EUROPEAN COMMISSION

Brussels, 19.10.2011
SEC(2011) 1229 final

COMMISSION STAFF WORKING PAPER

IMPACT ASSESSMENT

Accompanying the document

Proposal for a Regulation of the European Parliament and of the Council

on a series of guidelines for trans-European telecommunications networks

{COM(2011) 657 final}
{SEC(2011) 1230 final}

Lead DG: DG Information Society and Media

Disclaimer: This report commits only the Commission's services involved in its preparation and does not prejudge the final form of any decision to be taken by the Commission.

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IMPACT ASSESSMENT REPORT

1. POLICY CONTEXT, PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

This is the Report of the impact assessment of the legislative proposal for the Regulation on guidelines on broadband networks and digital service infrastructures in the trans-European networks of infrastructure (CEF) for the post 2013 programming period. These guidelines build on and update the former guidelines for trans-European Telecom networks from 1997, as amended in 2002[1].

1.1. Legal base, existing legislation and the Connecting Europe Facility

Articles 170-172 TFEU provide a legal context for the EU intervention supporting the establishment and development of trans-European networks in the areas of transport, telecommunications and energy infrastructures. Action by the Union shall aim at promoting the interconnection and interoperability of, and access to, national networks, taking into account in particular the need to link islands, landlocked and peripheral regions with the central regions of the Union. To this end, the Union shall establish a series of guidelines covering the objectives, priorities and broad lines of measures envisaged in the sphere of trans-European networks; these guidelines shall identify projects of common interest. The Union may support these projects of common interest supported by the Member States, particularly through feasibility studies, loans guarantees and, in the field of transport, also through the Cohesion Fund. Articles 169 and 173 TFEU are also of relevance since industrial policy and consumer issues are an integral part of the broadband networks and digital service infrastructures objectives.

The proposed intervention will be pursuant to Article 172 TFEU.

The Council Regulation 2236/95 of 18 September 1995 laid down the first general rules for the granting of Community financial aid in the field of trans-European networks for transport, telecommunications and energy infrastructures. The 1995 Council Regulation was amended several times with specific Regulations taking into account the developments for the fields covered and their intrinsic characteristics, but also in order to refine the eligibility criteria and the level of co-financing according to the type of projects. The Regulation No 1159/2005 amended the 1995 Regulation with specific modifications for the area of telecommunications. Specific guidelines for the trans-European Telecom networks were also adopted in 1997 by way of the Decision 1336/97/EC of the European Parliament and of the Council and amended by Decision 1376/2002/EC. It is necessary to replace the existing acts by the newly proposed guidelines for trans-European telecommunications networks in order to reflect new policy priorities, namely the use of EU funds to support the roll-out of broadband internet networks.

The proposed guidelines for trans-European telecommunications networks are part of a legislative package for a Connecting Europe Facility (CEF), including a general CEF Regulation and specific guidelines for energy and transport networks. While the Regulation establishing the CEF defines the conditions, methods and procedures for providing Union financial aid to trans-European networks in the fields of transport, energy and

[1] DECISION No 1336/97/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 June 1997 on a series of guidelines for trans-European telecommunications networks. Decision No 1376/2002/EC of the European Parliament and of the Council of 12 July 2002 amending Decision No 1336/97/EC on a series of guidelines for trans-European telecommunications networks

telecommunication infrastructures, the guidelines proposed here lay down the objectives, priorities and broad lines of measures envisaged for broadband networks and digital service infrastructures in the field of telecommunications. Similar guidelines are proposed for the fields of transport and energy respectively.

The current eTEN Guidelines have been proposed and adopted as a Decision of the European Parliament and of the Council which is specifically addressed to the Member States, rendering the Guidelines binding in their entirety for all the Member States. This reflected the scope of the previous guidelines, which did not cover private investments in telecommunications infrastructure and ensured consistency with the approach in transport and energy respectively. The present guidelines are addressed to broad categories of investors, including in particular telecom operators, utility companies, regional decision makers, including municipalities and partnerships. With more actors besides the Member States becoming involved in the planning, development and operation of projects of common interest in the field of telecommunications, it is important to ensure that the Guidelines be binding for all. The Commission has therefore chosen a Regulation as the legal instrument for this proposal.

1.2. CEF policy framework

In its **Europe 2020** strategy, the European Commission has recognised the need to act in support of the digital society:[2] "*Europe is falling behind on high-speed internet, which affects its ability to innovate, including in rural areas, as well as on the on-line dissemination of knowledge and on-line distribution of goods and services*."

One of the flagships for the Europe 2020 strategy is the **Digital Agenda for Europe** flagship initiative[3], which aims "*to deliver sustainable economic and social benefits from a Digital Single Market based on fast and ultra fast internet and interoperable applications*". The DAE also outlines the following targets:

- broadband access for all by 2013;
- access for all to much higher internet speeds (30 Mbps or above) by 2020; and
- 50% or more of European households subscribing to internet connections above 100 Mbps by 2020.

Europe 2020 also commits, inter alia, to facilitate the use of the EU's structural funds in pursuit of these goals with a view to overcome social, economic and territorial gaps with the provision of an open, affordable and good quality infrastructure to high speed internet across Europe.

The Commission in its Communication **"European Broadband: investing in digitally driven growth"**[4] concluded that the critical role of the internet means that the benefits for society as a whole appear to be much greater than the private incentives to invest in faster networks. Therefore, public support for this area is necessary, but should not unduly distort competition. The Council subsequently invited the Commission to make a proposal, in

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2 COM (2010) 2020

3 COM (2010) 245

4 COM(2010) 472

cooperation with the EIB and in collaboration with the MS, to support broadband financing without prejudice to the current multi-annual financial framework.

The European Parliament in its 8 June 2011 Resolution on **"Investing in the future: a new Multiannual Financial Framework (MFF) for a competitive, sustainable and inclusive Europe"**[5] stressed the importance of ensuring the rapid execution of the Union's Digital Agenda and of continuing efforts towards reaching by 2020 the targets of making available to all EU citizens access to high-speed internet, also in less developed regions

Finally, in its Communication **"A Budget for Europe 2020"** (hereinafter the MFF Communication), adopted on 29 June 2011, the Commission proposed to establish the Connecting Europe Facility, which is new in that it seeks to realise synergies across the fields of telecommunications, transport and energy.

1.3. Financing the future: developing a new policy using new means

The Commission's MFF Communication is breaking new grounds in that it extends the existing policy approach for Trans-European Networks to a new field, i.e. broadband internet. Apart from limited amounts of financial support granted under the Structural Funds, the Union has so far not given support to the development of broadband networks with European public funds. As opposed to the decentralised management system used in the Structural Funds, it is proposed to manage these funds and financial instruments centrally, for reasons of critical mass and to favour the cross-border nature of the investments. A new set of instruments have also been devised.

As argued in the policy papers above, the Commission considers access to high-speed internet a crucial catalyst for smart, sustainable and inclusive growth. Clearly, investing in this infrastructure is, first and foremost, the remit of the private sector. However, the problem definition developed in this document (section 2) argues that due to a number of imperfections in the market, such as long time horizons for return on investment and a lack of competitive pressure on incumbent telecoms operators as well as the cross-border nature of crucial digital services, the market is not making the necessary investments.

The Commission aims to address this problem through a mix of proven instruments, i.e. grant funding, and innovative financial instruments (the term “innovative” is used to differentiate them from grants). Financial instruments can provide equity/risk capital, guarantees to International Financial Intermediaries (IFIs), such as the European Investment Bank, that provide lending to a large number of final beneficiaries who have difficulties in accessing finance (in this case infrastructure project companies) or through risk sharing with financial institutions. This creates a leverage effect, multiplying the volume of finance resulting from the EU intervention. Hence, financial instruments are not a substitute for private investment, but indeed a way to stimulate private investment. That said, financial instruments cannot replace grant funding but complement it. As will be argued below, the optimum mix of instruments will be determined by the financial viability of the projects proposed.

As regards digital service infrastructures, most of the proposed action lines have come out of research and innovation activities, and have enjoyed Union support, on a small scale, for some

5 European Parliament resolution INI/2010/2211

time. Here the step change is in the proposed scaling up from pilot projects into Europe-wide deployment, by connecting digital public infrastructures offered separately (or in a "disconnected" manner) by a Member State or its regional and local authorities to a Europe-wide network, thereby making them interoperable and enabling a true Digital Single Market.

1.4. Consistency with other Union policies

Reinforcing the Single Market

The suggested CEF initiative aims to benefit several policy fields. First and foremost, work on the Digital Single Market is to be seen in the context of the **Single Market Act**[6], which, for example, addresses the need for interoperable and mutually recognised systems of e-identification, e-authentication and e-signatures. These are essential to ensure the free movement in the Single Market and in particular cross-border access to online public services for citizens and businesses. Likewise, effective functioning of cross-border public procurement is dependent on appropriate interoperable electronic infrastructures. Transport, energy and digital networks are seen as the backbone of the single market. Indeed, efficient infrastructures foster rapid free movement of people, goods and services and various types of energy and data (with the allocation of a sufficient radio spectrum) at a reasonable cost. Efficient economic integration relies on the integration of efficient infrastructure networks. Therefore, the development of those networks and of the digital single market have been also retained as part of the "Twelve levers to boost growth and strengthen confidence" in the Single Market Act.

Synergies with Energy policy – smart grids

Smart grids are considered essential to better manage energy consumption. They allow for decentralised energy production and delivery to improve conservation and energy efficiency, moving consumption from peak to off-peak hours, and maintaining a supply/demand balance in energy networks. Having households and enterprises connected to communication networks is a pre-requisite for smart grids. The proposed guidelines foresee actions to support synergies between broadband and smart energy distribution infrastructure and services deployment.

Synergies between digital and transportation networks: Intelligent Transport Systems

The deployment of ICT services and broadband networks is an essential part of the development of Intelligent Transport Systems (ITS). The ITS systems will integrate sensors and broadband networks to collect and distribute key pieces of traffic information among cars, roadside infrastructures and traffic planners. The use of broadband networks will allow providing more targeted information to individual commuters and has a particularly strong potential in the areas of reducing traffic congestion, lowering fuel consumption and helping users avoid accidents.

Synergies with environmental policies

The deployment of digital infrastructures will contribute to the development of energy efficient low-carbon economy in the areas including, but not limited to, tele-working, eCommerce, eGovernment. In addition, the above mentioned synergies with the policies in the area of transport and energy have a high potential for contributing to the reduction of

[6] COM(2011) 206 final

carbon emission. Certain minor adverse environmental effects in the construction phase of broadband networks (i.e. digging the ditches necessary to put down the cables) could be possible.

Beyond the above areas, other policy fields would be directly impacted as well, for example, the healthcare sector stands to benefit from huge savings through eHealth and telemedicine applications. In addition, the efficiency and quality of public services will be enhanced through cross-border online access to them.

1.5. Consultations and evaluations

The Commission has consulted extensively with the relevant stakeholder groups in the areas of broadband networks and digital service infrastructures. In this it became clear that the entire stakeholder community is in favour of the proposed activities. This section will only briefly discuss a few examples. A full overview of the consultations and evaluations carried out can be found in Annex 5 of this document.

As for large companies and broadband networks, in March 2011 Vice-President Kroes convened a "roundtable" of CEOs to request them to come forward with concrete proposals on how to address the broadband investment challenge. The CEOs, from a broad range of companies and stakeholders with an interest in broadband networks (including content providers, equipment makers, investors and telecoms operators from the world's leading companies such as Nokia, Alcatel Lucent, Google, Ericsson, News Corp etc[7]), submitted a paper in July 2011 summarising their common position[8]. As far as financing of broadband networks is concerned, a clear signal in support of the CEF was sent: "*The European Commission should provision public funding (incl. structural funds) to be used in risk sharing mechanisms between the EIB and the EC, for viable telecom infrastructure projects. It should also expand the RSFF's investment capacity & eligibility to broadband investments*". This signals that the telecom sector is not only receptive to the proposed instruments but also acknowledges its importance in meeting the broadband targets. It is remarkable in that the Roundtable comprised a cross section of senior decision-makers from large telecoms operators, i.e. the main private sector investors that might be crowded out by the proposed CEF funding for broadband network projects. As regards the rising demand for ultrafast internet, the CEOs were equally clear: *"Internet traffic is expected to be multiplied by 4 between 2010 and 2015".*

As for SMEs and broadband networks, a recent public consultation on Cloud Computing revealed that "*despite the great opportunities offered by web-based services, the reality is very different for small businesses. Almost two in ten small businesses cannot access even basic broadband. And even those that can access basic broadband, the service received often does not meet the needs of the business – eighteen per cent say there are services they are unable to use via their existing Current Generation Broadband. (…) Inadequate connectivity and speed is resulting in reduced productivity. An FSB (UK Federation of Small Businesses) study found that inadequate broadband speed reduces productivity by 33 per cent for small businesses.*"

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7 For a complete list of participants see: http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/11/508&type=HTML

8 http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/11/508&format=HTML&aged=0&language=EN&guiLanguage=en

As regards digital service infrastructures, most of these activities have been developed by the Commission on a smaller scale for quite some time, e.g. through CIP pilots. Accordingly, the Commission services are in close touch with the respective stakeholder communities. As an example, the Comité des Sages for digitisation recently endorsed the approach by Europeana so far, and recommended continuing the effort. [9] In a respective public consultation 75% of the participants advocated EU funding as an accelerator for digitisation processes across Europe.

1.6. Commission inter-service consultation and Impact Assessment Board process

The Impact Assessment inter-service steering group for this measure was consulted twice in July 2011 on the drafts of this Impact Assessment. The financial meeting took place on 28 July 2011 and the minutes from this meeting are included in an annex to this IA. The consulted DGs included MOVE ENER RTD, SG, ENV, CLIMA, MARE, REGIO, ECFIN, BUDG, COMP, ELARG, EMPL, ENTR, SJ, MARKT, as well as the EEAS.

The Impact Assessment Board examined a draft of this document on 31 August 2011. Its assessment was that the document could be further improved, namely with regard to the intervention logic and by providing further detail on the policy options. Subsequently, this document was updated to current form, including more information on the baseline scenario, a reworked problem identification chapter, introducing sup-options to the option "Broadband networks and digital service infrastructures in the trans-European networks of infrastructure", and re-defining the policy and objectives as well as updating the assessment of impacts.

2. PROBLEM DEFINITION

The main problems for both broadband and digital services identified are listed in the box and will be developed in the chapter below:

Summary of problems identified

Problem 1a: High-speed internet is a key infra-structure for the 21st century, but Europe falls far short of the necessary investments, leaving potential for growth and societal benefits untapped.

Problem 1b: There is little competitive pressure on incumbents to invest in modern broadband networks. Even where projects could be financially viable, alternative public and private investors (including local administrations and public utilities) are held back by high capital costs (interest rates) and the lack of long-term funding.

Problem 1c: There is currently no adequate strategy to publicly support the rollout of broadband networks in areas where there is no business case. Current levels of European support are sub-critical and are hampered a lack of planning and absorption capacity at the regional level.

[9] http://ec.europa.eu/information_society/activities/digital_libraries/doc/refgroup/annexes/results_consult.pdf

Problem 2a: The private sector will not replace public investment in the digital services central elements (platforms, generic services etc) essential to ensure trans-European connectivity, access and interoperability.

Problem 2b: Despite efforts on technical interoperability, on-line public services may stop at the border.

2.1. High-speed internet and the services it supports: potential for growth and societal benefits are untapped.

High-speed broadband is a crucial infrastructure of the 21st century. The internet, and technologies using the internet, support innovation, economic growth and improvements in daily life for both citizens and businesses. Wider deployment and more effective use of digital technologies enable Europe to address its key challenges and provide Europeans with a better quality of life through, for example, better health care, safer and more efficient transport solutions, cleaner environment, new media opportunities and easier access to public services and cultural content.

Broadband networks are generating much of the innovation that is shaping user demand in the electronic communications markets of the future. These investments will stimulate new demand for content/services, new innovation, which will in turn trigger more/new supply (virtuous cycle). Broadband networks will also be important for ICT progress which will in turn bring unique and radical solutions for the **societal challenges** ahead in areas such as health and demographic change, energy and resource efficiency, transport and congestion as well as climate change where broadband networks can offer potential for speedier green transformation, among others by facilitating deployment of smart energy networks. In addition, the availability of broadband networks will allow for more flexible ways of working. One example is self-employed who work virtually for firms that can increasingly source the best workers in cyberspace, while workers can maximise the return on their knowledge and experience. Increasingly, users will be able to generate content which will become a source of income, especially in creative industries and entertainment. At the same time, reconciling work and family life will become more feasible and will provide a new impetus for including currently excluded groups.

However, the digital infrastructure of the future is more than connecting pipes or installing antennas. In the digital world **networked services are an infrastructure on their own** (regardless of the physical networks they are channelled through). The Europe 2020 has acknowledged that: "*The single market was conceived before the arrival of Internet, before information and communication technologies became one of the main drivers of growth and before services became such a dominant part of the European economy. The emergence of new services (e.g. content and media, health, smart energy metering) shows huge potential, but Europe will only exploit this potential if it overcomes the fragmentation that currently blocks the flow of on-line content and access for consumers and companies*". Digital service infrastructures are the innovative, interoperable and cross-border services which address fields such as education and culture (eg Europeana see box below), eID management systems, eProcurement services, service infrastructure for PSI, cross-border eHealth services, security infrastructures, critical information infrastructures and safe internet service infrastructure.

Example: Europeana

Europeana is the European digital library that provides a single entry to digital content held by public cultural institutions (Libraries, museums, archives,..). The digitisation and preservation of this content is done by the public sector in the Member States with public support, sometime in partnership with the private sector. The EU effort in the CEF will enable the aggregation of this content into a unique platform providing ultimately access to all EU cultural resources. With around 40 M€ investment per year at EU level in the last 4 years, Europeana provides access today to more than 19 million cultural objects held by cultural institutions in the 27 Member States. Although it is already a world reference for digital cultural material, it presents still a small part of European cultural material held by public institutions.

The effort needs to be pursued both at national level (digitisation and preservation) and at EU level (integration and aggregation) to ensure not only the widest access and diffusion of our culture to all citizens but also its re-use by European creators to develop innovative content material and services. It is the role of the public sector, as indicated in the "Comite des Sages report" of 2010 on digitisation, to maintain and make access to publicly held cultural content. This is essential to ensure that exploitation and reuse of this content is open to all EU creators and creative industries (cultural arts, cinema and audiovisual, education, games, design and fashion,..) and not only to a limited number of private actors that would monopolise the exploitation of our cultural resources. Creative industries represent more than 3.3 % of EU GDP and consist of a large number of small size companies for which publicly owned content represent a major creation resource.

Both components of the proposed CEF interventions for telecommunications infrastructures (broadband networks roll-out and deployment of digital service infrastructures) are interconnected and mutually reinforcing. While sufficient broadband capacity is the key enabling technology not only for web growth, but also for research, innovation and digital services, its business case – and hence the incentive for the private sector to invest - is heavily dependent on its use. Conversely, both the design and take up of new broadband enabled services and solutions relies on the availability, speed, reliability and resilience of the physical networks.

However, a general problem is externalities i.e. that many benefits from services provided over high-speed internet, such as tele-medicine applications, accrue to public benefit and cannot be captured by private investors. There is also a problem of suboptimal resource allocation. Low penetration rates impede the development of value added bandwidth intensive services, and they reduce the overall impact that ICT related investments have on productivity and competitiveness of the EU economy as a whole.

2.2. Broadband networks – the need to stimulate investment in the infrastructures of the future

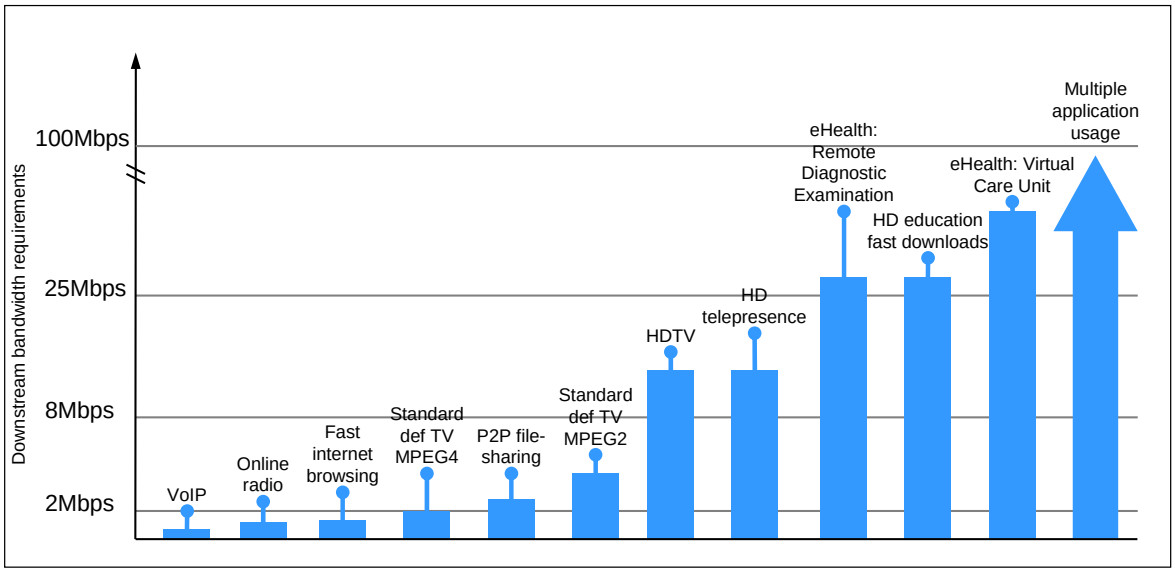
As mentioned above, broadband networks are a crucial infrastructure for Europe to get on a track for smart, sustainable and inclusive growth. However, about 7% of citizens are not at all connected to broadband internet – they live in "white spots"[10]. What is more, Europe's current internet infrastructure relies on old networks of copper cables. Only 1-2% of citizens are connected to ultra-fast internet via fibre networks (compared to 12% in Japan and 15% in

[10] Reported in "Broadband coverage in Europe", available at: http://ec.europa.eu/information_society/eeurope/i2010/benchmarking/index_en.htm

South Korea). These modern networks can guarantee connections of 100 Mbps and more and, in times of ever increasing internet traffic are widely regarded as the infrastructure of the future.

This old infrastructure limits the potential benefits from the internet, because many of the services offering social benefits or creating value-added require large bandwidth capacities. This is why the Digital Agenda for Europe aims to achieve the objectives of broadband access for all by 2013, access for all to much higher internet speeds (30 Mbps or above) by 2020, and 50% or more of European households subscribing to internet connections above 100 Mbps.

Figure 1 – Bandwidth need of a selected sample of digital technologies and services



Source: Analysis based on Broadband Stakeholder Group

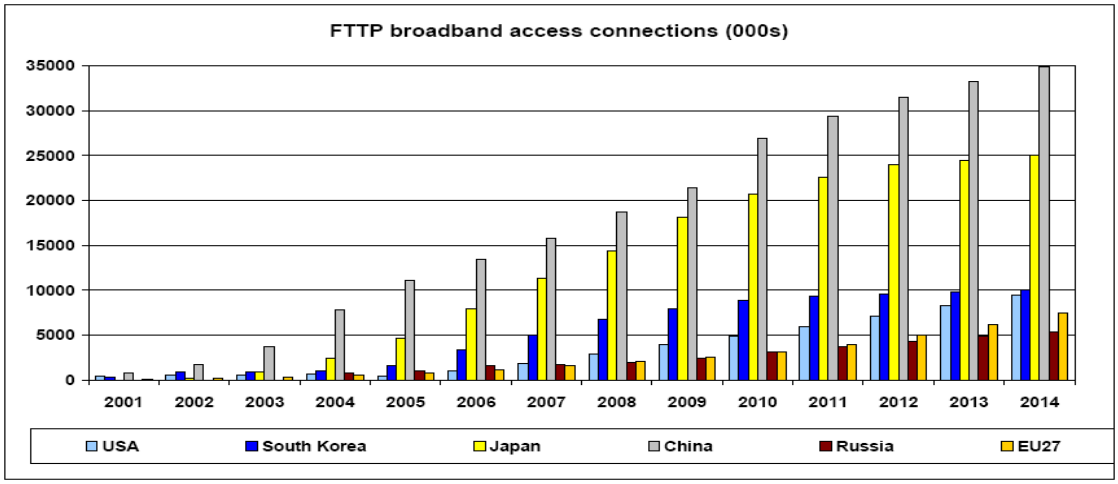
2.2.1. The investment challenge

As evidenced in the most recent DAE scoreboard, Europe is currently not on track to achieve these ambitious targets. [11]

- The EU coverage of high speed internet is well behind that of other competitors around the world
- The DAE scoreboard also indicates that the EU has today almost the lowest number of FTTH lines and estimates indicate that growth in the adoption of this technology in the EU will increase at lower speeds than in other countries.

[11] http://ec.europa.eu/information_society/digital-agenda/scoreboard/docs/scoreboard.pdf

Figure 2 – FTTP: number of broadband access connections



If Europe wants to achieve its ambitious broadband targets, substantial investment will be needed. The exact amounts needed are difficult to calculate but 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 € 181bn and € 270bn to provide sufficient coverage so that 50% of households are on 100 Mbps services.

Market analysts' estimates are that major telecommunications operators alone (and under the current investment environment) will invest not more than. €50bn by 2020 in ultra-fast fibre access networks. This would leave an investment gap of up to €220bn.

The problems with the roll-out of the broadband infrastructure touch primarily areas which do not have a high density of population, both in Cohesion and in non-cohesion Member States. The EIB has recently commissioned a study which demonstrates that most of the investment challenge is with large countries of the EU. For instance Germany, France, Italy and the UK account for approximately half of the total investment need. The EU-15 countries account for 77% of the investment challenge and new Member States for the remaining 23%.[1]

Problem 1a:	High-speed internet is a key infra-structure for the 21st century, but Europe falls far short of the necessary investments, leaving potential for growth and societal benefits untapped.

2.2.2. Market failures and the limitations of regulatory policy

The shortcoming in private investment as identified above can be attributed to a number of market failures:

- There is **little competitive pressure on incumbent network operators**, which are mainly ex-state monopolies.
- **Limitations of regulatory approaches:** Incumbent network operators have no interest to invest because regulation imposes open network access for (competitor) service providers. But open access is the essence of competition and without competition on a level playing field services are expensive and only few customers would be willing to pay for them. Since coverage is directly linked to penetration (and vice versa), the business case is weak in a vast range of areas except for those areas where not only population density is high

but also where people are educated and wealthy enough. The combination of these factors makes the business case, for certain areas, very difficult. This results in "islands of connectivity" and very large areas where the current model is not working. Existing (or planned) regulatory instruments can only partially address this issue.

The regulatory context

The EU regulatory framework aims at promoting efficient investment and innovation in new and enhanced infrastructure, taking due account of the risks incurred by all investing undertakings and the need to maintain effective competition, which is an important driver of investment over time.

In particular, under under Article 16(4) of Directive 2002/21/EC National Regulatory Authorities (NRAs) are developing regulatory responses to the challenges raised by the transition from copper to fibre-based networks, in the form of asymmetric regulatory obligations imposed to undertakings enjoying significant market. Member States may also impose obligations of reciprocal sharing of facilities on undertakings operating an electronic communications network to overcome bottlenecks in the civil engineering infrastructure and terminating segments.

In addition, the Commission has recently adopted a Recommendation on regulated access to Next Generation Access Networks with the view to provide guidance to NRAs in order to ensure regulatory consistency across the EU while providing more legal and regulatory certainty for market players.[12]

Finally, Community Guidelines for the application of State aid rules in relation to rapid deployment of broadband networks[13] designed to facilitate investments through summarising the Commission's policy in applying the State aid rules of the Treaty to measures that support the deployment of traditional broadband networks and the rapid roll-out of NGA networks.

However, the Commission acknowledges that the funding gap can only partially be addressed through existing or planned regulatory instruments.

- Where there is a business case for investment, **alternative public and private investors** (including local administrations and public utilities) **face capital constraints**, because banks perceive them as higher risks, thereby charging higher interest. Hence, even potentially viable projects are not undertaken.
- Similarly, capital constraints are linked to **long-term nature of infrastructure projects**: Alternative investors are not able to obtain long-term loans – loan maturities do not reflect the specificities of infrastructure investment.

Problem 1b: There is little competitive pressure on incumbents to invest in modern broadband networks. Even where projects could be financially viable, alternative public and

12 2010/572/EU

13 2009/C 235/04)

	private investors (including local administrations and public utilities) are held back by high capital costs (interest rates) and the lack of long-term funding.

2.2.3. Existing Member State and EU policies

Both Member States and the EU have recognised that the benefits which the internet creates for society as a whole are much greater than private incentives to invest in faster networks. Public intervention is particularly needed in areas where the business case for investment is weak. These are mainly areas with low or medium levels of population density.

Not least as a result of coordination work under the Digital Agenda for Europe, a number of Member States have adopted national broadband plans but few have fully operational plans for next generation networks with concrete implementing measures to realise their targets, notably as regards the necessary funding. It appears that Member States have no solution to the investment gap and, as mentioned above, Member States have invited the Commission to make a proposal, in cooperation with the EIB and in collaboration with the MS, to support broadband financing on the EU level.

Certain efforts exist on the EU level to support the roll-out of broadband networks, mainly under the Structural Funds and the European Agricultural Fund for Rural Development as part of the recovery plan: In the 2007-2013 financial period the Structural Funds have made a modest but important contribution to investment in broadband infrastructure: 2.3bn, of which 1.9bn in convergence regions but only 370M in competitiveness regions, although today both convergence and competitiveness regions face a similar challenge in terms of investment in high speed internet. Under the European Agricultural Fund for Rural Development, ca. €1.02bn have been earmarked for broadband investment.

Structural Funds and European Agricultural Fund for Rural Development support has so far exclusively relied on grant funding. Although available in principle, financial instruments have not been used to finance infrastructure, which has limited the potential impact of the funds. The management of Structural Funds is de-centralised, i.e. European funds are spent by national and regional authorities.

There are severe limitations to what the current Structural Funds model of supporting broadband networks can achieve: The 2010 Strategic Cohesion Report[14] highlighted great difficulties in regional capacity to plan, manage and implement broadband projects. Only 18.1% of the available funds had been absorbed by March 2010 against an overall average for all other themes of 27.2%. Substantial problems of absorption exist particular in Member States such as Romania, Bulgaria, Greece and Poland.

Other existing EU activities supporting the rollout of broadband networks are carried out under the Risk Sharing Finance Facility (RSFF) and the EIB but the current levels of funding are sub-critical.

Problem 1c	There is currently no coherent strategy to publicly support the rollout of broadband networks in areas where there is no business case. Current levels of European support are sub-critical and are hampered by a lack of planning and absorption capacity at the regional level.

[14] http://ec.europa.eu/regional_policy/policy/reporting/cs_reports_en.htm

See also annex 4 on broadband and its impacts for more information.

2.3. Digital service infrastructures: The Digital Single Market is still far from being reality

As mentioned above, digital service infrastructures are the innovative, interoperable and cross-border services which address fields such as education and culture, eID management systems, eProcurement services, service infrastructure for PSI, cross-border eHealth services, security infrastructures, critical information infrastructures and safe internet service infrastructure.

In practice, the policy challenge on the European level is mainly to ensure the interoperability and cross-border availability of online service infrastructures developed by the public sector in Member States, regions and localities. Without these infrastructures, the Digital Single Market will remain incomplete.

Example: Public Sector Information

The platform for open access to public sector information follows the same line as Europeana but addresses all publicly held information that can be made available for access and re-use. National portals providing access to information held by administrations and public organisations are being developed today in several Member States and the trend is acceleration to cover all of them. The trend is driven not only by transparency and democracy considerations but also and mainly by economic considerations given the huge potential for re-use of this content in new business opportunities. Examples are geographical information, statistics, weather data, business information, archives and publicly funded research data. Currently the potential of the re-use of public sector data in new information products and services and for efficiency gains in administrations is largely untapped. That is why the Digital Agenda for Europe singled out the re-use of public sector information as one of the key areas for action.

The EU effort will enable the creation of a single access point to data sets produced by public bodies in the Member States at national, regional or local level and by the European institutions (data.eu infrastructure). This can only be done only through EU funding in order to support the harmonisation and the interoperability of datasets at European level and to provide easy access to these sets which an essential condition for the development of EU-wide innovative applications and services. Public sector information is a public good that should available to all businesses at a marginal cost The overall economic gains from further opening up PSI by allowing easy access are estimated at around EUR 40 billion for the EU27, and aggregate economic impacts across the whole EU27 economy are estimated to be of the order of EUR 140 billion, showing clearly that there are large economic benefits from easier access to and greater use of PSI.

2.3.1. The elements of a digital service infrastructure

A digital service infrastructure is mainly composed by three elements:

a) **Core platforms** are the central element(s) or hub(s) of the digital service infrastructures essential to ensure trans-European connectivity, access and interoperability. This may encompass the continuous coordination, operation, maintenance, enhancement and promotion of digital service infrastructures. This may also encompass physical equipment, such as servers, dedicated networks and software tools. Core service platforms are open to all Member States.

b) **Generic services** provide the functionality and content of digital service infrastructures, e.g. making public sector information open to online access. They may be interconnected through a core service platform.

c) **Applications** add value to the core service platforms and/or generic services. They are developed by the private or public sector, or both in partnership, also for the purpose of commercial exploitation. .

The CEF will finance only the core platforms and the generic service levels.

2.3.2. Public interest and market failures in digital service infrastructures

As far as financing is concerned, for public services the first two layers are often relying on investments by public administrations at national and European level, while the third may concern new business models eg. take up of the public eID systems in eBusiness or eCommerce by the private sector as well as cross-border public 'services' using eID e.g. university registration. In areas where services could be entirely private (eg. smart energy distribution), initial public investments might be needed for the first two layers to encourage private actors recover *sunk costs* of early adopter and minimise the risks of engaging into innovative business models (layer 3).

The rationale for public (mainly: Member State) investment in digital service infrastructures is based on the public good created, be that in reducing energy consumption through smart grids, in making transactions more trustworthy through electronic identification, or through protecting children from harmful online content.

Example: Safer Internet

Children across the EU have adopted the Internet as a main part of their everyday life for discovering, studying, communicating or for simply playing. As the benefits of the Internet to our kids continue to grow, so are also some important risks. These include exposure to harmful content, grooming, the circulation of child abuse images and videos as well as the relatively limited availability of high quality content specifically targeting children. The infrastructure will provide support to create a better and safer internet for kids on line.

The services are of public interest where extended EU funding is likely to be needed to maintain the EU level cooperation and integration. Industry, including online content providers, may subscribe to maintaining some of the services (that support actions they have committed to under the self regulation – e.g. age verification, rating) and even contribute under corporate responsibility goals to more general awareness services but there will still be a need for EU funding on top of the services and activities funded at national level by the MS.

The basic infrastructures, i.e. funding layers 1 and 2 of digital infrastructures in areas of public services is often affected by a strong degree of *market failures* for several reasons:

- **Economies of scale and scope:** The lack of interoperable public services impedes the provision of cross-border services by private businesses. This is especially the case for markets that depend highly on ICT infrastructure such as the European energy market that needs European interoperability for the widespread deployment of smart metering systems based on broadband.
- In small countries they risk being **"sub-dimensional"** (lacking sufficient scale) and in large countries they risk engaging with fragmented solutions which are not interoperable

on a cross-border basis (and often on a cross-regions basis) and/or lack the suitable incentives to be interoperable.

- **Network effects** can be associated to the provision of European cross-border services such as eSignature or eInvoicing. The value of these services to economic operators will increase as more operators use them.

Indeed, regarding layers 1 and 2, the Union has made, for example, good experiences with the pan-European research and education network "Géant", the specific governance of which minimises the sub-dimensional risks and ensures efficient cross-border interoperability. Moreover, a cost-sharing model sees the participation of Member States (represented by the National Research and Education Networks "NRENs") and European Commission, optimising administration, operation and procurements trough "DANTE", the European Research Networking Organisation[15].

Problem 2a: The private sector will not replace public investment in the digital services central elements (platforms, generic services etc) essential to ensure trans-European connectivity, access and interoperability.

2.3.3. The cross-border policy challenge

Whereas Member States can be expected to engage in the modernisation of their public services to realise efficiency gains and savings resulting from the use of digital technologies, they have currently few incentives to invest in the interoperability and cross-border dimensions of such digital public services, even in areas in where technical viability of the interoperability has been demonstrated. The resulting fragmentation of systems and (often sub-optimal) solutions will be a major obstacle to the emergence of the digital single market, prevent the market expansion and growth of cross-border service and perpetuate transaction costs for pan-European companies.

An additional challenge for pan-European public services is caused by the multilinguality of the EU. If these services are to be adopted by the citizens and administrations of all EU countries, the users must be served in their own languages. Yet the system needs to provide for real-time exchange of information, making the language barriers disappear. Each Member state primarily has an interest to support and promote its own language(s), therefore the pan-European service infrastructure must provide the necessary incentives and facilities to make public service infrastructures multilingual.

Indeed to reap the benefits of Single Market *acquis* as regards areas such as the provisions of the Services Directive, eInvoicing, eProcurement wide implementation of such cross-border services are essential. In addition, the DAE announces that the ICT sector will lead the way on reporting its greenhouse gas emissions, set-up wide-scale pilot actions that give Europeans secure online access to their medical health data so that wherever they are, they can also give doctors access to their medical record. Effective cross-border solutions are necessary to fulfil these commitments.

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15 DANTE (Delivery of Advanced Network Technology to Europe), limited liability company and a “Not for Profit” organisation established in 1993 in Cambridge, plans, builds and operates advanced networks for research and education. It is owned by European NRENs (national research and education networks), and works in partnership with them and in cooperation with the European Commission.

In summary, the current situation results in high transaction costs for European companies, in particular SMEs in search of growth opportunities beyond their home markets, but also for increasingly mobile Europeans. More direct impact of limited inter-operability of public services affects in particular citizens living in state border areas, or working, studying or seeking medical treatment cross-border.

Problem 2b: Despite efforts on technical interoperability, on-line public services may stop at the border

See also more information in annex on the digital service infrastructures.

2.4. Baseline scenario for broadband and digital services

Based on the above discussion, the baseline scenario for broadband networks can be assumed to be the following:

- The revamped regulatory framework, including the NGA Recommendation, cannot be expected to sufficiently improve the business case for investment, in particular outside densely populated areas.
- Alternative investors will continue to face capital constraints, with high interest rates and insufficient long term loans.
- A gap in private investment of up to € 220bn will remain.
- Public support for broadband will remain sub-critical and lacking impacts. Under the new financial period (2013-2020) the Structural Funds can be expected to continue to make support available, at least for convergence regions, but the problem lacking planning and absorption capacity will remain. Another important source of funding, the recovery plan financing, ca. €1.02bn earmarked for broadband investment under the European Agricultural Fund for Rural Development as part of the recovery plan, would be discontinued.
- Using exclusively grant funding, public support will continue to leverage only limited private investment.

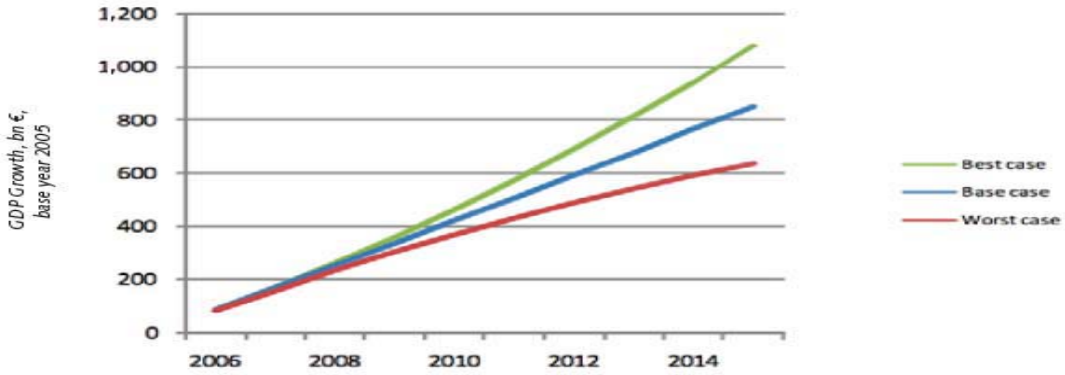
The baseline scenario for digital service infrastructures can be assumed to be the following:

- As mentioned above, many of the digital service infrastructures have been promoted by the Union for some time, e.g. as pilots under the Competitiveness and Innovation Programme. Although most of these digital service infrastructures are ready for deployment, current circumstances would not allow for this deployment to happen.
- Federating sufficient common support from the Member States at the time of austerity is unlikely and the private sector will not replace public investment in central (and generic) service elements such as platforms or interoperable protocols.
- Many public online services would continue to stop at the border. This in turn would keep citizens from benefitting from public services across borders
- The important potential for business models which rely on the availability of interoperable, European-wide digital infrastructures will remain untapped.

The physical infrastructures (broadband networks) and digital service infrastructures are closely interlinked. Should the EU not be able to reach its targets for broadband penetration, this would slow down the development of value added bandwidth intensive services, and reduce the overall impact that ICT related investments have on productivity and competitiveness of the EU economy as a whole.

A study commissioned by the European Commission (Micus 2008), identifies three scenarios concerning the cumulative growth effect of broadband deployment, as is shown in the graph below. However, it identifies the worst case scenario as the most realistic, meaning that Europe's broadband penetration levels as they are in 2010 no longer permit the economies to exploit the potential of broadband growth.

Figure 3 - Broadband-related GDP growth (EU27) 2006-2015 (cumulative), source Micus 2008



In sum, private investment in broadband would thus continue to be insufficient in many regions due to lack of competitive pressure and high commercial risk. Equally, public online services can be expected to remain under-developed and not inter-operable across borders due to fragmentation of sub-optimal efforts and technical solutions, lack of critical mass, high costs for service providers and beneficiaries of services.

2.4.1. Sensitivity analysis

Considering the high degree of uncertainty surrounding projections over a relatively long time horizon, especially for such complex systems as digital infrastructures and networks, an evaluation is provided below for the possible impact of external factors on the assumptions underlying the baseline scenario.

First, the high degree of uncertainty regarding budgetary constraints at the level of the Member States needs to be taken into consideration. The development of hard and soft infrastructure, being costly, very much depends on the coherent and efficient use of public and private resources available. Fiscal austerity and structural reforms in many EU countries will drive or have already driven public authorities to reassess their infrastructure investment programmes. For example, "*in Portugal and Spain, stopping or postponing infrastructure projects by downscaling investment expenditures is one of the most important contributions on the expenditure side. In Spain, a reduction of 0.5% of GDP is planned between 2011 and 2013. In Portugal, cumulative savings on investments will amount to 1.2% of GDP by 2013.*

In Ireland and Slovenia, infrastructure spending will be reduced, respectively, by 1.6% of GDP from 2011-14 and 0.8% of GDP in 2010-13"[16].

Moreover, access to financing by companies and infrastructure projects is particularly challenging in the countries with relatively high sovereign risk and subsequent uncertainties as regards the economic/regulatory environment (cost of capital, reduction of agreed support under existing incentive schemes, scaling down of public investment programmes, taxation, impact of sovereign rating on investor behaviour, etc). Finally, potential future liquidity shortages of financial institutions will have an impact on the availability of financing even for healthy corporations and projects.

It is uncertain to which extent these aspects will impact the implementation of infrastructure projects (in general). It is however likely that this uncertainty will be reduced by the creation of the CEF with its strengthened and more targeted financial EU contribution. In sum, although there are considerable uncertainties related to large scale EU infrastructure projects, the CEF would to a certain extent counter-balance these and consequently reduce risks perceived by investors, thus increasing their incentives to invest in infrastructure projects.

2.5. Justification for EU action: subsidiarity and EU added value

As mentioned above, the Commission will base its proposal for a Connecting Europe Facility on articles 170-172 TFEU: *"Action by the Union shall aim at promoting the interconnection and interoperability of, and access to, national networks, taking into account in particular the need to link islands, landlocked and peripheral regions with the central regions of the Union (Art 170 TFEU)."* Thus, the Union has the legal basis to act.

In terms of subsidiarity and on the basis of the Treaty mandate, the proposal for a Regulation on guidelines will not change the general division of competencies between the EU and the Member States, but will rather aim at improving the effectiveness of both the EU and Member States action in achieving the Trans-European Networks policy objectives within this division of competencies. The objectives outlined below will not be achieved by voluntary coordination among Member States alone due to the risk of duplication of efforts, setting different standards, difficulties in targeting the projects generating most externalities and the transnational characteristics of the spillovers generated by ICT.

As mentioned in the problem definition section, the economic and social benefits of network investment accrue not only to the investor but to society as a whole. Indeed, while the costs for infrastructure investment accrue locally, a considerable part of **the benefits accrue across the Single Market** or, indeed, even globally. This very characteristic argues in favour of action at a higher level than simply the Member State.

The more and the better people are connected, the larger is the market for eCommerce and online services, including innovative, high value-added business models. Broadband networks are a basis for a more efficient organisation of the European economy as a whole, increasing productivity and reducing transaction costs, both within Member States and across borders. These benefits will be reinforced through the network effects: the more users benefit from high-speed broadband, the more visible and effective are the above impacts. [17]

[16] OECD, Restoring public finances, 2011.
[17] Deloitte report "background support study to the DAE"

As regards **broadband networks** in particular, investment in modern telecommunications infrastructures needs to come, mainly, from the private sector. However, as seen above, the market is falling short of the necessary investments, and traditional policy approaches to infrastructure investment seem to be unable to deliver solutions. That is, not least, because private capital markets are organised globally, and investors perceive national markets in Europe as too small, and bottom up diversification as costly. As a solution, EU-level intervention including the joint establishment of financial instruments such as loan guarantees or equity funds supporting pan-European projects can provide tools for attracting private sector funds from both within and beyond the EU.

As regards **digital service infrastructures** in particular, there is a clear case for EU added value through coordinating and connecting Member State activities across borders, thereby ensuring interoperability and EU-wide usability. Indeed, due to non-territoriality of digital service infrastructures, and often their inherently cross-border character such as for example in case of seamless cross-border eGovernment services, relevant objectives of Europe 2020 and the DAE can only be achieved by a pan-European coordinated infrastructural approach. This is the case with the common services supporting cross-border and cross-sectoral interaction between European public administrations defined and implemented under the ISA program but where their sustainability remains nevertheless an issue. In the case non-EU action, Member States action is prone to coordination failure, setting different standards and not targeting projects which generate the most externalities. The current situation is indeed marked by "national islands" even in sectors prone to duplicability or transferability of solutions without major issues of culture or not-invented-here syndromes such as e-health applications.

3. OBJECTIVES

3.1. Overall objective

In addition to addressing the Treaty mandate as stated above, the overall objectives of the proposed initiative are those of the Europe 2020 strategy and its Digital Agenda flagship initiative: delivering sustainable economic and social benefits from a Digital Single Market based on fast and ultra fast internet and interoperable applications, with broadband access for all by 2013, access for all to much higher internet speeds (30 Mbps or above) by 2020, and 50% or more of European households subscribing to internet connections above 100 Mbps[18].

3.2. Operational objectives

In order to achieve the above, and reflecting the problems as defined in the previous chapter, the Union should aim at achieving achieve the following operational objectives:

1. **Influence the market dynamics for broadband investment**, by encouraging both traditional and new investors to engage in broadband infrastructure roll-out and ensuring a level playing field among them.

[18] By 2020, all Europeans should have access to internet of above 30 Megabits per second (Mbps) and 50% or more of European households have subscriptions above 100Mbps.

a) In areas where broadband network projects are potentially financially viable, ensure that investors, including alternative public and private investors, have access to capital, at reasonable costs (interest rates) and with a sufficiently long time-horizon.

b) In areas where there is no business case, provide sufficient levels of public financial support for the roll-out of broadband networks.

c) Across the Union, ensure that public and private investors develop the capacity to conduct broadband infrastructure projects, by providing technical assistance, e.g. for planning and mapping.

d) In supporting infrastructure projects, ensure that Union funds have a maximum mobilising (leveraging) effect on private and (other) public investment.

2. **Facilitate additional effort by Member States needed for the use of interoperable digital services** in order to permit for these essential services to function in a cross-border manner and to unlock the digital content resources generating opportunities for business development.

4. POLICY OPTIONS

4.1. Remarks on the approach

The options appraised in this section are presented in the context of ensuring the necessary consistency with the Commission proposal for the MFF.

The no policy change scenario will therefore be only briefly discussed under the next section as option 1. The present impact assessment will screen only option 2 on the inclusion of DG INFSO specific guidelines for the implementation of the broadband networks and digital service infrastructures part of the CEF. Option 2 has been divided into three sub-options that present three different scenarios for the implementation of CEF. This is the only option that is **fully consistent** with the Budget for Europe 2020[19], as discussed in the SEC(2011) 868, and in part II of the COM(2011) 50 final.

Note that option 1 includes a discussion of the 'no change' policy option. The baseline for option 2 will be the overall level of expenditure that has been already decided in the Budget for Europe 2020[20].

4.2. Option 1 – no policy change

This option corresponds to the baseline scenario developed under 2.4. In order to recall the main points, no policy change would mean the following:

For broadband:

- Mainly reliance on regulatory approaches to stimulate investment.
- Continuing capital constraints for alternative investors.

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[19] All documents are accessible at http://ec.europa.eu/budget/biblio/documents/fin_fwk1420/fin_fwk1420_en.cfm

[20] All documents are accessible at http://ec.europa.eu/budget/biblio/documents/fin_fwk1420/fin_fwk1420_en.cfm

- An investment gap of up to € 220bn.
- As regards public support, mainly reliance on the Structural Funds, with the persisting challenge of absorption capacity, and on grant funding.

For digital service infrastructures the baseline scenario would mean the continued limited support through project pilots (although most of the technological solutions have reached maturity and are ready for deployment) and policy coordination efforts, whereby Member States have no incentive to make existing solutions interoperable across borders.

4.3. Option 2 – broadband networks and digital service infrastructures in the trans-European networks of infrastructure (CEF)

The infrastructure networks concerned by option 2 consist of (i) broadband networks covering a geographically diversified portfolio of projects which contribute to the objectives set out by the DAE, and (ii) the development, deployment and sustainability of inter-operable, cross-border digital service infrastructures:

This option is the line of action included in the MFF proposal released by the European Commission on 29 June 2011, creating a "Connecting Europe Facility" to finance infrastructure. The new facility will "*finance infrastructure projects with high EU added value, not only 'hard' infrastructure, but also 'soft and smart' infrastructure and governance structures to realise the transport "Core Network", the energy "priority corridors" as well as digital infrastructure. The facility would target projects with high European value added, such as cross-border interconnections or the deployment of EU-wide systems, which must be implemented by 2020. Specific mechanisms would ensure that expenditure for each of the sectors would be ring-fenced, while preserving the necessary flexibility and performance orientation. At the same time, funding would continue for the Comprehensive Network through the Cohesion and Structural Funds (CSF), which would target projects of a national and/or regional interest. In order to maximise impact, appropriate provisions would ensure the combination of market based instruments and EU direct support, in order to encourage the participation of specialised infrastructure investors. The Commission would remain responsible for the overall planning and project selection, with the support of an executive agency, while project promoters would ensure physical implementation on the ground*".

The joint implementation of the CEF by Commission DGs INFSO, MOVE and ENER will allow for **flexibility** within the limits established by the Financial Regulations and for the implementation of synergies between different networks (joint use of civil works, synergies in case of smart grids and smart transport solutions).

For **broadband networks**, Union financial support would be provided to individual companies, special purpose vehicles and consortia involving, but not limited to, telecom companies (incumbents, alternatives), equipment suppliers, other utility companies (water, sewage, energy, transport), or construction companies which may find synergies in combined infrastructure investment and which may invest either alone or in partnership with regional and local authorities, including municipalities, who will most likely establish concessions for managing wholesale services of broadband infrastructures. Many equipment providers, but also content providers and other players in the value chain can be expected to be interested in such an arrangement.

For **digital service infrastructures**, Union financial support would be provided to industry, public administrations (national, regional, local) and non-profit entities individual companies:

- The industry at large: private operators such as ICT hardware and software companies, telecom companies (incumbents, alternatives), equipment suppliers, utility companies, Social Networking Sites, mobile and broadband operators, device manufacturers, businesses re-using and exploiting open data/public sector information. These operators may find synergies in combined or selective investments in infrastructure, core, generic and application services. In all areas, a large involvement of SMEs, in particular innovative SMEs in the ICT and creative industries sectors could be expected.

- Member States, regional and local public bodies, and EU institutions as data providers and re-users. In the particular case of Safer internet, it would also involve the Ministries of Justice, Internal Affairs, Education, alongside NGOs.

- Profit and non profit content providers and other players in the value chain can be expected to be interested in such an arrangement. For Europeana particularly, one of the major beneficiary would be the Europeana foundation (for developing and co-ordinating the central Europeana service) and national and regional content providers (cultural institutions such as museums and libraries, and private content holders).

Option 2 can be divided into three main sub-options, in relation to the way in which the guidelines could implement financing of the above mentioned digital infrastructures and services. The three sub-options can be enunciated as follows.

4.3.1. Sub-option 2.1: Financing through grants

This sub-option entails that financial support for both broadband networks and digital service infrastructures would uniquely take place through grants. The operational implementation would mainly be outsourced to an existing executive agency, such as the TEN EA. This agency would be in charge of launching calls for proposals aimed at selecting potential beneficiaries. Overseeing activities would be carried out by the Commission, liaising with the relevant executive agency.

Criteria for project selection would be:

- contribution to the Europe 2020 objectives of fostering smart, sustainable and inclusive growth, in particular by achieving the policy goals of the Digital Agenda for Europe, notably by creating a vibrant digital single market through more effective use of digital technologies;

- being based on mature technology ready for deployment,

- demonstrating clear European added value.

Additional, more specific selection criteria would be established in an annual and/or multi-annual work programme, as developed by the Commission with the assistance of a Member States Committee.

As far as **indicative co-funding rates** for grants targeting works; operation and maintenance are concerned, they would not exceed the following rates (*disclaimer: these figures are given as indications and may change over the course of negotiations*):

- actions in the field of broadband networks up to 50%;
- Core service platforms: up to100 % of the eligible cost;
- actions in the field of generic services up to 75 % of the eligible costs.

Grant funding would also allow for the Union to finance support actions and studies, including infrastructure mapping and technical assistance, in order to help the absorption capacity on the ground. Such support actions should be funded at a relatively high rate, such as 75% of the eligible costs.

For broadband networks, grant financing would target project proposals by one or several public or private undertakings/bodies or international organisations having received agreement from national authorities.

4.3.2. Sub-option 2.2: Financing through financial instruments

Under this sub-option financial support to infrastructure projects would be given uniquely via financial instruments. The Commission would work closely with relevant International Financial Institutions (IFIs), e.g. the European Investment Bank. IFIs would select projects based on their financial viability and applying established practices of due diligence. This option would thus put in place a due diligence mechanism that would be tasked with assessing the viability of investment projects taking into consideration a number of variables including population density, and other socio-economic factors such as average income level, education, age and ICT training. The combination of these factors and the situation on the ground in terms of broadband market will determine the most suitable set of investment models and the different contributions from private and public finances that will be required with a view to use, where possible, a variety of financial engineering tools.

The following financial instruments could be used:

- capital participations for investment funds or comparable financial undertakings with a priority focus on providing risk capital for infrastructures;
- a financial contribution to the provisioning and capital allocation for loans and/or guarantees or other risk-sharing instruments issued by an IFI on its own resources or by other financial intermediaries including with a public mission. Such risk-sharing schemes include but are not limited to project bonds,
- other specialised financial instruments, be they of loan, guarantees, counter guarantees, risk capital and any other legal forms of instruments.

The guidelines should allow the Commission to fully reap the benefits from the market potential of main financial institutions. This sub-option is therefore entirely market driven.

4.3.3. Sub-option 2.3: Combined financing approach

The approach proposed under sub-option three would combine the two approaches presented above. Accordingly, the governance structure would combine elements of both sub-options presented above. The decision concerning the appropriate blending of grants and financial instruments would be included in the annual work programmes, in line with the policy and sector necessity. Broadband networks might require a different financing mix than digital service infrastructure. Furthermore, broadband network deployment in regions where projects are potentially financially viable would rather be supported via innovative financial instruments whereas in regions where the business case is weak, e.g. in rural regions, support would rather take the form of grant financing.

The three sub-options are reviewed for the financing of broadband and digital service infrastructure in the impact section.

4.3.4. Option 2 – synergies with Structural Funds

However, the governance model proposed in the previous section for broadband networks deployment leaves room for synergies with the structural funds. For instance, local authorities could be part of the consortia financed by financial instruments and still benefit from Structural Funds at a co-funding rate foreseen by the structural funds regulations. In addition, the Cohesion policy could continue targeted investment in cohesion countries and rural regions in the form of grants.

4.3.5. Guiding principles

In the EU there is infrastructure based competition with telecom incumbents, new entrants and cable companies providing broadband access. Regulatory authorities can impose access remedies, price regulation and functional separation on dominant operators. This means that also service providers can compete based on these regulated access services at the wholesale level. Access prices and conditions take due account of investment risks and promote co-investment and risk-sharing mechanisms.

The CEF will of course be applied in full respect with principles of competition policies, in particular state aid rules. Indeed, an important argument in favour of an EU action in this field is preventing market partitioning and creation or maintenance of entry barriers.

The guiding principles for the functioning of the Fund will be correcting market and coordination failures, intervening only where an incentive effect is demonstrated and only to the extent necessary to trigger market participation. The Fund will indeed function as a subsidiary instrument only where and to the extent to which the market does not offer satisfactory outcomes (in terms of availability of funding or volume thereof). To prevent the risk of crowding out private financing of infrastructure, and thus delivering sub-optimal results in the longer term, these principles represent a crucial safeguard.

5. ANALYSIS OF IMPACTS

This chapter presents in a succinct fashion the analysis of the main impacts that can be envisaged from options 1 and 2. As far as the latter is concerned the impact assessment will firstly concern the general impacts stemming from the adoption of option 2 and then will

analyse the impacts associated with each of the three sub-options presented in chapter 4 above.

5.1. Impacts from the adoption of option 1: no policy change

This section presents the main impacts that are likely to be generated by the continuation of the current policy framework.

The option is not likely to **influence the market dynamics** for broadband investments. The main problem of fragmentation would remain untouched. Option 1 would entail not to invest in broadband networks at all, with the exception of the Structural Funds. No financial instruments would be foreseen even if they would better ensure the mobilisation of private and public capital in areas where broadband networks are potentially financially viable, but their cost of capital is too high or the payback time too long. A number of evaluation studies and reports provide useful insights on the strengths and weaknesses of current EU funding for infrastructure. In the area of ICT funding, the mid-term evaluation of the RSFF, completed in 2010[21], stressed the positive impact of the facility in expanding private financing and considered it as a highly efficient and effective instrument. Less positive is the evaluation of the performance of Structural funds in supporting ICT measures. The 2010 Strategic Report on Cohesion policy[22] highlighted a low absorption rate and pointed to a lack of administrative capacity for project preparation and implementation, compliance with state aid rules and inadequate assessment of possible future needs as problematic aspects. Thus there is very little indication that this option would, on its own, be effective.

Overcoming these problems would require the deployment of different rates of both private and public investment depending on the presence of these obstacles on the ground.

Under option 1, the **market failure** in the broadband market would not be addressed, or only very partially and in an uncoordinated manner e.g. through structural funds. There would be lower penetration rates which would produce a number of effects such as lengthen the investment payback time in infrastructures, slow down the development of value added bandwidth intensive services, and reduce the overall impact that ICT related investments have on productivity and competitiveness of the EU economy as a whole.

Numerous EU regions have **no broadband or high-speed broadband coverage**. According to the 2009 IDATE survey some 7% of the EU territory had no broadband coverage at the end of 2008. The situation has since probably not improved significantly due to substantial general decrease of investment activity in 2009 and 2010. Green-field investment justifies the roll-out of high-speed broadband networks to these white areas, as the roll-out cost difference compared to basic broadband networks capital expenditure is rather negligible.

Current network capacities cannot meet the demand for new content. Bandwidth demand from current applications alone, such as high-definition video, is projected to quickly saturate current broadband networks capacity if no substantial upgrades are implemented. Broadband demand is not limited to high-definition video delivery; as we have noted, many new innovative content, applications and services (e.g. for creative and cultural industries, high-

[21] Available at http://ec.europa.eu/research/evaluations/index_en.cfm?pg=rsff

[22] COM(2010)110 of 31.03.2010. Available at http://ec.europa.eu/regional_policy/policy/reporting/cs_reports_en.htm

definition tele-presence, cloud computing, telemedicine and remote surgery, e-learning and virtual campuses) would need expanded bandwidth to operate efficiently.

Under this option, **private investment in broadband would continue to be insufficient** in many regions due to lack of competitive pressure and high commercial risk. Equally, public online services can be expected to remain under-developed and not inter-operable across borders due to fragmentation of sub-optimal efforts and technical solutions, lack of critical mass, high costs for service providers and beneficiaries of services.

Hence, this option would not contribute to attaining the Digital Single Market, and many Europeans would continue to miss out on digital opportunities.

In terms of **facilitating additional effort by Member States for the deployment and use of interoperable cross-border digital services**, option 1 would entail the continuation of the current CIP ICT PSP programme. The programme would therefore be unable to build on the experience gathered during the pilot phase of a number of initiatives and would not be able to deploy the pilots. This would hinder the implementation of services in the core layer of digital service infrastructure and therefore would prevent reaching the critical mass needed for the take up of applications built on the core layer (digital services layers are described in the problem definition section).

Moreover, the potential offered by content-based services would be put in jeopardy if the EU fails to improve radically the level of trust and security of the relevant infrastructures, products and services. Today even very limited disturbances to the Internet and web services generate shock-waves through the society as a whole. Only a collective effort at EU level can help us improve the safety of content on the web.

Finally, when considering both policy options but notably option 1, the **cost of non-Europe has to be considered as well**. An estimate by Copenhagen Economics[23] situates the cost of non-completing the European digital single market, in the region of 4.1% of GDP by 2020. But also on an individual level, the cost of not facilitating investments in digital services and broadband can be important. As an example from only one country, the UK offline households are missing out on savings of above 600 € (£560) per year only from shopping and paying bills online.

5.2. Impacts from the adoption of option 2: broadband and digital service infrastructures in the trans-European networks of infrastructure (CEF)

5.2.1. General impacts stemming from option 2

The broadband and digital service infrastructures in the trans-European networks of infrastructure (CEF) will assist in achieving the DAE targets on broadband coverage, utilization and speed. This will in turn assist Europe in coming out of the economic/financial crisis better equipped and in better structural shape, when compared to entering the crisis. Europe has been structurally trailing behind the US, in particular in the context of knowledge economy. The number of digital jobs that can benefit from the availability of broadband networks within Europe's largest companies for instance is much smaller compared to the US and more than four fifths of Europe's digital jobs are in companies founded before 1950. The availability of broadband, and in particular high-speed infrastructure, can help Europe reduce

[23] The Economic Impact of a European Digital Single Market, 2010

the digital gap. In addition, as this is considered as a vehicle for development of innovative digital services, with focus on increasing the added value of products and services, it would indirectly improve the competitiveness of companies in the European economy.

Broadband networks would also have an impact on **improving the efficiency of public services**. The public sector holds enormous amounts of knowledge that needs to be more easily accessible. The use of E-government procedures has demonstrated an ability to generate savings for European companies through the reduction of administrative burdens. Other examples include, E-solutions, such as standardised and shared registration systems and data bases, e-portals to provide access to public services, digitalisation of financial management and tax administration, which all offer significant scope for efficiency savings.

This is why the impacts from the deployment of broadband networks cannot be disentangled from the impacts of endowing the EU with pan-European digital service infrastructures. The impacts analysed below thus also pertain to the digital services infrastructures.

The following sections will present some of the main economic, social and environmental impacts that could descend from the implementation of the CEF. A comprehensive list of impacts, divided by thematic area is included in annex.

5.2.1.1. Economic impacts

The preliminary results of a quantitative analysis being conducted by the OECD suggest that the expansion of **broadband positively affects labour productivity**. For OECD countries, raising broadband penetration rates by 1 percentage point in 2009 (e.g. 24.3% instead of 23.3%) results in a labour productivity growth rate that is higher by 0.02 percentage point. Broadband penetration rates higher by 5 percentage points translate into a rise in the labour productivity growth rate of 0.07 percentage points. A ten per cent higher broadband penetration in any year is correlated with a 1.5 per cent increase in labour productivity over the following five years[24] i.e. the effects of broadband penetration on productivity are more than proportional.

According to estimates of a leading consultancy[25] a 10% increase in broadband household penetration delivers a **boost to a country's GDP** that ranges from 0.1 percent to 1.4 percent. In addition, an OECD study[26] suggest that governments can achieve a ten year return on fully funding a national, point to point, open access FTTH network.

Digital service infrastructure can also generate large economic impacts.A 2010 KPMG study estimated that the cadastre's online access and **digital certifications** provision was saving Spanish tax-payers at least 157 million euro a year (against cadastral budget of 118 million for the same year). Another cost-benefit-analysis conducted by RSO and Cap Gemini for showed the Cadastre's electronic office was saving the tax payer about 7,758 million euro.[27]

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24 Roman Friedrich, Karim Sabbagh, Bahjat El-Darwiche, and Milind Singh (2009): Digital Highways. The Role of Government in 21st Century Infrastructure. Booz & Company.

25 Mobile Broadband for the Masses, McKinsey & Company, 2009

26 OECD (2010), OECD Information Technology Outlook 2010, OECD Publishing. Available at http://dx.doi.org/10.1787/it_outlook-2010-en Accessed 17th May 2011

27 Pricing of Public Sector Information Study, Deloitte, July 2011, forthcoming

In the sub-area of **environmental impact assessment** study states that this market was worth EUR 1 billion per year in 2009, with improved access to information saving up to EUR 200 million per year; including sub-national assessments could increase values by a factor of 10.[28]

In the geospatial sector, benefits could be increased by some 10-40%, depending on the estimation method, by improving access and data standards. Better policies in the area of **geospatial applications in local government** could help the productivity gains from applications almost double over the next 5 years. Large markets are also estimated in financial, energy and construction sectors.[29]

Better access and re-use of Public Sector Information through the creation of a European digital hub may have a relevant economic impact. In the United Kingdom welfare gains to the whole economy of easier access were estimated to be worth at the upper end EUR 5.1-6.7 billion per year, with middle range estimates of EUR 1.8-2.25 billion. Although the UK PSI access and licensing system remains somewhat different from other EU27 countries, UK estimates of the positive impacts of removing barriers to access are likely to be a realistic proxy across the EU27, due to the general nature of disincentives to use, lack of information, poor interoperability etc. that have stifled easy use of PSI. At a different level there are quantifiable benefits in time saved in work and leisure activities from making information flows simpler and more efficient.[30]

5.2.1.2. Positive externalities

Positive externalities are benefits that do not accrue to only a single economic actor, but spill over to society as a whole – thus making the social returns to capital investment higher than initial outlays[31]. The following main categories of positive externalities of common European action in broadband networks and digital service infrastructures deployment would emerge both at regional / MS level where the project is located and at the EU level. Note that synergies from digital service infrastructures are embedded in these categories and are referred to below:

a. The Innovation Diffusion Externality. New and more innovative services emerge that would benefit a growing number of users, thus ultimately improving the overall quality of life. From the infrastructure side, broadband coverage and penetration rates correlate positively with the "e-Readiness", or the capacity of consumers, businesses and governments to reap the full benefits of the Information Society.[32] As an example on the importance of infrastructure, the Irish Management Institute (IMI), together with the National Irish Bank, noted in a survey from 2008 that the strategic importance of broadband availability moved up twelve positions in the ranking from 18th to 6th place in only three years.

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28 Pricing of Public Sector Information Study, Deloitte, July 2011, forthcoming

29 Op.cit. Graham Vickery, July 2011

30 Pricing of Public Sector Information Study, Deloitte, July 2011, forthcoming

31 Deloitte report "background support study to the DAE"

32 A positive correlation is evident with the "2009 e-Readiness Rankings" compiled by The Economist's Intelligence Unit (EIU)

b. The Economic Efficiency Externality. Transaction costs are reduced; which makes it easier to conduct online business and attract foreign investments to certain locations[33], the effect of this can spill over to other geographical areas. Broadband development is already supporting a wide and increasing number of dedicated business, government and leisure applications and services. Bringing broadband to new areas means expanding the market for e-Commerce (which is a European one): more consumers would be able to purchase on-line, including across border, thus enlarging the market base, and to access public services on-line.

c. The Comparative Advantage Externality. As a General Purpose Technology enabler, broadband diffusion positively affects productivity (a ten per cent higher broadband penetration in any year is correlated with a 1.5 per cent increase in labour productivity over the following five years[34]), capital accumulation, and ultimately, GDP growth. This mechanism of transmission is not limited only to the region where broadband is deployed.

d. Network Externality. The more users that benefit from high-speed broadband, the more visible and effective are the above impacts. The benefits of broadband extend across many different social groups in many different ways, reinforcing each other. Technological progress e.g. in remote care, which directly lowers health care costs, postpones or eliminates the need for institutionalised care, and makes it possible to increase workforce participation from home. As an example, the Scottish West Lothian council independent living programme has succeeded in ensuring that elderly couples with severe impairments can stay in their own homes. They have thus saved the public budget £84,000 on an annual basis.

5.2.1.3. Social impacts

The European Commission estimates that broadband can contribute to net creation of over 100,000 jobs per year, which can as a structural phenomenon in turn affect the jobs of more than 1 million people each year[35]. In terms of **direct job creation**, only in Germany, the construction of broadband networks construction would create almost a million jobs (968,000) over the ten years up to 2020. In France, according to PMP[36], the construction of FTTH network would generate some 365.000 man-year employments, which translates into some €20 billion of added value. If extrapolated to an EU-scale, this could amount to some 2.770.000 man-year employments and €152 billion of added value to the EU economy.

In terms of **indirect job creation**, a study on broadband impacts in France conducted by CdDC[37], reveals that the number of newly established companies in regions that enjoyed public support in broadband investment, grew by 52.5% more in sectors largely depended on ICT and by 8.1% more in non-ICT sectors, between 2002 and 2007, compared to the growth in regions not enjoying such support. As shown by the same study, broadband, which in this

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33 In October 2008, the IMI, together with the National Irish Bank, published the results of its tenth survey of multinational companies located in Ireland. Compared to three years ago, the strategic importance of broadband availability moved up twelve positions in the ranking from 18th to 6th.

34 Roman Friedrich, Karim Sabbagh, Bahjat El-Darwiche, and Milind Singh (2009): Digital Highways. The Role of Government in 21st Century Infrastructure. Booz & Company.

35 The Impact of Broadband on Growth and Productivity, Micus, for the EC, 2008

36 Rapport d'étude de l'impact d'une accélération du déploiement du FTTH en France, PMP, for CdDC, 2010

37 Caisse des Dépôts et Consignations, Évaluation de l'impact territorial des RIP, 2010

particular case benefited from public investment, had a strong entrepreneurial effect, as it accelerated the take-up of entrepreneurship by 54% compared to regions without such a comprehensive broadband coverage.

Further social (and environmental) impacts can affect depopulated rural areas through the development of tele-working, eCommerce or smart metering. In rural areas the value added from people going online to profit from e.g. **eGovernment**, education and culture, eInclusion and eHealth services is even higher than in urban areas. This also argues for a high EU added value in creating synergies between broadband networks and digital service infrastructures. Indeed, savings derived from the possibility of using broadband for information sharing among public services (eAdministration) are up to four times higher than savings at the interfaces between public administration and users.

In the area of **trans-European access to cultural resources** a digital service infrastructure providing an easy-to-use, single access to European cultural content online would provide the necessary critical mass and turn Europe's cultural resources into a lasting asset for the digital economy. Coupled with a dedicated rights infrastructure, it would serve as a hub for the creative industries, nurture creativity, contribute to education, and spur innovation and entrepreneurship. This potential was underlined by the recent report 'The New Renaissance' by the 'Comité des Sages on bringing Europe's cultural heritage online'. It is also shown by the recent 'hack for Europe' contest, developing applications based on Europeana content.

The initiative would have indirect positive impact on the **Fundamental Rights**. It would indirectly contribute to the achievement of certain rights in the area of Solidarity, namely the right to health care through the activities in the area of eHealth (Article 35) and the right to environmental protection (Article 37) through overall positive environmental impact of the initiative.

5.2.1.4. Environmental impacts

Broadband-enabled smart grid services and devices could result in over €850 billion in gross energy savings. This approach is expected to reduce end-use energy consumption in the USA in 2020 by roughly 23 per cent of projected demand, potentially abating 1.1 gigaton of greenhouse gases annually (Davidson, Santorelli and Kamber, 2009).

A Smart Grid combined with broadband networks can contribute to sustainability by facilitating the reduction of CO2 emissions, enabling the integration of large scale renewables and increasing energy efficiency in the power sector. It supports competitiveness and open and efficient markets by increasing market participation through the aggregation of distributed prosumers (consumers also able to produce power) and through the strengthening of interregional markets.[38]

Creating “smart buildings” tied to the local power grid would enable utility companies to reduce the level of (wasted) reserve power held, leading to “lower prices and less price volatility”[39] The United States are already reaping the benefits of this. In California 33 per cent of all electricity consumed in the State is by commercial buildings – about US$10 billion per year (€7.09 billion in July 2008). The goal of the High-Performance Commercial

[38] http://ses.jrc.ec.europa.eu/index.php?option=com_content&view=article&id=93&Itemid=137
[39] (US Department of Energy, 2002; quoted in Baller Herbst Law Group, 2008)

Buildings Project (HPCBS), launched in 2000, is to cut energy use by 70 per cent in new buildings and save 50 per cent in retrofits of older buildings using broadband connections combined with other technologies. (The Baller Herbst Law Group, 2008).

5.2.1.5. Sector specific impacts of digital service infrastructure

The effects of investing in broadband networks and digital service infrastructures are not only confined to the macro-economic level but also to economic and social (thematic) areas and sectors. The box below provides, in a nutshell the main impacts that broadband networks and digital service infrastructures will spill over related sectors. These are developed in detail in annex[40]. Where no data about Europe were available, data and insights from US studies are used. These should be interpreted with caution due to existing US-EU differences, e.g. in transport/commuting patterns.

Box: sectoral impacts from broadband networks and digital service infrastructures investments (US and EU)

Rural areas

Broadband is a key location factor for businesses

Broadband and services make it easier for rural businesses to grow and improves quality of life.

Broadband prevents de-population of rural areas.

Education and Skills

4.5 per cent increase in educational attainment;

Education is enhanced by providing students and teachers with access to a vast array of resources;

Several educational services already require internet speeds in excess of 100Mpbs .

Health and care

The net total benefit from telemonitoring is in the order of €27.89 billion, this equates to 0.299 per cent of EU GDP for an average implementation cost of €1.11 billion per year

Reductions in hospitalisations due to tele-health were greater in remote areas (with a 50 per cent decrease in bed-days) compared to urban areas (29 per cent reduction in bed-days)

Employment and economy

[40] Note that whilst the categories provide a comprehensive overview of potential benefits (implicitly including eHealth, eLearning, smart grids and enhanced transport systems within environmental benefits and online gaming within wellbeing benefits) it does not capture explicitly cross-cutting initiatives (such as eGovernment, eCommerce, ePayment and SEPA) or technologies such as cloud computing and Web2.0 which will enhance the volume of uploaded user created content.

There is about a 15 per cent productivity boost from broadband.

FTTP can boost the US economy by at least €312 billion, this equates to 2.9 per cent of GDP

Environment, energy and transport

Broadband-enabled smart grid services and devices could result in over €850 billion in gross energy savings. This approach is expected to reduce end-use energy consumption in the USA in 2020 by roughly 23 per cent of projected demand, potentially abating 1.1 gigaton of greenhouse gases annually.

One (temporary) negative environmental aspect would be construction works in urban areas and in natural areas (Natura 2000 sites).

5.2.2. Assessment of sub-options against the programme's objectives: effectiveness and efficiency

5.2.2.1. Sub-option 1: Financing through grants

Sub-option 1 is based on the provision of grants for achieving the objectives of the Connecting Europe facility on the area of telecommunications. With regard to the objective of **influencing the market dynamics** for broadband, grants are likely to be only partially efficient and effective. In terms of efficiency the co-financing ratio needed by broadband networks is going to be high in relative (around 50%) and absolute terms, given the expected average size of the projects to be financed. Hence, a significant amount of resources would have to be mobilised to reach a modest impact on the estimated 220-270 billion Euros needed to reach the DAE targets. This would not trigger any leverage effect and would *de facto* overlap with the action of the Structural Funds. The amount of money provided by the CEF would not be sufficient in this case to generate a critical mass and demand would remain latent. Only some "islands of connectivity" would be endowed with broadband.

In areas where there is no business case, grants can be effective but given the amount proposed in the MAFF proposal, grants alone are not likely to reach a critical investment mass in the EU. Without critical mass, network effects and positive externalities engendered by them would not be perceivable. Grants can be effective in supporting and providing technical assistance, but are not the best tool to mobilise private investment (while may have some leverage effect on public investor, although in the current economic downturn this is not to be taken for granted).

However, grants are an effective mechanism to **facilitate efforts by Member States to deploy cross-border digital services**. In this case grants would serve as a pivot investment that grants EU co-financing towards infrastructure that Member states alone would not develop. Co-funding rates, as mentioned in chapter 4, for digital service infrastructure are typically high, up to 100% for the core service platforms that i.a. support cross-border and interoperable services since there are no "natural" Member State owners of these platforms. For the higher level generic services where the private sector can be assumed to be more present a co-funding rate of 75% will apply. Grants are thus an efficient financing mechanism for this set of projects as private investors have only a limited interest in the deployment of this type of infrastructure.

Nevertheless, this grant only sub-option is likely to achieve only partially the overall objective of delivering sustainable economic and social benefits from a Digital Single Market based on fast and ultra fast internet and interoperable applications

5.2.2.2. Sub-option 2: Financing through financial instruments

Sub-option 2 envisages the commitment of budgetary appropriation exclusively through financial instruments. The set of financial instruments foreseen has been described in chapter 4 above. The objective of **influencing the market dynamics for broadband investment** would be mostly achieved by financial instruments. Clearly the proposed resources in the CEF (9.2 Bn. €) are not sufficient to fill the gaps between the overall investment needs and the actual spending plans (based on our current understanding of the situation). In areas where broadband networks projects are potentially financially viable, financial instruments would act as an enabler of investment by public and private investors, lowering de facto their Weighted Average Cost of Capital (WACC) and shortening their payback time.

Using financial instruments would also foster efficiency through the higher leverage they can ensure. Leverage effects take place via co-investment and co-financing structures through financial instruments, where one € of EU budget invested in a field affected by a market failure has a strong multiplying effect on the total finance provided to final beneficiaries. In principle, leverage is not about simply co-investing with other investors, but rather attracting investment from other investors who would not invested without EU support. Based on RSFF and project bonds estimations, a financial contribution of €1bn from the EU budget is likely to attract other funds from public or private sectors which could underpin gross investment of €6bn - €15bn in broadband networks depending on the financing needs and the risk profiles of the underlying investments.

Although financing broadband networks only through financial instruments would boost the leverage generated by the EU contribution, it may not be ideal from the equity point of view. Without any grants, projects in sub-urban areas, which are inherently more bankable would always be preferred –other things being equal- to projects in rural areas.

Hence, using financial instruments alone would be less effective in areas where the business case is limited. In these so-called "white areas" private investors are not likely to invest due to low rate of return and high fixed costs generated by low population density. If the business case is so weak, co-investment and co-financing through financial instruments (which have typically a much lower co-financing rate than grants) becomes irrelevant. Also, financial instruments would probably struggle in mobilising a significant leverage effect technical assistance, planning, mapping and other support activities which are typically co-financed by grants.

Finally, financial instruments are unlikely to be an effective mechanism to **facilitate efforts by Member States to deploy cross-border digital services**. The experience from the CIP has shown than in this field is already difficult to have the Member States engaged in the process. Private investors are expect to invest in the application layer, but they are not likely to commit to invest in the core layer of digital service infrastructure, as this architecture cannot be commercially exploited.

This financial instrument only sub-option is therefore likely to achieve only partially the overall objective of delivering sustainable economic and social benefits from a Digital Single Market based on fast and ultra fast internet and interoperable applications.

5.2.2.3. Sub-option 3: Combined financing approach

Sub-option 3 provides for a combined financial approach that would help reaching the objectives presented in chapter 3, striking a good balance between grants and financial instruments. Although no formal earmarking for grants and financial instruments is advisable at this stage, potentially this sub-option implies that the main effort of investment relies on financial instruments, leaving the remainder for grants. In this scenario, grants and financial instruments would combine not only vertically (both funding schemes would be available for broadband networks and digital service infrastructures) but also horizontally, within a project. The right mix of funding schemes will be identified at work programme level. The governance for grants will be in line with the new financial Regulation as above, the governance for financial instruments will be in line with the conditions to be decided for risk-sharing and equity platforms for innovative financial instruments (forthcoming proposal of the Commission).

The potential of **influencing the market dynamics for broadband investment** would be fully achieved under this sub-option. In the field of broadband the bulk of funding would be allocated through financial instruments, so that the market potential is exploited to the full and that the wider range of actors as possible is involved in the consortia to be funded. The solution would be effective as public and private actors would get access to capital at lower cost and would have sufficient long-time horizon for their investment. No crowing out would therefore take place.

This sub-option takes into account that in a considerable number of cases there would be a mixture of support as projects are likely to involve areas which are closely to be economically viable with areas that are less attractive to the market. Hence a combination of instruments and funds would be required. In convergence regions, the grant would be provided by SF and CEF would provide financial engineering. In competitiveness regions, CEF could provide both type of assistance with a combination of financial instruments and grants depending on geographic and socio-economic situation. Should SF provide grants also for competitiveness regions, then CEF would proportionally limit its support (up to and not above the limit of EU support for those regions).

In this respect, under this sub-option there is clear synergy between the CEF and the **Structural Funds** both in terms of grants, financial engineering and support for streamlining project implementation that has so far prevented absorption of EU funds both in the cohesion and rural development domains.

Efficiency would prevail in areas where financial viability exists or almost existing, as a small EU investment would be leveraged as described in sub-option 2 above. Moreover, this sub-option would complement financial instruments with grants in areas where the business case is not strong enough. This would guarantee – through specific calls for "white areas" -that investment takes place also in rural and less populated areas. Finally other calls for proposals would be organised for support and technical assistance activities, mainly through grants.

As far as the objective of **facilitating efforts by Member States to deploy cross-border digital services is concerned,** this approach would allow the Commission to be flexible towards financial instruments, without the risk of crowding out private investors from digital service infrastructure. On the other hand it would ensure the disbursal of grants at high funding rates for the top layers (core services).

This sub-option which combines the focus of grants and the leverage effect of financial instruments is therefore likely to fully achieve the overall objective of delivering sustainable economic and social benefits from a Digital Single Market based on fast and ultra fast internet and interoperable applications.

6. COMPARISON OF OPTIONS

The following efficiency and effectiveness table provides a graphic comparison of the two options and the three sub-options presented in section 4 against the objectives described in section 3. The table summarises the line of reasoning and the impacts presented in section 5.

Objectives	Option 1 no policy change	Option 2 CEF		
		Sub-option 1 grants	Sub-option 2 financial instruments	Sub-option 3 combined approach
Overall objective				
Delivering sustainable economic and social benefits from a Digital Single Market based on fast and ultra fast internet and interoperable applications, with broadband access for all by 2013, access for all to much higher internet speeds (30 Mbps or above) by 2020, and 50% or more of European households subscribing to internet connections above 100 Mbps.	**0**	+	+	++
Specific objective 1: Influence the market dynamics for broadband investment, by encouraging both traditional and new investors to engage in broadband infrastructure roll-out and ensuring a level playing field among them.				
1a In areas where broadband network projects are potentially financially viable, ensure that investors, including alternative public and private investors, have access to capital, at reasonable costs (interest rates) and with a sufficiently long time-horizon.	**0** **(N/A)**	+	++	++
1b In areas where the business case is weak, provide sufficient levels of public financial support for the roll-out of broadband networks	**0**	++	+	++
1c Across the Union, ensure that public and private investors develop the capacity to conduct broadband infrastructure projects, by providing technical assistance, e.g. for planning and mapping	**0**	+	0	+
1d In supporting infrastructure projects, ensure that Union funds have a maximum mobilising (leveraging) effect on private and (other) public investment.	**0**	-	++	++
Specific Objective 2: facilitate additional effort by Member States needed for the use of interoperable cross-border digital services and unlock the digital content resources generating opportunities for business development.				
Facilitate additional effort by Member States needed for the use of interoperable cross-border digital services and unlock the digital content resources generating opportunities for business development.	**0**	**++**	**-**	**++**

Conclusion: option 2 with sub-option 3 (combined financing) is more suitable to meeting the DAE and the Europe 2020 targets in the field of ICT than option 1.

7. MONITORING AND EVALUATION

The Commission and other implementing bodies, such as EIB, EBRD and the TEN-T EA, will continuously monitor the impact of CEF investment in broadband (as well as in transport and in energy) in line with the indicators proposed in the CEF general Regulation. The indicators will cover areas such as (non-exhaustive list):

- Supply: Broadband access (to be checked against the DAE targets of access to 30 Mbs for all citizens by 2020 and access to 100 Mbs for at least 50% of citizens by 2020)
- Demand: Broadband uptake (to be checked against the DAE target of 50% of citizens having subscriptions for 100 Mbs by 2020)
- General monitoring indicators for investment programmes such as uptake of funds, time to grant etc
- proportion of grants vs. Innovative financial instruments

Starting from the entry into force of the Regulation and after consultation of the relevant Committee(s), the Commission will regularly publish a progress report on CEF broadband networks and digital service infrastructures investment, which will be submitted the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions.

The guidelines as such will not be evaluated but the scope of these will be assessed in the framework of the final assessment of the Digital Agenda for Europe. The guidelines will also be regularly monitored and updated as the need arises, this will supervised through the work in the relevant committees.

In addition to continuous monitoring by the Commission and other implementing bodies, an independent evaluation of general CEF framework shall be carried out at mid-term, taking into consideration the timing and advancement of programming as well as ex-post, a certain number of years after the end of the programming period. The evaluations will assess the intervention's relevance, efficiency, effectiveness, and preliminary impact. Specific emphasis shall be put on issues of governance and the appropriateness of implementation mechanisms.

ANNEX 1 – GLOSSARY

CCTV	Close Circuit TV
CEF	Connecting Europe Facility
CERT	Computer Emergency Response Teams
CIP	Competitiveness and Innovation Programme
CSF	Cohesion and Structural Funds
DAE	Digital Agenda for Europe
EBRD	European Bank for Reconstruction and Development
ECTA	European Telecoms Association
EISAS	European Information Sharing and Alert System
EIB	European Investment Bank
ENISA	European Network and Information Security Agency
epSOS	Smart Open Services for European Patients
ESOA	European satellite operators' association
EUTC	European Utilities Telecom Council
FP6	Framework Programme 6
FP7	Framework Programme 7
FTTH	Fibre To The Home
FTTP	Fibre To The Premises
FTTS	Fibre To The Subscriber

ICT	Information and Communication Technology
ICT PSP	Information and Communication Technology Policy Support Programme
IMI	Irish Management Institute
MEPSIR	Measuring European Public Sector. Information Resources
META-NET	Multilingual Europe Technology Alliance
MFF	Multi-Annual Financial Framework
NGA	Next Generation Access
OECD	Organization for Economic Cooperation and Development
PSI	Public Sector Information
R&D&I	Research, Development and Innovation
PEPPOL	Pan-European Public Procurement On-line
RSFF	Risk Sharing Finance Facility
SCADA	Supervisory Control and Data Acquisition
SEPA	Single European Payments Area
SPOCS	Simple Procedures Online for Cross-border Services
SSRN	Social Science Research Network
STORK	Secure idenTity acrOss boRders linKed
TEN-T	Trans-European Transport

EA	Network Executive Agency
TFEU	Treaty for the Functioning of the European Union
VOD	Video on Demand

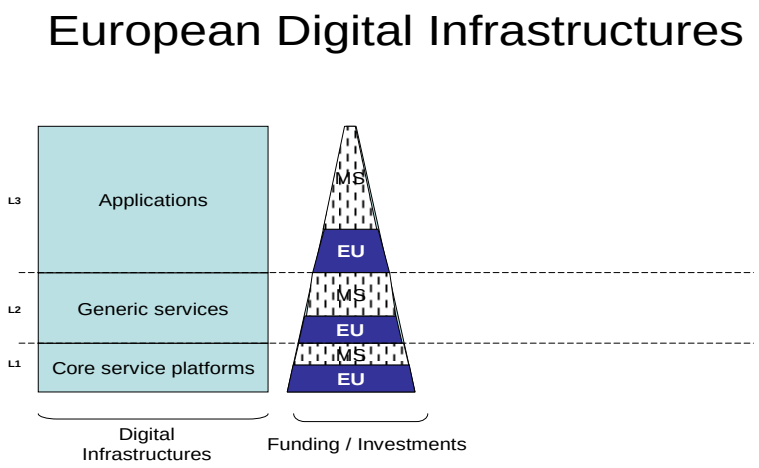
ANNEX 2 – WHAT IS A DIGITAL SERVICE INFRASTRUCTURE

In the area of public services the first two layers are often relying on investments by public administrations at national and European level, while the third concerns new business models spanning from those (eg. uptake of eID systems in eBusiness or eCommerce by the private sector). The layers are the following:

1) the **core service platforms** (networks, interoperable relays, communication protocols, specifications that permit to carry our transactions and servers);

2) the **generic services** layer (to enable functionality and carry forward instructions which may be specific to the application domain (e.g. health, public procurement, etc.);

3) the **applications** (mainly developed, depending on the application domain, by the private or public sector, or both in partnership, using core service and value added service infrastructures)



In areas where services could be entirely private (eg. smart grids), initial public investments might be needed for the first two layers to encourage private actors recover *sunk costs* of early adopter and minimise the risks of engaging into innovative business models (layer 3).

Funding layers 1 and 2 of digital infrastructures in areas of public services is often affected by a strong degree of *market failures.* The incapability of markets to fund those layers is due to two reasons:

The areas to be funded relate to public service delivery (hence not commercial by definition as a start);

In small countries they risk being "sub-dimensional" (lacking sufficient scale);

In large countries they risk engaging with fragmented solutions which are not interoperable on a cross-border basis (and often on a national basis) and/or lack the suitable incentives to be so.

Investments in layer 3 also reflect initial market failures as the "development costs" are perceived as *sunk* by business entities engaging in the delivery of those services, return on investments are uncertain or pay-back times too long increasing the financial exposure of business willing to provide innovative value-added networked services.

What kind of digital services

The digital service infrastructures, as decided in the MFF, and their areas of application are the following:

(a) Trans-European high-speed backbone connections for public administrations

Support to a public trans-European backbone service infrastructure that will provide very high speed and highly reliable connectivity between public institutions in areas such as public administration, culture, education and health.

(b) Cross-border delivery of eGovernment services

Support to standardised, cross-border, and user-friendly interaction platforms, which will generate efficiency gains both throughout the economy and in the public sector and will contribute to the Single Market.

(c) Cross-border eHealth services

Support to actions making the use of modern information and communication technologies in the field of health and in related fields to meet needs of citizens, patients, healthcare professionals, healthcare providers and policy makers.

(d) Multilingual access to online services

Support to enabling any business in the EU to offer online services in its own language that will be seamlessly accessible and usable in any EU language

(e) Enabling access to digital resources of European heritage

Support to digitalization of large collections of European cultural resources and fostering their re-use by third parties.

(f) Access to public sector information- data.eu

Support to achieving full access for re-use to all disclosable information held by the public sector in the EU by 2020.

(g) Safer Internet service infrastructure

Support to centres handling requests and alerts across Europe with the aim to dramatically reduce the time to take down illegal content from the internet.

(h) Smart Energy Services

Support to the use of modern information and communication technologies in the field of smart energy services to meet the needs of citizens (who can be producers as well as consumers of energy), energy providers and public authorities.

What kind of investment is needed and what role for the EU

The deployment of European digital service infrastructures will require important investments, the major part of which is to be done by the Member States. However, EU investments are needed to:

Ensure cross-border and cross-sectoral availability, access and use of services;

Provide the essential core and generic layers for services to be run on a cross-border basis in support of the digital internal market;

Provide the initial funding of innovative networked services with a European dimension and impact;

Enable businesses to capitalise on the size of an EU-wide internal digital market.

There is therefore an opportunity within the next MFF to provide support to deployment of these digital service infrastructures in areas of public interest.

The EU support would co-finance the development, implementation, maintenance, operation and evolution of core digital service infrastructures and their generic service layers.

- It will ensure that conditions for interoperability and standardisation are met.
- It would bring piloted and tested solutions to a state of operational maturity.
- It would identify and resolve interoperability bottlenecks and language barriers with a cross-border dimension (e.g. the deployment of cross-border health records exchanges platforms; e-identification and e-authentication, eProcurement platforms, etc).
- It would seek guarantees that the connecting links (physical and service interface) of cross-border services are established and that Member States administration would invest in them.
- It would establish common frameworks endeavouring to ensure interoperability and would bring already piloted and tested solutions to a state of operational maturity.
- In the end, it would ensure that key digital infrastructures for cross border public services are deployed for real-life use.

Lack of EU support to the implementation of digital service infrastructures means that common technical specifications, pilot and test versions of these infrastructures already built up by past and current programmes would probably cease to exist. It would also be more difficult to achieve pan-European interoperability and multilinguality without incentives, and there is a risk that Member States would seek individual solutions, falling back to a fragmented approach. Any European cross border service solutions in support of the digital internal market would need EU support, in addition to national financial investments.

ANNEX 3 - THEMATIC AREAS AND FAST START PRIORITY DIGITAL SERVICE INFRASTRUCTURES

The digital service infrastructures, as decided in the MFF, and their areas of application are the following:

(a) Trans-European high-speed backbone connections for public administrations

Support to a public trans-European backbone service infrastructure that will provide very high speed and highly reliable connectivity between public institutions in areas such as public administration, culture, education and health.

(a) Cross-border delivery of eGovernment services

Support to standardised, cross-border, and user-friendly interaction platforms, which will generate efficiency gains both throughout the economy and in the public sector and will contribute to the Single Market.

(b) Cross-border eHealth services

Support to actions making the use of modern information and communication technologies in the field of health and in related fields to meet needs of citizens, patients, healthcare professionals, healthcare providers and policy makers.

(c) Multilingual access to online services

Support to enabling any business in the EU to offer online services in its own language that will be seamlessly accessible and usable in any EU language

(d) Enabling access to digital resources of European heritage

Support to digitalization of large collections of European cultural resources and fostering their re-use by third parties, in full respect of copyright and related rights.

(e) Access to public sector information- data.eu

Support to achieving full access for re-use to all disclosable information held by the public sector in the EU by 2020.

(f) Safer Internet service infrastructure

Support to centres handling requests and alerts across Europe with the aim to dramatically reduce the time to take down illegal content from the internet.

(g) Smart Energy Services

Support to the use of modern information and communication technologies in the field of smart energy services to meet the needs of citizens (who can be

producers as well as consumers of energy), energy providers and public authorities.

All of these services will not be established without a dedicated large scale funding as Member States do not immediately find the incentives to invest in interoperable solutions for pan-European service integration. Investments in cross-border interoperability will also have a positive knock-on effect at local level as Member States will replicate the model in deployment service interoperability with regions and municipalities.

The list is not exhaustive and will be expanded to include further projects. These projects will be identified at a later stage in collaboration with the Member States.

Public trans-European backbone ("Mid mile") very high speed network

Trans-European Digital infrastructure should be developed to guarantee a digital continuum between citizens and the public services of European value thought unlimited, integrated, controlled and secure European backbone.

This service will be based on a very high speed network covering all Member States (and potentially beyond in neighbouring countries) connecting public institutions in areas such as public administrations, culture, education or health. The network will interconnect institutions either through the regional/national networks or directly. In particular it will provide the connectivity services for the higher-level European services previously listed. More generally, it will provide the backbone on which clouds for trans-European public services can be built.

This service will draw on the experiences made with the existent STesta network

In this way demand will be aggregated, therefore reducing costs and reaching critical mass in service provisioning much more quickly.

Interoperable online authentication schemes and eID management systems

The large-scale CIP Information and Communication Technology Policy Support Programme (ICT PSP) pilot *STORK*[41] aims at making the cross-border use of electronic identification possible, allowing citizens and businesses to use the eID technology of their home country to access eGovernment services in any Member State they live in or travel to.

STORK has a decentralized architecture based on technology nodes - PEPS (Pan European Proxy Service) - in the participating countries. The PEPS communicate among themselves using the Internet as communication carrier. The aim is to make it easier for citizens and businesses to use their eID for online transactions in the public and private sector.

Implementation of cross-border STORK solutions would be built on the STORK technical platform and implement the common specifications. Implementing cross border STORK solutions would mean a large step forwards towards 'Digital Living' for EU citizens and a key building block and enabler for other cross-border services. It also allows for service delivery tailored to the specific needs of a person as it allows for secure transmission of personal information (e.g. age above 18 years) under the control of the online user.

41 http://www.eid-stork.eu

Interoperable cross border eProcurement services

The large-scale CIP ICT PSP pilot *PEPPOL*[42] aims to make it easier for companies to bid for public sector contracts anywhere in the EU in a simpler and more efficient way;

Implementing cross border PEPPOL solutions would mean implementing the various technical building blocks, such as eSignatures, virtual company dossier (VCD), eCatalogues, eOrdering, eInvoicing and architecture development. The aim is to make electronic communication between enterprises and government bodies possible throughout the EU for all procurement processes.

Implementing the cross-border PEPPOL solution will enable EU-wide interoperable public eProcurement. PEPPOL implementation will allow any company in the EU to respond to European public tenders from any Member State covering as well pre-award and post-award electronic procurement activities.

Interoperable cross-border electronic procedures for setting up a business in another European country (in the context of the Services Directive)

The large-scale CIP ICT PSP pilot Simple Procedures Online for Cross-border Services *(SPOCS)*[43] aims to provide seamless cross-border electronic procedures for setting up a business in another European country in the context of the Services Directive, making the 'Points of Single Contact' easier to use across borders.

Implementation of SPOCS will remove the administrative barriers that European businesses face when offering their services abroad. It will contribute to the competitiveness of European businesses and particularly SMEs by enabling all businesses to benefit from available, efficient and interoperable electronic procedures.

Implementing cross-border SPOCS solutions would mean building on existing efforts of other large scale pilots (i.e. STORK solutions for eID and PEPPOL solutions for signature authentication), but also, via additional technical solutions, enhancing the cross-border use of eDocuments, eDelivery and content syndication.

SPOCS contributes to the development of high performing next generation Points of Single Contact through the availability of seamless electronic procedures. The aim is to make it easier for service providers willing to offer professional services outside their home country to deal with all necessary administrative procedures electronically through the Points of Single Contact.

Cross border eHealth services

The large-scale CIP ICT PSP pilot *epSOS* aims at making it easier for people to receive medical assistance anywhere in the EU by removing linguistic, administrative and technical barriers;

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42 www.peppol.eu.

43 http://www.eu-spocs.eu/

Implementing Smart Open Services for European Patients (epSOS) solutions on a pan-European scale would mean building on existing efforts and would strengthen the political momentum. Eleven additional countries have joined epSOS Consortium in its second phase; the eHealth Governance Initiative of state secretaries which provides political support has been launched; Member States are committed to follow up on the Council Conclusions on eHealth; in addition the Directive on patient rights for cross border care has been recently adopted, and a specific article (14) calls for MS cooperation in eHealth in the areas covered by epSOS.

Scaling up epSOS services to a pan-European infrastructure would also aim to: i) support and achieve eHealth interoperability, ii) support cross-border deployment of telemedicine services, iii) contribute to implement mechanism article 14 of the Directive on patient's rights for cross border healthcare on eHealth by adopting common sets of rule for health records semantics and procedures; iv) ensuring seamless connection between e-Identification platforms and services (as from STORK) and epSOS services.

Data.eu – Service infrastructure for PSI

The central objective of the DAE is to chart a course to maximise the social and economic potential of ICT, including through enhanced access to digital content to spur innovation and economic growth.

Public data is an increasingly important source of input for markets of online content. Open data re-use spurs growth of innovative commercial and non-commercial services and products. All studies show relatively rapid growth in PSI-related markets, no matter whether they are more or less open. Growth rates are estimated variously in the range of 6-11%. Estimates of the gains from the removal of current barriers to access and improving the underlying infrastructure are more scattered but they too are positive. Recently, an in-depth survey across the EU27 presented a picture of generally dynamic growth in the geographical information, meteorological information and legal information sectors through 2008. Although care needs to be taken with these estimates as they come from a wide range of sources using different methodologies, overall economic gains from further opening up PSI by allowing easy access at marginal cost can bring gains of around EUR 40 billion for the EU27, and aggregate economic impacts across the whole EU27 economy are estimated to be of the order of EUR 140 billion, showing clearly that there are large economic benefits from easier access to and greater use of PSI.

The legal framework obliging public bodies to open up data resources has been put in place and will be improved. What is needed for the cross-border potential to be realized is a solid infrastructure consisting of data platforms within Member States and a single European aggregate access point.

The full potential of open data is dependent on a concerted effort to establish standardised, interoperable solutions for data publication and access. To this day, national infrastructures are only starting to develop and a full EU support is required to ensure their coherence and to provide a pan-European aggregating infrastructure.

By providing exactly the type of solution enabling data discoverability and interoperability for re-use and creation of commercial and non-commercial added-value services and products across Europe, the data.eu initiative will address a key issue for innovation and growth.

Europeana, the European digital library, archive and museum

The DAE aims to promote wider access to knowledge, cultural diversity and creative content as well as to promote the digitisation and dissemination of cultural works in Europe. In line with the DAE, the aim of the Commission initiative is to make knowledge resources from Europe's cultural institutions easily accessible to all for work, study and leisure, and to turn these resources into a lasting asset for the digital economy. The report of the 'Comité des Sages' further underlines the potential of this area for innovation and job creation.

Given the nature of the cultural content as Europe's common good, the preservation and dissemination of which requires a common approach, the scope of the initiative cannot be limited to a national or regional level. Intervention at EU-level will protect Europe's culture as an invaluable asset, ensure that this inheritance can remain a living asset over time and that it can be passed on and shared as widely as possible without distinction or barrier. Activities on an EU-wide scale will ensure higher visibility of national cultural treasures and national institutions while creating a common ground for the developments which go beyond the national borders.

Further expected spin-off effects are the reduction of differences in the rights status of digitised materials, adoption of best practices in digitisation and preservation of digitised content, unification of markets in the content sector, encouragement of innovation and private business involvement by raising the commercial interest of aggregated content.

The digitisation of their assets will help Europe’s cultural institutions to continue carrying out their mission of giving access to and preserving our heritage in the digital environment. It will also give an important input to the creative industries, which account for 3,3% of EU GDP and 3% of employment.[44] These industries are faced with a digital transition that is shaking up traditional models, transforming value chains and calling for new business models. Digitising and providing wider access to cultural resources, in full respect of copyright and related rights, is an essential condition for the further development of Europe’s cultural and creative capacities and of its industrial presence in this field.

Safer Internet service infrastructure

Internet provides children with new opportunities; however, it also raises a number of risks to children and allows an array of ways to distribute online child abuse material.

To increase the trust of citizens, including parents and children, as part of pillar 3 of the DAE "Trust and security", the development of broadband-for-all must be accompanied by a coordinated and consistent set of instruments to keep children safe online and remove illegal content, in particular child abuse images.

Building on the results of the Safer Internet programme and in particular on the existing cooperation infrastructure, the initiative will scale up activities of European services to keep children safe online around three objectives:

- Provide access to high quality content online for all children, by supporting interoperability between information systems of white lists.

[44] EU Competitiveness report 2010

- Empower and protect children through interoperable information systems and web services to report abuse to the appropriate agency, online service supporting the verification of minimum age in online environments, and associated exchange of expertise.
- Fight against child abuse material, with eservices that enable hotlines (web based reporting points) to share more efficiently across Europe reports of child abuse images on the internet, and service oriented infrastructure to make available and interoperable technical tools are available to law enforcement agencies.

Infrastructure for multilingual access to services

One of the obstacles holding back the creation of a pan-European digital service infrastructure is the inability of current solutions to address Europe's wide diversity of languages. In order roll out over the entire EU, the digital service infrastructure must address citizens and administrations in the national and local languages. It should enable information exchange and full functionality across language barriers. This will mainly need to be achieved by means of automation (e.g. machine translation, automatic text analysis, summarization or classification) because the instant and urgent processing needs of online systems cannot otherwise be served. Automation in all EU languages requires a comprehensive base of language resources and tools. To date, such a base does not exist, except for a few languages and for a few use domains.

The impacts and benefits of a truly multilingual service infrastructure are obvious. Firstly, addressing the language barriers will help European industry, especially SMEs, outgrow their national markets. Secondly, the deployment of language tools and the structural reinforcement of the underlying language infrastructures will increase the choice and offer of attractive and valuable content and services in all languages which can significantly contribute to making every European truly digital. Thirdly, tackling language barriers is a critical success factor for cross-border public services and cross-border access to PSI as well as creative and cultural content.. Failure to provide multilingual digital services would leave the digital single market and digital public services divided and fragmented. Implementing these services in English only would entirely exclude about half of EU's citizens, in some member states a much larger majority. An effective multilingual service infrastructure, on the other hand, will ensure a full coverage of EU's territory and, in addition, open new global markets, especially in areas where European languages are spoken (e.g. USA, Canada, Latin America).

The infrastructure for multilingual access to services will facilitate and ensure the wide deployment of language technologies and automated tools for cross-border access to content and services by building and maintaining the necessary linguistic infrastructures. This is particularly important for countries whose languages are currently poorly covered by language technology tools because of a lack of market incentives or by a lack of public funding

Critical Information Infrastructures, including aspects of interdependencies

This would include support to:

- Establishment and operation of a network of well functioning National/Governmental Computer Emergency Response Teams (CERTs), by supporting adoption of baseline requirements, CERTs drills etc[45];
- The development of a European Information Sharing and Alert System (EISAS) targeting in particular citizens and SMEs, to be built as a network of national level capabilities covering all of Europe;
- Pan-European and International cyber incident management exercises (with focus on contingency, mitigation, mutual assistance and recovery strategies and measures) with a view also to enhance the security and resilience of underpinning communication networks;
- The development of innovative services and tools (like CERTs for Supervisory Control and Data Acquisition (SCADA) or smart-grids) to manage cross-domain security interdependencies.

The importance of protecting Critical Information Infrastructures (CIIs[46]), by granting their security and resilience, has been acknowledged by the Commission in the CIIP action plan[47] of 2009 and, in continuity with this, by the DAE[48], which announced measures focusing on, among others, preparedness, prevention and response. In this respect, the role of national capabilities in preventing, detecting and responding to cyber attacks and cyber disruptions, is to be leveraged and developed by means of a European integrated approach, which would benefit from the efforts of all actors involved (the Commission, the Member States and/or industry), with the support of the European Network and Information Security Agency (ENISA).

Smart grids deployment.

Investments in large-scale projects for demand/supply balancing using smart grid solutions for high and medium voltage electricity grids in large cross-border regions with significant variable electricity generation. The deployment of "Smart Energy' networks to increase the efficiency, flexibility, safety, reliability and quality of the European electricity and gas systems and networks to facilitate the transition to a more sustainable energy system. These address the transformation of current electricity grids into resilient and interactive service networks, controlling the real time flows and removing the obstacles to the large-scale deployment and effective integration of renewable energy sources and distributed generation. The objective for gas networks is to demonstrate more intelligent and efficient processes and systems for gas transport and distribution, including the effective integration of renewable energy sources and the use of biogas in the existing networks.

Horizontal priorities as mentioned in the MFF

45 Often also referred to as Computer Security Incident Response Teams (CSIRTs)

46 A definition of CIIs was proposed in COM(2005) 576 final

47 COM (2009) 149 final of 30 March 2009 on Critical Information Infrastructure Protection "Protecting Europe from large scale cyber-attacks and disruptions: enhancing preparedness, security and resilience.

48 COM (2010) 245 final/2 of 26 August 2010, A Digital Agenda for Europe

Innovative Management & Services. Technical assistance measures including project and investment planning and feasibility studies, in support of investment measures and financial instruments. For example, mapping of pan-European broadband networks will develop an on-going detailed physical surveying and documentation of relevant sites, analysis of rights of way, assessments of potential for upgrading existing facilities, etc.

ANNEX 4 – BROADBAND AND ITS IMPACTS: AN OVERVIEW

Introduction

The present annex was developed as part of an ongoing study by Deloitte and Tech4i2 on behalf of the European Commission (SMART 2011/0024). The annex is divided into six sections. The next section provides an overview of the key impacts of high speed broadband that can be found in the annex. The second section provides a brief overview of key sources of literature reviewed. The third section provides an overview of the impact of high speed broadband structured into ten benefits categories. The fourth section examines the current and potential future need for broadband connectivity in excess of 30Mbps. The final section provides an overview of the econometric literature that has investigated (using input output analysis or regression analysis) the impact of broadband and high speed broadband investment.

Key Impacts

More than 270 studies have been reviewed in creating this broadband impact report. Studies primarily suggest four major areas of benefit from the deployment of high speed broadband:

Education and Skills

- 4.5 per cent increase in educational attainment;
- Education is enhanced by providing students and teachers with access to a vast array of resources;
- Several educational services already require internet speeds in excess of 100Mpbs.

Health and care

- The net total benefit from telemonitoring is in the order of €27.89 billion, this equates to 0.299 per cent of EU GDP for an average implementation cost of €1.11 billion per year;
- Reductions in hospitalisations due to tele-health were greater in remote areas (with a 50 per cent decrease in bed-days) compared to urban areas (29 per cent reduction in bed-days).

Employment and economy

- There is about a 15 per cent productivity boost from broadband;
- FTTP can boost the US economy by at least €312 billion, this equates to 2.9 per cent of GDP.

Energy and transport

- Broadband-enabled smart grid services and devices could result in over €850 billion in gross energy savings. This approach is expected to reduce end-use

energy consumption in the USA in 2020 by roughly 23 per cent of projected demand, potentially abating 1.1 gigatons of greenhouse gases annually.

Macro-economic meta-analysis

Meta-analysis of several studies estimated that high speed broadband deployment investment of €270 billion will create about 3.99 million jobs in EU27 Member States.

Meta-analysis of several European studies estimated that the average level of GDP growth arising from broadband investment is 7.03 per cent, this would equate to an increase in EU27 GDP of €862.47 billion.

Meta-analysis of several US studies estimated that the average level of GDP growth across the US studies is 3.47 per cent, this would equate to an increase in EU27 GDP of €425.71 billion arising from high speed broadband investment.

An OECD study[49] suggest that governments can achieve a ten year return on fully funding a national, point to point, open access FTTH network.

High speed broadband and its applications

Viewed separately, very few of the areas or applications examined in this report require bandwidth above 30Mbps. However, utilisation of a small number of applications by households and businesses will already exceed this bandwidth requirement.

It is probable that developers of bandwidth hungry applications have been restrained in developing applications since high speed bandwidths have not been deployed sufficiently to enable mass-market utilisation of their innovations. The recent introduction of video conferencing style facilities for Facebook and Google+, requiring up to 8Mbps, and the development of bandwidth hungry high-definition telepresence applications (requiring over 24 Mbps) are perhaps examples of the way that developers are starting to utilise the growing bandwidth provided to an increasing number of users.

It is likely that bandwidth hungry applications will develop more rapidly in the future as the growing numbers of potential (high bandwidth enabled) users starts to provide developers with a growing market and thus enhanced economic case for development.

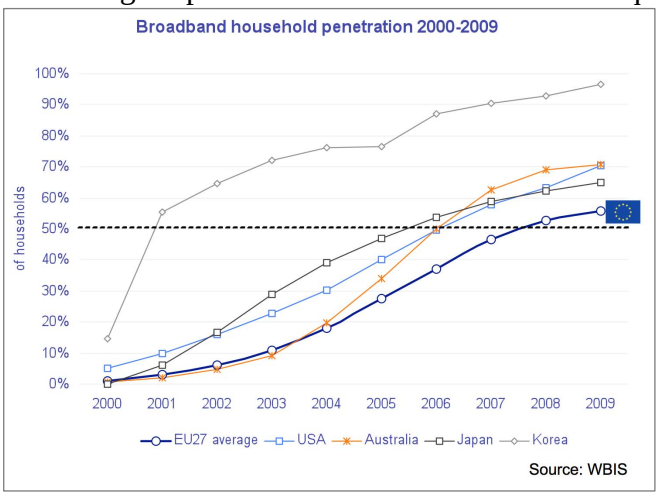
Literature overview

More than 200 academic papers and reports have been reviewed in preparing this annex. In addition 54 hard copy documents and 15 digital documents provided by the Commission have also been reviewed. It is important to note that the literature on the impact of high speed broadband is relatively poorly developed.

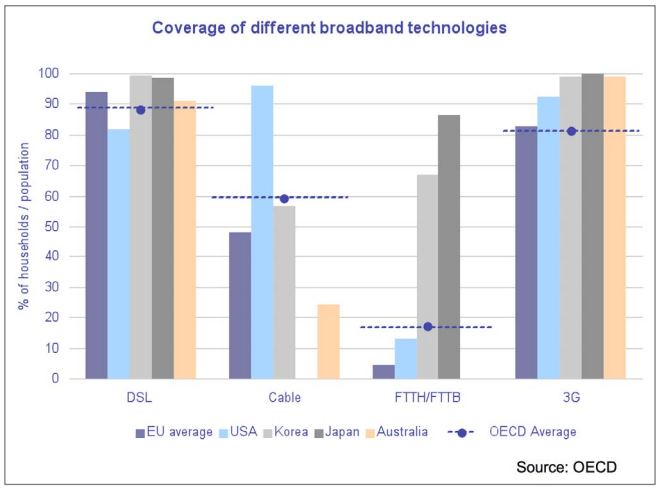
Only 22 (11 per cent) of the papers reviewed investigate high speed broadband. High speed broadband deployment is relatively recent and impact studies are sparse. **Studies largely examine the impact of internet connectivity and applications and services that are provided**

[49] OECD (2010), OECD Information Technology Outlook 2010, OECD Publishing. Available at http://dx.doi.org/10.1787/it_outlook-2010-en Accessed 17th May 2011

using broadband; rather than examining the connectivity requirements in Mbps and other technical details. The focus is on the services that are provided (and their impact) not on the underlying broadband networks. Econometric studies are amongst the small number of studies that focus on the nature of the infrastructure. To address this deficiency in each of the ten sections examining impacts details about bandwidth requirements and the significance of different bandwidths have been provided.



It is important to note that achievement of high speed deployment goals will also lead to the deployment of broadband in many areas where broadband is not currently available or is currently of very low quality. For example the 2010 iDATE report[50] notes that fixed broadband has a 24.8 per cent penetration rate (24.8 subscribers per 100 inhabitants – 125.8 million fixed broadband subscribers in EU27 States). This level of (inhabitant) adoption is similar to the 55.8 per cent household broadband adoption found by a recent EIB study[51] .



The EIB study highlighted that average DSL coverage in Europe (EU-27 + 2) was 94.4 per cent. This European average figure masks the fact that DSL coverage in rural areas was only 80 per cent. In addition, Europe has relatively low levels of deployment of infrastructure capable of meting the higher 2020 bandwidth targets (i.e. 50% or more of EU households subscribe to Internet access above 100 Mbps by 2020). Investment to achieve DAE targets will bring basic broadband to many households that are not currently covered by broadband (Target 1 Basic Broadband for all by 2013), particularly in rural areas.

Broadband benefits overview

This section provides an overview of benefits arising from high speed broadband in ten categories[52].

It is important to point out that whilst the ten categories provide a comprehensive overview of potential benefits (implicitly including eHealth, eLearning, smart grids and enhanced transport

50 IDATE. 2010. Broadband coverage in Europe; 2010 Survey. DG INFSO 80106 B

51 Koutroumpis, P. 2010. An assessment on the total investment requirement to reach the Digital Agenda broadband targets: Study prepared for the EIB PJ/INCO/ICT Division

52 The categorisation was developed by Tech4i2 in collaboration with the UK Digital Inclusion Team (http://www.esd.org.uk/esdtoolkit/Documents.ashx?doc=ESD03338g&agency=573) to capture the benefits arising from broadband deployment and digital inclusion.

systems within environmental benefits and online gaming within wellbeing benefits) it **does not capture explicitly cross-cutting initiatives** (such as eGovernment, eCommerce, ePayment and Single European Payments Area (SEPA)) **or technologies such as cloud computing and Web2.0 which will enhance the volume of uploaded user created content**. These, together with a consideration of CIP ICT PSP pilots, are therefore included in relevant sections throughout the ten categories.

Community and cohesion: Broadband benefits

Dickes et al (2009) in a report about rural communities in the USA state "overall, it appears that access and diffusion of high quality, high speed broadband networks is a critical economic and community development tool for all communities in the twenty-first century". They go on to point out that when considering rural areas as communities the role of broadband in supporting and enhancing economic development can be seen as essential "without access to high-speed, high-bandwidth internet service, rural communities already suffering from the economic effects of industrial restructuring and the current economic crisis may continue to find their communities increasingly less competitive".

Headline community broadband benefits can be described as:

Improved access in rural areas

- Broadband benefits rural areas in two key ways. First, broadband telecommunications has become a key location factor for businesses, almost as important as sewer, water, telephone, and electricity service. Second, broadband doesn't just make it easier for rural businesses to grow, it improves the quality of life in rural communities, making it easier for smaller locales to attract and retain residents (Hedlund, 2007).
- The tenth survey of multinational companies located in Ireland found that, compared to three years earlier, the strategic importance of broadband availability had moved up 12 places in the ranking, from 18th to 6th (behind wage inflation, price inflation, skills and availability of workforce) (IMI, 2008)

Improved communication benefiting communities

- The Digital Impact Group (2010) report that 80 per cent of broadband users reported using the Internet to get local or community news. At the local level, a total of 78 per cent of broadband users surveyed cited "keeping up with the news in my community" as very important or somewhat important.
- A JRC Study on Smart Grid projects in Europe (2011) points out that Smart Grid projects and investments are not uniformly distributed across Europe.[53] Most of them are located in EU15 countries, while EU12 Member States still lag behind. The uneven distribution of projects and the different pace, at which Smart Grids are being deployed across Europe, could make trade and cooperation across national borders more difficult and jeopardize the timely achievement of the EU energy policy goals.

Development of social networks

[53] http://ses.jrc.ec.europa.eu/index.php?option=com_content&view=article&id=93&Itemid=137

- The recent emergence of online social networking, with groups such as Facebook and Twitter, provides users with a forum to connect with friends, colleagues, and family (Crandall and Singer, 2010).
- The Baller Herbst Law Group (2008) report a study by Datamonitor, "social networks" revenues are expected to grow nearly four fold from €387 million in 2008 to €1.52 billion in 2012.

Several high speed broadband initiatives (such as Nuenen in the Netherlands) have used their enhanced bandwidth to support community TV initiatives. Communities that are not part of these initiatives have also developed community TV projects independently. Bandwidth requirements for TV vary depending upon compression techniques used. Users of the BBC iPlayer and Skyplayer applications recommend at least 2Mbps connections to view programmes[54]. HD TV requires between 8 and 5 Mbps to deliver crisp video to consumer's televisions.[55]

Crime and public safety: Broadband benefits

The impact of broadband in improving public safety and addressing crime is mentioned in only a small number of studies, though in many reports it is part of a generic expectation that broadband will improve government services. The role of broadband in improving the ability of the police and other agencies to respond to emergencies, including natural disasters, is seen as a benefit arising broadband.

Headline crime and public safety benefits include:

A contribution to the general improvement in public services

- Dabson and Keller (2008) note that a rapidly growing area of broadband use is for government services and public safety. Advocates for "eGovernment" identify its potential to increase transparency, improve customer service, update and streamline bureaucratic management practices and cut costs.

Improvement in disaster and emergency response

- A number of studies cite the significance of broadband in helping to improve disaster response (Digital Impact Group, 2010).

Improved outcomes through video communications and CCTV

- The improved use of video transmission is seen as helping a number of aspects of crime and community safety. For example, it can act as a deterrent to burglaries on businesses, (Scottish Government, 2011) or improve court functioning by enabling input to proceedings from remote locations (Barr, 2010).

Improved tackling of specific incidents

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54 http://www.sky.com/helpcentre/tv/sky-go/about-sky-go/technical-and-device-specifications/sky-go-recommended-broadband-speeds/, accessed 15th July 2011

55 http://gigaom.com/2008/08/12/why-we-need-fat-pipes-the-top-5-bandwidth-hungry-apps/

- The Digital Impact Group (2010) note benefits from greater connectivity, for example between health centres and utility providers. This can make for more resilient systems and more accurate responses to threats such as infectious outbreaks, bioterrorism and attacks to the energy grid.

Crime oriented video applications, such as the use of video transmissions for CCTV and also allowing witnesses to use video appearances in court, do not consume significant bandwidth. However, the higher quality images or the transmission of several images simultaneously, such as multiple CCTV feeds to a remote recording location (essentially a cloud computing situation) is more easily facilitated using high-speed broadband access. Two IP cameras using MPEG-4 video compression, with a screen resolution of 640 X 480 pixels at 7.5 frames per second require approximately 650Kbps upload bandwidth[56]. More cameras or higher quality images will require commensurately more bandwidth. The Scottish Government report (2011) notes the importance of higher speeds to allow improved CCTV functions to take advantage of cloud computing.

Education and Skills: broadband benefits

Education and skills development is the first of the three major areas that many commentators[57] suggest will make the greatest use and derive the largest benefits from high speed broadband deployment. The other two areas are health and economy.

The relatively large number of initiatives that provide high-speed broadband deployment to educational establishments supports the importance of high speed broadband. For example in New Zealand approximately €112 million is being earmarked specifically for improving schools' access. Korea has completed a Fiber to the subscriber (FTTS) program, connecting all 11,414 schools with at least 10 Mbps.

Headline education and skills benefits include:

Education as investment in human capital, with economic benefits

- Productivity within education itself can be enhanced through broadband - eLearning courses are considered 50 per cent less expensive than traditional face-to-face courses. Blended learning is 20 per cent less expensive than equivalent face-to-face seminars, but is more efficient than e-learning (Fornefeld et al., 2008)
- Children with internet access have been found to have higher standardized test scores, graduation rates, and earning potential (Digital Impact Group, 2010).

Increased employment in education

- In the USA the estimated effect of a five per cent increase in capital spending from second generation broadband deployment would be an increase of $4.3 billion (€3.5 billion in July 2010) in GDP and 43,871 jobs in education services (Crandall and Singer, 2010).

56 http://www.cctvcamerapros.com/IP-Camera-Internet-Connection-Speed-s/323.htm

57 Liebenau, J., Atkinson, R. Kärrberg, P., Castro, D. and Ezell, S. 2009. The UK's Digital Road to Recovery. LSE Enterprise Ltd. & the Information Technology and Innovation Foundation. Available at http://www.itsa.org/itsa/files/pdf/digitalrecovery.pdf Accessed on 10th July 2011

Increased availability of education

- One advantage of broadband is that education can be made more widely available through the internet. One aspect is in rural areas, Mulas et al. (2009) report that rural residents can also access college-level distance learning courses and degrees that may not be offered at local institutions.
- Broadband can facilitate distance-learning opportunities through teleconferencing. This has potential benefits for rural communities that may lack access to top-flight education resources. There are several examples of distance tutoring programs internationally (Crandall and Singer, 2010).

Improved education services

- 4.5 per cent increase in educational attainment (PriceWaterhouseCoopers, 2009)
- Education is enhanced by providing students and teachers with access to a vast array of resources. Text-based materials, photos and images, videos, animations, interactive lessons, data-manipulation tools, oral history collections, music, and educational gaming programs are just a few of the valuable benefits (The Baller Herbst Law Group, 2008).
- The development of online resources such as eBooks, Google Scholar, and Social Science Research Network (SSRN) provide academic institutions with access to fast and reliable research (Crandall and Singer, 2010).

There have been some dissenting views about the value of high-speed broadband in education. Kenny and Kenny (2011) do not question the principle but assert that the average secondary school in the UK already had internet access at 19.2 Mbps and this was sufficient to meet needs. An alternative view is put forward by the Communications Workers of America (2010) who list several educational services that require internet speeds of between 100mpbs to 1gbps. The Baller Herbst Law Group (2008) also highlight the need for high-speed broadband to enable meaningful two-way, interactive, real-time educational experiences using uncompressed high definition video streams.

Employment and economy: broadband benefits

There are a large number of studies that conclude that broadband and high-speed broadband has a significant and positive impact on economic growth (as measured through GDP). Some of this growth is created by investment in the infrastructure and works undertaken to deploy broadband, multiplier values have been applied to estimate the impact that this investment will have throughout an economy. Further details of these and an estimate of potential impacts in Europe are provided in section 6.

Several studies suggest that productivity of employees is increased by ICT and broadband, but not all studies find this. Some studies find that innovation, associated with broadband and high speed broadband may have a more significant affect.

Headline employment and economy benefits include:-

Increased economic output

- A recent report by Pike Research (http://www.pikeresearch.com/research/smart-grids-in-europe) forecasts that during the period from 2010 to 2020, cumulative European investment in Smart Grid technologies will reach €56.5 billion, with transmission counting for 37% of the total amount. The report also suggests that by 2020 almost 240 million smart meters will have been deployed in Europe.
- The annual average investment by broadband service providers in the USA over the next six years (2010-15) is predicted to be $30.4 billion (€24.7 billion in July 2010) in all broadband technologies, which corresponds to over 509,000 jobs created (Crandall and Singer, 2010)
- According to the International Energy Agency (IEA), Europe requires investments of €1.5 trillion over 2007-2030 to renew the electrical system from generation to transmission and distribution. This figure includes investments for Smart Grid implementation and for maintaining and expanding the current electricity system.
- FTTP can boost the US economy by at least $440 billion (€312 billion in July 2009, this equates to 2.9 per cent of GDP[58]). Greater utilisation of peer to peer applications with 100 mbps symmetrical capability can provide a further increase. There is about a 15 per cent productivity boost from broadband. (Next Big Future, 2009).
- Consumers receive more than $30 billion (€21.28 billion in July 2009) of net benefits (consumer surplus) from the use of fixed line broadband at home. Dutz et al (2009) also estimate, based on 2009 survey data, that the benefits of an increase in broadband speed from 100 times the typical historical speed of dial-up internet service to 1,000 times dial-up are in the order of $6 billion (€4.26 billion in July 2009) per year for existing home broadband users (Dutz et al, 2009)
- Looking at a panel of OECD countries in 1996-2007, Czernich et al (2009) found that a ten percentage-point increase in broadband penetration raised annual per-capita growth by 0.9 to 1.5 percentage points.

Increased productivity

[58] Bureau of Economic Analysis US GDP 2010 US$14.7 trillion in 2010

- Broadband has contributed a very significant proportion — perhaps ten to 20 per cent — of productivity growth in some OECD countries (LECG Ltd, 2009)
- ACIL Tasman (2004) looking at the impact of broadband in Victoria (Australia) conclude that their projections show how the financial, insurance and business service sectors are expected to experience the fastest and greatest productivity gains from broadband use. Agriculture and forestry and fishing sectors are expected to gain the least from direct productivity gains.

Increased employment

- Data from 1999 to 2006 revealed that communities with new access to broadband experienced 6.4 per cent higher employment growth on average than before they had broadband (Milano, 2010).
- The internet is a catalyst for generating jobs. Among 4,800 small and midsize enterprises surveyed, broadband access and technology created 2.6 jobs for each lost to technology-related efficiencies (McKinsey, 2011).
- Kolko (2010) looked at broadband availability and economic activity throughout the USA between 1999 and 2006 and concluded that the boost to employment growth was 5.0 per cent (statistically significant).

Building or maintaining the infrastructure for broadband

- The Internet in the USA employs 1.2 million people directly in jobs that build or maintain the infrastructure, facilitate its use, or conduct advertising and commerce on that infrastructure (Hamilton Consultants (2009). This represents 0.86 per cent of total US employment[59]

In general economic and employment benefits are identified as increasing through the increased take up of broadband rather than particular advantages of high speed broadband. For example cloud computing require speeds of up to 2 Mbps and 10 milliseconds of latency, and increased bandwidth will become more necessary as enterprises begin to store and save more data in the cloud[60]. A survey of firms in Scotland found that 58 per cent of businesses perceive that reliable, high-speed broadband is very important to the operation of their business (Scottish Government, 2011).

High Definition TelePresence applications provide high-definition 1080p video, spatial audio, and a setup designed to link two physically separated rooms so they resemble a single conference room even though the two rooms may be on opposite sides of the world. The application is a deluxe version of video conferencing aimed at businesses, it requires at least requires 24 Mbps and about a 50 millisecond latency to recreate the feeling of sitting in a room speaking with people[61].

Environment and transport: broadband benefits

Few studies identify the particular benefits for the environment of high speed broadband. The primary benefits identified were greater use of telecommuting, smart grids and smart

59 US Bureau of Labor Statistics. 2011. Total US employment in May 2011 139.334 million

60 http://gigaom.com/2008/08/12/why-we-need-fat-pipes-the-top-5-bandwidth-hungry-apps/

61 http://gigaom.com/2008/08/12/why-we-need-fat-pipes-the-top-5-bandwidth-hungry-apps/

buildings. Telecommuting could benefit from enhanced deployment of high speed broadband. Enhanced high speed deployment could enable greater use of higher quality video-conferencing. High speed broadband could also enable more efficient use of cloud computing and transfer of large documents and files.

Enhancements to logistics were quoted in some studies. However, these rely rather more on enabling wireless internet connectivity with lorries or trucks than enhanced utilisation of fixed broadband networks. It is doubtful that the provision of high speed broadband would improve logistics significantly compared to standard broadband.

Headline employment and economy benefits include:-

Reduction in greenhouse gas emission

- Enhanced adoption and use of broadband could achieve a net reduction of one billion tons[62] of greenhouse gas over 10 years in the US. If converted into energy saved this would constitute 11 per cent of annual U.S. oil imports (Fuhr and Pociask, 2007)
- Robust use of a smart grid may save between 60 million and 480 million US tons of carbon emissions per year (Davidson, Santorelli and Kamber, 2009).

Reduced travel

- 2006 estimate - 28 million Americans telecommuted at least once a month. Predicted to rise to nearly 100 million by 2010 (Crandall and Singer, 2010)
- Telecommuting will reduce greenhouse gas emissions in the US by 248 million tons due to less driving, 28 million tons due to reduced office construction, and 312 million tons because of energy saved by businesses. (Davidson, Santorelli and Kamber, 2009)
- Broadband and on-board computers in lorries will allow logistics managers to better coordinate and utilise trucks and enhance loads carried. This will boost capacity utilization by 3.3 per cent, saving US$16 billion (€10.14 billion in July 2008) annually in the US$500 billion (€307 billion in July 2008) trucking industry. (The Baller Herbst Law Group, 2008).

Reduced energy use

- Broadband-enabled smart grid services and devices could result in over US$1.2 trillion (€850 billion in July 2009) in gross energy savings. This approach is expected to reduce end-use energy consumption in the USA in 2020 by roughly 23 per cent of projected demand, potentially abating 1.1 US gigatons of greenhouse gases annually. (Davidson, Santorelli and Kamber, 2009)
- ICT and energy policy goals - A Smart Grid can contribute to sustainability by facilitating the reduction of CO2 emissions, enabling the integration of largescale renewables and increasing energy efficiency in the power sector. It supports competitiveness and open and efficient markets by increasing market participation through the aggregation of distributed prosumers (consumers also able to produce power) and through the strengthening of interregional markets.[63]

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62 One US ton is approximately 907kg, so 1billion US tons would represent just over 900 billion kg.

63 http://ses.jrc.ec.europa.eu/index.php?option=com_content&view=article&id=93&Itemid=137

- Creating "smart buildings" tied to the local power grid will enable utility companies to reduce the level of (wasted) reserve power held, leading to "lower prices and less price volatility" (US Department of Energy, 2002; quoted in Baller Herbst Law Group, 2008)
- In California 33 per cent of all electricity consumed in the State is by commercial buildings – about US$10 billion per year (€7.09 billion in July 2008). The goal of the High-Performance Commercial Buildings Project (HPCBS), launched in 2000, is to cut energy use by 70 per cent in new buildings and save 50 per cent in retrofits of older buildings using broadband connections combined with other technologies. (The Baller Herbst Law Group, 2008).

Many of the above studies identify how broadband deployment can contribute to the 2020 climate and energy targets:-

- Reduction in EU greenhouse gas emissions of at least 20 per cent below 1990 levels
- 20 per cent of EU energy consumption to come from renewable resources
- 20 per cent reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency.

As Timmers[64] identified at the ManagEnergy Annual conference broadband can contribute to the achievement of targets in two ways. Firstly, by bringing direct efficiency gains through measuring, monitoring, intelligent management and control. Secondly, through driving behavioural change by providing reliable data, identifying energy consumption (how much, where), enabling comparative analysis (identify common inefficiencies, best practices and opportunities).

Most smart grid and smart building applications require wireless connectivity in some form, and several studies note the need for more broadband spectrum for utilities. An IEEE Smart Grid project[65] estimated that data rates of '40 Kbps to 1 Mbps' were required. High speed broadband appears to offer few additional benefits to these initiatives (viewed in isolation) due to the relatively low bandwidth requirements.

Equality and inclusion: broadband benefits

This category of benefits relate to activities, which address inequalities, empower 'voiceless', isolated individuals and communities, and tackle exclusion.

Few studies directly identified the impact of high speed broadband on equality and inclusion. Most reports identified that high speed broadband could facilitate the development of applications or services that would tackle exclusion. Rural areas were, in most cases, expected to benefit most from the introduction of broadband, not least because in some rural areas internet access is very poor or non-existent thus depriving inhabitants of these rural areas of benefits that people in other areas often take for granted.

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[64] Timmers P. 2011. ICT contributing to the development of a more efficient Europe. EUSEW, "Local and regional action for sustainable energy". Brussels. 13 April.

[65] IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) (2009) Preliminary Proposal for Smart Utility Networks aka Smart Grid Communications

Headline equality and inclusion benefits include:-

Tackling exclusion

- In their Local Broadband Plan, Suffolk recognise the ability to use broadband in caring for the elderly by using telecare to enable the elderly to stay in their homes for longer while receiving the help and care that they need online and improving their quality of life. Social care customers will receive a personalised budget and high speed broadband will enable them to use their budget to maximum effect by sharing information or booking services and equipment online (Suffolk development agency, 2011)
- Assessment of the benefits of the Broadband Wales Programme suggested that individuals could be more included within new personal, employment and social networks (Atkins, 2006)
- One of the wider social benefits of FTTH coverage is the promotion of community links and an enhanced sense of belonging to a community (Plum, 2008)

Empowering 'voiceless', isolated individuals

- As early broadband adopters exploit new opportunities to have their voices heard, improving access for only a particular group may in fact undermine democracy by creating inequalities of access to crucial communication services (Plum, 2008)

Empowering rural areas

- Targeting key rural centres in the West Midlands will develop rural broadband networks and maximise the opportunity for economic growth (Ecotech, 2010)

In general equality and inclusion benefits are identified as increasing through the increased take up or access to the internet rather than particular advantages of high speed broadband. The Baller Herbst Law Group (2008) identify that remote server services for telecommuting are an application that could require speeds of up to 100Mbps. Improved video conferencing is seen as an advantage particularly in relation to video-conferencing with consequent reduced travel, particularly for those living in rural areas.

The key equality and inclusion issue highlighted in the studies reviewed relates more to equality of broadband access, than to any particular advantages from high-speed broadband. Several studies voice fears about rural areas being 'left behind' and potentially disadvantaged by not having broadband or high-speed broadband access at the same speeds as other locations.

Finance and income: broadband benefits

This category of benefits complements the economy and employment section (4.4). This previous section, which contained a large number of reports, focused on wider economic benefits. This section will focus on financial savings, mainly for the individual or household, which can arise from broadband connectivity.

The impact of broadband on pay through economic development can arise in a number of ways, for example – increased pay in an existing job, the acquisition of more skills leading to

higher pay, or more income through more opportunities or profit from running a small business.

Headline finance and income benefits include:-

Average Pay

- Direct jobs related to the "building and manufacture of broadband networks" pay 42 per cent more than the average for manufacturing jobs in other sectors (Columbia Telecommunication Corporation, 2009)
- Between 1998 and 2002 communities in which mass-market broadband became available by December 1999 experienced more rapid growth in employment, the number of businesses overall and businesses in IT-intensive sectors. But the data did not demonstrate statistically significant impacts on wages (Lehr et al, 2005)
- If the 1.6 million children who live in families which do not use the internet got online at home, their educational improvement could boost their total lifetime earnings by over £10 billion (€11.68 billion in July 2009) (PriceWaterhouseCoopers, 2009)

Household Income

- Strategic Economic Solutions (2007) examined the potential of the economic impact of a metropolitan broadband network for the city of Cape Town. They estimate that the project will contribute to indirect household income, and by 2026/27 it is expected that the project will have cumulatively added over R106bn (€11.1 billion in July 2007) to indirect household income.

Impact of lack of broadband access

- The Digital Impact Group (2010) conclude that each of the over 40 million digitally excluded households in a US study they were undertaking may have a current cost in the order of over US$2.5 billion (€2.04 billion in July 2010)
- UK households offline are missing out on savings of £560 per year (€654 in July 2009) from shopping and paying bills online.

Dutz et al. (2009) estimate that the increase in benefits of an improvement in broadband speed from 5 to 50 Mbps would equate to US$5.8 billion (€4.11 billion in July 2009) for U.S. households. However, the study was relatively unclear about how access to high speed broadband would deliver these benefits.

None of the studies investigating finance and income provide robust details of how high-speed broadband will lead enhanced financial and income benefits. It is unlikely high-speed broadband will have a significant impact in this area.

Health and care: broadband benefits

The impact of broadband in improving health and care is mentioned in a large number of studies. Indeed, this is one of the top three areas where broadband is perceived as having the greatest impact. Benefits can be seen in a number of ways. The Digital Impact Group (2010) looks at telemedicine, online health education, electronic health records and chronic disease management. Fornefeld et al (2008) in Europe look at benefits from electronic health insurance cards, secure messaging systems between health providers, and electronic patient

records. Telemedicine is defined as the delivery of health care by a physician to a patient using some type of interactive video technology when distance separates the two. Telehealth is a broader form of telemedicine that includes additional technologies, other types of health providers and distance education using both interactive and asynchronous platforms.

Headline health and care benefits include:-

Save consumers money

- Litan (2008) estimates the net total benefit from telemonitoring is in the order of US$44 billion per year (€27.89 billion in July 2008, this equates to 0.299 per cent of GDP[10]) for an average implementation cost of US$1.75 billion per year (€1.11 billion in July 2008)
- Connected Nation (2008) report that if every US state were to develop initiatives similar to ConnectKentucky, the United States could expect to gain US$662 million (€420 million in July 2008) saved per year in reduced healthcare costs. This equates to 0.0045 per cent of GDP[66]).

Save consumers time and travel

- 83 per cent of parents of children with special health care needs report driving more than an hour to see a specialist (California Broadband Task Force quoted in the Baller Herbst Law Group, 2008). If telemedicine can allow families to be treated in local clinics then their time and money will be saved.
- Monitoring conditions virtually by phone and the internet allows people to stay in their homes and avoid expending time and money on travel. The Digital Impact Group (2010) report that one Veteran Affairs telehealth program was found to reduce bed days of care by 25 per cent and hospital admissions by 19 per cent.
- The introduction of tele-consulting in rural Queensland saved Aus$125 (€79 in July 2007) per visit avoided as opposed to sending patients to the nearest city (Nooriafshar and Maraseni, 2007)
- Reductions in hospitalisations due to tele-health were greater in remote areas (with a 50 per cent decrease in bed-days) compared to urban areas (a 29 per cent reduction in bed-days) (Darkins et al, 2008)

[66] Bureau of Economic Analysis US GDP 2010 US$14.7 trillion

Improve outcomes and treatment

- Access Economics (2010) report a study that showed a weekly tele-nurse visit to patients with congestive heart failure resulted in 84 per cent lower readmission rates and also had significantly fewer emergency visits.
- Tele-health home monitoring of patients with dementia improved their medication compliance rates to 81 per cent against 66 per cent in the control group (Smith et al (2007)

Increased employment

- Kolko (2010) looking at whether broadband boosts local economic development examines broadband and industry employment growth, 1999–2006. 7.4 per cent of employment growth in health care and social assistance is associated with an increase in broadband availability.

The Baller Herbst Law Group (2008) report that a crucial part of effective telehealth services is the transmission of high-definition medical images. Under the FCC's former definition of "broadband" (200 kbps), it would take nearly a full day to download a 10 minute diagnostic video clip. With a symmetric 100 Mbps broadband connection, it would only take three minutes to transmit the video clip.

Health care and the development of telehealth and telemonitoring, particularly those elements requiring real-time uncompressed video or HD video connectivity, appear to require high-speed broadband of 10 Mbps or more.

Housing: broadband benefits

Only a handful of studies refer to the impact of broadband on housing issues. The most significant studies include research on the impact on housing by looking at communities that were among the early adopters of mass-market broadband.

Headline housing benefits were thought to be:-

Impact on the environment of broadband from home

- The use of broadband at home increases the ability to work from home and so reduces travel and associated CO2 emissions. For example a 2006 estimate suggests that 28 million Americans telecommuted at least once a month (this equates to 12.2 per cent of the working population[67]). This was predicted to rise to nearly 100 million by 2010 (Crandall and Singer, 2010).
- Each internet telecommuter saves about 3,500 kilowatt hours a year (Dutz, Orszag and Willig, 2009).

Economic benefits of broadband facilitated homeworking

- Broadband, allowing work from home, resulted in an increase in productivity of 20 per cent (Zhen-Wei Qiang, Rossotto and Kimura, 2009).

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[67] US working population in 2006 was 228.8 million Bureau of Labor Statistics

- Homeworkers took on average a quarter of the number of days sick leave a year (three days) than their office attending counterparts (twelve days - Zhen-Wei Qiang, Rossotto and Kimura, 2009).

Impact on the community of broadband from home

- Using broadband at home individuals can acquire skills and develop social networks through broadband-enabled web applications. These can facilitate peer-to-peer communities and their integration with the economy (quoted in Zhen-Wei Qiang, C. Z., Rossotto, C. M., and Kimura, K., 2009).

In general benefits are identified as increasing through the greater take up of broadband rather than particular advantages of high speed broadband. However improved video conferencing is seen as an advantage particularly in relation to reduced travel between home and work.

Wellbeing: broadband benefits

This category of benefit relates to activities, which focus on people's social wellbeing. This includes "The Need for Being", for meaning, purpose and fulfilment in life e.g. support for purposeful activities and 'quality of life activities' such as hobbies and interests. It also focuses on the "Need for Relating" and the need for social interaction with family, friends and others. These activities often fundamentally relate to 'happiness'. High-speed broadband provides many opportunities for HD and UHD video applications. Wellbeing benefits can obviously arise from some of the preceding benefits (a return to full health or possession of a job are known to improve wellbeing), this section therefore highlights on those that focus specifically on wellbeing.

Headline wellbeing benefits include:-

Time Saving

- A key benefit from broadband is the opportunity to save time. A prime example is increased teleworking reducing the amount of time spent on commuting. Connected Nation (2008) estimate that in the US US$35.2 billion (€22.31 billion in July 2008) in value could be attributed to 3.8 billion hours saved per year by accessing broadband at home (if every state were to develop initiatives similar to ConnectKentucky).

Improvement to home / work life balance

- The benefits from telecommuting resulting from broadband are not just the time resulting from the elimination of the commute to work. Fuhr and Pociask (2007) note that telecommuting allows workers to find more time savings by reorganizing their lives to take advantage of low congestion periods. To give one example - quality of life can increase as workers use a less crowded health club saving time.

The preceding benefits largely focus on time saving. Faster broadband will probably mean that online tasks can be completed more quickly. However, if the user still sits in front of a computer and simply does 'more of the same' it is questionable whether there is any net benefit.

Bandwidth requirements for social networking applications that facilitate social interaction and thus enhanced wellbeing are relatively limited. VOIP applications such as Skype use between 100kbps (for a single call) to 1.5Mbps for HD video calling[68]. Skype recommends 8Mbps download speeds for group video calling with seven or more people. The recent development of single and multiple person VOIP applications by Facebook[69] and Google+[70] suggest that the previously limited bandwidths required by these applications will expand in the future.

Broadband requirements: An aggregate view

The preceding sections have examined benefits and broadband and high speed broadband bandwidth requirements in ten different areas. In isolation very few of the areas or applications require bandwidth above 30Mbps.

It is probable that developers of bandwidth hungry applications have been restrained in developing applications since high speed bandwidths have not been deployed sufficiently to enable mass-market utilisation of their applications. A chicken and egg conundrum probably exists. However, it is possible that wider utilisation of bandwidth hungry high-definition telepresence type applications could reach the mass market if sufficient users possessed the required bandwidth (over 24 Mbps). The recent introduction of video conferencing style facilities for Facebook and Google+, requiring up to 8Mbps, is perhaps an example of the way that developers are utilising the growing bandwidth provided to many users.

Tucker (2010) notes that a number of high-definition, and perhaps 3D, video signals in a single house, together with some on-line gaming and some telecommuting could easily make large inroads into a high-speed 100 Mb/s broadband connection. Add to this the data requirements of new on-line services such as on-line health monitoring, energy monitoring and home security and there will be pressure on the network to deliver even more than 100 Mb/s to the home.

While Tucker's observation is perhaps a little exaggerated in terms of total bandwidth requirements. It is already evident that bandwidth requirements for households and businesses could already relatively easily exceed 30 Mbps with existing applications. A household viewing two HD TV programmes (2 x 8MBps) while taking part in two multiple user Google+ online conversations (2 x 8MBps) would need more than 30Mbps. Businesses using 4 good resolution CCTV cameras (5.3 Mbps), with six staff connected to cloud computing applications (12Mbps) with an HD Telepresence application (24 Mbps) would require a broadband connection with in excess of 40Mpbs bandwidth. It is likely that bandwidth hungry applications will develop more rapidly in the future as the numbers of potential users starts to provide developers with an enhanced economic case for development.

High speed broadband impact: Rates of return, job creation and GDP growth

An interesting study by Shearman (2011) analyses the impact of superfast broadband access with a major UK train infrastructure investment. The rail investment has a cost-benefit-ratio

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68 https://support.skype.com/en/faq/FA1417/How-much-bandwidth-does-Skype-need?frompage=search&q=bandwidth+consumption&fromSearchFirstPage=false, Accessed 15th July

69 http://www.facebook.com/videocalling, accessed 15th July 2011

70 http://www.google.com/support/forum/p/chat/thread?tid=2d4123ffb5499d0f&hl=en, accessed 15h July 2011

of about £2 for every £1 spent. In contrast broadband investment in broadband produces £20 of benefit for every £1 spent in deployment.

In a study for the OECD Enck and Reynolds[71] suggest that governments can achieve a ten year return on fully funding a national, point to point, open access FTTH network.

Many studies have used econometric analysis, usually input/output methods and regression techniques, to estimate the impacts of broadband deployment. An initial analysis of studies has been undertaken to investigate the impact of high speed broadband deployment.

These studies have examined the effect of expenditure on broadband deployment in three different areas. Firstly, ***direct*** **employment** created by network construction. Secondly, ***indirect*** **employment** generated by businesses selling to those that are directly involved in network construction. Finally**,** ***induced*** **or additional employment** induced by household spending based on the income earned from the direct and indirect effects (induced impacts were omitted due to the low number of studies including this element).

A review of four European studies[72] examined the direct and indirect jobs created by broadband investment. Three multipliers (high, average and low) were derived from the studies for each of the two job methods of job creation (direct and indirect). The table below shows the average values for direct and indirect jobs created by the total estimated expenditure for high speed broadband deployment in the 27 EU Member States. In total it is estimated that a high speed broadband deployment investment of around €270 billion will create 3.9 million jobs, see Table 1.

European and US studies also investigated the impact of broadband expenditure on GDP. There is a relatively high level of convergence among the European studies in terms of estimates for GDP growth, with the three studies providing values ranging between 6.6 per cent and 7.3 per cent. The average level of GDP growth across the three studies is 7.03 per cent, this would equate to an increase in GDP of €862.47 billion arising from high speed broadband investment[73]. It must be noted that more detailed forensic research is required to disaggregate the component elements of studies that examined GDP to examine the precise ways in which the cumulative benefits of first generation broadband and second generation high speed broadband are handled.

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71 Enck, J. and T. Reynolds (2009), "Network Developments in Support of Innovation and User Needs", OECD Digital Economy Papers, No. 164, OECD Publishing. http://dx.doi.org/10.1787/5kml8rfvtbf6-en

72 Katz, R.L. and Suter, S. (2009a). Estimating the economic impact of the broadband stimulus plan. Columbia Institute for Tele-Information Working Paper; Katz, R.L., Zenhäusern, P. and Suter, S. (2008). An evaluation of socio-economic impact of a fiber network in Switzerland, mimeo, Polynomics and Telecom Advisory Services, LLC; Katz, R.L., Waterlaus, S., Zenhäusern, P. and Suter, S. (2009b). The Impact of Broadband on Jobs and The German Economy. Columbia Institute for Tele-Information Working Paper; Liebenau, J., Atkinson, R., Kärrberg,P. Castro, D. and Ezell, S. (2009). The UK's Digital Road to recovery. LSE Enterprise Ltd. & The Information Technology and Innovation Foundation.

73 European GDP (PPS Euros at market prices) €12,268.4 billion in 2010 – Eurostat http://epp.eurostat.ec.europa.eu/tgm/refreshTableAction.do?tab=table&plugin=1&init=1&pcode=tec00001&language=en

Table 1 Expenditure and employment estimates from €270 billion high speed broadband investment

State	(%)	Direct job creation	Indirect job creation	Total jobs created
Austria	1,91%	39,085	37,001	76,086
Belgium	2,24%	45,954	43,503	89,457
Bulgaria	1,51%	31,014	29,360	60,374
Cyprus	0,12%	2,477	2,345	4,822
Czech Rep.	1,99%	40,796	38,620	79,416
Denmark	1,35%	27,591	26,119	53,710
Estonia	0,28%	5,701	5,397	11,099
Finland	1,33%	27,172	25,723	52,895
France	13,56%	277,839	263,021	540,861
Germany	19,24%	394,357	373,324	767,681
Greece	2,01%	41,157	38,962	80,119
Hungary	2,02%	41,500	39,286	80,786
Ireland	0,88%	18,013	17,052	35,065
Italy	11,90%	243,931	230,921	474,852
Latvia	0,44%	8,979	8,500	17,480
Lithuania	0,74%	15,075	14,271	29,347
Luxembourg	0,11%	2,285	2,163	4,448
Malta	0,05%	1,017	962	1,979
Netherlands	3,27%	66,945	63,374	130,319
Poland	6,91%	141,675	134,119	275,795
Portugal	2,00%	40,918	38,736	79,654
Romania	3,83%	78,455	74,270	152,725
Slovakia	1,03%	21,122	19,996	41,118

Slovenia	0,41%	8,476	8,024	16,500
Spain	7,26%	148,766	140,832	289,598
Sweden	2,18%	44,611	42,232	86,843
UK	11,45%	234,729	222,210	456,939
Total	**100,00%**	**2,049,640**	**1,940,326**	**3,989,966**

Note that this is the highest level of estimated investment needs, ranging otherwise from 181-270 BL€. Also note that it is expected that the partition (as percentage of total) will remain essentially the same for the Member States regardless of absolute expenditure figures.

US studies also suggest a relatively high level of convergence in terms of GDP growth, ranging between 3.26 per cent and 3.8 per cent. The average level of GDP growth across the US studies is 3.47 per cent, this would equate to an increase in GDP of €425.71 billion arising from high speed broadband investment.

Thus European studies would suggest a 3.16 fold 'return' on the estimated 270 billion investment in high speed broadband. The lower levels of growth in the US studies would suggest a more modest 1.56 'return' on the broadband investment. These levels are considerably lower than the 20 fold return predicted by Shearman (2011).

ANNEX 5 – RESULTS FROM PUBLIC CONSULTATIONS AND EVALUATIONS

7.1. Main results of public consultations

Numerous consultations with Member States, industry and social stakeholders have been carried out for initiatives in the field of broadband networks, digital service infrastructures and their financing aspects. In the particular field of **broadband rollout**, the consultations can be summarized as follows:

- In March 2011 Vice-President Kroes convened a "roundtable" of CEOs to request them to come forward with concrete proposals on how to address the broadband investment challenge. The CEOs, from a broad range of companies and stakeholders with an interest in broadband networks (including content providers, equipment makers, investors and telecoms operators from the world's leading companies such as Nokia, Alcatel Lucent, Google, Ericsson, News Corp etc[74]), submitted a paper in July 2011 summarising their common position[75]. As far as financing of broadband networks is concerned, a clear signal in support of the CEF was sent: "*The European Commission should provision public funding (incl. structural funds) to be used in risk sharing mechanisms between the EIB and the EC, for viable telecom infrastructure projects. It should also expand the RSFF's investment capacity & eligibility to broadband investments*". As regards the rising demand for ultrafast internet, the CEOs were equally clear: "Internet traffic is expected to be multiplied by 4 between 2010 and 2015".
- The first Digital Agenda Assembly took place in Brussels on 16th and 17th June 2011. There were two workshops dedicated to the rollout of broadband, several more on digital services. Altogether, the Digital Agenda Assembly was attended by more than 1,000 participants. The workshops on broadband networks organised under the umbrella of the Digital Agenda Assembly highlighted that the existing telecom investment model is unsuitable to bring about the rollout of affordable, high-quality broadband networks.
- The public consultation on the Europe 2020 project bond initiative, ran from 28 February to 2 May 2010, complemented by bilateral meetings organised between the Commission and EIB with financial institutions and a workshop organised by the Commission with Member States on 23 March. The consultation on project bonds highlighted a positive verdict overall concerning the importance of using the EU budget including financial instruments, to leverage investment e.g. for broadband networks. Nevertheless the stakeholders mentioned that it may be necessary to introduce new ways of thinking about financing investment, which has traditionally been financed on a corporate balance sheet.
- In March ECFIN and the EIB organized a series of bilaterals with key financial institutions. The meetings confirmed that the EIB's involvement in financing of broadband rollout would be crucial for investors to secure the investment grade (BBB+, A-), also a liquidity may be of a concern to investors some Member States. The financial sector foresees initial investments in PPPs.

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74 For a complete list of participants see: http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/11/508&type=HTML

75 http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/11/508&format=HTML&aged=0&language=EN&guiLanguage=en

- With aim to support the Commission preparations vis-à-vis meeting DAE broadband targets and to test the viability of the financing proposal, INFSO organised a workshop with Member States on 23 March. The workshop focused in particular on developing national broadband plans and facilitating broadband investment.
- In February, BEREC, a body of European regulators published a comprehensive paper on the NGA, including on country per country basis, which provides an up to date picture of the NGA roll-out plans in the different Member States.
- Recent Parliament's draft report on the future Multi-annual Financial Framework (MFF) recognises the importance of using the budget to leverage investment in broadband (i.e. the financial crisis has made private investors more reluctant to finance EU projects and has revealed the need to rebuild sufficient confidence to allow major investment projects to attract the support they need; hence the Parliament stresses that the support of the EU budget will be needed to attract and mobilise private funds towards projects of EU interest, especially for those projects not considered commercially viable, and therefore welcomes the Europe 2020 Project Bond Initiative, as a risk-sharing mechanism with the European Investment Bank (EIB), that provides capped support from the EU budget to companies issuing bonds to finance large-scale projects and infrastructure schemes) and emphasises the need to for a budget supporting Europe 2020 objectives (i.e. the Parliament stresses that the Europe 2020 strategy can only be credible if it is adequately funded; calls for the next MFF to reflect the ambitions of the Europe 2020 strategy and demands the Commission and the Member States to produce a credible funding framework ensuring, in particular, adequate funding for its flagship initiatives; argues, in this respect, that tasks, resources, and responsibilities must be clearly defined and well orchestrated between the Union and its Member States; calls on the Commission to clarify the budgetary dimension of the flagship initiatives as these priority action plans cut across all policies funded through the EU budget).
- With the support of the EU, the European Utilities Telecom Council (EUTC) is managing, since January 2009, ICT4SMARTDG an open virtual forum where stakeholders in the telecommunications services sector meet with stakeholders within the local distributed power generation sector, the manufacturers of local renewable sources and the distribution system operators. The objective is to create consensus on how to implement smart grids from the technical, financial and regulatory points of view.
- Finally, the Commission (DG INFSO) is currently managing an expert group on synergy between electricity utilities and telecom operators. The aim of the group is to bring together these two sectors in order to identify synergies at infrastructure and services level for the deployment of Smart Grids. The main conclusion of a recent (27 May 2011) workshop was that significant and sustained capital investment is required and that opportunities to use existing infrastructure exist, and collaboration in the development and operation of new systems can be beneficial for both.
- Following the adoption of the MFF communication, preliminary contacts have also been taken with key stakeholders as European Telecoms Association (ECTA), European satellite operators' association (ESOA) or Fibre To The Home (FTTH) Council to explore the possibilities for an infrastructure fund for broadband networks and digital service infrastructures. Their first reactions have all been positive.

  In all these consultations, the importance of using the EU budget to leverage investment in broadband was acknowledged. In particular:

- Stakeholders widely hold the view that the root causes for a lack of broadband investment is twofold: A lack of investment from incumbents and a lack of demand, due to the so far limited number of public and private services requiring ultrafast internet.
- Echoing the CEOs position paper, however, stakeholders expect the demand to increase, mainly due to the current explosion of traffic from videos over the internet (IPTV[76]). In particular Portugal Telecom noted that IPTV services brought an added value to the network, tackling market demand issues and delivering positive effects on its economic performance. Some stakeholders suggested actions to stimulate demand, including copy right issues, eGovernment and digital literacy.
- Stakeholders do consider that public authorities should explore alternative investments, including guarantees for loans.
- Finally, stakeholders think that there are huge risks in failing to roll out broadband, such as depopulation, delocalisation of businesses, political stagnation, entrenched social/economic problems, reduced attractiveness for economic investment and reduced competitiveness.

As far as **digital service infrastructures** are concerned consultations have taken place for Europeana multilingual services and Safer Internet, while sustainability studies are currently ongoing for projects such as Secure idenTity acrOss boRders linKed (STORK) (eID), Pan-European Public Procurement On-line (PEPPOL) and digital libraries. All these studies include consultation and interviews with relevant stakeholders. The viewpoints gathered from the consultations can be summarised as follows:

- In 2009 the Commission held an online consultation on, amongst other things, funding of Europeana. Respondents underlined that the cost for digitisation paid for by the Member States is many times larger than the cost for maintaining the central Europeana operation and also emphasise the investments Member States are making to set up national aggregators for cultural heritage material feeding into Europeana and to preserve the digital resources[77]. The *Comité des Sages* on bringing Europe's cultural heritage online[78] conducted a public consultation[79] as part of their work. 97% of all respondents were of the opinion that digitisation of Europe's cultural heritage should be funded predominantly, if not solely, through public funding. 72% of all respondents were of the opinion that the Europeana central service should be financed through European funding. While a vast majority of participants (65 %) considered that cultural institutions should be responsible for the long-term preservation of Europe's cultural heritage, 75% of the participants advocated EU funding as an accelerator for digitisation processes across Europe. In the coming years, Europeana will need to further develop its collections and provide additional services that allow creative industries to use Europeana content for innovative applications and services.
- Consultation of stakeholders done as part of the mid-term evaluation of the Safer Internet programme 2009-2013 concluded that the current focus of the programme is appropriate. European funding remains crucial for the projects to exist, while local operations and physical presence in the Member States remain of vital importance. Future challenges to be addressed include better and wider networking between all stakeholders, also beyond the EU (especially

[76] Internet Protocol Television

[77] http://ec.europa.eu/information_society/activities/digital_libraries/doc/consultations/results_online_consult_dec_09.pdf

[78] http://ec.europa.eu/information_society/activities/digital_libraries/doc/refgroup/final_report_cds.pdf

[79] http://ec.europa.eu/information_society/activities/digital_libraries/doc/refgroup/annexes/results_consult.pdf

in Russia and South-Eastern Europe); further development of links with key industry actors, international organizations, content providers and technology producers; closer cooperation between EC programmes, especially at the operational level.

- The Vision 2020 paper[80] of the Multilingual Europe Technology Alliance (META-NET) concludes that language barriers remain a major obstacle to the digital single market in the EU. The majority of eCommerce consumers are reluctant to buy online in another language, yet over 80% of eCommerce sites exist in a single language only[81]. The DAE scoreboard 2011[82] states that while 40% of EU citizens buy online, only 9% buy online across borders. A Eurobarometer study[83] showed that 90% of Internet users prefer to have websites in their own language, and that less than half of EU citizens is able to use English websites. There is a growing need for a multilingual digital service infrastructure that allows Internet users to access all services (whether public or private) and content in their preferred language. Failure to do so would lead to an "online exclusion" of the majority of EU citizens.

- The Commission has conducted the following studies to assess the different aspects of the PSI re-use market, including its economic valuation: Measuring European Public Sector. Information Resources (MEPSIR), Study on Exclusive Agreements, Economic Indicators and Case Studies on PSI pricing models, Study on pricing models for PSI, Study on market value of PSI, Study on re-use of cultural material. Key findings of the studies are available in Annex 3. Further data has been gathered through networking, cooperation, coordination and awareness raising activities with Member States and stakeholders. The Epsi platform provides wide-ranging PSI data across the EU.[84]

  The European Parliament in a draft report on the future MFF, recognized the importance of using the budget to leverage investment in broadband. This is due mainly to the financial crisis which has made private investors more reluctant to finance EU projects and has revealed the need to rebuild sufficient confidence to allow major investment projects to attract the support they need. Indeed, the Parliament stresses that the support of the EU budget will be needed to attract and mobilise private funds towards projects of EU interest, especially for those projects not considered commercially viable.

7.2. Other studies and evaluation carried out

The CEF for broadband networksand digital service infrastructuresis a new intervention, i.e. that there is no comprehensive ex-post evaluation available. Nevertheless, the conclusions from relevant reports and evaluations are as follows:

- For the use of the financial instruments, the Mid-Term Evaluation of the Risk-Sharing Finance Facility - a facility for Research, Development and Innovation (R&D&I) including for SME jointly financed by the Commission and the EIB - was completed by a group of independent experts in July 2010. It concluded that the use of Financial Instruments in addition to grants as "having dramatically expanded the financing" of research and innovation efforts. Although infrastructure investment is a different kind of expenditure than R&D&I, the

80 http://www.meta-net.eu/vision/index_html/reports/meta-net-vision-paper.pdf
81 http://ec.europa.eu/consumers/strategy/docs/EC_e-commerce_Final_Report_201009_en.pdf
82 http://ec.europa.eu/information_society/digital-agenda/scoreboard/docs/scoreboard.pdf
83 http://ec.europa.eu/public_opinion/flash/fl_313_en.pdf
84 http://www.epsiplatform.eu/

Commission can draw valuable lessons from the positive experiences with the Risk-Sharing Financial Facility.[85]

- The McKinsey Global Institute report on Big data[86] shows the potential of big data, of which re-use of data generated in the public sector PSI) is a significant component. According to McKinsey, big data could create some 250 BEUR in value, including both efficiency gains and a reduction in the gap between actual and potential collection of tax revenues.
- A 2011 study of the value of the PSI market in the EU[87] estimates the narrowly defined EU27 direct PSI-related market to be of the order of EUR 32 billion with a relatively rapid growth in the range of 6-11%. Overall economic gains from further opening up PSI by allowing easy access can bring gains of around EUR 40 billion for the EU27, and aggregate direct and indirect economic impacts across the whole EU27 economy are estimated to be of the order of EUR 140 billion, showing clearly that there are large benefits from easier access to and greater use of PSI. Economic valuations also demonstrate that the direct market associated with the use of PSI is less important than related spillovers and new uses in a wide variety of goods and services industries, and future innovations associated with easier access to PSI can be expected to add further economic and social benefits to the EU27 economy.[88] Although currently the EU PSI directive requires such data to be made openly available, in reality this data is generally inaccessible, hard to find or in a format that is not appropriate for ease of reuse. Indeed, the current obstacles to data access can be best addressed by creating a pan-European portal for public sector data and creating a technical and institutional infrastructure which allows the data to flow freely across borders, and to be found and re-used easily (the data.eu initiative is operating in this context). There has recently been a very fast world-wide growth of data markets, i.e. companies (typically startups) that aggregate data from various sources and offer access to them as a service[89]. Software giants such as Microsoft[90] and Amazon[91] have already connected the opportunities coming from the reuse of data with their cloud computing operations.
- In the context of Framework Programme 7 (FP7), the Commission has issued a call for proposals, ICT-2011-SME-DCL, to support work in the development of data markets and language resources and received an overwhelming response (more than 250 proposals mostly involving Small and Medium Enterprises). These responses all support the expectation of robust innovation and economic development to follow the development of a data standard compliant, technologically advanced and richly populated European data infrastructure.
- The Trans European Networks programme evaluation concerned the 2001-2006 period.[92] The programme supported deployment of trans-European e-services in the public interest and covered the following themes: eGovernment, eHealth, eInclusion, eLearning, and services for SMEs. The evaluation indicated that the programme made considerable progress in involving

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85 In the period from 2013 onwards, an 'extended-RSFF' Financial instrument will be used to support, if possible , the Research and Innovation dimension of projects funded through FP8/Horizon 2020 grants.

86 http://www.mckinsey.com/mgi/publications/big_data/index.asp

87 Review of recent studies on PSI re-use and related market developments, Graham Vickery, Information Economics, Paris, July 2011, forthcoming

88 Op.cit. Graham Vickery, July 2011

89 In Europe alone we have http://beta.kasabi.com ; http://www.duedil.com;https://www.innomis.com; http://www.floapps.com ; http://thedatatank.com ; http://datamarket.com; http://timetric.com; http://www.amee.com; http://ckan.net; http://www.data-publica.com; http://opencorporates.com

90 https://datamarket.azure.com/

91 http://aws.amazon.com/publicdatasets/

92 http://ec.europa.eu/dgs/information_society/evaluation/studies/s2006_02/index_en.htm

stakeholders from New Member States, SMEs and public bodies. It was concluded, that their participation strongly favoured the further deployment and uptake of project outputs at a pan-European level and the competitive health of markets for these and related services.

- The final evaluation[93] of the Safer Internet Plus Programme (2005-2008) concluded that the programme contributed to achieving a safer Internet through a range of interventions and produced a significant impact and influence. The programme has managed to successfully ensure that the themes and actions are relevant to the dynamic social and technological environment within which it operates.
- In a public consultation on a Green Paper on expanding the use of eProcurement in the EU in 2010 [94], 85% of respondents expressed themselves in favour of EU action to reduce cross-border barriers to eProcurement, particularly when it comes to mutual recognition of identification, standardisation of key interoperability requirements, convergence of core requirements for e-procurement systems and ICT solutions for proof of eligibility.
- The report on the final evaluation of the eContentplus programme found that Europeana contributed to creating better conditions for accessing, using, re-using and exploiting digital material.
- The Interim Evaluation of the Ambient-Assisted Living Joint Programme[95] concluded that the market for ICT for the elderly is very fragmented. In order to scale up successful solutions, with the aim of improving quality of life and saving care costs, what is needed is systems integration of services and technology. Technology deployment clearly relies on the availability of appropriate infrastructures, both physically (broadband availability) and in terms of cross-boarder public and private services.
- The Deloitte study on sustainability of eID finalised in June 2011 that proposes a roadmap with specific configurations and key actions to be undertaken for three scenarios of eID uptake.
- The 2010 Strategic report on Cohesion policy[96] reveals a slow absorption of Cohesion funds on ICT measures and particularly for those action supporting broadband networks.
- The Second Interim Evaluation of the FP7 reported that the strong push for innovation implemented in FP7 reflects the evolution in European policy thinking and the effects of the technology and market trends in the global ICT sector. It applies a mix of technology push and solution (market) pull to foster R&D excellence and innovation, focusing on the development of emerging technologies and taking into due account the areas of European technology and industry strengths. Participants appreciated the more pronounced focus on the exploration of new technology paths (compared to Framework Programme 6 (FP6)) and stressed the relevance of such exploratory actions to be undertaken at European level.
- EUKidsOnline pan-European survey[97] carried out by LSE in 2010 on 25.000 children and their parents shows that children in Europe are on average starting to use the Internet at the

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93 http://ec.europa.eu/information_society/activities/sip/docs/prog_evaluation/report_sip_en_2005_2008.pdf

94 http://ec.europa.eu/internal_market/publicprocurement/e-procurement/consultations/index_en.htm

95 Unlocking Innovation in Ageing Well. Interim Evaluation of the Ambient Assisted Living Joint Programme, December 2010.

96 http://ec.europa.eu/regional_policy/policy/reporting/cs_reports_en.htm

97 http://www2.lse.ac.uk/media@lse/research/EUKidsOnline/EUKidsII%20(2009-11)/EUKidsOnlineIIReports/D4FullFindings.pdf

age of 7 but only one in three 9-12 year olds feel that there are enough "good things for kids" of their age online, The study also shows that one in eight children have upsetting experiences online and they still lack skills and confidence using Internet. One out of three youngsters now connects via their mobile phones or other portable devices.

In conclusion, the evaluations and consultations show that interventions in the area of broadband networks and digital service infrastructures have been and will beneficial to Europe as a whole. The interventions have been enhanced by the lessons learned from the previous programmes and have the potential to produce stronger impacts and considerable European added value. Nevertheless, as the evaluations and certain comments show, there have been some difficulties in harnessing the whole potential, for example in absorption of the structural funds.