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IMPACT ASSESSMENT

Accompanying document to the

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN
PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

"Transforming the digital dividend into social benefits and economic growth"

and the

COMMISSION RECOMMENDATION

Facilitating the release of the digital dividend in the European Union

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SUMMARY OF CHANGES IN RESPONSE TO THE OPINION OF THE IMPACT ASSESSMENT BOARD

In its opinion the Impact Assessment Board requested improvements to the draft version of this Impact Assessment and issued the following main recommendations:

- The report should be strengthened with regards to the social and distributional impacts of the proposed measures, in particular on affected groups of consumers. It should also address more explicitly the distributional impact on individual Member States as well as on border regions and on third countries. It should also provide a summary of the underlying economic analysis and methodology used to estimate the projected benefits and costs on all relevant points of the main proposals;
- The report should integrate the main results of the stakeholders' consultation;
- The report should better explain what follow-up measures are envisaged and how the impact of these measures will be assessed, including in the case of the proposed technical harmonisation measure.

This final version addresses the comments of the Board in the following manner:

With respect to the first point, the revised Impact Assessment clarifies the social benefits in the background section (1.1). It also addresses distributional aspects under relevant options in the policy options (5) and assessment section (6), mainly the impact on groups of consumers and specific Member States of earlier analogue switch-off, the impact on the broadcasting sector, individual Member States and third countries of creating a sub-band for electronic communications services, and the impact of the same measure on the existing users of the band, mainly the users of wireless microphones.

Regarding analogue switch-off, one has to be aware that the current initiative could only affect the precise timing of the switch-off on 1 January 2012 but not the principle of switching off analogue TV by 2012, which was already agreed with Member States in the context of the Communication of 2005 on the switchover to digital broadcasting and ensuing political discussions¹. The other proposals regarding the achievement of the optimal use of spectrum in the UHF band (section 4.2) are presented to initiate a debate at EU level. They are at an early stage of development and do not therefore include concrete action at Community level. Therefore, these proposals could not be assessed with any great level of detail and further impact assessment may be required at a later stage.

Regarding the need to clarify the methodology used to assess benefits, the main text of the document is more explicit on the assumptions and the scope of the underlying analysis. In addition, the full version of the Commission study is made public.

The results of the public consultation have been integrated in the main text of the report as requested. The responses allowed a more nuanced assessment to be made of a certain number of issues but did not reveal fundamentally new developments, or changes, regarding the position of the main stakeholders.

With respect to the follow-up measures, these were addressed mainly by improving the section on the background (1) and problem definition (2) and by specific clarification in the sections on policy options (4) and assessment of impacts (5).

¹ COM(2005) 204, Communication on “Accelerating the transition from analogue to digital broadcasting”, 24 May 2005 and Council Conclusions of Telecom Council of 1/5 December 2005.

1. BACKGROUND, CONTEXT AND CONSULTATION

1.1 Background and context

This Impact Assessment accompanies proposals for a co-ordinated approach to the use of the radio spectrum freed up by the switchover of terrestrial TV transmission from analogue to digital format (Digital Terrestrial Television, or DTT) in order to maximise the social and economic benefits that can be reaped from this unique opportunity in the EU.

1.1.1 A significant amount of radio spectrum becoming available concurrently in Europe

This spectrum becoming available, located in the UHF (470–862 MHz) frequency band, is the result of the superior transmission efficiency of digital broadcast technology which requires five or six times less frequency than the old analogue one in order to transmit the same number of programme channels. It is commonly referred to as the "**digital dividend**".

1.1.2 Main objectives of the initiative

This initiative aims at taking advantage of the unique opportunity of the digital dividend at EU level in order to ensure that:

1. **There will be sufficient spectrum available in Europe to address the issue of rural access to broadband services** (where a wireless infrastructure is often the only workable solution) as well as **the issue of the "digital divide"**. "Broadband for all" is a primary objective of the EU's i2010 policy framework² and is linked to the European Economic Recovery Plan. This objective includes bridging the 'digital divide' between areas that have limited or no broadband coverage (typically in rural areas) and those that have access to high-speed broadband, as an important way of supporting social and economic cohesion. These objectives are also an integral part of the Commission's broadband initiative which is in the process of being adopted by the Commission. In addition, wireless broadband infrastructures could also be used by public services such as for PPDR (Public Protection Disaster Recovery) applications. From a societal perspective, access to broadband communications can have a significant impact on the competitiveness of the EU economy in terms of productivity gains and social impact, for example by increasing employment, reducing the need for mobility and providing more efficient health care and public administration services to the citizens. Finally, the digital dividend constitutes the most cost-effective spectrum to be allocated for the launch of the next generation of high-speed mobile broadband communications (typically used for smart phone and netbook PC connections).
2. In addition to the spectrum used for wireless broadband services, **there will also be sufficient transmission capacity for the future development of terrestrial broadcasting services** (e.g. High Definition Television) by increasing the average efficiency level of television transmission infrastructures. Terrestrial broadcasting has entered a period of intense transformation and innovation as it makes the transition to digital format. High Definition TV and mobile TV are high on the agenda in some Member States. Increasingly, the number of television programming channels creates

² Communication from the Commission "i2010 - A European Information Society for growth and employment"

the prospect of greater media pluralism, growth in media content production, and higher-quality, more interactive services. Spectrum is a rare public resource and it is important to ensure that there is an optimum use of this limited capacity by all users including by the main incumbent user (broadcasters). This objective must also take into account the Member States' competencies in the field of audiovisual policy, in particular in relation to cultural diversity and pluralism. Support for audiovisual and media policies is a priority goal for EU spectrum management.

1.1.3 A spectrum with exceptional qualities

The digital dividend is particularly suited to facilitate the achievement of the above objectives because the related frequencies are located in a very attractive part of the radio spectrum, offering ideal propagation characteristics: radio signals in these frequencies can travel over relatively long distances, reducing the number of costly transmitters, and can also penetrate buildings easily, meaning terminal equipment can be easily used indoors. These frequencies can also carry a significant amount of data and allow the use of relatively small antenna, which is particularly suitable for mobile devices.

1.1.4 The potential social and economic benefits are significant

High potential value

The digital dividend represents a rare opportunity in Europe when a significant amount of spectrum suitable for a variety of uses is becoming available across all Member States in a relatively similar timeframe. It has therefore attracted a lot of interest from potential users, with demand from users likely to significantly exceed supply. More generally, the digital dividend is truly a unique opportunity for Europe to meet the growing demand for radio spectrum, particularly for the wireless services described above, and can therefore contribute significantly to the Lisbon goals of competitiveness and economic growth and satisfy some of the most important emerging social, cultural and economic needs for the benefit of European citizens. The digital dividend carries both high economic as well as high social and public value. It would be counterproductive to oppose these two types of value as they often complement each other: it is clear that wireless access to broadband services creates public benefits such as "access for all" to the Internet, and hence an increased access to educational and cultural information, while offering cost savings and revenue opportunities for operators. At the same time, broadcasting services bring high value content through a number of platforms including terrestrial transmission in the UHF-band, IPTV on broadband access, and other platforms. Many predict the convergence of both domains in the long term, especially when taking into account the blurring separation between types of content and types of distribution platforms.

Social impact

The expected social benefits of the initiative are considerable and they derive from two main services having crucial importance for society: broadband access for citizens in presently underserved areas and improved broadcasting services. A number of studies³ have demonstrated the direct and indirect social effects of those applications. The need for additional broadband capacity in particular is at the core of the ongoing broadband initiative

³ See for instance Plum Consulting, *Restructuring Europe's economic and social progress: unleashing the potential of ICT* (January 2006); Ovum, *Bridging the Digital divide – less technology, more understanding* (23 March 2009).

and has also been elaborated in this context⁴ and reiterated recently by the Radio Spectrum Policy Group (RSPG) in its position paper of 14 May 2009⁵. A sizeable part of these benefits can be triggered at local and national level but this Impact Assessment looks at the significant incremental social value that can be generated by this specific Community initiative. The Impact Assessment also considers some negative impact of specific measures on selected communities of users (e.g. cost of upgrading equipment to continue receiving television programmes after the transition to digital format for consumers who can not afford to replace their old analogue TV set⁶) and in some cases, on specific Member States (e.g. Member States exposed to interference from third countries preventing the deployment of new services).

1.1.5 Limited window of opportunity

There is an urgent need to give access to the digital dividend spectrum to contribute to economic recovery

The current economic crisis clearly underlines the urgency of making sufficient radio spectrum available for wireless communications, which currently represent the most vibrant link in the technological innovation chain. They are essential to creating further efficiency gains and cost savings in the broader economy and are thus a key driver for economic recovery. The timeliness of this action is thus important so as to ensure that the digital dividend can contribute to the EU efforts for economic recovery.

Several Member States are going ahead

Recognising this urgency, a number of Member States have recently stepped up their efforts to develop full broadband access. As part of these efforts, several Member States have already expressed their intention to open up very soon the 790-862 MHz sub-band located in the upper part of the UHF-band, to deliver wireless broadband access. This means, however, that there is a risk of fragmentation if these Member States were to proceed on the basis of different conditions of use for the same spectrum, and thus there is an urgent need to ensure that there will be consistency at EU level in order to allow all Member States to take full advantage of this opportunity. While five EU Member States have completed analogue switch-off, the United States was the first non-European country to do so (in June 2009). The 700 MHz band, which forms part of the US digital dividend, was auctioned at the beginning of 2008. The auctions raised the sizeable amount of US\$ 19 billion⁷.

1.1.6 Longer term view to reap the full benefits

The recent acceleration of the developments concerning the 790-862 MHz sub-band has put the emphasis on the need to address EU coordination for this particular sub-band. One should

⁴ See for instance Connecting Europe at High Speed : National Broadband Strategies {SEC(2004) 599}, 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” and the 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.

⁵ RSPG09-284 Final

⁶ These issues are now well known as several Member States have already switched off analogue TV. A particularly publicised case was the approach used by the first region to switch-off, the Berlin-Brandenburg region, which included state subsidies to consumers for the purchase of digital decoders which were approved by the Commission under certain conditions.

⁷ US auction of the 700 MHz band in February 2008. FCC website, auctions: http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=73

keep in mind, however, that the digital dividend can be wider and offer other attractive possibilities in other parts of the UHF spectrum. A coordinated approach to the use of the overall digital dividend would significantly increase its capacity and impact – and hence the potential social and economic benefits – through increased efficiency in the use of spectrum via technical coordination and acceleration of the transition to new technologies, increased economies of scale in the single market, greater potential for interoperability of services, more stability and predictability for investors, increased innovation and competitiveness for European industry, more efficient spectrum negotiations with third countries.

1.1.7 Considerable political interest and support

The importance of a coordinated approach was also recognised by the European Parliament and by the Council in their responses to the earlier Commission Communication on "Reaping the full benefits of the digital dividend in Europe: A common approach to the use of the spectrum released by the digital switchover"⁸. The European Parliament adopted a Resolution⁹ which called on the Commission to submit proposals for better coordination of the digital dividend at Community level. The Council¹⁰ adopted specific conclusions in response to the previous Communication calling on the Commission to initiate the studies and consultations necessary to define a coherent basis for the coordinated usage of spectrum and to support and assist Member States in this process. Efficient use of radio spectrum was an important topic in the Review of the telecoms regulatory framework. The new rules about to be adopted foresee the establishment of a Radio Spectrum Policy Programme for important political decisions on radio spectrum matters to be adopted by the European Parliament and the Council.

The Radio Spectrum Policy Group (RSPG), a high-level group of experts from Member States that assists and advises the Commission on strategic aspects of spectrum policy, provided advisory input on the digital dividend issue (see section 1.2.1) and invited the Commission to act at EU level. This shows that Member States understand the added-value of acting at EU level and support developing a coordinated approach.

1.1.8 Envisaged policy instruments

Three main policy instruments are envisaged at the start of this initiative:

1. **A Commission Recommendation** to address two specific pre-requisites to the availability of a digital dividend, and which need to be fulfilled by Member States without any further delay. There is already a high degree of consensus in Europe on these preliminary actions:

- Member States to fulfil the political commitment for timely analogue switch-off in order to ensure that the target date of 1 January 2012 identified by the Commission in 2005¹¹ is adhered to;

⁸ COM(2007) 700

⁹ European Parliament Resolution of 24 September 2008 on reaping the full benefits of the digital dividend in Europe: a common approach to the use of the spectrum released by the digital switchover [2008/2099(INI)].

¹⁰ Council Conclusions on "Reaping the full benefits of the digital dividend in Europe: A common approach to the use of the spectrum released by the digital switchover" 2877th Council meeting, Luxembourg, 12 June 2008.

¹¹ COM(2005) 204, Communication on "Accelerating the transition from analogue to digital broadcasting", 24 May 2005 and Council Conclusions of Telecom Council of 1/5 December 2005.

- Member States to support regulatory efforts towards the harmonised use in the Community of the 790-862 MHz sub-band for electronic communications services other than, and in addition to, broadcasting services, and refrain from any action that might hinder or impede the deployment of such communication services in that band.

2. **A Commission Communication** that will identify the key policy issues for a common EU roadmap (a "blueprint" for further EU-level coordination of the digital dividend). To this end it will:

- explain the need to ensure an appropriate level of coordination in the European Union to reap the full social and economic benefits of access to this spectrum in Europe;
- outline the initial steps to be taken in order to ensure that the roadmap can be established and effectively implemented – by avoiding delay of the analogue switch-off and by preventing situations where a Member State takes individual decisions on the digital dividend that would seriously hinder a co-ordinated approach and undermine the contribution that the digital dividend can make to the EU efforts for economic recovery;
- call on Member States to consider the advantages of allocating the 790-862 MHz for electronic communications services on a technology and service neutral basis, and consequently signal the Commission's intention to propose harmonised technical conditions under which the 790-862 MHz sub-band – the upper part of the UHF band – can be made available for wireless broadband when a Member State decides to allow services other than broadcasting into those frequencies (see also Commission Decision in point 3 below);
- call on the European Parliament and the Council to give a political impetus on key strategic objectives, including the possibility of a deadline for the full availability of the 790-862 MHz sub-band for electronic communications in all Member States, or the adoption of a common EU position on the digital dividend in international spectrum negotiations (bilateral as well as in ITU).
- identify further measures to increase efficient use of spectrum and to enhance the digital dividend, which will be fed into the Commission proposal for a Radio Spectrum Policy Programme (established under the Review of the telecoms regulatory framework in order to establish strategic orientations on radio spectrum matters). This could include measures on the migration to more efficient and more versatile terrestrial broadcasting systems, which in turn would allow more programmes to be transmitted and improve the consumers' viewing experience, as well as the setting of a date for clearing the 790-862 MHz sub-band in parallel with the development of these more efficient broadcasting systems.

3. **A Commission Decision on the technical harmonisation of the 790-862 MHz sub-band**

In line with the above, the Commission would adopt a technical harmonisation decision (EC Decision) to set the technical parameters for use of the 790-862 MHz sub-band. The setting of these parameters is vital since high power networks, such as those used for fixed broadcasting services, and low power networks such as those used for fixed and mobile wireless broadband, cannot co-exist in an un-coordinated manner without considerable costs or spectrum inefficiencies being incurred. This reinforced coordination would facilitate EU-wide interoperability and would reduce distortions of competition in the single market. The envisaged Decision is to be implemented by Member States if and when they decide to change the designation of the sub-band, but a possible **deadline for the implementation** of

the Decision (mentioned in 2.) would be left to a **separate discussion with the European Parliament and Council, under the Radio Spectrum Policy Programme**, because of its political importance¹².

1.1.9 Main basis for this impact assessment

This impact assessment builds upon work undertaken by the Commission since 2007, in particular the previous Communication on the digital dividend mentioned above which clearly identified the potential for synergies at EU level. This Communication initiated a consultation and "consensus-building" process with a view to identifying the best possible approach, quantifying the potential cost and benefits of each option, and stimulating the dialogue between interested sectors.

These efforts were supported by several technical studies¹³, as well as by the in-depth study of the socio-economic impact¹⁴. This study, conducted on behalf of the Commission by a consortium of external experts, allowed to evaluate both in quantitative and in qualitative terms the various approaches and options to create optimal value from the digital dividend spectrum, and provided therefore an important input to this impact assessment.

1.2 Consultation and expertise

1.2.1 Overview of main external consultations

The consultation process was an integral part of each stage of policy development as a large part of the policy work consisted in creating awareness on the unique opportunities created by the emergence of a digital dividend. As well as the Commission's own efforts to raise awareness, notable through the Communication of November 2007, further attention was paid to this issue when a relatively limited part of the digital dividend was awarded in the US through auctions that raised the sizeable amount of US\$ 19 billion in February 2008.

Interested parties were given several opportunities to provide their input through the following activities and meetings. Each of these events contributed to the overall consultation process conducted by the Commission on the topic of the digital dividend:

- **Stakeholders' Hearings**¹⁵ .
- **Two Member States' workshops**¹⁶ .
- **Public consultation on the draft RSPG Opinion on the Digital Dividend**¹⁷ .

¹² A firm deadline for implementation would mean the obligation for Member States to vacate the 790-862 MHz sub-band from any existing high power broadcasting transmitters. This may affect the cost and/or the extent of terrestrial television services and has therefore a clear political dimension.

¹³ These studies were conducted by the CEPT under the Commission mandate on technical considerations regarding harmonisation options for the digital dividend in the EU. The reports are available at: http://ec.europa.eu/information_society/policy/ecommm/radio_spectrum/manage/eu/rsc/rsc_subsite/mandates/index_en.htm

¹⁴ Commission study on Study on "Exploiting the Digital Dividend, a European Approach!". Full information including final report accessible at: http://ec.europa.eu/information_society/policy/ecommm/radio_spectrum/documents/studies/index_en.htm#digitaldividend2009.

¹⁵ <http://www.analysismason.com/PageFiles/11730/Stakeholders%20hearings%20-%20Summary.pdf>

¹⁶ <http://www.analysismason.com/Global/Consulting/Digital%20Dividend/First%20Member%20States%20workshop%20-%20Summary%20-%2020090505%20REVISED.pdf>

¹⁷ http://rspg.ec.europa.eu/consultations/responses_digitaldividend_090515_0630/index_en.htm

- **Public consultation on the technical aspects of the digital dividend conducted by the CEPT**, in response to the mandates from the Commission¹⁸.
- **Public consultation** on the draft proposals set out in a consultation document entitled "Transforming the digital dividend opportunity into social benefits and economic growth in Europe"; this closed on 4 September 2009 and generated 122 contributions.

The general position of the main interested sectors, as identified during the successive steps of consultations, are summarised below:

- The **broadcasting sector** broadly supports the principle and objectives of the draft policy proposals, including, in most cases, the necessity to open up the 790-862 MHz sub-band for new services. However, the sector requests the Commission to exercise caution regarding future implementation, in particular concerning the risk of harmful interference to TV transmissions and to receivers and the cost of reorganising the broadcasting networks to clear up the 790-862 MHz sub-band from high power TV transmitters. While accepting that broadcasting services will be able to develop under the envisaged proposals, broadcasters warned against taking a purely economic approach. The sector also warns against further policy changes that could affect spectrum below 790 MHz. There were some notable differences of views among contributions from the broadcasting sector, in particular concerning the timing of the availability of spectrum above 790 MHz and the prospects of upgrading networks to achieve higher spectrum efficiency. The proposal to upgrade DTT¹⁹ receivers seems to be generally welcome by broadcasters as it would facilitate future enhancements in broadcasting services.
- **Telecommunications operators** express their wide-ranging support on virtually all topics. The contributions particularly welcome the opening of the 790-862 MHz sub-band for mobile and fixed wireless communications. Some mobile operators are somewhat sceptical about the possible use of white spaces (the gaps between spectrum blocks used by broadcasters) but do not oppose the draft proposal on this matter. Many contributions from telecommunications players call for ensuring the availability of further spectrum of the digital dividend on a service and technology neutral basis in the future. Several prominent telecommunications associations stress the need to address potential competitive issues as the available spectrum is likely to satisfy a fraction of the demand, and request that this issue be added to the Commission's work (this request emanates particularly from associations that include fixed operators).
- **Cable operators** fully support the underlying objectives in relation to the re-use of the 790-862 MHz sub-band and recognise the benefits that could be available to a large number of citizens. However, they are equally concerned that customers/ viewers could be negatively impacted by interference to their existing television and broadcast services, arising from the introduction of certain fourth generation mobile systems. The tests commissioned by this industry to provide broader validations and conclusions are still ongoing. Some criticism is targeted by cable operators at the CEPT, which allegedly did not consider all technical issues in sufficient depth.

¹⁸ The Electronic Communications Committee (ECC) of the European Conference of Postal and Telecommunications Administrations (CEPT) adopted on 1 July 2009 a draft ECC Decision on harmonised conditions for Mobile/Fixed Communications Networks operating in the band 790-862 MHz (ECC/DEC/(09)EE) , for which a public consultation has been launched. The text of the draft ECC Decision on the 800 MHz band can be found on the ECO web site www.ero.dk, under ECC Activities/Public consultations on ECC Decisions/Recommendations and Reports.

¹⁹ Digital Terrestrial TV

- **Existing users of white spaces** for **wireless microphone** services stress the great difficulty that they would face if they would be limited to using only one dedicated part of the UHF, and if new systems based on cognitive radio technologies²⁰ start making use of the same spectrum. They however support efforts by the Commission to discuss at EU level the issue of future relocation.
- **The constituency interested in using the digital dividend for PPDR (public protection disaster recovery) services** reiterated the need for spectrum below 1 GHz for their future high speed data services but did not present arguments to indicate if the use of the digital dividend would be a preferred option.

1.2.2 Internal consultations and consultation of other EU institutions

Regarding internal consultations, other services of the Commission with a policy interest in the subjects involved have been associated with the above consultative activities. There was also an Inter-Service Group meeting on spectrum policy on 18 June 2009 where the broad lines of the proposed Commission's proposals, which are the subject of this impact assessment, were presented to the participants. As a follow-up, the draft impact assessment document, as communicated to the secretariat of the Impact Assessment Board, was also transmitted to this group in the middle of August. Finally, an Impact Assessment Steering Group including all relevant services was established. This Group met on 18 September 2009 to discuss this impact assessment.

As far as other EU institutions are concerned, as indicated above the European Parliament responded to the invitation in the 2007 Commission Communication and adopted an own initiative resolution which has been taken into account in the proposal. The Council adopted specific conclusions in response to the previous Communication. The Communication was also addressed to the Committee of the Regions and the Economic and Social Committee. The Committee of Regions adopted its opinion²¹ on 19 June 2008.

1.2.3 Main conclusions from the consultative process

At the end of this process, there were four main topics which were identified as requiring concrete actions and which underpin the main proposals subject to this impact assessment:

- (1) The importance of a timely analogue switch-off, i.e. the end of analogue broadcasting by 2012 in Europe, as a pre-requisite to trigger investments in new infrastructures and unleash the expected social and economic benefits.
- (2) Requirement upon Member States to refrain from any action that would contradict or complicate the application of a co-ordinated EU approach in the 790-862 MHz sub-band.
- (3) The setting of technical parameters for the 790-862 MHz sub-band (so-called 800 MHz band) to allow access to the UHF spectrum for new uses such as wireless broadband access in rural areas, for example.

²⁰ Cognitive radio technologies allow radio equipment to identify frequencies which are not occupied by a primary user at a given moment, and to exploit them temporarily.

²¹ Opinion of the Committee of Regions on "Telecommunications reform package" (2008/C 257/10), <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2008:257:0051:0069:EN:PDF>

- (4) The potential for further increases in transmission efficiency by adopting the most recent digital compression technologies, without affecting negatively the capacity for current services.

1.2.4 Summary of results of the consultations on the first topic: Analogue Switch-Off

The stakeholders from the telecoms sector clearly asked the Commission to ensure that the analogue switch-off be completed at the latest by 1 January 2012, in accordance with the time table proposed in the Communication on the digital switchover in 2005. The broadcasting sector was more cautious on this point, however, and while not questioning the importance of the switch-off date, it drew attention to the substantial investments that, although unavoidable, do require careful planning in order to ensure both the continuity of service and that specific groups of viewers will not be negatively affected. The telecommunications industry also expressed the fact that certainty on switch-off in 2012 was more important than the precise date of 1 January 2012. A few Member States having plans to switch-off during the course of 2012 indicated that advancing their planning by a few months could be unworkable or counterproductive.

1.2.5 Summary of results of the consultations on the second and third topics: the 790-862 MHz sub-band and its technical harmonisation

At the Hearings, there was a broad consensus between stakeholders that the harmonisation of the 790-862 MHz sub-band²² for fixed and mobile wireless communications should not be mandatory. Instead voluntary harmonisation was desirable for political reasons. The telecoms sector expressed the wish that the Commission should make itself available to assist cross-border co-ordination, especially with non-EU countries. The sector finally stressed that opportunities for use of spectrum below 790 MHz should be explored. The broadcasting sector, although not generally in favour, did not oppose the principle of gradually opening up the 790-862 MHz sub-band to other services on a neutral basis. The stakeholders from services ancillary to broadcasting and programme making (mainly the wireless microphone industry) wanted to be recognized as existing users and expressed strong concerns about the availability of their service following the harmonisation of the 790-862 MHz sub-band for mobile services.

In the Member States workshops, the majority of respondents were in favour of opening the 790-862 MHz band, but were opposed to a fixed end date for opening the band. Most of them agreed with allowing electronic communications services in this band on a technology and service neutral basis. It was noticeable that opinions evolved positively from the first to the second workshop. The respondents to the RSPG consultation expressed generally a positive opinion, or at least a neutral attitude, towards a timetable for making the 800 MHz band available to new uses but there were few to favour making it mandatory at this stage. The compensation for the cost of clearing out the 790-862 MHz sub-band was a priority for many respondents in the broadcasting sector.

1.2.6. Summary of results of the consultations on the fourth topic: further improvements in broadcasting transmission efficiency

The Hearings showed differences of opinion among stakeholders from the broadcasting sector on whether action is required at a European level regarding MPEG-4/DVB-T2. The majority of stakeholders recognised the benefits of new compression techniques but were concerned

²² Often referred to as the "800 MHz band".

about mandating MPEG-4 transmission standards and a date for transition from MPEG-2 to MPEG-4 due to the costs involved for their industry. Broadcasters were widely supportive of minimum quality in the rejection of interference on all DTT receivers (interference immunity) as it is recognised that the poor quality of some receivers is already a worrying consumer issue.

At the Member States workshops, a number of Member States fully supported the recommendation to define minimum interference rejection standards for DTT receivers. However, Member States had mixed views regarding the idea of a binding EU-level action on the full adoption of MPEG-4, or equivalent standard, compatible receivers. Some of them stressed that most DTT receivers currently produced are MPEG-4 compatible and that market forces are already leading to the full adoption of MPEG-4 compatible receivers.

2. PROBLEM DEFINITION

2.1. Identified issues and their underlying drivers

The issues underlying the initiatives presented in the Communication and Recommendation are also documented in the Commission's 2007 Communication "Reaping the full benefits of the digital dividend in Europe: A common approach to the use of the spectrum released by the digital switchover"²³.

2.1.1. Lack of coherence of national approaches will lower the usability of the spectrum and hence the potential socio-economic impact of the digital dividend

For interference management reason, it is technically impossible, or very inefficient, to mix in the same spectrum various wireless services having fundamentally different types of technical characteristics. To illustrate this point, experts have estimated that mixing together high power and low power services in the UHF band (the band linked to the digital dividend) without at least proper channelling/guard band arrangements would reduce the overall theoretical transmission capacity of the band by as much as two thirds.

There is also a cross-border effect as the type of use of the UHF band in one Member State has an impact on the type of use that can be made by neighbours: e.g. if DTT is broadcast at high power levels throughout the band, it will significantly reduce the scope for neighbouring countries to make use the spectrum for other services. This would be particularly acute in smaller Member States or in Member States where a large proportion of the population lives within reach of signal transmissions from neighbouring countries including third countries (which create interference typically up to 100 kilometres from borders).

The current cross-border coordination of the UHF band between Member States is achieved on the basis of the International Telecommunications Union (ITU) Radio Regulations and, in particular, the Geneva 2006 Regional Agreement (GE-06) ruling the coordination of broadcasting frequencies. Some Member States anticipated the use of the UHF band also for other services than broadcasting and obtained at the last World Radio Conference (WRC) 2007 the possibility to allocate a part of the band (790-862 MHz) band for mobile communications²⁴. However, the ITU frequency planning remains based on the use of the

²³ Op. cit. COM(2007) 700.

²⁴ By undersigning footnote 5.316 of the ITU Radio Regulations, which allocates the band 790–862 MHz to the mobile service on a co-primary basis (except aeronautical mobile).

band for high power DTT and is therefore inadequate for the coordination of others services than broadcasting.

In the absence of EU regulations dealing with the 470–862 MHz band, there is currently a range of possible technical approaches to the digital dividend in order to cope with the interference issue. There is a risk that Member States would proceed to implement changes to the conditions of use of the spectrum at varying paces and with fundamentally different objectives. Some Member States have yet to develop plans for the digital dividend while others have specific proposals for future use. Such plans range from continuing to use the whole digital dividend for broadcast TV services, to allowing market forces to determine the future use of the spectrum.

In conclusion, the digital dividend will produce much better effects if coordinated at EU-level despite the fact that some of the expected benefits from the digital dividend can be realised at national level alone. In particular, coordination will allow much more efficient technical co-existence of networks supporting services other than existing broadcasting services.

2.1.2. Lack of EU coordination will prevent Member States to allocate the digital dividend to its best uses

The interference issue raised by the cross-border propagation of high-power DTT signals, and the resulting lack of coordinated clearance of part of the band, also impact on the ability of Member States and their Spectrum Management Authorities to discharge their duty under the Framework Directive.

The EU regulatory framework specifies that Member States must manage spectrum in a way that fosters efficiency and innovation. Cross-border interference permitted under the current agreements, however, places a great constraint on their ability to do so. In the absence of cross-border interference, the optimal allocation may be very different from what is practically achievable under current circumstances.

Consequently, national spectrum management authorities, in the absence of a consistent coordination mechanism to minimise the negative impact of interference in the EU, may be forced to conclude that the best use of the spectrum is still DTT, whereas if coordination was implemented it would be a different use. This creates further interdependence between Member States and their neighbours.

2.1.3. Lack of economies of scale and pan-European coverage of services may hurt the European economy and deter investments

Virtually all of the expected potential uses of the digital dividend (whether these are new broadcasting or wireless broadband services) rely on the possibility to achieve critical mass and economies of scale. It is also essential to underline the importance of a coordinated approach to ensuring that these economies of scale throughout the EU are maximised, and that internal market objectives are achieved as much as possible by enabling interoperability and roaming between Member States. Both of these can best be furthered through a common frequency allocation and common adoption of technical conditions. Typically, it is significantly more cost-efficient for equipment manufacturers to produce network and consumer equipment to a single set of technical conditions, than to have multiple, smaller-scale production lines for different markets. For example, the Commission study found that manufacturers of mobile communications equipment expect a potential market of at least 100 million inhabitants before investing in new production lines for the 4th generation mobile

communications equipment. The reduced development times and greater certainty associated with harmonised choice of technology and frequencies also enables manufacturers to bring equipment to market faster.

In the stakeholders' hearings and in the public consultation, it was made clear, by equipment suppliers and telecommunications operators in particular, that EU coordination would play a major role to create confidence and accelerate investments in new infrastructures.

2.1.4. Optimising the digital dividend in the medium term (spectrum below 790 MHz)

There is now a general consensus that the 790-862 MHz sub-band should be made available for the deployment of wireless broadband. However, the effects of further measures in the other sub-bands (spectrum below 790 MHz) need to be explored more carefully in the medium to long-term as they offer a potential for additional capacity to be progressively made available (independently from the precise use that could be made of it in the future). In particular, in the majority of Member States, DTT networks can be upgraded, including with existing technology, to become more spectrally efficient in the future. These upgrades vary in efficiency gains, the investment required to implement them, and the degree to which they are governed by well-established standards.

Upgrading is possible in three ways:

- **Compression technology:** Currently, most Member States use the so-called MPEG-2 standard for DTT signal compression, but a move to a more advanced compression technology such as the widely-available MPEG-4 H.264/AVC (MPEG-4) standard would almost double the capacity, and value, of the digital dividend.
- **Modulation and radio technology:** DTT in the EU uses the Digital Video Broadcasting – Terrestrial (DVB-T) standard. Improvements to the techniques used by DVB-T are brought by the DVB-T2 standard.²⁵ This standard is likely to enable a 30% increase in the capacity of a DTT multiplex compared to DVB-T.
- **Network topology:** Most DTT networks in the EU are mostly multi-frequency networks (MFNs).²⁶ This means that a given multiplex (a set of television programming channels broadcast in a given geographic location over an 8MHz frequency channel) uses different frequencies in different geographic locations to avoid self-interference. In the future, the increased use of single-frequency networks (SFNs), where all frequency channels are used at all sites, could substantially reduce the need for spectrum (but limit the possibility for regional programming).

It is therefore possible for DTT networks to benefit from significant efficiency improvements, should demand for large numbers of television programming channels and/or high-definition programming warrant it.²⁷ In the short term however, the most realistic, and most beneficial, upgrade option is for broadcasters using MPEG-2 to move to a better compression technology such as MPEG-4. One very significant issue, however, is that existing MPEG-2 decoders would not be able to decode MPEG-4 transmissions. MPEG-4 compatible terminals, which

²⁵ See http://www.dvb.org/technology/fact_sheets/DVB-T2-Fact-Sheet.0409.pdf.

²⁶ Or regional single frequency networks (SFNs).

²⁷ High-definition programming channels typically require twice the spectrum resources as a standard-definition channel.

must be backward compatible with MPEG-2, are also significantly more expensive than MPEG-2-only decoders, and this raises important considerations of consumer policy and cost.

A further potential obstacle is that due to the absence of minimum interference rejection standards in the current generation of DTT receivers, a significant proportion of these would be impaired by uses other than DTT in the 470–862 MHz band. In practice, where these receivers are in use, the signal from the DTT transmitter would conflict with the signal received from, for instance, wireless broadband transmitters in the adjacent frequency channel or in channels located nine channels apart (known as n+9).

In conclusion, enabling existing uses such as DTT to become more spectrally efficient can lead to the possible extension of the digital dividend (spectrum below 790 MHz) in the future. If it is possible to use less spectrum for a given number of television programming channels, more DTT programming channels can be offered or new uses can be introduced into the band. The consultations showed that EU action could play a significant role to create the necessary momentum to address the above issues.

2.1.5. Risk of disruption of important services already making use of part of the UHF where the digital dividend spectrum is located

The main category of legacy services in the UHF spectrum, and therefore potentially interfering with the use of the digital dividend, is commonly referred to as wireless microphones and services ancillary to broadcasting and programme making²⁸.

Wireless microphone and similar ancillary services can use these particular frequencies (known as ‘interleaved spectrum’ or ‘white spaces’). They are essential to a number of sectors of the economy, particularly broadcasting, content production and events organising (such as concerts and public speaking for instance). Any changes to the band should carefully consider the ability of these users to offer continuity of service.

2.1.6. A sizeable part of the benefits could be foreclosed in absence of proper coordination with third countries

As mentioned in 2.1.1, broadcasting transmissions can travel across border up to typically 100 kilometres and can prevent other services than broadcasting to operate in these geographical areas. In turn, this may prevent nation-wide services to be deployed since all regions can not be covered. There is therefore a clear advantage, and sometimes a necessity, to coordinate with third countries.

The current ITU rules foresee that, under the GE-06 agreement, uses other than DTT are not guaranteed protection from high-power DTT transmissions from neighbouring countries. The consultations also revealed that early bi-lateral negotiations between a Member States and third countries were often disappointing.

In this context, a common EU approach would allow to establish an EU-wide platform for negotiation with third countries. This was generally very welcomed by stakeholders and Member States concerned. One additional issue concern the incompatibility of existing

²⁸ In technical jargon, this is part of SAB/SAP respectively for Services Ancillary to Broadcasting (SAB) which support the activities of broadcast service companies carried out in the production of their programme material and Services Ancillary to Programme making (SAP) which support the activities carried out in the making of "programmes", such as film making, advertisements, corporate videos, concerts, theatre and similar activities not initially meant for broadcasting to general public.

Aeronautical Radio Navigation Systems operating in the Russian Federation, Belarus and Ukraine with future wireless broadband systems that are envisaged in the Member States bordering these third countries. There is a strong support to ensure this issue can be dealt with the interested countries at EU level.

2.2. Likely outcome in the absence of action at the EU level

A number of Member States have clearly stated their intention to designate, clear, and award the 790–862 MHz sub-band either directly for, or in a format that will enable, electronic communications services (e.g. wireless broadband). The situation is evolving rapidly, but at the time of writing these Member States included: Denmark,²⁹ Finland,³⁰ France,³¹ Germany,³² the Netherlands,³³ Spain,³⁴ Sweden³⁵ and the UK.³⁶ Other Member States have also indicated that they were contemplating creating such a sub-band after analogue is switched off both domestically and in neighbouring countries (this includes some countries outside the EU and therefore not subject to the Commission's recommendation to complete digital switchover by early 2012).

In the absence of action at the EU level to coordinate the adoption of the sub-band, it is likely that this momentum will nevertheless continue, and that those Member States bordered by countries where the sub-band has been identified, but currently undecided about the sub-band will also adopt it. Conversely, Member States that are surrounded by countries that are *not* likely to adopt the sub-band would be more likely to retain their GE-06 plans. This particularly affects Member States at the eastern and south-eastern borders of the EU, where the decisions of large neighbouring non-EU countries, such as Belarus, Russia, Turkey and the Ukraine, will have a significant impact.

This may result in two categories of Member States:

- Those that **will coordinate the use of the 790–862 MHz sub-band** according to the technical parameters that are set (i.e. for low-power services such as wireless broadband). For the purposes of this impact assessment and the related economic modelling, and based on information provided by Member States, these Member States are assumed to be, in the end: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Slovenia, Spain, Sweden and the UK.
- Those that **will retain high-power DTT in the whole band**. For the purposes of the economic modelling these Member States are assumed to be: Bulgaria, Cyprus, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Romania, and Slovakia. The acuteness of the issue would be even more serious if Italy would have been included in this list³⁷.

²⁹ <http://vtu.dk/nyheder/pressemeddelelser/2009/frekvenser-til-fremtidens-mobile-bredbaand/>.

³⁰ <http://www.lvm.fi/web/fi/puheet/puhe/view/904813>.

³¹ http://francenumerique2012.fr/html/france_2012.html.

³² http://www.bundesrat.de/cln_090/mn_8538/DE/presse/pm/2009/117-2009.html?_nnn=true and http://www.bundesrat.de/cln_090/SharedDocs/Drucksachen/2009/0201-300/204-09.templateId=raw.property=publicationFile.pdf/204-09.pdf.

³³ http://www.ez.nl/Onderwerpen/Betrouwbare_telecom/Frequentiebeleid/Consultaties_en_informatieve_papers/Consultatie_beleidsvoornemen_inzake_de_verdeling_van_het_resterende_Digitale_Dividend_in_de_UHF_frequentieband/Consultation_document_Digital_Dividend_in_the_UHF_frequency_band_470_862_MHz.

³⁴ <http://www.mityc.es/es-ES/GabinetePrensa/NotasPrensa/Paginas/dividendodigital020609.aspx>.

³⁵ <http://www.sweden.gov.se/sb/d/9760/a/94782>.

³⁶ <http://www.ofcom.org.uk/consult/condocs/800mhz/statement/>.

³⁷ There is still great uncertainty on the direction to be adopted in Italy at this moment.

As shown in Figure 2.1 below, assuming cross-border propagation of up to 100km in distance, large parts of the Czech Republic, Austria and Slovenia would be unable to benefit from new services deployed in the sub-band. This illustrates the potentially negative impact of one Member State’s decision on another.



Figure: Assumption of regions in which harmful interference is caused by Member States using the 790–862MHz sub-band for high-power DTT [Source: Analysys Mason, DotEcon, Hogan & Hartson, 2009]

For the purpose of the economic analysis performed in the context of the Commission study, a sensitivity analysis was conducted in which between 5 and 13 Member States would not adopt the 790–862 MHz sub-band without intervention at EU level. Member States in which the sub-band is not adopted will remain outside any single market that may emerge, limiting economies of scale in the EU as well as other benefits, such as pan-EU roaming.

In addition, there is a high probability that there will be some differences between technical conditions for the use of spectrum imposed by the Member States having adopted the 790-862 MHz sub-band for electronic communications services. This would result in a risk of

fragmentation of the internal market as the equipment operating in this band could not be completely technically compatible in all cases.

Finally, the absence of EU action would allow current uncertainty to persist until all Member States have formally adopted an approach to the sub-band. The economic analysis conducted by the Commission and the consortium (see final Commission study report³⁸), which is referred to throughout this impact assessment shows that this is likely to result in very substantial social and economic value remaining unrealised (for details, see more particularly sections 13.2 and 13.3 of the Commission study).

2.3. The advantages of EU intervention

Section 2.1 above outlines that a major issue for current use of the digital dividend spectrum is the cross-border interference, where DTT is used throughout the 470–862 MHz band. In the ‘no action’ scenarios described in the previous section, this problem would continue for a large proportion of Member States, which would in turn limit other benefits such as economies of scale, interoperability and roaming throughout the EU.

This illustrates that if Member States act alone, an optimal outcome across the EU may not emerge. This is because if neighbouring countries maintain high-power DTT transmission in the 790–862 MHz sub-band, the value they can realise from adopting that sub-band for alternative uses may be reduced. Through such an effect, actions by Member States alone are likely to significantly damage the interests of other Member States.

Intervention at the EU level is therefore justified on several counts as it can generate significant benefits compared to uncoordinated action by individual Member States. The main areas for potential additional value for the EU are:

- **Technical efficiency and interoperability:** a common frequency allocation would also create greater scope for roaming/interoperability for consumers. The cost-efficiency and feasibility of providing roaming services, particularly for wireless broadband, which enhances the value of the service to citizens, are greatly improved compared to a situation in which consumer equipment requires multi-band operation. In addition, EU-level action to incentivise or secure the improved efficiency of current uses of the spectrum would help create value at the EU level. For instance encouraging the adoption of advanced DTT compression technologies may help release digital dividend spectrum for other valuable uses, such as improved broadcasting and/or wireless broadband.
- **Economies of scale and innovation:** a common frequency allocation and common adoption of technical conditions would result in economies of scale for equipment manufacturing. A harmonised choice of technology and frequencies would reduce development times, costs, create greater certainty and enable manufacturers to bring equipment to market faster.
- **Securing investment and establishing international leadership:** an early decision on a coordinated approach to the use of the digital dividend spectrum at the EU level is likely to have two major impacts. Firstly, it will provide increased certainty to investors and

³⁸ The full text, as well as the executive summary, of the Commission study "A European approach to the digital dividend" conducted by Analysys Mason, Dotecon and Hogan & Hartson is available on-line at: http://ec.europa.eu/information_society/policy/ecomms/radio_spectrum/activities/index_en.htm [pending activation].

companies over the future availability of spectrum for uses other than DTT. This increased certainty is likely to foster substantial investment in research and development sooner than might otherwise have been the case. Secondly, it may influence neighbouring non-EU countries, increasing the potential benefits from adopting the sub-band. Benefits would be realised principally because of reduced interference from neighbouring countries. If a common use of the band emerged beyond the EU's borders because of this early leadership, economies of scale would also be enhanced. Both these impacts would benefit the EU by stimulating economic activity and providing opportunities for innovation within the EU which could be exported.

3. SPECIFIC OBJECTIVES PURSUED BY THIS INITIATIVE

The first specific objective is to maximise benefits from the digital dividend and to act sufficiently rapidly to avoid fragmented national legacy situations, which would hamper the establishment of a single market with regards to future services and equipment.

Secondly, this initiative seeks to ensure sufficient consistency between national approaches and foster convergence over time, with a view of supporting innovation and long-term benefits for consumers, strengthening the single market, and increasing EU competitiveness. These initiatives aim to further increase the availability of digital dividend spectrum by adopting common approaches to various technical and deployment issues, and providing more predictable and stable spectrum planning for investors.

Thirdly, the Commission's action should aim at facilitating the early efforts by several Member States to open up the 800 MHz band to new services such as wireless broadband and help avoiding unnecessary fragmentation (i.e. different Member States imposing different levels of technical or functional restrictions).

4. POLICY OPTIONS

The proposals under development include four main areas where direct actions are considered in order to achieve:

- Timely analogue switch-off of analogue terrestrial TV in the EU by 1 January 2012, as a pre-requisite to establish a digital dividend;
- Optimal use of spectrum in the UHF band (470-862 MHz);
- Avoiding un-coordinated action by Member States in the 790-862 MHz sub-band;
- Technical harmonisation of the 790-862 MHz sub-band.

The four proposals involving direct action result from an analysis of a range of options, which are summarised below.

4.1. Policy options regarding the timely switch-off of analogue TV

In its Communication on the switchover to digital broadcasting in 2005, the Commission set a target EU date for analogue switch-off of beginning 2012. This time frame has been further endorsed by the European Parliament and Council in their response to this Communication but this does not commit Member States legally. The Council has however referred to end of 2012 in its conclusions on this matter.

A number of Member States have now already switched off³⁹ or have announced plans to switch off analogue signals by 2012 (though not necessarily by the *beginning* of 2012) while at the same time several Member States have not yet adopted final plans. There is even the possibility that at least one large Member State delays analogue switch-off up to July 2013.

In this context, the situation of Member States located at the Eastern and Southern borders of the EU may remain partially constrained in what spectrum they can use because of cross-border interference from neighbouring non-EU countries which will not have yet switched off analogue television as the end date specified at international level (during GE-06) for the protection of analogue broadcasting is 2015.

4.1.1 No further EU action

This option would result in each Member State completing analogue switch-off according to its own timetable. On the basis of information available at the time of writing, it is expected that up to 11 Member States may switch off analogue signals after 1 January 2012, which poses a serious risk to efforts to exploit the digital dividend for economic recovery, although at least ten of these Member States are expected to complete switch-off by the end of 2012⁴⁰.

4.1.2 Recommendation that Member States take all necessary steps to switch-off analogue signals by 1 January 2012

This policy option will seek to ensure that there is no residual analogue transmission in the 470–862 MHz band by the start of 2012. This will help securing a critical mass towards a co-ordinated EU approach to the digital dividend and enable most Member States to take advantage of the spectrum that will be freed by the stopping of analogue terrestrial transmissions, while creating greater certainty for industry.

4.1.3 Mandating analogue switch-off by 1 January 2012 (a Community legal measure)

This option would ensure, by applying a legally binding Community measure, that analogue switch-off is completed across the EU by 1 January 2012. Such a legislative measure would carry significant political weight, as well as ensuring that the way was open for a fully co-ordinated approach to the digital dividend. However, it may cause difficulties for those Member States that have not been able to prepare sufficiently for the implementation deadline, and would also create difficulties of co-ordination with third countries, where the shift to new transmission configurations has yet to be co-ordinated with neighbouring countries to avoid interference with existing broadcasting services.

4.2. Policy options regarding the achievement of the optimal use of spectrum in the UHF band (470-862 MHz)

There are a number of policies and instruments that could usefully be employed in order to obtain an optimal use of the digital dividend spectrum. Apart from immediate action in the 790-862 MHz sub-band (dealt with under sections 4.3 and 4.4 below), the effects of further measures in the other sub-bands (spectrum below 790 MHz) need to be explored in more

³⁹ Member States that have already switched off analogue terrestrial TV (and are therefore in a fully digital format): Germany, Finland, Luxembourg, Sweden, the Netherlands. Belgium has partially switched (Flanders) and major areas in Austria.

⁴⁰ During the consultation process, Poland informed the Commission that it now plans to switch off analogue terrestrial TV by July 2013.

detail in the medium to long-term. These involve measures and orientations to ensure an efficient use of spectrum freed by analogue switch-off to be set out by the Commission and, ultimately, to serve as **input to the Radio Spectrum Policy Programme to be proposed to the EP and Council after adoption of the new telecoms package.**

4.2.1 No further EU action on coordination activities

Under this option, the EU would not adopt any measure, formal or informal, to increase the optimal use of spectrum below 790 MHz. There would be no specific action such as promoting interference resistant DTT receivers or better compression and transmission technologies beyond the guidelines currently in place. This would leave the issues raised in Section 2.1.4, such as potential interference to DTT receivers from other uses and the need for broadcasters to migrate transmission to more efficient technologies without prejudice to consumers, to the responsibility of Member States.

4.2.2 Proposing further coordination activities in sub-bands below 790 MHz

The Commission could issue a Communication outlining the benefits of further coordination action which could also feed into the proposals for a Radio Spectrum Policy Programme. The following issues could be covered by such an orientation:

(a) Coordination for the possible migration of DTT networks to more advanced transmission technologies (e.g. MPEG-4, DVB-T2) and interference resistant DTT receivers

A recommended timeline for the migration to MPEG-4 and/or DVB-T2 technologies could be produced at the EU level. While this would not be obligatory, it could gain momentum, leading to an accelerated adoption of these technologies.

(b) The possibility of implementing national Single Frequency Networks

A recommended timeline for wider deployment of national SFNs could increase the scope for a coordinated re-planning of the 470–862 MHz band across several Member States with the resulting benefits and costs.

(c) The use of more frequency-agile wireless broadband networks (e.g. variable duplex technology)

The Commission could encourage manufacturers to invest in and adopt more frequency-agile technologies, such as FDD systems that could operate with a variable duplex.

(d) Cooperate at EU level over examining the future use of interleaved spectrum

Wireless microphones rely on the availability of interleaved spectrum (spectrum shared by DTT on a geographic basis); a number of Member States dedicate frequencies nationally to this use. In the short-term the availability of interleaved spectrum will decrease due to the introduction of low/medium-power use into the 790–862 MHz sub-band.

Member States will therefore need to relocate wireless microphone use in order to adopt the sub-band. Benefits from economies of scale, as well as roaming, could potentially be created in future systems if the frequency location of dedicated channels were coordinated across the EU. In this option, guidelines would be produced regarding which frequencies Member States should dedicate.

In the medium to long term, the availability of sufficient spectrum in the 470–862 MHz band for wireless microphones and assimilated is less clear, and it would therefore be warranted to

consider measures to encourage users to either migrate to more spectrally efficient digital equipment or to migrate to spectrum outside the 470–862 MHz band, in a coordinated fashion across the EU.

Under this option, Member States would be also invited to cooperate with the Commission in examining the technical and regulatory conditions for using interleaved spectrum (white spaces) for applications that use cognitive technologies. Cognitive technologies will have the ability to detect dynamically whether frequencies are being used in a particular location, and if not, transmit over those frequencies. The introduction of cognitive technologies will be discussed at the next World Radiocommunication Conference (WRC-12) under agenda item 1.19. Decisions need to be made regarding which technical approaches may be permitted, as well as the technical specification required of the chosen approach. This option may ultimately result in a CEPT/ECC Common Position on the technical parameters and regulatory conditions under which cognitive technologies should be introduced.

(e) Increased involvement of EU-level institutions in cross-border spectrum coordination

The adoption of the 790–862 MHz sub-band across Europe may require significant re-planning of DTT between Member States. As discussed above, there may be doubts about the ability of Member States to make the necessary agreements, particularly with neighbouring non-EU countries, within desirable timescales without some EU-level coordination. This option would see EU-level institutions take a more active role in organising or facilitating those negotiations.

The strategic relevance and implications of these proposals should be first discussed with the European Parliament and Council as part of the future Radio Spectrum Policy Programme before taking more concrete steps towards their implementation (including the detailed impact assessment mentioned above).

4.2.3 Mandatory requirements to improve spectrum efficiency linked to the digital dividend

In order to ensure a co-ordinated approach, the Commission could propose a number of individual mandatory measures regarding the efficient use of the digital dividend spectrum and which could possibly be considered in the context of a future Radio Spectrum Policy Programme:

a) Accompanying measure for the migration of DTT networks to more advanced transmission technologies (e.g. MPEG-4, DVB-T2) and interference resistant DTT receivers

A legally binding Community measure could be to specify **minimum performance characteristics** for DTT transmission technologies. These could be the bit rate of each multiplex (set to be equivalent to DVB-T2) or parameters that define the performance characteristics of compression technologies (perhaps equivalent to H.264/MPEG-4 AVC as this is a mature standard and the variant that appears to be gaining momentum across the industry). As an intermediate measure, the minimum performance level could be **imposed only on DTT receivers** as a pre-requisite to facilitate the upgrading of the networks at a later stage.

A legally binding Community measure could also specify **minimum interference rejection standards** for DTT receivers which would include detailed specifications for the minimum

interference tolerance/rejection performance of the receivers, including the rejection of signals received in the adjacent channel and image channel (n+9).

A legally binding Community measure could also require that all Member States adopt **transmission technologies** that meet technology-neutral specifications.

b) Implementation of national Single Frequency Networks

Under this option, Member States would be required to adopt the use of national **Single Frequency Networks (SFNs)** within a specific timeline by applying a legally binding Community measure. This could either be for all DTT multiplexes or (more realistically) for a subset of multiplexes, allowing the remaining multiplexes to continue to be deployed using multiple frequency networks (MFNs) in order to provide regional content.

c) Cooperate at EU level to examine the future use of interleaved spectrum

Under this option, Member States would be required to provide information on a regular basis to a central EU database regarding the availability and use of the so-called "white spaces" or **interleaved spectrum**, to provide a mapping for providers of equipment and services that may wish to exploit the internal market potential for operating between existing broadcast frequencies.

4.3. Policy options regarding the coordination of Member State action to ensure a coherent approach for the 790-862 MHz sub-band

The EU has so far facilitated the public debate on the digital dividend through a series of Communications and CEPT mandates, but has not directly intervened to recommend or require that Member States follow any particular approach to the band.

4.3.1. No further EU action

This option would result in each Member State being able to adopt regulatory measures at the national level including moving new high-power services into the sub-band.

4.3.2. Recommendation that Member States follow a co-ordinated approach in the 790-862 MHz sub-band

This policy option will ensure that Member States refrain from any regulatory action regarding the use of the 790-862 MHz sub-band that would contradict or jeopardise the application of the technical harmonisation measure which is planned at EU level, for example the designation of new (not yet planned) digital broadcasting services in the 790-862 MHz sub-band that would undermine the internal market and create problems for neighbouring Member States seeking to roll-out wireless broadband services in the sub-band. Furthermore, action at the EU level will be consistent and will ensure that all Member States can reap the benefits of the digital dividend.

4.4. Policy options regarding the technical harmonisation of the 790-862 MHz sub-band

4.4.1. Guidelines for the harmonisation (non mandatory) of the 790–862 MHz sub-band

This policy option would see the EU limiting its action to facilitating the harmonisation of the 790–862 MHz sub-band, without any obligatory action. This could include, for instance, a role in centralising and disseminating information on the management of the sub-band in all Member States, by encouraging or obliging Member States to share their plans with sufficient notice. Under this policy option, the core action at EU level would consist of the preparation of non-obligatory guidelines for the technical harmonisation of the sub-band.

4.4.2. Commission Decision setting the technical parameters of the 790–862 MHz sub-band

Under this option, Member States would be required to make the 790–862 MHz sub-band available for electronic communications. This option introduces a binding requirement only for Member States that chose to designate the sub-band for any services other than broadcasting (i.e. when a Member State changes the current allocation for broadcasting services), and could therefore prevent the introduction of new services that do not correspond to the harmonised technical parameters. It would not, however, guarantee that the sub-band will effectively be available across the EU by a certain date (cf. 4.1.1. above). Awarding of the band could be conducted on a technology and service-neutral basis⁴¹ with common technological conditions and a common band plan.

4.4.3. Commission Decision setting the technical parameters and setting a mandatory end-date for clearing the 790-862 MHz sub-band of broadcasting (high-power) services

Under this option the Commission would introduce a harmonisation measure with the same technical parameters as that under 4.4.2, but which would also set a binding date for Member States to clear the 790-862 MHz sub-band of other services, notably broadcasting that uses high power transmitters that would not be compatible with the Decision.

⁴¹ Technology neutrality means no restriction to one or more technologies such as GSM, LTE, UMTS, WiMAX, but applying technological conditions such as power limit, duplex spacing, channel width.

5. ASSESSMENT OF IMPACTS

5.1. Impact of options regarding the timely analogue switch-off

The information currently available suggests that analogue switch-off will take place at varying times across the EU, despite the EU target date of beginning of 2012.

- Five (5) Member States have already switched off analogue transmissions: Finland, Germany, Luxemburg, the Netherlands and Sweden. In addition, large regions have already switched-off in Belgium (Flanders) and Austria.
- A further eleven (11) member States have official plans to complete analogue switch-off by the end of 2011: Austria, Belgium, Cyprus, Denmark, Estonia, France, Greece, Hungary, Latvia, Malta and Spain.
- Another nine (9) member States have plans to switch off during 2012: Bulgaria, the Czech Republic, Italy, Lithuania, Portugal, Romania, Slovakia, Slovenia and the UK.
- Ireland has announced intentions to comply with the Commission's recommendation and Poland's latest objective is to switch-off in July 2013 but no firm plans are yet in place in these two Member States.

5.1.1. *No further EU action*

Without EU intervention, it is likely that 11 Member States will still retain some analogue broadcasting by 1 January 2012. Analogue switch-off in those Member States may take place throughout 2012, but in some cases may be delayed beyond 2012. Two Member States seem unlikely to switch-off any time before the end of 2012, and this would affect neighbouring Member States since parts of their spectrum would be unusable for low power use. The affected Member States would themselves lose the benefits of new services.

5.1.2. *Recommendation that Member States take all necessary steps to switch-off analogue signals by 1 January 2012*

Recommending that Member States ensure that digital switch-off is accelerated in order to ensure that the analogue switch-off date of 1 January 2012 is adhered to, would have a number of benefits:

- There would be significantly increased pressure on Member States to comply with the 2012 deadline. Those Member States that have announced plans for analogue switch-off to take place before 2012 may miss their initial, self-imposed deadline because of implementation issues, and a recommendation to accelerate switch off by 1 January 2012 is likely to focus the efforts of all stakeholders.
- Another benefit is that there would be more certainty that digital dividend spectrum would be available from 1 January 2012 in most Member States, hence more certainty for market players and all interested parties.
- A widely applied analogue switch-off date of 1 January 2012 would also increase the probability that some Member States will award the 790–862MHz sub-band earlier than would otherwise have been the case. The Commission study by the consortium of consulting firms estimated that, even on the basis of the most conservative scenario

(modest demand for broadband services), avoiding a one-year delay in the availability of the sub-band 790-862 MHz across the EU could generate a collective benefit of several billion Euros in net present value (minimum EUR 1 billion in consumer and supplier surplus only, accumulated over 15 years). This figure is based on the cumulative effect of advancing the estimated overall economic benefits of the digital dividend by one year over a period of 15 years (social benefits are not included but are assumed to be positive as the social advantages of access to broadband services are clearly established⁴²). For the sake of comparison, the UK regulator (Ofcom) has estimated the impact of a one year delay to the availability of a part of the digital dividend (790-9862 MHz) to reduce the potential net benefits from GBP 100 million to GBP 400 million in the UK alone.

There are **social costs**, in particular due to the moving forward of the purchase of digital-to-analogue converters by consumers who will continue to use an existing analogue TV. This cost, estimated at approximately 50 EUR per converter per analogue TV set to continue to receive terrestrial TV via an antenna, is however low when compared to the aggregated total benefits mentioned above⁴³. The experience of switch-off in the five Member States which have already done so, as well as in the USA, indicates that this social impact is limited and can be mitigated through specific subsidies targeted to disadvantaged groups.

In conclusion, as all Member States are planning to switch-over to digital technology, the timing of the switch-off does not influence significantly the overall costs of the transition. To some extent, earlier investments could have a positive effect on economic recovery. Some constituencies may face costs earlier than expected and this should be taken into account by authorities but the overall benefit is clearly positive as illustrated above. The distributional effect of these costs on disadvantaged populations can be compensated by state subsidies (the Commission has approved such state subsidies as long as the choice of converter solution is technology-neutral)⁴⁴.

5.1.3 Mandating analogue switch-off by 1 January 2012 (a Community legal measure)

The impact of this option would be that there is no residual analogue transmission in the 470-862 MHz band after 1 January 2012, legally enforced by a Community measure. Member States who are unable to meet the analogue switch-off deadline of 1 January 2012 would tend to oppose the adoption of this Community measure citing major issues of public interest, as certain among them would be faced with the stark choice of significant and immediate extra switchover costs allied with the threat of cutting-off television viewers that could not be re-equipped in advance of the switch-off date.

⁴² See for instance Plum Consulting, Restructuring Europe's economic and social progress: unleashing the potential of ICT (January 2006); Ovum, Bridging the Digital divide – less technology, more understanding (23 March 2009).

⁴³ As a conservative estimate, socially-weak groups of populations representing up to 10% of the population could be affected in the potentially 11 concerned Member States (among those, there would be up to 2 or 3 million households, relying significantly on terrestrial reception, which could not be eligible to subsidies, or for which Member States would not have specific compensation measures in place). In this extreme case, the total expense to be moved forward could be EUR 150 million. The actual cost of the Community measure would actually be the interests on this amount accrued during 1 year on average, or approximately EUR 10 million. Only the advancement of the expense is taken into account since the switchover to DTT is an agreed policy, hence unavoidable, and already endorsed by all 27 Member States in 2005.

⁴⁴ See Commission Decision 2006/513/EC of 9 November 2005 on State aid C 25/2004: Financing of the introduction of DVB-T in Berlin-Brandenburg, Germany (OJ L 200, 22.7.2006).

Delaying the analogue switch-off in some Member States would have the following direct impacts:

- the 790-862 MHz sub-band cannot be adopted in those Member States;
- the continued high-power analogue transmissions in the 790–862 MHz sub-band would restrict the ability of neighbouring Member States to use the sub-band for uses other than high-power DTT (issue of cross-border coordination).

The social impact and impact on individual Member States would be similar as 5.1.2.

5.2. Impact of options regarding the achievement of the optimal use of spectrum in the UHF band (470-862MHz)

The impact analysis in this section examines which other actions could be taken in order to facilitate freeing-up of additional spectrum capacity, principally but not exclusively, below 790MHz⁴⁵ thereby enhancing the digital dividend. This additional capacity could be used to allow satisfying later demand for more broadcasting services, more electronic communications services, or both. The impact of these additional coordination possibilities have not been fully assessed in term of quantitative impact as they are **only at the stage of proposal for discussion at EU level**. They will be subject to a **further impact assessment** when precise actions, and their timing, will be considered as part of a possible future Community action. The following provides however an estimate of their potential impact.

5.2.1. No further EU action on coordination activities

Under this option, there would be no EU-level intervention on DTT receivers or MPEG-4/DVB-T2, beyond the obligations and guidelines already in force. The main benefit of this option is the absence of compulsory additional costs to upgrade receivers or transmission networks.

5.2.2. Further coordination activities in sub-bands below 790 MHz

(a) Preparation for a possible coordinated migration of DTT networks to more advanced transmission technologies (e.g. MPEG-4, DVB-T2) and ensuring more interference resistant DTT receivers

This could potentially result in large efficiency gains, illustrated for the DTT platform in the figure below.

⁴⁵ This assumes that the proposed policy option to require that Member States make available the 790–862MHz sub-band is first pursued (see 5.4. below).

<i>Type of improvement</i>	<i>Specific improvement</i>	<i>Gains compared to legacy situation (number of TV programming channels)</i>
Compression technology	MPEG-4 or better (instead of MPEG-2)	Up to 100% (twice as many TV programming channels)
Transmission standard	DVB-T2 or better (instead of DVB-T)	At least 30%
Network topology	National SFN (instead of MFN)	Up to 300% (using two frequency channels per multiplex rather than the typical six). The benefits depend however strongly on the type of SFN and on the topology of the Member State

Figure 5.1: Illustration of potential improvement in DTT spectrum efficiency

Over the next three to five years, the Commission could initiate research and analysis into the possibility of making uses of the 470–862MHz band more spectrum-efficient, and consider some of the following initiatives, listed below.

► **Inclusion of compression technology at least efficient as MPEG-4 in DTT receivers**

Recommending the inclusion of compression technology at least as efficient as MPEG-4⁴⁶ in all sold receivers (minimum efficiency standard), in addition to the old standards ensuring backward compatibility⁴⁷, would have two benefits compared to the “no further EU action option”: it would act as an incentive for Member States to migrate network earlier to these better transmission technologies, and it could reduce the total cost of a transition by reducing the number of MPEG-2 only receivers that would need to be replaced.

The Commission study has estimate the net benefit to be between EUR 3.6 and 8.8 billion in net present value over 15 years (net private value, or consumer and producer surplus)⁴⁸.

⁴⁶ The minimum efficiency standard is expressed by reference to a specific existing standard only by default of a generic measurement scale that could define such a level in absolute value.

⁴⁷ In practice, virtually all MPEG-4 decoders currently on the market can also decode MPEG-2 signals.

⁴⁸ See detail in Commission study on "Exploiting the digital dividend – A European Approach", p. 309 to 314.

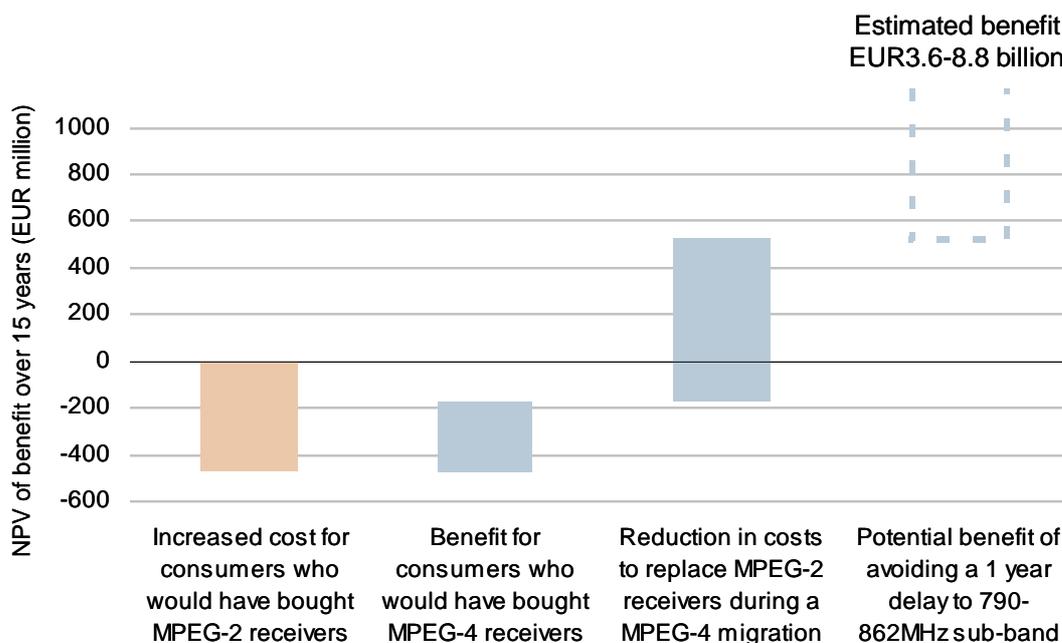


Diagram of costs and benefits of including MPEG-4 in all sold DTT receivers. Source: Commission study conducted by Analysys Mason, DotEcon and Hogan & Hartson.

The risk of negative social impact on consumers who have not access to the new technology would be compensated by a period of so-called "simulcast", or a period during which both the signals in the old and new standard would be broadcast as to allow the continuation of the reception by those consumers with their old TV set or set-top boxes. It is expected that, the future timing for a switch-off of the transmission in the older digital format would take into account the number of remaining older DTT receivers as well as the affordability of the new ones, and possibly of signal down-grading converter boxes.

There would be a positive distributional effect on Member States adopting the MPEG-4, or better standard, from the introduction of DTT as they would benefit from the lower prices stemming from larger economies of scale⁴⁹.

► Specification of minimum interference rejection standards

Specifying minimum interference rejection standards for DTT receivers would improve the quality of TV reception and reduce the cost of other equipment operating near the TV frequencies since those latter could use less expensive interference filtering components. The public consultation showed that this measure would be almost unanimously welcomed.

Although this may increase the cost of producing receivers, it is expected that this cost will be largely offset by gains in economies of scale, especially if this action is combined with the inclusion of minimum compression standards.

► The possibility of implementing national Single Frequency Networks

The public consultation and other sources have indicated that the advantages and costs of SFNs, which vary widely under various scenarios (e.g. high power or "cellular" SFNs), are

⁴⁹ France is a Member State that has adopted this approach as MPEG-4 will become compulsory on all DTT receives sold after 1 January 2010 and relative to TVs with screens larger than 51 cm in diagonal.

largely untested, and should therefore be assessed in more details based on practical experience.

► **The use of more frequency-agile wireless broadband networks**

The use of more frequency-agile systems (e.g. variable duplex technology) would improve the efficient use of spectrum. Since there is limited incentive for individual users and/or equipment manufacturers to invest in research to achieve substantial improvements in this domain, collective action such as research (possibly funded by Community programmes) could be recommended.

b) Cooperate at EU level over examining the future use of interleaved spectrum

There is a large group of existing users of interleaved spectrum⁵⁰, which mainly operate wireless microphones as explained before. The rearrangement of the UHF band will have a particular distributional impact on this community, and this needs to be addressed. It is considered that Member States are best placed to provide the alternative capacity needed to ensure the continuity of these services.

However, in the medium to long term, further clearance of DTT from the 470–862 MHz band, would mean that wireless microphones may not have access to sufficient interleaved spectrum to meet demand. Exploring possible short-term options to migrate these services to either more efficient digital technologies or to common spectrum bands would enable these longer-term issues to be addressed most effectively (more certainty for investors, new possibility for cross-border interoperability), for a limited cost (economies of scale). There are more benefits to having a cooperation concerning the future use of interleaved spectrum, more particularly to assist in reaching a Common Position in preparation for WRC-12.

In addition, Member States may soon consider allowing cognitive technologies to operate in the interleaved spectrum, following a recent decision in the US⁵¹. If this would happen, there could be benefits to envisage harmonisation at EU level as it would provide confidence to manufacturers and application developers. The potential value of such use of interleaved spectrum in the 470–862 MHz band to the EU could be EUR 20–30 billion, according to the study⁵² (mainly based on a critical review of previous studies by sectors and technology suppliers).

c) Increased involvement of EU-level institutions in cross-border spectrum coordination

The increased involvement of EU-level institutions in cross-border spectrum management and, in particular, in negotiations over changes in DTT assignments, would have the benefit of reducing the risk of delays in making the 790–862 MHz sub-band available for new services. The need for EU coordination between Member States may however be limited as bilateral and multilateral negotiations seem to make good progress.

Negotiations with non-EU countries (third countries), however, may be significantly more difficult. Further coordination is required with several Member States to facilitate the timely realisation of the sub-band, as the EU could not impose binding measures on those non-EU countries. An increased involvement by EU-level institutions in such difficult negotiations would certainly be beneficial to those Member States who have several or large non-EU

⁵⁰ Also called "white spaces"

⁵¹ http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-260A1.doc

⁵² Commission study on "Exploiting the digital dividend – A European Approach", p. 77 to 80, and p.158

neighbours. The public consultation confirmed the high interest of both Member States and stakeholders for such EU involvement to accelerate negotiations.

The cost of such a measure appears very limited, beyond the required staffing resources that must be made available.

5.2.3 Impact of mandatory requirements to improve spectrum efficiency linked to the digital dividend

The impact of mandatory requirements versus the impact of "further coordination activities", as described in 5.2.2., varies generally in an incremental way for each of the specific measures. At this moment in time, none of the measures can show a clear advantage for a compulsory approach at EU level. There is a need for more discussions on the political relevance and feasibility of some of the measures, for identifying possible Community action in more detail (form and scope) as well as for additional impact assessment.

5.3. Impact of options regarding the coordination of Member State actions in the 790-862MHz sub-band

5.3.1. No further EU action

This option would result in each Member State being able to adopt regulatory measures at the national level which can be contradictory with each other and which would jeopardise the application of the technical harmonisation measure that the Commission is planning to adopt in early 2010 with the assistance of the Radio Spectrum Committee (RSC) and on the basis of the preparatory work done by the CEPT.

5.3.2. Recommendation that Member States take no action that would interfere with the technical harmonisation measure being planned at EU level in the 790-862 MHz sub-band

Under this option, Member States will refrain from regulatory measure that would prevent or complicate low and medium-power bidirectional networks to use the 790-862 MHz sub-band. A regulatory measure at the national level could potentially complicate the application of the technical harmonisation measure the Commission is planning to adopt with the assistance of the Radio Spectrum Committee (RSC) and on the basis of the preparatory work done by the CEPT.

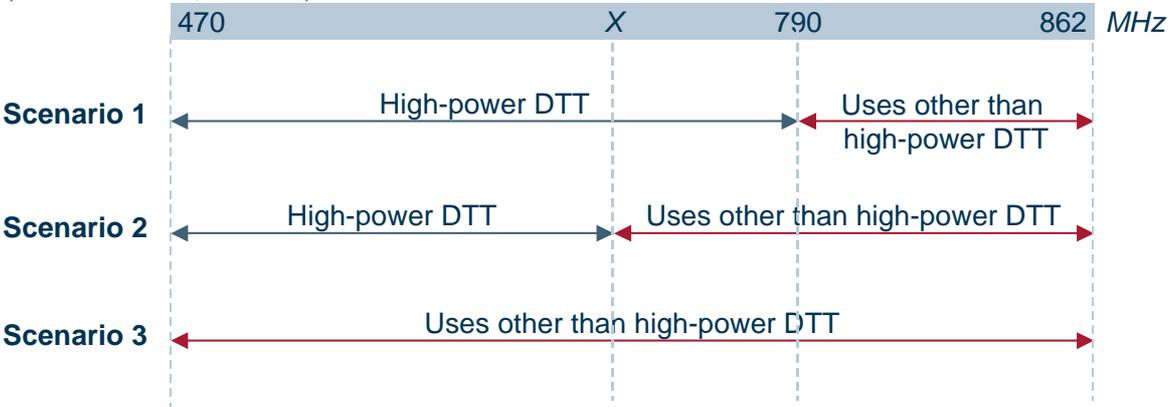
In addition, the Recommendation would aim at preventing the further build-up of legacy infrastructure in the sub-band, by requiring Member States to avoid the installation of new (not yet planned) high power DTT transmitters in this spectrum. By doing so, the cost of vacating this band in the future (if decided at political level) would be significantly lower (reduced negative legacy).

5.4. Impact of options regarding the technical harmonisation of the 790–862MHz sub-band

It must be emphasised that a timely switch-off of analogue terrestrial TV is a prerequisite for the use of medium/low power applications in the 790-862 MHz sub-band.

An important part of the Commission study consisted in assessing the magnitude of economic benefits that could be derived from the digital dividend across the EU over the next 15 years under different scenarios. These scenarios included a combination of spectrum supply and demand situations⁵³ ranging from:

- *Supply side*: a small part of the UHF open to new services (790-862 MHz, or 18%) up to the entire UHF band open to new services (470-862 MHz), and an intermediate step (694-862 MHz, or 42%).



- *Demand side*: low demand for main expected services (broadcasting and wireless broadband) to high demand for those services, with the possibility of new unexpected broadband uses.

		Wireless broadband		
		Low	High	High with new use
DTT	Low	Scenario A	Scenario B	Scenario C
	High	Scenario D	Scenario E	Scenario F

Demand scenarios for the 470–862MHz band [Source: Analysys Mason, DotEcon, Hogan & Hartson, 2009]

Spectrum supply scenarios for the 470–862MHz band [Source: Analysys Mason, DotEcon, Hogan & Hartson, 2009]

The underlying economic impact modelling used in the study was top-down (i.e. individual Member States are not analysed in detail) and based on (a) the evidence from previous studies on the incremental private value (i.e. consumer and producer surplus) of the services that could be provided assuming the level of spectrum supply specified in each of the supply scenarios, coupled with (b) estimates of the costs of network alterations or deployments and consumer equipment upgrades that might be required. This information was then used to quantify how differing divisions of the band among potential uses might translate into an economic value of the digital dividend across the EU.

The final economic benefits were expressed in terms of incremental private value (consumer and producer surplus combined) for the various types of possible EU-level scenarios when compared to a reference scenario corresponding to be no EU coordination (as described in

⁵³ Commission study on "Exploiting the digital dividend – A European Approach", chapter 12

section 2.2.). These results were quantified in Net Present Value accrued over a period of 15 years.

The two policy options introduced in Section 4.4 above represent progressive degrees of EU-level intervention.

The main conclusion of the study is that the private value that could be created by all Member States adopting the 790-862 MHz sub-band for electronic communications services would be between EUR17 billion and EUR44 billion depending on the assumed level of demand for different services as outlined above⁵⁴. A conservative mean estimate is EUR 30 to 40 billion (corresponding to modest DTT capacity increase due to better compression technology and sustained demand for mobile and fixed wireless broadband). National studies announced even higher benefits⁵⁵

This significant incremental private value of opening up the 790-862 MHz sub-band to new services under an EU-coordinated approach, over and above the “no further EU action” scenario, would accrue in the following ways:

- cross-border interference from DTT would not occur in the 790–862MHz sub-band, enabling alternative services such as wireless broadband to be effectively deployed throughout the EU;
- there would be benefits arising from the single market dimension: pan-European interoperability and roaming, particularly in terms of economies of scale for end-user and network equipment. Based on Normalised Price of equipment, the Commission study estimated these economies at 40% of retail prices for the first 50 million users, and with additional 5% for the next 50 millions, and finally 1.5% more if the remaining parts of the EU can be subject to the same harmonised conditions of use.
- there would be increased certainty provided to equipment manufacturers, which would accelerate research and development and enable services to be launched faster. During the stakeholders' workshop, manufacturers mentioned a minimum market of 100 million inhabitants as being the critical mass to start investing.

There will be also significant, and positively correlated social value, generated by the fact that the extent of access to broadband services will be greater and occur earlier than without this action, and through the possibility to create pan-European interoperability of services..

The net benefits take account of the costs that will inevitably occur during the necessary changes to broadcasting networks. These costs would primarily consist of:

- the reorganisation of frequency assignments, which could require both changes to the networks as well as bilateral negotiations with neighbouring countries, and possibly equipment costs in the case of Member States which are likely to decide to migrate to more efficient DTT standards in order to maintain the same level of development of DTT;

⁵⁴ Commission study on "Exploiting the digital dividend – A European Approach", details in chapter 13, summary results in 13.3.1

⁵⁵ For example, the study by ARCEP for the French government in 2008 indicated that a scenario that would ‘share’ the digital dividend between both electronic communications and audiovisual industries would add over EUR25 billion more to the French economy between 2012 and 2024 than allocating the digital dividend exclusively to the digital TV industry.

- in specific case, broadcast networks may require the replacement or reorientation of aerials (mainly a potential issue in the UK)⁵⁶.

According to the analysis performed by the consultants, there should be **no overall negative distributional impact** on the broadcasting services since any loss of broadcasting capacity in the 790-862 MHz sub-band should be compensated by network re-planning and/or improved transmission technology. In some case, financial compensation of broadcasters to cover these costs could be considered as well.

Regarding the **distributive effect on some Member States**, it is clear that costs will be depend on the amount of DTT transmitters located in the sub-band for each Member States. However, in all cases, Community action should have a positive impact as compared to no action since it is likely to facilitate the reorganisation of broadcasting networks (and lower the costs) as well as accelerate the realisation of the benefits in those affected Member States. Community action would also have a positive impact on the speed of the negotiations with third countries. As an example, as Community action is in development, one can see a growing interest of third countries in adopting a similar approach to the EU (e.g. Switzerland, Russia announcing analogue switch-off in 2015, North African countries considering the same sub-band for wireless communications).

5.4.1. Guidelines (non mandatory) for the harmonisation of the 790–862MHz sub-band

Implementing guidelines for the harmonisation of the 790–862MHz sub-band would provide a strong signal from the Commission of what it considers to be the most effective way to reap maximum benefits from the 790–862MHz sub-band. These guidelines would be aimed at persuading undecided Member States to adopt the measures presented in the Communication and Recommendation without formal obligations. The public consultation has also made clear that this action is largely anticipated by stakeholders and any failure to follow-up on the side of the Commission would create a degree of uncertainty in the market.

More generally, this option is likely to support maintaining the momentum which has been forming over the past few months, with Denmark, the Netherlands, Spain and the UK recently⁵⁷ announcing plans to clear and award the 790–862 MHz sub-band. This would unlock economic and social benefits in a larger proportion of the EU and increase benefits such as economies of scale, interoperability and roaming and increased certainty to industry, particularly for equipment manufacturers. As a result, parts of the identified benefit of EUR17 billion to EUR44 billion may be realised (see introduction to section 5.4).

Member States have expressed a preference for non-obligatory action to encourage the adoption of the sub-band. This is also the view put forward in the RSPG Opinion on the digital dividend.⁵⁸ Nevertheless, mere guidelines cannot guarantee the EU-wide adoption of the sub-band.

5.4.2. Commission Decision setting the technical parameters of 790-862 MHz sub-band

This policy option will reassure Member States facing difficulties to relocate high power broadcasting transmitters outside of this band, and therefore increase overall acceptance to build support for the sub-band for use by electronic communications in the foreseeable future.

⁵⁶ The UK is facing a particular situation where the operative frequency range of aerials vary from region to region.

⁵⁷ June 2009.

⁵⁸ RSPG Opinion on the digital dividend adopted on 19 September 2009.

This will avoid fragmentation and lead to an optimal use of the spectrum. The technical conditions set in the Decision will prevent the use of high-power applications that make the coexistence very costly and have a substantial cross-border impact. However, within these technical conditions, any service could be allowed and technology and service neutrality principles shall apply.

Furthermore, a common frequency allocation would also create greater scope for roaming for consumers. The cost-efficiency of providing roaming services, particularly for wireless broadband is greatly improved compared to a situation in which consumer equipment requires multi-band operation.

This policy option is likely to result in the vast majority of the calculated benefits to be realised (between EUR17 billion and EUR44 billion in net present value as explained in introduction to section 5.4 and detailed the study).

The Commission expects mobile broadband services to be deployed in this band. The ITU gave a co-primary allocation to mobile services in this sub-band. The CEPT measure (ECC Decision) on the 790-862 MHz sub-band is also adapted to mobile services. The availability of mobile broadband is a key condition to achieve the EU social objectives, incl. bridging the digital divide. All recent studies predict that UMTS or LTE are expected to be the most valuable uses of the sub-band. The sub-band 790-862 MHz should be also open to other services that meet the technical conditions set in the Decision.

If the sub-band was to be awarded under common technological conditions and a common band plan, this would remove the uncertainty on channelling arrangements, and hence on detailed spectrum planning for coping with interference, but at the expense of service and technology neutrality. It would require that all Member States award the 790–862 MHz sub-band exclusively for wireless broadband service, following common technological conditions and a common band plan (channelling arrangement). This would be the surest way to secure the full benefits calculated by the study conducted by the consortium for the Commission.

5.4.3. Commission Decision setting the technical parameters and setting a mandatory end-date for clearing the 790-862 MHz sub-band of broadcasting (high-power) services

While the absence of an end-date for clearing the 790-862 MHz sub-band in the above measure could lead to an uncertainty in the EU single market due to different speeds of implementation in different Member States, it is important to take into account the sensitivities of Member States on this issue, mainly due to different switch off speeds and different legacy situations regarding broadcasting.

Seeking to set that date in the current situation could be counter-productive and could give rise to greater uncertainty. If the Commission were to set an end-date, it is not sure whether all Member States would support such a measure. Furthermore, it is likely that a number of Member States would apply long transitional periods. Economies of scale could not be reaped and spectrum could not be used in the most efficient way.

Therefore, while it will be necessary at some point to fix a date beyond which the 790-862 MHz sub-band should be used exclusively by medium- to low-power services, in view of the importance of the matter and the political sensitivities outlined above, the **European Parliament and the Council could discuss the matter and propose an end-date** in the context of a Commission proposal under the Radio Spectrum Policy Programme in due

course. This would allow due account to be taken of the development of broadcasting services and would carry greater political support.

6. COMPARISON OF OPTIONS

6.1. Comparison of options regarding the timely completion of analogue switch-off

Figure 6.1. below summarises the benefits, costs and risks of requiring all Member States to switch off analogue broadcasting before 1 January 2012, compared to the “no further EU action” baseline.

<i>Option</i>	<i>Benefits compared to the “no further EU action” option</i>	<i>Costs compared to the “no further EU action” option</i>	<i>Risks</i>
1. No further EU action	Not relevant	NA. There are however some costs associated with the prolongation of simulcast (the parallel transmission of the same TV programmes in analogue and digital format) and an opportunity cost (see risks).	There is an indirect opportunity cost due to the delay in allowing the 800 MHz band to be used by electronic communications services. This cost of delaying potential benefits is estimated at min. EUR 1 billion in net present value over 15 years for any one year of delay of the switch-off date.
2. Recommendation that Member States take all necessary steps to switch-off analogue signals by 1 January 2012 (except those that have already switched-off)	<p>Increased pressure on some Member States to comply with the 2012 deadline (“momentum” effect on all stakeholders).</p> <p>Increased certainty as to the availability of the digital dividend by 1 January 2012.</p> <p>Increased probability that some Member States will award the 790–862MHz sub-band earlier than would otherwise have been the case. case (which has a potential benefit of between EUR1 billion and EUR10 billion in net present value over 15 years, in conjunction with other measures that aim to avoid delays in the availability of the sub-band).</p>	<p>Additional implementation costs for Member States that have planned analogue switch-off for after 1 January 2012.</p> <p>Spectrum may remain unused before 2015 (because of neighbouring countries outside the EU).</p>	Some consumers in vulnerable groups may not be adequately prepared for analogue switch-off by 1 January 2012 if the initial deadline was initially set for a later date. This risk can however be mitigated by considering adequately the special cases occurring only in a limited number of Member States, including the possibility of state subsidies aimed at these socially-weak groups (the conditions for such subsidies have been clarified by the Commission).
3. Mandating analogue switch-off by 1 January 2012 (a Community legal measure).	No residual analogue transmission after 1 January 2012, legally enforced by a Community measure.	<p>Additional implementation costs for Member States that have planned analogue switch-off for after 1 January 2012.</p> <p>Spectrum may remain unused before 2015 (because of neighbouring countries outside the EU).</p>	Threat of cutting-off analogue TV viewers that had not been re-equipped in appropriate time.

Figure 6.1: Comparison of options regarding advancing the analogue switch-off deadline

Although the costs mentioned above are limited to those maximum 11 Member States for which analogue switch-off would have taken place after 2012, the benefits would actually be realised across the EU, particularly in neighbouring Member States. The options 2 and 3 could help accelerating the adoption of the 790–862 MHz sub-band by a few months across the EU, thereby creating significant value (see Section 1.1), this compared with estimates for the cost of a one-year delay of EUR 1 to EUR 10 billion as explained in section 5.

6.2. Comparison of options regarding the achievement of the optimal use of spectrum in the UHF band (470-862 MHz)

Figure 6.2 below summarises the benefits, costs and risks of possible further measures to increase spectrum efficiency.

<i>Option</i>	<i>Benefits compared to the “no further EU action” option</i>	<i>Costs compared to the “no further EU action” option</i>	<i>Risks</i>
1. No further EU action on coordination activities	NA	NA	Additional spectrum can not be made available to new uses. The digital dividend is minimised.
2. Further coordination activities in sub-bands below 790MHz	EU able to react if additional spectrum is needed for new uses. High level of certainty to market players. Acceleration of the creation of a further digital dividend. Reduced costs for realising additional spectrum efficiency.	Additional regulatory burden to upgrade receivers. Cost of progressively replacing MPEG-2 receivers in the 15 Member States that currently use only MPEG-2 (The costs of replacing old DTT receivers should however be more than compensated by preventing more legacy devices from a certain date, and by lower costs due to economies of scale).	Detriment to some suppliers and consumers who would incur those costs sooner than anticipated.
3. Mandatory requirement to improve spectrum efficiency linked to the digital dividend	Strong EU action to improve spectrum efficiency. Technology-neutral specifications allow for flexibility in technology choice. Possible competitive advantage for the EU as a result of innovation in media industry (not assessed).	Costs of migrating to mandated specifications. Costs of replacing old DTT receivers.	Detriment to some suppliers and consumers who would incur those costs sooner than anticipated. Risk of picking specifications that are overtaken by further technological advances.

Figure 6.2: Comparison of options regarding other measures to increase spectrum efficiency

Option 2, further coordination activities, and especially the collaboration between Member States to share future broadcasting network deployment plans (e.g. migration to MPEG-4 or DVB-T2) and possibly the deployment of more Single Frequency Networks (SFNs) will lead to an increased efficiency of the use of spectrum below 790 MHz. This option will pave the way for a further digital dividend, while providing sufficient flexibility for Member States. Option 3, the mandating of minimum technology-neutral specifications in all DTT receivers

would provide more certainty to manufacturers and increased economies of scale over time, but still run the risk of being too closely associated with a current set of technologies that become outdated or are overtaken by further technological developments.

6.3. Comparison of options regarding the co-ordination of Member State action in the 790-862 MHz sub-band

Figure 6.3 below summarises the benefits, costs and risks of each of the policy options compared to the baseline that can be achieved by implementing the preferred option for the ensuring that Member States do not take action that would interfere with a co-ordinated approach in the 790–862 MHz sub-band throughout the EU.

<i>Option</i>	<i>Benefits compared to the “No further EU action” option</i>	<i>Costs compared to the “No further EU action” option</i>	<i>Risks</i>
1. No further EU action	NA	NA	The application of the technical harmonisation measure on the 790-862 MHz sub-band would be jeopardised.
2. Recommendation that Member States apply a co-ordinated approach in the 790-862MHz sub-band	Eased harmonisation at the EU level of technical conditions for the use of the sub-band. Creation of an EU momentum increasing the chances of more Member States adopting the sub-band, and hence accelerating the availability of the band in some Member States that are already considering moving in this direction. It would also allow more Member States to unlock the benefits of the expected services.	High-power networks would not be allowed in the 790-862 MHz sub-band from a certain date (to be approved at political level). Costs (if any) for Member States not being able to deploy high-power networks in the 790-862 MHz sub-band.	Some Member States might not respect the recommendation, undermining the overall impact of the initiative.

Figure 6.3: comparison of options regarding the preservation of a co-ordinated approach in the 790-862 MHz sub-band

The application of the technical harmonisation measure on the 790-862 MHz could be jeopardised in the absence of EU action ensuring that Member States respect a co-ordinated approach. The major benefit of this option is that high-power networks would not be allowed in the 790-862 MHz sub-band which would facilitate the technical harmonisation.

6.4. Comparison of options regarding the technical harmonisation of the 790-862 MHz sub-band

Figure 6.4 below summarises the benefits, costs and risks of each of the policy options compared to the “no further EU action” baseline.

<i>Option</i>	<i>Benefits compared to the “No further EU action” baseline</i>	<i>Costs compared to the “No further EU action” baseline</i>	<i>Risks</i>
1. Guidelines for the harmonisation of the 790-862MHz band	Increased probability that more Member States adopt the sub-band.	Negligible	Negligible. See comments in section 1.
2. Commission Decision setting the technical conditions for use of the 790-862MHz band	Increased probability that more Member States adopt the sub-band. Certainty of release of spectrum in the 790–862MHz sub-band on the longer term. Highly increased probability of realising benefits of EUR19 to 46 billion in net present value over 15 years.	Increased potential for legal action against NRAs’ decisions. Costs of increasing the efficiency of broadcast networks and reorganising transmission, of between EUR2 and EUR4 billion in net present value over 15 years.	Negligible for most EU Member States. See comments in section 1. It must be however noted that the outcome in Member States at the edge of the EU is dependent on their non-EU neighbours adopting a similar approach.
3. Commission Decision setting the technical conditions and setting a mandatory end-date for clearing the 790-862 MHz sub-band of broadcasting (high-power) services	Removing uncertainty in the EU single market due to a fragmented situation in a number of Member States. Further likelihood of realising the benefits outlined under option 2.	Additional costs for Member States that have not initially planned to use the band for other services than broadcasting.	Implementation delays by Member States due to different switch off speeds and broadcasting situations. Difficulties in coordinating an EU-wide plan for clearance of the sub-band with neighbouring third countries.

Figure 6.4: Comparison of options regarding the technical harmonisation of the 790-862 MHz sub-band

The costs of implementing non-obligatory guidelines in option 1 are likely to be very modest, but would not significantly increase the likelihood of achieving the major benefits of harmonisation. There would be a risk of a long term, difficult to reverse, fragmentation if early movers would adopt (even slightly) different technical specifications.

Requiring Member States to make the 790–862 MHz sub-band available, is likely to increase the probability of achieving the benefits of harmonisation. The major benefit from setting an end-date at the EU level for clearing the 790-862 MHz sub-band would be the removal of uncertainty in the single market caused by a fragmented situation in many Member States. As mentioned under 6.1, Member States that have not already carried out analogue switch-off might incur some costs, but such costs would be offset by economies of scale and by efficient use of spectrum.

Seeking to set a mandatory end-date immediately could be counter-productive and could give rise to uncertainty. If the Commission were to set an end-date, it is not sure whether all Member States would support such a measure. Furthermore, it is likely that a number of Member States would apply long transitional periods. Economies of scale could not be reaped and spectrum could not be used in the most efficient way. Therefore, while it will be necessary at some point to fix a date beyond which the 790-862 MHz sub-band should be used exclusively by medium- to low-power services, in view of the importance of the matter and the political sensitivities outlined above, the European Parliament and the Council could

discuss the matter and propose an end-date in the context of a Commission proposal under the Radio Spectrum Policy Programme in due course.

In summary, the more beneficial option at this point in time, and which satisfies proportionality requirements appears to be option 2, i.e. to require that all Member States apply the same technical conditions when changing the designation of the 790-862 MHz sub-band from the current designation for broadcasting, recommending that awards be conducted on a technology and service-neutral basis with common technological conditions and a common band plan.

Any later proposal by the Commission to introduce a common deadline for implementation of the technical harmonisation decision of the 790-862 MHz sub-band will be subject to a specific and more detailed evaluation of impact of that specific measure, in particular its possible distributional impact on business sectors, groups of citizens or specific regions.

7. EVALUATION AND MONITORING

The link between the use of the digital dividend in Member States and its social and economic impact across the economy, either in specific application areas, or in structural change is too complex for aggregate measures of impact to be used as indicators of the effectiveness of the measures considered. It is therefore proposed *to base the evaluation and monitoring on the operational objectives* in the specific areas of focus.

Special attention will be paid to assessing progress in the three main areas addressed i.e.:

- The timeliness of measures taken in Member States for ensuring the complete switch-off of analogue TV by 1 January 2012;
- The progress in making the 790-862 MHz sub-band available for electronic communications under harmonised technical condition in Member States;
- Progress in migrating to "best in class" technologies for the transmission of terrestrial broadcasting signals.

Specific indicators which will be updated regularly will include the following:

- Percentage of EU territory and/or population where the digital broadcasting switchover has been completed;
- Coverage of rural areas by mobile broadband;
- Availability of new services provided in the 790-862 MHz sub-band;
- Percentage of sold DTT receivers ready to process transmission compression standards at least as efficient as MPEG-4 AVC/H.264;
- Availability of minimum common standards for interference rejection on DTT receivers;
- Number of Member States having implemented the harmonised technical conditions of use for the 800 MHz band and the evolution of the prospect for an EU-wide implementation in the future;
- Percentage of broadcasting networks using the first generation of DVB-T/MPEG2 standards versus those using a next generation of more efficient transmission standards (at least as efficient as MPEG4 AVC/H.264);
- Progress on a common position on the possible use of "white spaces" in Europe;
- Availability of clear plans at Member State level and/or at EU level to ensure the continuity of legacy services such as wireless microphones.

From a more fundamental viewpoint, dealing with the evolving nature of the digital dividend issue will be a "dynamic" process: developments in technology, services, market demand and societal requirements will require that the actions established under the roadmap evolve in parallel. Particularly relevant factors of uncertainty which will have to be monitored are:

- the extent of consumer take-up of HDTV on the terrestrial platform in the future, compared to the take-up on other platforms such as satellite and IPTV on broadband networks (in particular in an NGA context);

- a higher growth of broadband wireless usage leading to a spectrum bottleneck⁵⁹;
- the emergence of unforeseen additional broadband uses which would require access to more spectrum below 1 GHz, for example public service uses such as Public Protection and Disaster Recovery (PPDR) or public security;
- the pace of introduction of new technologies: new transmission compression standards, new frequency agile technologies and their ability to take advantage of the white spaces;
- the possibility to create synergies with other regions of the world in the light of not foregoing the chance to benefit from potentially world-wide economies of scale.

To address these evolutions, the Commission will propose to establish a mechanism to monitor external developments affecting the roadmap, using where possible existing structures and contact networks. The collection of data for that purpose should be performed through access to sector-specific statistics, data collected in the context of the work in relevant EU policy areas (e.g. broadband penetration, broadcasting service take-up) and other appropriate sources. In addition, the Commission may launch additional studies and/or task the Communications Broadcast Issues Sub-group (CBISS) of the Communication Committee (COCOM) and/or the Radio Spectrum Policy Group (RSPG) to assess progress if required. The Commission further proposes to report on any need to review elements of the roadmap to the European Parliament and Council at least once every two to three years. This reporting would include changes in forecasts for spectrum demand and identify any future need for making further spectrum available on a co-ordinated basis.

⁵⁹ This has also been identified by the RSPG in its Position Paper on wireless broadband (Document RSPG09-284 adopted on 13 May 2009).

Annex A: Glossary of abbreviations used in the IA report

CEPT	European Conference of Postal and Telecommunications Administrations
DTT	Digital Terrestrial TV
DVB-T	Digital Video Broadcasting - Terrestrial
ECC	Electronic Communications Committee
ECO	European Communications Office
FCC	Federal Communications Commission
FDD	Frequency Division Duplex
GE-06	Geneva 2006 frequency plan
HDTV	High-Definition TV
ITU	International Telecommunication Union
MFN	Multi Frequency Networks
MPEG	Moving Picture Experts Group (ISO standard for audio and video compression and transmission)
RSPG	Radio Spectrum Policy Group
SAB/SAP	Services Ancillary to Broadcasting/Services Ancillary to Programme making
SFN	Single Frequency Networks
PMSE	Programme Making and Special Events
PPDR	Public Protection and Disaster Relief
TDD	Time Division Duplex
UHF	Ultra High Frequency (band)
UMTS	Universal Mobile Telecommunications System
WAPECS	Wireless Access Policy for Electronic Communications Services
WRC	World Radiocommunication Conference