex ante* conditions to use all existing physical infrastructures, including telecom and non-telecom ones, in view of ensuring cost orientation. This measure would replace existing SMP obligations imposed on electronic communication providers and minimise any divergence in the implementation of the right to use existing physical infrastructures throughout the EU. This system would thus be fundamentally different than the one foreseen under Option 3, which is based on free negotiations with an option for ex post dispute settlement (that could decide on the reasonableness of the request but could not impose cost orientation), and which would not impact existing SMP obligations.

The set-up of **comprehensive inventory of physical infrastructures** in view of full transparency and in accordance with clearly defined standards, also with a view to its visibility to market operators across borders; The EU provisions would define the infrastructure included in the scope of the inventory as well as the information to be gathered by Member States, including templates for the submission of information in order to ensure consistency of processing. With a view to avoiding disproportionate obligations, the requirements of the mapping exercise would build on the existing obligations and standards (e.g. transparency systems as imposed by the INSPIRE Directive). In addition to this, a single point of contact would be ensured at EU level, with the possibility to gain access to these mapping systems through an EU body, such as for example BEREC.

- **'Addressing barriers to cooperation in civil engineering works'**

Stronger measures aiming at the coordination of civil works, including both transparency measures already envisaged under the previous option and additional access obligations concerning coordination. First, there would be a general legal obligation for all actors undertaking civil engineering works (both privately and publicly funded civil works) to negotiate and agree to requests for coordination, under reasonable conditions (such as cost and timing). Therefore, under this Option and unlike in option 3, the reasonableness of the request to coordinate could be assessed by the dispute-settlement body for both public and private actors. The dispute settlement body would be empowered to force operators to accept coordination by imposing the terms and conditions, including price. Finally, a general obligation to lay down empty ducts suitable for electronic communications networks would be envisaged in the event of works financed with public money, in view of future use in accordance with State Aid rules[58].

- **'Addressing burdensome administrative procedures'**

The creation of a **full one-stop-shop**, concentrating all the permits (including building permits) needed for the deployment of new infrastructure. In contrast to the solution envisaged under Option 3, the leading central authority would have decision making powers. This would also render conditions for granting permits more uniform and harmonised, as requested by various stakeholders during the consultation process. It would allow furthermore the adoption of standard request forms, standard documentation required, standard time

[58] From a state aid perspective, see e.g. State aid case N 383/2009 – Germany – Amendment of the State aid broadband scheme N 150/2008 – Broadband in the rural areas of Saxony.

scales, etc., all enabling savings and economies of scale for operators seeking to undertake large deployment exercises.

- **'Addressing high barriers to deploy in-house equipment in existing buildings'**

An obligation to gradually ensure the availability of highs-speed-ready in-house technologically neutral infrastructures in **all buildings**, regardless whether newly built or already existing, by 2020; Also 'open access' to in-house infrastructure would be mandated with regard to all types of buildings.

Such measures could only be imposed through binding measures and can be best enacted through a Regulation under Article 114 TFEU, for the same reasons explained in the context of the third policy option.

5. ANALYSIS OF THE IMPACTS OF THE POLICY OPTIONS

5.1. Methodology

This chapter presents an analysis of the economic, social and environmental impacts of the four policy options identified in Chapter 4, aimed at reducing the costs of broadband rollout and facilitating it. As regards possible impacts on fundamental rights, as guaranteed by the Charter of Fundamental Rights, the proposed measures could interfere to some extent with the right to property, right to privacy and the protection of business secrets, right to conduct a business. The scope of these interferences and mitigation measures are discussed under analysis of impacts of options 3 and 4 (Sections 5.6.2 and 5.7.2 below respectively).

The impacts of each policy Option are measured taking into consideration each of the action areas included: mapping and access to infrastructure, civil engineering works coordination, streamlining permit granting and high-speed-ready buildings. The analysis builds on a qualitative assessment supported where available by quantitative data as regards generated savings, costs and benefits of measures of a similar nature. The core data are mainly derived from a study specifically commissioned to provide support for this impact assessment which uses case studies in specific Member States where similar measures have been implemented (See Annex IV).

The **broader economic impacts of each option are reviewed**, focusing on the **expected effects on network investment / broadband rollout**, and on **consumer welfare, growth, competitiveness, and Single Market** (see Section 5.2- 5.3 and Annex VII).

This broader analysis is based on an **assumed positive effect of cost reduction measures on broadband deployment,** which is explained at the introductory part of this chapter (Section 5.2)**.**

The distributional analysis of **the cost and benefits incurred by direct stakeholders** can be found in Annex VIII which presents summary tables and graphs visualising the impacts on direct stakeholders**,** and in Annex IX including more detailed analyses of direct benefits and

costs, including administrative ones. A summary of the analysis by option is presented in Sections 5.4-5.8.

The social and environmental impacts are based on this link between cost reduction measures and network investment. The main effects of broadband investment on the economy, on the society and on the environment are also reviewed by way of introduction (Section 5.3), together with some quantitative examples, to give an indication of the possible scales of these effects in the case of each policy option.

An **overall assessment for each category of impacts** is made taking into consideration, for instance, cases where **significant positive impacts outweigh possible negative impacts**. The business as usual scenario is considered to have overall neutral impacts. All the other options are evaluated through a comparative approach, first assessing the impacts as compared to the business as usual option, then moving to incremental impacts as compared to the previous ones. The impacts are rated as follows below and then summarised and **visualised at the end of the chapter**:

☺☺☺ Significant overall positive impacts

☺☺ Moderate overall positive impact

☺ Limited overall positive impacts

0 Neutral impacts

5.2. Impact of cost reduction measures on broadband deployment

A series of factors determine a decision by a company to invest in network rollout: demand, costs, strategic positioning on the market, etc. For this reason it is not possible to give a precise estimation of the additional investment linked with a certain level capital expenditure (CAPEX) savings. It is nevertheless safe to assume that the proposed measures and related CAPEX savings on investments would **influence positively high-speed broadband deployment**, then generating significant related economic, social environmental benefits (as analysed under Section 5.3). This assumption is supported by evidence in the analysed case studies (LT, PT)[59] and by findings of sector specific studies[60].

In order to give an indication of the potential impact of cost reduction measures on network investment and of the further economic, social, and environmental effects, a study prepared by Analysys Mason on "The socio-economic impact of bandwidth" (SMART 2010/0033) was used. This report looks, on the one hand, at the investment gaps for reaching the targets of the Digital Agenda Europe, under different public intervention scenarios, and, on the other

[59] See Annex IV Chapter 4.4.2 of Analysis Mason "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013)"

[60] See OECD (2008), "Public Rights of Way for Fibre Deployment to the Home", *OECD Digital Economy Papers*, No. 143, OECD Publishing. http://dx.doi.org/10.1787/230502835656, pag.25 and Analysys Mason study "The socio-economic impact of bandwidth" (SMART 2010/0033), and Analysis Mason "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013)"

hand, attempts to quantify broader economic impact of high speed broadband deployment under different scenarios.

Starting from the forecast[61] that the private sector will invest EUR 76 415 million in deployment of high-speed broadband by 2020, this report concludes that **substantial public efforts are needed to achieve the Digital Agenda targets.** The report further analyses two scenarios: the *do nothing* scenario[62] and a *major intervention* scenario, where a certain amount of public funding is combined with cost reduction measures. Even under the second scenario (over 57 billion EUR public funding combined with soft cost reduction measures leading to 10% savings) the coverage target for high-speed broadband remains a challenge, as can be seen in the table below, since this would still leave 14.2 million household not passed by high-speed broadband and therefore a significant percentage of households and businesses still unable to access the Internet-based digital services that high-speed broadband makes possible. Socio-economic impacts are then estimated for both scenarios (for details of these scenarios see Annex VII).

Table 1 – Investment scenarios and the achievement of the DAE targets

Scenario	Total NGA investment (EUR million)	Intervention investment (EUR million)	Commercial leverage due to intervention (EUR million)	Households passed by NGA in 2020 (thousands) (% EU27 households)	Households connected to NGA in 2020 (thousands) (% EU27 households)
Do nothing	76 415	0	0	208.592 (93.6%)	92 432 (41.5%)
Major intervention	211 179	57 084	118 203	214 314 (96.2%)	138 915 (62.3%)

The figures above illustrate that increased funding or/and more ambitious cost reduction measures are needed to reach the high-speed broadband coverage target and close the digital divide. It should be noted that the very last percentages of population which are deprived from access to high-speed broadband are the most difficult to address. A certain amount of financial intervention, therefore, remains indispensable (in particular in the most remote areas where the lack of sufficient demand would not make private investments profitable). However, it is clear that cost reduction measures would help in closing the digital divide by reducing investment cost for private operators and allowing a more efficient use of public resources, thereby reaching a larger number of households with the same intervention cost.

Figure 13 below explains the effect of the reduction of the investment costs in areas where public intervention would be required to overcome market failure (i.e. where commercial organisations do not envisage a sufficiently high return on their investment to make the case

[61] See Analysys Mason study; "The socio-economic impact of bandwidth" (SMART 2010/0033), Chapter 9.2. NGA investment and deployment

[62] Scenario analysed in detail in Analysys Mason on "The socio-economic impact of bandwidth" (SMART 2010/0033).

for high-speed broadband deployment). The solid grey line shows the break-even point where income from users exceeds the cost of provision of high-speed broadband: the break-even line shifts down as costs are reduced, reaching levels corresponding to a higher number of households, which were originally in less profitable areas.

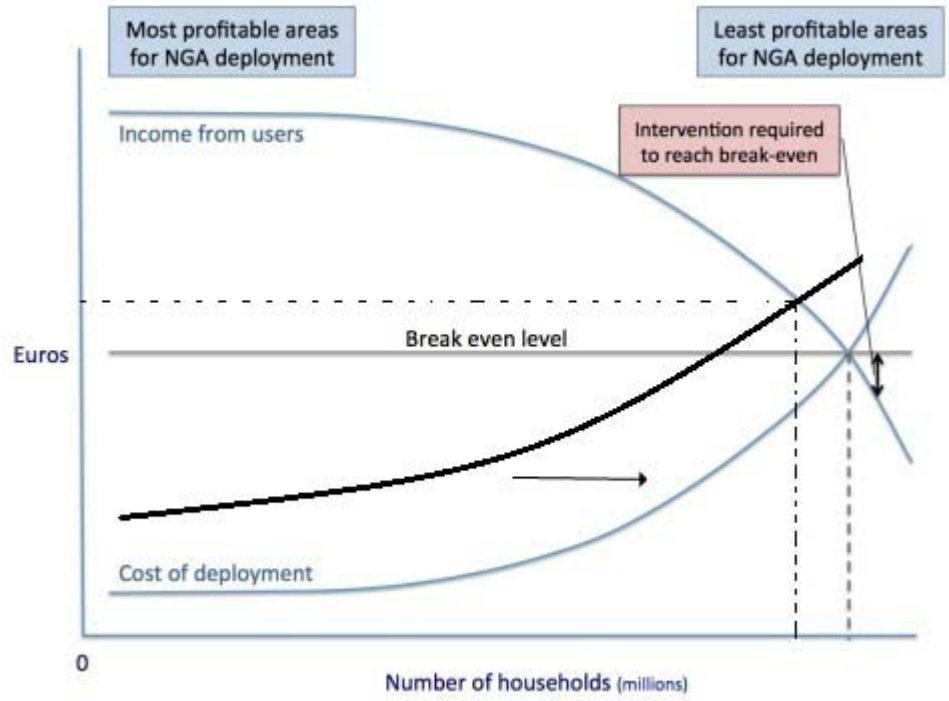


Figure 14 - Demand and supply diagram demonstrating when intervention will be required to deploy NGA (Source: based on Analysis Mason study "The socio-economic impact of bandwidth" (SMART 2010/0033)

This model is confirmed by experiences in Portugal and Lithuania where regulatory measures on access to ducts ensured that it would be economically viable to deploy in areas where the business case would not otherwise make sense. The scale of the impact of cost reduction measures on deployment of high-speed broadband depends however on the exact situation of each Member State (e.g. where sufficient public resources are available to invest in broadband, and where high-speed broadband deployment is led by the incumbent operator this impact would be more limited[63]; the impacts also depend, for example, on the available infrastructure suitable for broadband rollout, on the cost of infrastructure rental, etc.).

Regardless of these factors, cost reduction measures taken together still bring benefits in all Member States to both alternative operators and incumbents.

It thus appears that more solid envisaged cost reduction measures would shift the point where public intervention becomes indispensable further and would render public intervention in those areas more efficient. We can therefore assume that a certain level of impact of cost reduction measures on broadband deployment would always be present; the difference of

[63] See for example Annex IV - Analysis Mason (2012), Chapter 4.4.2

magnitude would then however differ, in relation to the different efficiency and effectiveness of the proposed Options.

5.3. General economic social and environmental impacts of broadband deployment

Several studies demonstrate the benefits of broadband deployment. First, the importance of Internet for the **economy** is well documented. There is in fact a growing body of literature, which identifies broadband as a general purpose technology that is fundamentally changing how and where economic activity is organised. Focusing on 13 countries that account for over 70% of the global GDP, McKinsey Global Institute (2011) estimates that *Internet economy* generates on average 3.4% of GDP (with up to 21% of GDP in some cases), with a great potential for growth still unexploited. Moreover, several studies[64] show a significant and positive impact of Internet on *GDP growth.* The most widely quoted one, Czernich & al (2009) concludes that a 10% increase in broadband penetration results in a GDP growth between 0.9% and 1.5%. The graph below illustrates this correlation.

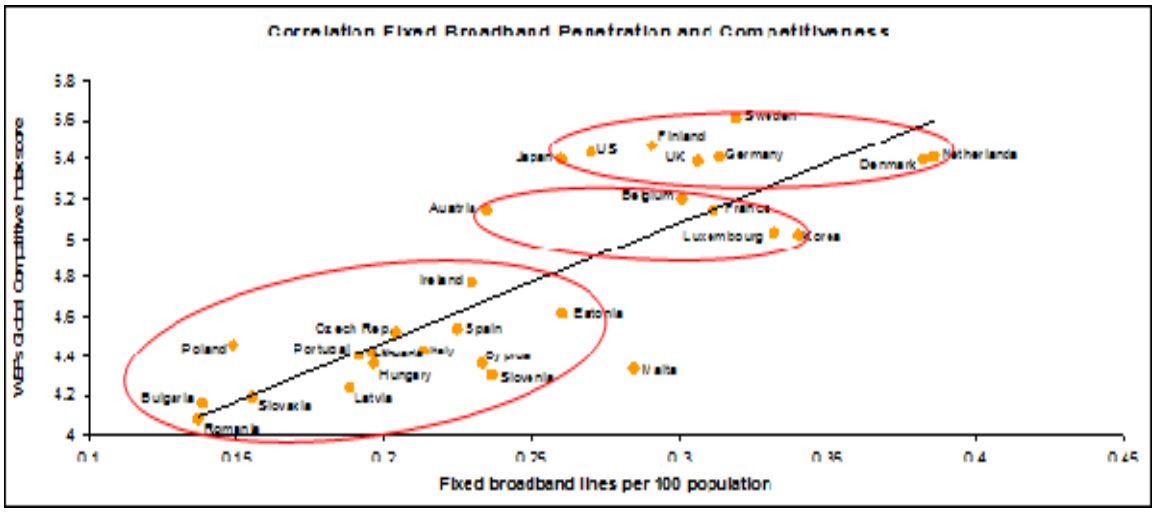


Figure 15 - Correlation between fixed broadband penetration and competitiveness

This growth can be explained as follows. Internet is considered to give **a competitiveness boost to enterprises:** a survey of The McKinsey Global Institute (2011) shows that SMEs with strong web presence *grow twice as fast and export twice as much* as the ones with minimal or no web presence. High speed Internet increases *productivity*, with gains ranging from 5 to 20%[65]. It also provides a platform to support *innovation* across sectors, stimulating a virtuous cycle in the development of the digital economy: it allows new services to take off and fuels a growing demand for bandwidth. Services such as high definition video conferencing, cloud computing, smart services, and even social media have changed the way business is done today. Broadband has been also found to have a positive impact on the development of *new businesses*. This results from the network effects of connectivity: when a

64 Koutroumpis (2009), Thompson and Garbacz (2009), The Allen Consulting Group (2003), The Impact of Broadband on the Economy: Research to Date and Policy Issues April 2012, ITU (2012)

65 Micus (2008), and Strategic Economic Solutions (2007) and Zhen-Wei Qiang, Rossotto and Kimura (2009).

large enough number of households are connected to broadband, the incentive to develop new businesses around information search, advertising and electronic commerce increases.

There is evidence that broadband rollout is also **a net job creator**: as any infrastructure project, it acts over the economy by means of multipliers, generating not only direct but also indirect jobs, via positive spill-overs in a variety of sectors. In a research on this topic, Tech4I2 and Analysys Mason (2012) reviewed six recent studies[66] and concluded that the indirect jobs created are even more numerous than the direct ones[67]. For example, in line with Liebenau et al.(2009) in the United Kingdom the impact of investing USD 7.5 billion to achieve the target of the "Digital Britain" Plan is estimated to generate 211,000 jobs-year (Total jobs), including 76,500 direct and 134,500 indirect and induced.

As evidenced by the ITU study (2012), there are specific economic effects of broadband that are not necessarily captured by economic growth or employment creation. This is the case of **consumer surplus**: broadband helps people to save money, largely through online shopping for goods and services. Greenstein and McDevitt (2009) estimated a consumer surplus of USD 7.5 billion generated between 1999 and 2006 by broadband adoption in the United States.

The use of broadband can further significantly reduce the cost of providing **health and social care services (e.g.** by allowing senior citizens to live longer in their homes) and/or improve the outcomes (e.g. through remote diagnosis and monitoring). Access Economics (2010) estimates that the net benefit of the widespread adoption of tele-health in Australia could be between AUD2 billion to AUD4 billion per annum (EUR1.39 billion to EUR2.78 billion in July 2010). Such savings are clearly connected with the widespread availability of high-speed broadband infrastructure, as lower bandwidth would in most cases not suffice to support these services.

Widespread broadband can facilitate improved **education** at lower costs, in particular in more remote or sparsely populated areas (e.g. through distance learning, in particular video conferencing and access to online information, see Educause, 2008).

- Literature also confirms a specific role of broadband in **crime prevention**, improvements to the police response to crime, improvements to the judicial process, and improving the ability of other agencies to respond to emergencies.

Based on the estimation that investment in broadband produces a 20:1 benefit ratio[68], the OECD concludes that the cost savings in just four sectors of the economy (transport, health, electricity, and education) would justify the construction of a national FTTH network[69].

---

66 Crandall et al (2003), Atkins et al (2009), Katz et al (2008), Katz et al (2009), Katz et al (2010), LSE Enterprise (2009); Liebenau (2011).

67 This is also confirmed by the study concerning American Recovery and Reinvestment Act, 2009, which shows the investment of USD 6.390 billion38 will generate 37,283 direct, whereas the indirect and induced jobs can create respectively 31,046 and 59,500 jobs. http://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_Impact-of-Broadband-on-the-Economy.pdf

68 Shearman, 2011.

69 Network developments in support of innovation and user needs, OECD, 2009.

Broadband has also significant **community benefits** as demonstrated by Kim et al. (2010). Broadband helps in connecting consumers, businesses and governments, thereby facilitating social interaction. It supports good governance (among others, by making community leaders more accountable), makes e-government possible, strengthens the social capital and increases civic engagement.

Finally, broadband **reduces the isolation of regions** by connecting customers, businesses and governments, making it easier for rural businesses to grow, improving life quality in rural areas, making it then easier for more remote locations to attract and retain their residents.

A further number of studies[70] investigate the benefits of broadband on improved **environmental sustainability.** It appears that a wide adoption and use of high-speed broadband would enable the proliferation of smart buildings, smart grids[71], would reduce travel needs, etc. all resulting in a significant reduction of carbon emissions. For example[7273], the introduction of smart grids only could reduce carbon emissions by 12% by 2030 with main levers being the integration of renewable energy sources and electric vehicles. McKinsey Global Energy and Materials (2009) found that broadband-enabled smart-grid services and devices could yield more than USD1.2 trillion in gross energy savings.

Based on the above we could therefore conclude that an increased broadband availability brings significant economic, social and environmental benefits[74]. This review is aimed at presenting the typology of potential impacts of this initiative, in qualitative terms. These benefits would materialise to different extents under the various policy options, given their different effect on the increase of broadband deployment as well as some of their particularities (e.g. the options creating room for cross-utility cooperation would certainly have more positive effects on the environment).

To give an indication of the magnitude of socio-economic impacts of the cost reduction measures envisaged by this initiative, reference is made again to the study prepared by Analysys Mason on "The socio-economic impact of bandwidth" (SMART 2010/0033), which assess the main benefits linked to the two scenarios described in Annex VII, where the second scenario includes cost reduction measures leading to 10% savings.

Table 2 - Benefits of high-speed broadband in the EU27 countries, by scenario (Source: Analysis Mason on "The socio-economic impact of bandwidth" (SMART 2010/0033))

70 Fuhr and Pociask (2007), Davidson, Santorelli and Kamber (2009), McKinsey Global Energy and Materials (2009).

71 Smart Grids: electricity network that can cost efficiently integrate the behaviour and actions of all users connected to it – generators, consumers and those that do both – in order to ensure economically efficient, sustainable power system with low losses and high levels of quality and security of supply and safety. A Smart Grid employs innovative products and services together with intelligent monitoring, control, communication, and self-healing technologies.

72 ICT Applications for the Smart Grid: Opportunities and Policy Implications", OECD Digital Economy Papers, No. 190, OECD Publishing.

73 The Smart Grid: An estimation of the Energy and CO2 benefits, 2010, Report by Department of Energy's Pacific Northwest National Laboratory.

74 For an extensive review of socio economic impacts of broadband see review in Analysys Mason on "The socio-economic impact of bandwidth" (SMART 2010/0033).

Scenario	Total NGA investment (EUR billion)	Input–output benefits (EUR billion)	Jobs created (million)	Consumer surplus benefits (EUR billion)
Do nothing	76.4	181.2	1.35	26.5
Major intervention	209.3	569.4	3.94	31.9

The table shows that significant benefits arise from investment in broadband deployment, in relation to cost reduction measures. While it is not possible to connect directly the two scenarios with the analysed policy options, this study will be used to make a few quantitative estimates of the impacts generated by each policy option.

5.4. Impacts of the option 1 "business as usual"

Monitoring and exchange of best practices including guidance

Option 1 as presented in detail in Chapter 4.1 would consist in promoting the adoption of good practice measures. As explained in Chapter 2.6 and in the impact analysis below, even if individual good practices address some of the inefficiencies and can have good cost benefit results and positive impact where implemented, the specific measures considered under this Option (mainly support on exchange of good practices), due to the voluntary approach, are not expected to produce sufficient economic, social or environmental impacts in the light of the objectives defined in Chapter 3. See table below for evidence of analysed case studies presenting strengths and weaknesses and cost and benefits of good practice measures for identified inefficiencies.

Table 3 Analysis of strengths and weaknesses and cost and benefits of good practice measures for identified inefficiencies.

INEFFICIENCIES	BEST PRACTICES	STRENGHTS	WEAKNESSES	COSTS	BENEFITS
Persistent **barriers to use existing physical infrastructures** suitable for high speed network rollout 2.4.1 Inefficiencies addressed by **increased transparency** of physical infrastructure (Database of physical infrastructure)	- Germany - introduced cross sector mapping of all infrastructure deployments in the country - Belgium (Flanders) and Poland - launched wider mapping exercises (GRB and GBDOT) in addition to the database providing information about infrastructure owners has been implemented in Flanders (KLIP) - Portugal - implemented a CIS database including info on available capacity of ducts of the incumbent	(+) Encourages deployment in shared ducts (+) Reduces damage to existing cables/pipelines and civil disruption (+) Cost limited by the fact that utility companies likely to have detailed and accurate knowledge of deployments	(-) Could be costly to implement, if infrastructure owners do not have information and duct surveys are required and might create additional costs for access seekers (-)Information on infrastructure location could be perceived as sensitive (commercial and security concerns, systems are however often USER ID and password protected)	- Cost for setting up the system e.g. cost of setting such atlas may vary from relatively law amounts 1-2 million (German Infrastrakturatlas and Portugal CIS database implemented by the two NRAs) to 75-77 million (for the Flamish mapping and Polish GBDOT) for complex systems that are however satisfying wider spatial planning purposes (INSPIRE Directive)	- Increased infrastructure sharing, including cross utilities - Significant savings linked to reduction of damage to existing ducts and cables could equate the cost of implementing infrastructure atlas in 3 years (AM estimation) (+) possible synergies with platforms for announcement of planned investments, dig alert systems, electronic permit granting submission systems
Inefficiencies addressed by **mandated access** to physical	- Portugal and Lithuania - mandated access to physical infrastructure	(+) Makes some deployments economically viable leading to increased NGA coverage as demonstrated by LT and PT measures (+) Low	(-) Little business interest on behalf of non-telecoms undertakings (-) May lead to disputes	- Negligible cost for the implementation to the government or the NRA (defining rules for sharing and setting up appropriate dispute settlement mechanisms) - Costs for the operator (cost for the ground surveys if	- Capex savings on investments (potential cost savings up to 75% for the network parts when no digging is required) - duct rental revenues for

infrastructure		implementation cost (+) Increased competition		needed, Access price/duct rental cost, possible disputes costs)	infrastructure owners - reduced permit granting costs
INEFFICIENCIES	**BEST PRACTICES**	**STRENGHTS**	**WEAKNESSES**	**COSTS**	**BENEFITS**
Barriers to coordination of civil engineering works 2.4.2 Addressed by **database/transparency measures of planned civil works**	- Finland co-digging portal Johtotieto , Sweden Lendingenskolle dig alert system that could be developed in a planned investments announcement database to ensure transparency of planned civil works - Belgian KLIP and Netherlands KLIC system of electronic submission of planning applications compulsory for any organisation wishing to carry out excavations - France - transparency and access to civil works	(+) Enable co-deployment and reduces the cost of new deployments (+)Platform implementation and running cost could be relatively low (+) Reduces damage to existing cables/pipelines and civil disruption	(-) Rollout plans may be commercially sensitive (-) Benefits mainly limited to the areas where new infrastructure is being deployed	- Cost of creating and running the technological platform (ex Finnish Johtotieto cost 200.000 EUR with an on-going yearly cost of 100.000 EUR and Swedish system serving damage prevention purposes cost EUR 1.8 million to implement between 2007-2010 and approx. 700.000 per annum to run) - Belgian KLIP cost 500.00 to implement and 250.000 per annum. A small administrative fee is charged for submitting a planning application using the KLIP	- Capex savings on co-investments (potential savings up to 60% depending on number of actors involved) - Reduced planning and tendering and permit granting costs - Savings during planning and deployment process (AGIV estimates that the Belgian KLIP system saves operators and authorities EUR 29.5 million per annum)
INEFFICIENCIES	**BEST PRACTICES**	**STRENGHTS**	**WEAKNESSES**	**COSTS**	**BENEFITS**
High **barriers to deploy in-house equipment** in buildings 2.4.4 Addressed by high-speed infrastructure for	Spain - obligation to equip all new and refurbished buildings with common infrastructure Fance- access obligations related to shared connection point and in house wiring of all	(+) Encourages operators to cover more apartment buildings (+) Encourages high-speed broadband deployment and	(-) Benefits mainly limited to the areas where population leaves in multi dwelling units (MDUs) (-) high-speed broadband take up continues to be slow	- Costs for physical infrastructure and wring ranging from EUR 300 to EUR 1000 per end users apartment. -Incremental costs of up to 2.5% of construction works for installing	- Cost savings on pre-equipping building ranging from 20% (France)to 60% (Spain) - Accelerated revenues for increased take-up

new and refurbished buildings	new buildings	competition	(-) Measure dependent on the success of the construction sector and consequently impact might be limited	in building telecom infrastructure	

5.4.1. Economic impacts: 0

The exchange of best practices regarding physical infrastructure mapping and sharing, coordination of civil engineering works, rights of way, and in-house wiring and further guidance on Articles 11 and 12 of the Framework Directive would stimulate the utilisation of the possibilities offered by the current regulatory framework and might furthermore raise awareness on measures adopted in Member States sometimes going beyond the regulatory framework.

Member States have full discretion whether to follow the guidance documents or not, and in particular whether to implement measures from one or more action areas. There might also be situations where NRAs might want to follow best practices encountered in other Member States but would lack the legal basis to do so. For example studies confirm that it is typically much more difficult to oblige non-telecom operators to open up their ducts to telecom operators, as in most countries NRA will not have the authority to do this, and thus new government legislation may have to be drafted to implement such measures[75].

Under these circumstances, and as discussed in Chapter 2.6, only a limited take up of these best practices can be expected. Many rights that can enable operators to speed up deployment would not be ensured all over Europe, since we cannot realistically expect, given the current trend, that all European electronic communication network providers would enjoy a general right to offer and to use the existing physical infrastructures including that of utilities, neither a right to transparent information regarding all existing physical infrastructures suitable for high speed network rollout and a right to on-site visits for more detailed surveys. In addition the general right to be informed about planned civil works and to be able to negotiate coordination of civil engineering works would also not be ensured, since many countries are not foreseeing specific initiatives in this regard or are addressing this issue only partially. Finally, also in relation to increasing the number of high-speed broadband ready buildings and related take-up, the right for electronic communication operators to access the concentration point and the right to negotiate access to in-building equipment would not be recognised all over Europe.

Moreover, where measures are implemented, it would be rarely *en bloc* therefore they would not have effects on the entire chain of steps involved in a typical network rollout. From a timing point of view, the spread of best practice throughout the EU, through this voluntary/soft approach, could only occur in the long term therefore not supporting the achievement of the Digital Agenda targets and the Europe 2020 Strategy.

The **cost benefit ratio of these measures would depend, among others, on the take up of the measures and on the implementation details in each region or Member State**.

Where implemented, the **main direct effects** would be on telecom physical infrastructure owners, on companies seeking to deploy broadband networks and on the administrative bodies implementing the measures.

[75] Analysis Mason "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013)".

As regards *companies seeking to deploy broadband networks*, their advantages are limited (due to the limitations of the current regulatory framework) but undeniable. The WIK model[76] shows moreover that such practices present advantages for *infrastructure owners* having to grant access too, provided that this access is granted at fair prices. More precisely, this study suggests that incumbents can also reduce their costs by infrastructure sharing, since the related earnings can increase the profitability of their high-speed broadband rollout, thus they can reach profitability at a lower level of market share, thereby improving rather than undermining their investment cases.

As regards implementation and administrative costs**,** it can be assumed that states or regions taking up these measures will minimise / optimise their costs in function of the already existing institutions, mechanisms, and structures. As indicated across sections 2.6 and 4.1, according to the information available to the Commission a number of EU Member States have already started to implement infrastructure mapping or are currently working on introducing such solutions (AT, BE, CY, CZ, DE, DK, FI, FR, IT, LU, NL, PL, PT, RO, SI, SE, UK). For these Member States the costs of implementing mapping measures would be marginal or sunk (e.g. the yearly costs for managing those systems including costs for collecting, updating and processing data). Member States that have not yet started a mapping exercise will have to incur bigger costs, once they decide to do so. It should be however noted that a mapping exercise (with the associated costs) may, in any case, need to be performed in the context of the implementation of the Broadband guidelines[77] and of the INSPIRE Directive. Although the mapping requirements are not perfectly overlapping, significant synergies are to be expected, with a de facto effect of decreasing overall costs.

The same reasoning applies to measures which are relatively less expensive to implement. Symmetric access and cross sector access to physical infrastructure would not be applied widely and the right for all infrastructure owners to offer access to their infrastructure would not be recognised all over the EU. We can further safely assume that the overall implementation and administrative costs would be marginal and incremental, since scattered initiatives exist also in the field of coordination of civil works, rights of way, and in-house wiring and given that Member States / NRAs are only expected to pick up new practices to the extent that their cost-benefit ratio seems appealing in their national contexts.

For a detailed analysis of costs and benefits of Option 1 see Annex VIII and IX including implementation and administrative costs and the good practice analysis included in Table 3.

---

[76] Dieter Elixmann, Dragan Ilic, Dr. Karl-Heinz Neumann, Dr. Thomas Plückebaum, WIK-Consult Report Study for the European Competitive Telecommunication Association (ECTA): The Economics of Next Generation Access - Final Report Bad Honnef, September 10, 2008.

[77] Some provisions concerning transparency of information on existing and new physical infrastructures as well as on access on these infrastructures are already envisaged by the current draft *EU Guidelines for the application of state aid rules in relation to the rapid deployment of broadband networks*, currently subject to intra-service consultation. Those measures are applicable exclusively to the broadband infrastructure financed through State Aid, but are however requiring Member States to provide for detailed mapping and analysis of coverage of areas benefiting from state aid. In applying the Guidelines, therefore, Member States will have to set up a dedicated central website at national level, concerning on-going state-aid tenders, information on the available infrastructures and conditions for access to existing infrastructures, transparency on the aid granted, including comprehensive and non-discriminatory access to information on the subsidised infrastructure.

As regards possible **broader effects**, given the analysis of the baseline scenario and the evaluation included in Section 2.6, it appears highly unlikely that the soft measures foreseen in Option 1 would spread throughout the EU at a sufficient pace and scale to ensure real cost sensitivities in the network deployment process and to trigger more investments in support of the Digital Agenda targets.

As an illustration, it is forecasted[78] that the private sector will invest EUR 76 billion in high-speed broadband deployment by 2020 if no significant public intervention takes place (the *do nothing* scenario). This level of investment would translate into 93.6% of the EU27 households passed by NGA and 41.5% of connected[79]. This would still leave 14.2 million household not passed by high-speed broadband and therefore a significant percentage of households and businesses still unable to access the Internet-based digital services that NGA makes possible (see Section 5.2).

All in all, the "business as usual" scenario can neither be expected to significantly reduce the costs of broadband rollout all over Europe, nor to have a strong effect on investment. As only **a very limited impact on investment** is anticipated throughout the EU, its **spill-over effects** (mainly but not only on *civil works companies* and *equipment manufacturers*) would also be **limited**. Moreover, the usual **positive indirect economic effects associated with a higher broadband coverage** such as *more productivity and innovation, better chances for SMEs, more consumer choice*, etc. **cannot realistically be expected**.

In addition, under the business as usual scenario, where some Member States might adopt (and certainly adapt) some practices while other will not, it is very likely that the current **fragmentation of rules in the EU will increase**. Over time, this would accentuate the patchwork of practices and regulatory regimes, with significant negative impacts **on the Single Market,** and indirectly on the possibility of Europe to support companies willing to invest cross-border and able to become stronger global players.

5.4.2. Social impacts: 0

The proposed measures, where implemented, would produce a certain but limited further network deployment, an associated (limited) *increase in employment and more high-speed broadband coverage*. This would translate into a modest reduction of the digital divide, of the isolation of regions, etc. (see section 5.3). The measures would also limit to a certain extent public nuisance related to unnecessary duplication of civil engineering works.

Yet for the reasons quoted above, the actual impact on investments and network rollout throughout the EU is estimated to be marginal. It follows then that all the **social effects would be insignificant.**

5.4.3. Environmental impacts: 0

As the transparency and sharing of infrastructure will not improve significantly, the risk of unnecessary civil engineering works, causing soil disruption, waste and pollution will persist. Therefore the impact of this policy Option on the environment is considered **marginal.**

---

[78] See Analysys Mason study: "The socio-economic impact of bandwidth" (SMART 2010/0033), Chapter 9.2. NGA investment and deployment.

[79] Euromonitor predicts there will be 222 825 500 households in the EU27 member states in 2020.

5.5. Impacts of the option 2: promoting efficiency gains

Promoting savings/cost reduction within the electronic communications sector: More intensive, coherent and harmonised application of the existing provisions and tools of the telecom regulatory framework

The specific measures considered under this Option (presented in detail in Chapter 4.2) are expected to produce **modest positive economic impacts**, which can subsequently also have some positive effects on the social and environmental situation.

5.5.1. Economic impacts: ☺

Promoting the cost reduction measures described in Section 4.3 through a Commission Recommendation under Article 19 would most likely lead to a more intensive and consistent application of the relevant provisions of the regulatory framework throughout the EU and thus generate higher impacts. Such an instrument would, indeed, have more weight and would allow for providing more support to Member States and subsequently to local authorities, as compared to exchange of best practice and even guidance documents. First, the national authorities have the underlying powers to implement the measures prescribed by a Recommendation under Article 19. Second, while Member States are not obliged to follow such Recommendations, they are nevertheless required to justify a decision not to do so.

Yet, even if more intensive measures are expected to be applied under this policy option than under Option 1, it must be stressed that they remain rather limited in scope – to telecoms infrastructure only (no utilities), to rights of way only (no other permits), and to sharing of in-house wiring only. Therefore the size and scale of the impacts of this Option are also limited.

As regards **the direct effects on the main stakeholders involved**, higher savings would be achieved on the overall cost for deployment if compared to the baseline scenario. These higher savings result from increased efficiency and reduced costs in the planning of infrastructure deployment, increased opportunities for telecom infrastructure access seekers due to transparency and symmetric sharing with better strategic decisions on network development, increased opportunities for coordination of civil works between electronic communications undertakings due to transparency on planned investments, decreased cost for negotiating sharing and co-deployment arrangements due to increase clarity on sharing obligations and possible co-deployment arrangements enhanced by NRAs. Savings in terms of human resources and time devoted to obtaining rights of way and negotiating conditions with authorities and land owners due to minimum requirements in transparency and non-discrimination in granting rights.

It is estimated that the reduced duplication of excavation works would lead to reduced cost for self-digging and quicker deployment of high-speed broadband of potentially up to 60% Capex saving on specific investment projects where sharing would occur (or 30% in case of tower sharing[80]).

[80] Analysis Mason "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013)".

However the fact that sharing would only regard electronic communications infrastructure would significantly limit the overall savings on the total investment costs. In addition the attractiveness of infrastructure sharing between telecoms would still differ across different Member States, as physical infrastructure rental prices are varying greatly in different MS and as rental prices are very relevant when deciding on using existing infrastructure versus self-digging (the cost of duct rental over 25 years can rise up to 24-42% of the cost of deployment, according to a UK research[81]). Instead, from the point of view of infrastructure owners, the lower the duct rental prices, the higher the disincentives to invest in physical infrastructure.

Similarly, a sectorial mapping system would not be an efficient instrument either for cross sector damage prevention, therefore preventing the achieving of significant benefits. Decreased savings from damage prevention would also affect the cost-benefit ratio for the mapping exercise. Due to the same limitation to the electronic communications sector, savings in the areas of coordination of public works and in-building equipment would not be achieved.

On the positive side, all parties directly affected by this initiative would benefit from the increased legal certainty given by a (rather detailed) Recommendation under Article 19 (e.g. leading to lower litigation costs).

The **implementation and administrative costs** of Option 2 also seem moderate, as all the measures could be implemented by the NRAs, which already have competences and powers in the field and often act as dispute settlement bodies. In that sense, the costs would be incremental. It should be highlighted that these costs are not public costs as such, since NRAs are financed by the industry to a very large extent. A fair system of sharing costs between the private and the public sector (and even among private operators) should be ensured to support the implementation of the more costly elements (e.g. mapping). Yet, unlike in Option 1, a Recommendation would be rather prescriptive, allowing less room for adapting to already existing or planned initiatives and leading to possible inefficiencies and higher sunk costs.

For a detailed analysis of impacts of Option 2 refer to Annexes VIII (impacts on direct stakeholders) and IX (impacts, including implementation and administration costs).

To give a notion of the magnitude of savings under Option 2 (which then determine the rest of the impacts: macro-economic, social and environmental), a rather (conservative) assumption of 5% additional savings is applied on the two scenarios discussed in under 5.2, where investments by 2020 range from EUR 76 billion to EUR 210 billion. Based on this hypothesis, the total amount saved would therefore go from a minimum of 3.8 billion to a maximum of 10.5 billion, depending on the amount of public finance involved. Such additional savings (compared to the business as usual scenario) would not shift the breakeven line significantly, and would thus only have marginal effect on high-speed broadband coverage. It is however not possible to translate the savings into extra investments as such, be

[81] At present the situation is extremely diversified for ex. monthly charges for access to incumbent owned ducts are ranging from 0.01 in Pt to 0.85 in AU, while the cost oriented price appears to be less than EUR 0.30 per meter monthly. For an analysis of duct and poles rental prices see for further analysis Analysis Mason Paragraph 4.4 of "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013)"

it from public or private actors, therefore it is not possible to make an estimate of the macro-effects of this savings[82].

Therefore, in the absence of public funding, only an **overall moderate positive effect on investment in networks** is expected, with modest welfare gains (lower prices, higher quality of service, increased choice etc.) and with modest benefits for isolated communities (in particular those that would normally not be covered by high-speed broadband services without the re-use of existing physical infrastructure or civil works' coordination arrangements). Under this Option, moderate positive macro-economic impacts are to be expected too, in relation to spill-overs to related industries (equipment manufacturers, civil engineering works companies), and potentially, increased innovation and productivity for all undertakings including SMEs.

Finally, a Recommendation is likely to increase, to a certain extent, consistency across the EU since the implementation of the provisions of the regulatory framework would be further harmonised. Fragmentation of the Single Market would nevertheless still remain relevant since ultimately Member States remain free to implement or not these provision. In particular, a high degree of differentiation in practices concerning civil engineering works coordination mechanisms and rights of way is foreseeable from a local authority to another.

For all these reasons, an overall **modest economic impact is expected under this Option**.

5.5.2. Social impacts: ☺

An overall moderate positive effect on investment in networks is expected under this Option, and, as such, a positive effect on **job creation**. On the other hand, the cumulated effect of the measures would lead to avoiding unnecessary works and thus **reducing public nuisance**.

One step further, investment in networks is expected to lead to an increased broadband coverage and competition. This would lead to modest benefits for communities - which would normally not be covered- and to a **reduced digital divide**. For examples of digitally supported services which are highly relevant from a social perspective such as e-health or e-education, please refer to 5.2.

5.5.3. Environmental impacts: ☺

Increased transparency and coordination of works within the electronic communications sector are expected under this Option, leading a **small positive impact** (mainly due to avoiding duplication of works).

5.6. Impacts of Options 3a and 3b: enabling efficiency gains

Unlocking the potential of cross-sector cooperation to achieve higher savings and efficiency gains

[82] Savings as such would lead to decreased outputs, as in any economic model. Yet savings are assumed to allow for additional investments. It is not possible to evaluate the increased outputs (i.e. the macro-economic effects of savings) given the lack of clarity on the additional investments enabled by these savings.

The specific measures considered under this Option (presented in detail in Chapter 4.3) are expected to produce **significant positive economic impacts**, which subsequently can also have positive social and environmental effects.

5.6.1. Economic impacts: ☺☺☺

Measures envisaged under Options 3a and 3b would have significantly increased impacts, mainly due to the creation of directly applicable rights and obligations for actors beyond the limits of the current regulatory framework.

A **right to use physical infrastructures across utilities at reasonable conditions** accompanied by sufficient **transparency of existing physical infrastructure** would ensure that virtually all infrastructures suitable for broadband rollout can effectively be used. Both the Analysis Mason study and the OECD report confirm that providing the regulator with powers to require the sharing of ducts and conferring full authority to local government to make the ducts of other utilities available for the rollout of electronic communications networks would facilitate investment and help reduce costs[83]. From the point of view of infrastructure owners, that, during the consultation process formulated certain critical points, it is essential that such infrastructure sharing is done at market prices – which are sufficiently high to counter a potential disincentive to invest, but also low enough to enable sharing. Increasing the scope of available infrastructures has a positive effect on incumbent operators, who could profit for example from access to infrastructure belonging to utility companies, whereas under the preceding policy options they would principally be subject to access obligations. Alternative operators would be able to profit from greater access to physical infrastructure which would compensate the additional delay and administrative weight of being subject to a light-touch access obligation. For certain utility companies, such sharing would bring about not solely additional revenues, but also additional competitive advantages (such as a faster deployment of smart grids).

Depending on the chosen Option (3a or 3b) as regards transparency of existing physical infrastructure, the impacts on infrastructure owners are different. Under Option 3b, Member States might choose not to implement the transparency requirements, yet if they do so, they would need to adapt to the model prescribed by the Recommendation. Under Option 3a, a certain minimum level of information must be made available to the public authorities or other parties, thereby creating costs (which might be lower than under Option 3a, but are on the other hand certain in all Member States / not optional).

Network security and commercial sensitivity issues, which were also raised by infrastructure owners, would be addressed by granting access to information on a "need to know" basis.

Option 3 would **unlock the potential for civil engineering works coordination**, given the right of undertakings to seek information on planned investments across sectors, thereby facilitating a change of culture in the long run. Additional opportunities would be created by

[83] Based on a comprehensive overview on the status of rights of way regulation in the OECD countries, the OECD develops recommendations on enhancing rights of way regulation to facilitate deployment of FTTH. In particular, barriers to rights of way which may slow down the pace of fibre rollout in local access networks are examined. OECD (2008), "Public Rights of Way for Fibre Deployment to the Home", *OECD Digital Economy Papers*, No. 143, OECD Publishing. http://dx.doi.org/10.1787/230502835656, pag.25.

the separate regime of access to civil engineering works financed by public means. Since no obligation to negotiate or to coordinate civil works exists for private actors, the costs of the measures in this area are considered negligible.

Furthermore, the establishment of **a single information point** through a legal instrument (Option 3a) would present the guarantee of a comprehensive solution for all permits necessary to rollout networks. The OECD considers that accessibility and quality of general information available are critical for applicants to obtain public right of way permits, and solving existing uncertainty can speed up the pace of high-speed broadband deployment. This particular measure is likely to impact more on new entrants who have fewer legal resources to untangle different procedures[84]. The costs of this measure would depend on the exact arrangements opted for by the Member State in each case. Moreover, if the single information point is established through a Recommendation under the TFEU (**Option 3b**) the costs might be lower (as Member States might choose not to implement the recommendation at all). Nevertheless, the effectiveness of the underlying rights and obligations established by the regulation regarding transparent, timely and non-discriminatory permit granting process could be put into question.

Finally EU rules mandating that all new and extensively reconstructed buildings are equipped to be "high-speed broadband ready" would ensure major savings as compared to retro-fitting existing buildings and easier/faster in-building deployment for electronic communications operators. However, it must be noted that these effects would only be visible in the medium and long run. In addition, additional costs (although minor) would be created for the housing sector.

It is difficult, if not impossible, to make an overall quantification of the **implementation and administrative costs** to be sustained for the entire EU for these Options. The initiative is mainly aiming at **organising access to the relevant information at a single point and making it available for those deploying broadband**. This is particularly valid in relation to the information on physical infrastructure and planned civil works and to the information on permit granting procedures, while, if applied together, could create synergies in itself.

Such costs would be highly dependent on the measures already in place in the given Member States or regions (these costs are very different across Member States[85] as it emerges from the Analysis Mason study and the public consultation contributions and depends on information that is already collected in specific countries and that different kind of infrastructure owners are already collecting and are providing to different authorities and even more on the choice of how much transparency each Member State is willing to implement or is already implementing – see Annex IX, for details on costs), as well as on the choices made by that Member States in implementing the provisions of the Regulation. In addition, important

---

84 OECD (2008), "Public Rights of Way for Fibre Deployment to the Home", *OECD Digital Economy Papers*, No. 143, OECD Publishing. http://dx.doi.org/10.1787/230502835656, pag.25

85 For example physical infrastructure atlases costs may vary from relatively low amounts 1-2 million (German Infrastrakturatlas and Portugal CIS database implemented by the two NRAs) to 75-77 million (for the Flemish KLIP GS mapping and Polish GBDOT) for complex system that are however satisfying wider spatial planning purposes (INSPIRE Directive) which goes beyond the minimum requirements laid down in the proposed option and are the expression of precise spatial planning policy choices of different Member States. While examples of costs for databases for the announcement of planned investments vary from 200.000 to 1.8 million.

synergies with other EU initiatives such as the INSPIRE Directive and the broadband Guidelines State Aid Guidelines make it difficult to identify separate costs, since some costs are already sustained in application of those EU rules. Given all this variables and the discretion left to member States, the impact assessment gives examples of costs by Member States but does not provide for an overall quantification of the additional administrative burden to be sustained for all EU Member States for those transparency measures using the Standard Cost Model[86].

For example, as regards transparency of existing physical infrastructure, costs depend on the amount of information that is already collected in specific Member States (either during telecom specific initiatives, for spatial planning purposes, e.g. in the implementation of the INSPIRE Directive or in the context of granting state aid). Also, costs depend on the quality of historical data of infrastructure owners, in particular the form and the level of maintenance. The main concerns about excessive costs of transparency exercises highlighted by stakeholders are dealt with in the following way. Neither **Option 3a nor Option 3b imposes a full mapping obligation**. They are based instead on the principle of ensuring the right for the operator/broadband developers to have access to information on existing physical infrastructure suitable for broadband rollout. In practice, both Option 3a and 3b mainly aim at organising access to this information at a central point and making it available for those deploying broadband. Even under Option 3a, the Member States are left free to ensure this right choosing modalities and structure of inventories that best suit the information systems already existing in their territories.

In addition, significant savings in implementation and administrative costs are possible if these measures are implemented jointly. The costs for the implementation of the transparency of existing physical infrastructure and of the platform for exchanging information on planned investments for coordination of civil works and damage prevention and eventually IT based permit granting systems are partially overlapping. It is up to the Member States to make better use of possible synergies to optimise costs for implementation of databases (equipment, software and management costs), however those potential synergies exist as it is confirmed by the Analysis Mason study since their research shows that those measures are interlinked and it is therefore likely that in some Member States existing systems could be further developed to add the functionality required, while in some cases significant developments would still be needed and some costs would be therefore shared across the measures and possibly combined solutions could be implemented.

Finally, those transparency systems also create potential new savings. As demonstrated by the Analysis Mason Report, cost savings from avoided damage on existing physical infrastructure could alone equate the costs of implementing an infrastructure atlas. For example according to different estimates, these savings can be significant and amount to a maximum of EUR 50 million per year (see Annex VII based on Analysis Mason).

[86] In the absence of a mapping obligation and the wide discretionarily left to MS about the way they could organise access to the already available information, the way they could increase transparency on not available information, the choice of subjects managing databases of physical infrastructure for each Member State and the missing information on the number of cross sector owners of physical infrastructure for all MS, it was impossible to apply the Standard Cost Model in relation to this measure.

It is not excluded that most of the measures could be implemented by the NRAs, which means that many, if not most of the implementation and administrative costs could be borne by the private sector. It is worth noting that no private stakeholder has opposed to such an idea.

For a detailed analysis of impacts on direct stakeholders of Option 3 and implementation and administrative costs refer to Annex VIII and IX based on Analysis Mason study.

In conclusion, this Option presents a clear and strong potential for savings and additional investments. This is due to universal access obligation applicable across sectors (including utility companies and public authorities), enabled by comprehensive transparency obligations. Likewise, symmetric transparency obligations applicable across sectors and specific obligations on public works are likely to lead to higher high-speed broadband coverage. Utility companies might furthermore have a role in the increase of NGA coverage, and possibly, increase competition in the provision of broadband services[87]. Undertakings seeking to deploy broadband networks would furthermore profit from time savings and lower costs in relation to better access to permit granting and to high-speed broadband ready buildings[88].

To give an indication of the magnitude of savings allowed by this Option, an assumption of 20% to 30% additional cost reduction[89] is made to the investment amounts described in Section 5.2. These larger savings are mainly related to cutting down the unnecessary costs related to doubling infrastructure and civil works and confirmed by Analysys Mason. Based on this assumption, the total amount saved on deployment would therefore go from a minimum of EUR 15.2 billion to a maximum of EUR 63.1 billion.

As concerns **broader impacts**, given the directly applicable rights and obligations imposed under this Option and the costs and benefits for the direct stakeholders discussed above, an overall significant positive impact on investment in high-speed networks can be expected. In consequence, a **higher broadband coverage** and **increased competition** can be expected. In

87 European investment in smart grid should reach 56 billion euro by 2020 (cumulative investments 2010-2020) as specified in Pike Research's report, "Smart Grids in Europe" that examines smart grid trends in Europe and forecasts the size and growth of the market for smart grid technologies through 2020 (http://www.pikeresearch.com/research/smart-grids-in-europe). Part of these investments could result in the co-deployment of dual use infrastructure.

88 This is confirmed by best practices example, like the Amsterdam Municipality that is coordinating co-deployment of civil engineering infrastructure through the Amsterdam Smart City platform. The Platform allows providers to submit long term plans for civil infrastructure deployment, so that other interested providers could share the cost of deployment. One right of way is then granted for large areas of the city and for a long period of time. The co-deployment includes the energy DSO and a black fibre provider, while the Municipality also replaces its sewers and ducts for traffic lights. As a result, not only the cost of deployment but also the environmental nuisances are significantly reduced.

89 Analysis Mason estimates that a 20-30 % overall CAPEX saving to the operator can be reached in case of a deployment project where all the measures from option 3 are implemented, as an integrated package of measure as we proposed (infrastructure atlas, access to infrastructure, planned investment announcement, NGA ready buildings). The estimate is based on specific assumptions that 25% of the deployment is in existing ducts, saving 75% in Capex for this part, 10% of the deployment connects the network to new housing developments, and co-deployment with other operators/utility companies is used, saving 15–60% and 5% of the deployment connects the network to pre-wired MDUs, saving 20–60%.

particular, broadband networks would reach areas which would otherwise be thought of as being commercially unattractive, and resources would be freed for further investments.

Due to significantly increased network investment, **positive macro-effects** on the economy would become visible, both in terms of spillovers to related industries (equipment manufacturers, civil engineering works companies), and increased innovation and productivity for all undertakings including SMEs. In particular enabled cross-sector solutions would stimulate innovation, new business opportunities and create synergies between different sectors that are otherwise difficult to achieve in the absence of specific enabling instruments. This could have a positive overall effect on the **EU competitiveness** through faster smart grid and intelligent transportation systems deployment and related energy efficiency gains.

Harmonization measures in the areas of infrastructure mapping and sharing, civil engineering works coordination and access to public works, permit granting rules, and in house equipment as envisaged under this Option would significantly **lower barriers to entry benefiting mainly smaller operators** that are less equipped to deal with complex administrative rules and would thus enjoy from enhanced access and co-deployment rules.

Importantly, such rules would **reduce fragmentation in the EU and as such contribute to the Single Market**, potentially facilitating the activities of pan-European operators which would be able to benefit from economies of scale and lower administrative costs while deploying in different Member States (see Chapter 2.7.1). Most of these impacts would be immediate, while others would occur on the longer term (e.g. the equipment of buildings with highs-speed broadband ready infrastructure). Overall, this comprehensive legislative framework would allow significant economies of scale for cross border operators and therefore support the strengthening of pan-European operators in the face of global competition.

5.6.2. Social impact: ☺☺

This Option ensures significant positive impact on investment and thus also on the labour market. Broadband rollout is a net job creator generating not only **direct but also indirect jobs**, across different sectors of the economy. While direct jobs and some of the indirect jobs are temporary, coinciding with the works, certain indirect jobs are long lasting (e.g. jobs in content provision and in equipment manufacturing). According to research, there is an average direct job creation of 9320 jobs per EUR billion spent[90] while the estimates for indirect jobs are on average higher than for direct jobs[91]. A certain amount of new jobs could also result from innovation in relation to cross-sector cooperation.

---

90 Tech4I2 and Analysys Mason "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013)" reviewed six recent studies and calculated an average direct job creation of 9320 jobs per EUR billion spent.

91 The estimates for indirect jobs are on average higher than for direct jobs. If national estimates, such as the ones made in France or Germany were extrapolated to an EU scale, rolling out broadband networks throughout the entire territory would amount to some 2.770.000 person-year employments and 152 billion EUR of added value to the EU economy.

Increased infrastructure sharing and coordination of civil engineering works will guarantee **a significant reduction of public nuisance** and related inconveniences for citizens, compared to a completely new rollout. It is not however possible to quantify the reduction of public works linked to the proposed measures, since this will also depend on the results of the negotiating process between owners of physical infrastructure and operators willing to deploy and on the willingness and capacity in a given territory to coordinate civil works.

The new rules concerning in-house installations would require investments to be incurred either by property owners or housing industry. Yet, the related costs would be incremental given the early stage of works. In exchange the value of the property would increase.

While the obligation of network operators to meet all reasonable requests for access to its physical infrastructure could restrict their right to conduct a business as well as their property right, the adverse effects in this respect is however mitigated by the provision that such access should be granted on fair terms and conditions, including price. Furthermore, this limitation must be considered justified and proportionate to the aim of reducing the cost of deploying high-speed electronic communications networks since it would reduce the need to perform civil engineering works, which account for almost 80% of the cost of network deployment.

With regard to the obligation on network operators to provide minimum information on existing infrastructures, safeguards as concerns the right to privacy and the protection of business secrets are provided through the provision of exemptions for the purpose of operating and business secrets.

The obligation on undertakings performing civil works fully or partially financed by public means, to meet any reasonable request for access in view of deploying elements of high-speed electronic communications networks, could restrict their right to conduct a business as well as their property right. However, any such obligation would only apply if it would not entail any additional costs for the initially envisaged civil works and if the request to coordinate is filed as soon as possible and in any case at least one month before the submission of the final project to the competent authorities for permit granting. Furthermore, this limitation must be considered justified and proportionate to the aim of reducing the cost of deploying high-speed electronic communications networks since it would allow electronic communications network operators to cover only part of the cost of the civil engineering works.

The obligation to equip all newly constructed buildings, with a high-speed-ready in-building physical infrastructure could have an impact on the property rights of the owners of the property concerned. This limitation must be considered justified and proportionate to the aim of reducing the cost of deploying high-speed electronic communications networks since it would exclude any need for retrofitting buildings with physical infrastructure.

The right of a providers of public communications networks to terminate its network at the concentration point in view of accessing the high-speed-ready in-building physical infrastructure, could have an impact on the right of property of the owners of private property concerned. Such restrictions are however limited by the obligation on the public communications networks to minimise the impact on the private property and to cover any costs incurred. Furthermore, this limitation must be considered justified and proportionate to

the aim of reducing the cost of deploying high-speed electronic communications networks since it would allow electronic communications operators to achieve economies of scale, when they deploy their networks.

The right of public communications networks to access any existing high-speed-ready in-building physical infrastructure could affect the property rights of the holder of the right to use the in-building physical infrastructure. This restriction is however limited since such access would have to be granted on reasonable terms and as it would only apply in cases where duplication is technically impossible or economically inefficient.

The right to an effective remedy for the parties concerned by the limitations outlined above are guaranteed by the possibility of referral to a competent national dispute settlement body, which should be without prejudice to the right of any of the parties to refer the case to a court.

A significant positive impact on investment could be beneficial for consumers, leading to slightly **increased coverage** and **reduced digital divide.** More citizens would then be able to benefit from innovative services enabled assistive technology, including social and public services (see Section 5.2). **For example, Analysis Mason made an attempt to evaluate** benefits of assistive technology enabled by high-speed broadband for independent living, for the EU27 countries, with total estimated savings in 22 Member States of EUR 1.727 billion per annum[92].

In addition to this further savings and benefits are possible, in support of rural and isolated areas. While it is not possible to exactly quantify these additional benefits (see footnote 23), it is obvious that these effects are higher than under Options 1 and 2.

5.6.3. Environmental impact: ☺☺

Under this Option, a significant increase in infrastructure sharing and civil works coordination arrangements for broadband deployment can realistically be expected. This, together with less damage to existing physical infrastructure resulting from mapping, would lead **to significantly reduced pollution, soil disruption, waste, etc. due to less duplication of civil engineering works.**

The measures suggested under this Option on the infrastructure level would also lead to an increased cooperation among sectors at infrastructure level (broadband could be deployed in synergy with energy and transport infrastructure, sewers, water, etc.). Specifically, with regard to the energy sector, the important role of the electronic communications sector in creating synergies with the utilities for smart grid deployment is confirmed by the work of the Smart Grids Task force[93], which is defining smart grid deployment models, where telecom companies have a significant role to play. Smart Grid opens up unprecedented opportunities for consumers to directly control and manage their individual consumption patterns, providing strong incentives for efficient energy use combined with dynamic electricity

[92] Analysys Mason on "The socio-economic impact of bandwidth" (SMART 2010/0033).

[93] The Smart Grids Task force (SGTF) is to advise the Commission on policy and regulatory frameworks at European level to co-ordinate the first steps towards the implementation of Smart Grids as defined by the Commission Communication COM (2011)202 on Smart Grids. The task force is jointly leaded by DG Energy and DG CONNECT for identifying synergies at infrastructure and services level between both the energy and telecommunication sectors.

pricing and the efficient integration of DER (distributed energy resources). The rollout of broadband will create a platform for traditional energy companies and new market entrants such as ICT companies to develop new and innovative energy services for enhancing the competition in the retail market, incentivise the carbon emissions reduction and provide opportunities for supporting the economic growth. Bringing together both energy utilities and telecom companies will boost the future competitiveness, will ensure access to broadband in isolated areas and will stimulate the rollout of digital energy services. It is estimated that smart grids could only reduce carbon emissions by 12% by 2030[94] with main levers being the integration of renewable energy sources and electric vehicles.

All in all, **given the cross-sector character of the measure, increased synergies could lead to a significant environmental impact, through faster smart grid and intelligent transportation systems deployment and therefore to energy efficiency gains and to CO^2 emissions reductions[95].**

5.7. Impacts of Option 4 mandating efficiency gains

Mandating cost reduction measures throughout the EU and across sectors

This option is expected to produce less positive economic impacts than Options 3a and 3b, and overall positive social and environmental impacts.

5.7.1. Economic impact: ☺☺

Under this option, an EU infrastructure atlas would be required, access to physical infrastructures would be imposed at cost oriented prices, and certain forms of coordination of public works would be imposed (mainly as regards public works). Finally, one-stop-shop on permit granting would be established and all buildings would need to become high-speed broadband ready by 2020. This Option is very clear as regards the scope of its obligations, including obligations across utilities.

The direct impacts can be summarised as follows. Mandating access to physical infrastructures across utilities at cost oriented prices would maximise sharing, but presents a significant risk of disincentives to investment in physical infrastructures, as expressed for example by cable operators in the Public Consultation. The potential for cooperation in civil engineering works is also maximised, but there might be risks regarding the efficient use of public resources and network security. Equipping all buildings with high-speed broadband ready access might also be excessively costly for the housing industry, costs which would be eventually passed to citizens. Despite all benefits related, the measures regarding the one-stop-shop, an EU infrastructure atlas and cost oriented infrastructure sharing seem to add significant implementation and administrative burdens compared to the previous policy option and thus to be very difficult to implement.

---

94 The Smart Grid: An estimation of the Energy and CO2 benefits, 2010, Report by Department of Energy's Pacific Northwest National Laboratory

95 See also Methodologies to Measure the Potential of Smart Grids for Green House Gas Reductions, SG4-GHG, Final Report 2012, Study funded by DG INFSO.

To give an indication of the magnitude of the allowed savings in deployment costs under option 4, an assumption of 40% cost reduction is made over the amounts described in Section 5.2. This would lead to savings ranging from EUR 30.4 billion to EUR 83 billion.

On the other hand, this Option would also be the most costly one, including in the respect of implementation and administrative costs. In particular, the administrative costs for the implementation and managing of mapping databases following harmonised EU standards, with a central access point at EU level, would be significant. Although important synergies exist with the INSPIRE Directive and with the Broadband State Aid Guidelines, additional efforts would be required to cover all electronic communications infrastructure in a relatively short timeframe. The costs of defining ex ante cost-oriented prices across industries would also be significant, considering that most Member States do not have regulators which are competent across several sectors. Additionally, the cost for deployment of additional empty ducts for all public works to overcome time discrepancies in civil works coordination would need to be covered by additional public funding. Although this cost is estimated to be marginal, question marks might nevertheless appear on the efficiency of such intervention. Significantly higher costs in human resources, legislative changes and possibly IT investment for the fulfilment of the one-stop-shop on permit granting procedures since various competencies would need to be merged and integrated.

For a detailed analysis of impacts on direct stakeholders of Option 4 refer to Annex VIII and IX.

Moreover, this option can present significant disincentives to invest which might negatively affect the overall broadband deployment. As mentioned in Chapter 3, the general objective of this initiative is to stimulate investment, therefore Option 4, which scores very well on the specific objective of bringing down broadband rollout costs, appears all in all to be rather risky. As a result, the direct economic impacts are estimated to be lower than under the previous policy option. In fact the impacts on network deployment and on competition seem to be moderately positive, while the burden for public authorities high.

On the other hand, this Option presents clear benefits from a Single Market perspective. The existence of a unified, coherent EU mapping system would significantly facilitate access and allow economies of scale in planning investments for cross-border operators. The same argument is valid for a one-stop-shop, which would reduce barriers to entry to national markets. Compared to the "business as usual scenario", but also to the preceding scenario, this policy option would have increased positive effects on the Single Market. The consolidation of the Single Market could allow the EU telecom players to become more important global players and potentially increase EUs competitiveness vis-à-vis third countries.

5.7.2. Social impact: ☺☺

This Option promises **moderately positive impact** on network investment and on high-speed broadband availability. It follows that impacts on **employment would also be, in best case, moderately positive**. A small amount of new jobs could in particular result from innovation in relation to cross-sector cooperation and from additional public works in relation to laying spare capacity. The stronger mechanisms to ensure the use of existing physical infrastructure and cooperation in civil engineering works would guarantee the smallest amount of

unnecessary works and thus significantly **reduce public nuisance.** A particular case is that of the imposed demand for high-speed broadband ready in-house equipment would significantly stimulate the jobs in related areas, but also add significant public nuisance in relation to new potentially unwanted works.

Further effects could arise from an increased availability of the high-speed broadband (which would be higher than in the first two scenarios but lower than in the third policy option): **better access to services, reduced isolation**, etc.

On the other hand requiring that all building should be equipped with broadband ready installations by 2020 would require significant investments by the owners of existing builds. The scale of these investments would depend on the actual state of existing installations. In addition, the property rights of owners, the right to privacy and the protection of business secrets as well as the right to conduct a business would be subject to limitations in much bigger extent than under option 3.

5.7.3. Environmental impact: ☺☺

The stronger mechanisms to ensure the use of existing physical infrastructure and cooperation in civil engineering works envisaged under this Option guarantee **the smallest amount of unnecessary duplication of works and therefore positive impacts on the environment** (pollution, waste, soil disruption etc.).

This Option furthermore **allows cross sector synergies to be exploited** (in particular for faster deployment of smart grids or in the implementation of the INSPIRE Directive). More precisely, given the cross-sector character of the measure, synergies could lead to faster smart grid and intelligent transportation systems deployment and energy efficiency gains. Mapped information on planned investments could be used for spatial planning purposes.

5.8. Summary of impacts

The overall impacts of each policy option – economic, social, and environmental – can be visualised in the graph below:

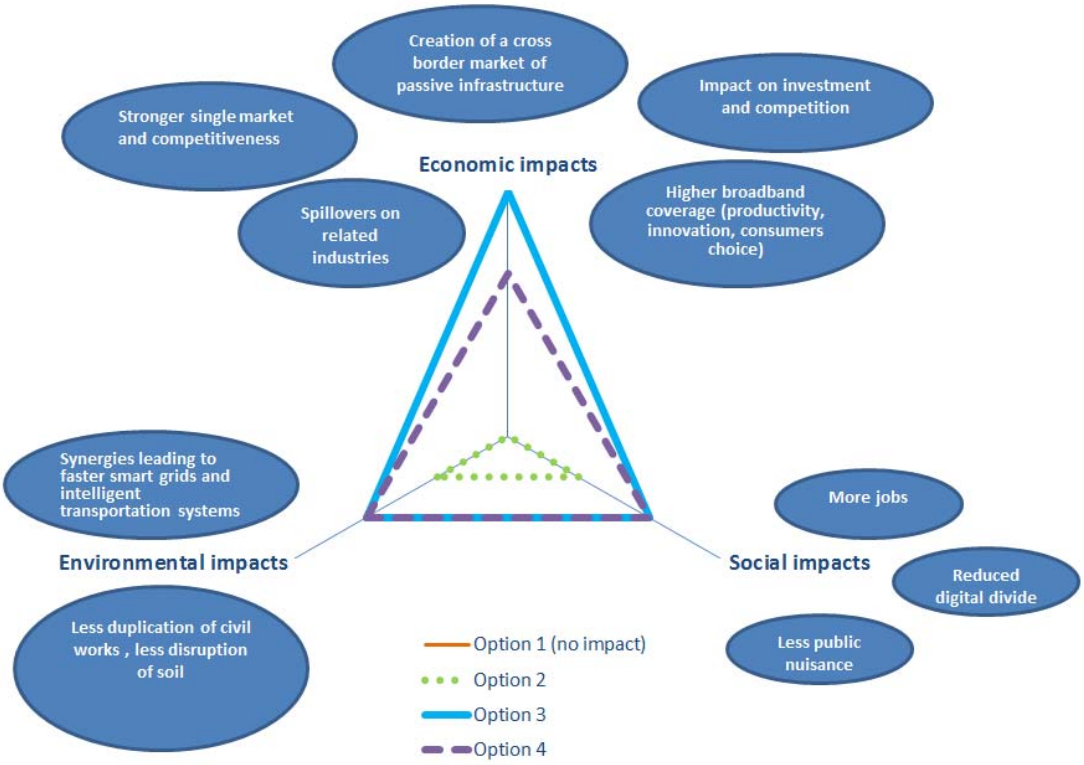


Figure 16 - Summary of main impacts of Option 1 to Option 4

6. CHOICE OF THE PREFERRED OPTION

This chapter gives an overview of the main arguments leading to the selection of policy options, in view of the operational objectives described in chapter 3. A full analysis is available in Annex X (Assessment of the effectiveness, efficiency and coherence). Options have been assessed against on the following criteria:

Effectiveness of the measures: are the measures proposed in the policy options sufficient to attain the operational objectives set?

Efficiency, including costs and benefits, of the measures (as described in chapter 5);

Coherence: Is the balance between effects across economic, social and environmental domains ensured? Are they coherent with the overarching objectives of EU policy?

The analysis shows that the significant efficiency gains cost reduction potential cannot be sufficiently exploited and passed on to the benefit of increased network rollout in the current fragmented (baseline) scenario. This finding is also valid if activities facilitating exchange of best practices are carried out and additional guidance provided, as foreseen under Option 1. In view of this lack of effectiveness, such a policy option falls short to achieve any of the desired operational objectives and should not be retained.

Option 2, by promoting a more intensive, coherent and harmonised application of the existing provisions and tools under the current electronic communications regulatory framework would have some (limited) positive effects compared with the baseline scenario or Option 1,

hence some effectiveness. With little costs but also limited benefits, this option would however not deliver the expected efficiency gains. Moreover, this option would not ensure sufficient coherence with the general policy objectives of the EU, as defined in particular in the Digital Agenda for Europe.

In contrast, Option 3 exploits the cost reduction potential to the full by extending the scope of the binding measures across sectors and throughout the broadband deployment steps. At the same time, the rights and obligations provided for would preserve commercial negotiations, an incentive on its own, and would respect the organisational autonomy of Member States (as reflected in the sub-options), hence avoiding unnecessary burdens on stakeholders and Member States. This option may imply additional costs and intervention at national level compared to options 1 and 2. However these costs depend very much on the structures and systems in place in Member States, and in practice significant savings would be made if Member States decide to implement those measures in a flexible way. More importantly, these costs appear to be offset by the significant benefits expected in inscreasingly efficient broadband deployment by operators and better broadband coverage for the society as a whole. Overall, option 3 ensures effectiveness in the view of identified objectives with a very good ratio of costs and benefits and coherence with general objectives of the EU policy (such as the Guidelines for Broadband State Aid and the INSPIRE Directive). Overall, this option appears therefore to be both effective and highly efficient, while ensuring coherence with the general objectives of the EU.

By manding cost reduction measures throughout the EU and across sectors, Option 4 appears to maximise the benefits for undertakings seeking to deploy broadband networks. As such, it appears to be the most effective option. However, it would entail a number of obligations and constraints in practice, which may be unnecessary or disproportionate to the achievement of the desired objectives. Compared to Option 3, Option 4 would add significant institutional complexity including transfers of competences. It would also generate significant additional costs due to specific obligations, such as those concerning in-house equipment. Moreover, business choices might be seriously impaired, with the risk of associated disincentives to invest, leading to fewer social benefits and for the environement, thus impeding the general objectives of the EU and the overall coherence of this option.

In view of the above, it appears that Option 3a is the best option available, given its effectiveness towards the identified objectives, costs-benefits analysis / efficiency and coherence of exploiting the cost reduction potential with general EU policy objectives.

Table 4 - Comparison of policy options by using standard criteria of effectiveness, efficiency, coherence.

	Effectiveness	**Efficiency**	**Coherence**
Option 1	Identified objectives not attained. The expected benefits would affect a limited number of stakeholders in a limited number of Member States. Voluntarily applied best practices would be limited to measures provided under the regulatory framework leaving the potential for savings from cross-sector deployment not exploited.	Some resources would be needed in those Member States that would decide to follow best practices. Yet, despite the presence of several initiatives at local and national level, the specific inefficiencies would not be sufficiently addressed. There are little synergies between national approaches and the best practices are rarely followed by others. The limited coordination achieved by guidance at EU level could only provide some common elements or best practices for consideration by central and/or local authorities when deciding to act. Overall, the impacts of this option would remain negligible, meaning little efficiency of the option.	Absence of economic, social and environmental impacts. No added value comparing to the action undertaken so far by the Commission to stimulate broadband rollout.

Option 2	The specific objective, i.e. to reduce bottlenecks and inefficiencies related to broadband rollout could be attained to some extent with regard to telecommunications providers in those Member States that would put in place propagated measures. In terms of operational objectives, the restriction of the scope to the electronic communications sector only would significantly impair its effectiveness in particular with regard to objective 3.2.1 (increasing the use of existing physical infrastructure suitable for broadband rollout) and 3.2.2 (increasing coordination in civil engineering projects)), as cross-sector deployment would not benefit.	Resources would be needed in those Member States that would decide to take-up measures promoted by the Commission under regulatory framework; The scale of the costs would differ among Member States. The costs could be slightly higher comparing to option 1, depending on the extent in which the recommendations would be followed. The impacts would be uneven across the EU, with positive impacts only in those Member States that would put in place promoted measures and would affect electronic communications operators only. While voluntarily applied recommendation(s) could lead to a more efficient deployment, fragmentation regarding the use of non-telecom infrastructure and the coordination of civil engineering works across sectors would not be improved, which would limit the efficiency of the option, leaving the full costs saving potential of cross-sector cooperation unexploited. The overall efficiency of this option would be limited.	Economic, social and environment impacts would be positive but their overall coherence would remain low, as this option does not contribute much to the overarching objectives as set out in the Digital Agenda for Europe and the Single Market Act II.

Option 3	The scope and scale of enabling measures under this option could ensure effectiveness, with all operational objectives attained, thus satisfying the specific objective while maximising cost savings. Rights and obligations accorded to electronic communications undertakings would allow to overcome existing barriers in a 'business friendly' way. In particular, the establishment of a right to use existing physical infrastructures under reasonable terms, coupled with a dispute settlement mechanism in case of failure, would ensure the possibility to exploit the potential of duct sharing, while preserving commercial negotiations. Moreover, the definition of a minimum set of information coupled with the right to request more detailed information/in site visits would keep the costs reasonable and limit the obligations on operators to what is necessary to ensure the objective. Providing a single information point to the market would make permit granting procedures and conditions more transparent and predictable, while leaving the decision to the authorities closest to the specific aspect to be regulated; finally restricting high-speed broadband ready in-house equipment to new buildings or major reconstruction works, would keep the costs on operators and owners reasonable. Under sub-option 3B, specific operational objectives (3.2.3 streamlining administrative procedures related to network rollout throughout the EU and 3.2.1 concerning the transparency needed to increase the use of existing physical infrastructure suitable for broadband rollout) might not be reached to the same extent in all Member States and at the same pace.	Additional resources would be needed from national authorities, communications providers, utilities and property owners to ensure the expected positive economic impacts regardless of the sub-option chosen. Providing market players with rights and obligations would lead to removing existing regulatory and unreasonable commercial barriers to infrastructure sharing and to coordination of planning civil engineering works, including cross-sector ones, while preserving commercial negotiation, subject to an ex post dispute resolution system aiming at ensuring a fair exercise of those rights. This option would also increase transparency, an important driver of infrastructure sharing, which in turn has an impact on costs, related to broadband rollout. The electronic communications undertakings would also be entitled to get information on transparent procedures and conditions for permit granting; they would benefit from economies of scope and scale in equipping new buildings with high-speed broadband ready infrastructures, whereas consumers could take advantage of such NGA ready equipment. Compared to option 1 and 2, where decisions about implementation of the measures currently available or promoted by the Commission depend on the Member States, a key element of the proposed measures lies in ensuring the cross-sector nature of this measure, which involves all the steps of network deployment. Against this background the efficiency of this option would be very good.	Given the expected impacts of the measures under this option, especially if translated into a binding measure, the coherence of this option with the general objectives of the Digital Agenda for Europe and Single Market Act II as well as other undergoing initiatives, is much more significant than under Option 2 and baseline scenario. All three types of impacts are positive and therefore balanced, despite a predominance of positive economic impacts over the social and environmental ones.

Option 4	In principle, mandating specific solutions would ensure that all identified objectives could be attained in all Member States. As far as transparency is concerned, the setting up of such a system would require significant operational costs for public institutions, information providers and access seekers, since the establishment of a European central point could mean mandating centralised features and a common database format. The imposition of ex ante cost orientation, in particular for access to telecom ducts and co-deployment, while reducing the costs for access seekers, could also undermine the incentives to invest. As such this measure could exceed what is necessary to reduce barriers to deployment. Similarly, the imposition on public actors of an obligation to deploy empty ducts when other infrastructure is laid down could reduce the incentive of private investors to invest in the first place, while waiting for future public investments, and it would entail investments which might not be recouped in the absence of market interest. Moreover permit granting requires local knowledge, which might not be ensured with full centralisation. Finally, generalising the obligation to equip building with high-speed broadband ready infrastructure would generate significant costs on property owners. In view of the above this option would go beyond what is necessary to achieve the envisaged operational objective, while putting at risk the general objective to which this initiative subscribes. Mandating specific solutions would create new obligations and constraints on stakeholders limiting the overall effectiveness.	Significant resources would be needed from authorities, communications providers, utilities, property owners; the Commission would also need to commit resources. This option would ensure the availability of the same information on the infrastructures suitable to host electronic communication networks all over the EU through a single point of contact, favouring in particular cross-border providers. The imposition of ex ante cost orientation regulation in the use of existing physical infrastructures and negotiating co-deployment would extend the regulatory competences already envisaged under the current Regulatory Framework to potentially every physical infrastructure and planned work and without the need of a market analysis, in view of ensuring as much cost reduction as possible. Moreover, in order to fully exploit the synergies of coordination of works financed with public money and to address the timing mismatch in investment decisions, the general obligation to lay down empty ducts suitable for electronic communications networks further aims at increasing effectiveness of the measure. A unique authority at Member State level would address completely the identified problems of lengthy, complex, diluted, and different permit granting procedures at local level in a number of Member States. Finally general obligation to have high-speed broadband ready buildings by a specified date would entail that by the indicated date all the buildings in the EU would have to be NGA-ready in terms of in-house equipment, in-house wiring and termination segments. Due to significant costs and disincentives to invest, however, the impacts overall would be less efficient.	Economic, social and environment impacts would be positive; yet, given some inefficiencies their overall coherence would be more limited than in option 3. Moreover, the risk of being counterproductive makes these measures costs-benefit inefficient also in the wider context and thus, their coherence would be smaller than in case of option 3.

7. MONITORING AND EVALUATION

This chapter presents the monitoring and evaluation mechanisms set in place in relation to this initiative. A choice was made for the lightest possible reporting obligations on the part of industry and national authorities, which at the same time allow to evaluate the extent to which objectives of the initiative are being attained and therefore to evaluate the instrument as such.

As explained in the previous chapter, the most effective and efficient policy option is the enlargement of the current regulatory framework so as to truly **enable** the implementation of such measures throughout the EU. A deliberate choice was made **against mandating** the utilisation of some cost reduction measures. For example, mechanisms need to be in place to facilitate cooperation in civil engineering works or usage of existing physical infrastructure; yet this cooperation is not mandated. At least as far as relationships between industry players are concerned, the obligations imposed via this initiative are, to a great extent, dealing with process (facilitation, enabling), rather than imposing a given outcome.

In principle, this choice has an impact on the indicators suitable to report on the outcome of this initiative: general indicators concerning the costs of deployment can provide a proxy of the effectiveness of the measures proposed *vis-à-vis* the specific objective of the proposal. Yet, on the basis of a relatively conservative estimate provided by Analysys Mason for "a typical Member State" in the context of integrated cost reduction solutions (see for details footnote 26), it is expected that the coherent and systematic application of the set of measures proposed under this initiative can bring down the costs of rolling out high-speed broadband networks by 25%, whereas with regard to specific operational objectives the benchmarks are as follows:

- at least 25% of the deployment takes place in pre-existing infrastructure;

- at least 10% of the high speeds networks are set up in co-deployment;

- as regards administrative procedures, as the main objectives are of a rather qualitative nature, no quantitative indicator is proposed for this specific objective. Progress in this area will be ensured through analysing qualitative indicators such as fair and timely decisions on applications, transparent and reasonable conditions to permits;

- at least 5% of the newly deployed networks reach multi-unit dwellings which are high-speed broadband ready.

The progress corresponding to attaining the **operational objectives** of the initiative (sharing of infrastructure, coordination of works, number of high-speed broadband ready houses, transparency and timeliness in granting administrative permits) will be checked upon through studies and surveys undertaken by the Commission. In contrast, including reporting obligations corresponding to these operational objectives would have significantly increased the administrative burden on companies and administrations.

The indicators for the **general objective** should also not be part of a separate reporting exercise and should be registered by the Commission from available sources, as data on investments are reported already in the framework of the Digital Agenda Scoreboard exercise and could be the subject of additional studies.

Based on all the information acquired through the Digital Agenda Scoreboard exercise and through the dedicated studies, the Commission should then evaluate, every three years, the impact of the proposed instrument, with a view to proposing necessary adjustments, if necessary.

8. LIST OF ANNEXES

I. Main outcomes of the public consultation

II. Minutes of the last IASG Meeting

III. Analysis of baseline scenario

IV. Study Analysis Mason

V. Main discarded policy options

VI Relevant provisions under the current regulatory electronic communication framework

VII. Analysis of the evolution of broadband rollout, the digital divide and the achievement of the Digital Agenda targets by 2020

VIII. Impacts by stakeholders: distributional analysis

IX Analysis of impacts and administrative costs by option

X .Assessment of the effectiveness, efficiency and coherence

XI. Glossary and Bibliography

EUROPEAN
COMMISSION

Brussels, 26.3.2013
SWD(2013) 73 final

Part 2

COMMISSION STAFF WORKING DOCUMENT

Impact Assessment
Annexes I-III

Accompanying the document

Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on measures to reduce the cost of deploying high-speed electronic communications networks

{COM(2013) 147 final}
{SWD(2013) 74 final}

Annex I

Results of the Public Consultation on how to reduce the cost of roll out of high speed broadband

Q1. *What are the benefits (including approximate savings) that could be achieved for NGA rollout by a more intensive infrastructure sharing within the EU, including the infrastructure of utility companies?*
Nearly all the respondents to the public consultation identified significant benefits for NGA rollout from a more intensive infrastructure sharing, including the infrastructure of utility companies, although different estimates of savings were put forward, depending on the existence, availability and conditions of access to passive infrastructure. While most respondents identified bigger cost and time saving potential in urban areas, sharing can nevertheless also be beneficial for extending the reach of NGA to remote and less densely populated areas. Enhanced sharing was identified by utility operators as a factor reducing the investment amortisation time and improving the investment over revenue ratio.
While for vertical integrated operators, both incumbents and ANOs, as well as public authorities and some utilities companies, enhanced sharing of infrastructure would lower barriers to entry and foster infrastructure competition, a limited number of replies, in particular from some ICT and dark fibre operators argue that, ultimately, these benefits come to the expense of service competition, because the limited space in the existing ducts would only allow collocation of a small number of operators. The conclusion according to which better use would lead to favourable urban planning, less digging and less nuisance, thus presenting significant social and environmental benefits was nevertheless unanimous.

Q2. *What are the benefits that could be achieved by a more coherent regime of infrastructure sharing within the EU, including the infrastructure of utility companies?*
Most public authorities would welcome a more coherent regime of infrastructure sharing as it would create a favourable investment environment, improve the competitiveness of the EU and contribute to the single market by facilitating the emergence of transeuropean operators. Providers acknowledge the potential for simplification of administrative procedures and underline that a coherent regime would ensure equal treatment of operators and transparency. Nearly all respondents agreed that coherence would increase visibility and legal certainty of facility sharing, thus promoting this mode of deployment and achieving the benefits underlined in the previous question. A minority of public authorities and associations of local utilities companies pointed to the additional costs related to the use of utilities' infrastructure and highlights the local character of the deployment, arguing for a case by case cost-benefit analysis of using the infrastructure of utilities companies for broadband deployment and against a Europe-wide regulation.

Q3. *Which are the main bottlenecks (practical, administrative, technical or legal) that operators wishing to deploy high-speed communication networks are confronted with when accessing existing infrastructures?*
Higher operational and maintenance cost of shared ducts, complexity, technical incompatibilities, higher risk for network security and integrity were reported as practical obstacles to accessing existing infrastructures more by the telecom operators and the public authorities, than from the utilities companies' side. Utilities companies concentrated on the

local character of deployment and on the *ad hoc* potential for cost reduction through sharing. Telecom operators seem more concerned about the different topology of utility networks, with different access points, as well as with the discrepancy of business models and of deployment timeframes between telecom and utilities companies. Lack of accurate information was the most recurrent topic when highlighting bottlenecks to sharing infrastructure, irrespective of the background of the respondents.

The cost of access to infrastructures, not only in terms of high prices or abusive conditions, but also of lack of transparent rules for construction, operation and maintenance cost apportioning, was almost unanimously identified as an obstacle discouraging access seekers. The absence of a legal obligation to share, or inversely of a right to access passive infrastructure was reported mainly by the incumbent operators and the public authorities, while NRAs insisted on the lack of clear rules dealing with liabilities. It seems that the refusal to grant access concerns equally private and public owned infrastructure and is linked to the disincentive of the first mover to allow access to a potential competitor. The question of ownership and exclusive rights to use infrastructure was raised in particular by some NRAs. Regulatory obstacles were identified by incumbents who highlighted that low prices of access to SMP infrastructure act as a disincentive for cross-utility sharing. Telecoms in general and some NRAs perceive the different conditions for access to public or private infrastructure as an important bottleneck, mainly for access to in-building wiring. In the case of mobile networks, sharing is impeded, according to the wireless operators, by legal provisions setting low frequency emissions thresholds.

Administrative obstacles were raised by all respondents More specifically, energy utilities companies emphasized on delays due to the lack of adequate procedures for handling infrastructure sharing, while the telecoms insisted on delays in permit granting and on incompatibilities of administrative procedures for telecoms and utilities companies. NRAs insisted on the absence of adequate dispute resolution mechanisms adjusted to the particularities of infrastructure sharing. A considerable number of local authorities admitted the existence of red tape, hindering co-deployment efforts. Lack of knowledge of the cost reduction potential of infrastructure sharing was outlined by public authorities, telecom operators and utilities companies.

Q4. *What are the good practices in the EU and in third countries that could be identified and be promoted with respect to achieving a more intensive infrastructure sharing with a view to deploying high-speed communication networks?*

A number of good practices have been identified as having the potential to be generalised across the EU (France, Spain, Germany, Portugal, Lithuania, Sweden, Scotland, UK for sharing of electricity poles Finland, Malta, Italy,) and beyond. France, Germany and Portugal were relatively popular examples.

Q5. *What would be the main benefits and disadvantages for broadband investment if access to ducts were mandated across infrastructures?*

The potential effect of a mandated access to ducts proved to be the question which divided respondents. Most incumbent operators and central authorities, including NRAs put forward more benefits than drawbacks, while the tendency is clearly reversed for alternative, dark fibre, cable operators and local authorities who warned against the eventual disadvantages of a mandated access to ducts. Utility operators (mainly energy) appear to be rather divided. As benefits, the opportunity to allow for a quicker and cheaper deployment of NGA networks, thus reaching grey, remote and less sparsely populated areas is withheld. The main disadvantage attributed to such a symmetrical regulation was that it could prove to be a

disincentive for operators to invest in passive infrastructure. Operators could be inclined to invest less in civil infrastructure, satisfying only immediate needs without building spare capacity, so as to avoid giving access. Alternative and dark fibre operators stressed that such a measure could be disproportionate and cable operators insisted that it could unduly favour the incumbent operators. A symmetrical obligation could accentuate the need for regulation, in order to be effective. From a technical point of view, such an obligation would induce all operators to follow the same topology, which is regarded from the ICT and equipment sector as negative, but does not seem an issue for the telecoms or the utilities companies.

Q6. *What measures could be envisaged to increase the business interest on the side of the utility companies to provide access to their infrastructure for broadband investment?*
Economic incentives, in the form of a fair and reasonable rate of return on investment are unanimously considered necessary to increase the business interest on the side of the utility companies to provide access to their infrastructure. In this sense, a number of utility companies argue in favour of lifting legal obstacles where they exist, especially the principle "charges cover cost", which acts as a disincentive for utilities companies to exploit their passive infrastructure. The creation of a market for passive infrastructure was advocated by the telecom sector. Alternative telecom operators would favour the generalisation of mandated access to suitable ducts. The development of a wholesale model, with clear definitions of cost items and cost models, defining in particular maximum values was suggested. The vast majority of the other categories of respondents however suggested that rates should not be cost oriented, but defined on fair terms. Reciprocal exchange of services was also largely supported from the telecoms and the utilities sectors and the public authorities. The possibility for the energy sector in particular to deploy faster and cheaper smart grids, in respect of the legal obligations imposed on these providers, seemed to attract the consensus from all sectors, while central public authorities saw a business case for energy operators to enter the telecommunications market and introduce more competition. Tax exemptions, proposed by some incumbent and wireless operators, were less popular.
Besides financial incentives, another recurrent set of measures increasing utilities' business interest in sharing passive infrastructure concerns dealing with technical and administrative obstacles. The establishment of standardised rules and procedures, broad enough to cover safety and health concerns would pave the way for an easier approach between the telecom and utilities sectors according to alternative operators, equipment manufacturers and public authorities, including NRAs. A coordination of permit granting, in the sense of the necessary update of the rights of way and permits in order to allow the sharing of infrastructure, was advocated by alternative operators. The existence of updated and accurate maps was also suggested by a fraction of alternative operators, so as to create a market place for infrastructure sharing.

Q7*: How do you assess the importance of systematic infrastructure mapping / of drawing up consistent inventories of infrastructure? Besides the potential economic advantages for electronic communications operators, do you see other advantages that such mapping could entail for citizens, public authorities or other (economic) operators?*
Overall, a certain degree of consensus appears to emerge across different categories of stakeholders as to the potential benefits of enhanced transparency concerning the existing passive infrastructures and in particular of systematic mapping. Nearly all respondents to the public consultation have recognised its positive added value, both in terms of economic advantages for the operators and of wider benefits for the society as a whole.

With regard to the economic aspects, the replies to the public consultation highlighted benefits both at the planning and the execution phases. Regarding the former, most incumbents, alternative operators as well as public authorities, *inter alia*, suggested that systematic knowledge of existing passive infrastructures is essential in order to plan the deployment of the network in view of the possibility to share existing facilities and to negotiate access with the owners of these facilities. In addition to that, the responses also showed significant benefits stemming from enhanced transparency in the execution phase. First of all, most respondents highlighted the positive impact of enhanced transparency in reducing damages to other passive infrastructures. Furthermore, knowledge of the utilities' infrastructures in a given area might facilitate coordination of works (mentioned by both telecoms and utilities companies), as well as maintenance activities (in particular for telecoms).
Besides the economic advantages for the operators, all categories of respondents mentioned additional benefits accruing to the society as a whole thanks to systematic mapping of passive infrastructures. Many national and local authorities suggested that systematic mapping enhances urban planning and soil management, as well as the adoption of broadband plans concerning the reduction of the digital divide. Both operators and public authorities also suggested environmental benefits, in terms of reduction of need for civil works and better coordination, as well as administrative benefits with regard to the management of permit granting procedures. Other utilities companies and public authorities finally mentioned the benefits of systematic knowledge of networks' infrastructures in order to improve disaster management.

Q9. *What information should be included in such maps with a view to facilitating cooperation, infrastructure sharing and broadband rollout? Who should be in charge of such mapping exercises and at what level should it be organised?*
The modalities of implementation of a mapping exercise bear a great relevance in view of their impacts on the costs, depending on the extent of the scope of passive infrastructures and information covered.
As to the information to be included in the inventory, there is a widespread consensus as to the need to include some geo-referenced information (GIS location, route of the network) as well as the type of utilisation and the size of the facility including also aerial lines. Several respondents also pointed out the need to include a contact point (the owner or the manager of the passive infrastructure), information on access points to the network (manholes, junctions, etc…) as well as quota and depth references. Additional information concerning the availability of space is considered important by several alternative operators and other utilities companies, although it is often acknowledged that it might be costly to maintain this information up-to-date and that availability in the context of mapping does not eliminate the need for in-site inspection. Some alternative operators considered that access to the incumbent's maps should be granted, while some incumbents also suggested including information about the in-house facilities or at least the existence of mutualisation points at the entrance of the building. Finally some respondents mentioned the inclusion of conditions for access (both economic and administrative ones).
Regarding the scope of the facilities to be included, some respondents (in particular utility companies) suggested that only passive infrastructures technically suitable for broadband roll-out should be included, while others (in particular among incumbents and local authorities) stressed the importance of having information on all utilities companies owned or managed by public and private bodies, also in view of reducing damages and facilitating coordination. With regard to this latter aspect, most recognise the added value of including information

about the planning of civil works, while others mentioned the risk that too early disclosure of investment plans might have negative impacts on competition.
Concerning the organisational modalities of a mapping system, most respondents across sectors pleaded for common mapping standards and access point at national level. In particular, many respondents pointed out that this should be managed by a body independent from the operators involved, also taking into account the safety concerns when defining conditions to access. At the same time some local authorities as well pointed out the merits of common standards at national or EU level. On the other hand, the added value of the involvement of the local authorities in terms of availability and accuracy of information (in particular by alternative operators, vendors and local authorities) is appreciated, in the form of federated systems accessible via a common interface. Finally some public authorities as well as incumbents suggested that in some cases mapping services might be available on a commercial basis and this might provide a market incentive to gather this information.
The BNetzA's atlas was the most recurring example cited by stakeholders, mentioning its broad scope, the national coverage and its gradual implementation (a first voluntary phase followed by a mandatory application), but also its weaknesses. Klic and Klip initiatives (in the NL and Flanders respectively) as well as the local initiatives in Sweden and Oslo were suggested as best practices, in particular in view of reducing damages in civil works. Other on-going projects were also mentioned (in Italy, Czech Republic, Finland).

Q10. *What would be the approximate cost of introducing systematic mapping?*
Together with the broad consensus on the potential benefits of systematic mapping, most respondents of all stakeholders' category are equally sensitive to the significant costs of this exercise, for both public authorities and operators contributing to the inventory.
Several estimates are mentioned by respondents, either on a per unit basis (few €/per connection mapped CAPEX + few €cents/per connection OPEX; 1 to 4 € per squared meter mapped), or based on existing experiences (77mln€ CAPEX in Flanders, approx 9-10mln€ OPEX for the Dutch KLIC system; 4mln€ contract tendered by ANACOM in Portugal; 300mln PLN (≈1 230 mln €) CAPEX + 30mln PLN (≈123 mln €) administrative costs in Poland) or extrapolation (between 500mln€ and 2bil€ for the EU). In particular, both set-up and maintenance costs might be relevant, depending on the level of detail of the information included, the need to update it, the inclusion of old infrastructures whose information might not be available, at least in digital format, as well as on the need to adapt to a standard format in view of the different mapping systems used by each operator or across sectors and countries.
A few respondents considered that, at least for old passive infrastructures, costs would outweigh the benefits, while confirming its feasibility for new facilities. The vast majority of respondents, on the contrary, stressed the importance to find the right balance in defining the level of detail of the information, also on the basis of the available existing information, in order to reduce the costs of the exercise, while at the same time ensuring most of the benefits. In particular, it was stressed that the systematic information needed at an early stage, such as in planning and negotiation phases, is significantly different from the more granular and detailed information needed in the execution phase. Moreover, in-site inspections are in any case needed in order to assess the current state of the facilities. In conclusion, while standardised and easily accessible basic information appears to be highly valuable at an early stage, systematic high level of detail might not bring significant added value, while it has a significant impact on the overall costs of the system.
Several respondents, including incumbents, alternative operators, public authorities and other utilities companies, also mentioned the need to take into account security and confidentiality

concerns while providing access to this information. Rather than preventing *in toto* any mapping exercise, these contributions point out the need to adopt some safeguards in defining the detail of the information required (in particular for some critical infrastructures such as water and energy networks) and, above all, in restricting access to access seekers with specific interests for the information provided (such as public authorities, operators, building companies, etc…). As far as confidentiality is concerned, information about investment plans and installation of active equipment should not be disclosed, according to some alternative operators.

Q11. *In your view, which substantial benefits would exist in offering possibilities to systematically lay new ducts when undertaking (public) works? In your experience, to what extent would additional potential revenue outweigh the extra costs?*
Many respondents across different categories of stakeholders have pointed out the significant potential for reduction of civil works costs stemming from a systematic policy envisaging additional spare capacity for future broadband network in performing public works. In particular direct reductions in the range of 10 to 50% for trenching costs are mentioned, as well as social benefits stemming from reduction of works and extension of covered areas, with limited additional costs in the performance of public works. In this latter regard, some local authorities nevertheless pointed out that while benefit could be significant, additional public funding would be necessary, in particular at EU level.
However, most contributions across stakeholders have also highlighted that this cost-saving potential might effectively be exploited only on a case by case basis. Most public authorities and telecom operators in particular point out the need to assess the supply and demand conditions as well as the future needs in order to decide where the additional capacity might be effectively used in the foreseeable future and before degradation of the infrastructure; at the same time, from a technical point of view, they stress that an overall network plan is needed (including a coherent design as well as additional facilities such as junctions, manholes, etc.) for a passive infrastructure to be suitable for broadband. Defining clear liability and cost sharing rules, moreover, could be a challenge. Finally the risk of a negative impact on incentives to invest for private operators is also mentioned. In conclusion most respondents across stakeholders warn against the risk of inefficiencies of a mandatory blanket obligation to lay down additional capacity whenever public works are undertaken, while some (in particular among telcos and public authorities) suggested that the outcome could be significantly positive if such a policy was included in more general broadband plans and/or policy assessing local demand and supply conditions (in particular in un-served areas) and defining transparent processes in order to include broadband passive infrastructure in on-going public works.

Q 12 and 15*: 12. What good practices are you aware of concerning transparency and coordination of civil engineering works? Should this be mandatory in the case of publicly financed works? 15. What other best practice examples to improve coordination of civil engineering works are you aware of?*
The following best practices were reported by the respondents:
Most systems aiming at coordinating civil works are implemented by local authorities, in view of their oversight of the works on-going on their territory. Many initiatives are based on informal regular coordination meetings at local level with the utilities companies concerned (once or twice a year) and in the context of the permit granting process, in order to share working plans in the concerned area and find solutions for coordination. This informal coordination may also be carried out at national level (e.g. Slovenian NRA) or backed by

general rules on consultation (for example for road authorities), or on mechanisms preventing recurring road works (like in Brussels) or on general rules mandating NGA-ready passive facilities for greenfield development areas (in Milan). IT-tools are also available at local level, in order to give visibility to the public plan of works (including atlas) or entailing alerting/noticing systems concerning forthcoming civil works, mainly in order to reduce risk of damages. More rarely these are implemented on a larger scale (Klic and Klip in NL and Flanders respectively). In other cases, coordination of works within the telecom sector is ensured by the industry association of telecom operators (Denmark) or by means of framework agreements with the incumbent (Italy), while commercial "work-exchanges" systems have also been reported in some countries. In Spain the Ministry can give opinions on the urban development plans concerning future broadband needs, while transparency and non-discrimination rules should be respected by local authorities when sharing civil works with other utilities companies. Finally general national rules on coordination of works, including apportionment of costs, are provided in the French CPCE Law L-49.
The respondents also mentioned general obstacles that hinder coordination, in particular cross-utility, like the mismatch of timing in both planning and executing phases. While in the former case it is often considered necessary to have a clear assessment of the potential demand in the area before deciding to join other civil works, with regard to the latter, the different execution techniques for the utilities companies involved may slow down broadband roll-out, in particular where less invasive techniques are available, such as micro-trenching. Other obstacles are also mentioned with regard to the fragmentation of procedures as well as with the risk of additional administrative burden in case of coordination, like the need for modification of building permits, increase of fees, delays in the replies to the call for coordination.
With specific regard to the scope of mandatory coordination mechanisms (the need to consult interested operators, dispute settlement mechanism or the obligation to accept co-deployment) most respondents (including public and private stakeholders) consider that they should be applied to public works only (i.e. financed with public money), while some alternative operators also included SMP operators and suggested that it should also involve the terminating segment in the end-user premise. In addition, the need for more transparency for urban and work plans and conditions (including fees) to join the public works was highlighted. Finally the risk to increase administrative complexity and red-tape with mandatory coordination mechanisms was mentioned.

***Q.13-14**: 13. Are you aware of any sources of information concerning planned civil engineering works? To what extent are they comprehensive (for instance covering different types of infrastructure) and easy-to-access? 14. To what extent would inventories of infrastructure be suitable for high speed communication infrastructure rollout? What kinds of infrastructures would you consider most suitable for being included in such an inventory? Who should be in charge of such an initiative? Should the obligation to announce planned investments apply only to the public sector, or also to private investors? What time horizon would you consider relevant for the availability of information about individual planned projects, so that this could lead to setting up concrete co-deployment projects? What are in your view the main organisational requirements, including costs, necessary for the establishment and maintenance of such an inventory?*
With regard to enhanced transparency of planned public works, a distinction could be drawn between long-term investment planning and short-term execution working plans. Concerning the former, most incumbents as well as some public authorities pointed out the need that transparency of detailed plans should be mandatory only for public entities, in order to protect

confidentiality but also to avoid anti-competitive coordination. Regarding short term information on executive works, on the contrary, there is a certain degree of consensus about the benefits stemming from the applicability to both private and public works; the issue of costs of the system, like in the case of mapping of existing infrastructures (see question 10), is also raised, but at least from the operators' point of view it has a more limited impact. However, also in this case there are divergences about the timing of the transparency system. Most incumbents and some public authorities and alternative operators identify the need for a long timeframe in order to trigger effective coordination (at least 6-12 months before the execution), although it is also often considered that from a pure technical point of view, coordination, in particular with other telecom operators, could take place in a much shorter timeframe (90 days or even less, up to 15 days before the execution).
As to the systems for ensuring transparency, many respondents mentioned the added value of information held by local authorities that should be primarily in charge of ensuring coordination of civil works, but the need is generally stressed to have some common standard of information transmitted and some degree of central coordination, like the inclusion in a broader mapping system, in order to avoid fragmentation. On the other side, it has been also noted that if included in a general mapping system, this information should be provided in a simplified form or it risks overburdening the functionality and also its effective use.

Q16. *How do you estimate the costs and period of time needed for a company to receive all the necessary permits needed to roll-out a high speed electronic communications access network?*
The responses confirmed the existence of a patchwork of lengthy, uncoordinated and unclear permit granting procedures, varying between countries and levels of administration and hindering the efforts of operators to roll-out high speed electronic communications access networks. Permit granting for radio-networks appears to be significantly more time-consuming than for fixed networks. While for the latter, the time varies between 2 weeks and 9 months, delays for receiving the necessary permits to roll-out radio-networks can go up to years and the industry notes a trend towards increasing timetables. Delays are attributed to the different administrative requirements, even within Member States, regions and municipalities, which require a huge amount of paperwork but also to the fact that radio-networks rely more on the use of private land, a factor which further delays deployment. Access of private buildings and property from fixed network providers appears also quite problematic and significantly delays NGA network deployment.
Most of the respondents were not in a position to provide accurate information about the cost of acquiring the necessary permits, as these are seldom harmonised in each Member State and vary depending on a number of heterogeneous parameters like the number of the competent authorities, the owner of the infrastructure, the extent of the project etc. The main costs include those of acquiring the permits (fees, but also paperwork) and the annual fees for land use. Calculation modes also differ significantly amongst Member States, different models currently being in force, from one-off fees based on the extent of the works to annual fees depending on the number of subscribers served.
A number of respondents provided actual data about the costs. It appears that permit granting for radio-networks is substantially more expensive than for fixed networks: While for fixed networks, the costs are in the order of few hundreds of euro, for mobile networks they can reach thousands. In some Member States, no fees for rights of way are collected, whereas in other, fees are quite expensive. It would be impossible to extrapolate from the responses to the public consultation an average of the cost of permit granting in the EU. Some respondents indicate that this could lie between 10% and 1/3 of the total cost of the infrastructure.

Q17. *What measures could help increase transparency and streamline the process of granting such permits? What kind of permits should be covered by such measures?*

Harmonisation of permit granting procedures was unanimously considered by the electronic communications sector as necessary in order to tackle their proliferation and lack of coordination. Standardisation, flexibility and streamlining, through a reduction of the number of the procedures, should cover permission requests, forms, deadlines, but also digging instructions. Uniform and transparent rules across each Member State were acclaimed by public authorities, local and central. The importance of eliminating divergence in the interpretation of rules was also acclaimed. Different suggestions for streamlining include establishing a code of conduct between NRAs and electronic communications providers on one side and local or other authorities on the other, or promoting regular coordination meetings. The introduction and generalisation of electronic means for the submission of requests, the exchange of necessary documents, the tracking process for managing applications, the issuing and publication of permits, through an appropriate interface is seen as a measure capable of reinforcing transparency and equality in permit granting. This interface would best be, according to central authorities, the same for all local authorities and providers should find there all necessary requirements for permits.

The need to harmonise fees within each Member State was particularly highlighted by the incumbent and dark fibre operators, as well as by trade associations of the electronic communications sector. Alternative operators and central authorities, including NRAs, insisted more on the need to ensure that fees are not arbitrary, but reasonably justified or even covering only the administrative cost of permit granting without being a source of income for local authorities. Synchronisation of the different timetables of competent authorities was particularly acclaimed by electronic communications providers, especially in view of the potential for co-deployment with utilities companies. The establishment of tacit approval, whenever the administrative deadlines expire without a decision being adopted is popular amongst operators not only of the electronic communications, but also of the utilities companies. The idea of benchmarking at EU level, with performance indicators measuring time and cost for permit granting at each local authority was backed by a few incumbent operators and NRAs.

Electronic communications providers, incumbents and alternative operators insisted on the need to introduce safeguards against unreasonable conditions attached to permits, in the sense of unreasonable technical requirements concerning depth or profile of the ditches and asphalting roads, unreasonable easement payments, fees for inspection and general prohibitions of civil works, or to define a white list of acceptable terms and conditions.

Telecoms and public authorities (ministries and NRAs) advocated the need to streamline the laws and regulations regarding civil works, including town planning, environment, and public health. Useful measures could also include exemption of categories of small works or infrastructures. Lastly, both dark fibre and wireless operators would appreciate if the legal framework allowed for a single authorisation for the deployment of a complete network in a region or municipality, irrespective of the different owners of infrastructures and the different authorities competent for permit granting. The need to introduce these measures in the National Broadband Plans was highlighted by certain incumbent operators.

Q18. *What kind of coordination would, in your view, facilitate the most the permits granting process? How should such coordination be best organised? How far should such coordination go and what would be the benefits achieved of the suggested level of coordination?*

As regards the kind of coordination which would facilitate the most the permits granting process, the public consultation reveals a clear tendency from all categories of respondents in favour of the establishment of a one-stop-shop. Only a small minority of respondents, mainly incumbents, rejected the idea of a one-stop-shop, in view of the difficulty to set it up. Most respondents do not consider that the establishment of such a one-stop-shop is incompatible with the respect of the different levels of authority for permit granting. However, two questions divide the respondents: which should be the powers of the one-stop-shop and which body should be vested with these competencies.

While some respondents, mainly a minority of the incumbent operators, manifested their preference for the establishment of a "full" one-stop-shop, concentrating competency for all permits required for the deployment of NGA networks, most of the respondents argued that a single point of contact, a single interface between the providers and the competent authorities, concentrating all permit requests, without however having the decision making power would be more efficient. The one-stop-shop could act as a single information point, ensuring transparency and predictability. It should be able to inform providers willing to deploy NGA networks, not only on the different permit granting requirements, but also on the available infrastructures and possibilities for co-deployment. In addition, it could act as a single interface for the submission of requests and should act as an intermediary, routing the applications to the competent local or central authorities. It could also actively manage the process, by using performance indicators and by intervening between the providers and the decision making authorities in case of delays and be able to escalate cases when deadlines are not respected. Lastly, it could publish all requests and permissions granted, so as to ensure transparency and equal treatment of the providers and ensure that all legal deadlines are respected by the competent authorities. Such a process could be linked to an appropriate complaints and dispute resolution process.

As regards the authority best suited to act as one-stop-shop, the trend from the answers, especially of the providers investing in NGA, shows preference for a central authority, like the telecom or energy NRA. Nevertheless, even if this body should preferably be at the central level, incumbent operators, utilities companies and local authorities underlined that, in order to be effective, coordination should be achieved at local level.

Q19. *How do you estimate the costs incurred by any measure suggested?*

No respondent has provided an estimation of the costs incurred by the suggested measures. The majority of the respondents consider however that the potential benefits would compensate the costs, which are expected to be low.

Q20. *What existing requirements under construction laws are you aware of regarding in-building equipment for electronic communication infrastructure? Please specify the Member State, region or municipality.*

Several requirements under construction laws were reported including standardisation of in-house wiring (AT, DE, Scotland, FI, Switzerland), exemption from building permit (CZ), obligation (FR) or recommendation (LUX) to equip new buildings with fibre, shared access to in-house wiring (DE, FR, PT, ES, Switzerland), obligation to lay down ducts in new urban areas (UK, IT).

Q21. *What is, in your view, the most suitable and cost effective way to ensure the existence of adequate and state-of-the-art in-building equipment, while also securing open access for electronic communications providers?*

Many respondents pointed to the need to distinguish the situation in buildings under construction and already existing ones. Clearly, the upgrading of installations in existing buildings, which amount for most of the buildings, generates the most onerous problems. Both incumbents and alternative operators referred to administrative procedures related to retrieving permissions for works from the owners, significant civil works' costs, regulatory barriers related to visual impact of the installations in buildings facades and absence of technical standards. To tackle this issue, several solutions were proposed varying from information campaigns addressed to buildings owners and trainings for construction companies, to the use of public funds and tax exemptions.

As regards buildings under construction, most respondents (telecom operators, authorities, associations, equipment manufacturers) favoured a legislative measure imposing obligations on construction developers. The expectations as to the scope of such measure differ among the respondents but these differences are not clearly related to the type of organisation they represent. Some pointed to the need of building standards and certification methods by independent bodies, including a 'neutral' communication box per each household, a utility room in the base of the building (eventually equipped with power supply independent from the building) or an empty electronic communications duct connecting the building to the street. Other respondents cautioned from over specifying the measure as this could inhibit innovation and breach the technological neutrality principle and favoured guiding principles like, for example, to equip buildings with a star-shaped empty pipe infrastructure, starting from the connection of the building.

All the respondents were clear as to the addressee of such obligation(s). The construction companies should ensure NGN ready telecoms installations on the same way as they are bound to provide energy, water and other utilities companies. On the contrary, imposing on telecoms operators to install in-house cabling at their own costs could lead to higher retail prices for the provided services and to unequal treatment of those building owners who have already invested in NGN ready in-building network.

The new rules concerning the state of the art in building equipment could be provided in construction codes or could also be specified when releasing building permits. If a binding legislative measure could not be proposed, professional organisations could develop 'good practices', such as foreseeing in the construction phase an empty electronic communications duct connecting the building towards the street. To ease the introduction of new rules a progressive removal of copper could be foreseen. After that date only fibre in new or refurbished houses would be allowed.

The main opposition to the concept of mandating NGN ready in building equipment came from cable industry and dark fibre operators, who identified a threat to technological neutrality and property rights. In their opinion, such obligation would endanger their business cases which currently depend on the long time return on investments in in-building installations.

As regards access to in-building infrastructure, the telecom operators favoured symmetric obligations in this regard, with, for example a requirement to adhere to the rules on sharing and maintenance costs of vertical network, whereas cable operators supported by some local authorities opted for non-mandatory open access based on voluntarily negotiated arrangements between the parties concerned.

Q22. *What would be the advantages and disadvantages of an obligation to equip buildings with open next generation access? How do you assess the additional costs incurred?*

Virtually all operators agreed that an obligation to equip buildings with open next generation access would considerably reduce roll-out costs of network operators, with the result that the

future generation services (e-health etc.) would be better accessible for individuals. The relevant regulation would boost the penetration rate and competition between the providers as well as stimulate technical innovation. On the other hand, some central authorities noticed that investment in in-house infrastructure, without equal improvement in the access networks, could be lost. They argued that wireless solutions could render in-house wiring obsolete. In addition, imposing NGN ready in-house wiring could be questionable in view of the consumers' choice not to get back to a 'wired solution'. Strong concerns were also expressed regarding the viability of the regulated NGN ready in-building infrastructure from the perspective of the technological development.
According to data from one of the NRAs, the cost of installing telecom infrastructure is capped at 2.5% (2% on average) of a new building's total construction cost. Comparing to the costs of other engineering systems (water, energy), they seem marginal. On the other hand, the cost of upgrading in-house cabling can amount up to two thirds of the total NGA roll-out cost.

Q23. *Are you aware of any good practices or measures other than those discussed above undertaken in order to facilitate the deployment of high speed broadband access networks? What has been their impact so far? How would you estimate the cost-saving potential of such measures?*
Several best practices were reported, with the Finish, French and Dutch example being the most popular. When it comes to different techniques, micro trenching, façade installation and setting up excavation standards were put forward.

Annex II

EUROPEAN COMMISSION
Directorate-General for Communications Networks, Content and Technology

Electronic Communications Networks and Services
Regulatory Coordination and Business

Ref. Ares(2012)1190957 - 10/10/2012

Inter-Service Working Group on an EU initiative to reduce costs and increase efficiency in the deployment of high-speed broadband Minutes of the meeting of 28 September 2012

Present:
DG CNECT Unit B1: Wolf-Dietrich Grussmann; Philippe Gerard; Enrico Camilli; Gerasimos Sofianatos; Alexandra Rotileanu; Erika Busechian; Joanna Borzecka; Ana Gradinaru; Unit B3: Jesus Pascualena; Guido Dolara; Unit H5: Merce Grido I Fisa;
DG MARKT: Denis Sparas
DG COMP: Bertrand Vandeputte; Soren Nirbel
DG ECFIN: Dimitri Lorenzani
SEC. GEN.: Stéphanie Vaddé
Excused: DG ENV, LS

UPDATE ON DEVELOPMENTS

- **Introduction**

CNECT B1 reported on the meeting with Neelie Kroes and explained that she is eager to see this initiative launched as soon as possible. The agreement of the IASG in order to send the document to the Impact Assessment Board is therefore essential. In parallel, it was reminded that this initiative was expected to be part of the Single Market II package, and that any legislative proposals would aim to be adopted in the first quarter of 2013.

The aim of this meeting is therefore to discuss and seek the IASG's approval on the draft Impact Assessment. Final agreement was aimed by Friday 5th of October 2012 at the latest. ENV previously informed that they would not participate but that they had no comments on the draft IA.

- **Results of the Public Consultation**

CNECT B1 presented the main results of the public consultation, which had attracted over 100 replies.
DG COMP enquired whether there was consensus among respondents regarding in-house wiring of all buildings. CNECT B1 replied that there was not really a consensus in this respect, most contributions indicating that in-house wiring for old buildings would be very costly, and on top of this, is it not certain that all buildings need NGA-ready access.

Unit B5 of DG CNECT asked what the view of utilities was as regards giving access to their ducts. Utilities insisted on the legal obstacles in sharing their infrastructures with the electronic communications operators and highlighted the potential of synergies with regard to smart grids. CNECT B1 reminded that sharing ducts should be based on commercial agreements, and that the initiative aimed at enabling sharing rather than mandating sharing.

SG stressed the importance of incorporating the messages from the public consultation within the text of the draft Impact Assessment, and noted a few additional points. Firstly, liability issues would arise. CNECT B1 explained that liability issues would be part of commercial agreements, hence would not be harmonised. Secondly, SG wondered about the amount of information to be shared as regards mapping and the need of explaining to citizens limitations of inventories access. CNECT B1 clarified this by referring to the preferred option, Option 3, which defines the scope of the access also based on feedback received in the public consultation. Under this scheme, the information would mainly be available on request. Lastly, the issue of business secrets was raised, and more specifically, how to avoid disclosure. CNECT B1 replied that competent authorities should manage the information exchange so as to ensure that these issues are taken into account indeed.

- **Results of Analysys Mason Study**

CNECT B1 briefly presented the study carried out by Analysys Mason, which will be annexed to the IA and is used to qualify the impact assessment. Among the findings of this study, it confirmed the overall saving potential, and it put into light additional savings for example thanks to preventing damages and synergies related to the different information systems involved.

In conclusions, CNECT B1 highlighted the willingness to reflect in the IA data and information coming from the public consultation, the studies, as well as the views previously expressed by the members of the IASG.

DRAFT IMPACT ASSESSMENT

- **Presentation of main changes in the document distributed pursuant to comments received**

CNECT B1 explained how the comments submitted by the members have been addressed in the version that the IASG members have received in advance of this meeting.

CNECT B1 highlighted the willingness to further reflect in the draft IA data and information from the public consultation, as well as from the study and opened the floor for additional comments.

- **Feedback /comments from representatives of the other DGs**

CNECT H5 was generally supportive. Input was provided on smart grids prior to the meeting, which had been incorporated. H5 stressed their wish to see positive environmental impacts of option 3 reinforced and provided reference to further studies giving estimates the greenhouse

gas reduction potential of smart grids. Great potential of exploiting synergies between telecom and energy sector was to be highlighted in the IA.

MARKT reminded that this initiative is important and part of the Single Market II and therefore fully support it. In particular, the amount of data in the IA was appreciated.
MARKT also asked whether the situation according to which energy companies cannot give access was routed in national or EU law. CNECT B1 replied that so far, this has only been seen under national law. MARKT also explained that it would be good to define the scope of the exercise (Articles 11 and 12 of the Framework Directive) by explaining shortly that SMP obligations are excluded.

MARKT also wondered about the level of ambition of the access pricing under Option 3. CNECT B1 replied that the approach to access pricing is a line of demarcation between Option 3 (access at reasonable conditions) and Option 4 (cost-orientation). While Option 4 is the most ambitious according to CNECT B1 there would be a number of negative impacts. MARKT explained that they would send drafting suggestion on the points mentioned.

COMP considered that this is a good document in which substantial time and effort were invested. They asked in particular if state aid issues would be taken on board. This was confirmed by CNECT B1. They wanted to see the discarded options included in the Annexes (see below). They also suggested clarifying and aligning the terminology by using co-deployment and not co-investment, passive infrastructure and not infrastructure only. In the problem definition, COMP also suggested to clarify Figure 1 under section 2.2 of the draft IA and add a list of passive infrastructure concerned by the proposed means.

ECFIN was pleased to notice that most comments on previous versions have been taken into account in the latest. Nevertheless, it was requested to take into account some further remarks: i) the missing issue of the operators' possible disincentive to invest as a consequence of the envisaged provisions, raised also by the stakeholders and to be duly developed; ii) in terms of data, a more consistent presentation of cost and benefits figures
(sometimes referred to a "typical" situation, some others presented as a range, without further explanation); iii) as regards the structure of Chapter 5, the impacts of each option should be assessed per category of stakeholder and then summarised, to provide an overview: iv) finally, ECFIN was asking for clarification on the lack of details about some of the proposed measures, e.g. the dispute settlement mechanism. CNECT B1 clarified that incentives to invest would indeed be addressed further in IA. As regards data it would be difficult to do more than is provided via the study in particular. CNECT B1 also explained that the purpose of the proposal is to build a common understanding more than to fix all details, which applies also to the dispute settlement mechanism, which satisfied ECFIN.

SG was positive about the added value brought to the draft impact assessment by the study. More details on cost experienced by Member State when implementing similar measures to the one proposed in the preferred option would be appreciated, preferably in a table format.

One additional question was whether the initiative can go beyond broadband rollout and serve other purposes. CNECT B1 replied that while the legal basis (Article 114 TFEU) and the time horizon put limits on possibilities to address all possible synergies between sectors in the initiative, the latter should not prevent other sectors from benefitting from synergies.

SG also asked to clarify the consequences of the initiative on property rights, on SMP regulation, as well as the difference between ducts and networks, and the lack for standardisation. SG also wondered about the relationship between mapping and Open Data Strategy. CNECT B1 clarified those issues.

In general terms, SG suggested to reflect a bit more in the titles of the options their actual contents, to shorten Option 1, and to add a list of discarded options (see below). CNECT B1 confirmed that those issues would be addressed.

Finally, SG wondered about the opportunity to impose "one stop shop" by way of regulation under Option 3. Finally SG asked if comitology would be considered. CNECT B1 replied that one stop shops would be targeted and hence fit with the chosen instrument and that comitology is not excluded.

- **Additional modifications**

CNECT B1 recalled that the IA would be further adjusted on the basis of the public consultation, the study and input received from ENISA as regards network security.

Comments expressed above would also be taken into account.

As regards Chapter 5, the text will be cut down: text that was in the previous version will be moved to the Annex, summary tables with costs and benefits by stakeholders would be added. No changes on substance were expected. This revision aims at making the analysis more systematic (per category of stakeholder) thanks to the new tables included; helping the reader to visualise the cost and benefits better.

- **Presentation of Annexes on baseline scenario and on discarded options**

The list of annexes was presented. As regards the Annex on discarded options, SG explained that they could be grouped, and that they should provide a short reasoning justifying why they were discarded.

CONCLUSION AND NEXT STEPS

In conclusion, CNECT B1 thanked the members for their valuable participation and input into the draft impact assessment. It was noted that all those efforts had made it possible to reach a document on which members could agree in principle, subject to comments by 5 October (lunchtime) on the final changes to be sent out by CNECT B1 early next week.

Ana Gradinaru

Annex III

Annex III

Baseline Scenario – existing measures and plans

This Annex analyses the existence, the nature and the maturity of measures throughout the EU in relation to:
- Public infrastructure databases or atlases
- Mandated Access to Passive Infrastructure
- Coordination of Civil engineering works
- Streamlining of Permit Granting Processes
- In-house equipment

Under point 1 of the Annex a general overview of existing measures is presented. In green are marked those existing practices that could be considered the best in the class, whereas in yellow are marked all other existing or planned measures. The following tables (2-6) present specific measures across the Member States per area. In these tables the dark yellow indicates good practices and light yellow marks local solutions, plans or rudimental measures (e.g. general legal basis without implementing measures).

The information provided in this Annex comes from the following sources:
- Deloitte study on cost-reduction practices with regard to broadband infrastructure roll-out : Deloitte Tech4i2 "Study on cost-reduction practices with regard to broadband infrastructure roll-out" 13/09/2012. Part of Study leading to an Impact assessment on the structuring and financing of broadband infrastructure projects, the financing gaps and identification of financing models for project promoters and the choice of EU policy. (SMART 2007/0035);
- Analysys Mason study "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013);
- inputs to public consultations on an EU Initiative to Reduce the Cost of Rolling Out High Speed Communication Infrastructure in Europe (27 April – 20 July 2012);
- draft Report of PT TRIS (ECC);
- own resources (questionnaire concerning national initiatives related to ducts);
- Cullen 'cross country analysis' .

Table of content

1. OVERVIEW OF EXISTING MEASURES

- measures scattered, partial or not adopted yet
- good practices
- lack of relevant measures
- no information available

Measure/ Country	Measure 1 Mapping	Measure 2 Mandated Access to Passive Infr.	Measure 3 Coordination of civil engineering works	Measure 4 Permit Granting Process	Measure 5 NGN ready In-house wiring
AT					
BE					
BG	-		-	-	
CY					
CZ					
DK					
EE					
FI					
FR					
DE					
EL	-				
HU					
IE					
IT					
LV	-				
LT					
LU					
MT	-				
NL					
PL					
PT					
RO					
SK	-				
SI					
ES					
SE					
UK					

2. PUBLIC INFRASTRUCTURE DATABASES OR ATLASES

BEST - Best practices
GOOD– Good practices of limited scope
LIMITED – Planned/Local/Basic measures
NOT-RELEVANT – No relevant measures reported
NA - No information available

	Country	Status	Measures
1	***AT***	No national public infrastructure database. Art.13a TKG gives a legal basis for a register of very limited data[1]. The City of Vienna has digital maps of all urban infrastructures. Part of it is publically available at http://www.wien.gv.at/viennagis/index.html.[2]	**LIMITED**
2	***BE***	No database at federal government level. In 1995, the Flanders region of Belgium implemented a Geographic Information System (GIS) decree, which aimed to create a geographical database of environmental and human factors covering the region. The agency in charge of the project is known as Agentscahp voor Geografische Informatie Vlaanderen (AGIV). In 2009, GIS framework was updated with the Spatial Data Infrastructure (SDI) programme, to bring the project in-line with the Commission's INSPIRE initiative. This consisted of three decrees, one of which is the Kabel-en Leiding Informatie Portaal (KLIP) decree, which is specifically with regards to cables and conduits[3].	**GOOD**
3	***BG***	No information available[4].	**NA**
4	***CY***	Geographic Information System for ANOs (unified project in progress)[5].	**LIMITED**
5	***CZ***	On 27 November 2008 the Memorandum on cooperation in the preparation, testing and implementation of the "digital map of public administration" was signed, under which the Interior Ministry started the project of the digital map of Public Administration (DMVS). The digital map of Public Administration offers the unification of data from various geographic information systems in one application. The project aims to facilitate the administration and access to spatial data for the authorities and the public in line with the Smart Administration, promoting efficient and user-friendly public administration, and development of eGovernment in the country. The DMVS will comprise the Digital Technical Map (DTM). DTM will be a large-scale computer-based map, describing the surface situation and elements of engineering networks (ie, including electronic communications). The primary users will be the public administration, citizens and it will also be a major source of unified and up-to-date information for the Integrated Emergency System of the Czech Republic[6].	**LIMITED**

[1] Own resources (questionnaire)
[2] Deloitte study, public consultations
[3] Analysys Mason study
[4] Deloitte study
[5] Own sources (questionnaire)
[6] Public consultations

6	***DK***	The Danish Register of Underground Cable (www.ler.dk) - managed by the Danish Enterprise and Construction Authority - contains information on all companies and associations who own underground cables in Denmark. The register is established in order to prevent accidental damages to underground utility cables. All owners of cables have registered their areas of interest in the register. An area of interest is the geographical area in which an owner of cables own cables. The exact location of cables is thus not registered. The Danish Telecom Industries Association maintains a database from which interested telecom companies automatically will receive an e-mail with offers of joint digging efforts from other telecom companies digging in a certain area. However, the database does not contain up-to-date information on the placement of telecom infrastructure[7].	**GOOD**
7	***EE***	A duct database in Estonia is owned by the incumbent and is accessible for all operators. The costs of using and maintaining the database are shared between the incumbent and the operators that make use of the database. The incumbent Elion owns almost 100 % of cable ducts. In accordance with the Estonian Construction Law, civil engineering infrastructure data are kept in an asset register, which is managed by the Ministry of Economic Affairs and Communication. This covers Utilities as well as telecoms[8].	**GOOD**
8	***FI***	In Finland state owned company (Johtotieto Oy) has quite comprehensive database on underground wires/pipelines and the situation is getting better all the time. This database is today mainly used for avoiding cable breaks while digging/constructing. Cities also own databases of their underground constructions. Cable position information is confidential due to security of the society[9].	**GOOD**
9	***FR***	There is no centralized passive infrastructure database in France, but France Télécom has developed a database with spatial data, based on GIS Arcview. However, the database is far from complete. Upon request of an alternative operator, France Télécom shares data on a specific area (raster map, vectorial map). France Télécom also gathers data from other operators and stores them in the database. Under the law of August 2008 any operator has an obligation to give geographical data on its network to local authorities on their demand, free of charge. The French national telecom regulatory authority (ARCEP) has recently published a guide for local authorities to help them formulate their demands vis-à-vis operators. In France there is a digital data basis for the routes and nature of existing copper networks operators including incumbents (France Télécom). It can be integrated into GIS systems by local authorities. The quality of data available is very heterogeneous[10].	**GOOD**
10	***DE***	In 2009, Bundesnetzagentur, the German Federal Network Agency, introduced the Infrastrukturatlas programme to map existing infrastructure that could be used for deployment of NGA networks. Infrastructure covered	**BEST**

[7] Deloitte study
[8] ibidem
[9] Public consultations
[10] Public consultations, Deloitte study
[11] Analysys Mason study

		includes: - wired telecoms infrastructure (line profiles of fibre, including cable core networks and last-mile fibre; nodes such as main distribution frames (MDFs) and cabinets; empty telecoms ducts) - wireless telecoms infrastructure (transceiver sites; fixed links; backhaul to transceiver sites) - other infrastructure (utilities such as electricity, gas, water and sewers; utility poles, including antenna masts; potential antenna sites on tall buildings; windmills; church towers) - transport networks (conduits on roads, highways, waterways and railways)[11]. The atlas is not related to particular wholesale products or market segment and currently does not contain data regarding the availability or the physical characteristics of the infrastructure. The infrastructure atlas can only be used by operators for specific projects. It is contains data on telecoms and Utilities[12]. In Bavaria it has been introduced a database with geographical information. Based on this database various applications are envisaged. One of them is a repository of building plans including civil and underground engineering.	
11	***EL***	No information available[13].	**NA**
12	***HU***	In Hungary, the SMP operator has to provide information about its civil engineering infrastructure upon request, on a case-by-case basis. The SMP operators are not obliged to establish an infrastructure database, nor has this database been established by the NRA or other institutions[14].	**LIMITED**
13	***IE***	No public infrastructure database exists[15].	**NOT-RELEVANT**
14	***IT***	In Italy, the SMP (Telecom Italia) is obliged to establish a database containing data on its own passive infrastructure (i.e. ducts, fiber). Local authorities maintain databases of the passive infrastructure of other operators, public entities and municipalities. According to the Italian Communication Code, data on new infrastructure needs to be notified by operators and local authorities to the Ministry of Telecommunication (now the Ministry of Economic Development)[16]. At the end of 2011 the Italian NRA issued a Decision (n. 622/11/CONS) that set up the infrastructure cadastre that will collect all the suitable pipes and ducts information for TLC use. Such a cadastre even if set up until now is not operative because operative rules for its implementation are still ongoing. The NRA will grant access based on the principle of reciprocity. Regione Emilia Romagna has promoted and led a project to include all the municipalities in a homogeneous documentation effort to document all underground infrastructures. The role of the Regione is fundamental in promoting uniform procedures, tools and documentation and geo-referencing techniques and in collecting at regional level all the local municipalities repositories of data by using a data federation structure (Lepida of regione Emilia Romagna)[17].	**LIMITED**

[12] Deloitte study
[13] ibidem
[14] ibidem
[15] ibidem
[16] ibidem
[17] Public consultations

15	***LV***	No information available[18].	**NA**
16	***LT***	No transparency obligation. Incumbent's RO for duct access is publicly available since 2005. No access to the Incumbent's e-map is offered. Municipalities keep information about the Civil Engineering infrastructure; some of them grant access to GIS-based tools with civil engineering infrastructure data[19]. A project is being developed to develop access to the e-maps managed by the municipalities in order to make information about civil engineering infrastructure available for developers of the broadband networks[20].	**LIMITED**
17	***LU***	The government asked in 2010 (ultra-fast broadband networks strategy) called for two national registers: for works and for infrastructure. (Art. 44(4) of the Law of 27 February 2011)[21].	**LIMITED**
18	***MT***	No information available[22].	**NA**
19	***NL***	The Kadaster (Land Registry) is responsible for maintaining the register of cables and infrastructure in the Netherlands, using the KLIC portal (system pools infrastructure data from all types of excavators such as gas, energy, internet, etc. and manages the exchange of infrastructure information). Although not a map as such, this database contains the locations of active infrastructure. Any organization that wishes to undertake excavation work is mandated by law to check the system to see which operators are active in the area in question. The law and the system are primarily in place to avoid accidents. However, it is envisaged that the system will be further developed into a complete centralised information system to meet the EC's INSPIRE directive over the next few years.[23] Coordination of civil engineering works already exists in the Netherlands. Such coordination is organized at local or regional level. The method and organisation varies but in essence it requires that information about upcoming engineering projects is shared between the various players (sewage, water, gas, electricity and telecommunication). Based on this information the interested parties to can decide to cooperate and as a result share the cost of the civil engineering works. Especially in the case of the development of new areas which require a completely new infrastructure such cooperation is common practice[24].	**GOOD**
20	***PL***	Polish operators are mandated to provide information on new deployments annually to the NRA, UKE. However, rather than detailed maps, they are required only to submit the location of nodes and the approximate location of connections between them. According to UKE, many Polish operators have their detailed network information stored as paper maps rather than in electronic form[25].	**GOOD**
21	***PT***	ANACOM, the Portuguese NRA, decided in 2009 to implement the Centralised Information System (CIS), a central infrastructure atlas aimed at reducing the cost of deploying new electronic communications equipment. Providing and regularly updating information is mandatory for all	**BEST**

[18] Deloitte study
[19] ibidem
[20] Draft report of PT TRIS (ECC)
[21] Own sources/Cullen analysis
[22] Deloitte study
[23] Analysys Mason study
[24] Public consultations
[25] Analysys Mason study

		organisations that own or operate infrastructure suitable for accommodating electronic communication infrastructure (including roads, railways, water and gas infrastructure). This requirement applies to local authorities, state-owned companies, utility companies, electronic communications companies, and any other bodies that may own relevant infrastructure. It extends further to the incumbent, Portugal Telecom, which must provide information on available space within its ducts[26].	
22	***RO***	The Pilot project to create a GIS for certain segments of the underground public electronic communications networks and of the associated infrastructure elements within cities. Together with that an inventory of these network segments and the associated infrastructure elements is being developed. GIS will encompass complete information on the development and geographical location of the network segments and of the associated infrastructure elements[27].	**LIMITED**
23	***SK***	No information available[28].	**NA**
24	***SI***	The Ministry which is also responsible for electronic communications (MVZT) runs a database on all public infrastructure, both telecoms and Utilities, which also include information on ducts, however only geographical and spatial data and no specific information on available capacity[29]. There are ongoing negotiations on an agreement with the Surveying and Mapping Authority on the upgrading of the existing Cadastre of Commercial Public Infrastructure and the creation of a browser that will offer a more detailed view of the characteristics of the network. The upgrading of the Cadastre and the creation of the browser are planned to be completed by the end of 2013, which would mean that tangible results would be available in 2014[30].	**GOOD**
25	***ES***	The incumbent runs a database as a part of its wholesale offer for duct access. The database provides information about the geographical location and characteristics of the civil infrastructure (ducts, manholes, poles, etc), i.e. Utilities as well as telecoms. There is a GIS based online database.[31] In the view of CMT decision of 5 July 2012, the incumbent has timeframes to update passive infrastructure information within 15 working days in case of vacancy information from any time when infrastructure is visited in the context of sharing visits, maintenance or cables, and 1 month on case of update or completion of technical information[32]. There were also positive experiences reported with commercial initiatives for mapping information. See, for example, the company INKOLAN active in Spain (http://www.inkolan.com/Contenidos/Ficha.aspx?IdMenu=A2238BD0-3048-4D9D-AB8CC91C6FDFD475). INKOLAN provides digital information about public services infrastructures: water, gas, electricity, telecoms and municipal networks. In this case, the market is providing a solution for the information needs of operators. Comparing to that a general obligation to have the information available in a public database may be a much less	**GOOD**

[26] ibidem
[27] Draft report of PT TRIS (ECC)
[28] Deloitte study
[29] ibidem
[30] Public consultations
[31] ibidem
[32] Cullen analysis

		efficient way of obtaining the information. Specialized companies can be more efficient[33].	
26	***SE***	There are three separate projects in Sweden. The first is an annual broadband survey in Sweden that maps out which services are available to each home. The second project is inspired by the Infrastrukturatlas and aims to develop a map that shows both existing and planned network deployments, thus to encourage infrastructure sharing and to attract players to deploy in new areas. Finally, there is the dig alert system, Ledningskollen, https://www.ledningskollen.se, which is designed to reduce damage to existing infrastructure during construction works. This splits the country into 1km-sided grid squares and provides information to those intending to carry out civil engineering works regarding which infrastructure owners are active in which areas. The database logs telecoms related cables but is accessible to all including Utilities for reference[34].	**GOOD**
27	***UK***	The National Joint Utilities Group (NJUG) is a UK organisation that aims to promote best practice for public street civil engineering works. Members include a number of UK water supply and energy companies, as well as Openreach, the local access network provider, and Virgin Media, the UK's largest cable operator. One initiative of the NJUG is to map existing underground assets to create an infrastructure atlas for the UK. In addition to the estimated 1 million kilometres of gas and water mains and sewers, and 500 000 kilometres of electricity cables, NJUG believes there are 2 million kilometres of telecoms cabling, all of which it wishes to map[35].	**LIMITED**

[33] Public consultations
[34] Analysys Mason study
[35] ibidem

3. MANDATED ACCESS TO PASSIVE INFRASTRUCTURE

BEST - Best practices
GOOD– Good practices of limited scope
LIMITED – Planned/Local/Basic measures
BASIC – Only asymmetric obligations to provide access to ducts
NON-RELEVANT – No relevant measures reported
NA - No information available

AS – asymmetric obligation to provide access to ducts
S - symmetric obligation to provide access to ducts
NR - not regulated

	Country	Status	SMP	Measures
1	***AT***	Operators that have exercised rights of way for the installation of network infrastructure on public or private land must permit other operators to share their infrastructure to the extent that such shared use is economically reasonable and technically feasible[36]	AS	**LIMITED**
2	***BE***	No specific measures are known to have been adopted[37]	NR	**NOT-RELEVANT**
3	***BG***	No specific measures are known to have been adopted[38]. There is an asymmetric obligation to provide access to ducts[39]	AS	**BASIC**
4	***CY***	The obligation to provide access to ducts is provided together with an obligation to reserve capacity in ducts (max 30% for own use). The NRA is setting the pricing for ducts access. However, in practice, the high price makes cheaper digging other ducts[40].	AS	**BASIC**
5	***CZ***	No specific measures are known to have been adopted[41].	NR	**NOT-RELEVANT**
6	***DK***	No specific measures are known to have been adopted[42]. Incumbent is not obliged to reserve capacity. However, there is an obligation to provide thorough documentation if neither ducts nor dark fibre is available in a specific area [43]. The Danish utilities often deploy FTTH through an extended use of trench sharing where overhead power lines are buried along with cables for streetlight and fibre ducts[44]	AS	**LIMITED**
7	***EE***	No specific measures are known to have been adopted[45]. There is an asymmetric obligation to provide access to ducts[46]	AS	**BASIC**
8	***FI***	No specific measures are known to have been adopted.[47]	Despite the legal basis,	**NOT-RELEVANT**

[36] Deloitte study
[37] ibidem
[38] ibidem
[39] Own sources/Cullen analysis
[40] Deloitte study
[41] ibidem
[42] ibidem
[43] Own sources (questionnaire)
[44] Public consultations
[45] Deloitte study
[46] Own sources/Cullen analysis
[47] Deloitte study

			in practice the obligation to provide access to ducts is not used.	
9	***FR***	Access to infrastructure, overseen by the French electronic communications and postal regulatory authority (ARCEP) is to be provided on a non-discriminatory basis by France Telecom, which must grant reasonable requests for access, make capacity available where constraints exist ("desaturation"); and provide planning information.[48] There is an obligation to reserve sub-duct for maintenance but in specific cases (feeder segment) this means 'sufficient space' to undertake corrective maintenance and necessary developments in the copper network. The same mount of spare should be reserved for ANOs as it is reserved for the future needs. In practice, by November 2011 around 6 050 km of ducts have been leased by ANOs from incumbent[49].	AS S	**LIMITED**
10	***DE***	The Federal Network Agency, BNetzA has imposed an obligation for passive infrastructure owners to provide access[50]. The incumbent may refuse access only in specific cases. Legislation is currently being put in place that obliges public utility companies to provide access to their infrastructure upon request. Steps are also being taken to apply similar measures to all owners of relevant infrastructure, including private utility companies. It is envisaged that an arbitration process will be put in place to settle any disputes that arise[51].	AS	**GOOD**
11	***EL***	The incumbent is encouraged to install, according to market demand, sufficient capacity in construction projects of technical infrastructure (i.e. ducts, sub-ducts, manholes, masts) so that other operators could use them[52]. Besides that no specific measures are known to have been adopted.	AS	**LIMITED**
12	***HU***	No specific measures are known to have been adopted[53]. There is an asymmetric obligation to provide access to ducts[54]	AS	**BASIC**
13	***IE***	No specific measures are known to have been adopted.[55]	AS	**BASIC**
14	***IT***	Non discrimination obligation applies to the space reserved by incumbent for maintenance. There is also an obligation to 'adopt	AS	**GOOD**

[48] Deloitte study
[49] Own sources (questionnaire)
[50] Deloitte study
[51] Analysys Mason study
[52] Own sources/Cullen analysis
[53] Deloitte study
[54] Own sources/Cullen analysis
[55] Deloitte study

		every possible measures' to decongest existing ducts. Different operators entered into agreements concerning duct sharing[56]. I n addition there is an obligation for a builder to make multiservice ducts available in new buildings[57].		
15	***LV***	No specific measures are known to have been adopted[58]	NR plans	**NOT-RELEVANT**
16	***LT***	Compulsory sharing of all passive infrastructure was introduced in 2004. Detailed regulation on the construction of network infrastructure and infrastructure sharing was introduced in 2005. Following a number of disputes, a second level of regulation was introduced in November 2011 that places a more asymmetric obligation on incumbent. These additional measures allow the NRA to regulate the operational problems that the previous complaints had referred to, as well as regulating access pricing, if two telecoms companies fail to reach an agreement and a dispute ensues. If another infrastructure company becomes involved in a dispute, the case will be escalated to the courts. The role of the NRA in case of these other infrastructure companies is to provide clarifications on the access obligations. There are a number of key areas of legislation considered to be the key in ensuring that the obligations to share infrastructure are clear, and thus keep disputes to a minimum[59].	AS S	**BEST**
17	***LU***	Shared access is mandated at planning permission stage and existing infrastructure cannot be duplicated [60].	AS	**GOOD**
18	***MT***	No specific measures are known to have been adopted[61]. There is an asymmetric obligation to provide access to ducts[62]	S	**BASIC**
19	***NL***	Third parties in the Netherlands are mandated to share their networks with telecoms operators when requested, provided this is technically feasible. In addition, the right to deploy in house wiring is considered to be a part of rights of way, which are granted free of charge for all providers of publicly available electronic communications provider [63].	S	**GOOD**
20	***PL***	No specific measures are known to have been adopted[64]. There is an asymmetric obligation to provide access to ducts[65].	AS	**BASIC**
21	***PT***	The national telecoms regulator has the power to determine the terms under which passive telecoms infrastructure can be shared – and has established regulations which must be satisfied before any operator may share infrastructure[66]. The laws state that all existing ducts that are suitable for the provision of electronic communications networks must be made available to operators. This includes:	AS	**BEST**

[56] Own sources (questionnaire)
[57] Deloitte study
[58] ibidem
[59] Analysys Mason study
[60] Deloitte study
[61] ibidem
[62] Own sources/Cullena analysis
[63] Deloitte study
[64] ibidem
[65] Own sources/Cullen analysis
[66] Deloitte study
[67] Analysys Mason study

		-infrastructure owned by the state, local authorities and Autonomous Regions -infrastructure owned by entities under the supervision of the state, local authorities and Autonomous Regions - public infrastructure and utility companies such as water, gas, transport and sewerage companies, as well as roads, railways and ports. Access to these ducts is defined as the owner making available physical infrastructures such as buildings, ducts, masts, inspection chambers, manholes and cabinets for the purpose of the accommodation, setting up and removal, and maintenance of electronic communications transmission systems, equipment and resources. The cost of access varies depending on who owns the infrastructure. For example, ANACOM, the Portuguese NRA, sets the prices for access to local authority-owned infrastructure, whilst electronic communication companies must charge each other cost-oriented prices. No specifications are imposed on operators deploying new ducts. Instead, the deploying operator is obliged to consult with other operators in order to determine if any other operator is interested in deploying along that route. If they are, the deploying operator must install ducts that are suitable for sharing; if they are not, then the duct operator is free to choose which type of duct is deployed.[67] It has been reported 16 operators sharing ducts[68].		
22	***RO***	A new Infrastructure Law was adopted recently which allows access to ducts, pillars or any other passive infrastructure, suitable for broadband rollout. The NRA is empowered to intervene if the conditions for access are considered by the access seeker unreasonable[69].	NR	**LIMITED**
23	***SK***	No specific measures are known to have been adopted[70].	NR	**NOT-RELEVANT**
24	***SI***	No specific measures are known to have been adopted. There is an asymmetric obligation to provide access to ducts [71].	AS	**BASIC**
25	***ES***	Shared access to capacity within a duct is granted only is no full sub-ducts are available. In practice, since mid September 2008 till April 2012 - 2 624 km of incumbents ducts have been accessed by ANOs (out of 6 500 requests)[72]. Besides that no specific measures are known to have been adopted[73].	AS	**LIMITED**
26	***SE***	No specific measures are known to have been adopted[74]	NR	**NOT-RELEVANT**
27	***UK***	As a result of the recent wholesale market access review, the incumbent is now subject to an obligation to provide access to its ducts and poles[75]. Besides that no specific measures are known to have been	AS	**BASIC**

[68] Cullen analysis
[69] Deloitte study
[70] ibidem
[71] Own sources (questionnaire)
[72] Cullen analysis
[73] Own sources (questionnaire)
[74] Deloitte study
[75] ibidem

		adopted. Scottish Water (SW) has pioneered the use of the public sewer network and property assets over recent years to extend fibre-optic infrastructure. SW's intention is to partner with a small number of companies who have a desire to act as asset brokers with a process to install fibre76.		

[76] ibidem

4. COORDINATION OF CIVIL ENGINEERING WORKS

BEST - Best practices
GOOD– Good practices of limited scope
LIMITED – Planned/Local/Basic measures
NOT-RELEVANT – No relevant measures reported
NA - No information available

	Country	Status	Measure
1	***AT***	No specific measures are known to have been adopted[77].	**NOT-RELEVANT**
2	***BE***	Since several years, various coordination regimes have been imposed in different regions. Formal procedures are set out and regular coordination meetings take place to discuss with all infrastructure providers the middle and long term public road interventions (Brussels, Flamish, Wallonie). The Brussels Region in Belgium has a 'Cellule de Coordination des Chantiers' to which anyone planning significant infrastructure works must file its plans to make them accessible to other major infrastructure companies, facilitating co-investment and co-ordination (in particular co-trenching) (OSIRIS). In the Flemish region, a pilot phase for a dedicated platform (GIPOD) is expected to start in September 2012. In Flanders the KLIP platform is available for professional and private customers.[78]	**BEST**
3	***BG***	No information available.	**NA**
4	***CY***	No specific measures are known to have been adopted[79]	**NOT-RELEVANT**
5	***CZ***	No specific measures are known to have been adopted[80]	**NOT-RELEVANT**
6	***DK***	An agreement exists to coordinate works between telecoms operators. Apart from minimizing costs for the involved parties and stimulation of competition in the market for the provision of infrastructure, the purpose of the agreement is to ensure non-discriminatory and transparent conditions for all parties joining the agreement, and to meet the authorities' requirements with respect to coordination of digging in order to minimize traffic inconvenience to citizens and businesses. The Agreement applies to deployment (digging) in areas/locations subject to public regulation, such as in road areas where the public authority must give permission for digging. A link to the Industry Agreement: http://www.teleindu.dk/t2w_757.asp There is also a solution that seems to provide useful support to the undertakings operating in the civil work activities is run in Denmark provided by the company GlobalConnect (see www.globalconnect.dk)[81].	**GOOD**
7	***EE***	No specific measures are known to have been adopted[82]	**NOT-RELEVANT**

[77] Deloitte study
[78] Public consultations
[79] Deloitte study
[80] ibidem
[81] Deloitte study, Public consultations, Analysys Mason
[82] Deloitte study

8	***FI***	In Finland there are regular meetings among different utility companies, municipalities and telecom companies. In these meetings participants share their plans and decide how and where it's possible to cooperate. For example the City of Joensuu has for years held regular joint construction meetings between different parties. The meetings are mainly occasions in which the parties are informed about matters. A state-owned company "Johtotieto Oy" has an internet-based service where operators able to share information on the planned works with each other to facilitate joint construction http://www.yhteiskaivu.fi[83] Prior to the launch of the portal, in December 2010, LVM published a guide to best practice for jointly constructing infrastructure. This was produced after interviewing a number of operators, and listed a number of challenges faced by such a scheme. Currently, there is no dispute resolution process in place, and is thought that in the case of a dispute, parties are left to negotiate freely between themselves.[84]	**BEST**
9	***FR***	Construction companies and builders must inform local communities of works on public buildings and thorough fares - the DICT (Déclarations d'Intention de commencement de Travaux)[85]. Infrastructure owners who are about to carry out installation or maintenance projects of „significant length (~150m in urban areas and ~1km in rural areas) are obliged to announce their plans for surface works (such as stripping and replacing surfaces/façades), works on overhead lines, and any works which require excavations to the local authorities. These infrastructure owners are also obliged to allow operators to install electronic communications equipment in any trenches that are created during the work. The operator must compensate the infrastructure owner for any extra costs that are incurred during the process, and the operator subsequently becomes the owner of the electronic communication equipment that has been installed, and thus is ultimately responsible for maintaining it.[86] A 2009 French law (L49 CPCE) requires local authorities to inform operators in particular of their willingness to launch new construction projects or to improve existing infrastructures (beyond a given length). In this case, operators or other public authorities can request permission to install their electronic communications cables. This permission can only be refused for reasons of security or network integrity. They must bear the additional costs of hosting the cables and part of the common costs. At regional level, there are some isolated initiatives. One example is CRAIG (Centre Régional Auvergnat de l'Information Géographique) : http://www.craig.fr[87].	**GOOD**
10	***DE***	The coordination of regional public works is normally in the competence of local authorities, and therefore it is a matter for the local administration. The annual coordination meetings initiated by the local authorities with other carriers or media wishing to build networks, have proven successful. In development planning in Germany the needs of telecommunications as well as the energy and water suppliers are mandatorily taken into account[88].	**GOOD**

[83] Public consultations, Deloitte study
[84] Analysys Mason study
[85] Deloitte study
[86] Analysys Mason study
[87] Public consultations
[88] Deloitte study
[89] Public consultations

		Some Federal States in Germany have launched first pilot inventories, e.g. the civil engineering works map ("Grabungsatlas") in Bavaria, the Hessen broadband-internet information system (HesBIS) or the construction sites map ("Baustellenatlas") in Lower Saxony. Bremerhaven has so-called "sub-groups" who hold trans-sectoral discussions about civil engineering work at regular intervals. Geographic information systems, in which construction sites are documented, are kept in part on the level of municipalities, counties or states. These are often available over the Internet and also serve other purposes such as information on traffic delays. In this context, a voluntary involvement of infrastructures that are eligible for the shared use would be quite reasonable[89].	
11	***EL***	No specific measures are known to have been adopted[90]	**NOT-RELEVANT**
12	***HU***	No specific measures are known to have been adopted[91]	**NOT-RELEVANT**
13	***IE***	Government consultations in progress[92]	**NOT-RELEVANT**
14	***IT***	An AGCOM decision is pending that would mandate: A negotiated technical framework agreement for rights of way with operators; Impose an obligation to build ducts suitable for fibre infrastrucuture for any new public work; Impose an obligation to inform AGCOM's registry of the planned works on the infrastructures.[93] In the municipality of Milan, whatever a public civil work is undertaken (e.g. road construction or maintenance works) the local authorities give the opportunity to private operators to lay their own infrastructures. In areas of new urbanization, even without the application of the operators, it's mandatory for the constructor to lay ducts, just in case of future demand by operators. The municipality of Milan, before starting planned civil engineering works, notifies all operators. Unfortunately, sometime the short time of notice does not allow operators to catch every opportunity. The sources of information used to notify about planned civil engineering works are: - written communication; - or "conference services" that is a meeting, with the electronic communication operators and the underground infrastructures owners involved in the projects, with the aim to share all the info for the project. These processes, that cover different types of infrastructure, are not very effective. It would be preferable to have an IT based process[94].	**LIMITED**
15	***LV***	Since 23.03.2012 in accordance with the Latvian Government Act for electronic communications networks construction regulations, information regarding the planned electronic communications ducts (planned for optical cables) construction works should be published on the Local Authorities internet web sites, but the regulation does not work because of paragraph's imprecise wording.[95]	**LIMITED**

[90] Deloitte study
[91] ibidem
[92] ibidem
[93] ibidem
[94] Public consultations
[95] ibidem

16	***LT***	No specific measures are known to have been adopted[96] According to the NRA, the Lithuanian government is looking to draft legislation that mandates public infrastructure companies to co-ordinate civil work, with help from the NRA. It is accepted that it is more difficult to enforce this on private companies from a practical point of view, and a softer „best recommendations guide approach is being considered instead[97]	**LIMITED**
17	***LU***	By convention (unregulated) different parties active in civil-working inform one another about planned civil-works[98]. City authorities for urban development shall share, long enough in advance (6-12 months), the relevant information about which areas are planned to be renewed and the number of new constructions planned. This will help to improve network extension planning for telecommunication operators[99]. A national construction works register is currently being developed to provide an online directory of all future civil engineering works to be carried out. In addition, guide prices will be listed for telecoms operators that are interested in participating in the civil engineering works in order to deploy their own infrastructure[100]	**GOOD**
18	***MT***	Malta's National Roads Authority road permit system informs all the utility services companies about the type of infrastructure that will be installed and gives each the chance to amalgamate any proposed works from the respective entities. This applies to all trenching works by utility services companies when installing any underground infrastructure. When the works are to be carried out on the strategic road network (arterial and distributor roads), the coordination is even more extensive and the coordination is broader and in more detail so as to minimise financial and disruptive impact.[101]	**GOOD**
19	***NL***	Since 2007 in the Netherlands local authorities have an increased role in coordinating civil engineering works in public grounds, requiring consent before actual work may start. In many cases however local authorities make use of excessive administrative fees for this role, which may even be prohibitive for actual fibre roll out.[102] The 'KLIC system' serves to coordinate works and creates a cadastre of underground infrastructures, aimed especially at avoiding damage to existing infrastructure from new works, but potentially also to explore sharing opportunities.[103] In addition, GBKN has been reported, meaning Large Scale Standard Map of the Netherlands - a detailed map which will in the future be integrated into the Registration Large Scale Tpography (BGT) - a detailed digital map of the Netherlands containing all objects such as buildings, roads, water, railroad and green objects in a unified way.[104]	**GOOD**

[96] Deloitte study
[97] Analysys Mason study
[98] Deloitte study
[99] Public consultations
[100] Analysys Mason study
[101] Deloitte study, public consultations
[102] Public consultations
[103] Deloitte study
[104] Public consultations

20	***PL***	In accordance with Article 62 of the Act for the Promotion of the Development of Telecommunications Networks and Services, road operators are required to locate telecommunications ducts within road lanes during road construction or reconstruction. Pursuant to Article 39 paragraph 6a, road operators must publish the following information on their website at least 6 months before submission of an application for a decision on environmental conditions, a road investment permit or a road construction permit: - Intention to start construction or reconstruction of the road, - Availability of the service duct. Road operators must notify the President of the Office of Electronic Communications (UKE), which publishes the information on the planned investment on its website. The UKE website also features mandatory notices published by its President in accordance with Article 39, paragraph 7c of the Act on Public Roads. The information includes the location of the planned service duct and the deadline for submission of the lease application. Browser link: http://www.ktech.uke.gov.pl/ In addition to that Poland has an inventory of the underground and aboveground infrastructure of all owners - Broadband Infrastructure Inventory System (SIIS), run by the Office of Electronic Communications.[105]	**GOOD**
21	***PT***	Mandatory regulatory system for making planned works public to facilitate sharing available, including on the CIS national centralised information system. The law stipulates that the performance of works which enable the construction or expansion of infrastructure suitable for the accommodation of electronic communication networks be made public so that electronic communication companies can become associated with the planned work. This is an obligation applicable generally to public sector companies and to electronic communication companies. The notice must contain information on the characteristics of the intervention to be performed, the period envisaged for its completion, charges and other conditions to be observed, as well as the deadline for joining the work and point of contact for obtaining clarifications, as well as any preclusive provisions affecting future interventions in the area covered by the notification. Notice of the performance of works must be given on the centralised information system CIS, to which all electronic communication companies have access (article 9 of Decree-Law no. 123/2009). Notices of the performance of works shall, in accordance with Decree-Law no. 123/2009, be given by the respective promoting entities no less than 20 days prior to the start of execution, whereas the deadline for joining the work to be performed can be no less than 15 days following the date of the notice given of the performance of the same work. To date, operators have informed ANACOM of these notices by email, whereas ANACOM, while the CIS is not operational, announces them, in a simplified manner, on its website, indicating the entity promoting the work and point of contact. In relation to the organisation requirements necessary for the establishment and maintenance of a system to register infrastructure suitable for the accommodation of electronic communication networks, as referred to above, in the particular case of ANACOM, tender specifications were drawn	**BEST**

[105] Deloitte study, public consultations
[106] Public consultations

		up with a view to launching a public tender to award the design and management of a CIS. For this purpose a Multidisciplinary Working Group was set up with personnel from the area of inspections (inspection of telecommunications infrastructure in buildings), of information systems, of regulation of infrastructure and legal. The tender specifications included the definition of the technical specifications of the CIS, whose implementation and management was to be tendered. In terms of the costs of implementing such an information system, it can be reported that in the public tender to award the CIS, published in Portugal's Official Gazette (Diário da República of 23 November 2010), a value of four million euros was considered as a base price for the procedure[106].	
22	***RO***	Transparency measures (i.e. an obligation to publish planned works on the website of local authorities) have been introduced in the recently adopted Infrastructure Law[107].	**LIMITED**
23	***SK***	No specific measures are known to have been adopted[108].	**NOT-RELEVANT**
24	***SI***	Operators must publish the intention for building their infrastructure on APEK's website and call for co-investors if there are any. Allied to this is a requirement to inform the portal of the Cadastre of the public economic infrastructure[109].	**GOOD**
25	***ES***	Recommendations have been published by the Telecommunications Market Commission. No mandatory regulatory procedures are known to have been adopted. Coordination works well at national road level but at municipal level it is said to be poor [110].	**LIMITED**
26	***SE***	Ledningskollen e-service used for checking cable location but not specifically fro enabling sharing of works.[111] The system works by splitting the entire country into 1km square grid cells; infrastructure owners then provide data on which cells they have deployments within (hence although spatial resolution is relatively high, Ledningskollen is not a true map-based system and was not conceived with the INSPIRE directive in mind). Ledningskollen will send these infrastructure owners automated messages if another party is planning on digging within this cell, thus the capabilities of the system have some overlap with the infrastructure atlas and the single information point for rights of way. Now, ~EUR600 000 of extra funding has been made available for a pilot scheme between PTS and a municipality in the south of Sweden, which aims to investigate what the cost and time savings of civil engineering works co-ordination are, whether the Ledningskollen platform is sufficient to facilitate such a scheme, and how much further development would be required. The CESAR system is currently only available to members of SSNf, and thus SSNf would have to consider modifying its business model if CESAR was to be modified into a portal for the co-ordination of civil engineering works. Any development would also require funding. The proposal for the Swedish Broadband Strategy was published in February 2007, and recommended that the viability of co-ordinating civil engineering works should be investigated by the government as a priority, in order to reduce the cost of, and speed up, the deployment of NGA services.	**BEST**

[107] Deloitte study
[108] ibidem
[109] ibidem
[110] ibidem
[111] Deloitte study, public consultations

		Further to this, in December 2011, PTS published a document that detailed its decisions and recommendations for broadband duct protocols[112].	
27	***UK***	In the UK there is a certain amount of coordination between utility companies laying equipment in a highway prior to the local authority undertaking major road works. There is little beyond this - and the company contractors rarely operate in the same road opening - they dig their own trenches. Nevertheless, there is web-based system for recording and notifying all road works under the UK's 'New roads and streets work act' of 1991. It is a well-established framework providing a standardised process in the UK for digging and re-instatement of trenches, accompanying notices provided to local authorities and to other utilities, and with set time scales. Under the terms of the legislation the highways and utilities committee has been also created, which meets on a quarterly basis to give guidance to councils on effective implementation and the coordination of works between various utilities. Under this system all works on the highway are co-ordinated and some companies are prevented from installing ducts if their works would cause too much disruption. The system is designed to protect the integrity of the highway network and the traffic disruption caused by road works, rather than any desire to co-ordinate the work in a collaborative manner. This operates in England and Wales, and the LGCSB plans the creation of an online application and tracking process for the management of applications for road opening permits in Ireland[113]. In 2007, a statement of understanding with regard to advance co-ordination was signed by four utility companies, although neither Openreach nor Virgin Media appears to have taken part to date[114]	**GOOD**

[112] Analysys Mason study
[113] Public consultations
[114] Analysys Mason study

5. STREAMLINING OF PERMIT GRANTING PROCESSES

BEST - Best practices
GOOD– Good practices of limited scope
LIMITED – Planned/Local/Basic measures
NOT-RELEVANT – No relevant measures reported
NA - No information available

	Country	Status	Measure
1	***AT***	The 2003 Austrian Telecommunication Act (Telekommunikationsgesetz – TKG) grants wayleave rights to telecoms companies, for public property such as streets and pavements, and grants conditional rights for wayleaves on private land, subject to compensation for the land owner. Municipalities cannot refuse rights of way, but have some powers to impose conditions regarding issues such as the timing of any street works[115].	**GOOD**
2	***BE***	No specific measures are known to have been adopted[116]	**NOT-RELEVANT**
3	***BG***	No information available[117]	**NA**
4	***CY***	The NRA has a strong coordination role and acts as a contact point, intermediate between the providers and the local authorities[118]	**LIMITED**
5	***CZ***	Government ministries responsible plan to prepare guidelines for local construction authorities to simplify the procedure for permits and rights of way, to revise the Construction Act in order to streamline the administrative process and to provide coordinated information on telecoms infrastructure (on public property) and on ongoing construction sites, in order to reduce the overall cost of network deployment and the administrative burden[119]	**LIMITED**
6	***DK***	No specific measures are known to have been adopted[120]	**NOT-RELEVANT**
7	***EE***	No specific measures are known to have been adopted[121]	**NOT-RELEVANT**
8	***FI***	Permits to lay cables along public roads are concentrated to ELY in the city of Tampere, as one-stop-shop[122]	**LIMITED**
9	***FR***	Access to infrastructure, overseen by the French electronic communications and postal regulatory authority (ARCEP) is to be provided on a non-discriminatory basis by France Telecom, which must grant reasonable requests for access, make capacity available where constraints exist ("desaturation"); and provide planning information[123].	**LIMITED**
10	***DE***	The Federal Network Agency, BNetzA is able to provide a right of use of public traffic ways free of charge for telecommunications lines serving public services. Private land owners are obliged to give access but if not given can be enforced within 10 weeks by the Agency[124].	**GOOD**

[115] Analysys Mason study
[116] Deloitte study
[117] ibidem
[118] Codification of the provisions for granting rights of way
[119] Deloitte study
[120] ibidem
[121] ibidem
[122] Contribution of the Finnish Ministry of Transport and Communications
[123] Public consultations
[124] ibidem

11	***EL***	A single point of contact is being established instead of the current 18 different authorities for antennas and base stations permit granting. Exemptions have also been made for small antennas and low emission sites, which provide time benefits and legal certainty, and electronic submission of applications is being introduced[125]	**BEST**
12	***HU***	No specific measures are known to have been adopted[126]	**NOT-RELEVANT**
13	***IE***	According to the Irish Department of Communications, Energy and Natural Resources (DCENR), existing public infrastructure is being used to facilitate the deployment of NGA networks, with fibre being deployed along existing rail, electricity, road and gas infrastructure. The DCENR already publishes maps of existing public infrastructure, and has also been considering the implementation of a one-stop-shop for access to state infrastructure, which would simplify any issues surrounding rights of way and administrative procedures for service providers[127]	**LIMITED**
14	***IT***	Permission is granted by regulatory statute and is delivered through means such as local zoning planning and integrated development plans [128]	**LIMITED**
15	***LV***	No specific measures are known to have been adopted [129]	**NOT-RELEVANT**
16	***LT***	No specific measures are known to have been adopted [130]	**NOT-RELEVANT**
17	***LU***	No specific measures are known to have been adopted [131]	**NOT-RELEVANT**
18	***MT***	No specific measures are known to have been adopted [132]	**NOT-RELEVANT**
19	***NL***	1998, this legislation was updated to give rights to all providers of electronic communications networks. In 2007, the legislation was further updated with the Telecommunications Act to remove the power of public bodies such as municipalities to deny rights of way for licensed companies wishing to install electronic communications networks. According to Article 5: - Public bodies must tolerate access to their grounds for operators to install or maintain cables. - This obligation is also extended to uninhabited privately owned land, although rights of way are automatically granted to inhabited privately owned land for the case of connecting a building to a telecoms network, and in this case the operator is also permitted to carry out any required maintenance or the removal of existing wiring where necessary. - If a body is constructing overhead wires for a non-telecoms use, such as power distribution, that body is obliged to allow telecoms operators to co-locate and subsequently maintain wiring along the infrastructure. Digging on public land requires a permit from the concerned municipality prior to digging. Written notice must be made to both the Mayor's office and the city council about the work, detailing the proposed time, place, and how substantial the proposed works are. In order to ensure public safety and	**BEST**

[125] Analysys Mason study
[126] Deloitte study
[127] Analysys Mason study
[128] Deloitte study
[129] ibidem
[130] ibidem
[131] ibidem
[132] ibidem
[133] Analysys Mason study

		reduce civil disturbances, the Mayor's office may impose requirements on the place of work, the timing of works (which must be within 12 months of the request). Municipalities must promote sharing, and thus also co-ordinate upcoming civil engineering works or duct sharing where possible, in order to minimise civil disruption. Automated or electronic systems are therefore likely to exist in some municipalities, as the system is broadly standardised. When wishing to work on private land, operators must send a letter to the land owner detailing the proposed plans, and undertake an individual negotiation. If no response is received after four weeks, a second letter is sent. The land owner can either then allow the operator to carry out the works, or raise a dispute with OPTA. If no dispute is raised within two weeks of the second letter, the operator is allowed to carry out its planned works. Automated or electronic systems might therefore be inappropriate for the case of private land owners, as each case is negotiated individually and some land owners may not have access to a computer. A key detail in the regulations is that there is no compensation for access for either private or public land owners. Operators are obliged to ensure that excavated ground is replaced and brought back to its original condition. Municipalities normally charge an administration fee for the required permit, but this is generally small, and is not compensation for digging. This makes deployment relatively cheap (in addition, the ground in the Netherlands is generally soft, so digging is cheap). However, operators are obligated to move cables should a land owner decide to carry out ground works, such as digging foundations for a new building, building a swimming pool or landscaping on the site where cables have been previously laid.[133]	
20	***PL***	In Poland since 2010: - Building owners are obliged to provide access to their building, and in particular the wiring distribution point/room within the building. If there is a duct system within the private land that is suitable for the deployment of telecoms equipment, and no alternative duct network exists, the owner of that duct is obliged to provide access to the operator seeking access to the duct. These access agreements must be resolved within 30 days of an initial access request. - If an end user living in an unconnected building requests a connection, the building owner is obliged to allow an operator to carry out installation and maintenance works within the building. All works are paid for by the operator. A private property owner is obliged to allow operators or local self-governments to deploy telecoms infrastructure to buildings on or above its land, providing that this does not lead to a „significant decrease in value of the property. The property owner must also allow access to its land for any maintenance of installed infrastructure. This sort of access will require the infrastructure owner to pay the building owner a fee, except in cases where the infrastructure is being used to connect the building to the network. The fee is to be negotiated between the two parties. For rights of access to public utility infrastructure, the procedures are slightly different. The body in charge of the public utility infrastructure is obliged to engage in negotiations with telecoms operators wishing to access the infrastructure. The president of the Office of Electronic Communications may intervene in negotiations in case a dispute may arise, in order to resolve the negations within 90 days of the access request.	**GOOD**

[134] ibidem

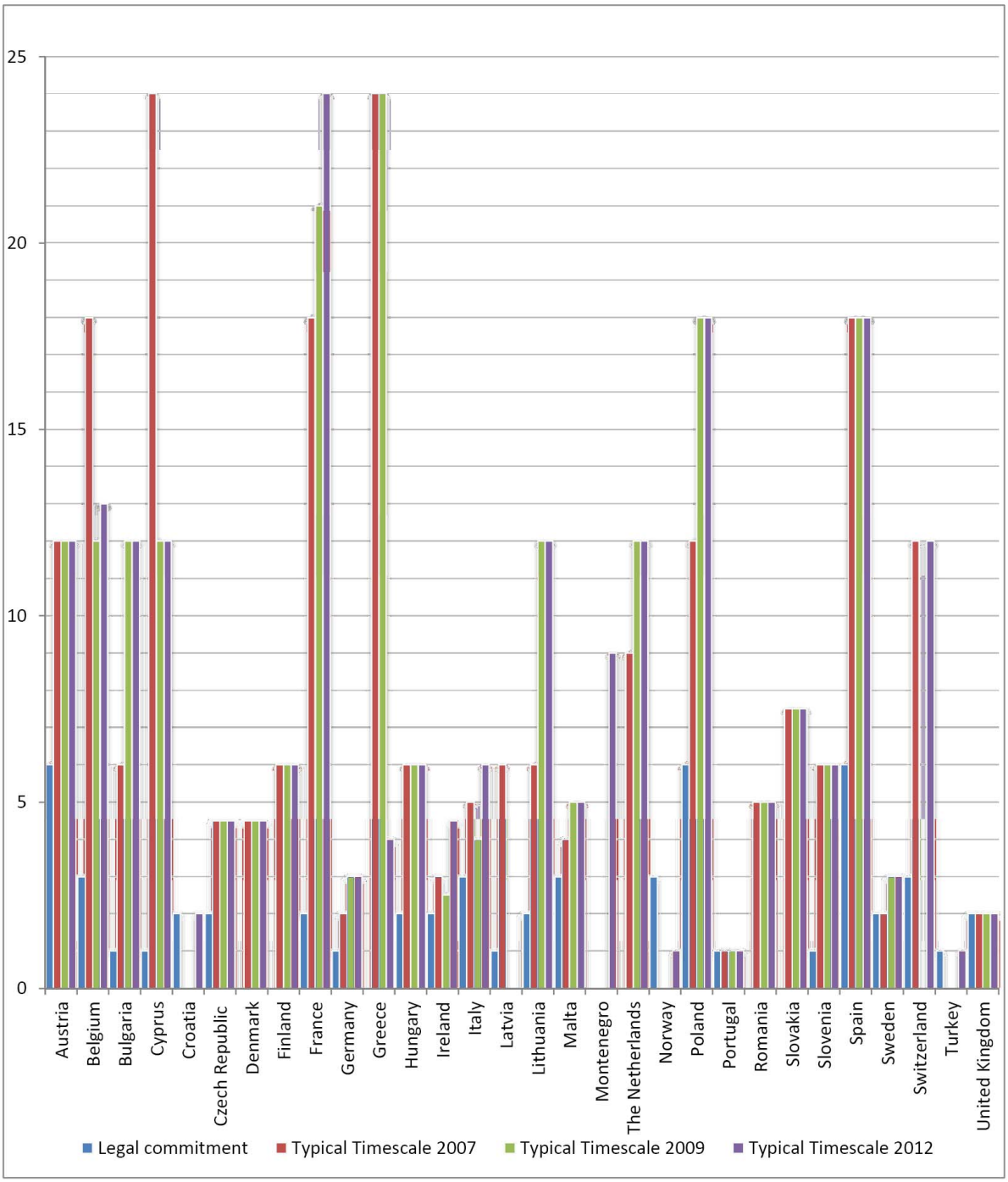
		However, the disadvantage of the scheme is that power is handed over to local self-governments to develop, use or acquire the rights to telecoms infrastructure and networks. In addition, the local self-governments must keep a record of infrastructure acquisition rights and must take responsibility for granting rights to the construction and maintenance of telecoms infrastructure, as well as supervising and regulating the works. This has made deployment relatively expensive as operators must pay an annual tax for deployments that are over public land, and additionally must pay an ongoing fee for any deployments along roads. As the self-governments are free to set these prices, there have been a number of complaints from smaller operators claiming that they struggle to compete with large ones. As a result, the NRA is looking to draft new legislation to ensure that operators are not overcharged for deployments. In addition to taking responsibility for co-ordinating access requests to third-party infrastructure, local self-governments must also respond to requests to access publically owned infrastructure, in which case the self-government is treated as a party with SMP and thus must respond to access requests within 30 days of receipt. Currently, there is no formal procedure in place for dealing with disputes between local self-governments and operators. Disputes are normally raised with UKE, but often resolving them requires drafting new legislation, which is a difficult, complex and time-consuming process.[134]	
21	***PT***	Decree-Law no. 123/2009 determines that the construction of infrastructure is subject to a procedure of prior notice given to the responsible local authorities, limiting cases where authorities may oppose intervention, narrowing the grounds for such opposition to typical situations. The costs incurred for access to and use of the public domain in the possession of local authorities is subject only to a municipal fee for rights of way, which has a very low value. The use of infrastructure which has already been constructed is subject to rules limiting the costs and period of time needed for the necessary authorisations to be granted for its use. The procedure to be followed for obtaining access to infrastructure may not extend beyond 20 days following presentation of the request by electronic communication companies. In terms of payment, and as mentioned above, the use of infrastructure which is encompassed by the public or private domain of local authorities is subject to the payment only of the municipal fee for rights of way (article 13, paragraph 4) or when such infrastructure belongs to or is managed by another entity, its use is subject to the payment of a remuneration which, necessarily, is to be cost oriented[135]. ANACOM has stated that the CIS should contain procedures and conditions governing the allocation of rights of way over infrastructure suitable for the accommodation of electronic communication networks[136].	**GOOD**
22	***RO***	The recently adopted Infrastructure Law introduced obligations regarding the transparency and the fairness of conditions (including fees) of rights of way.[137]	**LIMITED**
23	***SK***	No specific measures are known to have been adopted.[138]	**NOT-RELEVANT**

[135] Public consultations
[136] Analysys Mason study
[137] Deloitte study
[138] ibidem

24	***SI***	No specific measures are known to have been adopted.[139]	**NOT-RELEVANT**
25	***ES***	No specific measures are known to have been adopted.[140]	**NOT-RELEVANT**
26	***SE***	No specific measures are known to have been adopted.[141]	**NOT-RELEVANT**
27	***UK***	In the UK, operators must pay landowners either an annual or a one-off fee to bury cables in their ground. This has arguably been a roadblock to the deployment of broadband in rural areas, and recently the National Farmers' Union (NFU) and the Country Land and Business Association (CLA) have agreed to either charge lower wayleave prices or to provide free access to land in exchange for free broadband access[142]. The Electronic Communications Code ("Code"), a schedule to the 2003 Telecommunications Act, enables providers of electronic communications networks to construct infrastructure on public land (streets) & to take rights over private land[143].	**LIMITED**

[139] ibidem
[140] ibidem
[141] ibidem
[142] Analysys Mason study
[143] Deloitte study

Figure: Comparison between legal requirements and typical timescales for permission granting for Base Station deployment in months [144]



[144] Source: 'Base station planning permission in Europe' by GSMA, July 2012

6. ALIGNMENT MEASURES FOR IN-HOUSE EQUIPMENT FOR NEW BUILDING PROJECTS

BEST - Best practices
GOOD– Good practices of limited scope
LIMITED – Planned/Local/Basic measures
NOT-RELEVANT – No relevant measures reported
BASIC – Only asymmetric obligations to provide access to ducts
NA - No information available

	Country	Status	Measure
1	***AT***	CAT6 cabling is current practice in new office buildings in some states (eg. Tirol)[145]. The access to ducts can be subject to SMP regulation[146]	**GOOD**
2	***BE***	Fibre to the Home is an ambition of the Belgian digital initiative[147].	**NOT-RELEVANT**
3	***BG***	No information available[148] The access to ducts can be subject to SMP regulation[149]	**BASIC**
4	***CY***	Regulations relating to in-house wiring coordination are due to be published[150]. The access to ducts can be subject to SMP regulation[151]	**BASIC**
5	***CZ***	The legislation for construction permits (Act No. 183/2006 Coll., the Building Act) and its implementing regulations apply to all buildings regardless of their mode of financing, i.e. also to publicly financed constructions. The relevant building regulations lay down guidelines for the application of public interest. Construction of electronic communications is partially favoured, unlike other structures and facilities, they are only subject to simpler assessment and no authorization processes. In line with § 103 paragraph 1 point. b) Section 1 of the Building Act they do not require notification or building permit, and after completion they can be used immediately[152]	**LIMITED**
6	***DK***	No specific measures are known to have been adopted[153] The access to ducts can be subject to SMP regulation[154]	**BASIC**
7	***EE***	No specific measures are known to have been adopted[155] The access to ducts can be subject to SMP regulation[156]	**BASIC**
8	***FI***	New and renovated apartment blocks must implement CAT6 in house wiring. In addition each room has to have at least two telecom outlets. The same law also includes the old apartment houses which are being renovated. Operators install access equipment to the buildings, but internal networks and customer equipment are on building owner's or customer's responsibility[157].	**GOOD**

[145] Deloitte study
[146] Own sources/Cullen analysis
[147] Deloitte study
[148] ibidem
[149] Own sources/Cullen analysis
[150] Deloitte study
[151] Own sources/Cullen analysis
[152] Public consultations
[153] Deloitte study
[154] Own sources/Cullen analysis
[155] Deloitte study
[156] Own sources/Cullen analysis
[157] Public consultations

9	***FR***	In order to encourage operators to invest in NGA deployments, ARCEP has implemented three main measures since 2009. The first two relate to the shared point at which the MDU is connected to the operators' fibre networks (the shared connection point), and applies to all MDUs in densely populated areas. The third and most recent measure is concerning the installation of in-building wiring in all new buildings. The first measure is described in Resolution No. 2009–1106, which was passed in December 2009. At this time, FTTH deployments had already begun in Paris, although difficulties were encountered when attempting to connect the fibre network to buildings. The law originally dictated that fibre networks could be shared at the connection point to a building, in order to minimise disruption and damage to private property, and also to enable end users to select their preferred supplier. However, this second point was not economically favourable to the operators, and additionally there were found to be technical compatibility issues with the different FTTH technologies used. Following a consultation earlier in that year, ARCEP clarified these rules for very densely populated areas as defined by ARCEP. These are 148 areas in the 20 main French cities encompassing around 3.5 million households where the regulator deems it commercially viable for a number of FTTH providers to operate. ARCEP's 2009 decisions are as follows: - The equipment installed must be compatible with the different FTTH technologies, i.e. passive optical network (PON) and point-to-point (PtP). As well as ensuring competition, this measure also has the aim to encourage technology neutrality. - If an operator connects a building to its FTTH network, that operator is obliged to allow other operators to provide services through the equipment that the first operator has installed should an end user request services from another operator. -Access to shared connections must be granted in a non-discriminatory and transparent manner. Prices are not regulated as such by ARCEP; instead, each operator is required to submit a reference offer, detailing the technical and financial conditions of access. The three main operators' reference offers are fairly aligned in terms of pricing. Refusal of access is prohibited. -The first operator that connects the building to its FTTH network becomes the building operator and thus is responsible for managing the associated infrastructure. If there is no obvious building operator (for example on a newly built property), the owner of the building is able to designate a building operator. The building operator does not necessarily provide the end-user service, and may choose to be a neutral manager, providing passive access to the network Although the guidelines helped to clarify the rules of deployment, there were a number of disputes between operators regarding this regulation. As a result, a second measure was introduced, with clarifications made to the ruling in 2010. Article 2010–1312 was primarily used to create the rules of fibre deployment in less densely populated areas, encouraging collaboration between the main operators in places where the business case for deploying fixed NGA is less clear. However, the Article was also used to update Article 2009–1106, by stating that the preferred location of the building's access point was to be within the private premises of the building.	**BEST**

[158] Analysys Mason study
[159] Public consultations

		The third measure is slightly different and related to all areas of France. It was passed at the end of 2011 (Article R. 111-14, from the Ministry of Housing) and obliges all those applying for a construction permit from April 2012 to equip the associated building with vertical fibre, connecting all residential units to a central fibre access point. The measures are new, and the technical details have not been finalised as yet; this has been causing some compatibility concerns for operators and construction firms. In addition, it is unclear as to whether the measures are confined to new buildings or also include refurbishment projects, as the specific wording of the Article simply refers to the application for a building permit[158]. In addition there are many guidelines issued by professional organisations. For example, Union Technique de l'Electricité et de la Communication (http://www.ute-fr.com), a French national organisation for standardisation in the domain of electronics, member of the International Electrotechnical Commission (http://www.iec.ch) and the European Committee for Electrotechnical Standardisation (http://www.cenelec.eu), has edited three essential guides to help professionals in deploying in-building and in-house infrastructures. The Guide pour le raccordement des logements neufs à la Fibre optique is addressed to the construction market and explains the ways to update structured cabling into fibre, single and multifibre, with a cost reduction aim.[159]	
10	***DE***	In Germany, the Telecommunication Act states that the NRA may order proprietors or users of house wiring or ducts to give access to telecommunication operators. According to fire safety standards electronic communications operators have to use ducts of metal (instead of -maybe already existing - cheaper plastic ones) on the stairs for higher heat resistance. In most parts of Germany, the 2005/0738/D guideline on fire protection requirements for conduits, issued 17 November 2005, is the relevant framework. Deutsche Telekom follows this guideline and is, thus, required to have its equipment approved only once by the lower construction authority ("Untere Baubehörde") in order to use it in a mass roll-out. Additional individual approval procedures are only needed for non standard-equipment, which may be necessary in special cases. However, in some federal states, where this guideline does not apply, Deutsche Telekom is required to have its standard equipment approved again even if it follows the guideline applied elsewhere in Germany. This leads to additional costs but no additional safety for consumers[160]	**LIMITED**
11	***EL***	No specific measures are known to have been adopted[161]. The access to ducts can be subject to SMP regulation[162]	**BASIC**
12	***HU***	No specific measures are known to have been adopted[163]. The access to ducts can be subject to SMP regulation[164]	**BASIC**
13	***IE***	In 2011, the DCENR launched a public consultation regarding NGA-ready buildings in Ireland. The paper sets out proposed detailed technical regulations for an open-access interface for connecting new residential buildings to FTTH networks, along with recommended standards for in-building wiring. The recommendations are only for new buildings, as the	**LIMITED**

[160] Public consultations
[161] Deloitte study
[162] Own sources/Cullen analysis
[163] Deloitte study
[164] Own sources/Cullen analysis

		DCENR acknowledges that retrofitting buildings is often difficult and costly[165]. The access to ducts can be subject to SMP regulation[166]	
14	***IT***	The installation of ducts and spaces (the s.c. "multiservice" ducts) are included in the works of "primary urbanization" (power, sewage, water) for new buildings. As a consequence there is an obligation for the builder to make these infrastructures available inside the buildings; are now the non mandatory standards published by the Italian Electro Technical Conference (CEI). There is also a new law from **Lombardy** Region (Lombardy Regional Law 18/04/12 n. 7)[167]. The access to ducts can be subject to SMP regulation[168]	**LIMITED**
15	***LV***	Since 17.03.2011 there is a Government Act for electronic communications network construction; however, there are not too many statistics so it is too early to draw conclusions[169]	**LIMITED**
16	***LT***	Measures were introduced in 2009 following a consultation launched by the NRA, which resulted in telecoms operators being mandated to connect MDUs to their fibre network using ducts with a diameter greater than 90mm. This came about as operators had previously been directly burying cables, which resulted in the same ground being dug up numerous times as each operator would connect to the MDU separately. In addition, equipment installed by operators for the distribution of vertical and horizontal wiring must leave enough space to accommodate other operators[170].	**GOOD**
17	***LU***	Local authorities invited by government to implement regulation to ensure fibre in new builds from 2011. National strategy circular for high-speed networks of November 18th 2011 recommends the municipal authorities to introduce the obligation of installing in-house fibre cabling in newly constructed buildings in the municipal construction laws.[171]	**LIMITED**
18	***MT***	Minister has powers to draw up specifications to apply to new builds – including the provision of fibre. In November 2011, the Building Regulations Act came into force. This Act gives the power to the Minister to establish building control regulations in relation to a number of matters including electronic communication services installations. Work is currently underway to establish an adequate framework vis-à-vis in-house wiring so that we facilitate the deployment of fibre-to-the-home (FTTH) whilst ensuring competition and consumer choice[172] The access to ducts can be subject to symmetric regulation[173]	**LIMITED**
19	***NL***	No specific measures are known to have been adopted[174]. The access to ducts can be subject to symmetric regulation[175]	**BASIC**
20	***PL***	Work is currently underway to establish an adequate framework vis-à-vis in-house wiring so that to facilitate the deployment of fibre-to-the-home (FTTH) [176] In November an ordonance of the Minister of Transport was adopted defining the scope and character of the obligations related to deploying fibre	**GOOD**

[165] Analysys Mason study
[166] Own sources/Cullen analysis
[167] Public consultations
[168] Own sources/Cullen analysis
[169] Deloitte study
[170] Analysys Mason study
[171] Deloitte study, Public consultations
[172] Public consultations
[173] Own sources/Cullen analysis
[174] Deloitte study
[175] Own sources/Cullen analysis
[176] Own sources(contacts with the Ministry)

		in new buildings and ensuring access to existing infrastructure. The provisions will start binding as of February 2013.	
21	***PT***	It is obligatory for all new builds and renovations to incorporate fiber. The regimes governing telecommunications infrastructure in buildings (ITED) and telecommunications infrastructure in housing developments, urban settlements and concentrations of buildings (ITUR) were established by Decree-Law no. 123/2009. These are essential instruments which have proved useful in the regulation and definition of rules governing access by high-speed communication network operators with respect to buildings and housing developments and urban settlements. The final versions of the technical manuals known as the ITED Manual (technical prescriptions and specifications of telecommunication infrastructure in buildings – 2nd edition) and the ITUR Manual (technical prescriptions and specifications of telecommunication infrastructure in housing developments, urban settlements and concentrations of buildings – 1st edition) were considered by CENELEC as being the best and most consistent technical manuals, serving the interests of telecommunications operators and consumers by eliminating access barriers (ducts and cables)[177].	**BEST**
22	***RO***	No specific measures are known to have been adopted[178].	**NOT-RELEVANT**
23	***SK***	In accordance with the ECA new constructions of buildings intended for business or buildings with several apartments must be built in the manner to allow shared access of the in-house wiring for all operators to each customer separately[179].	**LIMITED**
24	***SI***	No specific measures are known to have been adopted[180]. The access to ducts can be subject to SMP regulation[181]	**BASIC**
25	***ES***	Spain has measures in place to enable building improvements which are part of general building review requirements (and which are tax deductible) in addition to Greenfield sharing provisions under Article 12 of the Framework Directive (Spain and Portugal for instance). Since 1998, there is a national regulation in force which passed in-building telecoms under exclusive competence of the central government regarding telecommunications. An obligation was introduced to equip all new buildings and buildings undergoing refurbishment with *common infrastructure* for telephone lines, TV connections (analogue and satellite) and broadband. At the time, these broadband measures consisted of installing either wiring or empty ducts that joined each apartment to a central in-building chamber (which was often located in the basement), which was designed for the location of equipment for broadband switching and distribution. The legislation included detailed technical regulations regarding the installation of the infrastructure, such as detailing the requirements for twisted copper pairs and TV coaxial cables. The infrastructure is owned and maintained by the building owner, not a particular operator; this was in response to disputes arising over the operator-owned telecoms equipment in pre-1998 buildings. In addition, a symmetric regulation was put in place that mandated any operator that installed NGA infrastructure within any building	**BEST**

[177] Public consultations
[178] Deloitte study
[179] ibidem
[180] ibidem
[181] Own sources/Cullen analysis
[182] Public consultations, Analysys Mason study

		to share it with other operators. A further update in 2003 added digital terrestrial television (DTT) distribution to the list of required common infrastructures. The legislation was significantly overhauled in March 2011, in light of DAE targets. Royal Decree 346/2011 (March 2011) approved the regulations governing common infrastructure for access to telecoms services inside new buildings. In addition, Order ITC 1644/2011 (June 2011)set out the regulations for installing the infrastructure. Constructors of new buildings (and buildings being refurbished) must now install passive NGA infrastructure such as fibre or coaxial cables that connect each apartment to the central distribution chamber. The regulations apply to all buildings that have „horizontal properties" – that is, where there are multiple owners – and so includes office blocks and businesses as well as MDUs. Before new construction projects are approved, a consultation must take place between the construction firm and the broadband operators in the local area, and this is supervised by the Ministry of Industry, Trade and Tourism. The consultation must assess which NGA deployments are in the local region, and thus determine what type of infrastructure will be suitable for deployment within that building. If there is infrastructure competition in the area (e.g. both cable and FTTH), then more than one type of technology must be deployed in the building. Deploying multiple infrastructures is more expensive than just one, but the Ministry believes this is necessary from a competition perspective. However, a key aim of the consultation is to avoid that inappropriate in-building deployments will never be used, and thus would waste money. It is optional for telecoms operators to take part in the consultation process, and if they wish to must commit to exchanging information and responding to requests from network designers when requests are made. However, as one of the key objectives of the Decree is to increase the supply of NGA services to end users and to promote competition, it would appear to be within the operators' interest to take part in the scheme. Service competition is also encouraged by the requirement for fibre operators to share the in-building fibre network. With the exception of DTT, where amplifiers are installed, normally only passive infrastructure is installed. However, regulations also extend into individual dwellings, with a minimum number of sockets per apartment specified for new construction projects. There are also construction standards published by telecommunication Engineering College under which buildings constructed after 1995 should be apt to copper and cable. Any operator which reaches the building has the opportunity to provide services to any of its households. For buildings constructed after April 2011 this regulation has been updated to include fibre cables[182].	
26	***SE***	No specific measures are known to have been adopted[183]	**NOT-RELEVANT**
27	***UK***	The UK government has relied on a non regulatory approach, a policy of issuing guidance rather than intervention. The section 38 of the UK New roads and streets work act requires that a building developer has to have tendered to providers of broadband infrastructure to install network in the new build areas. The responsibility for making this provision available was given to the local authority, which in the event of completion without broadband infrastructure was legally prevented	**LIMITED**

[183] Deloitte study

		from taking ownership of the linked roads, drains and sewage services, effectively foregoing ownership of the new build construction[184].	

[184] Public consultations

EUROPEAN
COMMISSION

Brussels, 26.3.2013
SWD(2013) 73 final

Part 3

COMMISSION STAFF WORKING DOCUMENT

Impact Assessment
Annex IV-part 1

Accompanying the document

Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on measures to reduce the cost of deploying high-speed electronic communications networks

{COM(2013) 147 final}
{SWD(2013) 74 final}

Final report for
the DG Information Society and Media, European Commission

Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013)

27 September 2012

Matt Yardley, Rod Parker, Mike Vroobel

Ref: 35207-296

Contents

Analysys Mason Limited
Exchange Quay
Manchester M5 3EF
UK
Tel: +44 (0)845 600 5244
Fax: +44 (0)161 877 7810
manchester@analysysmason.com
www.analysysmason.com
Registered in England No. 5177472

1 Executive summary

This document is the Final Report of a project carried out by Analysys Mason Limited ('Analysys Mason') on behalf of the European Commission (DG Information Society and Media) to assess the potential impact of the following five regulatory measures on reducing the cost of deploying high-speed broadband infrastructure across Europe:

- a centralised atlas of passive infrastructure
- mandated access to passive infrastructure
- a one-stop shop on rights of way and administrative procedures
- a database where all planned civil works must be published
- an obligation to equip all new buildings with high-speed Internet (100Mbit/s) as well as mandated open access to the terminating segment.

Background to the project

In its *Digital Agenda for Europe*,[1] the European Commission stated the target that "*Europe needs download rates of 30 Mbps for all of its citizens and at least 50% of European households subscribing to internet connections above 100 Mbps by 2020*."

The costs of deploying high-speed broadband infrastructure can be prohibitive, especially in rural areas, and the Commission is committed to addressing this issue. In the Commission's September 2010 communication, *European Broadband: investing in digitally driven growth*,[2] it announced plans to complete a review of cost reduction practices by 2012. As part of these plans, there is currently an open consultation with a closing date of 20 July 2012, entitled *Public Consultation on an EU Initiative to Reduce the Cost of Rolling Out High Speed Communication Infrastructure in Europe.*[3]

Civil works have been identified as the dominant cost (up to 80%) in infrastructure provision, and three main areas have subsequently been identified for cost reduction, namely: sharing of existing infrastructure, co-deployment of new infrastructure, and planning for infrastructure in new developments. Under these broad areas, the Commission wishes to evaluate the above five categories of measure that can be taken to reduce costs.

1 See http://ec.europa.eu/information_society/digital-agenda/index_en.htm

2 See http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0472:FIN:EN:HTML

3 See http://ec.europa.eu/information_society/policy/ecomm/library/public_consult/cost_reduction_hsi/index_en.htm

Our approach to the study

To assess the implementation costs and potential savings of each measure, we have considered two European case studies for each measure. In order to compile these case studies and collect the required data for a cost-benefit analysis, we have carried out exhaustive desk research and interviewed national regulatory authorities (NRAs) from ten different European Member States.

Summary of findings

The main findings from our impact assessment of each of these five regulatory measures are:

- **A centralised atlas of passive infrastructure** – Such an atlas could range from being a database that contains information on which infrastructure operators are active in what region (examples of such databases cost less than EUR10 million to implement), to a map that details the exact route of infrastructure as well as details of ownership and capacity for infrastructure sharing (which can cost many tens or hundreds of millions of euros). We believe that this measure could be an enabler of broadband deployment using shared ducts, and potential cost savings would be largely due to a reduction in the initial required investment for deployment; we note that currently duct sharing often takes place without such an atlas. An additional benefit would be the reduction in damage to existing infrastructure during excavation work, which could be between EUR10 million and EUR50 million per annum in some Member States. For this measure, we have considered Infrastrukturatlas in Germany and the mapping projects by the Agentscahp voor Geografische Informatie Vlaanderen (AGIV) in the Flanders region of Belgium as case studies.
- **Mandated access to passive infrastructure** – In many Member States, the incumbent operator is obliged to offer access to its ducts, and in some Member States a further universal access obligation has been placed on all other infrastructure owners. Clearly, the initial cost to the state or national regulatory authority (NRA) of implementing this measure is low. The ongoing cost of maintaining the measure depends on the amount of regulation required and the number of disputes that need to be resolved, though our case studies of Lithuania and Portugal suggest that this cost is low. Estimates of the savings made by sharing ducts range from 29% for a mixture of sharing and self-digging, to 75% if no self-digging is required.
- **A one-stop shop on rights of way and administrative procedures** – This measure is currently rare Europe; however, some Member States have taken steps to simplify the rights of way and administrative procedures process. Our case studies consider the Netherlands and Poland; in both states the NRA has obliged land owners to tolerate telecoms cables being deployed on their land. Again, the cost to the state of implementing this measure is thought to be low, with ongoing costs depending on the number of disputes, which itself is likely to be dependent on the clarity of the legislation. Implementing a one-stop shop is likely to require a centralised database and therefore some investment in IT. We believe that this measure is an enabler of self-deployment (i.e. without the use of shared ducts), and so it is difficult to

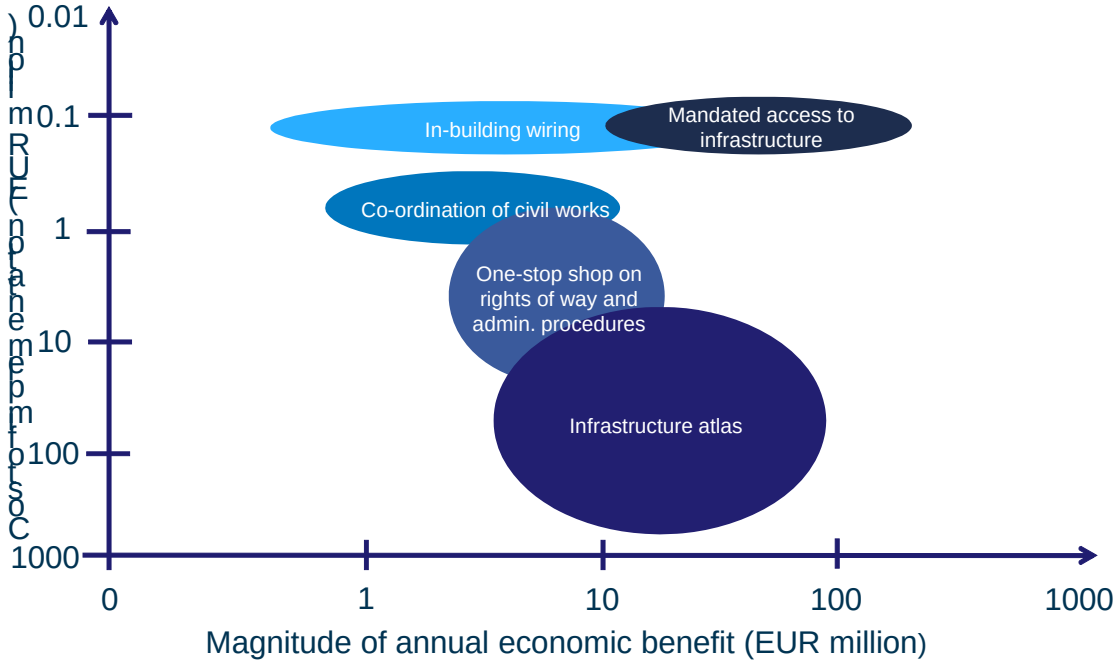
quantify the potential benefits. However, if implemented well, this measure could reduce the administrative burden on operators during the planning phase of network deployment, and could ultimately lead to greater coverage. Time savings accrued in the planning phase could also enable operators to realise revenues more quickly.

- **A database where all planned civil works must be published** – The aim of such a database is to reduce the cost of deployment by sharing the cost of excavation between operators and utility companies. Such costs can constitute as much as 80% of total deployment costs. Our case studies for this measure are Finland, which has implemented a simple web portal to encourage co-deployment, and Sweden, which is currently piloting and investigating a number of possible solutions. Evidence from our cases studies suggests that the cost of implementing these systems can range from a few hundred thousand euros, to the low millions. Estimates of cost savings vary from 15% up to a theoretical high of 60% if four operators are co-deploying. However, implementing such a system creates a number of challenges for operators, and we have examples where co-ordination of civil works could cost the operator more than if it were to deploy it alone.

- **An obligation to equip all new buildings with high-speed Internet (100Mbit/s) as well as mandated open access to the terminating segment** – This measure has been implemented in Spain and France for all new and refurbished buildings. The cost to the CMT (Spain) and ARCEP (France) of implementing this measure has been low, as the costs are principally incurred by the construction sector. Estimates of the cost of installing this wiring in a building during construction vary significantly (up to EUR20 000 for a Western European building containing 20 apartments), although this cost is thought to be small in comparison with the cost of providing utilities, such as water or gas. Additionally, the cost savings of pre-wiring a building during construction compared with fitting wiring retrospectively are thought to be significant (up to 60%). Regulations are also in place in France regarding the shared connection point to the operators' network. The French and Spanish NRAs claim that this measure has led to increased coverage, although the overall benefits may take time to be realised as this measure only applies to new or refurbished buildings.

The cost and overall benefits to an NRA of implementing each of these five regulatory measures is shown in Figure 1.1.

Figure 1.1: Estimate of the cost and overall benefits to an NRA of implementing each of the five regulatory measures [Source: Analysys Mason, 2012]



Conclusions

Overall, we estimate that **mandated access to passive infrastructure** is the measure that performs most strongly in a cost–benefit analysis, although experience has shown that it is mainly the ducts owned by incumbent telecoms operators that are the most utilised in next-generation access (NGA) deployments and that EU-level regulation is already in place to enable this. **Co-ordination of civil works** also has the potential to offer significant benefits due to the low costs of implementing this measure.

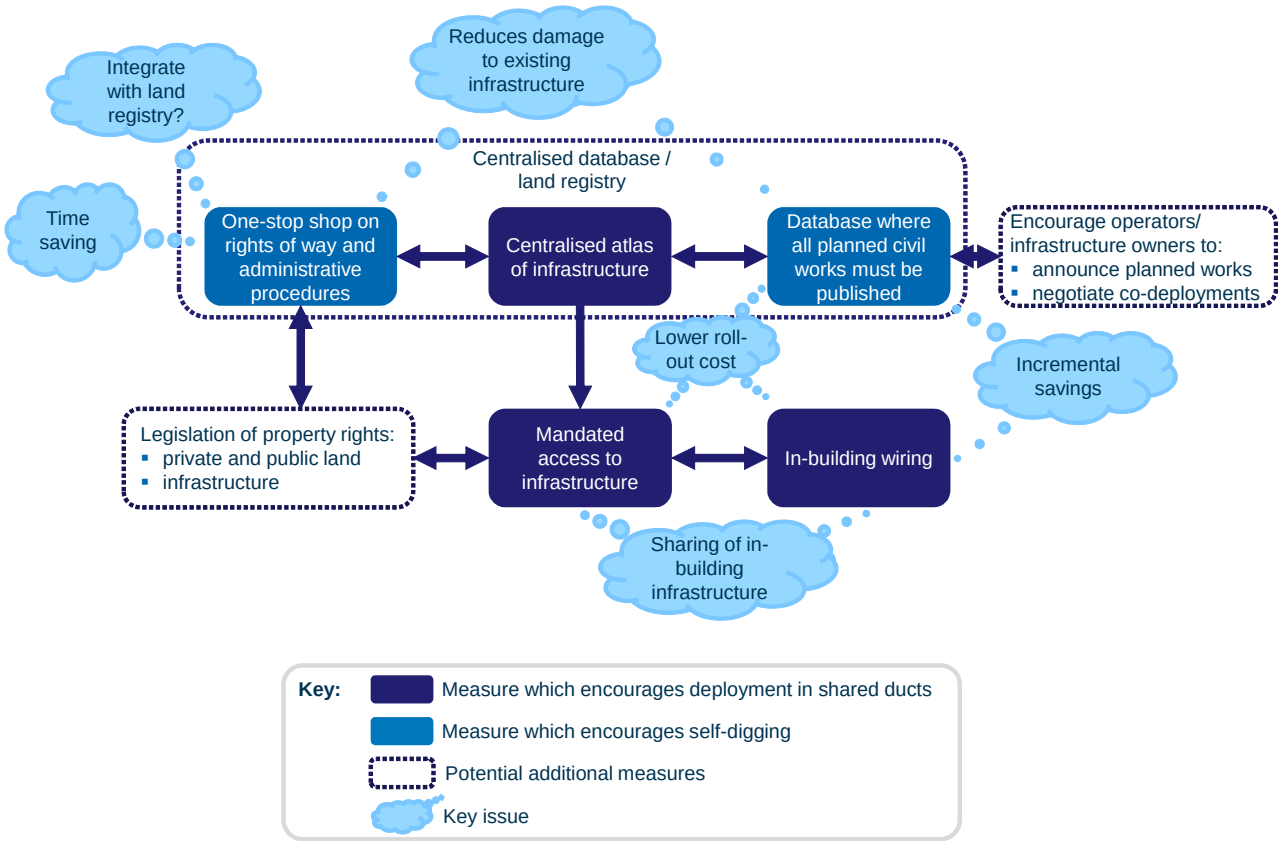
The cost to an NRA of implementing **in-building wiring** is low, but it may take some time for the benefits to materialise. Implementing a **one-stop shop for rights of way and administrative procedures** is primarily a time-saving measure, and so the economic benefits could be achieved from more rapid NGA deployments, which would in turn enable operators to generate revenues sooner.

A **centralised atlas of passive infrastructure** is an enabler of mandated access to passive infrastructure, but depending on the detail of the mapping, the land area covered and the amount of prior infrastructure knowledge, the costs of implementing such a measure could be extremely high. However, if the additional social and economic benefits of reduced damage to existing infrastructure are taken into account, such a mapping project could be worthwhile.

Furthermore, **these measures are interlinked**, in particular the centralised atlas of passive infrastructure, the one-stop shop on rights of way and administrative procedures, and the database of planned civil works, as shown in Figure 1.2. These measures all require a similar database

which could be based around a map-based portal. If implemented in parallel, it is likely that much of the IT implementation costs would overlap between these measures, and the resulting system would enable the implementation of mandated access to passive infrastructure, and thus encourage both deployment in shared ducts and self-deployment.

Figure 1.2: Summary of the effects of the five measures studied [Source: Analysys Mason, 2012]



2 Introduction

The European Commission, DG Information Society and Media ('the EC' or 'the Commission') has commissioned Analysys Mason Limited ('Analysys Mason') to undertake the study *Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment* (SMART 2012/0013). The study has assessed the potential impact of the following five regulatory measures on reducing the cost of deploying high-speed broadband infrastructure across Europe:

- a centralised atlas of passive infrastructure
- mandated access to passive infrastructure
- a one-stop shop on rights of way and administrative procedures
- a database where all planned civil works must be published
- an obligation to equip all new and refurbished buildings with high-speed infrastructure.

The EC's Digital Agenda for Europe (DAE) targets aim to achieve 100% coverage at speeds of at least 30Mbit/s and 50% household take-up of at least 100Mbit/s by 2020. In order to achieve these targets**,** Member States are investing heavily to accelerate the deployment of next-generation access (NGA) networks across Europe. Some Member States have a significant challenge ahead in achieving the required coverage, and thus there is significant interest in schemes that have the potential to reduce the cost of NGA roll-out. In those Member States that already have good coverage, lower deployment costs could increase infrastructure competition, which in turn could lead to an increased quality of service and lower retail prices.

It is widely documented[4] that civil works (i.e. digging or trenching) often makes up around 80% of the total deployment costs. Reducing this cost could have a significant and positive impact on the economic viability of some network deployments. In parallel with the Commission's recent consultation on how to reduce the cost of rolling out high-speed communication infrastructure in Europe,[5] this report considers five measures that could potentially reduce the costs associated with civil works. For each measure, we consider two case studies of Member States that have implemented these, or similar, measures. The case studies have been compiled from secondary research based on publicly available information and from interviews with key stakeholders, such as the NRAs in each of the case-study countries.

We have studied each of the proposed regulatory measures in detail, carrying out exhaustive desk research and considering two case studies for each measure. We have interviewed national regulatory authorities (NRAs) in ten different Member States in order to inform our case studies, and to benchmark the implementation costs and ongoing costs of each measure, as well as the potential benefits that they can bring. Based on this information, we have considered which

4 For example, see: http://ec.europa.eu/information_society/activities/broadband/investment/index_en.htm.

5 http://ec.europa.eu/information_society/policy/ecomm/library/public_consult/cost_reduction_hsi/index_en.htm.

measures are the most effective from a cost-benefit perspective, and thus have arrived at a number of conclusions with regards to reducing the cost of NGA deployment in Europe.

The remainder of this report is laid out as follows:

- **Section 3** presents the results of our impact assessment of a centralised atlas of passive infrastructure
- **Section 4** presents the results of our impact assessment of mandated access to passive infrastructure
- **Section 5** presents the results of our impact assessment of a one-stop shop on rights of way and administrative procedures
- **Section** Error! Reference source not found. presents the results of our impact assessment of a database where all planned civil works must be published
- **Section** Error! Reference source not found. presents the results of our impact assessment of high-speed infrastructure for new and refurbished buildings
- **Section** Error! Reference source not found. presents our conclusions

In addition, the following supplementary materials are appended to this report as annexes:

- **Annex A** gives a glossary of terms used in the report
- **Annex B** includes the notes from our interviews with stakeholders.

3 A centralised atlas of passive infrastructure

Definition: A centralised atlas of passive infrastructure is a database to which telecoms operators and other utilities send relevant information on their passive infrastructure, including ducts (e.g. actual availability, conditions for access), to the NRAs (or other responsible bodies). Those bodies would manage such information in a database and provide it only upon request to interested parties (thereby responding to security concerns).

3.1 Background

In many countries, the location and state of current infrastructure, such as underground electricity cables and water pipes, must be requested from the relevant authority or utility company as and when it is required. A number of different bodies may need to be contacted to collate this information, and it may not always be clear which authority is ultimately responsible for recording the data.

There are two principal advantages to a centralised atlas of this passive infrastructure:

- The first advantage is that operators and utility companies that are due to carry out civil works are more likely to be informed about where existing infrastructure is located, and hence are less likely to cause damage to that infrastructure when carrying out their own excavation works for new deployments. The continuous civil disruption because of damage caused in this way was an incentive to implement the measure in the Flanders region of Belgium (see Section 3.3).

- The second advantage is that such an atlas would be an enabler of passive infrastructure sharing, which could significantly reduce the cost of NGA deployment. Operators would be able to find out exactly where existing ducts lie, and may be able to place new cables and fibres within these, rather than carrying out their own excavation works and installing their own ducts, thus saving time, money and reducing unnecessary civil disruption.

Knowing only the location of ducts may not always be sufficient. It is also important to know who owns the duct, the administrative procedures for granting rights of way to the existing infrastructure, and, most significantly, whether the ducts are suitable for the deployment of additional infrastructure (e.g. whether there is sufficient space in a duct for more fibre). Such a detailed system exists in Portugal, with the incumbent telecoms operator’s ducts marked with red, amber or green lights to denote available space.

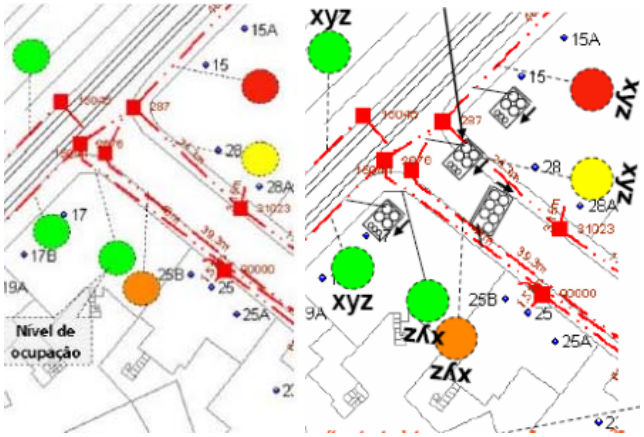


Figure 3.1: Example of Portugal's electronic map of duct locations (CIS), showing available duct capacity with red, amber and green lights [Source: ANACOM][6]

For example, a 2007 study of France Telecom's duct infrastructure conducted by the French NRA ARCEP found that in the sample areas, the proportion of duct segments suitable for installing multiple fibre networks was between 50% and 75%. Similarly, an Analysys Mason study[7] carried out on behalf of Ofcom, the UK's NRA, found that even in ducts where space is theoretically available, it may be unusable due to duct collapse, existing cable cross-over or duct engineering rules (such as regulations to prevent interference issues).

These detailed duct surveys take a considerable amount of time and money to carry out and may cause damage to the ducts. Moreover, it is not always possible to conduct such detailed surveys: a 2009 study by Analysys Mason[8] found that only 42% of planned manhole surveys were successfully carried out, due to complications such as health and safety concerns and flooding.

Whilst telecoms operators may have a good knowledge about the state and capacity of ducts closer to the core network, information about the ducts that are closer to the home is likely to be more limited. Due to the tree-like nature of telecoms networks, the total duct length will increase exponentially as the distance from the core network increases, and thus the survey costs will ramp up accordingly as the survey extends outwards in the network. As part of a study carried out on behalf of the Broadband Stakeholder Group[9] in the UK, Analysys Mason found that the total length of the lines between the cabinet and the distribution point was ten times that of the total length of lines joining the cabinets to the local exchange. (Please refer to Section 3.4.1 for greater detail on the factors that drive the cost of telecoms duct survey programmes.)

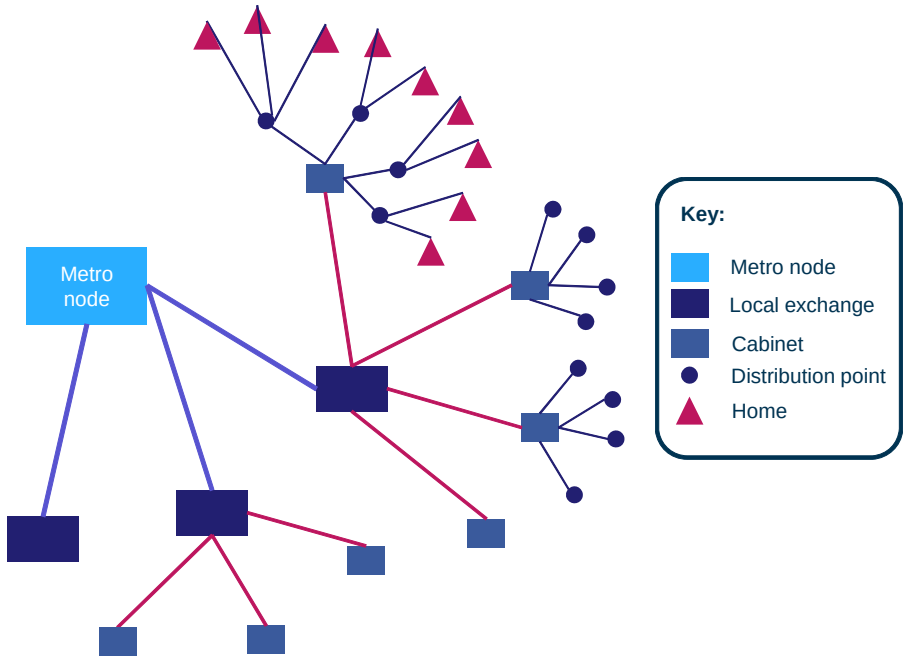
6 http://www.anacom.pt/streaming/RelatorioORAC28outubro2010.pdf?contentId=1057615&field=ATTACHED_FILE.http://www.bipt.be/GetDocument.aspx?forObjectID=3083&lang=en

7 Analysys Mason final report for Ofcom (15 January 2010), *Sample survey of ducts and poles in the UK access network*. Available at http://stakeholders.ofcom.org.uk/binaries/consultations/wla/annexes/duct_pole.pdf.

8 Analysys Mason final report for Ofcom (3 March 2009), *Telecoms infrastructure access – sample survey of duct access.* Available at http://stakeholders.ofcom.org.uk/binaries/telecoms/policy/ductreport.pdf.

9 Analysys Mason final report for the Broadband Stakeholder Group (8 September 2008), *The costs of deploying fibre-based next-generation broadband infrastructure*. Available at http://www.broadbanduk.org/component/option,com_docman/task,doc_view/gid,1036/).

Figure 3.2: Illustration of a tree-like structure of a telecoms network [Source: Analysys Mason, 2012]



Utility companies may have more detailed and accurate knowledge of their deployments than telecoms operators, as the former are more likely to be bound by regulations governing the installation and record-keeping of such infrastructure due to safety concerns (particularly for the gas and electricity sectors). It may therefore be more straightforward to collect geographical deployment information from utility companies, especially if information is already kept in electronic form. An infrastructure atlas could also have the additional benefit of reducing the damage caused to existing infrastructure during excavations works; in fact, this was the key reason for the introduction of such a system in Belgium (see Section 3.3.2).

There are a number of further issues related to this measure, and potential challenges in implementing it:

- How is the information acquired? Possible options include carrying out ground surveys and mandating infrastructure owners to provide the information. Note that in Lithuania, the incumbent operator, TEO, had told the NRA, RRT, that mapping out its entire network would be prohibitively expensive.

- Who is allowed to request information from the atlas? Network data is often treated as commercially sensitive, particularly by telecoms operators, and some companies may not wish to contribute to the atlas voluntarily.

- In Finland, concerns were expressed about the accuracy and detail of current data concerning underground infrastructure locations; for example, there was rarely any information about how deep in the ground the infrastructure is buried.

- Are ducts widely used? In Belgium, historically telecoms cables have often been buried directly in the ground rather than using ducts. Direct burial may be more common in the outer parts of the network, closer to the home, as the operators try to reduce costs when making the final connection between the home and the network. This is commonly seen in the cable networks when connecting between the network buried in the street and the home.

- How much information is already known? Are there other mapping projects in place, such as those addressing the Commission's INSPIRE initiative.[10] If so, do these projects overlap in terms of costs?

In order to consider the different ways in which these issues can be tackled, we have looked for examples in Europe, where attempts have been made to implement such an atlas. These examples are summarised in the table below. Two of these examples – Germany and Belgium – have been selected as detailed case studies for this measure, which are presented in Section 3.2 and Section 3.3, respectively.

Figure 3.3: Examples of countries that have attempted to implement a centralised atlas of passive infrastructure [Source: Analysys Mason, 2012]

Country	Description
Germany	**Case study** – see Section 3.2.
Belgium (Flanders region)	**Case study** – see Section 3.3.
The Netherlands	The Kadaster (Land Registry) is responsible for maintaining the register of cables and infrastructure in the Netherlands, using the KLIC portal. Although not a map as such, this database contains the locations of active infrastructure. Any organisation that wishes to undertake excavation work is mandated by law to check the system to see which operators are active in the area in question. The law and the system are primarily in place to avoid accidents. However, it is envisaged that the system will be further developed into a complete centralised information system to meet the EC's INSPIRE directive over the next few years.
Portugal	ANACOM, the Portuguese NRA, decided in 2009 to implement the Centralised Information System (CIS), a central infrastructure atlas aimed at reducing the cost of deploying new electronic communications equipment. Providing and regularly updating information is mandatory for all organisations that own or operate infrastructure suitable for accommodating electronic communication infrastructure (including roads, railways, water and gas infrastructure). This requirement applies to local authorities, state-owned companies, utility companies, electronic communications companies, and any other bodies that may own relevant infrastructure. It extends further to the incumbent, Portugal Telecom, which must provide information on available space within its ducts.
Poland	Polish operators are mandated to provide information on new deployments annually to the NRA, UKE. However, rather than detailed maps, they are required only to submit the location of nodes and the approximate location of connections between them. According to UKE, many Polish operators have their detailed network

[10] Infrastructure for Spatial Information in the European Community – "*an EU initiative to establish an infrastructure for spatial information in Europe that will help to make spatial or geographical information more accessible and interoperable for a wide range of purposes supporting sustainable development*"

Country	Description
	information stored as paper maps rather than in electronic form.
Sweden	There are three separate map-based projects in Sweden. The first is an annual broadband survey in Sweden that maps out which services are available to each home. The second project is inspired by the Infrastrukturatlas and aims to develop a map that shows both existing and planned network deployments, thus to encourage infrastructure sharing and to attract players to deploy in new areas. Finally, there is the dig alert system, Ledningskollen, which is designed to reduce damage to existing infrastructure during construction works. This splits the country into 1km-sided grid squares and provides information to those intending to carry out civil works regarding which infrastructure owners are active in which areas.
UK	The National Joint Utilities Group (NJUG) is a UK organisation that aims to promote best practice for public street civil works. Members include a number of UK water supply and energy companies, as well as Openreach, the local access network provider, and Virgin Media, the UK's largest cable operator. One initiative of the NJUG is to map existing underground assets to create an infrastructure atlas for the UK. In addition to the estimated 1 million kilometres of gas and water mains and sewers, and 500 000 kilometres of electricity cables, NJUG believes there are 2 million kilometres of telecoms cabling, all of which it wishes to map.

3.2 Case study: Germany

3.2.1 Market context

The German broadband market is largely DSL-based. The incumbent operator, Telekom Deutschland, was reported to have 44.7% of total broadband subscribers as of March 2012.

Cable is the most widely available form of NGA, with an estimated footprint of 76% of homes at the end of 2011, whilst DOCSIS3.0 coverage is estimated at 48%. Fibre-to-the-home (FTTH) coverage is thought to be low, although a number of cabinets have been upgraded to fibre, whilst fibre-to-the-cabinet (FTTC) coverage is estimated at around 28% at the end of 2011.

Fixed broadband penetration is just below the average for Western Europe, at 69% of households at the end of 2011, with DSL accounting for the vast majority (84%) of broadband connections. The Commission reports that, at the beginning of 2012, 7.8% of total broadband connections were of between 30Mbit/s and 100Mbit/s, and 0.4% were of 100Mbit/s or higher.

3.2.2 Measure implemented

In 2009, Bundesnetzagentur, the German Federal Network Agency, introduced the Infrastrukturatlas programme to map existing infrastructure that could be used for the deployment of NGA networks. Infrastructure covered includes:

- wired telecoms infrastructure (line profiles of fibre, including cable core networks and last-mile fibre; nodes such as main distribution frames (MDFs) and cabinets; empty telecoms ducts)
- wireless telecoms infrastructure (transceiver sites; fixed links; backhaul to transceiver sites)

- other infrastructure (utilities such as electricity, gas, water and sewers; utility poles, including antenna masts; potential antenna sites on tall buildings; windmills; church towers)
- transport networks (conduits on roads, highways, waterways and railways).

The Infrastrukturatlas framework[11] states that expanding NGA networks is important for the continued growth of the German economy, and that the cost of building fibre networks or radio links can sometimes make expansion economically unviable. The aim of Infrastrukturatlas is thus to reduce both the cost and construction timescale of NGA deployment by exploiting pre-existing infrastructure.

Infrastrukturatlas is being launched in three phases:

- **Phase 1** – In this phase, which was launched in December 2009, only Bundesnetzagentur had direct access to the database, acting as an intermediary between the database, the parties requesting data and those parties providing data. Those parties that wished to request information from the database were required to submit an application to Bundesnetzagentur. Bundesnetzagentur offered information, applications and contracts in PDF form on its website, as well as running an information hotline to cater for interested parties in Infrastrukturatlas.

- **Phase 2** – In this phase, which was launched in October 2011, Infrastrukturatlas has moved towards a system where authorised users are able to access it themselves to some extent, with Bundesnetzagentur releasing excerpts of the database to users as PDF maps, in a maximum resolution of 1:30 000. Infrastructure designated as commercially sensitive is not included in this, and access to the actual database is still reserved for Bundesnetzagentur only.

- **Phase 3** – this phase will be launched in late 2012 and will consist of a web application that will allow authorised users to view mapping information online. Bundesnetzagentur currently has no legal basis to charge a fee for requesting data from Infrastrukturatlas, and this is likely to remain the case for Phase 3.

A drawback of the system is that it does not include information on the suitability of sharing existing infrastructure. Bundesnetzagentur did want to include this information, but due to the lack of standards on duct capacity and the rapid development of infrastructure roll-out, it was decided that the project would have to go ahead without such provisions in place.

Currently, information on infrastructure location is provided to Bundesnetzagentur in electronic form, using the file formats set out in the framework. All data is collected from the infrastructure owners themselves, rather than from new ground surveys, although it is currently voluntary for infrastructure owners to take part. It is envisaged that in the future, infrastructure owners will be mandated to provide location information of their relevant infrastructure via the web application.

[11] See: http://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/BNetzA/Sachgebiete/Telekommunikation/Infrastrukturatlas/Phase2/ISA_Rahmenbedingungenpdf.pdf?__blob=publicationFile.

This is because although some bodies have embraced the scheme, some have shown no interest in sharing their infrastructure and thus do not want to provide information as to its whereabouts.

Notwithstanding these challenges, the scheme has been popular, and, as of May 2012:[12]

- 501 infrastructure owners were participating in the scheme
- 91 parties had requested to use the database
- 71 497km^2 of area had been mapped, covering a population of 3.5 million (see Figure 3.4).

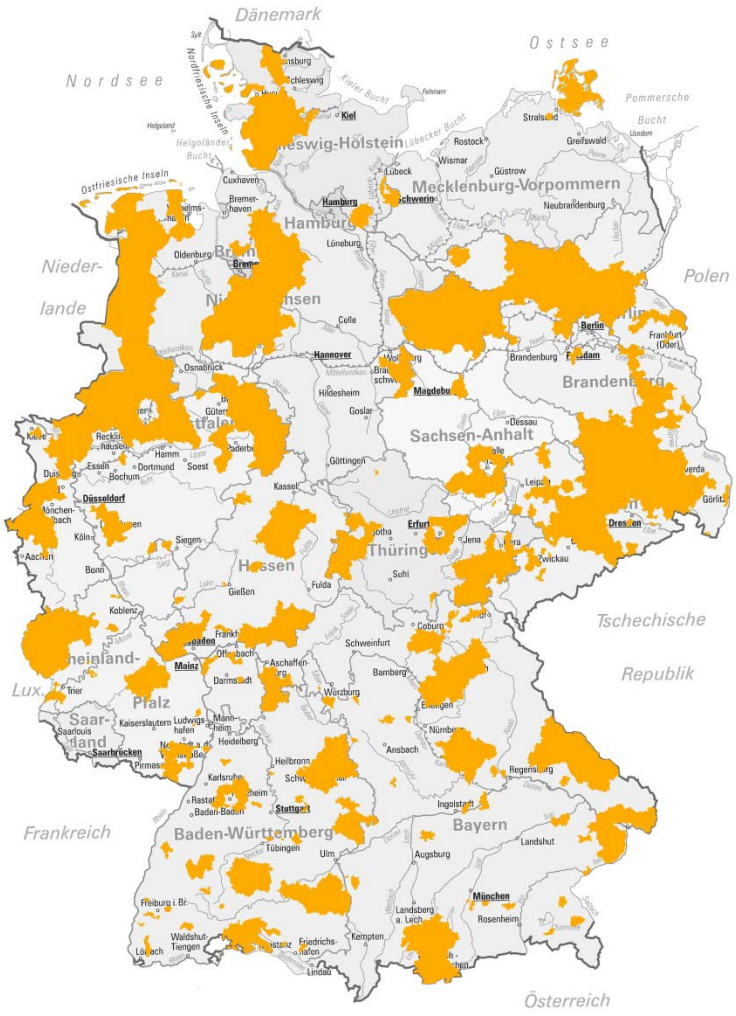


Figure 3.4: Progress of mapping Phase 1 (from December 2009 to September 2011) [Source: Bundesnetzagentur, 2012]

Note: Mapped areas are highlighted in yellow

It is noted that some users waited for Phase 2 of the project to be implemented before registering with the service.

12 Source: http://www.bundesnetzagentur.de/DE/Sachgebiete/Telekommunikation/Infrastrukturatlas/Statistik_ISA_Phase2_Basepage.html.

The project aims to cover the entire Federal Republic of Germany, but no deadline has been given for its completion. With the potential introduction of mandatory reporting in Phase 3, it is possible that the mapping progress will soon become more rapid.

3.2.3 Strengths and weaknesses

Strengths ↑	Weaknesses ↓
• Reduction in administrative/human effort in users requesting data • Potentially a key enabler of duct sharing • No ground surveys are required, which means that costs are kept relatively low for both the NRA and the operators	• High administration effort by the NRA required for collection and processing of data (i.e. the mapping process) • Operators are currently not mandated to provide the locations of their infrastructure, and so the database may be incomplete • Issues related to insurance laws concerning liability in cases of misuse of data • No information on total capacity or available capacity in ducts • May take many years to map the entire country

3.3 Case study: Belgium

3.3.1 Market context

Belgium was one of the first European countries to invest in high-speed broadband, and is one of the pioneers of copper-based NGA. The incumbent operator, Belgacom, has been deploying FTTC/VDSL for many years, and this network was reported to cover at least 81% of households by the end of 2011. Belgacom has also been trialling and deploying vectored VDSL in some areas, which is capable of delivering speeds of up to 100Mbit/s over shorter lines.

Belgium has nearly universal cable coverage (around 89%), and the vast majority of connections have been upgraded to DOCSIS3.0. Partly due to this high-speed availability, at the start of 2012, 28.5% of connections were providing speeds of between 30Mbit/s and 100Mbit/s (although just 1.5% of connections were of 100Mbit/s or higher).

As a result, Belgium has the second-highest broadband penetration in Europe, at an estimated 89% of households at the end of 2011, just behind the Netherlands.

3.3.2 Measure implemented

In 1995, the Flanders region of Belgium implemented a Geographic Information System (GIS) decree, which aimed to create a geographical database of environmental and human factors covering the region. The agency in charge of the project is known as Agentscahp voor Geografische Informatie Vlaanderen (AGIV). In 2009, GIS framework was updated with the Spatial Data Infrastructure (SDI) programme, to bring the project in-line with the Commission's

INSPIRE initiative. This consisted of three decrees, one of which is the Kabel-en Leiding Informatie Portaal (KLIP) decree, which is specifically with regards to cables and conduits.

KLIP was implemented after the Gellingen disaster, which was a large gas explosion in 2009, just one of the estimated 90 daily incidents of cable or infrastructure damage that were occurring in Belgium at the time. As of September of that year, all bodies that own or operate underground cables and pipes are obligated to register with KLIP and provide information on the areas in which they operate within 50 days of the decree being published. Furthermore, any organisations wishing to carry out excavations must submit a planning application electronically using the KLIP interface no more than 40 days in advance of commencement of works, and no fewer than 20. Those companies that do not comply are liable to a fine of between EUR50 and EUR100 000, in addition to those that do not co-operate with the new planning regulations. A small administrative fee is charged for submitting a planning application using the KLIP – in the past, planning applications were slow and complex, requiring often incomplete geographical data to be shared in paper format.

According to AGIV, the KLIP has improved the speed and simplicity of the process. Now, the company that wishes to carry out excavation work logs on to the KLIP. KLIP then contacts the operators of the infrastructure in that area, which then can check if they are affected by the planning application, and, if they are, provide the exact location of their infrastructure.

However, the database is not detailed, and the exact position of the underground wires and cables is not given, nor does it contain any information on dark fibre or empty ducts, as its focus is primarily on preventing accidents caused by excavations rather than for the ease of broadband deployment. A similar system exists in the Walloon and Brussels region (KLIM-CICC), which is linked to the KLIP database, although the KLIP is the more complete of the two.

In addition to, and currently separate from, the KLIP, AGIV has been producing the Large-scale Reference Database (GRB) since 2004, a long-term project that aims to produce an accurate map of underground cables, pipelines and surface features (such as roads and property numbers) of the whole of the Flanders region[13]. This is focused on mapping the locations of passive infrastructure, rather than being a full survey of potential duct capacity. The project is funded by the Flemish Regional Government and the utility companies, which agreed on the need to produce such a map. The project is divided up by region, and stakeholders are able to register their interest in the preliminary phase, before the mapping begins. The database is available online and access is unrestricted to most services.

13 http://www.agiv.be/gis/projecten/?artid=202

Figure 3.5: Illustration of the GRB online portal [Source: AGIV, 2012]

AGIV is currently planning a second phase of the KLIP: Informatie Model Kabels en Leidingen (IMKL). The aim of the project is to completely automate the excavation planning process, using a mapping system; this should have the effect of easing the deployment of NGA infrastructure in third-party owned ducts, as well as encouraging the co-ordination of civil works (see Section **Error! Reference source not found.**). IMKL cannot be implemented until the exact location of underground infrastructure is known, and the GRB database is complete. Thus, it is envisaged that at some point in the future, the GRB project and the KLIP database will be combined, which has the potential to create a complete map-based atlas of passive infrastructure which complies with the EC's INSPIRE directive, as well as providing a one-stop shop on rights of way and administrative procedures.

3.3.3 Strengths and weaknesses

Strengths ↑	Weaknesses ↓
• Gives those operators deploying infrastructure an idea of which other operators are in the area, and therefore an indication of any potential sharing opportunities • There are plans to upgrade the system to a full map-based database • Reduces the likelihood of accidents during construction works, thus reducing the risk of civil disruption	• The database is not currently detailed enough to be a standalone solution in reducing the cost of broadband deployment • The system was expensive to roll out and the costs of running it are high (see Section 3.4.1) • In the past, the incumbent operator, Belgacom, often buried copper cables directly rather than installing ducts, and so there is likely to be limited duct space of interest to operators in the region

3.4 Financial implications

3.4.1 Costs of the measure

Mapping projects are often expensive, with the cost being heavily dependent on the detail and scale of the mapping project implemented, as well as the amount of prior knowledge regarding the location of infrastructure.

Cost to the NRA or government

According to the European Competitive Telecommunications Association (ECTA), the initial budget for the Flanders GIS mapping project ten years ago (i.e. what is now known as the GRB database) was EUR77 million for implementation, in addition to EUR80million spread over 12 years for maintenance. The KLIP database alone cost EUR500 000 to implement and receives funding of EUR250 000 per annum.[14]

Considering the small area and population of the Flanders region, and the fact that the database is not yet detailed enough to be of significant benefit to broadband deployment, the costs of such a project in many areas might be likely to outweigh the benefits. For example, a surface mapping project in Poland which takes a similar approach (GBDOT) is costing ~EUR75 million.

However, in some cases, where there is adequate data on the location and state of infrastructure, such a map could make sense. For example, the Infrastrukturatlas in Germany has cost the NRA an estimated EUR1 million (excluding staff costs and some IT costs). Thus far in 2012, an average of 6.6 members of staff at Bundesnetzagentur have been dedicated to the project, up from 2.2 at the start of the project in 2009. The relatively low costs of implementing the Infrastrukturatlas compared to the AGIV project are because the authorities have simply collected location data from infrastructure owners, rather than undertaking a complete mapping operation. Furthermore, the incremental cost of adding newly constructed infrastructure to the database is likely to be negligible.

In Portugal, the IT systems required for the CIS database implemented by the NRA, ANACOM, have cost in the region of EUR2 million. Here, most operators have adequate data on the geographical routes of their networks and are able to upload this information to the system, and so expensive ground surveys are rarely required.

There are three separate map-based projects in Sweden. The first is an annual broadband survey in Sweden that maps out which services are available to each home. This costs ~EUR60 000 per annum to run, as well as ~300 hours of staff time to carry out tasks such as quality checking. The second project is inspired by the Infrastrukturatlas and aims to develop a map that shows both existing and planned network deployments. This is to encourage infrastructure sharing and also to

[14] http://www.corve.be/docs/english/parlementaire_vraag_egovernment-eng.pdf.

attract players to deploy in new areas. So far, ~EUR75 000 has been spent on software developers over one year to implement the required IT platform. Finally, there is the dig alert system, Ledningskollen (see Section **Error! Reference source not found.**), which is designed to prevent damage to existing infrastructure during construction works; this cost ~EUR1.8 million to implement between 2007 and 2010, and costs EUR600 000 to EUR800 000 per annum to run.

In the Netherlands, the software for the KLIC database costs the Kadaster (land registry) EUR76 000 to procure.[15] This consists of a large-scale map onto which all infrastructure owners are required to upload the location of their assets to (see Section 5.2.2). If errors are found, or unexpected cables are discovered during civil works, the excavator is able to update the database with more accurate information.

However, many of the example projects examined have multiple purposes, for example providing a portal for announcing planned civil works (see Section **Error! Reference source not found.**), or reducing the administrative burden associated with the planning or permit application process (see Section 5). Thus, it is highly likely that some implementation costs would overlap across these different measures, in particular IT costs (which have typically been found to be in the EUR several millions range), and the collection and processing of data, which could amount to many hundreds of staff hours each year.

Cost to the operators

In Germany, the operators are likely to have incurred some administrative costs from gathering and providing information to the NRA, though the exact details of this are unknown. Bundesnetzagentur has tried to minimise this cost by accepting data in a range of electronic formats. Moreover, Bundesnetzagentur does not charge operators for requesting information from the database as it is a non-for-profit organisation and has no legal basis to charge for the service.

In contrast, in the Netherlands, each request to the KLIC database costs EUR21.50, generating annual revenues of around EUR10 million. As with Bundesnetzagentur, the Kadaster is a non-for-profit organisation and thus uses this income to cover costs and reinvest in the system.

In Portugal, the incumbent operator, Portugal Telecom, is required to provide information on the available capacity of a duct using a red-amber-green system. To determine this availability, duct surveys are carried out when another operator has expressed an interest, this other operator must pay a one-off survey fee for this service, thus minimising the cost incurred by Portugal Telecom, or indeed ANACOM. These survey costs are set by Portugal Telecom's regulated duct reference offer, and amount to EUR69 per application, in addition to any additional costs incurred, such as construction costs.[16]

15 However, due to complications with the tendering process, the Kadaster had to pay out EUR10 million in compensation to other software procurement firms (see http://www.binnenlandsbestuur.nl/digitaal-besturen/nieuws/foute-aanbesteding-kost-kadaster-10-miljoen.3519485.lynkx)

16 http://ptwholesale.telecom.pt/GSW/PT/Canais/ProdutosServicos/OfertasReferencia/ORAC/ORAC.htm

Cost of surveys

As the cost of implementing an infrastructure atlas is largely dependent on the detail of the data included in the database, it might make sense in some Member States to implement such a measure using a two-phase approach. The first phase could contain geographical information of existing passive infrastructure, populated by requesting the information from the operators and utility companies; this could be similar to Infrastrukturatlas, and may cost EUR several million to implement. The second phase may provide more detailed information about the (likely) shareability of each duct, from the results of a ground survey; this could be similar to projects in Poland and cost EUR hundreds of millions to implement, depending on the geographical extent of the infrastructure mapped and the number of different types of infrastructure covered.

The advantage of this approach is that it might be possible to implement the first phase fairly quickly and at a reasonable cost to the NRA, assuming the information is readily available from operators and utility companies and no surveys are required. This might allow telecoms operators to identify expansion opportunities that they did not originally believe to be economically viable. It would also have the advantage of reducing damage to existing infrastructure during civil works, as previously mentioned, as well as increasing the opportunity for the co-ordination of civil works (see Section **Error! Reference source not found.**).

However, operators are likely to favour the wait-and-see approach if they are aware that a more detailed database is being developed. Commencing a deployment with the knowledge of duct locations but no knowledge of duct shareability would be extremely risky to operators, and they are likely to be reluctant to do so. Also, as previously mentioned, the amount of information available on existing telecoms ducts is likely to decrease as the distance from the exchange increases. The majority of the cost of deployment is likely to lie in this area, as the total length of lines increases due to the tree-like structure of a telecoms network. If little information is known, this first phase may do little to reduce the risk of operators considering new deployments. If the second phase were to be implemented, it would be very costly to survey these areas, as the total length of the network could increase by ten-fold at each stage outward (see Section 3.1).

To put this into perspective, we have estimated the cost of undertaking duct surveys of BT's network in the UK, based on Analysys Mason's experience in this area. Our calculations suggest that carrying out a nationwide inspection survey of the ducts joining local exchanges to cabinets would cost around EUR7.9 million. This would rise dramatically to ~EUR495 million if the survey were to be extended to cover the rest of the network between the cabinet and the home. The results of our calculations for different coverage areas are shown in the table below.

Figure 3.6: Estimate of costs for performing detailed duct surveys of BT's infrastructure in the UK [Source: Analysys Mason, 2012]

Coverage area (percentage of homes, in order of density)	Cost of surveying between the local exchange and the cabinets	Cost of surveying the complete access network
25%	~EUR5 million	~EUR95 million
50%	~EUR7 million	~EUR160 million
75%	~EUR11 million	~EUR250 million
100%	~EUR33 million	~EUR495 million

The results show that the majority of the cost is incurred in surveying the most rural 25% of ducts, which are furthest away from the exchange. In terms of coverage expansion, in most Member States, it may only be necessary to map out certain areas on the edge of economic viability, so a universal survey programme could be an unnecessary expense. Our calculations are based on the following assumptions:

- There are 145 000 manholes between the exchange and the cabinet, and 4.2 million footway boxes between the cabinet and the customers' premises in the UK.
- It costs EUR225 to survey a manhole and EUR110 to survey a footway box.
- The cost estimates are based on our experience of completing surveys in the UK of infrastructure from the exchange to the cabinet[17] and from the cabinet to the customers' premises.[18] However, the sample sizes in our surveys were relatively small (0.02% of chambers and 0.013% of total chambers / 0.008% of total poles respectively). It is likely that unit costs can be reduced if surveys are carried out on a larger scale.
- However, it should be noted that, in some case, it is likely that additional certified personnel may be required to remove residual gas from manholes, which would significantly increase the cost of an inspection.

Only the cost of inspecting the incumbent operator's telecoms duct network is considered; including multiple types of infrastructure would increase the costs considerably, as additional surveys would be required. However, as illustrated with the case of the UK shown in the table below, telecoms equipment is often the furthest deployed type of infrastructure.

Type of infrastructure	Length
BT / other telecoms	2 000 000
Electrical cables	482 000
Water mains	396 000
Sewers	353 000

Figure 3.7: Amount of underground infrastructure deployed in the UK [Source: The Off-highway Plant and

17 "Telecoms infrastructure access – sample survey of duct access" (Analysys Mason, March 2009).

18 "Sample survey of ducts and poles in the UK" (Analysys Mason, January 2010).

Gas mains	275 000	*Equipment, 2012]*

A number of factors determine the cost and implementation time of these surveys, and in some cases the problems encountered will make it impossible to even conduct the survey:

Restrictions by authorities

- **Traffic-sensitive areas** – it may be difficult to obtain the correct permits to access chambers located in traffic-sensitive areas. In some cases, authorities require significant notice in order to grant permission, prolonging the survey programme and increasing the cost of the project.
- **Special event restrictions**– some chambers may be located in areas restricted by the council due to special events, such as Christmas parking embargos, religious festivals and street parties, preventing access to whole areas of the network.

Health and safety issues

- **Sewage** – Analysys Mason has experience of some chambers being inaccessible for health and safety reasons due to the presence of sewage. This was because the chambers had been completely flooded, and the sewage network had spilled into the telecoms infrastructure network. It is difficult to mitigate this risk, as it cannot be predicted.
- **Deep manholes** – some access chambers may be very deep, requiring a surveyor to take extra safety precautions, causing time delays and potential disruption to the programme.
- **Residual gas** – some access chambers may contain a high level of residual gas, causing the chamber to be an unsafe place of work and making a survey difficult or impossible. It is difficult to mitigate this risk as it cannot be predicted.
- **Accuracy of infrastructure drawings** – it is possible that some operators' drawings may be out of date, and hence may not be accurate. These inaccuracies can lead to time delays, programme disruption and possibly inaccurate surveys.

Access issues

- **Hazardous objects placed on the top of chambers** – it is possible that manhole covers could be blocked by objects such as scaffolding and parked cars, making the chambers inaccessible.
- **Overgrown vegetation** – particularly in rural areas, chambers may be overgrown, leading to time delays, and programme disruption.
- **Chambers located in dense pedestrian areas** – working in chambers that are located under busy pavements, for example at pedestrian crossings, may cause an unacceptable level of congestion, as well as the potential for injury to pedestrians.
- **High cable density in chambers** – in heavily loaded chambers, the

survey of ducts and cables can be challenging, and less accurate, due to the general congestion and complexity of cable and duct arrangements.

Other issues

- **Climatic conditions** – heavy rain during a survey may result in the need for extensive pumping of chambers and manholes, leading to significant delays, and programme disruption. Analysys Mason has experience of chambers being completely flooded, making it impractical to drain the water out of them.
- **Issues relating to the surveying of poles** – these issues may include trees obstructing poles; access to the pole itself; fragile roofs; nearby overhead power lines; lower parts of poles being subject to vandalism.

Summary of costs

(EUR millions)	Implementation cost		Ongoing costs	
Member State	**NRA**	**Operator**	**NRA**	**Operator**
Belgium	77 (0.5 for KLIP)	Unknown	~7 (0.25 for KLIP)	Unknown
Germany	1	Low	Unknown	Low
Netherlands	0.076	Low	Unknown	Unknown
Portugal	2	Low	Unknown	Unknown
Poland	75	Unknown	Unknown	Unknown
Sweden	0.075 – 1.8	Unknown	0.006 – 0.08	Unknown

3.4.2 Savings from implementing the measure

A centralised atlas of passive infrastructure is an enabler of passive infrastructure sharing, and thus the cost savings associated with this measure relate to the reduced civil works required to deploy NGA networks due to duct sharing. This is quantified in Section 4.4.2.

Moreover, such a measure may have the potential to allow more infrastructure sharing than would normally be realised, and thus have the additional benefit of driving out coverage to areas that would otherwise be economically unviable.

AGIV's KLIP database has also had the benefit of significantly reducing the administrative burden related to the planning process prior to civil works taking place (this is considered in greater detail in Section 5). AGIV estimates that the system saves the authorities and the operators a combined EUR29.5 million per annum[19] in administrative and planning expenses alone.

A further benefit of such an infrastructure map would be the reduction in damage to existing cables and infrastructure during civil works; in some cases this was the main reason for implementation of

[19] http://www.agiv.be/gis/organisatie/?artid=587.

such a system. In Flanders, for instance, there were around 30 000 incidents per annum of existing infrastructure being damaged. This figure was even higher in the Netherlands, at around 40 000 incidents per annum, which equates to EUR40 million and EUR80 million in direct and indirect losses, respectively. In Sweden, one infrastructure owner has reported that incidents involving its network have reduced from 8–12 occurrences per annum to around 2 since the introduction of the Swedish dig alert system Ledningskollen (see Section **Error! Reference source not found.**). Sweden's NRA plans to collect more extensive data regarding the impact on damage to infrastructure in the near future.

It is therefore possible that the cost savings from damage to existing infrastructure alone could equate the cost of implementing an infrastructure atlas in perhaps two to three years. According to the Kadaster, in the initial years of the KLIC database in the Netherlands, overall damage to existing infrastructure was down by around 10% per annum, but this trend was broken in 2011 with a slight increase in incidents, possibly due to excavators showing less care as they attempt to cut costs. In Belgium, insurers have reported an annual decline of 3– 5% in damages to cables and pipes since the introduction of KLIP in 2007.

3.5 Summary

- In Germany, a database is being developed that aims to map out all passive infrastructure deployments in the country, and eventually make an atlas available via an online portal for registered users (such as telecoms operators and utility companies). In the Flanders region of Belgium, a less detailed database exists that provides information about which infrastructure owners are active in what area, and a more detailed mapping project is also currently underway.

- The main benefit of implementing a centralised atlas of passive infrastructure is that such a measure is an enabler of passive infrastructure sharing, which could lead to significantly lower deployment costs and also increased NGA coverage (see Section 4).

- As well as this, experience suggests that such an atlas can lead to a reduction in the amount of damage caused to existing cables and pipelines when new civil works are carried out. Although quantitative data is fairly limited regarding how much these savings can amount to, it is conceivable that it could be as much as tens of millions of Euros in some Member States, in addition to the related potential improvements in health and safety.

- In many cases, the cost of these mapping projects is high, and in some cases could be prohibitive. For the system to be complete, it would also need to include information on the available capacity within ducts – which is sometimes unknown – and ground surveys. However, to investigate these properties would add further cost. Additionally, there are issues with the information on infrastructure locations being commercially sensitive, and in Germany there have been legal concerns about the misuse of the system.

- In some cases, however, the cost to the NRA is relatively low in Member States where operators have kept electronic records of infrastructure locations, and can easily provide that data to the NRA for a central database. Additionally, implementing a system that only adds information on the potential duct capacity for sharing when a detailed survey has been requested and paid-for by an interested party could also help to minimise costs.

4 Mandated access to passive infrastructure

Definition: Mandated access to passive infrastructure involves telecoms operators and other utility companies being obliged to open up their passive infrastructure for access by interested operators, where technically feasible, and under reasonable and non-discriminatory conditions. In addition, a dispute settlement mechanism could be foreseen.

4.1 Background

As discussed in Section 3.1, allowing telecoms operators to deploy new NGA infrastructure such as fibre and cables in existing ducts owned by third parties reduces the amount of excavation work required, and results in initial time and cost savings, as well as reduced civil disruption. It may also allow some deployments that would normally have a challenging business case to become economically viable, due to the associated cost savings; this is normally of particular importance in areas of low population density.

Historically, the majority of infrastructure sharing has been based on private agreements between companies, or the use of infrastructure made available by public organisations. However, there has been a growing trend across Europe of mandating infrastructure owners to allow access to telecoms operators for the purpose of broadband deployment.

Examples include European NRAs mandating telecoms operators that are deemed to have significant market power (SMP) to open up their ducts to smaller, competing alternative telecoms operators (altnets), resulting in asymmetric regulation. Examples of this include, but are not limited to, Telefónica (Spain), Portugal Telecom (Portugal), Telekom Slovenije (Slovenia), Deutsche Telekom (Germany), BT (UK) and France Telecom (France). It is much rarer for altnets or cable operators being mandated to share their ducts as well (symmetric regulations) – in the Netherlands, for example, alternative operators have so far been unsuccessful in their lobbying to gain access to the extensive cable infrastructure of UPC and Ziggo.

Regulating prices and dealing with anti-competitive behaviour is a potential challenge for this measure; sharing must be made attractive without putting the infrastructure owner at a disadvantage. In many cases, cost-oriented or benchmarked prices are imposed by the NRA. In Italy, for example, the incumbent operator, Telecom Italia, must provide wholesale access to its ducts at cost-oriented prices, which are monitored by the NRA, AGCOM.

It is typically much more difficult to oblige non-telecoms operators to open up their ducts to telecoms operators, as in most countries the NRA will not have the authority to do this, and thus new government legislation may have to be drafted to implement such measures. In addition, it may also be inappropriate for the NRA to regulate the access, as this is likely to be outside the NRA's area of expertise (for example, attempting to impose cost-oriented prices on a gas utility provider).

There are a number of further issues related to this measure, and potential challenges in implementing it:

- What business interest is created for utility companies? For utility companies that do not currently share their infrastructure, are the potential revenues from duct sharing adequate compensation for the effort associated with opening up their ducts to telecoms operators? For those utility companies that currently allow sharing, would a change in legislation affect the business case for sharing (e.g. if they were obliged to move from charging retail prices for duct rental to cost-oriented prices)?

- Is it possible that one operator or infrastructure provider has the most sought-after ducts? If so, is there a risk of the duct becoming full? When does the duct become so full that it causes inconvenience for the duct owner? Are there potential safety implications?

- How much scope is there for increasing the footprint of the NGA network using shared ducts? Or is it more likely to be a driver for creating infrastructure competition in areas which are already covered?

- Is much information known about the location and shareability of existing infrastructure? If not, will this make sharing difficult? Will a programme of duct surveys therefore be necessary? If so, these costs could be significant and should not be overlooked (see Section 3.4.1).

In order to consider the different ways in which these issues can be tackled, we have looked for examples in Europe, where attempts have been made to implement such a measure. These examples are summarised in the table below. Two of these examples – Lithuania and Portugal – have been selected as detailed case studies for this measure, which are presented in Section 4.2 and Section 4.3, respectively.

Figure 4.1: Examples of countries that have attempted to implement mandated access to passive infrastructure [Source: Analysys Mason, 2012]

Country	Description
Lithuania	**Case study** – see Section 4.2.
Portugal	**Case study** – see Section 4.3.
Germany	Legislation is currently being put in place that obliges public utility companies to provide access to their infrastructure upon request. Steps are also being taken to apply similar measures to all owners of relevant infrastructure, including private utility companies. It is envisaged that an arbitration process will be put in place to settle any disputes that arise.
The Netherlands	Third parties in the Netherlands are mandated to share their networks with telecoms operators when requested, provided this is technically feasible.

4.2 Case study: Lithuania

4.2.1 Market context

In Lithuania, FTTH coverage reaches an estimated 60% of households, and cable coverage was greater than 76% at the end of 2011. The incumbent, TEO, dominates the broadband market, with a 50.1% market share. TEO operates both a copper-based ADSL network as well as an FTTH network, with an estimated coverage of 57% of households in 50 towns and cities[20] at the end of 2011.

According to the Lithuanian NRA, the Communications Regulatory Authority (RRT), overall, broadband penetration stood at 30.9% of households at the end of 2011. FTTH accounted for 50% of all broadband connections. As a result, Lithuania has one of the highest levels of high-speed broadband take-up in Europe – according to the Commission, at the start of 2012, 30.6% of connections were between 30Mbit/s and 100Mbit/s, and 9.4% were faster than 100Mbit/s.

For historical reasons, there are more than 100 Internet service providers in Lithuania, and according to RRT, a distinguishing feature that almost all of these providers have their own networks. This has resulted in both intense service-based and infrastructure-based competition amongst the ISPs, especially in the larger cities.

4.2.2 Measure implemented

Lithuania has been successful in promoting infrastructure-based competition, and RRT, claims that this is largely due to mandated duct sharing between operators as well as other non-telecoms infrastructure operators. Compulsory sharing of all passive infrastructure was introduced in 2004, and detailed regulation on the construction of network infrastructure and infrastructure sharing was introduced in 2005.

In 2009 two complaints were registered with the RRT regarding TEO making the technical inspections of its ducts difficult, failing to provide adequate information to other operators, and attempting to raise duct rentals. Also in 2009, the RRT commenced a market analysis exercise of wholesale physical network infrastructure access, taking into account these complaints. As a result of this market analysis, a second level of regulation was introduced in November 2011 that places a more asymmetric obligation on TEO, as an operator deemed to have SMP. These additional measures allow RRT to regulate the operational problems that the previous complaints had referred to, as well as allowing it to regulate other infrastructure sharing issues such as access pricing (see Figure 4.2).

[20] According to TeleGeography.

Figure 4.2: Standard prices for access to TEO's ducts [Source: TEO, RRT, 2010]

Cost item	Standard prices (excl. VAT, as of April 2010)
The one-off charge for investigating technical conditions of space in ducts and providing information, where the length of the ducts is up to 1km	LTL560 (~EUR160)
The one-off charge for investigating technical conditions for the lease of space in ducts and providing information, where the length of the ducts is more than 1km	LTL0.56 per metre (~EUR0.16)
The monthly charge for the leasing of space in 1km of ducts (when renting over 50 km discounts scheme applies)	LTL100 (~EUR30)

The prices charged by other operators and by non-telecoms infrastructure companies are not strictly regulated and so parties are free to negotiate a suitable price on a case-by-case basis. However, if two telecoms companies fail to reach an agreement and a dispute ensues, RRT has the competence to decide on a suitable price in the context of the dispute; this could be a cost-oriented price, for example. As RRT is not responsible for regulating non-telecoms companies, if another infrastructure company becomes involved in a dispute, the case will be escalated to the courts. However, in such a case, RRT can still participate in the process and provide its conclusions to the court. It claims that it is willing to attend these court hearings with the aim of ensuring the development of consistent judicial practice; it also publishes the final decisions on its website, in order to make clear any rulings and discourage any potential future disputes.

Whilst the direct regulation of non-telecoms infrastructure companies does not fall within the competence of RRT, its role is to provide clarifications on the common infrastructure sharing framework to these companies – for example, if an infrastructure provider has doubts about whether it has to provide access to a telecoms operator, it may contact RRT, which will clarify the situation.

There are a number of key areas of legislation which, from its experience thus far, RRT believes are key to ensuring that the obligations to share infrastructure are explicit, and thus keep disputes to a minimum:

- With regards to sharing of existing ducts, the key considerations are:
  - a clear methodology for the calculation of free space within a duct
  - a clear and exhaustive list of acceptable reasons for a duct owner being allowed to refuse access to its ducts
  - a precise administrative procedure for how ducts can be surveyed/ investigated, and deciding whether access should be granted or not
  - a procedure/methodology in place regarding how prices should be set in the case of a dispute.

- With regards to the construction of new ducts, the key considerations are:
  - a clear definition of the required size of inlets installed at the connection point to apartment blocks
  - a clear definition of the size of the technical distribution room within apartment blocks

– an obligation to install ducts of a minimum diameter leading into apartment blocks.

The second set of regulations overlap to some extent with the measures regarding high-speed infrastructure for new and refurbished buildings. As explained in Section **Error! Reference source not found.**, having pre-installed ducts that are suitable for sharing can significantly reduce the cost of covering an apartment block with NGA.

When deploying new telecoms networks, existing telecoms ducts (normally belonging to TEO) are considered as a priority as the reference offers and the procedures are already in place. According to RTT's 2010 report,[21] of the 655 098km of ducts on the market, 97.8% was owned by TEO, implying that alternative operators have not had the need to build their own ducts. In addition, by 1Q 2009, 78 of the 160 electronic network and service providers in Lithuania were using the duct access scheme, with TEO being the main provider of duct access, in addition to ISPs, cable TV operators, dark fibre providers and utility companies.[22]

With mandated access to passive infrastructure having been in place since 2004, historically Lithuanian alternative operators had the option of either adopting a business model based on local loop unbundling (LLU), or deploying its own fibre in existing ducts. The latter option was perceived as simpler, as it would limit the ultimate dependence on the incumbent operator, and may have been slightly cheaper to implement. Mandated access to passive infrastructure therefore allowed alternative operators to plan and deploy their networks extremely quickly, with these altnets being responsible for nearly all of the FTTx build initially. Three to five years later, the incumbent became under pressure from this competition and was forced to before deploy its own NGA infrastructure; this is illustrated in Figure 4.3. This is a characteristic of the market that is less commonly seen in Western European countries, where often it is the incumbent that is generally more advanced than the alternative operators.

21 Source: http://www.rrt.lt/en/reviews-and-reports/lithuanian-communications-sector.html.

22 Source: http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CE4QFjAA&url=http%3A%2F%2Fwww.rrt.lt%2Frrt%2Fdownload%2F11247%2F4_shared_use_natalija.ppt%3D&ei=l44GUKnQK6On4gSg-JGbCQ&usg=AFQjCNEmuvqBeK3iXxOHBN5fHgeY_4U7Ww

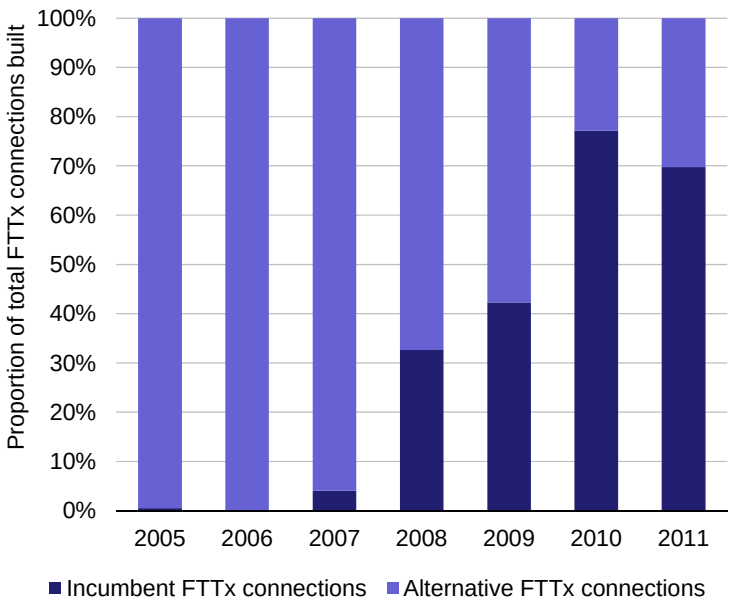


Figure 4.3: Evolution of breakdown of FTTx deployment by operator type in Lithuania [Source: RRT[23], 2012]

It is, however, accepted that space in incumbent-owned telecoms ducts is limited, and there is likely to be more demand for space within other infrastructure deployments such as electricity ducts (where regulations for the technical specifications for fibre deployment already exist) and heating pipes (which are normally deployed in large, manhole-like ducts, and so there is plenty of room for fibre deployments).

A further regulation was introduced in 2009, following a consultation in that year, to address the problem of each operator carrying out excavation work in order to lay cables, often to connect an MDU to its NGA network. To save money, operators often directly buried fibre into the ground, rather than deploying ducts, which led to increased costs and civil disruption due to unnecessary excavation work. The consultation resulted in a more detailed regulation on the construction of network infrastructure, with all new deployments that connect to MDUs being located within a duct, of a minimum diameter of 90mm, in order to accommodate other operators. The operators embraced the new regulations, as the cost of the continual digging was onerous.

One challenge that the system has faced is the difficulty in generating business interest from utility companies. RRT says that duct rental prices are relatively low, and so duct rental revenues are relatively small in comparison with the revenues that infrastructure operators receive from their core business. It is therefore of little interest to these companies in focusing much business attention on renting ducts out to operators. This has not been a significant problem in Lithuania, due to the universal access obligation. On this basis, RRT recommends that if this were to be extended throughout Europe, access would need to be mandatory for public utility companies, and private companies should be made aware of other potential benefits, such as the possibility of telecoms operators agreeing to clean and maintain their rented ducts.

[23] Presentation to the Digital Agenda Assembly by RRT, 21-22 June 2012.

4.2.3 Strengths and weaknesses

Strengths ↑	Weaknesses ↓
• Low cost of implementation to the government, the NRA or the operator • Has made many NGA deployments economically viable, which has led to Lithuania having some of the highest NGA coverage in Europe • Mandated duct access has led to good infrastructure-based competition, which has led to the NRA being able to regulate the market more lightly than in some other European countries	• Disputes do still occur, which result in time being spent by the NRA and the operator • Little business interest on behalf of non-telecoms infrastructure companies; they often do not see the benefits • Costs could be incurred by the operator seeking use of the shared duct, for example if it needs to pay for a duct survey

4.3 Case study: Portugal

4.3.1 Market context

Historically, the Portuguese broadband market has been underdeveloped compared to other Western European countries, particularly in terms of penetration. This led the Portuguese government in 2008 to create a EUR800 million credit facility for the roll-out of NGA infrastructure[24]. This was supplemented with funding provided by the leading telecoms players to bring the total investment to just under EUR2 billion. Partially as a result of this, at the end of 2011, Portugal had extensive NGA coverage due to a large cable footprint (covering an estimated 87% of households) and an expansive FTTH network (covering an estimated 58% of households). The majority of FTTH roll-out is by the incumbent, Portugal Telecom (PT), which had a market share of 50% as of March 2012.

Overall, broadband penetration in Portugal stood at 60% of households at the end of 2011, which is still one of the lowest in Western Europe: 35% of broadband connections were cable, and 10% were FTTC. Furthermore, the Commission reports that, at the start of 2012, 12.3% of connections were between 30Mbit/s and 100Mbit/s, and 1.3% were 100Mbit/s or higher.

The pay-TV market in Portugal is well developed. PT and the two main cable operators (which together account for 89.8% of the broadband market) offer a comprehensive portfolio of IPTV and/or cable TV services, often as part of a double or triple-play option.

4.3.2 Measure implemented

The history of duct sharing in Portugal dates back to 1991, when PT was obliged to allow one of its rivals, a cable company, to deploy its network in PT's ducts. Since then, PT has been obliged to allow access to its duct and pole network, and, in 2009, the NRA, ANACOM, extended this ruling

[24] Source: Telegeography

on duct access to all operators and public utility companies. These rulings were passed as Decree-Law 123/2009[25] and Law 32/2009.[26]

The laws state that all existing ducts that are suitable for the provision of electronic communications networks must be made available to operators. This includes:

- infrastructure owned by the state, local authorities and Autonomous Regions
- infrastructure owned by entities under the supervision of the state, local authorities and Autonomous Regions
- public infrastructure and utility companies such as water, gas, transport and sewerage companies, as well as roads, railways and ports.

Access to these ducts is defined as the owner making available physical infrastructures such as buildings, ducts, masts, inspection chambers, manholes and cabinets for the purpose of the accommodation, setting up and removal, and maintenance of electronic communications transmission systems, equipment and resources. The cost of access varies depending on who owns the infrastructure. For example, ANACOM, the Portuguese NRA, sets the prices for access to local authority-owned infrastructure, whilst electronic communication companies must charge each other cost-oriented prices. This is to take into account the cost incurred by operators for setting up sharable infrastructure, whilst maintaining transparent and non-discriminatory prices. Infrastructure owners must justify to ANACOM that their prices are reasonable, although this has caused some difficulty in the regulation of smaller players and non-telecoms operators, as it can sometimes be difficult for ANACOM to confirm if the prices are reasonable or not.

PT has a comprehensive and regulated reference offer in place; some of the access prices included in its reference offer are shown in the table below.

Figure 4.4: Extract from PT's duct reference offer [Source: PT, 2012]

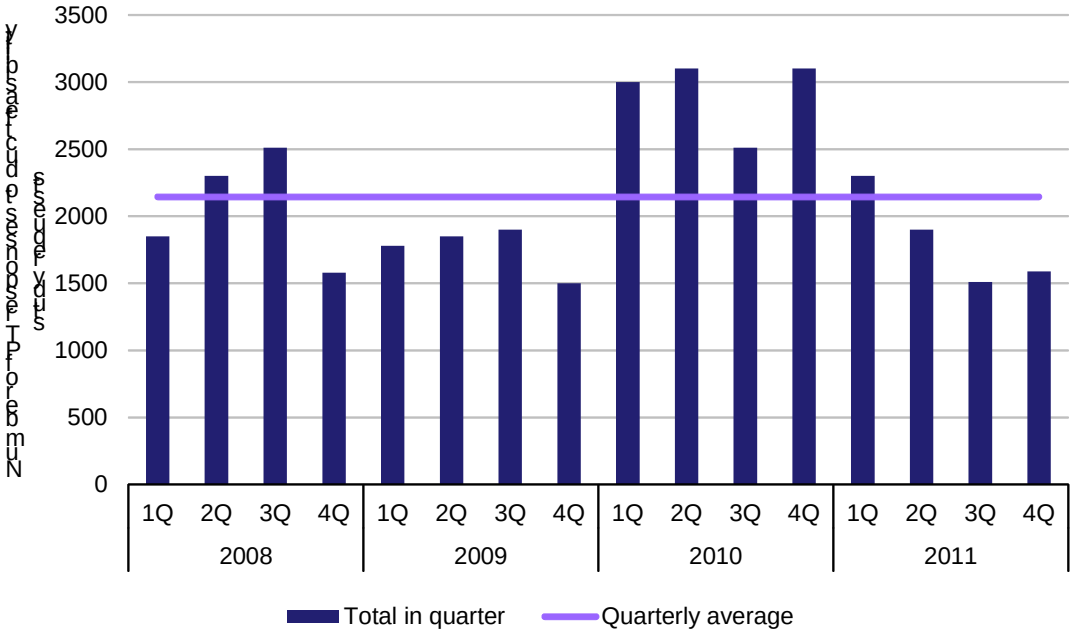
	Lisbon and Porto	Other areas
Monthly price for sub-duct sharing per km per sq. cm	EUR10.60	EUR8.30
Monthly price for duct sharing per km per sq. cm	EUR9.80	EUR7.50
Price of application for duct survey (feasibility study)	EUR69.00	

ANACOM has also monitored the number of responses to requests for feasibility studies from other operators seeking access to PT's ducts, as shown below in Figure 4.5. This has averaged at around 2100 responses per quarter over the last four years.

Figure 4.5: Number of responses to PT's duct feasibility study requests per quarter [Source: ANACOM, 2012]

25 http://www.anacom.pt/render.jsp?contentId=976699.

26 http://www.anacom.pt/render.jsp?contentId=991784.



Infrastructure owners that have the obligation to give access to their infrastructure are permitted to refuse access to their ducts if they can prove:

- the infrastructure is unsuitable for accommodating electronic communications equipment
- accommodating electronic communications equipment would compromise the primary use of the infrastructure, or present a safety risk
- that an additional occupant would lead to lack of space for the primary occupant.

The vast majority of duct access is to PT's ducts, and so ANACOM claims that disputes are rare. This is because the asymmetric regulation on PT has been in place for some time, and the reference offers are clear and well regulated. There have been cases of PT's ducts running out of space; however, due to the universal regulation on other operators, there is normally an alternative route, and so this is rarely a problem. As a result of PT's extensive duct network, there has been little interest in using non-telecoms ducts, with the exception of historical deployments: the main example is Oni Communications (Onitelecom), which in the past was owned by utility companies, and thus has deployments in electricity ducts due to the previous company structure.

No specifications are imposed on operators deploying new ducts. Instead, the deploying operator is obliged to consult with other operators in order to determine if any other operator is interested in deploying along that route. If they are, the deploying operator must install ducts that are suitable for sharing; if they are not, then the duct operator is free to choose which type of duct is deployed.

4.3.3 Strengths and weaknesses

Strengths ↑	Weaknesses ↓
• Negligible cost of implementation to the government or the NRA	• Interest is mainly in PT's ducts, and unclear as to whether non-telecoms ducts will be

• Has made many NGA deployments economically viable, which has led to increased infrastructure competition • As most interest is in PT's ducts and PT's reference offer has been in place for some time, disputes are rare	useful if PT's ducts become full • Little business interest on behalf of non-telecoms infrastructure companies; they often do not see the benefits • Universal sharing regulation applies to all duct owners, but prices are difficult to regulate for small and non-telecoms operators

4.4 Financial implications

4.4.1 Costs of the measure

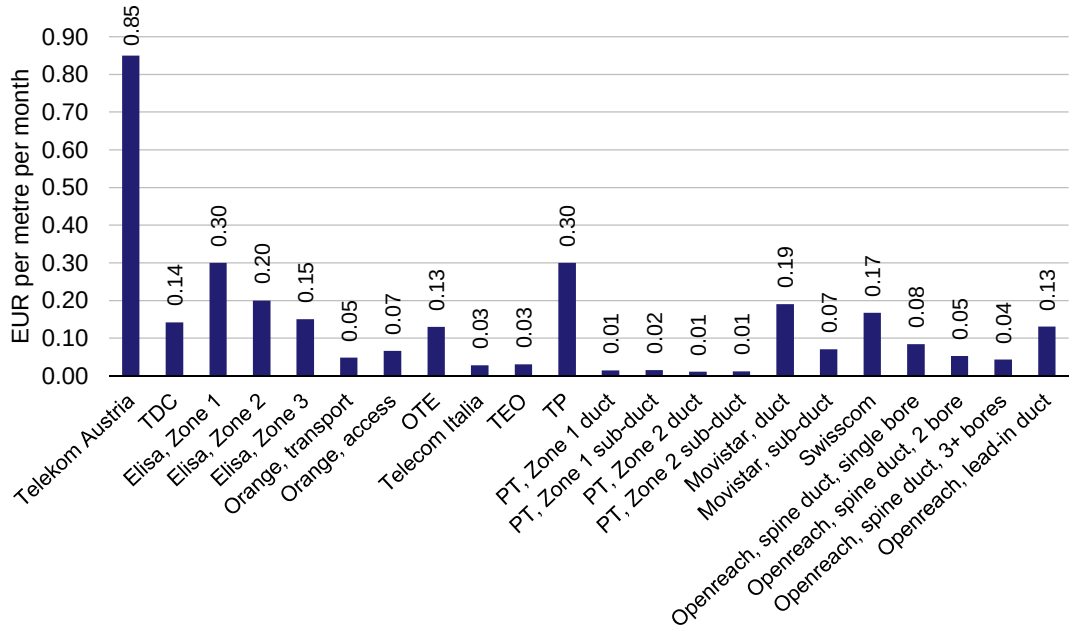
Cost to the NRA or government

In both Lithuania and Portugal, the cost of implementing and maintaining the schemes has been negligible (with the exception of drafting the legislation). However, where information on the location and shareability of ducts is limited, the cost of conducting a survey should not be overlooked (see Section 3.4.1), although in many Member States, this cost is normally incurred by the access-seeking operator.

Cost to the operators

For operators, despite the initial capex saving on deployment, it is important to consider the cost of duct rental, which can be significant over longer periods. According to a recent study by Analysys Mason Research,[27] after 10 years, the cost of duct rental for a shared deployment in the UK is 9–16% of the initial deployment cost (7–12% of total 10-year cost, including initial deployment and ongoing maintenance). This rises to 24–42% of the deployment cost after 25 years. As shown in Figure 4.6 below, access prices vary widely across Europe.

Figure 4.6: Monthly charges for access to incumbent-owned ducts in Europe [Source: Analysys Mason, 2011]

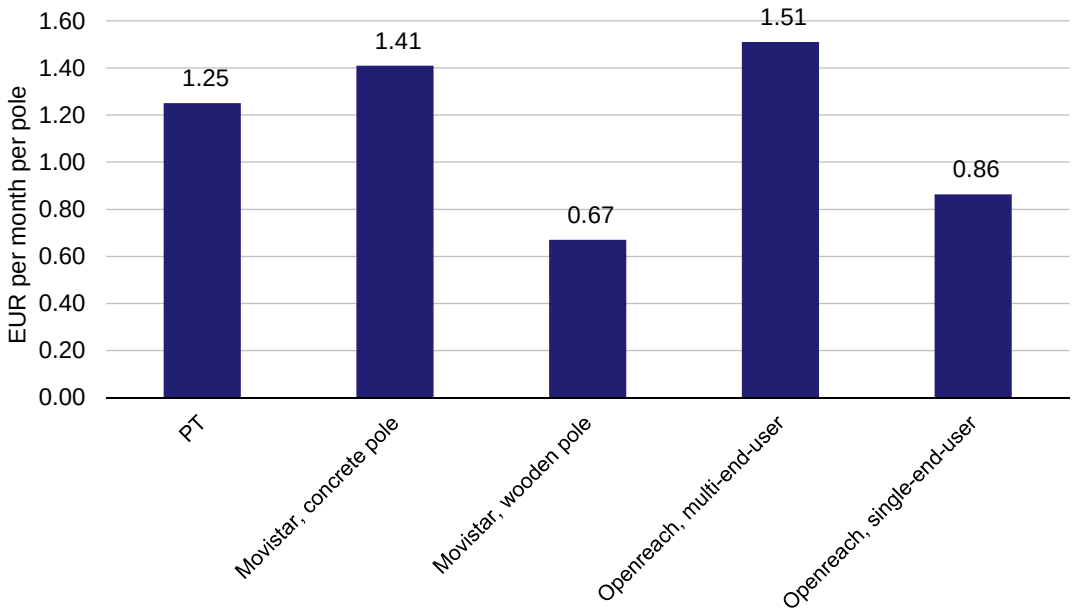


27 Analysys Mason Research (2012), *PIA versus self-build in the final third: digging into the costs*. See http://www.analysysmason.com/Research/Content/Reports/PIA-self-build-fibre-Aug2012-RDTW0/.

In many Member States, cost-oriented prices are imposed on the incumbent operator, and so these access prices are able to give an indication of the cost incurred by the operator which is granting access to the infrastructure. Typically, this cost appears to be less than EUR0.30 per metre per month.

Some incumbent operators have also been mandated to provide access to poles; the monthly access pricing is shown in Figure 4.7 below. The link between the home and the final distribution is often more likely to be deployed aerially in more rural areas, and so this is an important factor to consider in deployments at the edge of economic viability, such to extend the footprint of NGA networks.

Figure 4.7: Monthly charges for access to incumbent-owned poles in Europe [Source: Analysys Mason, 2011]



Sharers are also liable to unpredictable costs associated with surveys and duct improvement or replacement, such as those detailed in Lithuania and Portugal in Figure 4.2 and Figure 4.4 respectively.

4.4.2 Savings from implementing the measure

The cost savings of implementing access to passive infrastructure in both Lithuania and Portugal are unknown, though RRT believes that if this measure were not in place, NGA deployment would have been more limited in Lithuania. It claims that even in 2004, when RRT launched the first consultations on mandated access to passive infrastructure, operators made it clear that allowing access to ducts would ensure that it would become economically viable to deploy in areas where the business case would not otherwise make sense. It could therefore be argued that a major benefit brought by the implementation of this regulatory measure in both countries have been the socio-economic benefits that arise from bringing NGA to communities that would not normally be covered by the service.

In Portugal, the implementation of this measure has led to infrastructure competition, which has in turn brought benefits to end users, such as potentially increased quality of service and lower retail prices. However, the broadband markets in both Lithuania and Portugal were relatively underdeveloped around the time the measure was implemented. In particular, in Lithuania, opening up TEO's ducts to other telecoms operators allowed the alternative operators to beat the incumbent operator to deploying NGA infrastructure, with the incumbent having only caught up in the last two years. In most Western European countries, however, the situation is very different as NGA deployment is often led by the incumbent operator, and so the impact that such a measure would have on NGA coverage is likely to be more limited.

According to the partners of the Enhancing Next Generation Access Growth in Europe (ENGAGE) group,[28] the initial cost of network deployment in Western Europe using existing ducts ranges from EUR20 to EUR25 per metre, rather than an average of EUR80–100 per metre for deployments that require digging, thus resulting in a 75% cost saving. This is the ideal case where it is assumed that an entire deployment can be located in existing ducts, and so it is in line with the assumption that civil works accounts for up to 80% of the initial deployment cost.

In contrast, a study by Analysys Mason Research[29] makes clear that coverage cannot be achieved with shared infrastructure alone, and some excavation will be required in areas where no suitable infrastructure is available. The study examined the cost savings that may be achieved by using passive infrastructure sharing in the UK for reaching areas where the business case for NGA deployment is less clear (e.g. in rural areas). As well as traditional trenching, the study also considers a faster and cheaper excavation technique, slot cutting, which is suitable for hard surfaces such as roads and footpaths. The paper concludes that savings on the initial deployment costs range from 29% for relatively densely populated areas using a combination of infrastructure sharing and traditional trenching, to 58% in areas that are located further away from the exchanges (i.e. very sparsely populated areas) and using the cheaper slot-cutting trenching approach. However, due to the duct rental incurred by the deploying operator (as described in Section 4.4.1), the payback period may only be reduced by two to five years.

Figure 4.8 below shows the estimated range of initial cost (i.e. capex) savings that can be achieved from deploying a network using existing passive infrastructure rather than self-digging.

28 A group consisting of12 partners from 10 European countries.

29 Analysys Mason Research (2012), *PIA versus self-build in the final third: digging into the costs*. See http://www.analysysmason.com/Research/Content/Reports/PIA-self-build-fibre-Aug2012-RDTW0/.

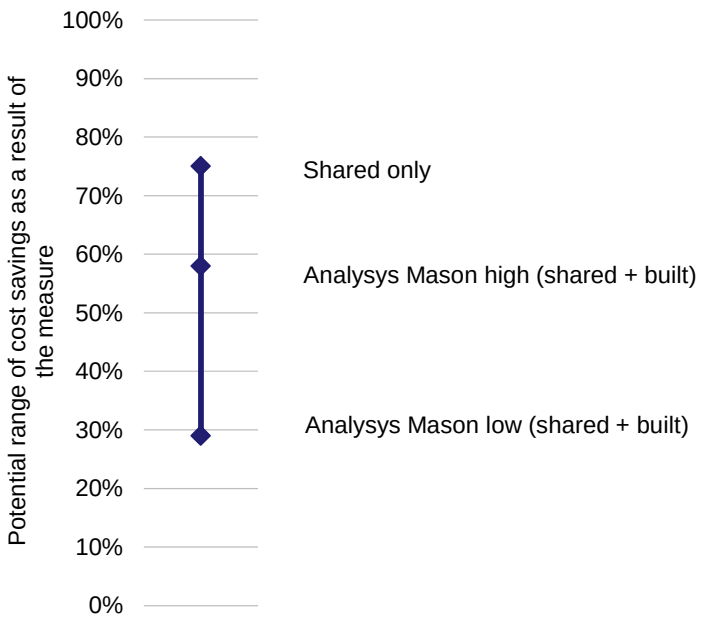


Figure 4.8: Range of potential cost savings from mandated access to passive infrastructure [Source: Analysys Mason, 2012]

4.5 Business interest on behalf of utility companies

Although we have noted that there is little interest from utility companies in opening their networks to third parties, it is possible that there are synergies which can be exploited which have not been fully considered. For example, the Commission is pushing for the installation of Europe-wide smart grids, and so electricity companies may allow an operator to use space in electricity ducts into a home, in return for the operator providing the backhaul from the smart meter, thus reducing costs and increasing the speed of deployment on both sides. A potential issue with this approach is in the maintenance procedure in the case of faults occurring. For example, in a similar scheme in New Zealand, any maintenance visits required the attendance of both a power expert and a telecoms expert, regardless of which type of infrastructure the fault was with; this would be likely to lead to increased operating expenses for both networks.

Another example of collaboration is Jelcer Networks in the Netherlands, which is currently deploying an FTTH network through the sewer system. The company claims that 98% of Dutch households are connected to the sewer network, and is currently deploying in rural areas. It claims that deploying in these sewers rather than digging can lead to a significant cost saving, and as the fibres are within a protected environment six meters underground, they are far more unlikely to be uncovered or damaged than conventional deployments. Jelcer Networks has developed a system of inserting fibres into its own sleeves within the sewer network, which are likely to be very small in comparison with the diameter of the sewer, and thus could constitute a new revenue stream for the sewer owner whilst only incurring a relatively minor hassle; Jelcer Networks claims that the deployment system does not affect the operation of the sewers. The company also claims that its work has helped to improve the geographical knowledge of the sewer system, as it has been necessary for the operator to map the system out in detail in areas of deployment. Other examples include Scottish Water in the UK – which has allowed fibre deployment in some of its sewer network – and Swiss company *KA-TE System AG* – which has also

developed a system called fibre access by sewer tube (FAST) that uses sewer maintenance robots to deploy fibre along sewer systems.

Analysys Mason has found in the past that sewer networks may be the most ideal type of infrastructure for the deployment of NGA networks, rather than water pipes for example, which are often limited in terms of available space and may present health and safety hazards such as the risk of contaminating the water supply. However, Analysys Mason has also found that some sewer owners have been unwilling to allow deployment within their infrastructure due to worries about damage occurring to the system, or the lack of compensation. An example of this is the Fibrecity project in Bournemouth in the UK, where fibre operator i3 ran a pilot scheme of deploying through Wessex Water's sewer network; the deal collapsed due to 'contractual problems', with Wessex Water citing issues with the technology employed and the limited compensation offered by i3. However, it is likely that as technology continues to advance, the issue of damage being caused to existing infrastructure is likely to be mitigated over time. One additional problem is that in many Member States, rural areas are unlikely to be connected to the mains sewer network – the Netherlands is an exception as it is generally densely populated throughout the country.

4.6 Summary

- Mandated access to passive infrastructure has been in place in both Lithuania and Portugal for many years. This measure consists primarily of a universal regulation applied to all public and private bodies (such as telecoms operators, gas and electricity companies) in addition to asymmetric regulation on the incumbent telecoms operator (TEO in Lithuania and PT).

- In both countries, the majority of deployments have used the incumbent operator's ducts because they are the most suitable for broadband deployment (in terms of both location and capacity for sharing), and because the asymmetric regulations typically mean that the procedures and reference offers are in place, thus making access simpler.

- The direct benefit from this measure is a potentially significant reduction in the cost of deployment. In both Portugal and Lithuania, the implementation of this measure has led to NGA being deployed to areas where it would not normally be economically viable. An additional benefit of this measure has been strong infrastructure competition, which could in turn benefit consumers in terms of increased quality of service and lower retail prices.

- The main drawback of this measure is that duct owners do not always see the advantages of sharing their infrastructure – for example, the income they receive from duct rental may not justify the inconvenience incurred by allowing access. For this reason, the NRAs claim that the universal obligation is entirely necessary.

- The cost to the NRA or government of implementing this measure is low (except for the cost of drafting the legislation to implement such a measure), and as the case of Lithuania has shown, no special systems need to be in place to allow sharing to take place. Ongoing costs to

the state are mainly due to administration and dispute resolution, although this cost is also likely to be low, assuming that the legislation is clear and disputes are relatively rare. Operators that make use of shared access will face the cost of duct rental; although rental is often regulated, it can become a significant operating expense, especially over long periods.

- The cost savings from this measure to operators can be very significant, which are estimated to be up to 75% per meter of the cost of deploying existing infrastructure rather than excavating afresh.
- Although historically most deployments have used incumbent operators' ducts, in some Western European countries these ducts alone may not be sufficient to increase the footprint of NGA networks. There are a number of examples of operators deploying infrastructure in sewer networks, which are ideal as there is often plenty of available space and they are buried deep underground and thus are unlikely to be damaged. However, in many Member States most rural areas may not be connected to the mains sewer network.

5 A one-stop shop on rights of way and administrative procedures

Definition: A one-stop shop on rights of way and administrative procedures would be an organisation that managed information and permits on rights of way. Relevant authorities, including local authorities, would provide information on necessary permits, applicable rules and conditions, and so on to this central organisation (possibly the NRA). That organisation would not only provide information to interested parties, but could also act as an intermediary by receiving and forwarding permit requests to the relevant authorities, and monitor that existing deadlines are adhered to.

5.1 Background

When an operator wishes to deploy new infrastructure, it is normally required to negotiate rights of way directly with the owner of the land on which it wishes to carry out work. For public land, such as roads and footpaths, applications must usually be made with the relevant local authority or municipality, whereas access to private land is subject to wayleaves negotiated with the land owner. In addition, if the planned work might affect any existing infrastructure, the operator must negotiate rights of way with the concerned owner. The process of obtaining rights of way can therefore be long and complex. Moreover, there can be difficulties in determining the land or infrastructure owners, and the operator must negotiate rights of way with each individually. Thus, a relatively small deployment could result in a significant administration effort to co-ordinate wayleaves.

Additionally, operators must often apply for permits before they are able to commence civil works. This is often a complex process which often requires operators to apply for different permits from municipalities and local authorities. Although in many cases this may only incur a small administrative fee for the operator, as with rights of way and administrative procedures, this application process could constitute a significant time and administrative burden. Operators across Europe have reported delays in the permit issuance process of between two weeks and nine months; for a permit to install wireless equipment, this can rise to a number of years.

If a central body existed to manage rights of way and administrative procedures, this could have a positive impact on the administrative burden faced by telecoms operators, and indeed any infrastructure provider that is planning civil works. This could consist of, for example, an organisation that keeps a record of what land is owned by whom, and could forward wayleave applications from the operator to the landowner and act as an intermediary for wayleave negotiations, as well as being responsible for the distribution of building permits. This could be either an existing body which has been given the additional responsibility of co-ordinating such measures, or a new body specifically set up for that purpose. This is, however, not a process that has been widely adopted in Europe. Instead, some Member States have passed legislation granting

greater wayleave rights to telecoms operators, thus simplifying the administrative effort required prior to carrying out civil works. This measure is likely to be an enabler of operators deploying their own infrastructure, and is a simple way of encouraging operators to deploy more NGA infrastructure.

There are a number of further issues related to this measure, and potential challenges in implementing it:

- Have infrastructure owners/municipalities/private land owners been mandated to provide access if a telecoms operator wishes to deploy telecoms infrastructure on its property? If so, will they be compensated for the disruption?
- How much centralisation is envisaged? Is it truly a one-stop shop, or will operators still have to negotiate with land owners individually?
- Has this been implemented on a municipality or local authority level? If so, are there different procedures depending on the regions? Do different authorities charge different fees?
- Which organisation becomes ultimately responsible for co-ordinating rights of way and administrative procedures? Is this within the scope of the telecoms NRA or should this be undertaken by another organisation that has the power to intervene across multiple industries?

In order to consider the different ways in which these issues can be tackled, we have looked for examples in Europe, where attempts have been made to implement such a measure. These examples are summarised in the table below. Two of these examples – the Netherlands and Poland – have been selected as detailed case studies for this measure, which are presented in Section 5.2 and Section 5.3.

Figure 5.1: Examples of countries that have implemented measures to simplify rights of way and administrative procedures [Source: Analysys Mason, 2012]

Country	Description
The Netherlands	**Case study** – see Section 5.2.
Poland	**Case study** – see Section 5.3.
Austria	The 2003 Austrian Telecommunication Act grants wayleave rights to telecoms companies, for public property such as streets and pavements, and grants conditional rights for wayleaves on private land, subject to compensation for the land owner. Municipalities cannot refuse rights of way, but have some powers to impose conditions regarding issues such as the timing of any street works.
Greece	Delays in the issuance of antenna licences have ranged from 24 to 36 months, leading to 80% of antennas being deployed without a licence. A single point of contact is being established instead of the current 18 different authorities. Exemptions have also been made for small antennas and low emission sites, which provide time benefits and legal certainty, and electronic submission of applications is being introduced.

Country	Description
Ireland	According to the Irish Department of Communications, Energy and Natural Resources (DCENR), existing public infrastructure is being used to facilitate the deployment of NGA networks, with fibre being deployed along existing rail, electricity, road and gas infrastructure. The DCENR already publishes maps of existing public infrastructure, and has also been considering the implementation of a one-stop shop for access to state infrastructure, which would simplify any issues surrounding rights of way and administrative procedures for service providers.
Portugal	ANACOM has stated that the CIS should contain procedures and conditions governing the allocation of rights of way over infrastructure suitable for the accommodation of electronic communication networks.
UK	In the UK, operators must pay landowners either an annual or a one-off fee to bury cables in their ground. This has arguably been a roadblock to the deployment of broadband in rural areas, and recently the National Farmers' Union (NFU) and the Country Land and Business Association (CLA) have agreed to either charge lower wayleave prices or to provide free access to land in exchange for free broadband access. Additionally, in September 2012, the Department for Culture, Media and Sport announced that it would reduce the administrative burdens associated with broadband deployment. This would be done by allowing broadband providers to install street cabinets in any location without prior approval from local authorities,[30] curtailing wayleave negotiations, relaxing restrictions on aerial deployment, and negotiating a new policy such to reduce the hindrance of traffic regulations on deployment.

5.2 Case study: the Netherlands

5.2.1 Market context

The cable network in the Netherlands is operated by two cable operators – Ziggo and UPC – and covered an estimated 95% of households as of 4Q 2011. Incumbent operator KPN is rolling out both FTTC/VDSL to its copper network and a new FTTH network, which were estimated to cover 53% and 15% of households, respectively, at the end of 2011.

The Netherlands has the highest fixed broadband penetration in Europe, at an estimated 90% of households at the end of 2011 and of these, 44% subscribe to cable, FTTC or FTTH technologies. The Commission reports that, at the start of 2012, 19.3% of broadband connections in the Netherlands provided downstream speeds of between 30Mbit/s and 100Mbit/s, and 2.1% of connections provided downstream speeds of 100Mbit/s or higher.

[30] Apart from in exceptional circumstances, such as in areas designated as Sites of Special Scientific Interest.

5.2.2 Measure implemented

The legacy of reformed rights of way for telecoms operators in the Netherlands dates back to the nineteenth century, with wayleave rights granted to the state telecoms operator in the Dutch Telegraph Act. In 1998, this legislation was updated to give rights to all providers of electronic communications networks. In 2007, the legislation was further updated with the Telecommunications Act to remove the power of public bodies such as municipalities to deny rights of way for licensed companies wishing to install electronic communications networks. The aim of this specific provision is to encourage the success of fibre deployment in the Netherlands. According to Article 5:

- Public bodies must tolerate access to their grounds for operators to install or maintain cables.
- This obligation is also extended to uninhabited privately owned land, although rights of way are automatically granted to inhabited privately owned land for the case of connecting a building to a telecoms network, and in this case the operator is also permitted to carry out any required maintenance or the removal of existing wiring where necessary.
- If a body is constructing overhead wires for a non-telecoms use, such as power distribution, that body is obliged to allow telecoms operators to co-locate and subsequently maintain wiring along the infrastructure, assuming that there will be no major overall change in the appearance of the infrastructure, or impediment to the original body that is constructing the infrastructure.

Digging on public land requires a permit from the concerned municipality prior to digging. Written notice must be made to both the Mayor's office and the city council about the work, detailing the proposed time, place, and how substantial the proposed works are. In order to ensure public safety and reduce civil disturbances, the Mayor's office may impose requirements on the place of work, the timing of works (which must be within 12 months of the request). Municipalities must promote sharing, and thus also co-ordinate upcoming civil works or duct sharing where possible, in order to minimise civil disruption. Automated or electronic systems are therefore likely to exist in some municipalities, as the system is broadly standardised. The NRA, OPTA, notes that the existing system works well as the municipalities understand the regulations and employ professionals to deal with the process.

When wishing to work on private land, operators must send a letter to the land owner detailing the proposed plans, and undertake an individual negotiation. If no response is received after four weeks, a second letter is sent. The land owner can either then allow the operator to carry out the works, or raise a dispute with OPTA. If no dispute is raised within two weeks of the second letter, the operator is allowed to carry out its planned works. Automated or electronic systems might therefore be inappropriate for the case of private land owners, as each case is negotiated individually and some land owners may not have access to a computer.

A key detail in the regulations is that there is no compensation for access for either private or public land owners. Operators are obliged to ensure that excavated ground is replaced and brought back to its original condition. Municipalities normally charge an administration fee for the required permit, but this is generally small, and is not compensation for digging. This has advantages for OPTA as it has no need to regulate prices, and advantages for operators, as it makes deployment relatively cheap (in addition, the ground in the Netherlands is generally soft, so digging is cheap).

However, operators are obligated to move cables should a land owner decide to carry out ground works, such as digging foundations for a new building, building a swimming pool or landscaping on the site where cables have been previously laid.

According to OPTA, disputes are generally rare, occurring once or twice per year, thus the process is not particularly time consuming or costly to oversee (before the Telecommunications Act in 2007 clarified some of the details on rights of way, disputes were far more common and dispute resolution became a significant administrative and cost burden on OPTA). Most disputes occur around the issue of relocation cables; in order to have cables removed or relocated free of charge, the ground owner must follow specific procedures, and operators are careful to look for breaches in these procedures so they will not have to pay. Relocating cables is expensive, and typically operators will wish to avoid paying for this whenever they can. OPTA normally attempts to deal with most disputes by mediating the negotiation process rather than making a formal decision, in order to save time and administration effort. The civil courts are also deemed competent to handle disputes, although operators have praised OPTA in the past for its expertise in dispute resolution, and so is normally the preferred body (according to OPTA, in 2007, when the Telecommunications Act was being reformed, operators lobbied to keep the resolution process with OPTA rather than the civil courts). There have also been examples of cases going to both OPTA and the civil courts, with the processes going on in parallel and OPTA and the courts reaching different decisions.

OPTA does not keep a register of location of ownership; this is the responsibility of a body called the Kadaster. The Kadaster runs a service called KLIC (Dig Alert). Dutch legislation states that any party that wishes to carry out excavation works must inform the Kadaster of any cables or pipes that are already in the ground, to avoid damage. They do this by consulting the KLIC database, which states which operators are present in that particular area. The party that wishes to carry out work logs onto the KLIC system and draws a polygon on the map interface detailing the area of proposed work. KLIC then automatically contacts infrastructure owners which are active in that area, which must subsequently provide details of their deployments in that area. The Kadaster then updates KLIC with the new information, and sends an electronic map of the area in question to the party that originally requested the information. As mentioned in Section 3.4.1, the party requesting information must pay the Kadaster an administration fee of EUR21.50. The primary purpose of KLIC is thus to reduce damage to existing infrastructure during construction works, rather than for simplifying procedures for rights of way and administration.

As with AGIV's infrastructure atlas project in Belgium (see Section 3.3.2), KLIC is another example of a system potentially having more than one purpose, as the Kadaster is gradually using KLIC to build up a centralised atlas of passive infrastructure, and it is envisaged that it will be developed into a full atlas conforming to the INSPIRE directive. This will be able to facilitate access to existing passive infrastructure, as well as the co-ordination of civil works. This therefore further suggests that some of the implementation costs of the five different measures considered may overlap.

5.2.3 Strengths and weaknesses

Strengths ↑	Weaknesses ↓
• The long history of simplified rights of way legislation in the Netherlands has made deployment more straightforward and has reduced administrative burdens. This is likely to be a strong contributory factor to the strong infrastructure competition and coverage seen in the Netherlands today[31] • As all land owners must tolerate telecoms cables being installed, the measures have simplified the network planning process	• Still requires operators to negotiate individually with land owners and to apply to municipalities for permits • Disputes over the removal and relocation of cables can be complex

5.3 Case study: Poland

5.3.1 Market context

Broadband coverage has historically been low in Poland. DSL and cable coverage is estimated to be the lowest in Europe (with the exception of Greece and Italy, which do not have a cable operator), at 77% and 37% of households at the end of 2010 and at the end of 2011, respectively.

In terms of fibre coverage, FTTH and FTTC/VDSL covered an estimated 3% and 5% of households respectively as of the end of 2011.

Overall, broadband penetration of households in Poland was the second lowest in Europe at the end of 2011, at 36%: around a third of broadband connections were cable connections, whilst the remaining were DSL connections; only 3.5% of connections delivered speeds of 30Mbit/s or higher at the beginning of 2012.

[31] This is in addition to other important factors such as the Netherlands having a high population density and soft ground, which makes digging relatively easy.

5.3.2 Measures implemented

In May 2010, the Polish government passed an amendment to the Telecommunications Act,[32] which included a number of measures designed to encourage to deployment of broadband networks across the country. The Act is long and complex, encompassing a number of different areas that aim to encourage NGA deployment, and refers specifically to fibre deployment a number of times.

The Act has taken away the rights of way from private land owners in most cases, in an effort to encourage more buildings to be connected to NGA networks:

- Building owners are obliged to provide access to their building, and in particular the wiring distribution point/room within the building. If there is a duct system within the private land that is suitable for the deployment of telecoms equipment, and no alternative duct network exists, the owner of that duct is obliged to provide access to the operator seeking access to the duct. These access agreements must be resolved within 30 days of an initial access request.

- If an end user living in an unconnected building requests a connection, the building owner is obliged to allow an operator to carry out installation and maintenance works within the building. All works are paid for by the operator.

A private property owner is obliged to allow operators or local self-governments to deploy telecoms infrastructure to buildings on or above its land, providing that this does not lead to a 'significant decrease' in value of the property. The property owner must also allow access to its land for any maintenance of installed infrastructure. This sort of access will require the infrastructure owner to pay the building owner a fee, except in cases where the infrastructure is being used to connect the building to the network. The fee is to be negotiated between the two parties.

For rights of access to public utility infrastructure, the procedures are slightly different. The body in charge of the public utility infrastructure is obliged to engage in negotiations with telecoms operators wishing to access the infrastructure. The president of the Office of Electronic Communications (UKE) may intervene in negotiations in case a dispute may arise, in order to resolve the negations within 90 days of the access request.

However, the disadvantage of the scheme is that power is handed over to local self-governments to develop, use or acquire the rights to telecoms infrastructure and networks. In addition, the local self-governments must keep a record of infrastructure acquisition rights and must take responsibility for granting rights to the construction and maintenance of telecoms infrastructure, as well as supervising and regulating the works. This has made deployment relatively expensive as operators must pay an annual tax for deployments that are over public land, and additionally must pay an ongoing fee for any deployments along roads. As the self-governments are free to set these prices, there have been a number of complaints to UKE from smaller operators claiming that they

[32] http://www.itu.int/ITU-D/eur/NLP-BBI/CaseStudy/CaseStudy_POL_New_Act.html.

struggle to compete with large ones. As a result, UKE is looking to draft new legislation to ensure that operators are not overcharged for deployments.

In addition to taking responsibility for co-ordinating access requests to third-party infrastructure, local self-governments must also respond to requests to access publically owned infrastructure, in which case the self-government is treated as a party with SMP and thus must respond to access requests within 30 days of receipt. Currently, there is no formal procedure in place for dealing with disputes between local self-governments and operators. Disputes are normally raised with UKE, but often resolving them requires drafting new legislation, which is a difficult, complex and time-consuming process.

5.3.3 Strengths and weaknesses

Strengths ↑	Weaknesses ↓
• Has implied the rights-of-way process, and so, in principle, operators should be able to deploy wherever they need to	• The prices charged by landowners can be high, which discourages deployment, especially from smaller operators • Power has been handed over to local self-governments, so not a one-stop shop as such, and there are major differences in procedures and pricing across regions. Additionally, these local self-governments charge an annual tax on buried infrastructure, which can be a significant cost burden on operators • Still requires operators to negotiate individually with ground owners and to apply to municipalities for permits • A fairly new piece of legislation, so there are still problem areas such as the dispute resolution process

5.4 Financial implications

5.4.1 Costs of the measure

Cost to the NRA or government

We are not able to quantify the costs of setting up a one-stop shop on rights of way and administrative procedures as we are not aware of any Member State setting up such a system. The cost to the NRA or government of implementing the measures described for the Netherlands and Poland is low, and is principally due to the drafting of legislation. We believe that the majority of the cost of setting up a dedicated one-stop shop would be incurred in setting up a centralised database and therefore there may be significant IT expenses. This could be similar to the IT costs incurred for the mapping project in Portugal (see Section 3.4.1), or the Ledningskollen project in Sweden (see Section 5.4.1), which cost EUR2 million and EUR1.8 million to implement,

respectively. It is likely that some of the IT costs associated with setting up a one-stop shop would overlap with those of an infrastructure atlas and a database of planned civil works, if the three measures were to be implemented in parallel.

The largest cost to the NRA is that associated with managing disputes. Ongoing costs in the Netherlands have been low since the clarification of the Telecommunications Law in 2007, which has significantly reduced the number of disputes. Primarily, these 2007 updates to the Law consisted of making it absolutely clear who has right of way, where and when. Additionally, OPTA adopted the process of allowing the ground owner and access seeker to reach an agreement first, before OPTA steps in to mediate the discussions if necessary. This is normally successful, and so disputes rarely escalate to the point where OPTA is forced to step in and make a formal decision.

Ongoing costs may be higher in Poland, as the system has not been in place for as long as the one in the Netherlands. Ground owners are therefore less likely to be aware of the laws, the dispute resolution process is not as clear, and regulation and procedures vary across regions as it is the local self-governments that have the responsibility for overseeing these procedures.

Cost to the operators

In Poland, the majority of the cost is incurred by the operator, which must pay for access to the ground, pay an annual tax for having assets in the ground once deployment is complete, and pay a further fee in the case of deployments being along a road. These costs vary significantly from region to region (as access prices to public ground is imposed by local self-governments), but can range from a lower end of EUR1–2 per metre up to EUR250 per metre.

In the Netherlands, operators are not required to compensate land owners for access, although as previously mentioned must move cables if ground owners wish to carry out their own excavation work (e.g. building a swimming pool). This can be costly to operators.

Summary of costs

(EUR millions)	Implementation cost		Ongoing costs	
Member State	NRA	Operator	NRA	Operator
Netherlands	0.076	Low	Unknown	Unknown
Portugal	2	Low	Unknown	Unknown
Sweden	0.075		0.06	Unknown

5.4.2 Savings from implementing the measure

This measure is an enabler of self-deployment. The main area of cost saving is to the operator in the form of time and administrative savings during the planning and deployment process. Additionally, one could argue that this time saving could lead to earlier service revenues, also benefiting the operator. These savings are therefore likely to vary widely, and are difficult to

quantify. However, as mentioned in Section 3.4.2, AGIV's KLIP system in Belgium is in part designed to simplify the planning and permit process, and AGIV estimates that the system saves operators and authorities a combined EUR29.5 million per annum.[33]

Another benefit of simplifying rights of way and administrative procedures could be that smaller players are less disadvantaged by having few staff dedicated to the permit application process and potentially less understanding of a complex system than larger players; this could result in lower barriers to entry.

5.5 Summary

- Neither the Netherlands nor Poland has implemented a true one-stop shop on rights of way and administrative procedures, but both countries have reformed this process significantly, taking power away from land owners. The Netherlands is the most centralised of the two examples, where, although operators must write individually to each ground owner, one body (OPTA) is in charge of overseeing the dispute process. Poland has given most of the power to the local self-governments, so the measures vary widely across the country.

- Giving automatic rights of way to operators allows them to deploy wherever they need to, and is likely to result in greater coverage and infrastructure competition, as in the Netherlands. Another feature of this case study is that operators do not have to compensate land owners, making deployment more straightforward with low rights of way costs and administrative burdens.

- In Poland, land access prices and taxes apply to operators; these can constitute significant costs to operators. Additionally, operators in both countries are still required to negotiate individually with each ground owner, and so there is still likely to be some administrative burden on the operators.

- The cost of implementing these measures is very low to the NRA or government, and only requires little more than the passing of legislation. Ongoing costs consist of regulation and dispute resolution, and so depend on how clear the legislation is. In the Netherlands, legislation has been in place for some time, so the ongoing costs to the NRA are low. In contrast, laws have been introduced more recently in Poland, so the costs could be higher.

- The savings from these measures are mainly in time and administration during the planning and deployment process. It could be argued that the time saving leads to the potential of earlier revenues from services, but these savings are difficult to quantify. Additionally, it is possible that simplifying rights of way and administrative procedures would make market entry easier for smaller players as they would be more likely to benefit from simpler processes and the quicker generation of revenues.

[33] http://www.agiv.be/gis/organisatie/?artid=587.

EUROPEAN
COMMISSION

Brussels, 26.3.2013
SWD(2013) 73 final

Part 4

COMMISSION STAFF WORKING DOCUMENT

Impact Assessment
Annex IV - Part 2

Accompanying the document

Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on measures to reduce the cost of deploying high-speed electronic communications networks

{COM(2013) 147 final}
{SWD(2013) 74 final}

A database of planned civil works

Definition: A database of planned civil works provides an opportunity for third parties to express interest in specific works. Such a database could be managed by the NRA or another body.

Background

The lack of co-ordination of civil works in many Member States can lead to wasteful duplication of costs, when multiple companies need to perform street works in the same location. By creating a communications process whereby all planned civil works are published to interested parties, costs can be shared and thus reduced for all stakeholders, as well as minimising disruption from street works. For example, if excavations are taking place in order to lay new water pipes, a fibre operator that is interested in deploying infrastructure in that location may be able to take part in the project, such that it can deploy its network whilst the excavation work is taking place. In this case, the cost of the civil works are reduced for each operator (subject to the negotiation that they have agreed to), and costs would decrease further if more infrastructure operators were to become involved. The database could be used to register interest from different utilities, so that they are notified when civil works are planned in any locations of interest. This measure is therefore an enabler that is designed to encourage NGA operators to deploy their own infrastructure by reducing civil works costs.

In the most densely populated areas, a street may have six different types of utility deployed along it (water supply, sewer, gas, electricity, cable and telephony), and so it is possible that maintenance to at least one of these services may be required fairly regularly. The number of parallel utility deployment reduces in more rural areas, which may not be covered by the mains gas, cable or sewer network. Very rural areas may have no mains services, although it is possible that co-deployment could increase the economic case for deploying infrastructure to these areas, particularly in the case of new developments.

Some co-ordination of civil works is usually performed by the public sector, but at a local rather than national level. There are some calls for the mandated co-ordination between public companies, as it is in every government's interest to save public money wherever possible, especially given the current financial climate. Including the private sector would pose further challenges due to the increased communication and co-ordination required. Indeed, a Finnish study (see Section 0) found that this was one of the most significant areas of difficulty. In addition, problems were encountered over the issues of funding and scheduling: due to careful budgetary procedures, it may take infrastructure operators up to two years before funding can be allocated to a particular project, and so there is not always enough warning before another infrastructure operator undertakes the planned civil works, and hence schedules do not align.

Therefore, such a database could raise questions about the commercial relationships between stakeholders that make use of the database, particularly in relation to price setting, costing methodologies and how to cater for the different kinds of business model in play. For example, telecoms operators and utilities often differ in terms of their weighted average cost of capital (WACC), investment horizons and attitudes to risk.

For telecoms operators, there is a trade-off in terms of the risks and benefits of complying with this measure: by announcing roll-out plans with enough notice to allow others to co-ordinate, operators could save money in a potential co-ordination agreement, but they are also giving away their NGA strategy to competitors, which could act more quickly given this information. It is therefore conceivable that an operator might prefer to stick to its own roll-out strategy and bear the full cost of roll-out rather than exposing itself to the risk of disclosing its strategy. A shorter-term announcement might protect the operator's plans, but then would not allow other operators sufficient time to co-ordinate; this approach, however, could have the additional benefit of other infrastructure owners being able to contact the operator in the case that they have existing infrastructure in the deployment area which is prone to damage. This is therefore another area where there is potential for the purpose of a measure, and therefore the implementation cost, to overlap.

The scope for co-ordination might therefore be limited to telecoms operators working with other utility companies where there is no competitive threat. It therefore seems unlikely that mandating operators to announce roll-out plans in good time would not be beneficial to the market. A study by the Swedish NRA (see Section 0) suggests some innovative procedures that are designed to deal with these issues.

There are a number of further issues related to this measure, and potential challenges in implementing it:

Is co-operation imposed or encouraged? If it is encouraged, how is this implemented?

What would any measures actually mandate? Would it be an obligation to announce plans, an obligation to negotiate or an obligation to grant access?

Have these measured given rise to disputes? If so, how are these resolved? Is the NRA able to deal with disputes if a non-telecoms infrastructure company is involved?

In order to consider the different ways in which these issues can be tackled, we have looked for examples in Europe, where attempts have been made to implement such a measure. These examples are summarised in the table below. Two of these examples – Finland and Sweden – were selected as detailed case studies, and are presented in Section 0 and Section 0.

Figure.1: Examples of countries that have attempted to implement a database of planned civil works [Source: Analysys Mason, 2012]

Country	Description
Finland	**Case study** – see Section 0
Sweden	**Case study** – see Section 0
Denmark	The Telecommunications Industry Association in Denmark co-ordinates intended rights of way and civil works to encourage collaboration between infrastructure providers. This scheme is based on voluntary participation.
France	Infrastructure owners who are about to carry out installation or maintenance projects of 'significant length' (~150m in urban areas and ~1km in rural areas) are obliged to announce their plans for surface works (such as stripping and replacing surfaces/façades), works on overhead lines, and any works which require excavations to the local authorities. These infrastructure owners are also obliged to allow operators to install electronic communications equipment in any trenches that are created during the work. The operator must compensate the infrastructure owner for any extra costs that are incurred during the process, and the operator subsequently becomes the owner of the electronic communication equipment that has been installed, and thus is ultimately responsible for maintaining it.
Lithuania	According to the NRA, the Lithuanian government is looking to draft legislation that mandates public infrastructure companies to co-ordinate civil work, with help from the NRA. It is accepted that it is more difficult to enforce this on private companies from a practical point of view, and a softer 'best recommendations guide' approach is being considered instead.
Luxembourg	A national construction works register is currently being developed to provide an online directory of all future civil works to be carried out. In addition, guide prices will be listed for telecoms operators that are interested in participating in the civil works in order to deploy their own infrastructure.
Portugal and Belgium	Bodies intending to carry out civil works in Portugal and Belgium are now obliged to publish prior notice of this, so that other interested parties (including telecoms operators) are able to participate in them should they wish.
UK	One of the NJUG's working groups, the Advanced Co-ordination Group, hopes to reduce disruption to the public by co-ordinating necessary civil works in the UK. In 2007, a statement of understanding with regard to advance co-ordination was signed by four utility companies, although neither Openreach nor Virgin Media appears to have taken part to date.

Case study: Finland

Market context

Finland has a cable network with an estimated coverage of 86% of households. At the end of 2011, FTTH coverage was estimated to be the third-highest is Europe, at 36%. Overall take-up, however, was low for Western Europe, at 57%, with 76% of broadband connections being DSL. The incumbent operator, TeliaSonera, has a 30.2% of the market, and is the main provider of FTTH services.

The Commission reports that, at the beginning of 2012, only 3.6% of connections delivered speeds of between 30Mbit/s and 100Mbit/s, and 5.6% of connections delivered speeds of 100Mbit/s or higher.

Measure implemented

Finland has one of the most ambitious national broadband plans in Europe, aiming to have at least 99% population coverage of 100+Mbit/s services by 2015. Although 95% of this is expected to be achieved by market forces,[1] the Finnish government has been considering ways to reduce the cost of NGA deployment.

Finland's Ministry of Transport and Communications (LVM) claims that in some cases, excavation work can account for 80% of the cost of deployment of telecoms infrastructure, and so significant overall cost savings can be achieved by co-ordinating construction work. In addition, it claims that if construction work were to be co-ordinated for four deployments that would normally be made separately (e.g. water pipes, gas pipes, electricity cables and fibre), the overall construction time could be halved, thus further reducing cost and reducing civil disruption.

A portal has therefore been set up by the state-owned company, Johtotieto Oy (Co-digging). This is an electronic platform where operators and infrastructure owners are able to advertise work that they intend to carry out, or conversely find out whether other bodies are carrying out work in areas of interest. The portal is not currently based on a detailed geographical platform; instead, projects are categorised by town or city. Interest in the portal has been widespread, and it was developed with the co-operation of a number of key players including TeliaSonera and the state-owned power company Vattenfall. Rather than mandating parties to use the system, announce plans and co-ordinate works, the strategy has been to encourage operators and infrastructure owners to do so. To this effect, the government has embarked on a programme of marketing and advertising, with the advertisements developed such as the one shown below in Figure *2*.

Figure 2: Example of a government advertisement encouraging co-operation over civil works in Finland [Source: LVM presentation[2], 2011]

1 http://ec.europa.eu/information_society/digital-agenda/scoreboard/countries_2012/country_fi.html.

2 http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=5&ved=0CFsQFjAE&url=http%3A%2F%2Fec.europa.eu%2Finformation_society%2Fevents%2Fcf%2Fdaa11%2Fdocument.cfm%3Fdoc_id%3D18153&ei=-OMHUL7kMdOk0AWN1PmJBQ&usg=AFQjCNHFX3novYXZNKvyIpb0WJWdFo23_g.

Prior to the launch of the portal, in December 2010, LVM published a guide to best practice for jointly constructing infrastructure.[3] This was produced after interviewing a number of operators, and listed a number of challenges faced by such a scheme:

Lack of co-operation between parties – Operators are not used to sharing roll-out plans with rivals, and although it is normal for utility companies to have multi-year project plans, the utility companies rarely co-ordinate with one another. In addition, it has been found that many water company projects are not in areas that are of commercial interest to telecoms operators. A potential solution to this would be to hold regular meetings between the concerned parties regarding future construction plans.

Issues with lack of scheduling compatibility – Construction projects generally require two years' notice due to the slow process of reserving funding. Thus schedules would need to be shared at least two years in advance of works commencing.

Lack of funding. In addition to the above point, there may be no funding available at all for the construction of a fibre network in the area that civil works is being carried out. It is then up to the main contractor to decide whether or not it wishes to install empty fibre ducts for future use. All transport infrastructure built by municipalities with state funding is designed with the provision of telecoms infrastructure in mind.

Concerns that simultaneous construction works could add complexity to the project. However this has been resolved by careful project planning, and only awarding contracts to construction firms with a strong track record.

The location and routes of existing underground infrastructure is poorly documented according to the Finnish operators, especially in areas of low population density, for example, there is rarely any information about how deep infrastructure is buried.

It is these challenges that the launch of the portal aims to overcome. An example of a success story provided by the LVM is Vattenfall (which, as previously mentioned, co-operated with setting up the scheme), which has decided to deploy its new cabling underground rather than overhead and has embraced the scheme. When undertaking new projects, as the principal client, Vattenfall arranges planning meetings, prepares planning documents and draws up joint contracts. It is up to the individual parties, however, to draw up the plans and specifications for the infrastructure they require. Only contractors that meet experience requirements are invited to tender, and the cheapest is then selected. According to the LVM, joint construction projects led by Vattenfall have been successful, have kept to schedule, have an improved safety record and have a reduced number of warranty claims in a set period. LVM claims that the most important success factors are:

[3] http://www.localfinland.fi/en/authorities/information-society/broadband/Documents/2010%20LVM%20Kuntaliitto%20Best%20Finnish%20Practices%20on%20Joint%20Construction%20of%20Infrastructure%20Networks.pdf.

availability of information at an early stage
good co-operation between parties
a principal client, which co-ordinates the works
joint tendering for contractors, and one successful principal contractor (sometimes with subsidiary contractors, which may be responsible for areas such as site safety
a principal supervisor, whose roles will include ensuring that that the project is delivered on time and on budget.

The portal is, however, in its early stages, and there are likely to be further challenges to overcome. Currently, there is no dispute resolution process in place, and is thought that in the case of a dispute, parties are left to negotiate freely between themselves. Clearly, this is a weakness that could potentially lead to delays in construction. There is also still the challenge that interest from some players can be limited, and the service may not be suited to the needs of some players, perhaps having limited information about an area of interest for deployment. An additional challenge is that some local authorities or infrastructure owners may believe they have a good knowledge of all planned works in their area; this is likely to be a barrier to adoption of the system, and results in the information available on the system being incomplete, thus affecting other users of the system.

Strengths and weaknesses

Strengths ↑	Weaknesses ↓
• The system is User ID and password protected to protect confidential information, but out is still open enough about project plans for users • The system is very cheap to implement and run, compared to the potential cost savings to operators	• Portal is not of interest to some players • Still in early stages and development still may be required (e.g. no dispute resolution process in place currently). Additionally, alignment of implementation plans across different organisation is likely to be a major barrier to implementation

Case study: Sweden

Market context

At the end of 2011, Sweden had the second-highest level of FTTH coverage in Western Europe, at 41% of households, and cable coverage was roughly average for Europe at 60%. Broadband penetration was the eighth-highest in Europe, at 71%: 30% of total connections were FTTH, and 18% were cable.

Broadband take-up is therefore high, with the Commission reporting that 16.4% of connections were providing speeds of 100Mbit/s or higher at the start of 2012. As with Finland, the incumbent operator is TeliaSonera, which enjoys a relatively modest market share of 36%, followed by Com Hem (a cable operator), Telenor and Tele2, each of which has a similar market share of between 15.7% and 18%. TeliaSonera, Telenor and Tele2 are all involved with FTTH deployment.

Measures implemented

According to the Swedish Post and Telecom Authority (PTS), in recent years there has been rising demand for high-speed broadband in rural areas of Sweden, and many of these areas have seen a lack of supply. In part, this is because the pay-back time of network deployments in areas with low population density is typically much longer than in urban areas, and so operators can be unwilling to deploy infrastructure in those areas.

The proposal for the Swedish Broadband Strategy[4] was published in February 2007, and recommended that the viability of co-ordinating civil works should be investigated by the government as a priority, in order to reduce the cost of, and speed up, the deployment of NGA services. The reduced costs would also result in a decreased pay-back time of investment, increasing the commercial viability of network roll-out. Further to this, in December 2011, PTS published a document that detailed its decisions and recommendations for broadband duct protocols.[5] The document suggests that excavation accounts for 60% to 80% of total deployment costs, and thus total costs could be significantly reduced by the co-ordination of civil works. However, PTS accepts there are a number of obstacles to the adoption of such a scheme, namely:

differing plans between telecoms companies and utility companies in terms of both timing and location of deployment
concerns over the payback period in deployment areas
lack of information regarding the deployment plans of other parties
concerns over other costs, including unforeseen technical costs
concerns over payment for access to land, as well as other legal concerns.

PTS therefore suggests a number of different solutions that aim to capitalise on the cost saving of co-ordinating civil works, whilst addressing the above concerns:

A utility company installing new infrastructure installs co-located empty ducts suitable for fibre deployment – An Infrastructure Clearing House (ICH) then reimburses the utility company for the cost incurred in installing the ducts. When an operator wishes to lay fibre within the ducts, it pays both the ICH and the utility company, thus the company that installed the duct sees a profit and is incentivised for installing the infrastructure. The business model is designed such that the ICH will see a profit on ducts that are used by operators, although those that are not used will obviously incur a loss.

Developing a commercial platform for the co-ordination and management of excavation activities – PTS considers a number of possible solutions such as creating a platform that has the purpose of monitoring applications for and upcoming civil works and a platform for recording the location of cabling.

4 http://www.pts.se/upload/documents/en/proposed_broadband_strategy_eng.pdf.

5 http://www.pts.se/upload/Rapporter/Internet/2011/2011-26-kannalisation.pdf.

Developing existing IT platforms to create a duct co-ordination system – PTS's Ledningskollen system (which provides location information of existing cables, primarily to prevent cables being accidentally dug up) and the Swedish Urban Network Association's (SSNf) Centralt system för Accesser CESAR (an information directory for purchasing access to fibre) could be developed to identify co-location possibilities for ducting. According to PTS, the number of requests for information from CESAR has recently increased, and work is in progress to further improve the system.

Of these options, it appears that Ledningskollen is the most likely to advance. The system works by splitting the entire country into 1km square grid cells; infrastructure owners then provide data on which cells they have deployments within (hence although spatial resolution is relatively high, Ledningskollen is not a true map-based system and was not conceived with the INSPIRE directive in mind). Ledningskollen will send these infrastructure owners automated messages if another party is planning on digging within this cell, thus the capabilities of the system have some overlap with the infrastructure atlas and the one-stop shop for rights of way. Now, ~EUR600 000 of extra funding has been made available for a pilot scheme between PTS and a municipality in the south of Sweden, which aims to investigate what the cost and time savings of civil works co-ordination are, whether the Ledningskollen platform is sufficient to facilitate such a scheme, and how much further development would be required. The funding is being spent on consultants and web developers who have been tasked to create an online portal to facilitate co-deployment. Additionally, the proposal for ICH is currently under consideration in Sweden by the relevant stakeholders. The CESAR system is currently only available to members of SSNf, and thus SSNf would have to consider modifying its business model if CESAR was to be modified into a portal for the co-ordination of civil works. Any development would also require funding.

PTS places much of the responsibility with the municipalities, in part because it is estimated that around 81% of Swedish ducts are owned by municipalities. PTS also believes that the day-to-day running of any co-ordination should be in the hands of the lowest possible level, so it makes sense for the municipalities to take responsibility for this. Finally, in Sweden, municipalities are broadly independent, and so PTS may not have the authority to intervene in some cases.

Unlike the measures implemented in France (see Section 0), it is not envisaged that there will be an obligation to announce or co-ordinate works. This is in part due to a debate within government about the national security concerns of any national infrastructure database 'getting into the wrong hands'. However, there has been some government intervention in the form of agencies responsible for the construction of roads and power networks being obliged to consider broadband deployments when building new infrastructure. Overall, it is hoped that players will see the benefits of the measures and will actively seek to co-operate.

The most significant of these benefits is that where the measures are in place, broadband deployments should go further for the same investment, resulting in better coverage. Additionally, PTS claims that it is important for utility companies to take into account broadband deployment into their business plans, as broadband is becoming a more important part of life, and thus different

industries depend more and more on broadband infrastructure being in place. Finally, from a public funding point of view, it is important for all governments to lower costs where they can.

However, a non-mandated scheme would need to overcome a number of challenges. Firstly, co-ordination would disrupt the core business of utility companies, many of which are not interested in broadband deployment, which may lead to longer lead times between planning and construction, and additional costs. Furthermore, there is an issue with greed, as some companies may be willing to allow co-deployment, but only at a high cost to the company wishing to co-operate.

Strengths and weaknesses

Strengths ↑	Weaknesses ↓
• Could lead to reduced deployment costs of broadband, and better coverage • PTS is carrying out a thorough consultation and pilot process, with many innovative ideas being considered, which is likely to lead to a strong solution being implemented • By handing responsibility over to municipalities, it allows the day-to-day running of the measures at a low level • The introduction of an ICH, including utilities implementing fibre compatible ducts, addresses the issue of the co-ordination of projects across different sectors	• Cost and time savings currently unknown, which is causing difficulty in convincing policymakers and stakeholders to take an interest in the measures • Many utility companies are not interested in broadband as it is not part of their core business; they may therefore see co-ordination as an inconvenience • Particularly for the case if ICH, cost savings are limited to areas where new infrastructure is being deployed, so impact could be quite limited in the context of the overall NGA roll out. • The Government is concerned about national security implications of a national infrastructure database being accessible.

Financial implications

Costs of the measure

Cost to the NRA or government

The costs incurred by the NRA or Government are mainly due to the cost of setting up the IT systems and the ongoing administration effort. As previously mentioned, the IT costs could overlap with other measures such as the infrastructure atlas and the one-stop shop on rights of way and permits, if implemented in parallel.

In Finland, the portal was rolled out in two phases, with a total implementation cost of around EUR200 000. The ongoing cost is thought to be less than EUR100 000 per annum in operations and maintenance. This is funded by the state, and thus operators and infrastructure owners do not incur costs. These costs are likely to be very low compared with the potential savings from the measures.

In Sweden, Ledningskollen cost ~EUR1.8 million to implement between 2007 and 2010, and costs between EUR600 000 and EUR800 000 per annum to run. As previously mentioned, a further ~EUR600 000 of funding has been allocated for a pilot project to investigate the feasibility and benefits of using the system for the co-ordination of civil works. PTS' business projections suggest that ICH would at least break even within five years of implementation, and be quite profitable after ten years, however, this would require an estimated EUR25–35 million of initial funding. Due to the projected long-term profitability, it is hoped that pension funds may be interested in investing in such a system. As well as this, the possibility of European funding (from the Connection Europe Fund) has been briefly considered. These costs are separate from those incurred from the broadband survey project and infrastructure atlas project discussed in Section **Error! Reference source not found.**. PTS does not intend to attempt to consolidate these systems as it has found that they all act as useful planning tools, but each serve a different purpose and thus each add value as standalone products.

Cost to the operators

As mentioned in Section 0, the main cost to the operator is exposing itself to the risk of announcing its rollout plan to competitors which may be able to move more quickly. In addition, there is likely to be an administrative burden of announcing roll-out incurred by the operators.

Summary of costs

(EUR millions)	**Implementation cost**		**Ongoing costs**	
Member State	**NRA**	**Operator**	**NRA**	**Operator**
Finland	0.2	-	0.1	-
Sweden	1.8	Low	0.6 - 0.8	-

Savings from implementing the measure

As mentioned in Section 0, this measure is an enabler of self-deployment. Therefore, the overall economic savings are achieved by operators, and this is the difference between the cost of deploying alone or deploying in a co-ordinated project. On this basis, if a project is shared between two parties, it is possible that a 50% saving on excavation could be achieved by each party. Assuming there are two players involved, and the cost of excavation forms 80% of the deployment cost, then the cost saving achieved by each operator could be 40% of total deployment costs. Furthermore, if more than two operators were to be involved, the excavation costs per operator decreases further, saving around 53% for three players.

It is worth noting that savings will only be achieved in areas where deployments overlap, and as previously mentioned, although the most densely populated areas may have several different types of utilities deployed in a parallel fashion, this is no longer the case in less densely populated areas, which may only be connected to one or two services. It is therefore unlikely that the co-ordination of civil works will be possible in all areas of a fibre deployment project, except when utility access is being provided to new developments. This issue also means that the benefit is also likely to be

incremental, with benefits not seen in a wider context for some time. Companies such as Inexus in the UK already provide multiple utility access including fibre deployment.

It is likely that more players becoming involved would increase the complexity of the project, and thus the excavation cost. For example, there may be special regulations for the installation of power cables or gas pipes, which the project will have to conform to if these utility companies became involved. Gas pipes may require a trench of up to 100cm in width, costing around EUR50 per metre, whereas a micro-trench may cost under EUR10 per metre, thus it would not be worth an operator co-ordinating with the gas company unless the gas company were to pay for the majority of the works. Nevertheless, it has also been found that joint tendering for construction work has resulted in lower prices from contractors, so it seems possible that in some cases the cost savings could be greater than 50% to each operator.

Interest could be generated on behalf of the utility companies by considering the different investment time horizons. Utility companies, generally have a longer accepted payback time on investment than telecoms companies. In Sweden telecoms operators have expected 50-70% of the initial investment per home to be recouped within 2 – 5 years, and shareholders are strongly averse to these companies making what they see as speculative investments. This is in contrast with the utility companies (many of which are former state monopolies) and may wait 10 – 20 years for payback on the initial investment. By considering innovative co-deploying strategies, such as utility companies installing empty ducts alongside new infrastructure, they may be able to see a short-term benefit from operators renting ducts, as well as the long term benefit of providing their normal utility service.

According to LVM, the savings to operators in using co-ordinating civil works for deployment is thought to be 'tens of per cent'. Depending on the size of the operator, this could be EUR tens of millions or even EUR hundreds of millions. A more conservative estimate was reached in a 2011 study[6], which concluded that overall savings can be between 15% and 30%. In Sweden, PTS does not have an idea of the time or cost savings that could be achieved from the measures; it is carrying out a pilot project to investigate this.

6 *Möglichkeiten des effizienten Einsatzes vorhandener geeigneter öffentlicher und privater Infrastrukturen für den Ausbau von Hochleistungsnetzen*, Dr H. Giger et al, 2011

Figure *3* shows the estimated range of cost savings that can be achieved from the co-ordination of civil works.

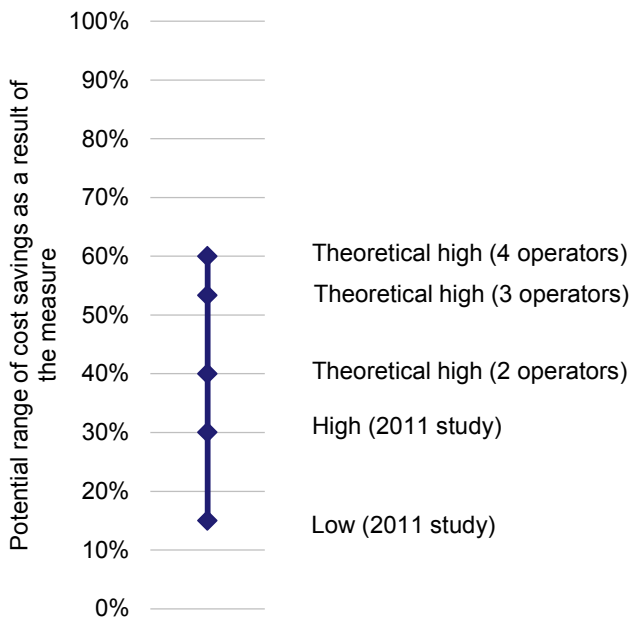


Figure 3: Range of potential cost savings from co-ordinating civil works [Source: Analysys Mason, 2012]

Summary

The implementation of co-ordination of civil works is in its very early stages in Europe. Finland has implemented a basic web portal that allows companies who are excavating to advertise where they are carrying out work, and to search for other parties that are planning work in the same place. In Sweden, a number of different options are currently being considered, with a pilot scheme in progress at the moment. 70% of Swedish municipalities have taken some steps to implementing co-ordinating civil works.

The main benefits are the potential time and cost savings in infrastructure deployment, perhaps leading to increased coverage. In addition, there will be reduced civil disruption. There is also the possibility of economic and social advantages of companies from different industries working together (as broadband is becoming more important to all industries).

However, there are a number of challenges faced by this scheme, for example it is likely to disrupt the core business of utility companies, who may not be interested in broadband deployment. Furthermore, utility companies may not be building in areas of interest to operators, and regulation regarding utility deployment has the potential of making deployments more expensive. The Swedish Government has also expressed concerns about a national database of planned infrastructure construction having national security implications.

The costs of such a scheme vary, although the IT cost of setting up a web portal such as the one in Finland appears to be EUR hundreds of thousands, which is low compared with the potential benefits. PTS estimates for the cost of a portal are fairly similar, although the cost of setting up an Infrastructure Clearing House is much higher and in the EUR tens of millions. However, the business case of such a project is designed to be profitable in the long term.

There is little data on the savings achieved in the past from such a scheme. In theory, the combined cost saving from two operators rolling out should be around 40%, but studies have shown it could be lower at between 15% and 30%.

The mandating of the deployment of fibre compatible duct by utility companies alongside new infrastructure deployments could lead to significant cost savings, but could also lead to unnecessary costs being incurred if it is deployed in areas where sufficient duct space is already available or where there is unlikely to be market demand for deploying fibre. Therefore, some analysis to determine this prior to deployment would be desirable. From a wider perspective however, it is likely that savings would be incremental and take some time to be seen.

High-speed infrastructure for new and refurbished buildings

Definition: This measure would see the provision of in-building infrastructure such as vertical wiring and a shared connection point in new and refurbished buildings. This would aim to facilitate the connection of an end user in an apartment to a high-speed broadband network.

Background

Installing infrastructure to enable high-speed Internet access is much more cost effective at the time of building than retrospectively. This is particularly the case in MDUs, which may have a complicated layout, limited space, and where retrospective installation may result in significant redecoration costs; these issues could represent a significant barrier to NGA adoption.

If, however, property developers are mandated to make provision for high-speed Internet access (in terms of in-building wiring and appropriate ducting on any land under development), this can be controlled as part of the planning permission process for new developments. Ensuring open access to this infrastructure serves to maximise competition and the supply of services to end users. Two wiring solutions are shown below in Figure *4*.

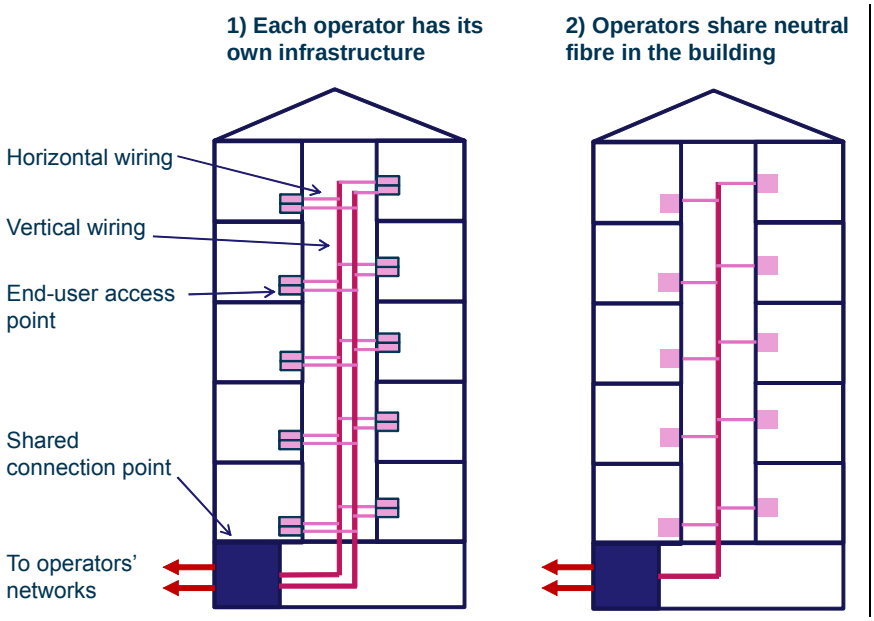


Figure 4: Illustration of in-building wiring in an MDU [Source: Analysys Mason, 2012]

There are potential issues regarding responsibilities for the ongoing ownership and maintenance of infrastructure, which is why such measures are usually limited to passive infrastructure. It is important to define appropriate levels of responsibility for property developers, in order to avoid any adverse effects such as making rural development unviable. The UK government considered making in-building wiring requirements part of building regulations. However, the inherent complications meant that these new laws did not come to fruition. Other Member States, such as Spain and France, have introduced this measure (see Section 0 and Section 0), but care is needed to ensure that the specified technical requirements are compatible with that specified by the

operators. Indeed, if it is implemented successfully, the measures could encourage FTTH take-up, which is low in many countries, in part due to many buildings not being wired for fibre.

There are a number of further issues related to this measure, and potential challenges in implementing it:

Do the measures apply to refurbished buildings as well as new buildings? This is a key issue, as the impact on NGA take-up is likely to be slow if only new buildings are included. This could be of particular interest in some Eastern European Member States, where there have recently been initiatives to refurbish aging MDUs.

Do measures go beyond vertical wiring and go as far as the horizontal wiring of individual apartments? Connecting each individual apartment directly to the NGA network would simplify the adoption process and remove a barrier to take-up.

Despite these challenges, some Member States have implemented this measure successfully. These examples are summarised in the table below. Two of these examples – Finland and Sweden – were selected as detailed case studies, and are presented in Section 0 and Section 0.

Figure 5: Examples of countries that have implemented an obligation to equip all new buildings with high-speed Internet (100Mbit/s) as well as mandated open access to the terminating segment [Source: Analysys Mason, 2012]

Country	Description
France	**Case study** – see Section 0.
Spain	**Case study** – see Section 0.
Ireland	In 2011, the DCENR launched a public consultation[7] regarding NGA-ready buildings in Ireland. The paper sets out proposed detailed technical regulations for an open-access interface for connecting new residential buildings to FTTH networks, along with recommended standards for in-building wiring. The recommendations are only for new buildings, as the DCENR acknowledges that retrofitting buildings is often difficult and costly.
Lithuania	Measures were introduced in 2009 following a consultation launched by RRT, which resulted in telecoms operators being mandated to connect MDUs to their fibre network using ducts with a diameter greater than 90mm. This came about as operators had previously been directly burying cables, which resulted in the same ground being dug up numerous times as each operator would connect to the MDU separately. In addition, equipment installed by operators for the distribution of vertical and horizontal wiring must leave enough space to accommodate other operators.
Portugal	A number of provisions are in place in Portugal regarding the specification and use of ducts installed in newly erected buildings, to facilitate the deployment of fibre in-house wiring.
Republic of Korea	South Korea, which has the highest take-up of fibre worldwide (20.4% of total households as of June 2011), has had a scheme in place since 1999 in which owners of buildings that contain at least 20 residential units are encouraged to deploy high-quality vertical wiring throughout their premises. Although the scheme is voluntary, around 6500 buildings have been certified to date, equivalent to 3.3 million households. There are four grades of certification, based on the speed of service that the in-building networks are able to provide, ranging from 'Third' (up to 10Mbit/s) to 'Special' (over 1Gbit/s).

7 *Recommendations For Open Access Fibre Ducting and Interior Cabling for New Residential Buildings – Making Homes Fibre Ready* (See: http://www.dcenr.gov.ie/NR/rdonlyres/31113BCF-785A-42EC-99D1-99460E017520/0/Consultation_Paper_Recs_For_Open_Access_Fibre_Ducting_and_Interior_Cabling_for_New_Residential_Buildings.pdf)

Case study: Spain

Market context

Cable coverage in Spain stood at 60% of households at the end of 2011, which is in the mid-range of European countries, and two thirds of this network is estimated to have been upgraded to DOCSIS3.0. Thus far, fibre deployment has been slow, with just 6% of households covered at the end of 2011. It is thought that the cabinets in Spain are unsuitable for the deployment of FTTC, and so, in the long term, the main driver of NGA infrastructure competition is likely to be FTTH.

Overall, broadband penetration in Spain stood at 62% of households at the end of 2011, which is around the median for Europe, although DSL accounts for the vast majority of broadband connections. The Commission reports that, at the start of 2012, just 6.3% of connections were between 30Mbit/s and 100Mbit/s, and only 0.1% were 100Mbit/s or higher.

Measure implemented

The legacy of in-building wiring in Spain dates back to the 1960s, when the sharing of in-building wiring for analogue TV was mandated. This was important in the Spanish context, as much of the population lived (and indeed still lives) in MDUs. Telecoms equipment, however, was not covered, so in these buildings, any telecoms infrastructure belongs to the operator that installed it, which in most cases is the incumbent, Telefónica.

In 1998, an obligation was introduced to equip all new buildings and buildings undergoing refurbishment with *common infrastructure* for telephone lines, TV connections (analogue and satellite) and broadband. At the time, these broadband measures consisted of installing either wiring or empty ducts that joined each apartment to a central in-building chamber (which was often located in the basement), which was designed for the location of equipment for broadband switching and distribution. The legislation included detailed technical regulations regarding the installation of the infrastructure, such as detailing the requirements for twisted copper pairs and TV coaxial cables. The infrastructure is owned and maintained by the building owner, not a particular operator; this was in response to disputes arising over the operator-owned telecoms equipment in pre-1998 buildings. In addition, a symmetric regulation was put in place that mandated any operator that installed NGA infrastructure within any building to share it with other operators. A further update in 2003 added digital terrestrial television (DTT) distribution to the list of required common infrastructures.

The legislation was significantly overhauled in March 2011, in light of DAE targets. Royal Decree 346/2011 (March 2011)[8] approved the regulations governing common infrastructure for access to

[8] See: https://sede.minetur.gob.es/es-ES/procedimientoselectronicos/Documents/SE%20Telecomunicaciones/ICT2011/RealDecreto_346_2011.pdf.

telecoms services inside new buildings. In addition, Order ITC 1644/2011 (June 2011)[9] set out the regulations for installing the infrastructure. Constructors of new buildings (and buildings being refurbished) must now install passive NGA infrastructure such as fibre or coaxial cables that connect each apartment to the central distribution chamber. The regulations apply to all buildings that have 'horizontal properties' – that is, where there are multiple owners – and so includes office blocks and businesses as well as MDUs.

Before new construction projects are approved, a consultation must take place between the construction firm and the broadband operators in the local area, and this is supervised by the Ministry of Industry, Trade and Tourism. The consultation must assess which NGA deployments are in the local region, and thus determine what type of infrastructure will be suitable for deployment within that building. If there is infrastructure competition in the area (e.g. both cable and FTTH), then more than one type of technology must be deployed in the building. Deploying multiple infrastructures is more expensive than just one, but the Ministry believes this is necessary from a competition perspective. However, a key aim of the consultation is to avoid that inappropriate in-building deployments will never be used, and thus would waste money.

It is optional for telecoms operators to take part in the consultation process, and if they wish to must commit to exchanging information and responding to requests from network designers when requests are made. However, as one of the key objectives of the Decree is to increase the supply of NGA services to end users and to promote competition, it would appear to be within the operators' interest to take part in the scheme. Service competition is also encouraged by the requirement for fibre operators to share the in-building fibre network.

As these measures have been put into place with DAE targets in mind, specifications for twisted pair installations are carefully set out in the Decree, which stipulated the maximum length and cable type for different sizes of building, in order to ensure a minimum quality of service. In addition, the capacity of the fibre network installed must be over specified to take into account growing demand and the possibility of fibres becoming damaged. The specific technical regulations are set out in the annexes of the Royal Decree 346/2011.

With the exception of DTT, where amplifiers are installed, normally only passive infrastructure is installed. However, regulations also extend into individual dwellings, with a minimum number of sockets per apartment specified for new construction projects.

The Ministry cannot recall any examples of disputes between contractors and operators; it claims that the procedures that have been put in place are designed to deal with issues before disputes occur. Firstly, the person in charge of the common infrastructure deployment must be a certified telecoms engineer, and the applications are independently checked by one of several accredited bodies, before the project is permitted to go ahead. In addition, the Ministry may elect to survey

[9] See: https://sede.minetur.gob.es/es-ES/procedimientoselectronicos/Documents/SE%20Telecomunicaciones/ICT2011/OrdenITC_1644_2011.pdf.

the project. However, conflicts have arisen in the past in projects that have tried to reduce costs, for example by construction firms not considering all the necessary requirements that are necessary to comply with the regulations. Most of the process is carried out using electronic procedures, so despite sounding complex, the measures have not resulted in significant administration or staff costs.

Overall, the Ministry claims that there has been a positive impact on coverage; cable operators in Spain often consider the deployment case on a building-by-building basis (e.g. buildings close to the beach might only be occupied during the holiday season, so the business case is weaker than buildings in the city, which are likely to be occupied all year round). The Ministry has found that cable operators are prepared to deploy in a building that has fewer end users wishing to take the service in buildings with common infrastructure than that in older buildings, due to the ease and reduced expense of deployment. Therefore, regulation has made it economically viable to cover some buildings that normally would not be in the interest of the operator to cover.

Strengths and weaknesses

Strengths ↑	Weaknesses ↓
• Internationally recognised as a strong scheme (considered 'excellent' by the OECD)[10] • Particularly important for Spain, as a large proportion of the population live in MDUs • Measures have encouraged coverage expansion, as cable operators cover buildings that would not normally be economically viable to cover	• As the regulations only apply to new and upgraded buildings, the impact is slow to take effect (~20% of buildings now have common infrastructure) • The scheme is heavily dependent on the Spanish construction sector, which has been in decline over the past few years • The scheme does not include a labelling scheme to promote fibre-ready buildings (such as the one seen in South Korea, for example)

[10] See: http://www.oecd.org/dataoecd/53/35/50488898.pdf.

Case study: France

Market context

Over the last decade, the French have embraced broadband, and at the end of 2011 broadband penetration in France was estimated at 83% of households, which is the fifth-highest in Europe. However, take-up of NGA services has been slow, with 93% of all broadband connections being DSL at the end of 2011, and only 2.9% of lines were 30Mbit/s or faster. In part, this is because NGA coverage is relatively low, with cable and FTTH covering an estimated 38% and 8% of homes, respectively, at the end of 2011. However, all of the main operators – France Telecom, Iliad (Free) and SFR – (which had a broadband market share of 41.9%, 21.8% and 21.6%, respectively) have extensive fibre deployment plans currently in progress, and fibre coverage is therefore expected to grow significantly by 2020 – a significant investment driver for FTTH roll-out is thought to be the popularity of pay-TV in France.

Measure implemented

In order to encourage operators to invest in NGA deployments, ARCEP has implemented three main measures since 2009. The first two relate to the shared point at which the MDU is connected to the operators' fibre networks (the shared connection point), and applies to all MDUs in densely populated areas. The third and most recent measure is concerning the installation of in-building wiring in all new buildings.

The first measure is described in Resolution No. 2009–1106,[11] which was passed in December 2009. At this time, FTTH deployments had already begun in Paris, although difficulties were encountered when attempting to connect the fibre network to buildings. The law originally dictated that fibre networks could be shared at the connection point to a building, in order to minimise disruption and damage to private property, and also to enable end users to select their preferred supplier. However, this second point was not economically favourable to the operators, and additionally there were found to be technical compatibility issues with the different FTTH technologies used.

Following a consultation earlier in that year, ARCEP clarified these rules for very densely populated areas as defined by ARCEP. These are 148 areas in the 20 main French cities encompassing around 3.5 million households where the regulator deems it commercially viable for a number of FTTH providers to operate. ARCEP's 2009 decisions are as follows:

[11] See: http://www.arcep.fr/uploads/tx_gsavis/09-1106.pdf.

The equipment installed must be compatible with the different FTTH technologies, i.e. passive optical network (PON) and point-to-point (PtP). As well as ensuring competition, this measure also has the aim to encourage technology neutrality. In addition, a number of solutions are permitted:

- a dedicated fibre is installed between the access point and the end user's premises for each operator
- a shared fibre is installed, which is only used by the operator selected by the end user
- a passive splitter device allows the end user to change service providers as and when required.

If an operator connects a building to its FTTH network, that operator is obliged to allow other operators to provide services through the equipment that the first operator has installed should an end user request services from another operator.

Access to shared connections must be granted in a non-discriminatory and transparent manner. Prices are not regulated as such by ARCEP; instead, each operator is required to submit a reference offer, detailing the technical and financial conditions of access. The three main operators' reference offers are fairly aligned in terms of pricing. Refusal of access is prohibited.

The first operator that connects the building to its FTTH network becomes the building operator and thus is responsible for managing the associated infrastructure. If there is no obvious building operator (for example on a newly built property), the owner of the building is able to designate a building operator. The building operator does not necessarily provide the end-user service, and may choose to be a neutral manager, providing passive access to the network.

Although the guidelines helped to clarify the rules of deployment, there were a number of disputes between operators regarding this regulation. France Telecom and SFR have filed complaints with ARCEP against Free, which was allegedly making it difficult for its rivals to gain access to buildings it connected. According to TeleGeography, French newspaper *Les Echos* quoted an unconfirmed source that claimed that Free's infrastructure had been badly built, making it difficult for its rivals to provide their services to those buildings that Free had connected.

As a result, a second measure was introduced, with clarifications made to the ruling in 2010. Article 2010–1312 was primarily used to create the rules of fibre deployment in less densely populated areas, encouraging collaboration between the main operators in places where the business case for deploying fixed NGA is less clear. However, the Article was also used to update Article 2009–1106, by stating that the preferred location of the building's access point was to be within the private premises of the building. ARCEP has explained that at the time of the decision, this was the best option as it encouraged building owners to consider more carefully which operator they would prefer to be the neutral manager, and thus promote competition and responsibility amongst the operators. This is in contrast to less densely populated areas, where access points must be located in the public domain, with the result that access to FTTH networks on the operator's side works in a similar way to LLU. ARCEP has said that, in retrospect, even though all of the operators were in agreement with ARCEP that Article 2010-1312 was the best way forward, this ruling has resulted in two main complications:

In each building, every landlord must be in agreement as to whom the neutral manager will be, which will install and maintain the access point and vertical network. This is often a lengthy and tedious process.

It is often difficult for operators other than the neutral manager to access the premises, as they will need permission from the building owners, thus in some cases it has been difficult for end users to change operators.

Disputes about how pricing is determined have continued to emerge, for example how the weighting of access pricing is split between the vertical link and the 'last metre' that connects the vertical wiring to the end user's fibre terminal.

The third measure is slightly different and related to all areas of France. It was passed at the end of 2011 (Article R. 111-14, from the Ministry of Housing) and obliges all those applying for a construction permit from April 2012 to equip the associated building with vertical fibre, connecting all residential units to a central fibre access point. The measures are new, and the technical details have not been finalised as yet; this has been causing some compatibility concerns for operators and construction firms. In addition, it is unclear as to whether the measures are confined to new buildings or also include refurbishment projects, as the specific wording of the Article simply refers to the application for a building permit.

Strengths and weaknesses

Strengths ↑	Weaknesses ↓
• The FTTH access point measures have encouraged investment in NGA as the rules of the game have been clearly stated and stability has been created from an investor's point of view • Ideally, the measures should mean that end users are able to choose and switch operators easily, which should encourage competition • The new in-building wiring measures could facilitate NGA take-up, seeing as no further intervention will be needed when end users in these connected buildings wish to take the service (currently most buildings have a copper distribution network, but fewer have a fibre network) • The issues encountered by operators in retro-fitting existing premises highlight the advantage of mandating deployment in new infrastructure	• Although deployment has been encouraged, take-up of NGA continues to be low (according to the latest figures by ARCEP, ~1.7 million households were connected to an FTTH network, but only ~0.25 million had taken the service as of mid-2012) • Having the access point located within the private property means that choosing the neutral manager is a long and difficult process, and other operators have found accessing properties difficult, which could hamper competition • The in-building wiring measures are still in their early stages of development, and the technical guidelines are yet to be finalised, which could result in some incompatibility issues and disputes between construction firms and operators

Financial implications

Costs of the measure

Cost to the NRA or government

An advantage of these measures is that the cost to the government and/or the NRA is negligible (with the obvious exception of the initial consultation and drafting of the legislation). In the case of Spain, a 2007 legislation obliged all government services (such as electronic signatures and registers) to be made available electronically by 2010, and so the platform for introducing these measures was largely already in place. As a result, the cost is incremental and thought to be low.

Cost to the operators

In the examples considered, operators have not incurred any costs when new laws oblige new and refurbished buildings to be fitted with common NGA infrastructure. However, in France, it is up to the operator to build this terminal segment in such a way that it can be shared by other operators, which may incur some addition cost.

Cost to other sectors

For installing the in-building wiring in new buildings, it is the construction firm that must cover these costs, although these are relatively low (much lower than the cost of in-building water and gas distribution, for example). As access to NGA services becomes more and more important to consumers, it is possible that these construction firms may see a future benefit from the measures, with pre-wired buildings being sought-after by property purchasers. Therefore the construction sector could become more willing to deploy NGA infrastructure as consumer demand grows for NGA services.

The table below shows the costs of installing infrastructure in a building containing 20 units.

Figure 6: Costs of installing in-building wiring in a MDU containing 20 units [Source: Analysys Mason, 2012]

Member State	Vertical cost (EUR)	Horizontal cost (EUR)	Total cost (EUR)
France (**existing** building)	Unknown	6000 (300 per premise)	Unknown
Spain (**new** building)	Unknown	Unknown	15 000 – 20 000[12]
UK (**new** building)	2500	2500 (125 per premise)	5000

In France, the cost to an operator of installing an FTTH connection box in the end user's apartment (in an existing building) and connecting it to the in-building vertical wiring is estimated by ARCEP to be around EUR300.

[12] The EUR15 000 figure includes the installation of ducts only, and not the required wiring, which would then need to be installed when an individual apartment decided to subscribe to an NGA service. The EUR20 000 includes all the necessary cabling.

Our Spanish benchmarks suggest that the complete cost of wiring a new building containing around 20 units for telecoms, TV and ducts for broadband is thought to be around EUR15 000, rising up to EUR20 000 if the actual fibre/NGA cabling is installed (as per the 2011 measures).

It should be noted that these figures are likely to be heavily dependent on labour rates, which vary significantly across Europe. As an example, Analysys Mason's benchmark for in-building wiring in India, where labour rates are extremely low is EUR55 per apartment.

Savings from implementing the measure

In France, an estimated average of saving 20% can be achieved from pre-wiring new buildings with NGA services as opposed to retrofitting existing buildings with the required infrastructure. That is, placing an FTTH connection point in the end user's apartment and connecting it to the in-building vertical wiring would cost ~EUR240. This saving comes from being able to carry out all of the work in one step, and not having to negotiate with, and approach, individual tenants and landlords.

In Spain, our benchmarks suggests that the cost saved by pre-wiring new buildings (or installing wires in ducts in post-1998 buildings) instead of retrospectively installing wiring is thought to be around 60%. These cost savings largely come from knowing where wires can be installed and not having to survey the roof, facades, internal ducts, etc. All buildings are different, and retro-fitting each one is normally difficult and expensive.

Figure 7 shows the range of potential savings per building from pre-wiring a building during the construction phase as opposed to retrospectively wiring it.

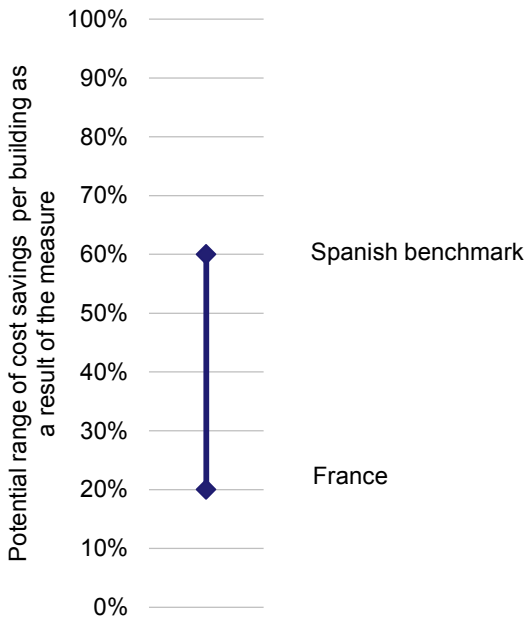


Figure 7: Range of potential cost savings per building from in-building wiring [Source: Analysys Mason, 2012]

Additionally, in the case of France, the savings to the government come from placing the connection obligations in the hands of the operators. ARCEP claims that these regulations have clearly set out the 'rules of the game' from an investor's point of view and so has encouraged NGA deployment, which has been a key benefit. The economic benefits would therefore come

from earning revenue from NGA services sooner than expected. However, as previously stated, NGA take-up in France has been disappointing thus far, and so these significant NGA revenues are unlikely to have materialised yet.

Overall, operators are likely to see significant financial benefits when connecting end users in MDUs which have in-building NGA infrastructure already in place. As mentioned in Section 0, it is possible that the measures may make some buildings economically viable to cover, when they would not be without the measures in place, from the point of view of the operator.

Summary

Regulations mandating the installation of in-building wiring in new MDUs are in place in Spain and France. In addition, regulations exist regarding the inter-operating sharing of in-building infrastructure that has been installed by operators.

This measure is of particular importance in countries such as Spain, where a high proportion of the population live in MDUs. The regulations have helped operators to increase coverage, as the existence of in-building wiring may make an MDU commercially viable to cover. In addition, having neutrally owned infrastructure promotes competition and allows end users more choice over their operator.

The main identified weakness is that the measures only apply to new buildings, or buildings undergoing renovation, therefore the benefits are incremental and slow. Additionally, it is doubtful as to whether the measures have significantly increased take-up.

The cost to the government or NRA is generally low, consisting of drafting the legislation and carrying out ongoing regulatory work. Most of the cost is incurred by the construction industry, which must install the wiring in the first place. Cost estimates vary greatly, but overall, these are low, especially when compared with installation of other services such as water or gas.

However, the savings that come from installing the wiring during the construction phase in comparison with retrofitting wiring can be huge. The extra cost of retro-fitting wiring comes from the additional survey work required in order to determine where wiring can be run, and having to negotiate with every tenant and landlord, as well as the building owner; this is also a highly time-consuming process, as highlighted by the experience in France.

Conclusions

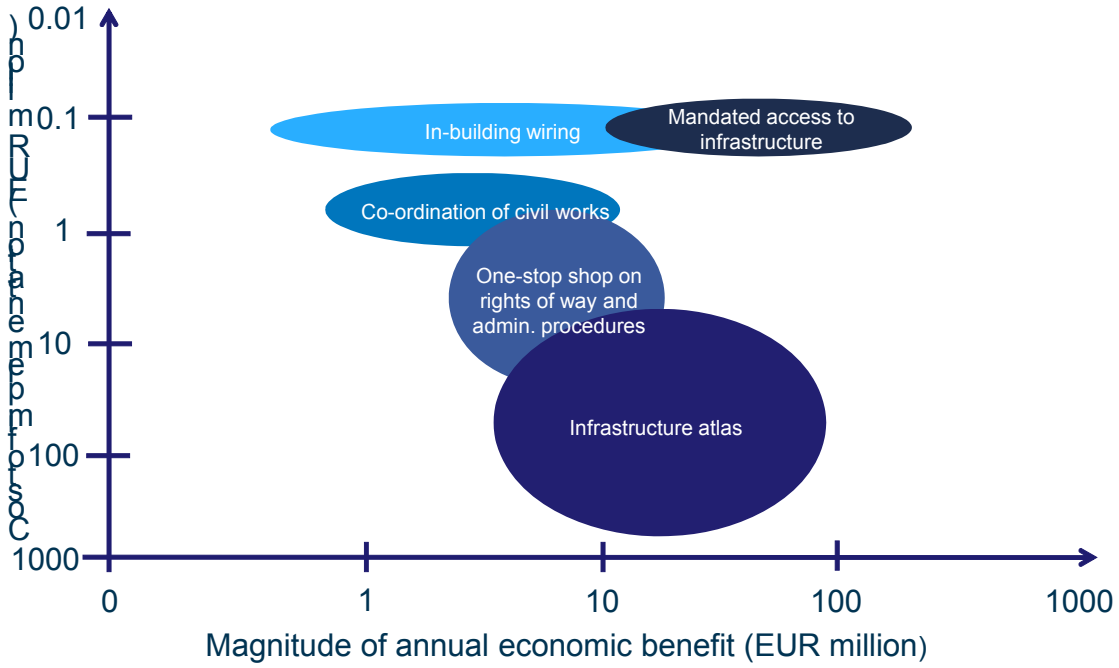
Having carried out exhaustive research and interviewed stakeholders around Europe, we believe that the five measures are all interlinked and should not be considered separately:

We believe that a **one-stop shop on rights of way and administrative procedures** and the **database where all civil works must be published** are enabler of operators self-deploying infrastructure, and not relying on shared ducts. The former can lead to savings in time and administration costs associated with digging; the latter can lead to significant cost savings associated with the digging process itself.

A **centralised atlas of passive infrastructure** will aid the implementation of **mandated access to passive infrastructure**, which will lead to deployment in shared ducts due to lower initial investment costs compared with self-digging. However, we do not believe that a centralised atlas of passive infrastructure is necessary to implement mandated access to passive infrastructure**.** A centralised atlas of passive infrastructure will have the additional benefit of reducing damage to existing infrastructure during civil works due to better knowledge of the location of existing pipes and cables; this could constitute a significant social and economic benefit in some Member States.

The cost and overall benefits to an NRA of implementing each of these five regulatory measures is shown in Figure *8*.

Figure 8: Estimate of the cost and overall benefits to an NRA of implementing each of the five regulatory measures [Source: Analysys Mason, 2012]



Overall, we estimate that mandated access to passive infrastructure is the measure that performs most strongly in a cost–benefit analysis. However, experience has shown that it is mainly the ducts owned by the incumbent operator that are the most utilised in NGA deployments. Co-ordination of civil works also has the potential to offer significant benefits due to the lower costs of implementing this measure.

The cost to an NRA of implementing and regulating an obligation to install in-building wiring for new and refurbished MDUs is also low. It is the construction industry that will incur the majority of the cost, but this sector could see future financial benefits as NGA access becomes more important to property purchasers. However, the benefits from this measure will be incremental and so it may take some time for the benefits to materialise.

A one-stop shop on rights of way and administrative procedures is primarily a time-saving measure, and so the economic benefits could be achieved from more rapid NGA deployment, which would in turn enable operators to generate revenues sooner.

A centralised atlas of passive infrastructure is an enabler of mandated access to passive infrastructure, but depending on the detail of the mapping, the land area covered, the amount of prior infrastructure knowledge, and the likelihood of new NGA deployments in the atlas coverage area, the costs of implementing such a measure could be extremely high. It is possible that a phased approach could be taken to implement such an atlas, where data on the locations of existing infrastructure is requested from operators and utility companies first, with a more detailed second stage survey following where the shareability of ducts is considered. This would allow some information to be available to operators quickly, perhaps encouraging roll-out, although it may lead to a 'wait and see' approach if operators believe that there will be even more detailed information available in the future, as a result of the much more cost-intensive second stage. However, if the additional socio-economic benefits of reduced damage to existing infrastructure are taken into account, such a mapping project could be worthwhile.

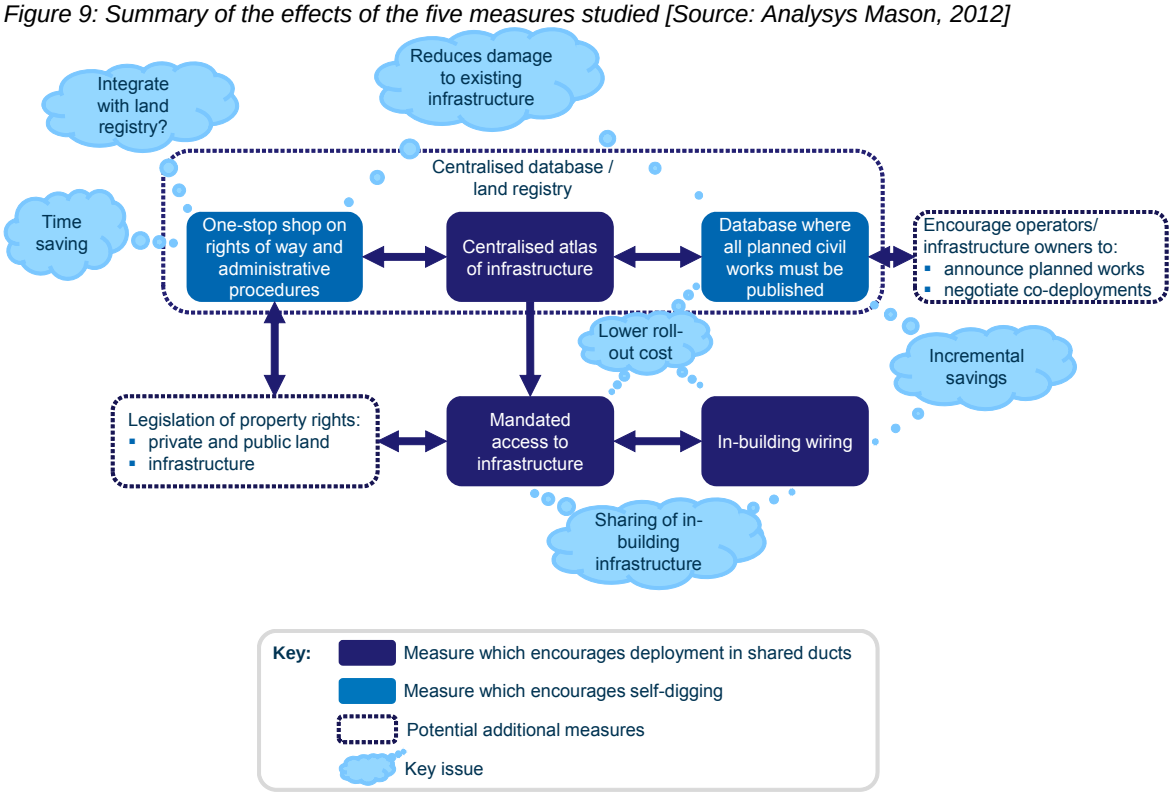
It should be noted, however, that mandated access to passive infrastructure was brought into effect in Lithuania when the broadband market was poorly developed, and so the success of the measures there may not transfer well to Member States with more developed broadband markets, such as those in Western Europe. Indeed, both RRT in Lithuania and ANACOM in Portugal have made clear that by far the most useful and utilised ducts belong to the incumbent operators, and so the interest in other operators' ducts has been lower, and very limited in the case of non-telecoms ducts. Notwithstanding this, in some cases incumbents ducts will become full, or ducted access may not be available, particularly in the last drop to the customer premises, so the availability of ducts from other utilities could become attractive. This approach goes beyond the telecoms domain and will require cross-sector co-ordination at national and EC levels. In addition, the suitability of alternative ducts will vary from state to state and will therefore need to be examined on a state-by-state basis.

Finally, in-building wiring can simplify the investment situation for all operators, and is likely to lead to increased roll-out, either through self-deployment or shared deployment. However, as it

only affects new and possibly refurbished buildings, the benefit of implementing such as measure will only be realised slowly over time.

Our research shows that these measures are all interlinked, as shown in Figure 9, in particular the centralised atlas of passive infrastructure, the one-stop shop on rights of way and administrative procedures, and the database of planned civil works. It is therefore likely that in some Member States, existing systems could be further developed to add the functionality required for the other measures. Whilst it is likely that significant development would still be required, so it is that some of the costs would be shared across the measures, and a combined solution could lead to significant overall benefits.

Figure 9: Summary of the effects of the five measures studied [Source: Analysys Mason, 2012]



This integrated solution could lead to the following annual economic benefits in a typical Member State:

Centralised atlas of passive infrastructure	Between EUR10 million and EUR100 million in reduced damage to existing infrastructure during civil works. Further capex savings seen by operators from passive infrastructure sharing.[13]
One-stop shop on rights of way and administrative procedures	Up to EUR50 million across all parties in reduced administration.[14]
A database where all civil works should be published	Incremental and unknown capex savings seen by operators from passive infrastructure sharing; perhaps up to EUR tens of millions per annum.

To give an example, if we assume that:

25% of the deployment is in existing ducts, saving 75% in capex for this part
10% of the deployment connects the network to new housing developments, and co-deployment with other operators/utility companies is used, saving 15–60%
5% of the deployment connects the network to pre-wired MDUs, saving 20–60%.

Then, the potential capex savings to the operator are in the range of ~20–30%. There will also be the additional social and economic benefits of reduced damage to existing pipes and cables, and the economic benefit from the reduced administrative burden to both the operators and the authorities, as described above.

Many of the implementation costs, however, are either difficult to quantify or vary greatly. In order to provide some insight into the key variables behind these costs, the table below summarises the main cost drivers of implementing each measure.

13 Assuming an obligation to share passive infrastructure was also introduced.

14 Based on savings seen from KLIP in the Flanders region of Belgium (see Section **Error! Reference source not found.**).

Figure 10: Summary of main cost items [Source: Analysys Mason, 2012]

	Measure	Main cost drivers	Other cost drivers	Main benefits
1	Infrastructure atlas	Detail of database, area covered, prior knowledge of deployments	IT costs, inspecting ducts	Could lead to more duct sharing, reduces damage to existing infrastructure during civil works
2	Mandated access to infrastructure	Amount of regulation required, amount of disputes		Reduced deployment capex
3	One-stop shop on rights of way and administrative procedures	Setting up a centralised body, ease of obtaining information on land ownership and rights of way and administrative procedures	IT costs (on-line database)	Time and admin saving during planning and deployment
4	Co-ordination of civil works	Setting up a body to co-ordinate planning, advertising & marketing, co-ordinating the works	IT costs (on-line portal)	Reduced deployment capex
5	In-building wiring	Ensuring that regulations mean that only useful infrastructure will be deployed	Installation costs incurred by construction company	Incentivises operators to increase coverage

Glossary of terms

Abbreviation	Definition
ADSL	Asymmetric digital subscriber line
AGCOM	Autorità per le Garanzie nelle Comunicazioni (Italian NRA)
AGIV	Agentscahp voor Geografische Informatie Vlaanderen
ANACOM	Autoridade Nacional de Comunicações (Portuguese NRA)
ARCEP	L'Autorité de régulation des communications électroniques et des postes (French NRA)
BIPT	Belgisch Instituut voor postdiensten en telecommunicatie (Belgian NRA)
CESAR	Centralt system för Accesser (Sweden)
CIS	Centralised Information System (Portuguese Infrastructure Atlas)
CLA	Country Land and Business Association (UK)
DAE	Digital Agenda for Europe
DCENR	Irish Department of Communications, Energy and Natural Resources
DOCSIS3.0	Data Over Cable Service Interface Specification Version 3.0
DSL	Digital Subscriber Line (refers to all forms of ADSL, but not VDSL)
DTT	Digital terrestrial television
EC	European Commission
EU	European Union
FTTC	Fibre-to-the-cabinet
FTTH	Fibre-to-the-home
FTTx	Fibre-to-the-home/premises/cabinet
GBDOT	Georeferencyjna Baza Danych Obiektów Topograficznych (Poland)
GIS	Geographic information system
GRB	Large-scale Reference Database (Belgium)
ICH	Infrastructure Clearing House (Sweden)
IMKL	Informatie Model Kabels en Leidingen (Belgium)
INSPIRE	Infrastructure for Spatial Information in the European Community
IT	Information Technology
KLIC	Information model for cables and pipelines (Netherlands)
KLIM-CICC	Federaal Kabels en Leidingen Informatie Meldpunt / Contact fédéral Informations Câbles et Conduites (Belgium)
KLIP	Kabel en Leiding Informatie Portaal (Belgium)
LLU	Local loop unbundling
LVM	Liikenne- ja viestintäministeriö (Finnish NRA)
MDF	Main distribution frame
MDU	Multi-dwelling Unit
NFU	National Farmers' Union (UK)
NGA	Next Generation Access
NJUG	The National Joint Utilities Group (UK)
NRA	National Regulatory Authority

Abbreviation	Definition
OFCOM	Independent regulator and competition authority for the UK communications industries (UK NRA)
OPTA	Onafhankelijke Post en Telecommunicatie Autoriteit (Dutch NRA)
PDF	Portable Document Format
PON	Passive Optical Network (FTTH standard)
PtP	Point-to-point (FTTH standard)
PTS	Post- och telestyrelsen (Swedish NRA)
RRT	Ryšių Reguliavimo Rarnyba (Lithuanian NRA)
SDI	Spatial Data Infrastructure (Belgium)
SMP	Significant market power
SSNf	Swedish Urban Network Association
TV	Television
UKE	Urząd Komunikacji Elektronicznej (Polish NRA)
VDSL	Very-high-bit-rate digital subscriber line
WACC	Weighted average cost of capital

EUROPEAN
COMMISSION

Brussels, 26.3.2013
SWD(2013) 73 final

Part 5

COMMISSION STAFF WORKING DOCUMENT

Impact Assessment
Annexes V-XI

Accompanying the document

Proposal for a REGUILATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on measures to reduce the cost of deploying high-speed electronic communications networks

{COM(2013) 147 final}
{SWD(2013) 74 final}

ANNEX V

LIST OF DISCARDED OPTIONS

This Annex lists group of proposals that have been discarded from further analysis of impacts because they were manifestly not in line with the subsidiarity or proportionality principles, ineffective or inefficient vis à vis the specific objectives of reducing broadband deployment costs and/or counterproductive in view of other objectives or EU policies (such as competition, technological neutrality, etc…).

- **Measures incentivising broadband investments** (such as public funding for the execution of coordinated civil engineering works projects or tax exemptions for infrastructural investments in passive infrastructures).
  While **public funding** may be considered an important factor to ensure the roll-out of NGA networks in particular in remote areas, this kind of measures would not tackle the more specific objective to reduce the costs of deployment pursued by this initiative and affecting both privately and publicly funded projects. Moreover, tax harmonisation would also go beyond the scope of powers provided for at EU level.

- **Full harmonisation of construction and urban planning law applicable to passive infrastructures** (including harmonisation of right to expropriate, restrictions to separate public works in order to force co-deployment, etc…)
  While some minimum requirements of permit granting procedures may be essential to reduce the red tape limiting investments, a full harmonisation at EU level would run against the subsidiarity principle. In alternative, a benchmarking exercise of time and cost for permit granting at local level at EU level could be ineffective and highly costly.

- Imposing specific **cross-utility business models** for the provision of wholesale access to new and/or existing passive infrastructures (such as mandating passive infrastructure clearing houses or cross-utility network companies managing the access to the passive infrastructure or mandating specific rules on tariff regulation of the main service ensuring sufficient incentives to share the infrastructures with electronic communications networks)
  Different business models may develop in the market in order to better exploit the synergies across utilities and the timing mismatch of investments in passive infrastructures. However a mandatory wholesale business model would run against the proportionality principle. In addition, **mandating a specific tariff regulation** of the main services provided by other utilities would not fit with the scope of the initiative and could interfere with the pursuit of the general interest linked with the provision of these services and the related regulatory system.

- Mandatory **exemption from permit granting procedure for civil works** concerning passive infrastructure for broadband.
  While certain civil works may have limited impacts and could well be exempted from permit granting in order to reduce administrative costs, a general exemption from permit granting of civil works concerning passive infrastructures for broadband laid down in EU law could be not proportionate *vis à vis* other general interests in some other cases and it could run against the subsidiarity principle.

- **Tacit approval for permit granting** of civil works concerning passive infrastructures for broadband
  While presumption of tacit approval in the absence of an explicit decision concerning the permit may well be an instrument provided for in national law in order to ensure the interest of the applicant to obtain a decision within a reasonable time and therefore to reduce administrative costs of permit granting procedures, a mandatory principle of tacit approval for permit granting

concerning passive infrastructures established by EU law could impinge on competences of national authorities and the subsidiarity principle.

- Imposing **specific constructions techniques and/or network topologies** with the aim to reduce deployment costs
  Instructions concerning the technologies to be adopted would impair competition among operators and could stifle innovation, in contrast with the technological neutrality principle.

- **Mandatory switch-off of the copper network** by a predefined date (including removal of un-used cables)
  Such a measure would mainly deal with demand stimulation, rather than addressing the objective of cost reduction, while at the same time running against the technological neutrality principle. The mandatory removal of un-used cables could prove to be not proportionate, while it could be an element for commercial negotiation when market interest arises.

ANNEX VI

ANNEX VI

Relevant provisions under the current electronic communications regulatory framework

The table below summarises the provisions under the current framework for electronic communications relevant for cost reduction measures. These are enshrined in the Framework Directive 2002/19/EC as amended by Directive 2009/140/EC (FD) and the Access Directive 2002/19/EC as amended by Directive 2009/140/EC (AD) and cover both asymmetric and symmetric obligations that can be imposed in particular on electronic communications operators. The main limitations for each measure are identified in bold.

Measure	**Legal basis**	**Scope**	**Specific requirements**	**Enforcement**	**Cost sharing principle**
Sharing of passive infrastructure	Art. 12(1)(a) AD	Subject: **Electronic communications network operators** with significant market power **(SMP)** Object: Buildings, entries to buildings, building wiring, masts, antennae, towers and other supporting constructions, ducts, conduits, manholes, cabinets	- based on the nature of a market problem identified by a market analysis - proportionate and justified in the light of the objectives laid down in Art. 8 FD - public consultation - European coordination according to Art. 7/7a FD	NRA	Cost orientation
	Art. 12(1) FD	Subject: **Electronic communications network operators** that are holders of rights of ways or beneficiaries of expropriation procedure Object: Buildings, entries to buildings, building wiring, masts, antennae, towers and other supporting constructions,	- measures taken should be objective, transparent, non-discriminatory, and proportionate	NRA Empowerment but **no obligation**	Private arrangement

		ducts, conduits, manholes, cabinets			
Mapping of facilities	Art. 12(4) FD	Subject: **Electronic communications operators** Object: Information necessary to establish a detailed inventory of the nature, availability and geographical location of facilities	- upon request by the competent authority	Competent authority together with NRA Empowerment but **no obligation**	n.a.
Facilitating co-deployment and coordination of public works	Art. 12(2) FD	Subject: **Electronic communications network operators** that are holders of rights of ways or beneficiaries of expropriation procedure Object: Facilitating the **coordination of public works**	- in order **to protect the environment, public health, public security or to meet town and country planning objectives** - public consultation	Member State (legislator or administrative authority) Empowerment but **no obligation**	Rules for apportioning the costs can be imposed
Streamlining administrative procedures	Art. 11 FD	Subject: Electronic communications network operators Object: **Granting rights of ways only**	- simple, efficient and transparent procedures - transparent and non-discriminating conditions - decision within six months of the application	Competent authority	n.a.
In-house equipment	Art 12(3) FD	Subject: - Electronic communications network operators that are holders of rights of ways or beneficiaries of expropriation procedure - owners of wiring Object: Sharing of **existing wiring**	- where justified on the grounds that duplication of such infrastructure would be economically inefficient or physically impracticable - public consultation	NRA Empowerment but **no obligation**	Rules for apportioning the costs can be imposed, including risk adjustment where appropriate

		inside buildings or up to the first concentration or distribution point where this is located outside the building			

Annex VII

ANNEX VII

Analysis of the evolution of broadband rollout, the digital divide and the achievement of the Digital Agenda targets by 2020

This annex presents the two scenarios which served as a basis for quantifying certain aspects of the problem definition and especially of the analysis of impacts. It draws largely from an extensive study prepared by Analysys Mason and Tech4i2, to be published in January 2012[1].

This study forecasts that under a scenario with no public intervention (**the do nothing scenario**), the private sector will invest EUR 76 415 million in next generation access (NGA) deployment by 2020. This level of investment will mean that 93.6 per cent of EU27 households (208.6 million) are passed by NGA (i.e. will have fast internet of 30 Mbps available) and 41.5 per cent of households (92.4 million) will be connected with at least 30 Mbps speed[2]. This would still leave 14.2 million household not passed by NGA and therefore a significant percentage of households and businesses still unable to access the Internet-based digital services that NGA makes possible. As for the 100 Mbps target (at least 50% of homes subscribing), relying exclusively on commercial deployments, we could only reach 26% and public interventions are even more relevant for this target.

To ensure equity of access and to achieve the Digital Agenda targets, public intervention is needed with both cost reduction measures and public funding.

The study also estimates that in a **major public intervention scenario** (including 10% deployment cost reduction, which is a rather conservative estimate, related to soft measures, as the potential of such measures can in reality reach 20-30 %[3]), the assessed needed intervention to provide coverage in all areas not covered by fixed NGA and to reach the 50% take-up target on 100 Mbps would be of EUR 57 084 million[4]. This level of intervention investment encourages commercial leverage of EUR 118 203 million (2.07 times the intervention investment). Under this scenario an additional 5.7 million households are passed by NGA by 2020 (in comparison with the do nothing scenario). This scenario also leads to an additional 46.5 million households connecting to NGA.

The two scenarios are summarised below:

Scenario	Total NGA investment (EUR million)	Intervention investment (EUR million)	Commercial leverage due to intervention (EUR million)	Households passed by NGA in 2020 (thousands) (% EU27 households)	Households connected to NGA in 2020 (thousands) (% EU27 households)
Do nothing	76 415	0	0	208.592 (93.6%)	92 432 (41.5%)

1 See Analysys Mason and Tech4i2 "The socio-economic impact of bandwidth" (SMART 2010/0033), Chapter 9.2. NGA investment and deployment

[2] Euromonitor predicts there will be 222 825 500 households in the EU27 member states in 2020

[3] Analysis Mason "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013)"

[4] In the major intervention scenario it is assumed that to reach the 100Mbps target (where the estimated gap is much larger in relation to that target) we need 82% of coverage of 100Mbps to ensure 50% take-up including additional funding to be used as end-user subsidy.

Major intervention	211 179	57 084	118 203	214 314 (96.2%)	138 915 (62.3%)

Although the number of houses remaining to be connected seems small, in fact, the smaller this number, the higher the connection costs. This is because the remaining households are located in areas where income from users will not meet the cost of deployment, and those deploying NGA would make a loss. In that sense, cost reduction measures would help in shifting the break even line for companies wishing to deploy in this areas (with or without public money support) and thus would help reduce the digital divide. Such cost reduction measures would render public investments more efficient, too.

This same study quantifies broader economic impact of high speed broadband deployment under these two scenarios described above. While the do nothing scenario would be closed to the business as usual scenario under the present impact assessment, the level of investment reached in the major intervention scenario implies in addition to cost savings of 10% a huge public resource intervention that is not the objective of the analysed cost reduction initiative. However the assessment of benefits linked to the two scenarios still gives a quantification of impacts that would be reached in the do nothing case and in the case when we consider the achievement of the most ambitious DAE target.

Scenario	Total NGA investment (EUR billion)	Input–output benefits (EUR billion)	Jobs created (million)	Consumer surplus benefits (EUR billion)
Do nothing	76.4	181.2	1.35	26.5
Major intervention	209.3	569.4	3.94	31.9

The table demonstrates that considerable benefits will arise from investment in broadband deployment. Input output benefits provide far higher levels of benefit than those achieved by consumer surplus analysis under both scenarios - under the *do nothing* scenario consumer surplus benefits contribute 12.8 per cent of total (input output and consumer surplus) benefits, they comprise 5.3 per cent of total benefits in the *major intervention* scenario.

Job creation benefits are relatively high. But job creation impacts are relatively slow to materialise. In the first three years of the major intervention scenario less than a third of the total jobs are created with 27.5 per cent (1.083 million jobs) of total jobs in the first three years. Intervention to support broadband deployment will help to stimulate economies and create jobs but the effects are not as immediate as would be desirable in the current economic circumstances.

Annex VIII

ANNEX VIII

Analysis of distributional effects – costs and benefits for direct stakeholders

1. Costs & benefits for direct stakeholders under OPTION 1

Stakeholders	Benefits	Costs	Cost benefit assessment
Undertakings deploying broadband	A few undertakings in a limited number of Member States would profit from cost reduction measures, which would however be limited in the scope (telecoms infrastructure only, rights of way only, as determined by the current regulatory framework).	A few undertakings in a limited number of Member States would incur certain administrative and operational costs (e.g. transparency of planned works, duct rental, etc.)	Although benefits would overweight costs for a minority of undertakings deploying broadband, the effect across the EU would be insignificant.
Passive infrastructure owners[5] **(telecom)**	A few undertakings in a limited number of Member States would have increased revenues from infrastructure rental, assuming a satisfactory compensation. However prices of passive infrastructure access vary widely across Europe and for example the monthly charges for access to incumbent owned ducts are ranging from 0.01 in PT to 0.85 in AU, while the cost oriented price appears to be less than EUR 0.30 per meter monthly[6].	A few undertakings in a limited number of Member States would incur certain administrative and operational costs (e.g. mapping of infrastructure and of planned works etc.). They might also have reduced incentives to invest unless compensated satisfactorily.	The cost benefit ratio would be highly dependent on the prices set by regulators. Moreover, as this would apply only to a minority of undertakings deploying broadband, the effect across the EU would be insignificant.
Passive infrastructure owners **(non telecom)**	No major impacts.	No major impacts.	No major impacts.

[5] **Passive infrastructure owners** are all the actors owning passive infrastructure suitable for broadband roll out, ducts, conduits, manholes, cabinets, poles, masts, antennae, towers and other supporting constructions. This would in principle include telecom and non telecom owners, like public authorities (for ex.owning transport infrastructure), municipalities and utilities (energy networks, sewers etc.).

[6] For an analysis of duct and poles rental prices see Analysis Mason Paragraph 4.4 of "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013)"

Housing sector	No major impacts.	No major impacts.	No major impacts.
Public authorities	Member States and regions remain free as to whether and how to implement the measures.	No support or detailed guidance is granted as to the implementation of the measures. Costs are fully dependent on solutions adopted by Member States, therefore they could differ substantially.	The cost benefit ratio varies greatly across Member States. Yet, it can be assumed that Member States would minimise / optimise their costs in function of the already existing institutions and structures.

The figure below is meant to help the reader visualise the relative importance of direct economic impacts under Option 1 and is not meant to give a quantitative assessment of costs and benefits, which are qualitatively described in the table above.

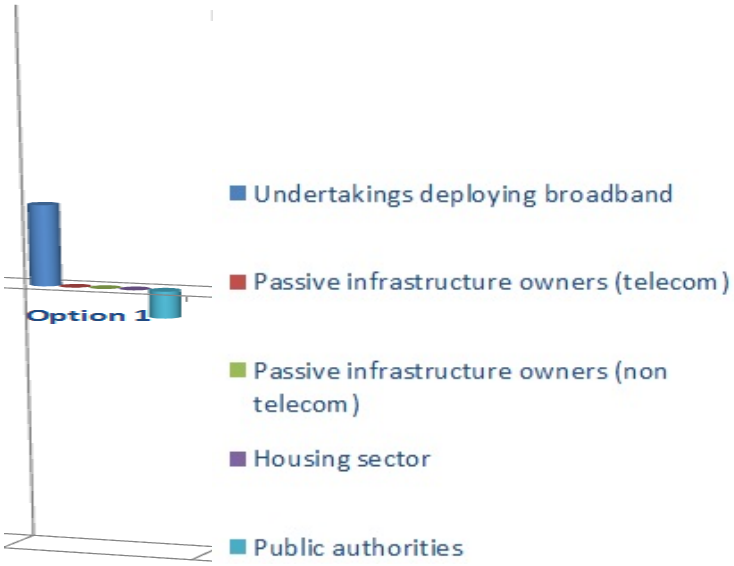


***Figure 1**: Direct economic impacts of Option 1 per category of stakeholder*

2. Costs & benefits for direct stakeholders under OPTION 2

Stakeholders	Benefits	Costs	Cost benefit assessment
Undertakings deploying	All undertakings in a certain number of Member States would profit from Increased efficiency in the planning of infrastructure	All undertakings in a certain number of Member States would incur certain administrative and operational	The benefits would overweight costs (as confirmed in the consultation process) and

broadband	deployment, increased opportunities for telecom infrastructure access, and for co-deployment between telecoms, lower costs for negotiating sharing and co-deployment arrangements, the CAPEX savings on investments[7] (25% to 75% savings for duct sharing, 15% to 60% savings for co-deployment, 20% to 60% savings for in building wiring) and quicker NGA deployment, savings in terms of human resources and time devoted to obtaining rights of way, and increased legal certainty.	costs (e.g. transparency of planned works, duct rental, etc.) The costs would vary especially in function of rental charges which at present vary greatly in the EU, but are still considered relatively low.	these effects would be felt by a larger number of undertakings deploying broadband than under the previous option, given the nature of the instrument. Therefore the direct impact on these undertakings across the EU would be higher.
Passive infrastructure owners (telecom)	All telecom passive infrastructure owners in a certain number of Member States would better exploit their assets due to an increased sharing of infrastructure, resulting in additional revenues. For those companies involved in co-deployment, the increased coordination of works would lead to a reduced cost for joint tendering and joint permit granting requests.	All telecom passive infrastructure owners in a certain number of Member States would incur increased costs for collecting and sharing data on existing passive infrastructure and on planned investments, as well as related to allowing access and negotiating sharing arrangements. Disincentives to invest might appear if access is granted at a low price.	Although the access to infrastructure might affect passive infrastructure owners negatively if the costs for access are too low, we consider that the benefits would outweigh the costs, in particular given the other measures. Also, an EU market for passive infrastructure would be created, given the nature of the instrument.
Passive infrastructure owners (non telecom)	No major impacts.	No major impacts.	No major impacts.
Housing sector	Potential financial benefits in selling NGA access ready labelled buildings would derive from recognisable value in the market	Market development might compel construction companies to incur additional costs to equip buildings as	The benefits would compensate for the incurred costs.

[7] On savings see also Chapter 2.4 of this Impact assessment, Annex VI with Detailed analysis of impacts and Analysis Mason "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013)"

	and would influence property purchasers and increase the value of properties.	NGA ready.	
Public authorities	Member States would benefit from detailed guidance as to how to implement the measures and to obtain efficiency gains.	The requirement to harmonise specific features of already existing databases would create some administrative costs. Additional costs would be incurred in relation to the alignment of the rights of way processes. For those Member States that decide to implement the Recommendation from scratch, the costs could be substantial.	Direct impacts on public authorities, including administrative burden, are considered moderately burdensome: Member States would either need to implement a clearly defined and limited set of harmonising measures or give reasons for not implementing it.

The figure below is meant to help the reader visualise the relative importance of direct economic impacts under Option 2 and is not meant to give a quantitative assessment of costs and benefits, which are qualitatively described in the table above.

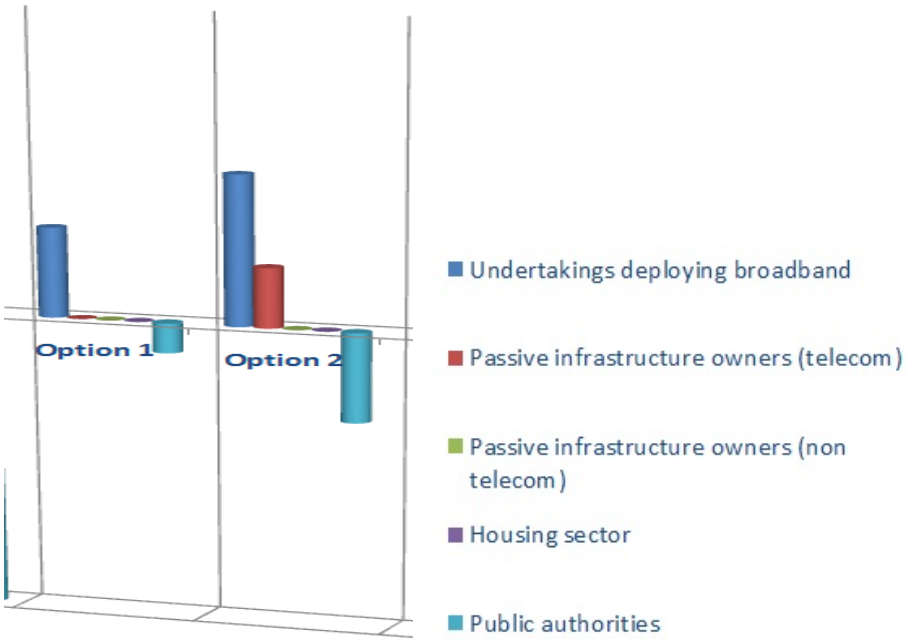


***Figure 2**: Direct economic impacts of Option 2 per category of stakeholder, as compared to Option 1*

3. Costs & benefits for direct stakeholders under OPTION 3

Stakeholders	Benefits	Costs	Cost benefit assessment
Undertakings deploying broadband	Undertakings throughout all Member States would be able to improve infrastructure planning due to increased transparency and would benefit from increased opportunities for access, including non-telecom infrastructures, and for co-deployment between various actors across sectors due to transparent information on planned investment and access to civil works. The CAPEX savings on investments[8] (25% to 75% savings for duct sharing, 15% to 60% savings for co-deployment, 20% to 40% savings for in building wiring) and quicker NGA deployment (due to sharing, permits, NGA ready buildings, etc.) would reduce the break even point and increase number of profitable investments. Increased legal certainty and dispute settlement mechanism would lower costs for disputes. Cross border operators would benefit most from harmonised rights and obligations throughout the EU.	All undertakings throughout the EU would incur certain administrative and operational costs (e.g. duct rental costs, costs for detailed ground surveys, transparency of planned works, etc.)	The benefits would greatly overweight costs for this category of stakeholders and the effects would be felt by all EU undertakings wishing to deploy broadband. Therefore the direct impact on these undertakings across the EU would be quicker and significantly higher.
Passive infrastructure owners (telecom)	All telecom passive infrastructure owners throughout the EU would better exploit their assets due to an increased sharing of infrastructure, resulting in additional revenues. Mapping	All telecom passive infrastructure owners in a certain number of Member States would incur increased costs for collecting and sharing data on existing passive	Benefits would be higher than the costs, in particular given that access would be granted following commercial negotiations, allowing

[8] Savings are estimated on the basis of case studies in different Member States, see also Chapter 2.4 of this Impact assessment, Annex VI with Detailed analysis of impacts and Analysis Mason "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013)"

	would decrease excavation damage (savings estimated at tens of millions of Euro per year per Member State). For those companies involved in co-deployment, the increased coordination of works would lead to a reduced costs for joint tendering and joint permit granting requests.	infrastructure and on planned investments, as well as related to allowing access and negotiating sharing and co-deployment arrangements.	for profits for all undertakings across the EU which are infrastructure owners, as well as the measures in the other areas (e.g. permits, co-deployment, etc.)
Passive infrastructure owners (non telecom)	Utilities' infrastructure owners would better exploit their assets due to cross-utility sharing of infrastructure, resulting in additional revenues. Greater benefits could derive form synergies in the deployment of smart grids and increased civil engineering works coordination.	Costs for utility infrastructure owners would be mostly related to allowing access, negotiating sharing and co-deployment arrangements, including responding to security concerns.	Benefits from the additional revenues and in particular from the potential co-deployment (smart grids) would outweigh the costs. In addition, competition issues would be less relevant.
Housing sector	Some benefit for the housing sector would derive mainly from selling new "NGA access ready" labelled buildings, with increased recognisable value in the market, as compared to old houses.	Developers and construction companies would incur some additional costs to equip and certify buildings as NGA ready.	The benefits would be just slightly higher than the incurred costs.
Public authorities	A small reduction of the administrative burden would be experienced by public authorities concerning the grating of rights of way and other permits, due to increased public works coordination and increased use of existing passive infrastructure.	Public authorities would incur non-negligible costs in relation to the setting up and managing of atlases including suitable infrastructure of utilities (from the low millions to tens of millions, depending on the degree of complexity of the mapping), the creation and running of a platform collecting announcements of planned investments and the establishment of the single point of information on permits. Significant costs might also be related to	Although the costs of these measures seem very high, there are many synergies between them, which would reduce the overall costs. Moreover, often part of the cost of mapping systems might be already sustained or planned for spatial planning purposes (e.g. INSPIRE Directive) or exist in the data bases of companies. Therefore synergies could be

		dispute settlement systems related to access to infrastructure, co-deployment agreements across sectors, as well as to permit granting.	created for sharing the cost of atlases between different functionalities/sub products of existing or planned mapping systems.

The figure below is meant to help the reader visualise the relative importance of direct economic impacts under Option 3 and is not meant to give a quantitative assessment of costs and benefits, which are qualitatively described in the table above.

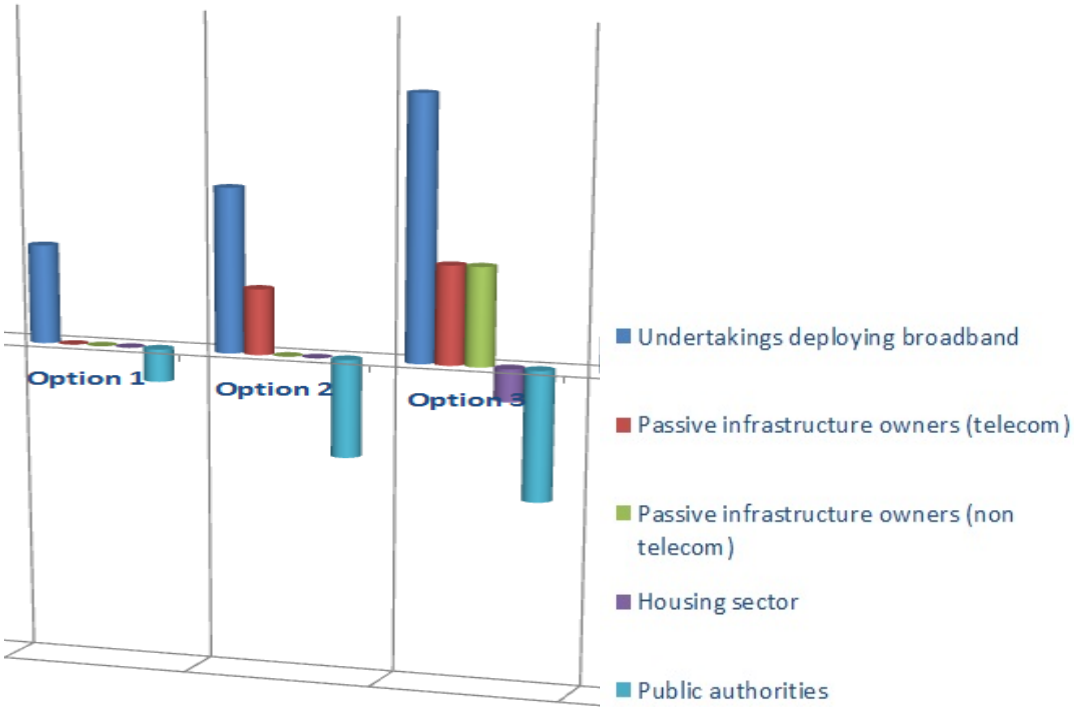


***Figure 3**: Direct economic impacts of Option 3 per category of stakeholder, as compared to Options 1 and 2*

4. Costs & benefits for direct stakeholders under OPTION 4

Stakeholders	Benefits	Costs	Cost benefit assessment
Undertakings deploying broadband	All benefits for undertakings deploying broadband spelled out under the previous option would be maximised, in particular due to the cost orientation of acquiring access, the possibilities for co-deployment offered by public works / by the extra capacity (spare ducts) laid by the public authorities, the Full one-stop-shop and the fact that all buildings become NGA ready (leading to increased demand).	These undertakings would still incur certain administrative and operational costs, but these would be significantly reduced (e.g. duct rental costs)	The benefits for this category of stakeholders are maximised under this option.
Passive infrastructure owners (telecom)	The main benefits for telecom passive infrastructure owners throughout EU would be the decreased excavation damage, the increased possibilities to co-deploy, and the streamlined permits regime.	Telecom passive infrastructure owners throughout EU would not be able to make profits, but just to cover their costs. The main costs would be related to collecting and sharing data on existing passive infrastructure and on planned investments, as well as related to allowing access and negotiating sharing arrangements.	This option would lead to a significantly reduced business interest on the side of passive infrastructure owners due to cost-oriented prices for access, thus to a potential disincentive to invest.
Passive infrastructure owners (non telecom)	Benefits for utility companies would mainly derive form synergies in the deployment of broadband (e.g. smart grids, smart transport systems, etc.)	Costs for utility infrastructure owners would be mostly related to allowing access, negotiating sharing arrangements, including responding to security concerns. Moreover, under this option, revenues would only be allowed to the extent that	The business interest on the side of the utilities would be lower due to the cost oriented prices. The synergies in the deployment of broadband might however mitigate to an extent the inconveniences of

		they cover these costs.	sharing infrastructure.
Housing sector	Construction companies would derive benefits from extra works due to the need to equip all buildings with NGA.	Construction companies and property developers would incur additional costs related to the need to certify buildings as NGA ready.	The benefits would outweigh for the incurred costs, in particular given the extra demand for works.
Public authorities	A higher reduction of the administrative burden would be experienced by public authorities concerning the grating of rights of way and other permits, due to increased public works coordination and increased use of existing passive infrastructure. Also, certain functions (e.g. maintenance of EU mapping system) would be taken over at EU level.	The implementation and managing of mapping databases at EU level would be significant and would potentially duplicate some of the costs already incurred at national level. Additional costs as compared to the previous options would relate to the definition of ex ante cost-oriented prices across industries, and to the deployment of additional empty ducts for all public works. Also, significantly higher costs in human resources, legislative changes and possibly IT investment for the fulfilment of the full one-stop-shop on permit granting procedures since various competencies would need to be merged and integrated.	In terms of administrative burden and costs for public authorities, this option seems rather ambitious and heavy.

The figure below is meant to help the reader visualise the relative importance of direct economic impacts under Option 4 and is not meant to give a quantitative assessment of costs and benefits, which are qualitatively described in the table above.

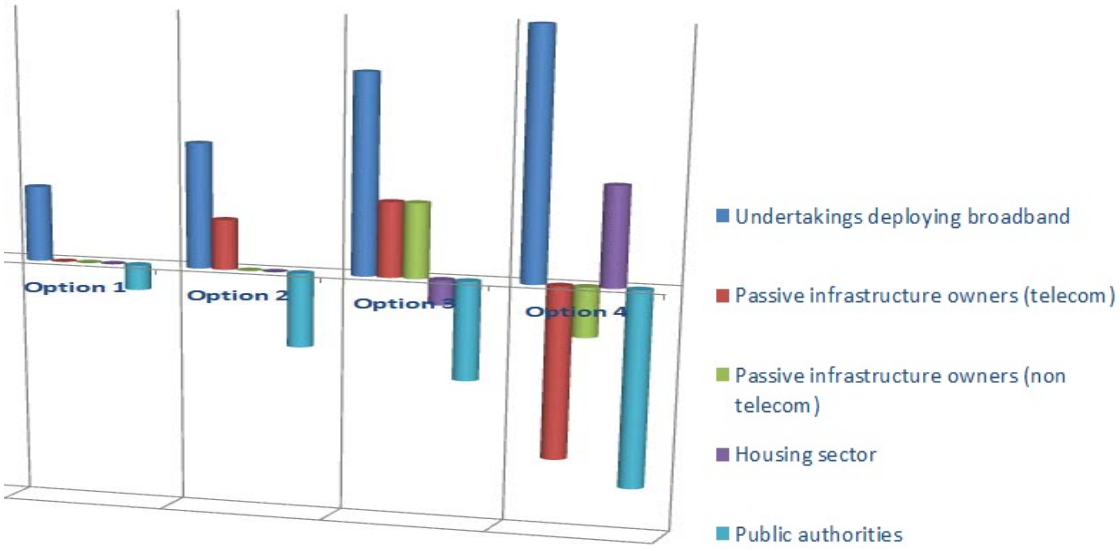


***Figure 4**: Direct economic impacts of Option 4 per category of stakeholder, as compared to Options 1, 2 and 3*

Annex IX

ANNEX IX

ANALYSIS OF IMPACTS AND IMPLEMENTATION AND ADMINISTRATIVE COSTS BY OPTION

The tables below are mainly based on findings presented in the Analysis Mason study "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013)" and on feedback to the public consultation, with particular reference to implementation and administrative costs incurred by public authorities in Member States that implemented measures that are similar to those proposed under this impact assessment.

For each policy options benefits and costs for main stakeholders are presented followed by an additional analysis related to the implementation and administrative costs.

IMPACTS AND ADMINISTRATIVE COSTS OF THE OPTION 1 "BUSINESS AS USUAL"

Benefits for main stakeholders involved/positive direct economic impacts
Guidance on Art. 11 and 12 of the Framework Directive regarding infrastructure mapping and sharing, cooperation in civil engineering works, rights of way, and in-house wiring would stimulate the utilisation of the possibilities offered by the current regulatory framework. The exchange of best practices might furthermore offer practical solutions and raise awareness on measures adopted in Member States sometimes going beyond the regulatory framework. The actual utilisation and cost benefit ratio of these measures would **depend, among others, on the implementation details in each region or Member State**. Clear **limitations** would however be related to the types of infrastructure envisaged for reuse or co-deployment (telecoms only), to rights of way in a strict sense (rather than all permits), and to sharing in-building infrastructure (rather than ensuring NGA ready buildings), unless Member States pass additional legislation. **Undertakings deploying high speed broadband** in those specific Member States/regions benefit from: - **Higher efficiency and reduced costs in the planning of infrastructure deployment** due to increased transparency and clarified rules on sharing passive infrastructure - **Reduced costs for investments** (cost savings due to access to shared infrastructure are estimated between 30 and 60%, while coordination in civil engineering works might occasionally lead to savings up to 50%). - **Time and cost savings for rights of way in the area of in-house equipment**. Those operators would then be able to profit from major savings and facilitation measures and thus be **able to invest in areas where investments would otherwise not be economically feasible**, eventually **increasing competition.**

Costs for main stakeholders involved/negative direct economic impacts
For undertakings which are mainly or solely telecom **infrastructure owners**, the measures concerning infrastructure sharing could on the other hand reduce the incentives to invest, unless they are compensated in a satisfactory way.

IMPLEMENTATION AND ADMINISTRATIVE COSTS OF THE MEASURES INCLUDED IN OPTION 1	
PUBLIC INFRASTRUCTURE DATABASES OR ATLASES - TRANSPARENCY MEASURES **(Guidance on transparency mapping)**	**Administrative burden for authorities:** As regards **administrative costs**, this option would be a rather easy and cheap one to implement. Member States and regions would remain free as to whether and how to implement the measures. They would not need to adapt mapping exercises to the type of pre-existent information on network infrastructures, since no requirement on transparency of already existing information would be imposed. It can therefore be assumed they will minimise / optimise their costs in function of the already existing institutions, mechanisms, and structures. This includes, for instance, adapting mapping exercises to the type of pre-existent information on network infrastructures. **Cost of setting up and managing mapping systems for authorities:** MS are already implementing different transparency systems. As indicated across sections 2.6 and 4.1, according to the information available to the Commission a number of EU Member States has implemented infrastructure atlases or infrastructure registers or is currently working on introducing such solutions (AT, BE, CY, CZ, DE, DK, FI, FR, IT, LU, NL, PL, PT, RO, SI, ES, SE, UK). This list includes mapping systems created with a view to prevent damages at the time of civil works and local initiatives, limited to one city (e.g. AT, IT). This means that these Member States or specific regions/cities already sustained some costs for setting up mapping systems and yearly costs for managing those systems including costs for collecting, updating and processing data. Some additional investments might however be needed for the fulfilment of the provisions concerning transparency of information on existing and new passive infrastructures as well as on access on these infrastructures that are envisaged by the current **draft EU Guidelines for the application of state aid rules.** Those measures are requiring Member States to provide for detailed mapping and analysis of coverage of areas benefiting from state aid. In applying the Guidelines, therefore, Member States will have to set up a dedicated central website at national level, concerning on-going state-aid tenders, information on the available infrastructures and conditions for access to existing infrastructures, transparency on the aid granted, including comprehensive and non-discriminatory access to information on the subsidised infrastructure. This compulsory database would therefore not address the need of transparency related to the telecom passive infrastructure that was not financed through state aid and would cover other passive infrastructure of other sectors (energy, sewers, transport) suitable for broadband roll-out only insofar this infrastructure was explicitly included among those to be re-used for the roll out of the subsidised network. In some Member States part of the cost of mapping systems might be already sustained or planned for spatial planning purposes, in application of the INSPIRE Directive, which however covers mainly infrastructure owned by public authorities or by companies mandated by public authorities. The scale of additional investments in MS on top of the cost that they already sustain for financing mapping exercises will depend on the following characteristics of existing mapping exercises: the geographic scope (national/local), the type of infrastructure mapped (telecoms infrastructure/all

	passive infrastructure), the scope of information required/provided from/to operators/utilities. Obviously, those MSs that have not started yet considering a mapping exercise will have to incur bigger costs, once they decide to do so. **Synergies between costs/significant overlaps:** Limited savings possible for joint implementation since Member States are usually not implementing all off the databases that could allow for synergies, where economies of scale can be created with mapping jointly with the platform for announcement of planned investments for coordination of civil works and damage prevention and eventually It based permit granting systems However part of the cost of mapping systems is already sustained or planned for spatial planning purposes, therefore synergies could be created for sharing the cost of atlases between different functionalities/sub products of existing or planned mapping systems;
	Administrative burden for business and other infrastructure owners In some MS infrastructure owners will sustain a cost for collecting and sharing data on existing infrastructure which will however depend on the level of detail of the information chosen and from the level and quality of already existing information in single Member States and on the spatial planning instruments already implemented in Member States.
ACCESS TO PASSIVE INFRASTRUCTURE AND DISPUTE SETTLEMENT MECHANISMS (Guidance on infrastructure sharing)	**Administrative burden for authorities** NRAs that are imposing SMP access obligations and symmetric sharing based on art.12 are already sustaining cost of dispute settlement mechanisms, according to mechanisms already ensured by the present regulatory framework (see Annex VI). Those costs would continue to be sustained without substantial changes, however still in a limited number of Member States.
	Administrative burden for business and other infrastructure owners Telecom infrastructure owners subject to SMP obligations on access to passive infrastructure and those subject to symmetric sharing based on art.12 obligations are obliged to give information on their infrastructure to interested access seekers and negotiate access agreements. Those costs would continue to be sustained without substantial changes, however still in a limited number of Member States.
COORDINATION OF CIVIL ENGINEERING WORKS (Guidance on transparency requirements on planned civil works)	Civil works coordination costs at local level would continue to be sustained in a limited number of Member States (coordination meetings, negotiation costs related to access to civil works as in France etc.). **Administrative burden for authorities:** would be mainly linked to the cost of voluntarily organising coordination meetings at local level and creating and running the database/technological platform collecting announcements of planned investments. As indicated across sections 2.6 and 4.1, the coordination of civil works is taking place mostly at a local level (BE, FI, DK, DE, LU, NL and SE) in the form of ad hoc meetings or on more formalised way. This includes the Member States which have introduced digging alert systems with an option allowing for coordination of planned works already in (or could be further developed into platforms for the announcement of planned investments. Some other MSs require some sort of coordination of civil works at the time of public roads construction (MT, PL,UK), whereas a few others imposed by law coordination system at local (FR) or central level (PT).

	We can give some examples of cost of creating and running the platforms already sustained by MS E.g. the cost of Finnish Johtotieto (co-digging portal) was EUR 200 000 with an on-going yearly cost of 100 000, whereas Swedish Lendingenskolle dig alert system that could be developed in a planned investments announcement database cost EUR 1.8 million to implement between 2007-2010 and approx. 700.000 per annum to run. NRAs that are imposing co-deployment obligations based on art.12 would be sustaining relatively small cost of dispute settlement mechanisms. For the MS that are already addressing the coordination issue those cost would continue and likely even increase as in the Swedish case where there are plans to further develop the Lendingenskolle system. In these Member States public authorities would have to incur the costs of investing in electronic communication network with a view to announcing their own planned investments and the cost of creating and running the database/technological platform collecting announcements of planned investments. However many member states are not developing any system of announcement of planned investments and we assume that they would not significantly increase this spending on transparency aimed at incentivising co-deployment.
	Administrative burden for business and other infrastructure owners As regards the administrative burden on actors deploying broadband (mainly private operators) and on owners of infrastructure (utilities and operators), in MS where they are already required to coordinate civil works, they would continue to send information on owned infrastructure and to announce planned investments. We assume that the situation would not change considerably, given the soft character of the measures and that investors would continue sustaining a small cost for sharing data on planned investments in the limited number of MS where this system exist**.** There is a consequent slightly reduced administrative burden for joint tendering and joint permit granting for construction work in the few Member States where coordination is happening on a wider basis and not only in exceptional circumstances. .
STREAMLINING OF PERMIT GRANTING PROCESSES – COORDINATION, TRANSPARENCY, E-PERMITS **(Guidance on facilitating permit granting)**	**Implementation cost and administrative burden for authorities** **Cost for facilitation of permit granting (IT supported permit granting, or single contact point coordinating function for permit granting)** Only a minority of Member States created and are running the database/technological platform facilitating permit granting. Netherlands introduced the possibility of electronic submissions of requests for permits, whereas Greek NRA introduced a single contact point for mobile permits. Poland and Portugal have adopted laws limiting the powers of local authorities to deny rights of way for telecoms operators wishing to deploy electronic communications networks. Only one MS has implemented already the single contact point for permit granting. The cost incurred for setting up the Single Contact Point system for the Licensing of Antenna masts in Greece developed internally by the Greek NRA was the equivalent of 24 man-months (IT analysis and programming with the aid of Spectrum Department personnel) and 25.000 Euro in computer and network systems for hosting the Single Contact Point (central database replication, web

	application hosting, multiple connections handling). The costs of implementation of the relevant legislation in Poland from the perspective of costs incurred by the NRA or implementing authorities were low, as they consisted on adoption of relevant legislation. We assume that Member States that haven't yet introduced possibility of submission of electronic requests are not going to invest additional resources in this regard and furthermore single contact point like mechanisms are not going to be widespread. Therefor the administrative costs would be limited to Member States that are already implementing similar kind of measures.
	Administrative burden for business and other infrastructure owners No major savings are to be expected in terms of time an administrative savings for operators due to reduced complexity of the permit granting procedure and the coordinating role exercised by the designated authorities. However some savings might occur, as for example, in case of the AGIV's KLIP system in Belgium that is in part designed to simplify the planning and permit granting process, AGIV estimates that the systems overall saves the operators and authorities combined EUR 29,5 million per annum.
ALIGNMENT MEASURES FOR IN-HOUSE INFRASTRUCTURE FOR NEW BUILDING PROJECTS	**Administrative burden for authorities** Best practices on in house infrastructure might spread in some additional Member States. Further to the example of FR and ES, no significant additional administrative burden is expected. The cost to the government and/or the NRA is negligible (with the obvious exception of the initial consultation and drafting of the legislation).
	Implementation cost and administrative burden for business and other infrastructure owners Operators have not incurred any costs when new laws obliged new and refurbished buildings to be fitted with common NGA infrastructure. However, in France, it is up to the operator to build this terminal segment in such a way that it can be shared by other operators, which may incur some addition cost. On the other hand, installing the in-building installations in new buildings is on the construction firms that must cover these costs, although these are relatively low (much lower than the cost of in-building water and gas distribution, for example). As access to NGA services becomes more and more important to consumers, it is possible that these construction firms may see a future benefit from the measures, with pre-wired buildings being sought-after by property purchasers. Therefore the construction sector could become more willing to deploy NGA infrastructure as consumer demand grows for NGA services.

IMPACTS AND ADMINISTRATIVE COSTS OF THE OPTION 2: PROMOTING EFFICIENCY GAINS

Benefits for main stakeholders involved / positive direct economic impacts
Compared to a guidance document or best practices, a Recommendation would help in achieving a more consistent application of the regulatory framework by being more prescriptive and would therefore ensure in general higher impacts. A Commission Recommendation would, indeed, have more weight and provide more guidance to Member States and subsequently local authorities. While Member States are not obliged to follow it, they are required to justify a decision not to do so. Furthermore, a Recommendation would be limited as regards the types of infrastructure envisaged for reuse or co-deployment (telecoms only), to rights of way in a strict sense (rather than all permits), and to sharing in-building infrastructure (rather than ensuring NGA ready buildings). In those Member States that would apply the Recommendation, the following benefits would be visible for the main stakeholders:
For undertakings deploying broadband:
- **Increased efficiency and reduced costs in the planning of infrastructure deployment** linked to facilitated sharing and co-deployment arrangements due to some degree of harmonisation of inventories and planned infrastructures announcements affecting awareness on existing and planned infrastructure; harmonisation would particularly facilitate cross border providers; - **Increased opportunities for telecom infrastructure access seekers** due to transparency and symmetric sharing (that would most probably be more widely applied); operators would be able to make better strategic decisions on network development; - **Increased opportunities for co-deployment between telecom** due to transparency on planned investments; - **Cost for negotiating sharing and co-deployment arrangements would decrease due to increase** clarity on sharing obligations and possible co-deployment arrangements enhanced by NRAs; - **Capex savings on investments: reduced duplication of excavation works leading to reduced cost for self-digging and quicker NGA deployment** potentially up to 60% (or 30% in case of tower sharing[9]**);** - **Savings in terms of human resources and time devoted to obtaining rights of way and negotiating conditions** with authorities and land owners due to minimum requirements in transparency and non-discrimination in granting rights; - **Cost savings on in house equipment** would be achieved due to defined rules for in house sharing and specific conditions;
On all electronic communication infrastructure owners
- **Assets would be better exploited** due to an increased sharing of infrastructure resulting in additional revenues for infrastructure rental; - **Increased coordination of works/co-deployment would lead to a reduced cost for joint tendering and joint permit granting requests**.
On construction companies
- **Potential financial benefits** in selling NGA access ready buildings if property purchasers would consider the increased value of properties.

[9] E.g. the initial cost of network deployment in Western Europe using existing ducts ranges from EUR 20 to EUR 25 per metre, rather than an average of EUR 80–100 per metre for deployments that require digging, thus resulting in a 75% cost saving (ENGAGE Group) other estimates confirm a range between 60% and 30% savings, with 30% savings for tower sharing, see Analysis Mason.

Costs for main stakeholders involved / negative direct economic impacts
For undertakings deploying broadband:
- **The total cost of passive infrastructure rental** such as ducts, poles, towers etc. would increase, due to increased infrastructure sharing (but this would be certainly compensated by the savings on civil engineering works. The overall cost benefit ratio in this respect would vary in function of rental charges which at present vary greatly in the EU, more specifically from 0.01 to 0.85 euro monthly for access to incumbents ducts[10]).
For all electronic communication infrastructure owners:
- **Infrastructure owners will sustain a cost for collecting and sharing data on existing infrastructure and on planned investments** which will however depend on the level of detail of the information chosen and from the level and quality of already existing information in single Member States and on the spatial planning instruments already implemented in Member States. As such, there might be costs of migration from databases of electronic communication infrastructure owners to a unified information system; - **The inconveniences and costs related to allowing access and negotiating sharing arrangements** due to widely implemented symmetric access would increase. Alternative operators would increasingly need to provide access on their own infrastructure, while this is only exceptionally the case now (at present only 6 MS are imposing symmetric obligations). The symmetric access obligation could, in very specific cases, affect already acquired competitive advantages, which however could be mitigated by the flexibility of commercial negotiations in defining access conditions. Should MS decide imposing access obligations at a low cost this might create a disincentive to further invest in passive infrastructure.
For construction companies
- Market developments might compel construction companies to incur **additional costs to equip buildings** as NGA ready.

IMPLEMENTATION AND ADMINISTRATIVE COSTS OF THE MEASURES INCLUDED IN OPTION 2	
The administrative cost to be sustained by public authorities would related to a more coherent implementation of the regulatory framework . Typology of costs would not differ radically from the administrative costs analysed under the baseline scenario that was already considering the application of the current framework, except from the fact that **those implementation and administrative costs would be sustained in a bigger number of Member States,** since we presume that the Recommendations would be more effective in promoting already existing regulatory measures if compared to a simple guidelines and best practice exercise.	
For the public authorities	- The requirement to harmonise specific features of already existing databases (facilities to be covered, the information to be included and ensuring access for interested parties) and to introduced transparency on planned investments would create **additional administrative costs, as compared to the usual costs of developing and maintaining such databases;** However no additional cost would be sustained to ensure transparency on non –telecom infrastructure and neither to enhance

[10] Analysis Mason, "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013)".

	coordination of civil works cross-sectors, since recommended measures would exclusively be limited to the telecom-sector**.** Presuming a wider application of symmetric obligation within the telecom sector also the cost for NRA to regulate and the related cost for dispute settlement sustained by the NRA would slightly increase, even if considering that departments are already in charge of remedies and solving disputes, this should not lead to a radical increase in those costs. - **Additional costs would be incurred in relation to the alignment of the rights of way process** in terms of minimum requirements for transparency and non-discrimination.
On all electronic communication infrastructure owners	Recommended transparency measures related to owned infrastructure and planned investments would create a slight increase of the cost for collecting and sharing data. Those costs would however be similar to the one sustained under baseline scenario, even if those would be sustained in a bigger number of Member States. **Legal uncertainty would be reduced** since the Recommendation would ensure more precise guidance reducing controversies regarding correct implementation of e.g. duct sharing obligations, with corresponding litigation costs. Availability of dispute settlement mechanisms would further reduce costs in case of disputes;

IMPACTS AND ADMINISTRATIVE COSTS OF THE OPTION 3 ENABLING EFFICIENCY GAINS

Benefits for main stakeholders involved / positive direct economic impacts
Compared to a Recommendation, a regulation would have significantly increased and quicker impacts due to the creation of directly applicable rights and obligations for actors beyond the limits of the current regulatory framework. **Universal access to passive infrastructures across utilities** accompanied by **infrastructure mapping systems** would ensure that virtually all infrastructures suitable for broadband rollout can indeed be used. **The potential for civil engineering works coordination** would be truly enabled, given the obligation to announce planned investments and to negotiate co-deployment when requested, which would be applicable across sectors thereby also facilitating a change of culture on the long run. Additional opportunities would be given by the separate regime of access to public civil engineering works. The establishment of a " single contact point " through a legal instrument would present the guarantee of a comprehensive solution for all permits necessary to rollout networks. EU rules mandating that all new and extensively reconstructed buildings are equipped to be "NGA ready" would ensure major savings and easier/faster in-building deployment for electronic communications operators. n particular, the following benefits would occur rather fast and throughout the entire European Union:
On undertakings deploying broadband:
- Increased efficiency and reduced costs in the planning of infrastructure deployment; Setting up of cross-sector inventories of infrastructure suitable for broadband rollout would effectively ensure awareness on existing and planned infrastructure. Such transparency mechanism would enable eliminating cases where access or co-deployment are *de facto* blocked by lack of knowledge on passive infrastructure network suitable for broadband roll out and cooperation is not possible due to lack of transparency on planned investments. When coupled with a suitable access regime and measures to encourage co-deployment (like right to access to public works) this would trigger more investments, including in 'difficult' areas where currently individual investments are too burdensome. Increased transparency would also reduce the costs of access seekers (less administration, less field studies prior to investment, etc.) and lower the market entry barrier for smaller operators. - **Increased opportunities for cross-infrastructure access seekers;**

Since the proposed measures would clearly cover all civil engineering works (not just telecoms actors as it is currently the case for the regulatory framework), the possibilities for cooperation would be significantly increased and thus also the economic impacts of the measure.
In particular, transparency, rights to on demand surveys and universal access obligation applicable also to infrastructure that is not under the authority of the NRA would increase the 'pool' of infrastructure suitable for broadband investments (this is especially relevant when incumbents ducts are full or do not exist). Opening up infrastructure that belongs to actors outside the telecom world (e.g. utility ducts) would ensure that the measure is advantageous not only for alternative operators, but also to incumbent operators and other utilities.

- **Increased opportunities for cross-border access seekers**;

Harmonisation of minimum transparency rights and obligations could also be beneficial to cross-border operators, who would have the guarantee of essential information on passive infrastructure across the EU and a widespread universal access obligation.

- **Increased co-deployment opportunities** due to transparency on planned investments and granted access to civil engineering works of public undertakings**,** provided that they do not entail additional costs for the public operator;

- **Capex savings on investments : reduced duplication of excavation works leading to reduced cost for civil engineering works and self-deployment and quicker NGA deployment;**

Measures reducing duplication of works have a huge saving potential. The initial cost of network deployment in Western Europe with the use of existing ducts ranges between EUR 20 to EUR 25 per metre, whereas deployments that require digging - EUR 80–100 in average per metre. This means 75% costs saving[11] when no digging is required. In case of tower sharing the savings amount to 30%. Overall, savings from rolling out networks based on existing ducts and some self-deployment , as opposed to greenfield investments, are estimated to range between 29 and 58%, including administrative and rental costs, corrected to net present value[12].
Alternatively for the case of **co-deployment linked to enabled coordination of works** the estimated range of potential cost savings for coordinating civil engineering works varies from 15% to 60%[13]. As the examples of Lithuania and Portugal[14] show, relevant measures on transparency and access translate into more NGA networks and generate more resources for greenfield investment in new areas that would not be normally covered by the service.Utility companies might furthermore have a role in increase NGA coverage, and possibly, increase competition in the provision of broadband services15

- **Cost savings on pre-wiring new and extensively reconstructed buildings;**

EU binding rules according to which all new and extensively reconstructed buildings shall be "NGA ready" will ensure major savings[16] time-wise (for surveys and negotiations with tenants, landlords, building owners) and money-wise (cost of retrofitting existing buildings assessed at 60% of versus 2.5% of construction works in case of new buildings[17]) for electronic communications operators, allowing further investments and enhancing competition throughout the EU. According to different estimations, the range of potential cost savings per building for in-building wiring amounts from 20% to 60%.

[11] ENGAGE Group , *ibid*.

[12] Analysis Mason Research (2012), PIA versus self-build in the final third: digging into the costs. cited by Analysis Mason *ibid*, page 2637

[13] *Ibid*.

[14] *Ibid*.

[15] European investment in smart grid should reach 56 billion euro by 2020 (cumulative investments 2010-2020) as specified in Pike Research's report, "Smart Grids in Europe" that examines smart grid trends in Europe and forecasts the size and growth of the market for smart grid technologies through 2020 (http://www.pikeresearch.com/research/smart-grids-in-europe). Part of this investments could result in the co-deployment of dual use infrastructure.

[16] As reported by many stakeholders in the public consultations. Analysis Mason, *ibid*.gives examples of 20% reduction of costs in France

[17] Public consultations; Analysis Mason, *ibid*.

- **Revenues from NGA services would come sooner;**

This would be possible thanks to speeding up the administrative procedure for necessary permits and effective implementation of in-house wiring regulations encouraging NGA deployment.

- **Cost savings in the permit granting process** In particular cost savings would be possible in terms of human resources and time devoted to obtaining permits and negotiating conditions with authorities and land owners;

This is confirmed by best practices example, like the Amsterdam Municipality that is coordinating co-deployment of civil engineering infrastructure through the Amsterdam Smart City platform. The Platform allows providers to submit long term plans for civil infrastructure deployment, so that other interested providers could share the cost of deployment. One right of way is then granted for large areas of the city and for a long period of time. The co-deployment includes the energy DSO and a black fibre provider, while the Municipality also replaces its sewers and ducts for traffic lights. As a result, not only the cost of deployment but also the environmental nuisance are significantly reduced.

- **Cost savings related to increased legal certainty and** availability of dispute settlement mechanisms that would further reduce costs in case of disputes.

On infrastructure owners:

- **Reduction of costs related to excavation related damages to existing infrastructures;**

All actors undertaking civil works would benefit from the decreased risk of accidents since the location of existing infrastructure would be known and alert systems could be easily implemented. According to different estimations, these savings can be significant and amount up to EUR 50 000 000 per year[18]. Thus, cost savings from damages on existing infrastructure alone could equate the cost of implementing an infrastructure atlas in perhaps two three years (in NL the amount of incidents was around 40.000 incidents per annum leading to EUR 40 million and EUR 80 million in direct and indirect losses, in Sweden after the introduction of Dig alert systems operators reported 80% reduction of incidents).

- **Better exploitation of assets due to revenues for granting access;**

In some cases (e.g. sewer networks in Netherlands and Scotland[19]) the rental fees can be an attractive supplement to the main business case. It has to be noted however that the rental prices are in some cases not significant enough to create a business interest for utilities, if compared to their core business, therefore a universal access obligations is important in ensuring the possibility for sharing this infrastructure for broadband deployment. In view of the fact that there is no mandated access to ducts on a cost oriented basis and that there is room for commercial negotiation under reasonable terms, the disincentive to invest appears not to be significant.

- **Reduced cost for tendering and permit granting;**

Such savings would be possible thanks to joint tendering for construction work and joint permit granting.

- **Facilitated co-deployment of smart grids for the electricity sector;**

- **Financial benefit for construction industry.**

The benefits could result from increased value of NGA access ready-buildings, as this is becoming increasingly important for property purchasers.

On authorities:

- **Reduced administrative burden for public authorities** concerning the grating of rights of way and other permits, due to increased public works coordination and increased use of existing infrastructure, both leading to less need for digging reducing the amount of requests for permits.

[18] *Ibid*.

[19] *Ibid*.

Costs for main stakeholders involved / negative direct economic impacts
*On undertakings deploying broadband**:***
- Cost related to ground detailed survey; These costs would appear once the inventory would be in place and there would be interest in sharing infrastructure. The costs will reflect specific requests by interested operators to verify feasibility of deployment through sharing (rights to on demand surveys could be envisaged with specific fees being paid by access seekers as it is already done for example in Portugal, to avoid universal survey programme that could in certain cases represent an excessive expense). **- Cost of passive infrastructure rental** An increased level of shared infrastructure could lead to increased overall infrastructure access costs for broadband deployment in absolute terms, it would however be overcompensated by the significant savings due to avoided digging expenses (at present monthly charges for access vary greatly in EU).
On infrastructure owners:
- Cost related to collecting and sharing data on infrastructure and on planned investments; This cost would mainly be applicable to utilities and alternative operators, as SMP operators are often subject to information obligation. The exact cost will depend on the level of detail of required information as well as the state of existing data basis collecting relevant information in Member States, where a certain degree of information is already undertaken in application of the INSPIRE Directive. E.g. In case of BNetz mapping system the incurred costs were small[20]. **- Cost related to migration from infrastructure owners databases to general unified information systems;** Utilities and some operators normally already have detailed information databases on their infrastructure. This data can be re-used, if made available to interested parties. This means migration which may require format adjustment. However, in Germany for example the NRA tried to minimize this cost accepting data in a range of electronic formats
On construction industry:
- **Costs related to obligation to equip new and renovated buildings** with passive infrastructure for high-speed Internet access would be probably incurred by housing industry or infrastructure owners. In case of costs for construction industry many sources indicate that this would be an incremental cost (up to 2.5% of construction works) that would be significantly lower than the costs for other services (water, gas)[21].
On the authorities (for assessment of costs see also the table below with implementation and administrative costs of the measures of Option 3)
- Cost of setting up and managing mapping systems including suitable infrastructure of utilities; Costs and administrative burden of setting up infrastructure mapping system very much depends on the information already available in the specific Member States; however it can be relevant (in particular where such information is not directly available to infrastructure owners. Costs for running those databases yearly also vary significantly **- Cost of creating and running the database/technological platform collecting announcements of planned investments;** **- Cost for single contact point coordinating function for permit granting (human resources and possibly IT investment facilitating the** single contact point **function);** While the establishment of a single contact point would not deprive the competent authorities from their decision making powers, a small part of the cost (mainly of dealing with the operators) would be transferred to the single contact point. At the same time, the costs of creating a single contact point can be maintained relatively low by appointing an existing authority to deal with this issue, rather than establishing a new authority, as well as by

20 Ibid.

21 Ibid. study - max 20,000€ per 10apt dwelling

transferring a small part of the new costs to the industry. Yet, these costs are limited and estimated to be significantly lower than the overall benefits of the measure.

- Cost related to running dispute settlement systems related to access to infrastructure, co-deployment agreements, **permit granting.**
Dispute settlement systems are already in place for the disputes between undertakings according to the telecom regulatory framework.
The costs for disputes could be reduced by making known in advance the main elements to be taken into account when assessing unreasonable refusals and in view of the development of case law decided by the central dispute settlement body

IMPLEMENTATION AND ADMINISTRATIVE BURDEN OF THE MEASURES INCLUDED IN OPTION 3	
Obligation to provide information for every owner of passive infrastructure (suitable for broadband rollout)	**Implementation costs and administrative burden for authorities:** Costs and administrative burden of gathering information on passive infrastructures suitable for broadband rollout (in particular of setting up infrastructure mapping systems) depend very much on the information already available in the specific Member States and on the level of detail of the information required. However this cost can be relevant in particular where such information is not directly available to infrastructure owners. These costs can be optimised by not requiring an unnecessary level of detail from infrastructure owners, by using existing data as much as possible, and also by giving multiple functions to the setup system, leading to further important savings (e.g. preventing damage from excavation, facilitating co-deployment across sectors with significant savings in case of joint implementation of the mapping system and of the coordination platforms for the announcements of planned investments and possibly the electronic permit granting procedures). Additional costs may appear in case of the decision on accepting data in different formats, which would however strongly favour implementation and reduce burden on infrastructure owners. Moreover, often administrative costs are not to be seen entirely as an additional administrative burden related to the EU level initiative, since part of the cost of mapping systems might be already sustained or planned for spatial planning purposes (INSPIRE directive); therefore part of those costs are already incurred by Member States and synergies could be created for sharing the cost of atlases between different functionalities/sub products of existing or planned mapping systems. Often the issue is also the availability of the information for the relevant stakeholders. **Cost for the authorities can include:** – *Cost for setting up the system* E.g. cost of setting such atlas may vary from relatively law amounts 1-2 million (German Infrastrakturatlas and Portugal CIS database implemented by the two NRAs) to 75-77 million (for the Flamish mapping system and Polish GBDOT) for complex system that are however satisfying wider spatial planning purposes (INSPIRE Directive) which goes beyond the minimum requirements laid down in the proposed option. – *Cost of collecting and processing data,* including information from different sources in one atlas (operators information, other utilities) Costs for running those databases yearly vary significantly. – *Cost of surveys:* the cost of implementing an infrastructure atlas is largely dependent on the detail of the data included in the database, it might make

sense in some Member States to implement such a measure using a two-phase approach. The first phase could contain geographical information of existing passive infrastructure, populated by requesting the information from the operators and utility companies; this could be similar to Infrastrukturatlas, and may cost EUR several million to implement. The second phase may provide more detailed information about the (likely) shareability of each duct, from the results of a ground survey; this could be similar to projects in Poland and cost EUR hundreds of millions to implement, depending on the geographical extent of the infrastructure mapped and the number of different types of infrastructure covered.

Synergies between costs/significant overlaps:

– *Significant savings possible with joint implementation*: depending on the choices of Member States, the costs for the implementation of this measure and the platform for announcement of planned investments for coordination of civil works and damage prevention and eventually IT based permit granting systems are partially overlapping and should therefore not be considered two times.

Part of the cost of mapping systems is already sustained or planned for spatial planning purposes, therefore synergies could be created for sharing the cost of atlases between different functionalities/sub products of existing or planned mapping systems.

– *Reduction of costs related to damage prevention systems* that could be incorporated in infrastructure atlases systems; When a damage prevention system would be implemented, as it happens in some Member States in connection with mapping systems, all actors undertaking civil works would benefit from the decreased risk of accidents since the location of existing infrastructure would be known and alert systems could be easily implemented. According to different estimations, these savings can be significant and amount up to EUR 50 000 000 per year. Thus, cost savings from damages on existing infrastructure alone could equate the cost of implementing an infrastructure atlas in perhaps two three years (in NL the amount of incidents was around 40.000 incidents per annum leading to EUR 40 million and EUR 80 million in direct and indirect losses, in Sweden after the introduction of Dig alert systems some operators reported 80% reduction of incidents, in NL after the introduction of the KLIC database, overall damage to existing infrastructure was down by around 10% per annum).

Some examples of costs for mapping databases incurred in Member States:

*Summary of costs **(EUR millions)***

	Implementation cost		**Ongoing costs**	
Member State	**NRA**	**Operator**	**NRA**	**Operator**
Germany	1	Low	n.a.	Low
Portugal	2	Low	n.a.	n.a.
Netherlands	0.076	Low	n.a.	n.a.
Belgium	77	n.a.	~7	n.a.
Poland	75	n.a.	n.a.	n.a.
Sweden	0.075 – 1.8	n.a.	0.006 – 0.08	n.a.

Source: Analysis Mason, "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment (SMART 2012/0013)"

	German Infrastrakturatlas – the project cost for the NRA was approximately 1 million euro, since rather than undertaking a complete mapping operation the authorities have simply collected location data from infrastructure owners. Furthermore, the incremental cost of adding newly constructed infrastructure to the database is likely to be negligible. **Portuguese Central Infrastructure Atlas (CIS)** has cost EUR 2 million. Since most operators have adequate data on the geographical routes of their networks and are able to upload this information to the system, and so expensive ground surveys are rarely required. The incumbent, Portugal Telecom is required to provide information on the available capacity of a duct using a red-amber-green system. To determine this availability, duct surveys are carried out when another operator has expressed interests, and they must pay a one-off survey fee for this. For further details see Analysis Mason study.
	Administrative burden for business and other infrastructure owners – Cost for operators and other infrastructure owners for providing location data to the mapping system. – Very limited additional cost for the provision of information related to newly built infrastructure, since most of the information is already produced for the execution of works, and would just need to be transferred to the mapping system. – Administrative burden depends on the level of detail of the information chosen: for already existing infrastructure cost of ground surveys, could be needed to send the needed information to the mapping system if the information is not available.
Mandating "reasonable" access to all existing infrastructures suitable for network deployment, while foreseeing a dispute-settlement mechanism	**Implementation costs and administrative burden for authorities** Cost of dispute settlement mechanisms or for exercising the mediating function for the NRAs or other chosen competent authorities need to be taken into account. Competencies across sectors will have to be put together and a mechanism will have to be developed concerning the application of the reasonableness test.
	Administrative burden for business and other infrastructure owners Since access agreements are to be defined through negotiation no additional administrative cost is borne by owners of infrastructure to define reference offers. However costs might have to be incurred ex post (during negotiation, or in case of litigation, etc.)
Transparency requirements on planned civil works for all investors (public and private) with an obligation to negotiate and a dispute-settlement mechanism. Also, an obligation to grant access for all public works (civil works financed with public money)	**Implementation and administrative burden for authorities** - Cost of creating and running the database/technological platform collecting announcements of planned investments; E.g. the cost of Finnish Johtotieto (co-digging portal) was EUR 200 000 with an on-going yearly cost of 100 000, whereas Swedish Lendingenskolle dig alert system that could be developed in a planned investments announcement database cost EUR 1.8 million to implement between 2007-2010 and approx. 700.000 per annum to run. - Cost of public authority to manage the platform for announcement of planned investment that could probably only partially be recovered by contributions from infrastructure owners (ex in the form of very small administrative fee for planning applications as in the Flemish example) - Cost for all public authorities to announce their own planned investments - Reduced administrative burden for local authorities since an increase in the civil

	work coordination would reduce the number of needed permits and rationalise civil works authorisation process. The database would provide however a very useful planning instrument for the public authorities, that would allow to have an overview of all planned civil engineering works in a given territory and timeframe, possibility to ensure rationalise permit granting process a decreased level of demands for rights of way since works would be better coordinated and joined for the same location and better exploitation of planned public works investments, sharing its civil works cost component with other interested parties. - Administrative costs for dispute settlement or for exercising the mediating function
	Administrative burden for business and other infrastructure owners - Small administrative burden for concerned actors announcing planned investments in infrastructure. - Slightly reduced administrative burden for joint tendering and joint permit granting for construction work.
Single contact point with coordinating function for permit granting	**Implementation cost and administrative burden for authorities** While the establishment of a single contact point would not deprive the competent authorities from their decision making powers, a small part of the cost (mainly of dealing with the operators) would be transferred to the single contact point. At the same time, the costs of creating a single contact point can be maintained relatively low by appointing an existing authority to deal with this issue, rather than establishing a new authority, as well as by transferring a small part of the new costs to the industry. Yet, these costs are limited and estimated to be significantly lower than the overall benefits of the measure. Costs would typically be: - Cost for exercising the coordination role (human resources). - Costs for IT investment facilitating the single contact point function and electronic permit granting management. To some extent these costs would have to be incurred anyway, in the light of the e-administration targets, therefore synergies in planning expenditures could be achieved while introducing electronically based procedures for granting permits. The cost incurred for setting up the single contact point system for the Licensing of Antenna masts in Greece developed internally by the Greek NRA was the equivalent of 24 man-months (IT analysis and programming with the aid of Spectrum Department personnel) and 25.000 Euro in computer and network systems for hosting the OSS (central database replication, web application hosting, multiple connections handling). - Cost savings due to streamlined permit granting processes facilitated by IT system (see below estimates in the case of Flanders)
	Administrative burden for business and other infrastructure owners - Time an administrative savings for operators due to reduced complexity of the permit granting procedure and the coordinating role exercised by the OSS E.g; In case of the AGIV's KLIP system in Belgium that is in part designed to simplify the planning and permit granting process, AGIV estimates that the systems saves the operators and authorities combined EUR 29,5 million per annum.
Obligation for new (and majorly renovated) buildings that in-house	**Implementation and administrative costs for authorities** - No significant additional administrative burden, except for monitoring compliance, potentially issuing guidelines) The current construction works anyway

equipment is NGA compatible and mandating access to in-house NGA equipment for all buildings	are subject to permits such costs can therefore be minimised by integrating the implementation of the new rules with already existing permission processes.. Mandating NGA ready in-house equipment would therefore influence conditions of grating such permits, without altering much the procedure of issuing permit Further to the example of FR and ES, no significant additional administrative burden is expected. The cost to the government and/or the NRA is negligible (with the obvious exception of the initial consultation and drafting of the legislation).
	Implementation and administrative burden for business and other infrastructure owners - Costs of negotiating access to in house NGA infrastructure. Operators have not incurred any costs when new laws oblige new and refurbished buildings to be fitted with common NGA infrastructure. However, in France, it is up to the operator to build this terminal segment in such a way that it can be shared by other operators, which may incur some addition cost. On the other hand, installing the in-building installations in new buildings is on the construction firms that must cover these costs, although these are relatively low (much lower than the cost of in-building water and gas distribution, for example). As access to NGA services becomes more and more important to consumers, it is possible that these construction firms may see a future benefit from the measures, with pre-wired buildings being sought-after by property purchasers. Therefore the construction sector could become more willing to deploy NGA infrastructure as consumer demand grows for NGA services.

IMPACTS AND ADMINISTRATIVE COSTS OF OPTION 4 MANDATING EFFICIENCY GAINS

Benefits for main stakeholders involved / positive direct economic impacts

Under this option, an EU infrastructure atlas would be required, access to passive infrastructures would be imposed at cost oriented prices, and certain forms of coordination of public works would be imposed (mainly as regards public works). Finally, an EU one-stop-shop on permit granting would be established and all buildings would need to become NGA ready by 2020. This option is very clear as regards the scope of its obligations, including obligations across utilities.

The main benefits for the direct stakeholders are to an extent similar to the ones described in option three. Compared to those, the **differences** are as follows:

For undertakings deploying broadband:

- **Higher savings in infrastructure deployment** in particular through access to infrastructure at cost oriented prices, the right to co-deploy when public works are undertaken at a marginal cost, and an increased availability of spare capacity (e.g. extra ducts laid by public authorities);
- **Higher savings in terms of human resources and time devoted to obtaining permits** due to an EU one-stop-shop for companies willing to invest cross border;
- **Increased cost and time savings** on access to in-house NGA of all buildings;
- **Potentially faster revenues** from NGA services due to these time savings.

Costs for main stakeholders involved / negative direct economic impacts
The main costs for the direct stakeholders are to an extent similar to the ones described in option three. Compared to those, the **differences** are as follows:
For (all) infrastructure owners:
- **Significantly reduced revenues** resulting from granting access to their infrastructures given the cost orientation of offerings, which would reduce the business case for infrastructure owners; this brings a significant risk that owners are disincentivised from further investing in their passive infrastructure. - **Higher cost of collecting and providing fully harmonised data** on infrastructure to a central EU body;
For construction companies and building owners:
- **Significantly higher cost** to equip all new and old buildings with passive infrastructure for high-speed Internet access
For public authorities
- **Cost for the implementation and managing of mapping databases at EU level would be significant and would potentially duplicate some of the costs already incurred at national level,** implying cost of migration from national to EU wide system. This would adversely affect in particular Member States that already implemented their own mapping systems. - **Additional costs of defining ex ante cost-oriented prices across industries,** while most Member States do not have regulators which are competent across several sectors; - The cost for deployment of **additional empty ducts** for all public works to overcome time discrepancies in civil works coordination would need to be covered by additional public funding. Although this cost is estimated to be marginal, question marks might nevertheless appear on the efficiency of such intervention; - **Significantly higher costs in human resources, legislative changes** and possibly IT investment for the fulfilment of the **full one-stop-shop** on permit granting procedures since various competencies would need to be merged and integrated.

IMPLEMENTATION COST AND ADMINISTRATIVE BURDEN OF THE MEASURES INCLUDED IN OPTION 4	
The cost to be sustained would be significant and higher than in Option 3.	
For the public authorities	The administrative costs for the implementation and managing of mapping databases following harmonised EU standards, with a central access point at EU level, would be significant. Although important synergies exist with the INSPIRE Directive and with the Broadband State Aid Guidelines, additional efforts would be required to cover all telecom infrastructure in a relatively short timeframe. The costs of defining ex ante cost-oriented prices across industries would also be significant, considering that most Member States do not have regulators which are competent across several sectors. Additionally, the cost for deployment of additional empty ducts for all public works to overcome time discrepancies in civil works coordination would need to be covered by additional public funding. Although this cost is estimated to be marginal, question marks might nevertheless appear on the efficiency of such intervention. Significantly higher costs in human resources, legislative changes and possibly IT investment for the fulfilment of the full one-stop-shop on permit granting procedures since various competencies would need to be merged and integrated.
On infrastructure owners	The measures regarding the EU infrastructure atlas seem to add administrative burdens compared to the previous policy option also to operators in case they would need to share fully harmonise data on their own infrastructure.

ANNEX X

ANNEX X

ASSESSMENT OF THE EFFECTIVENESS, EFFICIENCY AND COHERENCE

Section 1 - EFFECTIVENESS OF OPTIONS

Are the measures proposed in the policy options sufficient to attain the operational objectives set?

Option 1 Business as usual	Measures proposed under option 1 would consist mainly in the propagation of best practices and guidance from the Commission to the extent currently provided for by the Regulatory Framework. The decision to apply the relevant practices would be in the hands of the Member States, thus the effectiveness of the propagated measures across the EU would be uneven. The lesson learnt from existing practices could be applied to a limited extent, given the scope of the regulatory framework; further guidance could be provided, however limited to the telecom sector only. Thus, the specific objective to reduce the costs of network deployment in the EU is not ensured by this policy option. This policy option falls short to achieve the desired objectives as defined in section 3.
Option 2 Promoting efficiency gains within the telecom sector	While measures proposed under option 2 could have positive effects in terms of a more coherent implementation of existing powers, their effectiveness across the EU would be comparable to measures considered under option 1/baseline scenario. This is because the scope and scale of this option remains limited to telecom operators and the implementation of any promoted measures would remain voluntary. As a result, the objective to reduce broadband deployment costs across Europe would be limited to telecom providers only and in those countries that would follow any promoted measures. This implies the risk that the uneven playground in the EU for telecom providers would persist or even increase.
Option 3 Enabling efficiency gains across sectors	The measures foreseen under this option would address all of the identified inefficiencies and bottlenecks effectively across sectors and in a proportionate manner. Thanks to a set of rights and obligations telecom providers would receive tools to overcome existing barriers in a 'business friendly' way. In particular, the establishment of a right to use existing passive infrastructures under reasonable terms, coupled with a dispute settlement mechanism in case of failure, would ensure the possibility to exploit the potential of duct sharing, while preserving commercial negotiations. Moreover, the definition of a minimum set of information coupled with the right to request more detailed information/in site visits would keep the costs reasonable and limit the obligations on operators to what is necessary to ensure the objective. Providing a single contact point to the market would make permit granting procedures and conditions more transparent and predictable, while leaving the decision to the authorities closest to the specific aspect to be regulated; finally restricting NGA-ready in-house equipment to new buildings or major reconstruction works, would keep the costs on operators and owners reasonable. The scope of these measures is wider than the baseline scenario and also the scale of the intervention corresponds to the defined objectives. As such, the proposed measures meet the effectiveness test. They do not go beyond that what is strictly necessary to attain these objectives. However, their effectiveness will be more limited if the proposed measures combine a binding legal instrument and a Council Recommendation as proposed under sub-option B, as implementation of the recommendations might differ across the EU. Yet, thanks to

	enabling efficiency gains by means of a basic set of rights and obligations under a binding instrument, this hybrid approach would still be much more effective than the baseline scenario, option 1 or option 2. The adoption of a binding instrument (sub-option A) endorsing all the rights and obligations would ensure a uniform application across the EU making the objective to reduce broadband deployment costs across Europe more plausible than option 1/option 2 or the baseline scenario. All in all, regardless of the legal form for implementation of proposed measures, the effectiveness of this option is good or very good.
Option 4 Mandating efficiency gains across the EU	The measures proposed under this option entail full harmonisation across the EU by means of mandated solutions. While the scope of this option is similar to option 3, its scale differs visibly. This option could in practice generate a number of obligations and constraints not necessarily proportionate to the desired objective, if not counterproductive. As far as transparency is concerned, the setting up of such a system would require significant operational costs for public institutions, information providers and access seekers. In addition to that, access to a European central point might not always be appropriate for access seekers, while mandating centralised features and a common database format might lead to some relevant information being lost in the harmonisation process. The imposition of ex ante cost orientation, in particular for access to telecom ducts and co-deployment, while reducing the costs for access seekers, could also undermine the incentives to invest. As such this measure could exceed what is necessary to reduce barriers to deployment. Similarly, the imposition on public actors of an obligation to deploy empty ducts when other infrastructure is laid down could reduce the incentive of private investors to invest in the first place, while waiting for future public investments, and it would entail investments which might not be recouped in the absence of market interest. Moreover permit granting requires local knowledge, which might not be ensured with centralisation. Finally, generalising the obligation to equip building with NGA-ready infrastructure would generate significant costs on property owners. In view of the above this option would go beyond what is necessary to achieve the envisaged operational objective, while putting at risk the general objective to which this initiative subscribes. Thus, despite the same scope this option ensures more limited effectiveness compared to option 3. Despite the highest legal certainty, especially in comparison to the baseline scenario, the effectiveness of the proposed measures is low and thus falls short to achieve the desired objectives.

Section 2: EFFICIENCY OF OPTIONS

Efficiency, including costs and benefits, of the measures (as described in chapter 5)

Option 1 Business as usual	There is currently a patchwork of rights, obligations and procedures applied by Member States governing the deployment and use of passive infrastructures suitable for broadband networks, despite the fact that some obligations concerning the roll-out and the use of passive infrastructures may be imposed to electronic communications network providers according to the existing Regulatory Framework. Despite the presence of several initiatives at local and national level, in order to enable operators to enhance cross-utility synergies, effective coordination of works, transparency of available infrastructure or to promote NGA-ready in-house infrastructures, important issues of barriers across utilities as well as lack of coordination among the authorities involved have not been sufficiently addressed. There are little synergies between national approaches and the best practices are rarely followed by others. The limited coordination that could be achieved by guidance at EU level could only provide some common elements or best practices for consideration by central and/or local authorities when deciding to act. The cost both for administration and communications providers would however be limited. In conclusion, while this option would not imply significant costs (mainly collection of best practices and guidelines), cost savings would only remain marginal.
Option 2 Promoting efficiency gains within telecoms sector	This option would consist in promoting the provisions and tools provided for in the regulatory framework, and in particular those in Articles 11 and 12 of the Framework Directive. Thereby it would reduce costs more than measures under the baseline scenario,. Yet, these gains would be moderate. Measures proposed under this option would facilitate broadband deployment in infrastructures of telecom providers, with very limited or no impact beyond the scope of the Regulatory Framework. Similarly to option 1 or the baseline scenario Member States would remain relatively free to decide whether or not to implement these powers. In those Member States, where recommendation(s) would be followed, telecom providers might sustain some additional costs to ensure transparency of existing passive infrastructure and planned investments. The benefit could be relevant when sharing and co-deployment would happen, ranging from 29% to 58% cost saving from infrastructure sharing coupled with self-digging (up to a 75% in case of full duct sharing) and from 15% to 60% cost savings of new deployments in case of coordination of civil engineering works. However, their savings would remain scattered. When adopted by Member States, those measures could lead to non-negligible administrative costs for national authorities, which would however affect only a limited number of authorities and telecom operators. The scale of the costs would differ among Member States. Yet, in case of a follow-up, these costs could be slightly higher comparing to option 1, depending on the extent in which the recommendations would be followed. While voluntarily applied recommendation(s) could lead to a more efficient deployment, fragmentation regarding the use of non-telecom infrastructure and the coordination of civil engineering works across sectors would not be improved, which would limit the efficiency of the option, leaving the full costs saving potential of cross-sector cooperation unexploited.

	This option is therefore only partially effective in terms of costs and benefits and therefore it is not sufficient to fully reap the cost-reduction potential.
Option 3 Enabling efficiency gains across sectors	Providing market players with rights and obligations would lead to removing existing regulatory and unreasonable commercial barriers to infrastructure sharing and to coordination of planning civil engineering works, including cross-sector ones, while preserving commercial negotiation, subject to an ex post dispute resolution system aiming at ensuring a fair exercise of those rights. This option would also increase transparency, an important driver of infrastructure sharing, which in turn has an impact on costs related to broadband roll-out. The telecom providers would also be entitled to transparent procedures and conditions for permit granting; they would benefit from economies of scope and scale in equipping new buildings with NGA-ready infrastructures, whereas consumers could take advantage of such NGA ready equipment. Compared to option 1 and 2, where decisions about implementation of the measures currently available or promoted by the Commission depend on the Member States, a key element of the proposed measures lies in the cross-sector nature of those measure, which involves all the steps of network deployment. In case of sub-option 3B providing for a mixed legal instrument, the benefits and costs would be less significant for measures subject to a (Council) recommendation. The efficiency of measures introduced by means of a binding instrument accros the four operational objectives in sub-option A would be much more important. This option would imply different kinds of administrative costs for operators and authorities (see for details Ch. 5), exceeding those under option 1. Some of them would be negligible (implementation of the obligation, extended dispute settlements mechanisms), while other could be relevant, as those for the setting up and managing the required central contact point. However the actual costs would depend on the amount of information already existing in specific MS, while significant savings would be possible if these measures are implemented jointly (as showed by Analysis Mason Report cost savings from avoided damages on existing passive infrastructure could alone equate the costs of implementing an infrastructure atlas). Additional savings would be ensured by pre-wiring of new and refurbished buildings where the cost would be mainly sustained by the housing sector partially compensated by the added value of a high- speed communications infrastructure. Therefore these costs appear to be offset by the benefits in terms of increased efficiency in broadband deployment for the operators and quicker and broader broadband coverage for the society as a whole. In view of the above this option would enable operators to fully or mainly exploit most of these synergies while ensuring fair balance between benefits and costs. The overall efficiency of this option would be significant.
Option 4 Mandating efficiency gains across EU	Compared to option 1 or the baseline scenario, this policy option would entail a full harmonisation of measures aiming at reducing costs in order to guarantee that all EU operators will be able to operate in the same regulatory environment in deploying their broadband networks. This option would ensure the availability of the same information on the infrastructures suitable to host electronic communication networks all over the EU through a single point of contact, favouring in particular cross-border providers. The imposition of ex ante cost orientation regulation in the use of existing passive infrastructures and negotiating co-deployment would extend the regulatory competences already envisaged under the

	current Regulatory Framework to potentially every passive infrastructure and planned work and without the need of a market analysis, in view of ensuring as much cost reduction as possible. Moreover, in order to fully exploit the synergies of coordination of works financed with public money and to address the timing mismatch in investment decisions, the general obligation to lay down empty ducts suitable for electronic communications networks further aims at increasing effectiveness of the measure. A unique authority at Member State level would address completely the identified problems of lengthy, complex, diluted, and different permit granting procedures at local level in a number of Member States. Finally general obligation to have NGA-ready buildings by a specified date would entail that by the indicated date all the buildings in the EU would have to be NGA-ready in terms of in-house equipment, in-house wiring and termination segments. The implied costs of mandating measures both on the communications providers and authorities would have been very high, negatively impacting the expected benefits. This option would aim at ensuring homogeneity across the Union. At the same time, as illustrated in Chapter 5, this would imply significant administrative costs at EU level for Member States and operators. Thus the efficiency of this option would be smaller, due to unbalanced ration of costs and benefits.

Section 3: COHERENCE OF OPTIONS

Coherence: Is the balance between effects across economic, social and environmental domains ensured? Are they coherent with the overarching objectives of EU policy?

	Overall economic impact = positive – negative impact	**Social impact**	**Environnemental impact**
Option 1	0	0	0
Option 2	□	□	□
Option 3	□□□	□□	□□
Option 4	□□	□□	□□

Option 1 Business as usual	The choice of option 1 is not effective from the perspective of the objectives and as such would not contribute much to the achievement of objectives as defined in Digital Agenda for Europe, Guidelines for Broadband State Aid, Single Market Act II. As explained in section 2.1.4 (new measures to stimulate broadband) the Commission has undertaken a number of actions to step up its efforts to stimulate broadband rollout. From this perspective option 1 does not bring much added value. All identified economic, social and environmental impacts would not be measurable.
Option 2 Promoting efficiency gains within telecoms sector	Comparing to the option 1 and baseline scenario, the expected economic, social and environmental impacts of the measures proposed under option 2 would contribute to the overarching EU objectives, as defined for example, in the Digital Agenda for Europe, Guidelines for Broadband State Aid and considered under Single Market Act II. Yet, given the limited effectiveness of these measures, the coherence of this option remains at very basic level.
Option 3 Enabling efficiency gains across sectors	Given the expected impacts of the measures under option 3, especially if translated into a binding measure, the coherence of this option with the general objectives of the Digital Agenda for Europe, Guidelines for Broadband State Aid and Single Market Act II as well as other undergoing initiatives, is much more significant than under option 2 and baseline scenario. All three types of impacts are positive and therefore balanced, despite a predominance of positive economic impacts over the social and environmental ones.
Option 4 Mandating efficiency gains across EU	The measures proposed under option 4 would contribute to the objectives of Digital Agenda of Europe, Guidelines for Broadband State Aid Single Market Act II and other on-going initiatives more than option 2 and baseline scenario. The positive balance of the economic, social and environmental impacts remains preserved. On the other hand, the risk of being counterproductive makes these measures costs-benefit inefficient also in the wider context and thus, their coherence would not be significant.

Annex XI

ANNEX XI

GLOSSARY AND BIBLIOGRAPHY

BEREC: Body of European Regulators of Electronic Communications

CAPEX: Capital Expenditure

DAE: Digital Agenda for Europe

DER: Distributed Energy Resources

EFTA: European Free Trade Association

FTTH: Fibre To The Home

GDP: Gross Domestic Product

GSM: Global System for Mobile Communications

IASG: Impact Assessment Steering Group

ICT: Information and Communication Technology

LTE: Long Term Evolution

NGA: Next Generation Access

NRA: National Regulatory Authority

OECD: Organisation for Economic Co-operation and Development

RSPP: Radio Spectrum Policy Programme

SME: Small and Medium Enterprises

SMP: Significant Market Power

TFEU: Treaty on the Functioning of the European Union

BIBLIOGRAPHY

- Analysys Mason "Support for the preparation of an impact assessment to accompany an EU initiative on reducing the costs of high-speed broadband infrastructure deployment" (SMART 2012/0013).

- Analysys Mason Tech4i2 "The socio-economic impact of bandwith" (SMART 2010/0033).

- Atkinson, R., Castro, D. & Ezell, S.J. (2009). The digital road to recovery: a stimulus plan to create jobs, boost productivity and revitalize America. The Information Technology and Innovation Foundation, Washington, DC

- Booz and Company, Maximising the impact of Digitalisation, 2012

- COM(2010)245 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Digital Agenda for Europe.

- COM(2010)472 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: European Broadband: investing in digitally driven growth.

- Copenhagen Economics (2010), the economic impact of a European digital single market, commissioned by European Policy Center.

- Crandall, R., Jackson, C., & Singer, H. (2003). The Effect of Ubiquitous Broadband Adoption on Investment, Jobs, and the U.S. Economy. Washington DC: Criterion Economics.

- Dieter Elixmann, Dragan Ilic, Dr. Karl-Heinz Neumann, Dr. Thomas Plückebaum, WIK-Consult Report Study for the European Competitive Telecommunication Association (ECTA): The Economics of Next Generation Access - Final Report Bad Honnef, September 10, 2008

- Davidson, C. M., Santorelli, M.J., Kamber, T., 2009. Broadband Adoption: Why It Matters And How It Works. New York Law School's Media Law & Policy Journal, 2009, 19, pp14-56.

- Deloitte Tech4i2 "Study on cost-reduction practices with regard to broadband infrastructure roll-out" 13/09/2012. Part of Study leading to an Impact assessment on the structuring and financing of broadband infrastructure projects, the financing gaps and identification of financing models for project promoters and the choice of EU policy. (SMART 2007/0035)

- Ecorys, TU Delft and TNO, Steps towards a truly Internal Market for e-communications in the run-up to 2020, report on the cost of non-Europe released on February 2012 Annual FFTH Council Report April 2011- April 2012.

- Fuhr J. P., Pociask, S.B., 2007. Broadband Services: Economic and Environmental Benefits.

http://ec.europa.eu/information_society/digitalagenda/scoreboard/docs/2012/scoreboard_broadband_markets.pdf.

- http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/128520.pdf .

- http://www.gsma.com/gsmaeurope/gsma-europe-report-on-base-station-planning-permission-in-europe/.

- ICT Applications for the Smart Grid: Opportunities and Policy Implications", OECD Digital Economy Papers, No. 190, OECD Publishing.

- ITU, Impact of broadband on the Economy, Regulatory&Market Environment http://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_Impact-of-Broadband-on-the-Economy.pdf

- Liebenau, J., Atkinson, R. D., Kärrberg, P., Castro, D. & Ezell, S. J. (2009, April 29). The UK's Digital Road to Recovery. Retrieved from: http://ssrn.com/abstract=1396687

- Katz, R., L. & Suter, S. (2009a). Estimating the economic impact of the broadband stimulus plan (Columbia Institute for Tele-Information Working Paper). Retrieved from www.elinoam.com/raulkatz/Dr_Raul_Katz_-_BB_Stimulus_Working_Paper.pdf

- Katz, R. L., Vaterlaus, S., Zenhäusern, P. & Suter, S. (2010a). The Impact of Broadband on Jobs and the German Economy. Intereconomics, 45 (1), 26-34., - Koutrompis, P. (2007), The economic impact of broadband on growth: A simultaneous approach.

- Mario Monti. A new Strategy for the Single Market, report to the President of the European Commission (9 May 2010)

- McKinsey & Company, 2009. Mobile Broadband for the Masses.

- McKinsey & Company, 2011. Measuring the Net's growth dividend.

- Methodologies to Measure the Potential of Smart Grids for Green House Gas Reductions, SG4-GHG, Final Report 2012, Study funded by DG INFSO.

- Micus (2010), The impact of broadband on growth and productivity. Micus: Dusseldorf.

- Möglichkeiten des effizienten Einsatzes vorhandener geeigneter öffentlicher und privater Infrastrukturen für den Ausbau von Hochleistungsnetzen, Dr H. Giger et al, 2011.

- Network developments in support of innovation and user needs, OECD, 2009.

- OECD study "Public Rights of Way for Fibre Deployment to the Home", OECD No. 143, OECD Publishing. http://dx.doi.org/10.1787/230502835656

- Shearman, P., 2011. Are there better ways to quantify the value of superfast broadband? Broadband Stakeholder Group.

- Study on cost-reduction practices with regard to broadband infrastructure roll-out 13 September 2012. The study was based on extensive desk research, telephone interviews with national government officials and two surveys among national regulatory authorities.

- The Smart Grid: An estimation of the Energy and CO2 benefits, 2010, Report by Department of Energy's Pacific Northwest National Laboratory.

- Thompson, H.G. and Garbacz, C. (2008), Broadband Impacts on State GDP: Direct and Indirect Impacts.

- Zhen-Wei Qiang,C.Z., Rossotto, C. M., and Kimura K., 2009. Economic Impacts on Broadband. In World Bank, 2009 Information and Communication for Development-Extending Reach and Increasing Impact, Ch. 3., pp 55-70.