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**RSPG WORKING GROUP ON WIRELESS BROADBAND –FINAL POSITION PAPER**

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## **Summary**

1. Broadband services play a major part in electronic communications and the wider economy today. They provide substantial benefits to EU citizens and consumers by improving and enabling a wide range of economic, social and cultural activities. In this position paper, the RSPG aims to provide strategic guidance with a view to maximising the value that wireless broadband can generate in the medium to long term for the economy and society in the EU. For this purpose, the RSPG focused on ways to address the digital divide and to ensure that a potential lack of suitable spectrum will not stand in the way of the development of wireless broadband across Europe.

### *Tackling the digital divide*

2. The RSPG welcomes the political commitment across Europe to tackle the digital divide between those that have and those that do not have access to broadband services. The European Commission has in place programmes, such as the i2010 initiative and has more recently identified high speed broadband for all as an element in its 2009 economic recovery package, with specific funding. A number of Member States are developing and implementing ambitious plans to ensure full broadband population coverage within the next few years. This commitment is towards extending the coverage of broadband networks and improving the quality of service that users enjoy.
3. As part of these plans, wireless broadband access will often play a key role in bringing broadband to all, first because its cost effectiveness may exceed that of wired broadband especially where population densities become low and second because of the distinct value offered by mobility and wireless connectivity in general. The contribution of wireless to broadband for all will be through the extension of mobile, nomadic and fixed terrestrial networks, as well as through satellite networks for the most remote communities. However, despite these specific attributes, wireless broadband networks, whether as part of wider national or regional networks or otherwise, face real challenges and commercial success should not be taken for granted. For example, local circumstances could affect the cost of provision of services.
4. Consequently, the RSPG emphasises that the relative roles of wired, terrestrial wireless and satellite networks in extending coverage and quality will depend on

local circumstances and that a “one size fits all” approach to the digital divide is not suitable.

5. The RSPG supports the breadth and diversity of Member States’ approaches that cover the supply side (extent and quality of network coverage; content supply such as e-health, e-inclusion or e-government applications for example those improving public safety) and the demand side (helping new users adopt services through education and other support to potential users). These approaches involve both centrally run projects at a national level and decentralised initiatives that give a prominent role to local stakeholders which may be, where relevant, local authorities and other public bodies. These plans may involve national as well as EU funds, to make up for a shortfall in private initiatives at this time, but it is of course essential to promote competition and maintain incentives for private investment in the broadband market. In particular, it is important to avoid introducing distortions in the competition between platforms (e.g. between wired and wireless) if projects benefit from subsidies or other support.
6. The RSPG also recognises the potential of frequency spectrum below 1 GHz in reducing the digital divide through wireless networks, because of its superior coverage capabilities. The RSPG therefore supports the timely authorisation for uses including wireless broadband of such frequency bands (in particular the 800 MHz band covered by the RSPG opinion on the digital dividend and the 900 MHz band), where they are available, in order to achieve increased coverage in an efficient way.

*Maximising spectrum opportunities and preventing potential shortages*

7. Access to suitable spectrum is of course strictly necessary for the delivery of wireless (including mobile) broadband services. A relatively large amount of spectrum that can be used, among other things, for the provision of wireless broadband services to end-users is already identified across the EU on a harmonised basis. The extent to which these bands are used at this stage or whether they are already authorised for use may vary across Member States.
8. However, mobile broadband services have seen a particularly rapid growth in the past months in a number of Member States. User demand for ever more and ever better broadband on the move, including for data hungry applications such as video, is developing and could accelerate in unpredictable ways. The RSPG also noted that wireless broadband technologies improve continuously and when new technologies can be used, more efficient use of existing spectrum resources is possible. These new technologies may also open the door for new applications and new uses.
9. The RSPG believes that Member States and the European Commission can facilitate the successful and sustainable growth of wireless broadband in the EU and avoid spectrum bottlenecks by taking the following approach.
  - a) Action on spectrum that is already harmonised. To realise the potential of spectrum that is already identified for services that include wireless broadband, the European Commission and Member States should focus on two aspects.
    - First, they should ensure that unnecessary constraints (such as constraints on the introduction of new technologies or on the provision of mobile services, taking due account of competition issues at a national level) are removed as soon as practicable. In this context, the RSPG welcomes the

on-going action in Europe to amend the GSM Directive and facilitate the use of new technologies in the 900 MHz band.

- Second, Member States should ensure that spectrum that is available for new uses (for example the 2.6 GHz band and the 800 MHz band covered by the RSPG opinion on the digital dividend) is authorised for use as soon as practicable.
- b) Having better European visibility of market developments in the wireless sector. Improving the availability of meaningful data on the development of wireless broadband access and services on a consistent and comparable basis in Europe would be beneficial, especially in relation to spectrum bands that are harmonised at European level.
- c) Being ready to respond to requirements for additional spectrum for wireless broadband.
- The RSPG recognises that rapid changes in the market demand for wireless broadband services could take place. The RSPG considers that it is essential for the Commission and Member States to keep supporting the development of competition and innovation for these services. The RSPG invites Member States and the Commission to maintain a regulatory framework which facilitates technical advancement and more efficient use of spectrum, and to keep wireless broadband developments under review, such that action is taken in an appropriate and timely manner to mitigate potential issues.
  - Where a risk of shortage in the availability of spectrum for wireless broadband is identified at European level, the relevant European Institutions should take appropriate action. This may include identifying additional spectrum for services including wireless broadband. Other measures, such as infrastructure sharing, may also offer scope for reducing potential shortages and may be considered at national level.
  - The RSPG noted that a European institutional framework is already in place to deal with this challenge of identifying further spectrum for electronic communications services including wireless broadband, through the RSPG (on policy and strategy) and the RSC (for implementation measures). The existing European legislative framework for electronic communications networks and services is currently under review and the Commission and Member States should be ready to act under the new framework when it is in force.
  - Regarding the identification of further spectrum, the RSPG encourages a coordinated and harmonised European approach based on least restrictive technical conditions allowing flexibility over the services and technologies that may be deployed. Any such approach should reflect the potential variations in circumstances across the EU (both in terms of pre-existing spectrum constraints and service development trends) as well as uncertainties regarding future circumstances (e.g. user demand, technology capabilities, emergence of new applications).
- d) In their efforts to prepare for the longer term, the European Commission and Member States should also work to anticipate ways in which technology innovation may change usage of, and needs for spectrum as well as access to spectrum resources. For example, it is relevant to consider how cognitive radio and dynamic spectrum access would sit alongside the authorisations not just of today but also in the foreseeable future. The RSPG work programme for 2009 already includes a specific work stream on cognitive technologies, which will help taking this issue forward.

## **Introduction**

10. Wireless services are an essential part of electronic communications services today. They are also an essential part and enabler of economic and social activity and have become part of the fabric of life. They undergo constant and sometimes rapid or even unexpected changes, and help transform the way we live and work. It is essential for regulators to be continuously forward looking to ensure the continued development of markets and services under their watch and to stimulate their optimal development.
11. In this position paper, the RSPG applies this forward look to wireless broadband services with a view to identify ways to maximise the benefits that they can bring to citizens, consumers and society as a whole.
12. The benefits of broadband are wide ranging, from increases in productivity, growth in commercial opportunities based on the internet market-place, to social value from the dissemination of information in ways that can help education as well as inclusion and participation in society or developments in public health and safety. The current economic context sets difficult challenges for Europe and both the European Commission<sup>1</sup> and Member States<sup>2</sup> have identified the role that increased broadband access and better broadband services can play as part of recovery plans. Within the pool of options for the delivery of broadband access, wireless broadband holds specific potential to address some of the short term challenges that Europe faces, and the intrinsic value of mobility offers great opportunities both now and into the future.
13. This is why, following an overview of what broadband is in Europe, this position paper first considers the digital divide between those that have access to broadband services and those that do not, and the range of European initiatives designed to tackle it. This shows the important role that wireless broadband will often have. This paper then sets out an approach to the future development of wireless broadband in the medium to long term with recommendations for spectrum strategy. This covers specifically ways to avoid possible future shortages in the availability of spectrum suitable for electronic communications services including wireless broadband.
14. To paint a picture of broadband today, the RSPG conducted a survey of Member States based on a questionnaire designed to cover principally national plans to reduce the digital divide and to support broadband for all as well as spectrum use for wireless broadband. The questionnaire responses and the data in this report were intended to help paint an indicative picture of the landscape for wireless broadband across Europe rather than highlight individual cases.
15. In addition, to anticipate what might happen in future, this paper attempts to set out an informed and balanced view of how circumstances might develop. In doing so, the RSPG fully recognises the need to allow for different turns that events could

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<sup>1</sup> See COM(2009) 36 final of 28 January 2009 – Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions “Investing today for tomorrow's Europe”

<sup>2</sup> See Presidency Conclusions, Council of the European Union, Brussels, 12 December 2008 17271/08, [http://ec.europa.eu/sport/information-center/doc/timeline/european\\_council\\_12-12-2008\\_conclusions\\_en.pdf](http://ec.europa.eu/sport/information-center/doc/timeline/european_council_12-12-2008_conclusions_en.pdf).

take over period of 10 to 15 years or more, even where a particular scenario might seem more likely than others at this point in time.

**Broadband is a changing concept, continuously evolving, principally delivered through wired networks today but with an important role for wireless**

16. This section provides an overview of broadband access in Europe, first by setting out what broadband means in the context of this position paper and then by briefly reviewing the various options for broadband access in Europe, including a sense of their relative importance today. It concludes with an invitation to the European Commission and Member States to continue their efforts to gather statistical information on wireless broadband.
17. There is a clear view across all Member States of what is not a broadband service. If a data service offering internet access and associated applications has a bandwidth that is equal to or less than what analogue connections through a copper telephone line can offer, i.e. less than 128 kbps, then it is not a broadband service. However, Member States take different approaches to defining what broadband is in terms of service performance. Some identify specific minimum speeds, which can vary from the minimum of 128 kbps to higher values such as several Mbps; others do not use fixed minimum speeds. Paragraph 26 comments further on the collection of broadband information on a consistent and comparable basis.
18. For the purposes of this position paper, the notion of broadband is not linked to specific values for downstream and/or upstream speeds. The RSPG noted that the notion of broadband is continually evolving and could be best described in qualitative terms in the context of this paper. For technical performance, the paper refers to the expectation an average user is likely to have of a broadband experience, given the types of services that a majority of his peers are likely to be able to receive. Today, this is likely to mean the possibility of accessing a range of services from web browsing to voice-over-IP, and including for example standard definition video streamed over the internet. Detailed statistics on performance can then be used to consider which share of broadband access (that is non-narrowband access) matches this qualitative description in a given area at a particular point in time. Finally, irrespective of technical performance, for a broadband service to be really accessible to users, it also has to be affordable.
19. This document includes some information on headline speeds. This is only by way of illustration of current or expected capabilities, given that these may change with technological development and that a number of practical factors affect how the service that a user actually receives relates to headline speeds.
20. There are two broad categories of platforms used to deliver broadband services.
  - a) Wired platforms.<sup>3</sup> They use different types of wires or cables to reach end users' premises.
    - i. DSL. Digital Subscriber Lines use existing copper lines of telephone networks to deliver broadband services, with the latest version of the

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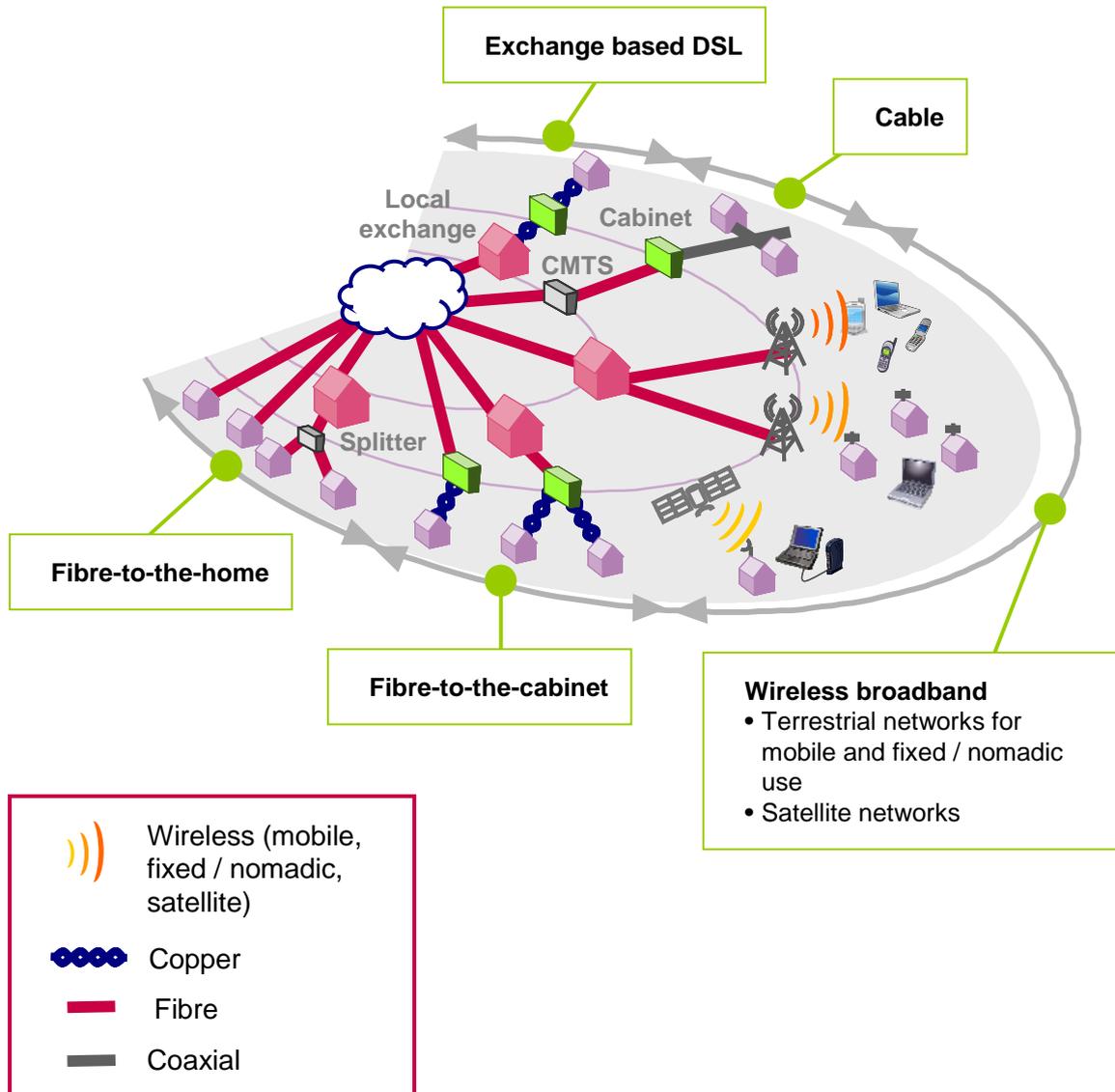
<sup>3</sup> We do not cover broadband access through Power Line Communication as its relative importance (both in terms of coverage and adoption) is limited in Europe and its future role seems unclear.

- technology offering headline downstream speeds of up to 24 Mbps. DSL is currently the dominant source of broadband access in Europe, as discussed in the Annex; see Figure 2 and Figure 3.
- ii. Cable. Originally used to deliver broadcast services and following relevant upgrades, cable networks are now used to deliver broadband services which can reach headline downstream speeds of up to 20 to 50 Mbps or more. In a few Member States such as Belgium, Denmark or the Netherlands, their share of overall broadband access can be significant.
  - iii. FTTx. Fibre networks are the next generation of high-speed wired networks, substantially faster than the latest version of DSL. At present, they are at a relatively early stage of development in Europe. By contrast, in Japan and South Korea, FTTx access already accounts for a large share of subscriptions. Fibre networks can reach different points relative to end-users. This point can be the street cabinet, from which typically a few hundred customers are then served using existing copper lines (headline downstream speeds of up to 40 Mbps), or this can be directly to the user premises, with a fibre connection to each dwelling or office (headline downstream speeds of up to 100 Mbps or more).
- b) Wireless platforms. They use different types of wireless equipment to reach end users via the airwaves.
- i. Terrestrial networks. At present, most wireless broadband subscriptions are delivered through 3G networks, with headline speeds of up to 10 Mbps in some locations. Figure 5 in the Annex clearly illustrates the rapid success of mobile broadband (data services for computers using 3G USB dongles) since operators introduced attractive offerings (in terms of service quality, device and flat tariffs) approximately two years ago. In several Member States, mobile broadband has already taken an important place in the overall picture of broadband access across all platforms (wired and wireless). Figure 7 also shows the trend that data traffic over 3G networks has generally been following recently, with a real explosion in volumes over the past months. Both adoption and use underline the value that users are likely to attach to mobility for broadband. In some Member States, other networks providing fixed, nomadic and in a few cases mobile broadband access also account for a material share of overall broadband access (e.g. use of the spectrum bands 3.4-3.6 GHz in countries like the Czech Republic, Hungary, Ireland and developing in Italy) with headline speeds of up to 10 Mbps or more. In other Member States adoption and use of wireless broadband services other than 3G remains low for the time being.
  - ii. Satellite networks. They are a marginal source of broadband access in the EU in terms of number of subscribers. However they provide blanket coverage of Europe, therefore reaching even the most remote communities, with the exception of coverage of the northern most latitudes from geostationary satellites. Satellite broadband offers typical headline speeds of up to 2 Mbps. Some of the systems currently in operation cover all Member States. These solutions are already part of plans to provide broadband for all in some Member States.
21. It is relevant to note here that unlicensed spectrum use e.g. for WiFi has played an important part in bringing the benefits of broadband to large numbers of consumers and is a real success story. However, it is in effect a localised extension of other services in the categories above rather than a separate category of broadband access in its own right. This is also true of underlay technologies such as Ultra

Wide Band which are at a relatively early stage of development. This paper therefore does not cover such use in any more detail.

22. Figure 1 below illustrates these various delivery platforms.

**Figure 1: illustration of the main types of networks that deliver broadband access to end users**



23. The short descriptions above of the various options for broadband access highlight differences in headline speeds, as some technologies inherently offer better maximum performance levels. These figures support the view that the best wired option is likely to provide markedly higher speeds in most cases than the best wireless option. But it is also worth noting that the best wireless option may offer a competitive technical performance relative to an average wired option (if not better). Speed is only one of a range of parameters that matter to users. Mobile broadband services offer the distinct value of mobility. A broader range of parameters also includes service availability, device capability, content and applications, contractual terms and price.

24. The quality of broadband has improved substantially in Europe in the recent past, particularly as the process of local loop unbundling has gathered pace.
- a) Paragraphs A12 to A15 in the Annex provide indicative comments regarding the quality of wired broadband connections at the end of 2006 and 2007 across a number of Member States. Such factors as the version of the technology actually in place, contention between users connected to the same cabinet and the distance relative to the local exchange can result in a contrast between headlines speeds and the quality levels that users actually experience. The Annex also indicates that there are differences between what users experience in a given country.
  - b) Similar factors also apply to wireless broadband (speeds depend on the technology used, the distance between the user and the base station, the physical obstacles on the way...), with an added complexity for mobile and nomadic services, as the number of users competing for the bandwidth available from one base station can vary through time. In the case of satellite services, contention between particular users can be magnified as a single satellite provides coverage to multi-country regions; latency can also affect the user experience because of the distance that transmissions need to travel between the satellite and the Earth's surface.
25. In practice, some wired and wireless broadband users may not always be in a position to enjoy the sort of experience referred to at paragraph 18 above. The second section below includes further comments in relation to the digital divide in terms of broadband quality.
26. By way of conclusion to this overview, the RSPG notes that there are limitations to the data that are available regarding broadband access and services in Europe. Specifically in relation to wireless broadband, the amount of statistical information available on coverage, adoption and quality of service is generally scarce. These data are central in understanding European broadband markets and in shaping informed policies for the future. The RSPG considers that the availability, validity and accuracy of European statistics and comparisons on wired and wireless broadband, is an important issue. The RSPG therefore encourages the European Commission and Member States in their efforts to collect concise and specific data on wired and wireless broadband access and services on a consistent and comparable basis. For wireless broadband, this should focus on spectrum bands that are harmonised at European level, and should clearly distinguish between the various types of wireless broadband applications (mobile, fixed, nomadic and satellite) and the spectrum bands in which they operate.

## **Tackling the digital divide in Europe**

27. This section first considers which particular aspects of the digital divide this paper focuses on. It then sets out a summary of the wide-ranging plans that Member States are preparing and implementing to address this divide through public initiatives, for which EU funds are available.
28. The digital divide refers to the divide between certain groups of people who have access to and/or make use of certain digital services and others who do not. The dividing line can be a function of a range of criteria, for example gender, age or socio-economic background. This position paper focuses principally on the

*geographical divide* in respect of access to a broadband service (whether wired or wireless), with some areas left without any broadband coverage. This paper also considers the *quality divide* that relates to access to the latest technologies and highest data rates, with some areas only having access to less advanced broadband services (this is likely to be strongly correlated to the geographical divide).

29. At a high level, the data presented in the Annex (Figure 2 and Figure 4) illustrate that in most Member States the current coverage of both wired and wireless networks is likely to leave some areas and communities without broadband access. In addition, amongst users that receive internet/data services above the minimum performance of 128 kbps, some may only enjoy relatively low speeds compared to the best services available in a given Member State or even compared to the average service available. Comparing Figure 2 and Figure 4 also shows that some material increases in the adoption of broadband should be possible by ensuring that some groups that can already get access to broadband services actually adopt them.
30. Member States and the European Commission recognise the importance of broadband in economic terms and in broader social terms. The benefits that broadband can offer include increased productivity, new training mechanisms and new commercial opportunities through access to the internet marketplace. Other benefits extend to wider social aspects such as inclusion and participation of citizens in a range public issues that affect them or developments in public health and safety. Member States and the Commission have identified at a political level that broadband has an important role to play, both in the short term to help in the recovery from the current economic crisis, and just as importantly in the long term for the welfare of EU societies.
31. Member States are therefore developing or implementing plans to tackle the digital divide. These include ambitious plans that cover a range of aspects on the supply side and on the demand side, with important roles for spectrum and wireless services.
  - a) Supply side measures include the creation of incentives, often through public investment programmes, to extend the coverage of broadband networks to areas where services are not currently available, and which go hand in hand with incentives to improve the quality of broadband services in areas already covered. On the issue of quality, several Member States are setting targets for minimum performance levels, often associated with requirements on affordability for users. In some cases, performance targets are of the order of tens of Mbps for all within a few years. Other measures relate to the supply of content such as e-health, e-inclusion and e-government applications, designed to stimulate interest and extend the benefits of broadband services.
  - b) Demand side measures involve activities to train non-adopters in the use of broadband services, to increase confidence in on-line security. In some cases, they also involve user subsidies to help cover one-off costs of equipment such as personal computers, broadband connection equipment or fitting cables to premises, as well as the running costs of subscription to a broadband service.
32. In relation to the extension of broadband coverage, two types of approaches stand out to illustrate the levels at which action can be directed to improve coverage and services.

- a) At a national level, several Member States are establishing nationwide plans to deliver a particular level of broadband service to all. Some are considering minimum performance levels of several Mbps or tens of Mbps within a few years. This can mean stimulating private investment and/or providing public subsidies to compensate a shortfall in private investment at this time. The options for stimulating private investment are wide-ranging. They include, for example, facilitating the installation of new wired and wireless physical infrastructure, making available suitable frequency spectrum below 1 GHz (e.g. digital dividend at 800 MHz, new technologies in the 900 MHz band), or facilitating appropriate network sharing between operators. In an example of nationwide plan involving public subsidy, one Member State (Ireland) purveyed for the implementation of such a national scheme through a public tender for the provision of wireless broadband services with specified requirements in areas of the country not currently covered.<sup>4</sup> Participants in the tender were free to decide which technologies to use to meet the coverage, quality and user tariff requirements, knowing they would benefit from funds from both the State and the EU. Interestingly, the winner of the tender will be using wireless technologies to delivery the services, mainly terrestrial (3G) but also satellite for the most remote communities.
- b) At a local level, some Member States have, where legal and institutional arrangements allow, created conditions for certain public bodies, such as local authorities, to become involved in the provision of broadband services locally, following an assessment of the effects on competition. They can become involved by creating and owning local wired infrastructure that connects to national networks, or by becoming holders of spectrum authorisations that give rights to the use of radio frequencies to deliver services including wireless broadband. Where public bodies can transfer their rights to use spectrum, this can increase the range of options in the search for private partners to deliver local broadband services. These local initiatives have the attraction of providing a local solution to a local issue. For example in France, the France Numérique 2012<sup>5</sup> plan sets out, among other objectives such as mobile broadband for all, policy objectives to reduce the digital divide. They are based on increasing competition and on initiatives involving local authorities to improve competition and broadband coverage in their territories (public private partnership initiatives as part of an overall strategy of extension of wired broadband internet coverage; a label “Universal Broadband Internet” will be soon established).
33. The two levels of intervention above highlight the potentially important role of wireless in bridging the geographical divide, through both terrestrial and satellite networks. However, the relative roles of wired, terrestrial wireless and satellite networks in extending coverage and quality will depend on local circumstances. A “one size fits all” approach to the digital divide is not suitable. The most cost-effective mix of solutions will vary across Member States and within a Member State across regions, depending on their circumstances.
34. Public initiatives to intervene in the extension of broadband coverage and the provision of services can involve considerable public funds, in addition to generating private investment. Specific funds are available from the European Commission to make these plans happen. Such initiatives require a careful analysis

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<sup>4</sup> Tender completed in December 2008. See [www.dcenr.gov.ie/NBS](http://www.dcenr.gov.ie/NBS).

<sup>5</sup> See <http://francenumerique2012.fr/>.

of the impact of intervention on competition and incentives for private investment in the medium to long term. In particular, the RSPG considers that it is important to avoid distorting competition between different platforms for broadband access (e.g. between wired and wireless broadband), where projects benefit from subsidies or other public support.

35. The measures described above provide stimulating leads for Member States and the Commission to reflect on. Their diversity suggests that further information exchanges, both on successes and on less effective implementations, would be valuable exercises to conduct. Subject to interest from Member States and the Commission and to relative priorities within its work programme, the RSPG could host associated discussions in future particularly in so far as they relate to wireless services and spectrum access. This could help Member States and the Commission learn in more detail from national experiences and achieve their goals in respect of the digital divide.
36. In principle, in addition to the geographical divide and the quality divide considered above, there is the possibility of a broadband mobility divide. Adoption and usage trends suggest that consumers are likely to place a specific value and enjoy specific benefits from mobile broadband services. Similarly to issues related to mobile voice coverage, issues could emerge around the lack of availability of mobile broadband coverage in certain areas. This is an issue that the RSPG may want to revisit following the implementation of the current wave of national and European digital improvement plans, given the role of wireless in these plans and the scope for resulting extensive wireless and mobile broadband coverage.

### **Spectrum policy can help make a difference to broadband access and can prepare for future changes that remain uncertain**

37. This section turns to the role of spectrum and spectrum policy in the successful development of broadband access. It covers the harmonisation conditions that favour widespread consumer services, regulatory measures that will help maximise welfare benefits from spectrum that is already harmonised. It also covers how the Commission and Member States should prepare to respond to avoid a potential lack in suitable spectrum for wireless broadband, as well as to allow for potential future developments in technology.
38. To allow services such as wireless broadband to become mass-market services, a suitable spectrum framework is one of the elements that need to be in place. One of the main aims of this framework is to create conditions in which manufacturers can realise economies of scale in the production of equipment, in particular user equipment such as handsets, dongles and wireless broadband computers that will be able to operate in a large number of countries. This includes Europe but also other geographical markets for example in America and Asia as far as possible. The benefits of these economies of scale can then flow to operators, services providers and consumers.
39. European harmonisation has resulted in the identification of a number of spectrum bands for services including wireless broadband through binding European measures. They constitute a substantial core of spectrum suitable for terrestrial wireless broadband comprising the following bands:

- a) Currently in use for mobile services in all Member States with high numbers of subscribers - 900 MHz (880-915 MHz / 925-960 MHz), 1800 MHz (1710-1785 MHz / 1805-1880 MHz), 2.1 GHz (1900-1920 MHz, 1920-1980 MHz / 2110-2170 MHz);
  - b) With different parts currently in use in most Member States and with generally low numbers of subscribers except in a small number of Member States - 3.4-3.6 GHz (available on a non-exclusive basis for terrestrial electronic communications networks, in accordance with Commission Decision 2008/411/EC<sup>6</sup>);
  - c) To be designated by 1 January 2012 and subsequently made available in accordance with Commission Decision 2008/411/EC<sup>6</sup>, noting that it is already in use for wireless broadband in a small number of Member States – 3.6-3.8 GHz;
  - d) Planned for award in most Member States for services including mobile broadband and recently licensed in one - 2.6 GHz (2500-2690 MHz) (available now – subject to derogations – on a non-exclusive basis for terrestrial systems capable of providing electronic communications services in accordance with Commission Decision 2008/477/EC<sup>7</sup>).
40. The RSPG recognises that, due to local circumstances in some Member States or regions (e.g. geography, demography, market demand, number of commercial operators, availability of spectrum in some bands), some of the spectrum bands above may be partly unused at this stage (e.g. in the range 3.4-3.8 GHz) or the use of some bands may not already be authorised (e.g. 2.6 GHz).
41. The RSPG considers that in order to help deliver the full benefits of wireless broadband, it is important to ensure that these harmonised bands are authorised in a way that supports investment and innovation. This specifically means ensuring as soon as practicable, in light of national circumstances, that new technologies, including UMTS and when available LTE, can be used in the 900 MHz and 1800 MHz bands and that mobility is allowed across the pool of core bands identified above. The implementation of corresponding measures at national level should take due account of relevant regulatory considerations that relate to a Member State's specific context, for example in relation to potential competition issues.
42. Some bands within the core list above are becoming available for award in the short to medium term across Europe, particularly the 2.6 GHz band and in some cases frequencies in the 3.6-3.8 GHz band. Member States are also considering whether – and, if so, how best – to make available a digital dividend at 800 MHz. The RSPG considers that the prompt authorisation for use of frequencies, when spectrum becomes available for uses including wireless broadband, is a key element in ensuring successful development of these services. This will help address the risk of shortages of spectrum in the short to medium term and will provide opportunities for timely innovation and new competition. Awards of cleared spectrum are an important complement to liberalisation of bands that are extensively used at present, as they can facilitate early introduction of new technologies, services and competitors. According to a large number of Member States (from responses to the questionnaire), a significant amount of spectrum will

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<sup>6</sup> Commission Decision of 21 May 2008 on the harmonisation of the 3 400-3 800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community.

<sup>7</sup> Commission Decision of 13 June 2008 on the harmonisation of the 2 500-2 690 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community.

become available in the coming years for electronic communications services and is likely to be used to roll out the next generation of wireless broadband networks.

43. The RSPG also noted that wireless broadband is likely to increase the needs for higher capacity for wireless base station backhauling. While noting that other mitigating options may be available (e.g. femtocells), improving fixed links capacity is likely to be needed in some bands. This issue is best managed at national level.
44. Beyond the European core of frequencies suitable for wireless broadband and their conditions of use, the RSPG considered how to continue facilitating the development of wireless broadband in the EU. As explained at paragraph 26, the RSPG believes that it would be beneficial to improve the availability of specific, consistent and comparable data on the availability and quality of wireless broadband services in Europe. Such information would help in characterising current market circumstances at regular points in time and therefore in thinking about potential future developments. In addition, the RSPG considers that the Commission and Member States should be prepared to react promptly to potential future additional spectrum requirements and risks of shortages of suitable spectrum for wireless broadband. This is considered in more detail below.
45. Spectrum managers are always likely to be on the receiving end of demand for more spectrum for particular uses for reasons that include the following. First, more spectrum could help realise cost savings and/or access new markets for operators, depending on the characteristics of the spectrum involved. Second, requests for more harmonised spectrum to serve future demand may come at little or no costs to those who make them. However there are many competing uses for spectrum, both existing and potential, that may include wireless broadband but also other services. Also, as is generally the case with prospective analysis including in consultation with stakeholders, it is particularly difficult to establish with real precision what the future will look like in 10 to 20 years. But there are also costs to not adopting a forward look and not anticipating change so the RSPG considers that it is important to do so in a timely way.
46. There are three main elements that guide the RSPG's views on potential additional spectrum for uses including wireless broadband.
  - a) As discussed above, there is a substantial amount of spectrum available for uses including wireless broadband (2.1 GHz; parts of 3.4-3.6 GHz and of 3.6-3.8 GHz), and Member States are making further spectrum available to the market for these purposes in the short term (2.6 GHz; digital dividend at 800 MHz where relevant and new uses at 900 MHz and 1800 MHz). Due to local circumstances (e.g. geography, demography, market demand, number of commercial operators, availability of spectrum in some bands), in some Member States or regions, some spectrum may be partly unused at this stage (e.g. in the range 3.4-3.8 GHz) or the use of some bands may not already be authorised (e.g. 2.6 GHz).
  - b) Perception is that there is a marked increase in the use of mobile broadband and that traffic on the internet backbone has changed by orders of magnitude in the space of a few years as video applications have become available and ever more popular. This outlines the possibility that user demand could continue to increase so as to make additional wireless broadband spectrum highly desirable or even essential in the medium to long term. However, this is by no means certain and a different scenario could unravel for example in which demand is suitably accommodated in current spectrum allocations in the medium to long term. This could be because of actual levels of demand at the time or the effect of technological

improvements on capacity for example. In addition, circumstances may differ between Member States, as Figure 6 in the Annex suggests with varying patterns in the adoption of wireless broadband services at this stage.

- c) The lead times to identification of additional spectrum in the EU, to industry's response to this identification (by way of standards and equipment development) and to making spectrum available at national level can be long and are interlinked to a large extent. In principles, there are risks that a delay in the identification of additional spectrum for a particular use could play a part in constraining market developments and reducing benefits to society.
47. The RSPG therefore considers that in preparing for the future, Member States and the European Commission should be ready to take appropriate and timely action where a shortage in the availability of spectrum for wireless broadband is identified. This would be likely to involve identifying additional spectrum at European level. Spectrum bands which are likely to be suitable as further supply for electronic communications services including wireless broadband fall into three main categories, depending on the band and/or depending a Member State's circumstances. First, there are spectrum bands which may become available in some Member States as a result of changes in the way that public sector spectrum is used (e.g. at 4.4-5.0 GHz in the UK).<sup>8</sup> Second, there are spectrum bands where spectrum may become available as a result of releases by other categories of existing users. Finally, there are additional spectrum bands that may already be available for these uses in some Member States.
  48. The RSPG also noted that infrastructure sharing between wireless broadband operators may provide some scope for increasing the capacity of networks and addressing potential spectrum shortages. The Commission and Member States could consider sharing information on this subject in the context of the European Regulators Group, covering aspects such as potential effects on competition.
  49. The European Union already has in place the institutional framework to deal with the challenge of identifying further spectrum for electronic communications services including wireless broadband. The Commission can act through the RSPG to identify its strategy and policy on this aspect. The Radio Spectrum Committee can then adopt technical implementation measures to develop this strategy for particular spectrum band(s). The Commission and Member States should be ready to act within this framework in a timely way. This overall EU legislative framework for electronic communications is currently under review and the Commission and Member States should also be ready to consider action under the resulting new legislative framework when it comes into force.
  50. Regarding the identification of further spectrum, the RSPG encourages a coordinated and harmonised approach to create suitable conditions for economies of scale, based on least restrictive technical conditions for these purposes, allowing flexibility over the services and technologies that may be deployed.
  51. Finally, technology development is a key enabler of better broadband and more generally better spectrum use. The RSPG welcomes efforts by Member States and the European Commission to consider how future technological developments may change the way in which some wireless equipment is likely to use, need or access

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<sup>8</sup> See the RSPG opinion on best practices regarding the use of spectrum by some public sectors, 2009.

spectrum. This should inform the development of the conditions of today's spectrum authorisations. This is particularly relevant in respect of cognitive radio and dynamic spectrum access which may provide new opportunities within the lifetime of some existing spectrum authorisations and of authorisations which will be granted in the near term. The RSPG work programme for 2009<sup>9</sup> includes a specific work stream on cognitive technologies which will help taking this issue forward.

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<sup>9</sup> RSPG Work Programme 2009- Document RSPG09-253 rev 1  
([http://rspg.groups.eu.int/doc/documents/meeting/rspg18/rspg09\\_253\\_workprogramme2009\\_rev1.pdf](http://rspg.groups.eu.int/doc/documents/meeting/rspg18/rspg09_253_workprogramme2009_rev1.pdf)).

## **Annex 1 – summary of available data on wired and wireless broadband**

- A1. This Annex provides a summary of relevant information that the RSPG considered during its work on the issue of wireless broadband. The information relates to the two main issues that the group investigated: the digital divide (geographical and quality) and potential future requirements.
- A2. The RSPG ad-hoc working group looked at a range of data sources and selected sources that seemed appropriate, in particular:
- IDATE reports on Broadband Coverage in Europe<sup>10</sup> (2007 Survey, data as of 31 December 2006 and 2008 Survey, data as of 31 December 2007); and
  - the Communications Committee's Working Document on broadband access in the EU (situation at 1 July 2008).<sup>11</sup>
- A3. These sources include estimates either from those who prepared the reports or from parties such as operators who submitted information. When third parties such as operators make data available, there can be differences in the nature of the data reported for a given indicator or in the way they were measured or assessed. It is therefore important to treat the data with caution. However, they provide a helpful guide to the situation across the countries covered and are an important source of information for the purposes of this position paper. As noted in the main part of this document, the RSPG recognises that improving the availability of meaningful data on the development of wireless broadband access and services on a consistent and comparable basis in Europe would be beneficial.
- A4. Other sources provide similar relevant information (OECD, Eurostat, a COCOM report of July 2008). However, the IDATE report is particularly relevant in that it contains information on all Member States, on the population coverage of networks and the data transfer speeds of wired networks, both important elements in considering the digital divide. This is why this Annex uses this source, which covers data up to December 2007, even though other sources may have more recent data on some other indicators.
- A5. Where possible this Annex includes some data on Japan, South Korea and the USA by way of benchmark (see wired broadband penetration).
- A6. This document includes several charts. The order in which countries appear in charts remains the same throughout and is as per the order of the first chart, i.e. with countries ranked by level of DSL coverage (based on the IDATE data as of 31/12/2007).

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<sup>10</sup> Data as of 31/12/2006 - [http://ec.europa.eu/information\\_society/eeurope/i2010/docs/benchmarking/broadband\\_coverage\\_10\\_2007.pdf](http://ec.europa.eu/information_society/eeurope/i2010/docs/benchmarking/broadband_coverage_10_2007.pdf). Data as of 31/12/2007 - [http://ec.europa.eu/information\\_society/eeurope/i2010/docs/benchmarking/broadband\\_coverage\\_2008.pdf](http://ec.europa.eu/information_society/eeurope/i2010/docs/benchmarking/broadband_coverage_2008.pdf). Data for Romania and Bulgaria, who joined the EU in 2007, are not available in these IDATE reports for the indicators considered here.

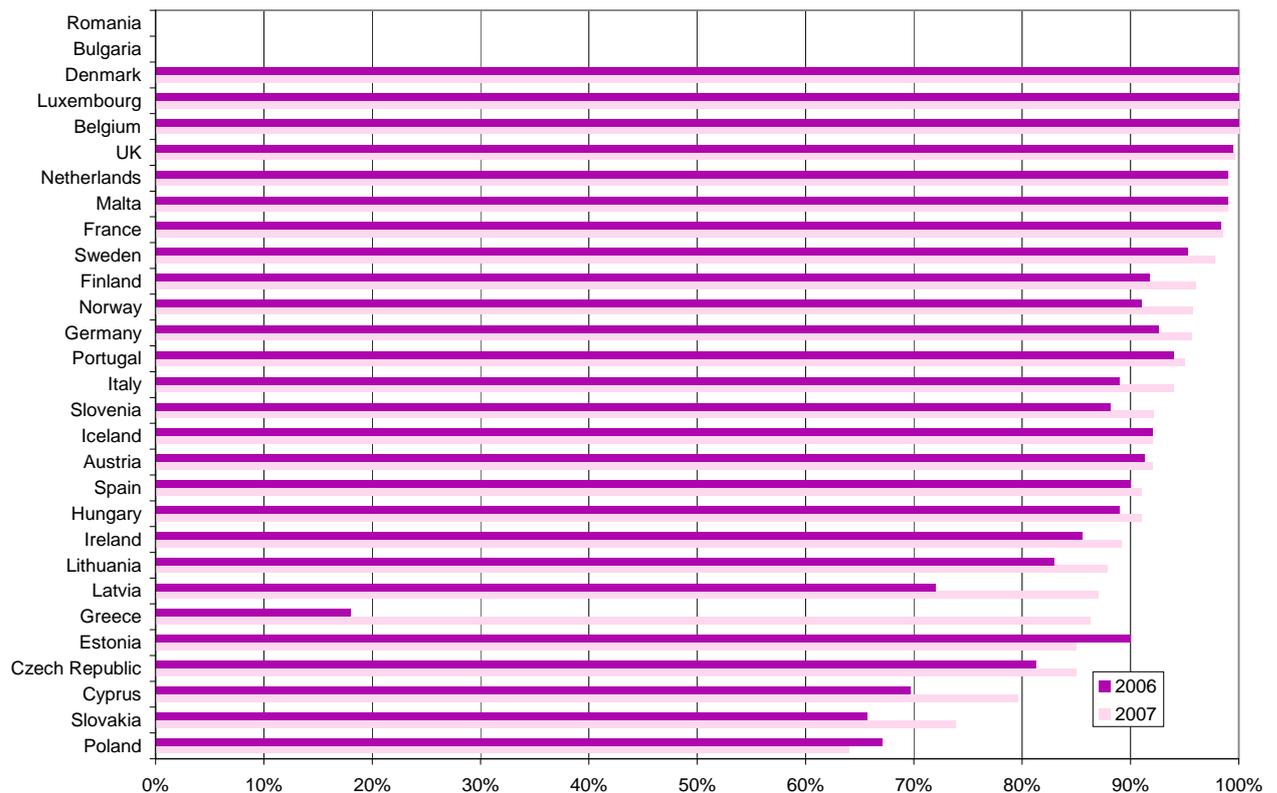
<sup>11</sup> [http://ec.europa.eu/information\\_society/policy/ecomms/doc/implementation\\_enforcement/broadband\\_and\\_access/Broadband\\_data\\_july\\_08.pdf](http://ec.europa.eu/information_society/policy/ecomms/doc/implementation_enforcement/broadband_and_access/Broadband_data_july_08.pdf)

- A7. The structure in this Annex is as follows and summarises the indications that the RSPG ad-hoc working group took away from the available information it considered.
- a. Wired broadband networks generally cover a large majority of the population in European countries, but few Member States achieve 100% coverage.
  - b. The quality of service that parts of the population can receive may be limited.
  - c. Some material gains in broadband adoption are likely to come from stimulating adoption for those who are already covered.
  - d. Mobile broadband coverage varies significantly across Europe and rarely offers clear prospects at present of achieving coverage where wired networks are not available.
  - e. A rapid increase data traffic marks today's early development of mobile broadband, while future development could follow a range of different courses.

**Wired broadband networks generally cover a large majority of the population in European countries, but few Member States achieve 100% coverage**

- A8. Figure 2 below shows the proportion of population that can get access, i.e. are covered by DSL services. The IDATE coverage figures tend to overestimate coverage as some subscribers who are covered by broadband in principle may not or can not receive a broadband service in particular if they are some distance away from an exchange. The issue of broadband quality is covered further below.
- A9. This Annex uses DSL for the wired coverage indicator, as in all countries mentioned, cable coverage (and FTTx coverage) is lower. It seems reasonable to assume that there will generally only be a marginal number of people (if any) covered by cable broadband (or FTTx) but not by DSL.
- A10. The main messages are as follows.
- a. Few countries report coverage levels of 100% of the population. In these cases, it might also be that the scope for overestimate of coverage means that the real values could actually be less.
  - b. Therefore, at present, in most European Member States, wired broadband has so far left a digital divide within each State that can in some cases be quite significant (with over 20% of the population still not covered) or relatively small but seems enduring (a few percentage points or even tenths of a percentage point).
  - c. As explained above, there are a number of reasons for considering these data with caution. For example, the definition of broadband may vary from country to country (with broadband being linked to speeds of 512 kbps or more in some countries) and different processes for gathering or assessing the data. This results in limitations on the comparability of the data for parameters such as coverage and penetration.
- A11. This highlights the widely held view that in a number of Member States, reaching (near) 100% broadband coverage through wired networks is often not technically and commercially viable and that extending the coverage of wired networks may not be the most cost-effective way to reduce the digital divide in terms of access.

**Figure 2: Percentage of population covered by wired broadband (DSL, 12/2006 and 12/2007)**



Source: IDATE, Broadband Coverage in Europe (2007 and 2008 surveys, data as of 31 December 2006 and 31 December 2007).

Note that the figures may overestimate coverage.

### **The quality of service that parts of the population can receive may be limited**

A12. It is important to complement the information on coverage (a binary issue: covered or not) with some additional information on the quality of service available. The research to prepare this Annex has not identified information on the broadband speeds available to the population covered.

A13. However, the IDATE reports provide information on the broadband speeds that subscribers (i.e. those that are covered and take up wired broadband but not those that are covered and do not take up the service) receive. This is only an approximation for the overall quality of broadband that is available (for example, it is possible that some of those who are covered but do not subscribe choose not to at least in part because they consider the speed of available services too low). However, this is a helpful indicator to get a sense of the issue.

A14. The IDATE reports show that the speeds that subscribers receive have generally increased between 2006 and 2007, sometimes rather markedly. However, they also show that, in some Member States, speeds below 512 kbps and below 1Mbps are likely to account for a non-trivial proportion of subscriptions (see IDATE reports for more detail).

A15. Considering coverage figures in light of broadband speeds is important to assess

availability against particular objectives. In broad terms, the IDATE information on broadband speeds suggests that coverage figures may need to be revised down when taking account of particular service quality targets.

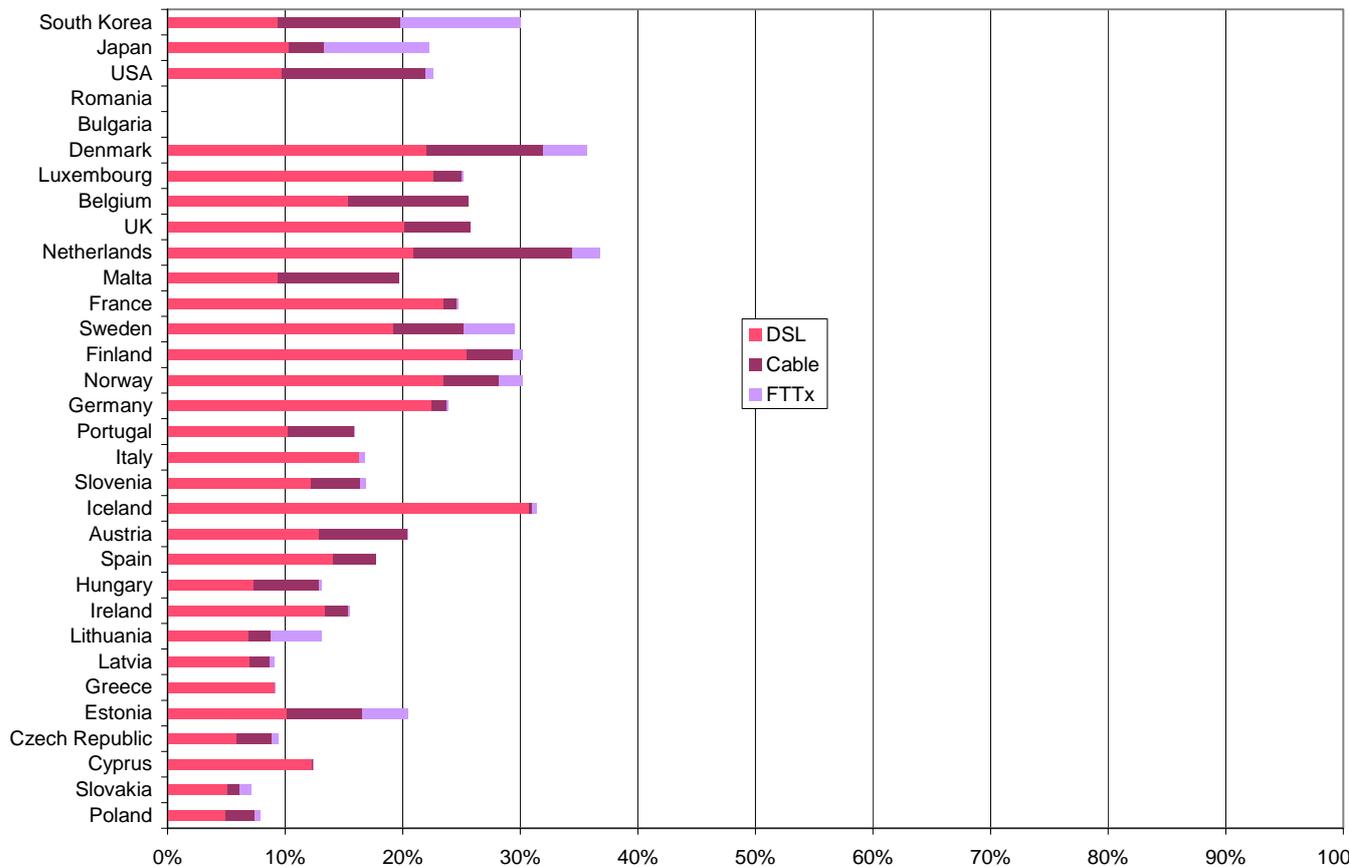
### **Some material gains in broadband adoption are likely to come from stimulating adoption for those who are already covered**

A16. This section considers adoption, i.e. a measure of subscriptions to wired broadband services as a percentage of the total population. In the case of wired broadband, it is relevant to bear in mind that subscriptions relate to a fixed location, i.e. a household or a business site. Therefore full adoption at all relevant sites would not result in 100% population penetration but in a lower figure. The RSPG also noted that a wireless broadband subscription could relate to either a household (e.g. fixed/nomadic terrestrial or satellite broadband) or an individual consumer (e.g. mobile broadband).

A17. Figure 3 below illustrates the fact that in most if not all Member States, a significant progress in extending broadband penetration is likely to be possible by stimulating adoption of services for those already covered. Taking the level of adoption for all those that are covered by wired broadband to its maximum is likely to mean, in most cases, a material reduction of the digital divide of say at least 10% or more (as a % of population).

A18. An objective to stimulate adoption for those already covered is distinct from any objective to reduce the digital divide by seeking to increase coverage or to ensure (near) full population coverage. These two objectives can of course exist in parallel (or in sequence).

**Figure 3: Wired broadband penetration – subscriptions as a percentage of total population (DSL, cable, FTTx, 12/2007)**



Source: IDATE, Broadband Coverage in Europe (2008 Survey, data as of 31 December 2007), except for South Korea, Japan and USA.

Source for South Korea, Japan and the USA: Analysys, Broadband Area: connections and penetration, data for 12/2007.

A19. Figure 3 includes data on Japan, South Korea and the US by way of benchmark. This suggests that overall, a number Member States score relatively well compared to these three countries in terms of overall penetration as a percentage of population. However, the proportion of FTTx penetration in Japan and South Korea suggests that the quality of broadband is likely to be different and higher there.

**Mobile broadband coverage varies significantly across Europe and rarely offers clear prospects at present of achieving coverage where wired networks are not available**

A20. The latest IDATE report also includes information on wireless broadband coverage, through the coverage of 3G networks. This information probably needs to be treated with even more caution than other statistics included in this Annex for reasons that include the following.

- a. The coverage figure for a given country is generally that publicly reported by the operator that declares the highest level of coverage in that country. It is therefore unlikely that these coverage levels are measured according to a consistent methodology.

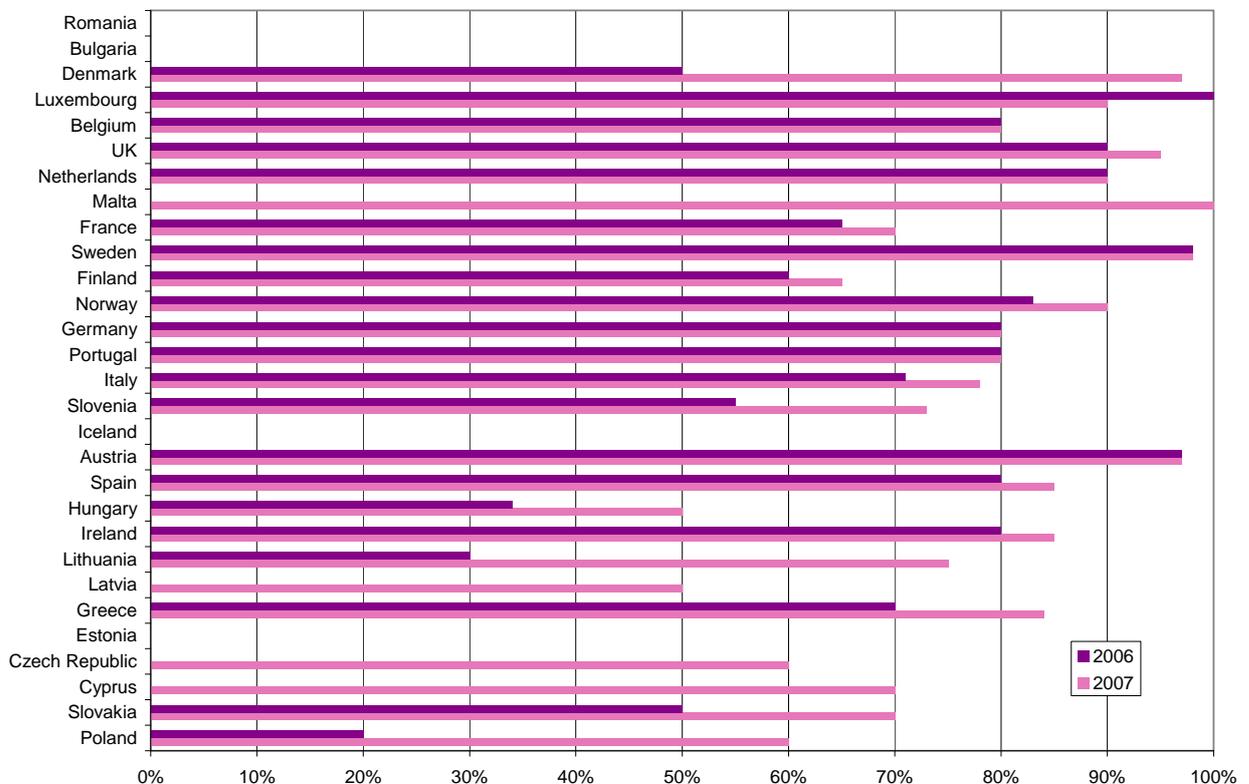
- b. Whether a user can enjoy a mobile broadband experience within an area of coverage will depend on such factors as the contention ratio (how many users are attempting to receive mobile broadband services at a given time within the coverage area of a base station) and the user's position relative to the base station (the user's distance relative to the base station; whether there are obstacles such as buildings or walls...).

A21. However, three elements that may be drawn from the IDATE data are that::

- a. reported 3G coverage levels varied significantly across the 27 Member States in December 2007, from 50% to 100%, reflecting different stages in the development of 3G networks;
- b. 3G coverage generally does not extend beyond wired broadband coverage in the EU. Therefore, under the circumstances captured in the IDATE report as at the end of 2007, it seems unlikely that 3G networks operating at 2.1 GHz could provide broadband coverage where wired networks do not (or at least not without further development where this is possible);
- c. the IDATE information gives an assessment of the percentage of population that is covered by 3G networks. Population densities vary sometimes significantly between Member States and, together with a Member State's geographical features, it can have a strong influence on how easy or difficult it is to achieve a certain level of population coverage.

A22. There may however be exceptions to this general observation where 3G population coverage could exceed that of wired broadband.

**Figure 4: 3G networks coverage (% of population covered, 12/2006 and 12/2007)**

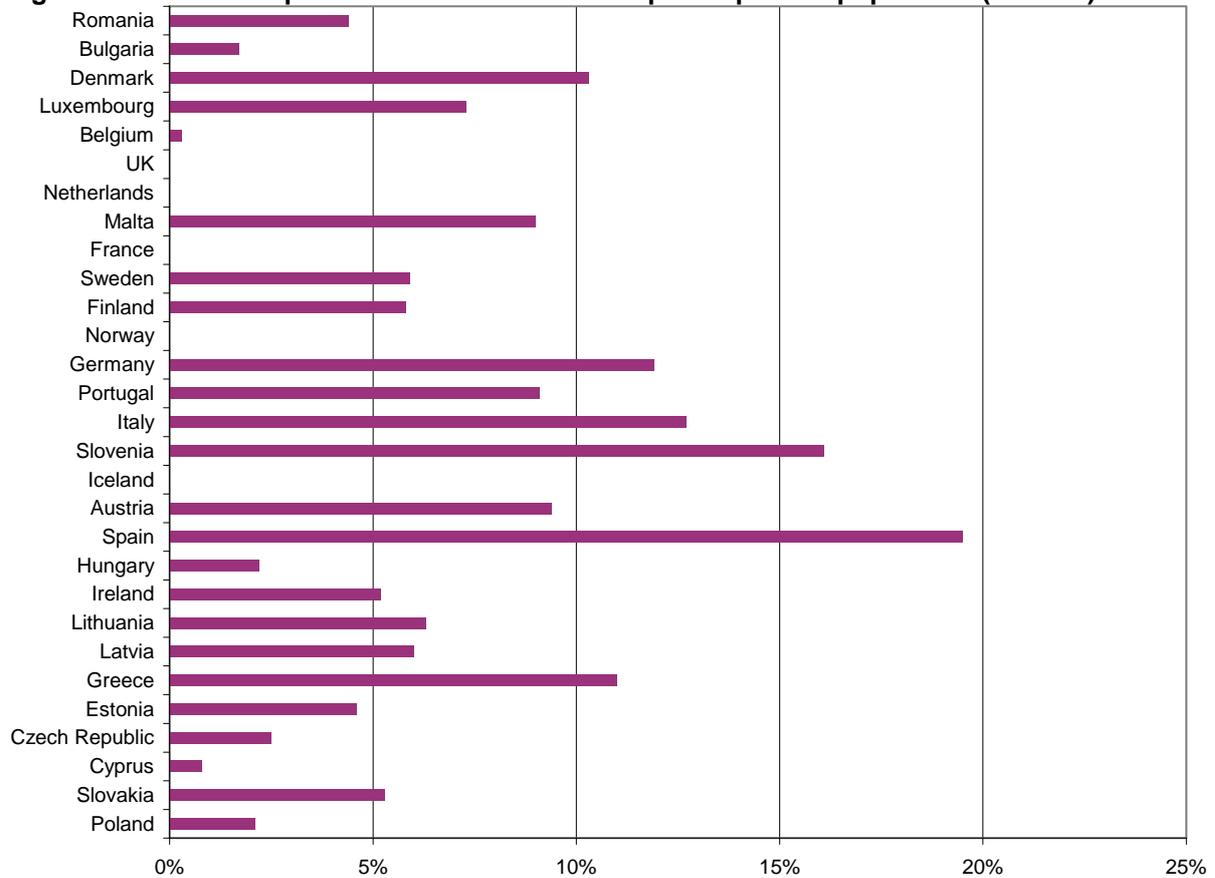


Source: IDATE, Broadband Coverage in Europe (2007 and 2008 surveys, data as of 31 December 2006 and 31 December 2007)

A23. The COCOM working paper of July 2008 also provides some estimates of the penetration of mobile data services using both handsets and data cards/dongles.

Figure 5 illustrates the diversity of penetration in Europe, which ranges from less than 1% to almost 20% of the population according to the data, and the early stage in the take-up of mobile data services.

**Figure 5: mobile data penetration in active subscriptions per 100 population (07/2008)**



Source: COCOM, Working Document on broadband access in the EU, July 2008

Note: estimates may not have been provided on a consistent basis

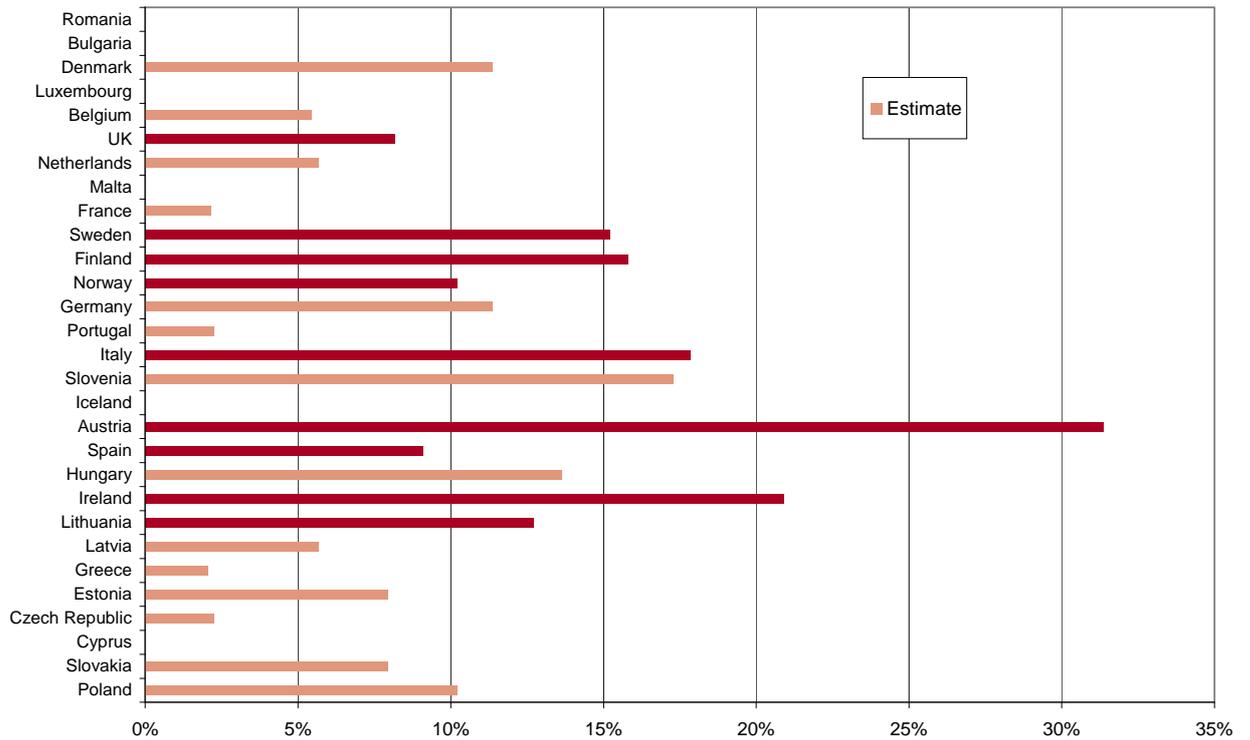
### **A rapid increase data traffic marks today's early development of mobile broadband, while mobile data revenues may not be following at the same pace**

A24. Finally, this section considers some of the indicators of the importance of wireless broadband and of trends in its development.

A25. The first indicator is the share of mobile broadband users (3G dongles and data cards) as a proportion of the total number of broadband subscriptions (wired and wireless). There is limited public information available on such metrics and the data below is taken from a public presentation by Analysys Mason. It comprises a number of estimates and does not include a detailed description of the methodology used for preparing the data. The RSPG emphasises the limitations of this information but considers that it provides a helpful indication given the availability of data on these issues. These data, shown in Figure 6, suggest that:

- a. like for 3G coverage, there are large differences between those countries for which data are available;
- b. mobile broadband accounts for a significant share of broadband subscriptions, over 10% and up to 31%, in 12 Member States.

**Figure 6: Mobile broadband subscriptions as a % of total broadband subscriptions (wired and wireless, 2008)**



Source: Analysys breakfast briefing - The Impact of mobile broadband on MNO network investment, 25 November 2008<sup>12</sup>.

A26. Table 1 below summarises the information covered in this Annex for those 12 Member States; it is extracted from previous figures.

<sup>12</sup> Analysys Mason, Breakfast Briefing, London, 25 November 2008, <http://www.analysismason.com/PageFiles/8262/Analysys%20Mason%20Breakfast%20Briefing.pdf>

**Table 1: main indicators for 12 Member States where mobile broadband accounts for 10% or more of total broadband subscriptions (12/2007, except mobile broadband penetration 2008)**

	National DSL coverage (% of pop.) 12/2007 IDATE	Wired broadband penetration (% of pop.; DSL, cable, FTTx) 12/2007 IDATE	3G coverage (% of pop.) 12/2007 IDATE	Mobile broadband penetration (% of total broadband subscriptions) 2008 Analysys Mason
Poland	64%	8%	60%	10%
Lithuania	88%	13%	75%	13%
Ireland	89%	15%	85%	21%
Slovenia	92%	17%	73%	17%
Italy	94%	17%	78%	18%
Hungary	91%	13%	50%	14%
Norway	96%	30%	90%	10%
Austria	92%	20%	97%	31%
Finland	96%	30%	65%	16%
Germany	96%	24%	80%	11%
Sweden	98%	30%	98%	15%
Denmark	100%	36%	97%	11%

A27. The information in Table 1 and paragraphs A12 to A15 suggests that there may be two main categories within these 12 countries:

- a. some Member States where the available coverage and/or speeds of wired broadband might not be significantly better than those of 3G mobile broadband, e.g. where there are relatively high proportions of wired subscriptions with speeds below 512 kbps and between 512 and 1024 kbps;
- b. other countries offer relatively high connection speeds and penetration rates for wired broadband, suggesting that other factors such as the value of mobility to users, consumer spending power and/or pricing of mobile broadband services might drive adoption.

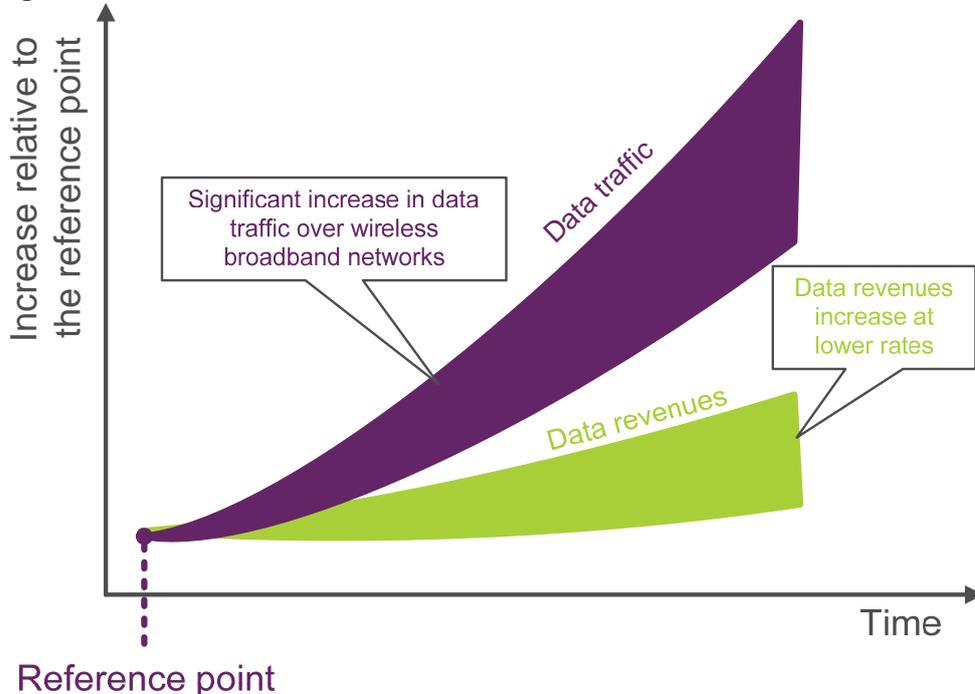
A28. This may underlie different circumstances for mobile broadband adoption, either mainly as a complement to wired broadband (consumers subscribing to both) or mainly as a substitute (consumers subscribing to one and not the other). However, the data covered in this Annex does not support any firm conclusions on these aspects.

A29. For the purposes of this Annex, the RSPG ad-hoc working group has not considered pricing levels in any detail. However, it recognises that they are likely to be an important element in understanding take-up and use of mobile broadband (3G) services.

A30. The increase in data traffic over 3G networks is another key indicator of the growing importance of mobile broadband and the enthusiasm with which users have adopted this service. It is relatively early in the development of these services and therefore only limited data is available. However, some clear trends seem to be emerging, which are represented in Figure 7. These trends are mainly based on limited market information from Member States and anecdotal evidence from public sources. They should therefore be taken with caution and considered as an early indication of current circumstances. This figure illustrates the trend that data traffic over 3G networks appears to have followed across some Member

States since the introduction of new internet friendly devices (recent smart phones, USB dongles) and of flat tariffs for data services. The graph seeks to highlight the particularly substantial increase in data traffic over 3G networks in recent months.

Figure 7: Trends in data traffic and revenues over 3G networks



Source: Ofcom, Analysys (Research report - Mobile broadband: another substitution threat for fixed operators? August 2008), 2008

A31. Figure 7 also contrasts the increase in data traffic against the trend that revenues for data services have generally followed over the same period. Available information suggests that, while revenues from data services have been increasing, there appears to be a clear difference between the rate of increase of data revenues and that of data traffic. This suggests that there might be different scenarios for how mobile broadband could develop in the future.

A32. Above all, the general trends on mobile broadband adoption and use does suggest that consumers are likely to value mobility for broadband data services. There are also other specific aspects of mobile broadband that distinguish it from wired services to date, such as the availability of “pay-as-you-go” plans, which free consumers from the need to enter into long term contracts to gain access to broadband from a computer or a mobile device.