Commission for
Communications Regulation

Proposed Draft Strategy

Proposed Strategy for Managing the Radio Spectrum: 2008 - 2010.

An Assessment of the Economic Impact of Spectrum Usage and a Proposed Strategy to manage the Radio Spectrum in Ireland.

Document No:	**08/20**
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All responses to this consultation should be clearly marked:- "Reference: Submission re: ComReg 08/20" as indicated above, and sent by post or e-mail, to arrive on or before 5 pm, 11 April 2008, to:

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Please note ComReg will publish all respondents submissions with the Response to this Consultation, subject to the provisions of ComReg's guidelines on the treatment of confidential information – ComReg 05/24

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Contents

1 Foreword

The Commission for Communications Regulation (ComReg) is responsible for the efficient management and use of the radio spectrum, a key natural resource. In this document ComReg sets out its strategy for managing the use of the radio spectrum in Ireland from 2008 to 2010 in order to ensure that the maximum strategic, economic and social benefits can be leveraged from the use of the radio spectrum for end users.

Ease of access to radio frequencies is an essential requirement for telecommunications, and particularly for aviation, broadcasting, maritime services, defence services, public safety, and the many private businesses that rely on mobile radio. As communications increasingly become mobile, the demands to access radio spectrum are set to increase. During the life of this plan we will see new and innovative spectrum deployments in many areas including the liberalisation of GSM spectrum and the licensing of Digital Terrestrial Television (DTT) across Ireland. With the deployment of DTT, ComReg will play its part in raising awareness of the potential of the ensuing Digital Dividend for all end users. Other key areas to be addressed in the period to 2010 include the release of additional spectrum below 4 GHz to meet wireless broadband access and multimedia mobile services and the provision of spectrum for a modern digital radiocommunications emergency services network.

ComReg also sees potential for greater leverage of spectrum as a key national asset. In its last spectrum strategy for the period 2005 to 2007, ComReg introduced a new and innovative licensing regime for carrying out technical tests and trialling new applications and technologies. The scheme has been successful and has allowed licensees to test or trial new products or services in a realistic radio environment at an early stage of development, such that subsequent commercial offerings can be properly tailored to meet the needs of users. To date ComReg has issued close to 70 licences under the test and trial scheme to both new and some very well known companies who are using Ireland as a test-bed. ComReg believes that more can be done to reinforce Ireland's position as a key location of choice for research and development in the use of spectrum and, as part of its new strategy statement, ComReg will work with other state agencies, Government, commercial organisations and third level institutions to develop its goals in this key area.

It has become commonplace that new commercial service offerings are deployed on a trans-national basis. Consequently, and in conjunction with the UK Office of Communications (Ofcom), the licensing authority in Northern Ireland, ComReg successfully issued its first 'all-island' licence on a technology and service neutral basis. In addition, ComReg has employed auctions as a market-based tool to assign licences and is committed to doing so in the future where appropriate. ComReg remains committed to employing cost effective and transparent procedures in order to facilitate market entry and stimulate cross platform competition for the benefit of end users.

As set out in the document, ComReg is committed to encouraging competition and supporting innovation throughout the life of this plan. In this regard ComReg very much welcomes comments from the public, users, industry, Government and interest groups in response to this draft strategy document.

Mike Byrne
Commissioner

2 Executive Summary

The radio frequency spectrum is a vital but finite natural resource which provides the means to convey audio, video and other content over distances ranging from a few metres to thousands of kilometres. Radio spectrum is essential for the continuing provision of our now ubiquitous mobile communications and to provide wireless reception of broadcast services. It is also fundamental to the safe operation of air and maritime transport, used widely by the defence forces, emergency services and supports many important scientific applications.

The period to 2010 promises a number of changes in the deployment and use of spectrum. This document sets out ComReg's strategy for managing the use of the radio spectrum in Ireland over this period in order to ensure that Ireland can, against this backdrop, leverage the maximum benefits economically, strategically and socially from use of the radio spectrum.

ComReg has reviewed the economic contribution made by the use of radio spectrum to the Irish economy and estimates that the contribution for 2006 is almost €3 billion, equivalent to 1.67% of total GDP. The number of direct employees whose jobs are dependent on use of the radio spectrum is conservatively estimated to be in excess of 30,000.

In preparing this strategy ComReg has identified six **key drivers**. These are:

(i) The demand from wireless **Consumers** for all their business and entertainment requirements to reach them on one single device in any location.

(ii) **Innovation** demands for suitable spectrum in order to establish new wireless electronic communication services.

(iii) The imminent establishment of new **Government Services** (emergency and public safety networks) is driving demand for unused spectrum.

(iv) To **Harmonise Irish Radio Spectrum** with European and International spectrum allocations to accrue the benefits of alignment with larger market economies.

(v) Significant changes are expected in the European regulatory framework for electronic communication affecting the **Legal and Regulatory Environment** ComReg operates in.

(vi) In line with European initiatives Ireland is employing **Intelligent Transport Systems** which will require appropriate spectrum and a licensing framework in the near future.

In its recent corporate strategy publication[1] ComReg set out its four broad objectives, all of which are core in this regard also:

- To ensure all **consumers** are appropriately informed and protected and have easy access to a wide range of competitively-priced quality products and services[2]
- To create the conditions for sustainable, dynamic and innovative **competition** in the sectors we regulate, which delivers a choice of high quality products and services at competitive prices to consumers
- To promote **innovation** in converging platforms and technologies by creating a supportive and predictable regulatory environment which enables industry and other stakeholders to make informed decisions on future investment, roll-out and deployment of new technologies
- To be a **professional, innovative organisation** that is a leading source of expertise in the communications sector

On the basis of **likely demands** for spectrum and changes in the legal and regulatory environment resulting from the six drivers and to support ComReg's corporate strategy, a number of broad radio spectrum management strategies have been developed and these are set in greater detail at Section 6. These broad strategic goals are further reflected in **specific actions** that have been identified for each of the various users of spectrum as outlined in Section 7.

The key tasks facing ComReg in the next two years include:

1. The liberalisation of the GSM Spectrum bands to facilitate the growth of the public mobile services and innovation through the use of 3G and other technologies in these bands.
2. The licensing of Digital Terrestrial Television across Ireland and facilitating access to the ensuing Digital Dividend.
3. The provision of spectrum for public safety and emergency services in support of a Government tender for a modern digital radiocommunications network.
4. The release of additional spectrum below 4 GHz, to meet market demand and to support the expected requirement for additional spectrum to facilitate broadband and multimedia mobile services.
5. Responding to the introduction of a modified European regulatory structure for electronic communications services and networks. [3]

[1] Document ComReg 07/104, "Strategy Statement (2008-2010)."

[2] Within the context of this strategy, industry is treated as a consumer of spectrum.

Synopsis of this document:

- Spectrum – Ireland's advantage and how ComReg will continue to use the test and trial scheme to further encourage innovation is brought out in Section 4.2.

- Section 4.4 provides a summary list of the frequency bands that have been identified for possible release in the time period covered by this new spectrum strategy.

- The economic and social impact of spectrum use – Section 5 – The contribution of spectrum to GDP and employment is growing steadily and shows the importance of managing this natural resource.

- The six drivers of the strategy over the next two years, as we see them, are detailed in Section 6.3. Here the focus is on what consumers want, innovation, and legal and regulatory changes that we expect.

- The strategy, in support of ComReg's high level goals is detailed in Section 6.4 and is based on consumer demands, the protection of consumers, providing opportunities both competition and innovation to occur and how best spectrum management can support the organisation.

- A new category of service, Wireless Access **Platforms** for Electronic Communications Services is discussed in Section 7. This is our adoption of the European Commission Wireless Access **Policy** for Electronic Communications Services (WAPECS) initiative which has moved us, in some areas, away from narrowly defined allocations and applications towards technology neutrality and service neutrality. This is one of the key areas where ComReg is promoting competition and innovation. This Section also provides ComReg's strategy for each radio service. Each service that we regulate has a proposed strategy from which ComReg will identify projects and actions to be carried out over the next two years to bring the strategy to fruition.

- A number of annexes give details on the work undertaken by ComReg on spectrum monitoring and compliance, non-ionising radiation, the regulatory framework under which ComReg operates and further details on the WAPECS concept.

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[3] The main emphasis of this framework is the promotion of competition and a single European market in electronic communications and is currently under review with the aim of introducing the revised legislation in the EU by 2008 followed by implementation in Member States by 2009-2010. The review is focusing on flexible spectrum management, streamlining market reviews, consolidating the internal market, strengthening consumer protection and user rights, improving security and removing outdated provisions.

3 Submitting Comments

ComReg welcomes any comments on this strategy as well as expressions of interest in using particular spectrum; however it would simplify the task of analysing responses if comments are referenced to the relevant section numbers from this document. In particular comments on the following (non-exhaustive) issues would be particularly welcomed:

- Which approach should ComReg take in licensing the various spectrum bands?
- Within what timeframe do you consider that ComReg should make various spectrum bands available?
- Are there any other spectrum options that ComReg should consider?

In Section 7.4.3, fixed service bands below 3 GHz, particular views are sought in order to best inform ComReg's position.

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4 Spectrum Management in Ireland

Management of the radio spectrum entails the careful combination of administrative, regulatory and technical procedures necessary to ensure the efficient operation of radiocommunication equipment and networks. A primary goal of spectrum management is to ensure optimal use of the radio spectrum, having regard to social, economic and technical considerations.

In managing the radio spectrum, ComReg must balance a range of often competing factors. These include:

- ensuring that ComReg meets the requirements of all radio services and that there is a balance between commercial and public policy requirements;
- maximising social benefits arising from radio use, for example in relation to public safety, national security and health care; and
- enhancing Ireland's competitiveness by ensuring that adequate spectrum is allocated and assigned to users that derive the highest economic value from it.

In addition, there is a need to ensure the efficient use of the spectrum within the bounds of spectrum constraints and technology developments. Clearly, the regulatory process of ensuring the optimal use of the spectrum needs to be flexible and responsive in order to adapt to changes in technologies, demand, markets and public policy.

The main Acts governing the radio sector are the Wireless Telegraphy of 1926, 1956, 1972 and the Broadcasting and Wireless Telegraphy Act, 1988 (together "WT Acts"). The primary WT Act providing the legislative framework for radiocommunications and for managing the radio spectrum is based on conditions and principles developed in the 1920s. In the 82 years since the enactment of the 1926 WT Act, the environment, whether it is technology, economic, regulatory, legal or social, in which the legislation is expected to be applied, has changed considerably. The primary legislation needs to be revised to take account of changes arising from developments in spectrum management as well as technological developments. Any new national legislation will also need to reflect legislative developments within the EU regulatory framework concerning spectrum.

Public policy goals play a significant role in determining spectrum management policies. Technical efficiencies may have to be compromised in order to safeguard the provision of certain public services such as safety, defence and public broadcasting services. Technical and economic efficiencies may also be constrained by international obligations related to spectrum use, especially restrictions on the amount of power that can be exported across national borders.

4.1 ComReg's Role

ComReg is the National Regulatory Authority (NRA) responsible for the regulation of the electronic communications sector (telecommunications, radiocommunications and broadcasting[4] transmission) in Ireland. In carrying out its role in relation to radio spectrum management, ComReg must:

- ensure that measures taken are proportionate in ensuring the efficient management and use of the radio spectrum; and
- have regard to international developments with regard to the radio frequency spectrum.

The process of allocating frequencies to radio services and the regulatory framework are largely determined by external factors such as public policy, legislation and international agreements or regulations. ComReg plays an active role, along with the Department of Communication, Energy and Natural Resources (DCENR), in international fora to ensure that as far as possible the international allocation and regulatory framework accommodates Ireland's specific requirements. ComReg also participates in technical compatibility studies and in the development of technical standards to support more efficient and flexible use of the spectrum.

ComReg's spectrum management activities embrace four main areas, namely frequency allocation, the regulatory framework for electronic communications services, frequency assignment and enforcement. As of December 2007 there were 15,559 active radio spectrum licences in Ireland and by way of example, Figure 1 illustrates the breakdown of the 7 100 new individual licences issued by ComReg in the last three years. It can be seen that three categories account for the majority of licences issued, namely fixed links, ships radio and business radio. Fixed links are used extensively to support the roll-out of mobile phone networks for example, and are individually licensed by ComReg. Ship radio licences and business radio licences are held by many individuals and companies in Ireland, whereas other licence categories are relatively specialised and issued in correspondingly smaller quantities. [5]

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[4] In relation to broadcasting ComReg's role is limited to spectrum management and assignment issues. Broadcast policy is decided by the Minister for Communications, Marine and Natural Resources and content issues are regulated by the BCI and the RTÉ Authority.

[5] Since September 1, 2007, the responsibility for the licensing of radio communications equipment on Irish Ships and associated Certificates of Competency was transferred to the Marine Radio Affairs Unit of the Department of Transport. ComReg remains responsible for spectrum management issues.

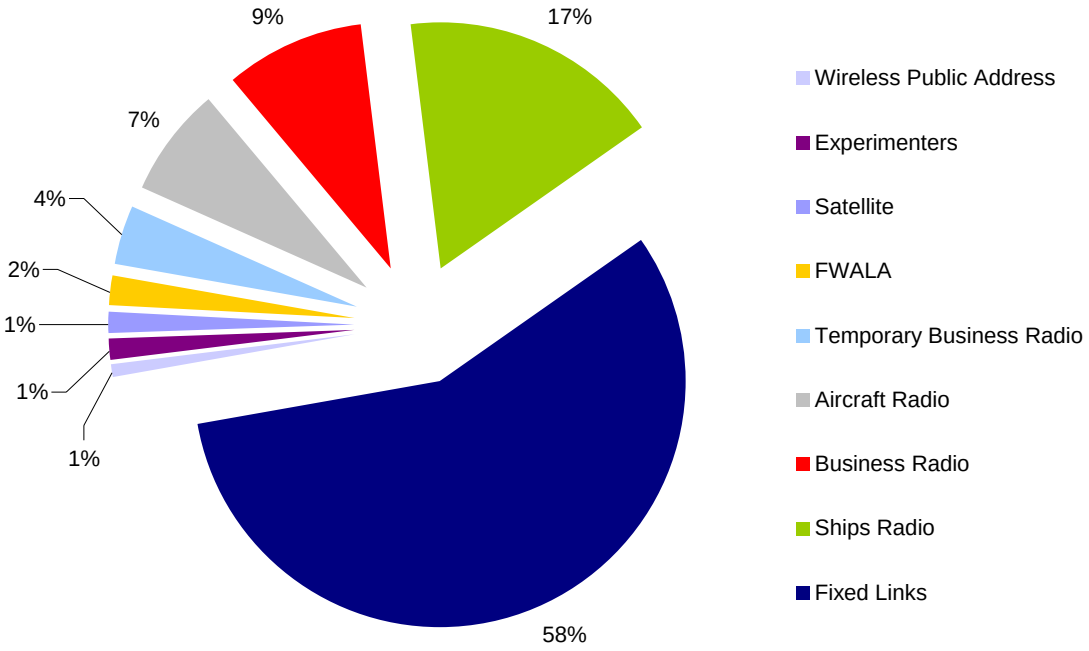

Figure 1: Breakdown of the total volume of new licenses issued in the period October 2004 to December 2007

ComReg monitors licensed operators to ensure that they are in compliance with their licence conditions and investigates complaints of interference. ComReg is also obliged to ensure that all radio equipment placed on the market is in compliance with the R&TTE[6] and EMC[7] Directives. ComReg also monitors the radio spectrum to ensure that there are no unlicensed operators and continues to take appropriate enforcement action against any person or business found operating a radio system without a licence. Further details are contained in Annex A.

As radio frequencies naturally extend beyond national borders spectrum management requires an in-depth knowledge of, and involvement in, European and global spectrum management developments. Much of the radio spectrum requires international planning and in some cases this constrains how specific frequencies or frequency bands may be used. This is particularly so in the aeronautical and maritime sectors, where, because of the global nature of these services, ships and aircraft must use specific frequencies for navigation and communication purposes. In addition, there are a number of internationally harmonised frequencies for commercial radio systems such as cellular (mobile) phones. The TV and radio

[6] The R&TTE Directive refers to Article 3(2) of Directive 1999/5/EC of The European Parliament and of The Council of 9 March 1999 On Radio Equipment And Telecommunications Terminal Equipment and the Mutual Recognition of Their Conformity O.J. 7.4.99 L 91/10.

[7] The EMC Directive refers to Council Directive 2004/108/EC of 15 December 2004 on the approximation of the laws of Member States relating to electromagnetic compatibility OJ L 390/24.

broadcast bands have been harmonised for many decades, to facilitate co-ordination between neighbouring countries and the development of consumer markets.

Global regulation is primarily within the remit of the International Telecommunication Union (ITU), while regional regulatory authority lies with the European Union (EU) and the European Conference of Post and Telecommunications Administrations (CEPT). These bodies define the broad framework within which all spectrum users must operate, and in some cases have developed harmonised approaches to spectrum use in order to facilitate international services, open markets and minimise the risk of interference between users.

The role of these international bodies and further details on the national framework for spectrum management is described in more detail in Annex B.

4.2 Spectrum – Ireland's Natural Advantage

Ireland's geographic position on the western edge of Europe and low population density provides a key natural advantage that allows ComReg to promote its test and trial licence scheme. When taken with the rapid evolution of wireless technology Ireland has an excellent opportunity to encourage global developers to choose this country as a test-bed for new product or service concepts.

Test and Trial licences enable developers to gain timely access to appropriate radio spectrum for a limited period, whilst avoiding any adverse effects on existing users. A lack of congestion in most frequency bands means that frequencies can be made available to test products in a live environment, aimed at Irish, European or wider global markets. Such tests may range from purely technical trials, e.g. to determine coverage characteristics in different frequency bands, to evaluation of user attitudes to pre-launch services.

In response to market demands and to encourage and maximize the use of radio spectrum for the benefit of industry and research institutions in Ireland, ComReg launched a substantially enhanced Test and Trial wireless scheme in 2005. The new licence scheme enables innovators to carry out field tests of wireless technologies and services that otherwise would not be possible under typical spectrum management regimes. It facilitates the development of new systems which are not yet fully standardised, giving companies in Ireland a clear advantage over other nations where access to spectrum is more restricted. Additionally it also facilitates the testing and manufacture of systems destined for deployment in foreign markets, where different standards and regulations may apply.

The test licensing scheme has enabled a wide variety of organisations to test and develop new radio equipment including international equipment manufacturers such as Ericsson (GSM and 3G) and Intel (WiMax). The trial licensing scheme allows industry to have the ability to garner consumer feedback on wireless services in a live trial environment prior to commercial launch. The scheme, which has been praised by many markets players, is currently being used by mobile network operators (O2 and 3) to trial mobile TV and by RTÉ to trial digital TV and radio (TDAB, DRM). Ireland's abundance of uncongested spectrum allows ComReg to endeavour to accommodate requests for any frequency bands not currently being

used in a particular location for test licences, including parts of the mobile and broadcasting bands.

ComReg believes that more can be done to reinforce Ireland's position as a key location of choice for research and development in the use of spectrum. As part of its new strategy statement to 2010, ComReg will work with other state agencies, Government, commercial organisations and third level institutions to develop its goals in this key area.

4.3 Market Mechanisms and Spectrum Management

In recent years there has been increasing international interest in the application of market based approaches to spectrum management, with the objective of increasing flexibility and promoting more economically efficient use of radio spectrum. The two principal market based mechanisms that have been applied are auctions and secondary trading. Auctions have been used as an alternative to comparative selection procedures for awarding rights to use radio spectrum where the number of rights available is limited. Secondary trading allows spectrum rights to be traded between entities, providing a means of accessing radio spectrum via the market rather than the regulator.[8]

4.3.1 ComReg Position on Auctions

ComReg does not at this stage favour any specific approach for awarding spectrum rights, but prefers to consider each award on its own merits. In making such an assessment ComReg balances the size and scale of the Irish market, public policy considerations, social considerations, economic and market considerations, legal factors and expected demand and use in order to determine the most appropriate allocation method to deliver an efficient outcome.

In the last two years ComReg has developed new licensing regimes based on first-come-first-served (e.g. FWALA), beauty competitions (e.g. the fourth 3G licence) as well as auctions (e.g. the All-Island Spectrum award). Auctions have proved to be a quick, fair and transparent method for assigning frequencies. As a result auctions are the preferred assignment method where the demand for spectrum exceeds its supply. Underpinned by a technology neutral-approach and, where appropriate, by a service-neutral approach, auctions are proving to be successful in facilitating the promised introduction of new services and greater competition in the market. Where auctions have been used ComReg has purposefully used a simple auction process, the first- or second-price single-sealed bid format. However, the use of auctions in Ireland for spectrum allocation is changing as markets evolve and recently a second-price single sealed bid approach was used to assign the All-island spectrum licence.

[8] Although the regulator still has a role to ensure that the traded spectrum continues to be used in an appropriate manner.

As spectrum demands evolve and increase it is conceivable that in the lifetime of this strategy statement that ComReg may hold its first simultaneous multiple round auction (SMRA).

4.3.2 ComReg Position on Spectrum Trading

There are a number of studies discussing the potential benefits to greater liberalisation and, in particular, of introducing trading of spectrum rights. A major study commissioned by the European Commission (EC)[9] gave a conservative estimate that the EU could gain by at least €9bn per year as a result of introducing liberalisation.

ComReg has considered the potential benefits of spectrum trading for specific licence categories and has concluded that secondary markets could potentially play a role in ensuring the efficient assignment and use of the spectrum in some areas. However, use of spectrum trading needs to be underpinned by primary legislation which is not yet the case.

4.4 New Spectrum Opportunities

This section provides a summary list of the frequency bands that have been identified for possible release and is intended to provide information to potential users, licensees and industry in general about spectrum that may be made available in the time period covered by this spectrum strategy statement. There are a number of factors beyond ComReg's control, including technological change and demand, results of public consultations and finalisation of Government policy that can affect the identification of spectrum.

The information in this section should be used as a guide only and nothing in this section should be taken to bind ComReg to any course of action in later processes. While ComReg has made a best endeavour to identify potentially useful frequency bands which might be considered for future allocation, the absence of any specific band in this document or this section in particular should not be taken to indicate that such a band will not be considered for allocation in the future or during the period covered by this strategy. ComReg continues to monitor spectrum demand, regional, international and commercial developments and may seek to make other bands available should future circumstances warrant such a course of action.

[9] Study on conditions and options for introducing secondary trading of radio spectrum in the European Community, by Analysys Consulting Ltd, DotEcon Ltd and Hogan & Hartson LLP.

Spectrum Band	Timing / potential for Release	Notes
169 MHz	Updating of Business Radio Guidelines	Harmonised European band
Interleaved UHF Spectrum	Consultation in Q1 2008 on licence conditions which could be applied to mobile TV	
925 – 937.8 MHz paired with 880 – 892.8 MHz	Following the GSM Bands Liberalisation consultation	Currently allocated to GSM only
1452 – 1492 MHz	Subject to market demand – 2009 / 2010	Ideal for mobile multimedia services
1805 – 1831 MHz paired with 1710 – 1736 MHz	Following the GSM Bands Liberalisation consultation	Currently allocated to GSM only
1875 – 1880 MHz paired with 1780 – 1785 MHz	Following the GSM Bands Liberalisation consultation	Guard Band
1915 – 1920 MHz	TBD	Currently allocated to 3G TDD only
2010 – 2025 MHz	Competition planned for late 2008	Currently allocated to 3G TDD only Subject to market demand
2300 – 2400 MHz	Subject to market demand - 2009	Potential WAPECS band
3660 – 3710 MHz	Additional FWALA / BWA consultation – 2008	
3760 – 3800 MHz	Additional FWALA / BWA consultation – 2008	
3500 – 3510 MHz	Following the conclusion of the Government National Broadband Scheme tender – Mid 2008	BWA spectrum, if required, for the use of the winner of the National Broadband Scheme
26 GHz band	Competition to be held in Q2 2008	Further details available on ComReg Website[10]
31 GHz band	Potential CCTV fixed link band and new fixed link band	Subject to market demand

[10] See http://www.comreg.ie/radio_spectrum/26ghz_spectrum_competition.691.html

5 The Contribution of Radio Spectrum to Ireland's Economy

A key consideration in developing a strategy for radio spectrum management is the extent to which use of the radio spectrum contributes to the Irish economy and national competitiveness. Research carried out by ComReg, based on publicly available data, concluded that the total contribution to Irish GDP arising from the use of radio spectrum in 2006 was nearly €3 Billion, or approximately 1.67% of that years total GDP. Spectrum's contribution to the economy has grown substantially over the last 4 years, both in absolute terms, and as a relative share of the economy, even though this was a period of high general economic growth. Between 2003 and 2006 years, the annual rate of growth of spectrum's contribution was 14.1%, while the rate of growth of GDP was 6.1%. Thus, even during a period extremely rapid economic growth, spectrum grew even faster and has become a more important part of the economy.

Spectrum is also an important and growing source of employment; a conservative estimate of the number of employees in Ireland whose jobs are dependent on the use of radio spectrum was over 30,000 in 2006.[11]

These figures highlight the importance of radio spectrum to the Irish economy. The social benefits arising from use of the radio spectrum are also considerable. Efficient functioning of the Gardaí, fire and ambulance services, for example, depends on reliable mobile communications, while radio plays a major role in enabling the Irish Defence Forces to carry out their duties both at home and overseas. Radio is fundamental to the safe operation of air, sea and land transport. Additionally Ireland plays a particularly important role in managing international radio traffic in the aeronautical sector, dealing with all flights between Europe and North America. Thus it is clear that the contributions of the defence, public safety and transport sectors to society and the economy is heavily dependent on access to radio spectrum.

The use of spectrum, through its ability to facilitate the encouragement of new technologies and innovation, is also likely to have contributed strongly to general increases in productivity. While this is not measured directly, nearly all economists acknowledge the link between increased use of ICT technology and boosting productivity, thus it is highly probable that the indirect effect of spectrum usage (in terms of boosting general productivity across the economy) is extremely significant.

[11] These conservative estimates understate the total contribution of spectrum as it was not possible to value all services because of lack of suitable data.

5.1 Calculating the contribution of Radio Spectrum

The contribution to GDP of a given company making use of radio spectrum was determined by taking the profits generated by its operations ('operating profit') and adding it to company staff payments. Payments to staff provide an indirect contribution to the economy as a result of wages spent.

Depreciation, which denotes the notional loss of corporate assets over time, is subtracted from capital expenditure, which constitutes an addition to the assets of the corporate entity. This provides a more accurate measure of actual cash flows within the economy. The figure for capital expenditure (Capex) is taken for fixed tangible assets only and excludes disposals (assets that are sold or written off by the company).

This can also be expressed in the following way:

GDP contribution = Operating profit + Staff payments + [Depreciation – Capex]

The estimate of GDP contribution is qualified in two important respects. First, the estimate excludes small companies to which the Companies (Amendment) Act 1986 applies[12]. This is because such companies are exempt from filing a full set of financial accounts. As a result, some data needed to perform the GDP contribution estimate cannot be readily obtained in accordance with the above methodology. While the individual turnover amounts for small companies are relatively low, on aggregate the contribution of such companies may actually be quite large but unaccounted for.

The second qualification relates to the types of companies making use of radio. Since users (and uses) of radio spectrum are not homogenous, spectrum was categorized as either fundamental or tangential to various different types of corporate operations.

The provision of mobile services for example can only be undertaken via the use of radio frequencies. This is also true for most broadcasting services provided in Ireland. Radio spectrum can also be considered 'fundamental' to the aviation sector, since the safe operation and volume of air traffic could only be accomplished through the use of radio. Other sectors, such as the medical device industry, make use of radio though only in a tangential way. Clearly not all medical devices produced are wireless medical devices, but it is difficult to assess the nature and extent of radio use in this industry as the equipment operates mainly in the 2.4 GHz unlicensed band.

This leads us to providing the following two estimates for the GDP contribution arising out of the use of radio spectrum in Ireland:

[12] ss. 11, 12 Companies (Amendment) Act 1986. 'Small companies' have a have a turnover of less than €7.3m and fewer than 50 employees.

- The first is a conservative estimate based on services to which radio spectrum can fairly be regarded as fundamental. In real terms we estimate that this amount to €2.4 bn. or 1.4% of GDP.

- The second more broad-based estimate which consists of those companies where use of spectrum is tangential to their operations amounts to €2.8 bn. or 1.67% GDP.

5.2 GDP and Employment Contribution

The following tables show the estimated contribution to GDP (Table 1) and employment for each of the main uses of radio spectrum (Table 2).[13]

	GDP (€m)				
	2002	2003	2004	2005	2006
Mobile	491	716	919	869	1410
Broadcasting	293	332	294	297	283
Fixed links[14]	n/a	n/a	4	2	13
Air services	331	373	535	744	706
Low Power Devices	575	530	495	481	399
Other Services	4	2	4	4	7
Sub Total	**1634**	**1953**	**2251**	**2397**	**2758**
GDP	**130215**	**139413**	**148502**	**161498**	**165047**
% of total economy	**1.25**	**1.40**	**1.52**	**1.48**	**1.67**

Table 1: Summary of GDP Contribution

The approach taken to determine the contribution of radio spectrum to GDP was to include the direct revenue contribution of the relevant operators in each sector in conjunction with estimates of the forward and backward linkages in the economy. These were based on the value chains for spectrum using sectors. For example, for mobile services this approach included revenue generated from mobile retailing and software, security and other suppliers to the mobile sector. For broadcasting services it included revenue generated through forward links to the advertising industry. The wider impacts on the economy as a whole were estimated using a general economic multiplier of 1.1 to arrive at the final figures in Table 1.[15]

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[13] Data for maritime services was not included as it is not possible to determine with a reasonable degree of confidence, the extent to which these depend on radio (unlike aeronautical services, most maritime activities could be undertaken without radio spectrum, albeit with reduced efficiency and safety).

[14] Fixed link figures exclude infrastructure links for mobile and broadcast networks which are included in those sectors. Estimates are based on number of licensed links and typical maintenance costs (see Annex B).

[15] In economic theory, multipliers are premised on the notion that an initial spending rise can lead to even greater increase in national income as a result of indirect effects associated with the expenditure.

Figure 2 below illustrates the relationship between Ireland's total GDP in years 2002 to 2006 with the aggregate contribution of the radio sector over the same period. In real terms growth has increased on average approximately 17.2% annually. The contribution of radio services has continued to track the proportionate increase in economic growth within the Irish economy over the last five years. The correlation illustrated by the graph below is suggestive of the value in terms of cost and efficiency that is accompanied by enhanced telecommunications capacity.

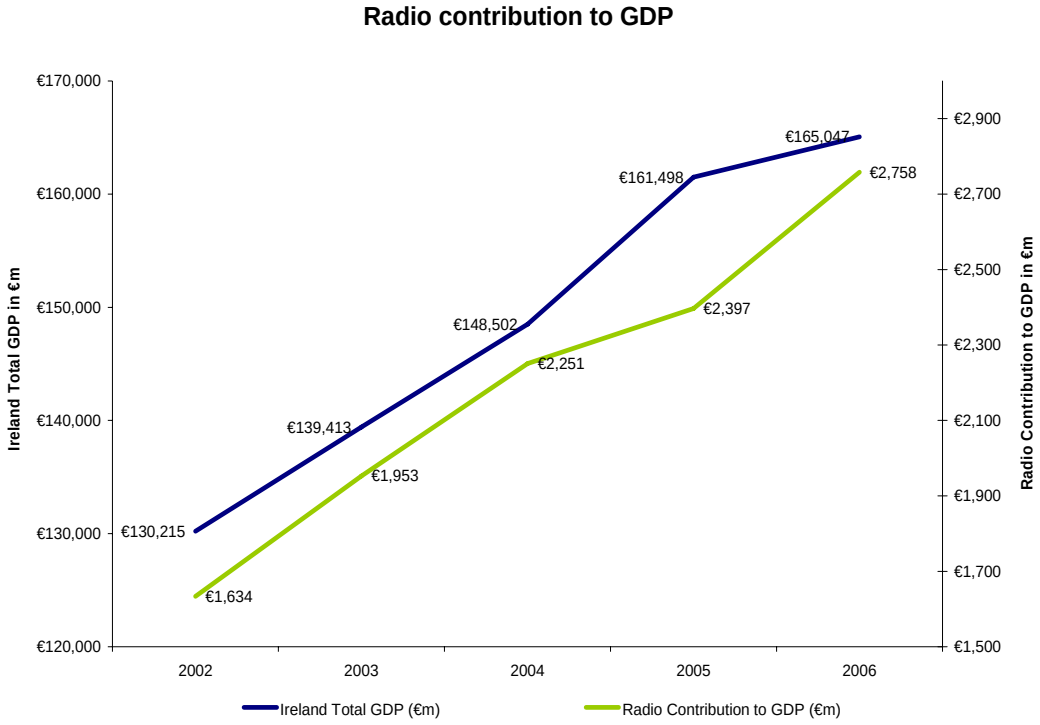

Figure 2: The radio sector's contribution to Irish GDP[16]

In other words, an initial change in aggregate demand can cause a further change in aggregate output for the economy. The general economic multiplier used in this statement is reported in "The Macro-economy of Ireland," by Leddin and Walsh.

[16] While a perfectly linear and parallel correlation cannot be expected in estimations of this order, GDP in Ireland was somewhat above its trend growth in 2005. This is perhaps attributed to factors such as unusually high growth in another sector within the economy such as construction. It should also be noted that changes in the communications sector such as the merger of Chorus/NTL and acquisition by UPC broadband affect how financial data is reported. These changes may not be fully captured by the methodology as adopted.

In Table 2, below, the employment effects were estimated directly where suitable data was available, for example from annual reports. The multiplier of 1.1 was also used in this context.

	Employment				
	2002	2003	2004	2005	2006
Mobile	6404	6056	5215	5768	6168
Broadcasting	4510	4553	4803	4931	4710
Fixed links			98	89	389
Air services	11978	11829	12174	14595	15986
Low Power Devices	2547	2633	2884	3449	3012
Other Services	23	75	74	80	127
Total	**25462**	**25146**	**25248**	**28912**	**30392**

Table 2: Summary of employment impacts

6 Strategy for Managing the Radio Spectrum

Under the Communications Regulation Act 2002 ComReg is required to ensure the efficient management and use of the radio frequency spectrum in Ireland. In this regard ComReg publishes every two years, a Strategy Statement for the electronic communications sector. ComReg's current Strategy Statement[17] is a forward-looking document that serves as a framework for action by the organisation for the period 2008-2010. It sets out ComReg's plan for the delivery of identified key priorities and forms the foundation for this document focusing on the Spectrum Strategy for the same period.

6.1 ComReg's Mission

ComReg enables the development of a sustainable, competitive and dynamic communications sector in Ireland and empowers consumers to make informed choices.

The management of the radio spectrum is one of the enablers of this mission. The use of spectrum is intrinsic to the sustainability of the communications sector. Making spectrum widely available increases competition. Technology neutrality is one way of increasing flexibility and increasing the dynamism of the sector.

6.2 ComReg's Vision and High Level Goals

ComReg's vision for the electronic communications sector entails facilitating the conditions for sustainable, dynamic and innovative competition to exist in the sectors we regulate and for all consumers to be appropriately informed and protected and to have easy access to an increasingly wide range of competitively-priced quality products and services.

Our vision is of ComReg promoting innovation in converging platforms and technologies by creating a supportive and predictable regulatory environment that facilitates convergence and which enables industry and other stakeholders to make informed decisions on future investment, roll-out and deployment of new technologies. To ensure achievement of our vision, ComReg is a professional, innovative organisation that is acknowledged as a leading source of expertise in the electronic communications sector.

[17] Document ComReg 07/104, "Strategy Statement (2008-2010)."

In moving towards this vision ComReg established the following four high level goals:

- To ensure all consumers are appropriately informed and protected and have easy access to a wide range of competitively-priced quality products and services.

- To create the conditions for sustainable, dynamic and innovative competition in the sectors we regulate, which delivers a choice of high quality products and services at competitive prices to consumers.

- To promote innovation in converging platforms and technologies by creating a supportive and predictable regulatory environment which enables industry and other stakeholders to make informed decisions on future investment, roll-out and deployment of new technologies.

- To be a professional, innovative organisation that is acknowledged as a leading source of expertise in the communications sector.

6.3 Spectrum Management Strategy Drivers

As all wireless communication technologies require access to radio spectrum, and as the demands for these technologies rise, so too will demands to access the radio spectrum. The technological uses of spectrum are both varied and wide-ranging and extend from entertainment, leisure and consumer products to education, health and public safety. Digital Terrestrial Television (DTT) technology for example, has provided a more efficient use of spectrum than the analogue service it is replacing. This will release spectrum that could be utilised for new broadcasting or non-broadcasting services, increasing competition and giving consumer's additional choice. At present, a DTT trial is currently being conducted across Dublin County and the North East of the country[18].

Demand is difficult to predict in an era of rapid technological development. There is however, little doubt that demand for spectrum will continue to increase, and that its management will become increasingly nuanced. The ready availability of spectrum has prevented, in most areas, any excess demand issues arising. But, greater consideration may have to be given to competition as the growth of consumer markets and new technologies place pressure on the remaining spectrum available.

In the preceding spectrum strategy ComReg grouped the drivers of spectrum demand into five categories namely: markets; technology; social & cultural; economic and legal & regulatory taking a long term view (5-10 years) of spectrum demand. In this draft strategy ComReg has identified **six key drivers** which are likely to have a significant impact on demand for spectrum and hence on any strategy for managing the radio spectrum over the next two years.

[18] See http://www.dcmnr.gov.ie/Broadcasting/Digital+Television/

6.3.1 Consumers

Consumers of communications services demand access with few if any restrictions on location or time when the services are available. To meet this demand industry is moving to supply more of what were traditionally seen as fixed services (e.g. broadcasting, broadband, etc) to a mobile platform.

Also, consumers increasingly expect to receive all their business and entertainment requirements through a single device/handset. Meeting this demand for multimedia content will require a considerable increase in radio bandwidth.

Both of these consumer demands are key drivers in the convergence[19] between the three traditionally separate areas of fixed, mobile and broadcasting services.

6.3.2 Innovation

Existing operators and licensees, as well as potential market entrants and entrepreneurs, typically seek to gain market share or develop new businesses by leveraging innovation to differentiate products or services. Creating a regulatory environment supportive of innovation in new electronic communications services is critical in realising the benefits of a vibrant telecommunications industry and this philosophy underpins much of ComReg's approach to spectrum management.

6.3.3 Spectrum for Government Services

Future requirements for security and public safety related radiocommunications always needs to be considered as part of any spectrum strategy. This includes the licensing of new services in unused spectrum set aside for the emergency services for example Emergency TETRA at 380-400 MHz. This should then naturally lead to the release of existing spectrum used for analogue technology by these services in the VHF and UHF bands, potentially for commercial use. The growing use of CCTV and surveillance technologies in the support of security and policing actions is also likely to require the use of higher frequency bands which can support the broadband communications links required.

6.3.4 Spectrum for Intelligent Transport Systems (ITS)

Road safety remains a major concern across Europe where in 2005; road accidents killed over 40,000 people in the European Union and injured more than 1.2 million. In Ireland 333 people died on the roads in the twelve months from the end of June 2006 to June 2007, an average of 28 fatalities per month.[20]

Integrated safety systems, which use information and communication technologies in intelligent solutions, are being developed by the automotive industries in order to

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[19] Convergence in this context is the deployment of multiple digital media such as broadcasting, telecommunications and information technology to deliver integrated multimedia content and services.

[20] Road Safety Strategy 2007 -2012, Road Safety Authority, www.rsa.ie.

improve road safety and reduce the number of accidents on Europe's roads. Across Europe there has been significant activity on the development of ITS which is placing demands on access to radio spectrum in order to accelerate the deployment of these systems and the European Commission mandated CEPT to identify appropriate spectrum in support of ITS. In Ireland, the Department of Transport has published a consultation about the development of Intelligent Transport Systems (ITS).[21]

6.3.5 Harmonisation of Irish Spectrum Allocations

Ireland has a highly developed economy and is a large user of communications technology per capita. While Ireland does not manufacture large quantities of radiocommunications equipment, its consumers are viewed internationally as 'early adopters' of new communications technologies. Ireland's geography and demographics make it uniquely suitable as a test bed for the deployment of innovative communications technologies. In order to maximise these benefits allocation of the radiofrequency spectrum needs to be particularly cognisant of market developments both in Europe and internationally.

6.3.6 Legal and Regulatory Environment

Ireland's legislative framework for wireless services has within the past 5 years largely been shaped from the EU level through the introduction of the EU Regulatory Framework for Electronic Communication. The main emphasis of this framework is the promotion of competition and a single European market in electronic communications. This framework is currently under review with the aim of introducing the revised legislation in the EU by 2008 followed by implementation in Member States by 2009-2010. The review is focusing on the following principles:

- Flexible spectrum management.
- Streamlining market reviews.
- Consolidating the internal market.
- Strengthening consumer protection and user rights.
- Improving security.
- Removing outdated provisions.

At a national level, it is anticipated that within the next 2-5 years new legislation relating to the regulation of the electronic communications sector will be introduced. These include a new Radiocommunications Act, which will replace the Wireless Telegraphy Acts 1926-1988, as well as a new Broadcasting Act.

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[21] Consultation Paper on Intelligent Transport Systems, March 2006, http://www.transport.ie/viewitem.asp?id=7365&lang=ENG&loc=1512

6.4 Spectrum Strategy Supporting ComReg's High level Goals

To assist in achieving ComReg's high level goals and having regard to the six strategy drivers specific to spectrum, ComReg has developed the following broad radio spectrum management strategies.

6.4.1 Spectrum Strategy in Support of Consumers

High Level Goal
To create the conditions for sustainable, dynamic and innovative competition in the sectors we regulate, which delivers a choice of high quality products and services at competitive prices to consumers

1. In support of the industry responding to consumer demands

Strategies

- Implement technology neutral licence conditions as far as practical recognising ComReg's role in preventing harmful interference to co- and adjacent-channel users.

- Implement service neutral licence conditions as far as practical given international agreements, European legislation, the requirement to limit harmful interference, support of national policy and operating in the best interests of consumers.

- Release additional spectrum below 4 GHz,[22] to meet market demand, to support the expected requirement for additional spectrum to facilitate broadband and multimedia mobile services. In doing so to utilise appropriate market mechanisms when assigning available spectrum that allows prospective licensees the opportunity to acquire only the spectrum they deem necessary.

2. In support of the industry as a consumer of Spectrum

Strategies

- Supply information in the form of this strategy, the radio frequency plan, comprehensive consultations, industry forums, seminars and workshops.

[22] Spectrum below 4 GHz is preferred for mobile services due to its superior propagation, coverage and penetration characteristics.

- Use market mechanisms where demand exceeds supply to ensure the most efficient user acquires spectrum.

- Use a form of incentive pricing to stimulate technologically efficient use of spectrum and promote the release of underutilised spectrum.
- Remove barriers to convergence by working to improve legislation so as to facilitate convergence across sectors.

- Continue to ensure that appropriate spectrum continues to be available to meet the needs of public safety, emergency services, safety of life services and the defence forces in view of their vital role in the safeguarding of human life, property and national security.

- Make access available to harmonised spectrum to facilitate Intelligent Transport Systems in Ireland.

- Seek to harmonise the use of spectrum in Ireland with international and European allocations to take advantage of the economies of scale generated when a number of markets utilise a common technology.

3. In direct support of Consumers

Strategies

- Protect consumers by ensuring that Non-Ionising Radiation emitted by licensed and licence-exempted services meets international standards (further details on ComReg's current work in this area can be found in Annex A).

- Ensure that consumers are guaranteed a minimum Quality of Service (QoS) from network operators by conducting drive tests and QoS survey programmes.

- Deal promptly with cases of non-compliance and, using all legal and regulatory tools at ComReg's disposal, take appropriate action against non-compliant equipment found on the Irish market. Ensure safety-of-life services are always given the highest priority.

- Actively participate in European wide cross border market surveillance campaigns with the aim of conducting technical tests on sample consumer products to assess conformity with the R&TTE Directive. This includes

liaison with the National Consumer Agency (NCA) which is responsible for co-ordinating Ireland's RAPEX[23] activities.

6.4.2 Spectrum Strategy in Support of Competition

High Level Goal
To create the conditions for sustainable, dynamic and innovative competition in the sectors we regulate, which ultimately delivers a choice of high quality products and services at competitive prices to consumers

In providing opportunities for competition

Strategies

- Ensure flexibility and ease of access to radio spectrum to accommodate technological advances and market factors in order to leverage Ireland's competitive advantage.
- Seek to provide further opportunities to promote the use of radio/wireless systems to enhance Ireland's competitiveness.
- Exploit spectrum to facilitate cross-platform competition in order to maximise the benefit accruing to consumers.
- Where appropriate, continue to liberalise the constraints applied to spectrum rights of use, to permit deployment of alternative technologies or services, where harmful interference does not result.
- Optimise use of the spectrum resource by encouraging the use of spectrum efficient radio systems and the use of the most appropriate frequency band for the application in order to maximise spectrum usage in critical frequency bands.
- Where appropriate, utilise market mechanisms when assigning spectrum where these mechanisms can encourage the efficient use of the spectrum.

[23] RAPEX is the EU-wide rapid alert system for all dangerous consumer products. It allows for the rapid exchange of information between Member States and the EC on measures taken to prevent or restrict the marketing or use of products posing a serious risk to the health and safety of consumers. ComReg liaises with the NCA on issues relating radio and electronic products which may pose a risk to consumer welfare.

6.4.3 Spectrum Strategy in Support of Innovation

High Level Goal
To promote innovation in converging platforms and technologies by creating a supportive and predictable regulatory environment which enables industry and other stakeholders to make informed decisions on future investment, roll-out and deployment of new technologies

Provide appropriate spectrum to the market on a timely basis and in a manner that encourages and facilitates industry innovation

Strategies

- Adapt the allocation of, and access to, the spectrum resource to provide spectrum that best meets the needs of the user.
- Allow potential licensees to determine the amount of spectrum required for their choice of technology and service offering within reasonable, transparent, non-discriminatory and proportionate limits.
- Facilitate new and innovative services and to support and promote innovation, research and development in new radiocommunication techniques, spectrum-based services and applications.
- Promote the innovative Test and Trial licence scheme to position Ireland as a test-bed for wireless system testing and service trials.
- Align spectrum fees and licence duration with investment cycles so that investors can expect a fair return on investment.
- Release available spectrum under 3 GHz for which there is a demand.
- Utilise market mechanisms in assigning available spectrum so that prospective licensees have the opportunity to acquire the amount of spectrum they deem necessary.

6.4.4 Spectrum Strategy in Support of the Organisation

High Level Goal
To be a professional, innovative organisation that is a leading source of expertise in the communications sector

Develop and implement regulatory policies in accordance with international and national standards

Strategies

- Continue to consult regularly and widely on spectrum issues in order to have the benefit of industry and other stakeholders' views when making decisions.
- Continue to work to protect Ireland's national interests when harmonising and co-ordinating spectrum utilisation with other countries, regional and international organisations.
- Continue to work with all stakeholders to ensure the efficient use of spectrum in Ireland.
- Plan and manage the utilisation of the spectrum resource in accordance with both national and international legislation.
- Where appropriate, ensure compliance with international agreements on frequency usage and technical standards as a requirement for spectrum access, recognising that these agreements are necessary for harmonious system operation, efficient spectrum management, spectrum utilisation, compatibility, competitiveness and avoidance of interference.
- Continue to represent and promote Irelands position with regard to all radio services in the relevant international fora, at both a regional (European) and Global level, within the EU, ITU and CEPT.
- To influence European legal and regulatory developments to ensure that Ireland's best interests are promoted and protected, and that:
    - The correct balance is achieved in the philosophy and practise of spectrum management between different sectors.
    - Sufficient flexibility is achieved to ensure that future spectrum management initiatives are not unecessarily limited.
    - A wide range of spectrum management tools are made available so that best practise in spectrum management can be achieved.

These broad strategic goals are reflected in ComReg's positions regarding spectrum for specific services, detailed in Section 7.

7 Strategy for Specific Radio Services

Radio spectrum is available for the provision of a variety of communications services and networks. These include radio transmission networks, public access services – such as mobile telephony and broadband access networks, broadcast networks as well as radio navigation systems, business radio, ships' radio, amateur radio, consumer products and equipment used in industry, medicine and commerce. In addition, the nature of the spectrum means that certain parts of the spectrum are more suitable for particular purposes than others.

7.1 Wireless Platforms for Electronic Communication Services

In June 2004 the EC requested an opinion from the Radio Spectrum Policy Group (RSPG) on a coordinated EU spectrum policy approach concerning Wireless Access Policy for Electronic Communication Services (WAPECS). The driver behind this request came from the EC workstream to develop policy approaches ensuring that spectrum issues related to the growing and evolving variety of radio access platforms for public wireless communications complied with the overall policy goal of developing the EU internal market and European competitiveness.

WAPECS is a framework for the provision of electronic communications services within a set of frequency bands to be identified and agreed between European Union Member States in which a range of electronic communications networks and electronic communications services may be offered on a technology and service neutral basis, provided that certain technical requirements are met, i.e., to avoid interference, to ensure the effective and efficient use of the spectrum and the authorisation conditions do not distort competition.

The term "WAPECS" has been used to signal a move away from too narrowly specified allocations and applications, for which specific spectrum is designated. Under this definition of WAPECS, it is envisaged that technologies will be stimulated to deliver all electronic communications services within their capabilities, making use of any frequency band and networks. However, this is subject to technical coexistence requirements which need to be tailored to each specific band. Further details on WAPECS are contained in Annex C.

ComReg, which played a leading role in the RSPG in developing the WAPECS concept, sees this European policy as a platform to initiate many of the strategy objectives put forward in this document, including:

- The move towards technology neutral licensing.
- The move towards service neutral licensing.
- The demand for multimedia platforms.
- The trend, in some areas, towards convergence of the fixed, mobile and broadcasting services.
- The promotion of competition and innovation in Ireland.

7.1.1 Proposed ComReg Strategy for WAPECS

Within the European framework of WAPECS, ComReg's proposed strategy is to develop a generic licensing framework and the necessary secondary instruments that permit the licensing of WAPECS services, which may include multimedia services, in Ireland. This licensing framework will:

- Promote technology neutrality whenever possible.
- Promote service neutrality where such a designation is not in conflict with the national interest.
- Ensure that spectrum assigned is used efficiently and effectively.

7.2 Public Mobile Services

Mobile communications is one of the fastest growing sectors in telecommunications with mobile phone penetration rates in Ireland now standing at 114%.[24] There are three licensed 2nd generation or GSM[25] systems operating in both the 900 MHz and 1800 MHz frequency bands with enhancements such as GPRS[26] and EDGE[27] to improve their data handling capabilities. To date, ComReg has also issued four 3rd generation (3G) or IMT-2000/UMTS[28] licences in the 1900 – 1980 MHz, and 2110 – 2170 MHz bands.

The key drivers of demand for public mobile spectrum are likely to be new and faster data applications, for example the delivery of audiovisual content to mobile phones or high speed access to the Internet or corporate intranets. The Mobile Data Association (MDA) reported that 2008 is likely to bring flat rate tariffs and that devices that work at a level of 'adequate ease' are likely to be a major area of focus.[29] The MDA further predicted that:

- the worldwide cellular subscriber base will reach 3.75 billion by year end 2008;

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[24] Quarterly Key Data Report – December 2007 – ComReg Doc 07/106.

[25] GSM- Global System for Mobile Communications is a cellular, digital, land-based mobile communications system.

[26] GPRS- General Packet Radio Service is a GSM data technique that transmits and receives data in packets rather than establishing a continuous channel from a portable terminal for the transmission and reception of data. It makes very efficient use of available radio spectrum, and users only pay for the volume of data sent and received.

[27] EDGE - Enhanced Data rate for GSM Evolution EDGE features both a packet capability, EGPRS (Enhanced General Packet Radio Service), and a circuit switched capability, ESCD (Enhanced Circuit Switched Data). EDGE packs up to 69.2Kbps into eight timeslots, for a total theoretical bandwidth of 473.6Kb.

[28] UMTS is a European standard which is part of the IMT-2000 family. Other IMT-2000 standards may be deployed but at the time of the licence competition the EU required that at least one UMTS-based 3G mobile network must be licensed in each Member State to facilitate roaming (Decision no. 128/1999/EC of the European Parliament and of the Council of 14 December 1998 refers).

[29] See press release "2008-the year of the mobile customer2 at www.themda.org

- a minimum of 5GB storage will become standard in devices which will drive demand for downloading media;
- Bluetooth adoption will head towards 2 billion worldwide opening up new application channels for health, social care and wireless headsets.

It is unclear yet how much consumer demand exists for value-added content, however the popularity of internet-based music download services and associated portable music players and attractively priced mobile downloads are proving to be a major growth area.

The implications for spectrum demand in Ireland could be significant. Current 2G networks do not have the capacity to support such services and it is questionable whether 3G networks can meet the real demand. This could, for example, fuel demand for more economic delivery platforms, such as a handheld digital video broadcasting technology (e.g. DVB-H or T-DMB) which in turn could lead to pressure to free up some of the analogue TV spectrum to accommodate this technology.

7.2.1 Economic Contribution

GDP and Employment Impacts

The GDP and employment contributions of the public mobile sector comprise the direct contribution from mobile operators, the forward and backward linkages to mobile retailing and software, security, messaging and other suppliers to the mobile sector respectively, and multiplier effects on the rest of the economy.

The top section of Table 3 provides estimates of the GDP and employment associated with public mobile operators, retailers and suppliers from 2002 to 2006. Data for retailers and operators are shown together because the retailing operations of the operators are consolidated in their annual accounts. The indirect impacts are estimated using a multiplier of 1.1.

	GDP (€m)				
	2002	2003	2004	2005	2005
Mobile operators and retailers	272	529	706	644	1130
Mobile sector suppliers	174	122	129	146	152
Sub-total	446	651	835	790	1282
Multiplier effect	45	65	84	79	128
Total	**491**	**716**	**919**	**869**	**1410**

	Employment				
	2002	2003	2004	2005	2006
Mobile operators and retailing	3538	3485	3061	3178	3486
Mobile sector suppliers	2284	2020	1953	2066	2121
Sub-total	5822	5505	5014	5244	5607
Multiplier effect	582	551	501	524	561
Total	**6404**	**6056**	**5215**	**5768**	**6168**

Table 3: GDP and employment associated with public mobile services

7.2.2 Spectrum for Public Mobile Services

Ireland has already designated bands 1900-1980 and 2110-2170 MHz for IMT-2000/UMTS and licensed four operators to supply 3G services across Ireland in these bands (as shown in graphical form at Annex D).

Concerning the 2010-2025 MHz spectrum band, ComReg is seeking expressions of interest in the future use of this band and specifically, if there is sufficient interest, to initiate a public consultation and competition design to release this spectrum for new mobile applications under WAPECS.

The CEPT Electronic Communications Committee has developed a non-binding Decision[30] which provides a common approach across Europe in designating the frequency band 2500 – 2690 MHz for terrestrial IMT-2000/UMTS systems from January 2008, subject to market demand and national licensing schemes. The EC is currently finalising a Decision that seeks to harmonise the band and to add flexibility in the use of the band. It is expected that this binding Decision will be finalised in mid 2008.

In Ireland this band is currently used for MMDS broadcasting services licences valid in some cases, up to 2014. ComReg is exploring a long term strategy to meet the needs of the MMDS users and licensees and new wireless services (IMT or otherwise). ComReg intends to hold a consultation with industry to develop a coherent strategy to facilitate the development of 3G services in the 2.6 GHz band in line with market demand whilst accommodating any ongoing requirement by MMDS operators and their customers. It is intended that workshops and consultations will be carried out over the next 12 to 18 month period as the 3G mobile market develops.

[30] ECC Decision of 18 March 2005 on harmonised utilisation of spectrum for IMT-2000/UMTS systems operating within the band 2500 – 2690 MHz (ECC/DEC/(05)05).

The Electronic Communications Committee has also developed a non-binding Decision[31] designating the GSM bands 880-915 MHz, 925-960 MHz, 1710-1785 MHz and 1805-1880 MHz (see Annex D) for use by IMT-2000/UMTS networks in line with the WAPECS concept. These frequency bands are already widely harmonised in Europe for GSM networks and implementing this decision will provide opportunity for better coverage for IMT-2000/UMTS networks and, ultimately, more capacity.

7.2.3 Mobile Communication Services on Aircraft

Mobile Communication Services on Aircraft (MCA) is a recent innovation to provide communications facilities for mobile terminals on commercial aircraft that allows users to use their personal communications equipment during the 'in flight' phase of their journey, in much the same way as they would on the widely available terrestrial public mobile networks. An MCA system comprises a Base Station (BTS) and Network Control Unit (NCU) on board the aircraft and a radio link, typically via satellite, to a ground station and then interconnection to the public telecommunications networks.[32]

There is a need for a harmonised approach to the system together with its harmonised use to ensure the provision of an uninterrupted service whilst aircraft cross the borders of various countries and to reduce the regulatory requirements placed on administrations, terrestrial network operators and aircraft operators. It will frequently be the case that on any flight an aircraft will travel through the airspace of more than one country with the time spent in the airspace of any individual country being of short duration. An agreed regulatory approach is required to ensure that the spectrum utilised by the system can be used in any national airspace that the aircraft is crossing, provided that the system conforms to agreed limits in order to prevent harmful interference.

Within Europe, the framework of technical operation, the responsibility for the authorisation of the spectrum utilised onboard an aircraft as well as the recognition of this authorisation by other Member States has been established in an Electronic Communications Committee Decision[33]. Following this, the EC is formulating a pan-European regulatory approach led by the Communications Committee (CoCom) and Radio Spectrum Committee (RSCom) to deal with the authorisation and subsequent licensing of such services through an EC Decision and Recommendation

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[31] ECC Decision of 1 December 2006 on the designation of the bands 880-915 MHz, 925-960 MHz, 1710-1785 MHz and 1805-1880 MHz for terrestrial IMT-2000/UMTS systems (ECC/DEC/(06)13).

[32] For more technical details regarding the system's operation refer to ECC Report 93 'Compatibility between GSM equipment on board aircraft and terrestrial networks (incl SEAMCAT scenario files)' available at www.ero.dk.

[33] ECC/DEC/(06)07 ECC Decision of 1 December 2006 on the harmonised use of airborne GSM systems in the frequency bands 1710-1785 and 1805-1880 MHz.

on MCA. ComReg recently held a consultation on MCA examining the national regulatory, technical, economic and legal issues[34] and will report in due course.

7.2.4 Proposed ComReg Strategy for Public Mobile Services

A recent report[35] acknowledged that total mobile Average Revenue per User (ARPU) has declined in most Western European countries primarily because of decreasing voice ARPU. Voice ARPU has been declining mostly as a result of declining Mobile Termination Rates and aggressive price-based competition. Active subscriber levels continue to grow and there is a steady increase in non-voice ARPU. It is expected that this trend will continue at least in the short term as regulators and governments continue to exert downward pressure on termination rates. Irish mobile operators have the third highest level of data revenues among countries analysed in a recent Yankee Group report, with 22%[36] of revenue attributable to data revenues, unchanged since Q2 2007, and a 1% increase in the proportion of revenues from data services when compared with data from Q3 2006.

In addition several new services may have an impact on the development of the mobile market in the next two years, including:

- HSDPA which is being rapidly rolled out in Europe and in Ireland;
- Flat-rate tariffs which are become increasingly prevalent as operators seek to simplify their tariff structures;
- DVB-H which is in a position to become a mainstream broadcast technology since the EC formally announced its commitment to it in July 2007;
- Mobile WiMax which has an uncertain future because of the focus by mobile network operators on UMTS and HSPA.

For the first time in Q3 2007, ComReg collected revenue figures associated with mobile broadband subscriptions of the 3 mobile operators (see figure 3) offering these services. These revenues are included in the "Voice and Other Revenue" element of Figure 3. As a result, Q3 2007 data is not comparable with data in previous quarters; data prior to Q3 2007 is presented here for historical trend purposes only.

Mobile retail revenues for the quarter were over €518 million. Of this, €93 million was attributed to data services such as SMS and MMS which accounted for 18% of all retail revenues in Q3 2007.[37]

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[34] ComReg 07/62 - Consultation on Mobile Communications On Board Aircraft (MCA).

[35] Report by Analysis research – "Mobile Market Perspectives 2008" - http://research.analysys.com/.

[36] Data revenues identified by the Yankee Group include revenues from SMA, MMS, GPRS and 3G data services.

[37] Data revenues identified by ComReg in this analysis include only revenues attributable to SMS and MMS messaging services.

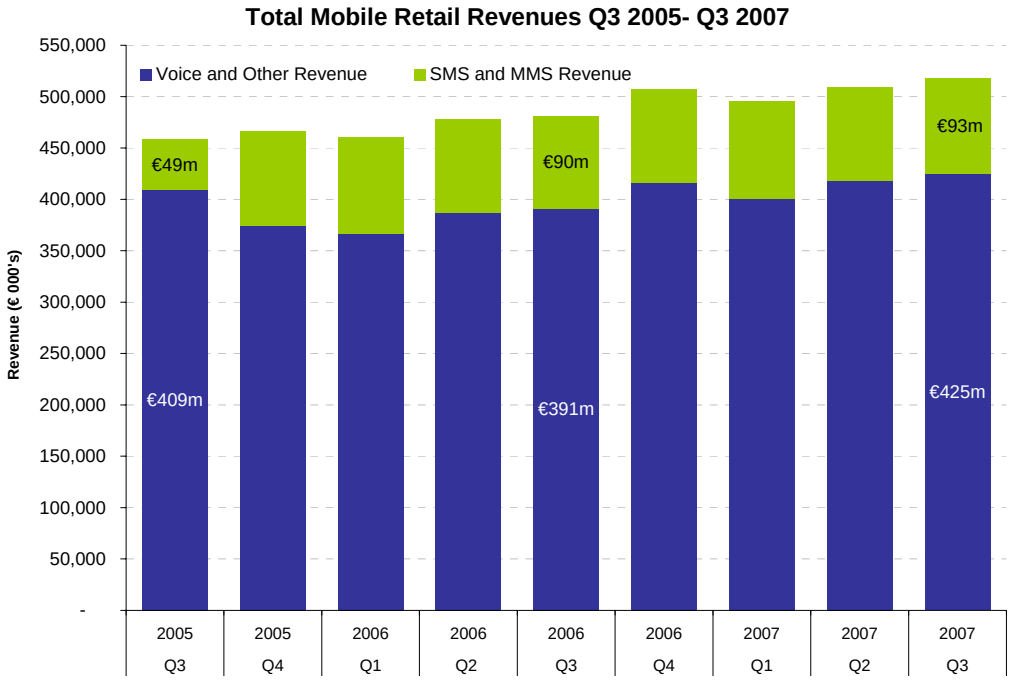

Figure 3. Total mobile retail revenues Q3 05 – Q3 07

Ireland continues to experience demand for innovative wireless services. In this regard, 900 MHz, 1800 MHz and 2 GHz spectrum is very attractive for the provision of such services because of its propagation characteristics and the ready availability of equipment. ComReg is obliged to ensure the efficient use of the radio spectrum and is therefore investigating all options on how best to accommodate these innovative services. In addition, two of the 900MHz GSM licences expire in 2011 followed by the third 900 MHz GSM licence, and all of the 1800 MHz GSM licences expire in 2015. It is prudent that ComReg consider the options open to it in order to maintain a supportive and predictable regulatory environment in line with ComReg's high level goals.

There are numerous options available to ComReg regarding the unassigned GSM spectrum, as well as what action to take in light of various licences expiring in the next few years. Therefore ComReg's proposed strategy for the public mobile services centres on:

- Conducting a comprehensive public consultation(s) on the 900 MHz and 1800 MHz bands during 2008 in order to make an informed decision well before any licences expire. This consultation is also intended to cover the possible release of currently unassigned spectrum in the 900 and 1800 MHz.

- Conducting a public consultation on the future use of the 2010-2025 MHz spectrum band and, if there is sufficient interest, to initiate a further public consultation and competition design to release this spectrum.

- Continuing, amongst other things, its involvement in European fora develop protection criteria between different possible users of these bands.

- Continuing to monitor and publish the results of the quality of service surveys offered by current GSM and 3G licensees.

- Accommodating requirements for trials of wireless technologies on a non-interference, non-protected basis.

- Formulating a coherent strategy to facilitate the development of 3G services in the 2.6 GHz band in line with market demand whilst accommodating any ongoing requirement by MMDS operators and their customers.

- Finalising the regulatory issues surrounding MCA.

7.3 Broadcasting Services

Broadcasting is a major user of the radio frequency spectrum. RTÉ, the public service broadcaster established under the Broadcasting Authority Act 1960, as amended, provides national radio and television services. The Broadcasting Commission of Ireland (BCI), established under the Broadcasting Act (Funding) Act 2003, is responsible under the Radio and Television Act, 1988, the 2001 Act and the Broadcasting (Amendment) Act 2007 for the authorisation of Irish broadcasting services other than those provided by RTÉ. ComReg is responsible for the allocation, assignment and licensing of the associated radio frequencies under the various Broadcasting Acts.

In May/June 2006 the second session of a ITU Regional Radiocommunication Conference (RRC) re-planned the broadcast frequency bands 174-230 MHz (VHF Band III) and 470-862 MHz (UHF Bands IV and V) previously covered by the Stockholm Agreement, to facilitate the introduction of digital terrestrial broadcasting services. ComReg, together with the BCI and RTÉ, assisted the DCENR in the work of this conference which resulted in a new international treaty, known as the Geneva 2006 (GE-06) Agreement, in effect a frequency plan, which should provide the basis for VHF/UHF digital terrestrial broadcasting for the next 20 to 30 years.

7.3.1 Spectrum for Broadcasting Services

Bands Covered by the Geneva 2006 Agreement

In 2006, following a Regional Radiocommunications Conference, the use of the frequency bands 174-230 MHz and 470-862 MHz were harmonised across Europe for digital broadcasting. The Agreement, known as Geneva 2006 (GE-06), essentially harmonised the technical parameters for digital broadcasting and at the same time has introduced flexibility for future systems.

The GE-06 Agreement provides significant flexibility in implementing the frequency plan ("the Plan"). The concept of allotment planning provides a high degree of flexibility regarding the:

- Location of broadcasting transmitters within the corresponding service area and interference envelope of an entry in the Plan.
- Concept of a spectrum mask which offers flexibility in implementing broadcasting services with different characteristics or other applications, provided that interference and the protection requirement are kept within the envelope of the corresponding entry in the Plan. If the proposed use exceeds the limits of this envelope, it requires prior agreement from affected administrations.

Nevertheless some limitations still exist under the GE-06 Agreement. These include:

- The use of these frequency bands for digital services will continue to be constrained until protection of analogue transmissions has ceased, which is generally expected by 2012 or sooner in some countries in the EU. It should however be noted that in the context of the GE-06 Agreement, analogue TV broadcasting is protected until June 2015.
- Although the provisions of the GE-06 Agreement allow other services to be provided within the limits of the envelope of an entry in the Plan, it is not possible to notify to the ITU mobile uplink transmissions of any kind in this band. Furthermore, such use would require guard bands to protect television or sound broadcasting, hence making coexistence and coordination between the different services difficult.

The band 174 – 230 MHz (VHF band III)

Currently, this band is being used for analogue broadcasting as established under a 1961 Regional Agreement (known as Stockholm 1961 or the ST61 Agreement) is based on a fixed channel arrangement of 8 MHz for analogue television. As the Stockholm 1961 Agreement was revised to accommodate the new GE06 Agreement, analogue TV broadcasting in this band is protected until June 2015. As a consequence, this band can now be used for a fixed channel arrangement of 7 MHz bandwidth for digital television and 1.75 MHz for digital sound broadcasting (T-DAB), in the absence of analogue television.

The GE-06 Agreement provides each country with a similar amount of spectrum on the basis of frequency allotments and/or assignments, serving different geographical areas, which may be combined to provide layers of national coverage. Ireland's share is 1 national digital TV layer and three national digital sound layers (each layer is comprised of 1.75 MHz). In order to maintain flexibility to respond to market requirements for TV or sound broadcasting, Ireland has planned for portable indoor reception for both TV and sound broadcasting.

470 – 862 MHz (UHF bands IV and V)

Currently, this band is being used for analogue broadcasting under ST61 Agreement and use of the band is based on a fixed channel arrangement of 8 MHz for analogue television. As the ST61 Agreement was revised to accommodate the new GE06 Agreement, analogue TV broadcasting is protected until June 2015.

In this band, as in the band 174 – 230 MHz, the GE-06 Agreement provides each country with a similar amount of spectrum on the basis of allotments and/or assignments, serving different geographical areas, and which may be combined to provide layers of national coverage. Ireland's share is 8 national digital TV layers of 8 MHz each planned for fixed reception.

Although not covered by the GE-06 Agreement, use of the band 470 – 790 MHz is also permitted on a secondary basis in Ireland and some other countries by services ancillary to broadcasting in accordance with a footnote in the ITU Radio Regulations (footnote 5.296).

1452 – 1492 MHz

The use of the band 1452 – 1479.5 MHz for digital sound broadcasting is subject to a European Agreement (known as the Maastricht 2002 Special Arrangement) is based on a fixed channel arrangement of 1.75 MHz bandwidth, with the specific characteristics of T-DAB and on the basis of allotments. Very few countries have introduced digital sound broadcasting services using T-DAB in this band and, where these services have been introduced, take-up has been limited. The band is available in Ireland and could be made readily available for multimedia services using T-DAB or other technologies if there is sufficient interest in doing so.

The main limitations arising from the international regulatory environment in the band 1452 – 1492 MHz are:

- Mobile uplink transmissions in this band require guard bands to protect sound broadcasting, hence making their coexistence and coordination difficult.
- The Maastricht 2002 Special Arrangement was developed on the basis of T-DAB system parameters. However, the Special Arrangement now includes a provision to allow other services within the limits of the envelope of an allotment entry in the Plan. It may therefore be possible to consider alternative channel arrangements for use in this band.
- The requirement of each country to provide protection for the potential reception of satellite broadcasting services in other countries limits the availability of the band 1479.5– 1492 MHz for terrestrial broadcasting services. Again, some arrangement with affected neighbours may be possible to facilitate flexibility.

7.3.2 The Introduction of Multimedia Services

Multimedia Services are seen as the coming together of the traditional broadcasting (point-to-area-coverage) and communication services (one-to-one) in a mobile environment. This convergence will occur not only in the networks themselves but also within the terminal, using different systems and frequency bands.

Multimedia services should not be understood only as traditional broadcasting over mobile phones. The video component will appear in many services – not only through broadcast delivery. Furthermore, the evolution of usage shows a growing demand for interactive functionalities and on-demand rather than traditional broadcasting (which does not mean that the return channel needs to be provided in the same frequency band). Broadcasting technologies are more appropriate for content with a high number of viewers, permitting more effective use of the spectrum. One-to-one communication technologies are more effective for content to be delivered to fewer numbers of viewers. The availability and supply of high quality multimedia services with attractive new features could bring significant benefits to consumers.

In 2006 the Radio Spectrum Policy Group (RSPG) of the EC released an opinion on the introduction of multimedia services, focusing on the use of spectrum currently allocated to broadcasting.[38] The RSPG considers that multimedia services are one of the promising new services fostering growth and innovation among the many that are seeking urgent and easy access to spectrum. The RSPG further considered that European action to enable the development of multimedia services must be taken in a way that:

- Does not distort the use of spectrum as a whole.
- Promotes and does not distort competition.
- Encourages innovation; maximises benefits across the European Union;
- and does not conflict with national and European content legislation aiming at promoting cultural diversity and media pluralism.

Additionally, RSPG considers that introduction of multimedia services could be facilitated by:

- Issuing new licenses, or reviewing current licences with a view to broadening their scope, to allow the provision of multimedia services.
- Limiting the constraints and obligations to the minimum required, while taking into account the international coordination, planning and legal framework.

[38] Radio Spectrum policy Group Opinion on "The Introduction of Multimedia Services in particular in the frequency bands allocated to the broadcasting services" - 25 October 2006 - RSPG Opinion 5.

7.3.3 Digital Dividend

As terrestrial broadcasters migrate to digital technologies, among the benefits of this transition will be improvements in spectral efficiency. In particular, to replicate the current analogue TV broadcasting services on an equivalent digital platform requires less spectrum, resulting in a surplus of broadcasting spectrum. This potential surplus is known as the 'Digital Dividend'. The basic concept of the Digital Dividend is that spectrum which was almost exclusively set aside for broadcast use can now be used to accommodate other services.

Across Europe, there has been significant debate about the potential benefits to the broadcasting and wireless communications industry that can be derived from the Digital Dividend. In November 2007, the EC launched a paper[39] which concluded that the full benefits of the digital dividend can only be realised with the support and active cooperation of Member States and all stakeholders, and if a common approach is adopted to spectrum planning.

ComReg actively participates in ongoing work at a European level to identify and agree frequencies which could be harmonised to provide a digital dividend. However, ComReg balances this against its current legislative obligation to provide spectrum for DTT services.

As DTT is rolled out in Ireland from 2008, spectrum requirements for digital broadcasting will become clearer. ComReg will then be in a position to develop a strategy to identify the available Digital Dividend spectrum. In the meantime, ComReg will monitor developments in Digital Dividend strategies amongst EU and CEPT Member States. ComReg is seeking views on the approach that should be taken to releasing this dividend and possible applications that should be taken into account in order to best utilise the spectrum.

7.3.4 Economic Contribution

GDP and employment impacts

The economic contribution of the broadcasting sector comprises the GDP and employment associated with the operations of RTÉ, independent national terrestrial TV, independent commercial radio, cable/MMDS and satellite pay TV. In addition to the broadcasters and pay TV operators there are forward linkages to the advertising industry and wider economic effects. Data from annual reports of the broadcasting operators were used to calculate these effects.

In order to calculate the GDP contribution of the commercial radio sector, the GDP contribution of TodayFM was calculated using the methodology identified in Section 5.1. A ratio was generated for commercial sector using the TodayFM turnover and

[39] Reaping the full benefits of the digital dividend in Europe: A common approach to the use of the spectrum released by the digital switchover
http://ec.europa.eu/information_society/policy/radio_spectrum/docs/ref_docs/com/com_dd_en.pdf

the total turnover of commercial radio in Ireland. As the revenue generated from commercial radio is derived almost exclusively from advertising and the operating costs of a radio stations are comparable, the use of such a ratio in this way was considered reasonable. The ratio was then multiplied by TodayFM's GDP contribution, as calculated, to obtain an estimate for the GDP contribution of the commercial radio sector in Ireland.

	Broadcasting GDP (€m)				
	2002	2003	2004	2005	2006
TV and Radio	266	309	267	270	257
Multiplier effects	27	31	27	27	26
Total	**293**	**332**	**294**	**297**	**283**

	Employment				
	2002	2003	2004	2005	2006
TV and Radio	4100	4139	4366	4483	4282
Multiplier effects	410	414	437	448	428
Total	**4510**	**4553**	**4803**	**4931**	**4710**

Table 4: GDP and employment impacts associated with broadcasting

7.3.5 Proposed ComReg Strategy for Broadcasting

ComReg's proposed strategy for broadcasting is to:

- Monitor the development of digital modulation techniques that have the potential to replace the analogue service with high quality broadcast services in the VHF, short wave, medium wave and long wave broadcast bands.
- Ensure present operator compliance and protect authorised services from illegal use of spectrum.
- Facilitate the introduction of digital broadcasting technologies in VHF Band III.
- Facilitate the introduction of Digital Terrestrial Broadcasting (including fixed reception and mobile TV) in UHF Bands IV and V.
- Seek to licence mobile multimedia services in the UHF band. ComReg recognises there is a demand for a mobile TV service in Ireland and

intends to consult in the first quarter of 2008 on licence conditions which could be applied to mobile TV.

- If sufficient demand is expressed, to conduct a public consultation on the future use of the 1452-1492 MHz band and competition design to release this spectrum.

7.4 The Terrestrial Fixed Services

The bands above 1 GHz, often referred to as the microwave bands, are used predominantly for fixed point-to-point links ('fixed links'). While in some countries demand for some bands has declined in popularity as a result of the use of optical fibre, the use in Ireland is growing strongly and they remain vitally important to many businesses. They are used mainly by telecommunications operators, mobile phone operators, broadcasters, utilities, and the emergency services to provide transmission networks which are flexible, cost effective and to provide redundancy and back-up for other networks. They are used extensively in fixed telecommunications networks both to carry trunk traffic and to provide broadband access networks. As a result, fixed links play a vital role in the development of a competitive telecommunications industry in Ireland.

There are currently over 8 900 licensed fixed links in Ireland. The frequency bands between 3 and 11 GHz are suitable for the development of long distance, high capacity infrastructure radio networks. High capacity links generally occupy the bands above 12 GHz. The pressure on spectrum allocated to fixed links is expected to continue to increase as the demand for alternatives to copper and fibre infrastructure, particularly in the access network, continues to grow. In response to this demand ComReg opened up the 80 GHz fixed link band in late 2007 to accommodate short distance but very high bandwidth links.

7.4.1 Economic Contribution

GDP and employment impacts

Fixed links are primarily used to support the activities of cellular operators, public utilities, broadcasters and fixed telecoms providers. Estimates have already been made of the economic contribution of cellular operators and broadcasters and these include the economic activity (GDP and employment) associated with the operation of their fixed link networks. However, so far, the economic benefits from use of fixed links by fixed telecom operators other than cellular operators have not been counted. Since predominant users of such links are service providers of Fixed Wireless Access Local Area (FWALA) services we have based our estimate on these providers only.

In the case of FWALA service providers we have departed from our initial methodology measurement of GDP based on the formula outlined in Section 5.1. This is because companies operating these services have made considerable capital investments in recent years and are expected to make contributions to GDP in the

future. For this reason we included staff payments and number of employees in our estimate. These are provided in Table 5 below.

	GDP (€m)				
	2002	2003	2004	2005	2006
Staff Payments	N/A	N/A	4	2	13
Multiplier					1
Total			**4**	**2**	**14**

	Employment				
	2002	2003	2004	2005	2006
Employees			89	81	354
Multiplier			9	8	35
Total			**98**	**89**	**389**

Table 5: GDP Employment impact associated with FWALA services

7.4.2 Approach to Licensing Fixed Services

In Ireland, all fixed link bands are shared between users and the relevant frequency bands are managed by ComReg to minimise interference to neighbouring operators. In order to ensure the most efficient use of the spectrum and to avoid harmful interference, ComReg established guidelines for users which detail the application process, the frequency bands, link length policies, and the technical parameters associated with link licensing.[40]

ComReg currently has a policy not to assign blocks of radio spectrum for radio point-to-point systems in most bands. This is to ensure optimum use of the radio spectrum for the benefit of the maximum number of users and this is clearly the case if there are a large number of smaller users as only a few would be able to obtain access to spectrum unless some of the bands were managed by a third party. ComReg has reviewed this strategy and concluded that there are circumstances where the use of a block of spectrum may lead to improved efficiencies, especially where the demand by smaller users is limited or non-existent.

To this end ComReg has taken a multifaceted approach to opening up the 26 GHz fixed link band by dividing the band into three parts. 280 MHz of spectrum is set aside for FWA services under the FWALA licence scheme. A block of 224 MHz is currently set aside for individual licensing as per the current individual licensing scheme. The remaining 952 MHz of spectrum has been set aside to provide 17

[40] See ComReg Document 98/14R3 "Guidelines to Applicants for Radio Links above 1 GHz."

blocks of national spectrum for users to self-manage. These 17 blocks are currently in the process of being assigned through the use of an auction[41] and, depending on the number of blocks assigned, the amount of spectrum set aside for the other uses may be increased subject to demand.

7.4.3 Consultation on the Use of Fixed Service bands below 3 GHz

Internationally, a number of bands below 3 GHz have been allocated to both fixed services and mobile services on a co-primary basis. The excellent propagation characteristics of spectrum below 3 GHz make it ideal for mobile communication systems as the propagation characteristics are more favourable for mobile terminals utilising electrically small and inefficient antennas, as well as for long-distance fixed link systems.

Last year ComReg completed an initial review of the use of band allocated to fixed services below 3 GHz and sees an opportunity to continue the use of the bands for fixed links while making future provision for mobile services in these bands if the use and demand for spectrum requires it.

The 450 MHz Fixed Link Band.

Point-to-Point Radio Link Licences below 1 GHz are limited to the 450 – 470 MHz band.[42] This band is mainly used for very low capacity, long length links by the emergency services, health boards and a few business radio users. There are currently 88 links in the band and in the last two years ComReg has only dealt with 2 applications for links in this band. The impending award of a Government tender for the provision of a National Digital Network for the emergency services will result in many of these links, which are supporting the analogue network, to become unnecessary.

The European Common Allocation Table[43] notes that parts of the bands 450-457.5 / 460-467.5 MHz may also be used for existing and evolving public mobile networks on a national basis. Services at 450 MHz have far greater range over services at 900 MHz, for example, the ETSI GSM400 standard[44] has made provision for cells sizes in the order of 120 km[45] and allows for seamless roaming between networks in this band and higher frequencies. This spectrum is therefore ideally suited for the provision of mobile, especially mobile broadband to rural areas. ETSI also

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[41] ComReg 07/93 – "The Award of National Block Point to Point and Point to Multipoint Assignments in the 26 GHz band."

[42] See ComReg 02/11R – "Point to point radio link licenses below 1 GHz and point to multipoint licenses."

[43] See http://apps.ero.dk/ECA/

[44] See ETSI EN 301 087 – Digital cellular telecommunications system.

[45] Implementation of 3g capabilities in developing countries a straightforward path to imt-2000, Document 02/169-E, ITU-D Study Group 2.

published a specification for the use of Code Division Multiple Access (CDMA) technology[46] in the band, a second suitable technology for this band.

In order to change the future allocation of this band ComReg intends to close the band to new fixed link applications and over the next three years move all remaining links out of the band. Any links remaining following the establishment of the National Digital Network will be offered spectrum the 1.3, 1.4 or 2 GHz fixed link bands. ComReg is seeking comments on this proposal.

The 1.3 GHz Fixed Link Band.

Currently, the Guidelines to Applicants for Point to Point Radio Link Licences > 1 GHz (ComReg Document 98/14R5) permit the licensing of point-to-point link in the 1362.5-1375 MHz and 1504.5-1517 MHz portion of the 1.3 GHz band. This full band covers 1350 – 1375 MHz paired with 1492 – 1517 MHz.

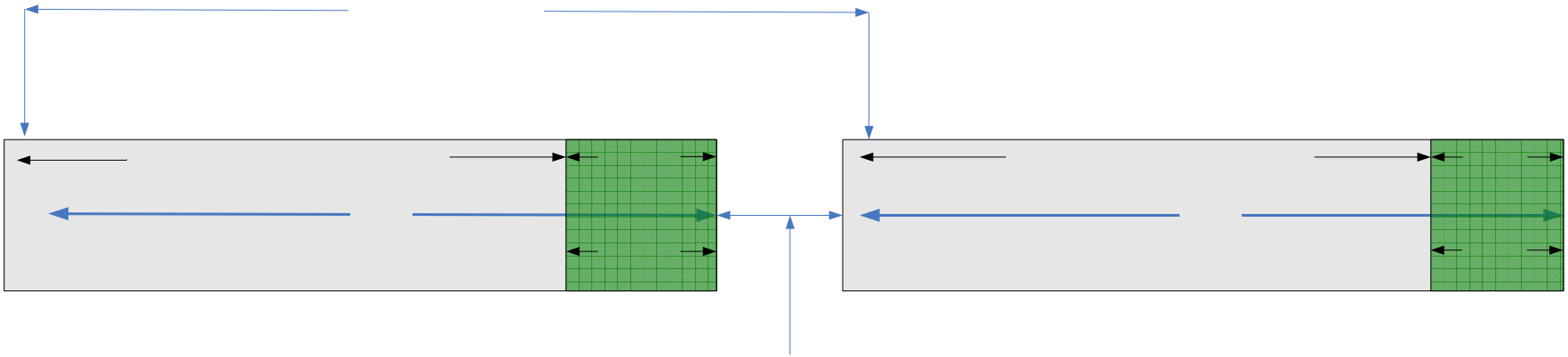
This band is used for low capacity, long-hop links – typically for private telecom link and telemetry collection. In Ireland the band is not extensively used; there are a limited number of users and only sporadic demand for new links. ComReg believes that it should be possible to consolidate all of the existing 1.3 GHz Point-to-Point Licensees in this band into a 2 x 5 MHz block, in order to make a part of this spectrum available for future mobile services.

Set out below are two opinions for which ComReg is seeking comment. ComReg believes that both options will provide sufficient spectrum for existing and future fixed links (at current rates of demand) while setting aside useful blocks of spectrum for future mobile services. However, in order to release spectrum in this band, some licensees may be required to move from their currently licensed frequency.

[46] See ETSI EN 301 449 – Harmonised EN for CDMA spread spectrum base stations.

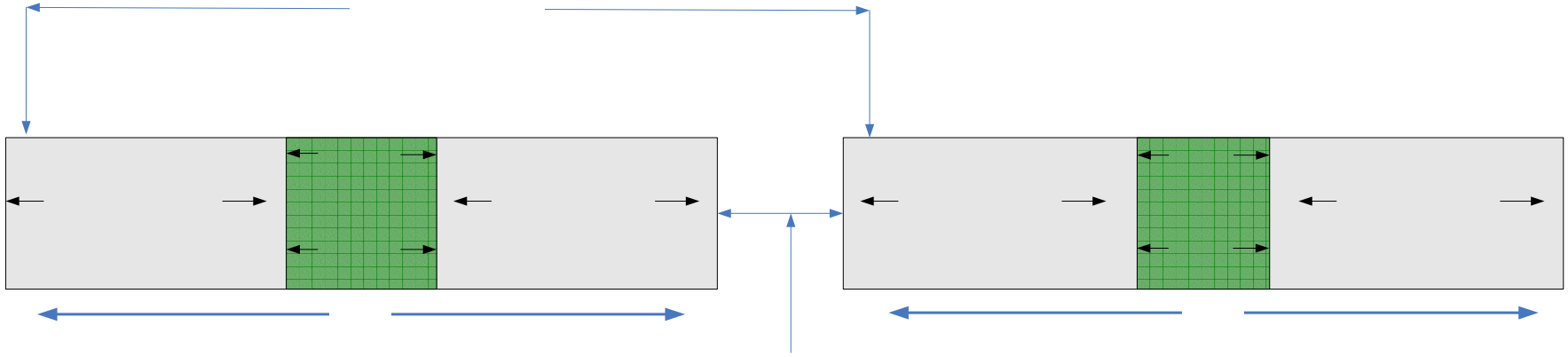
Option 1 - Continuous Spectrum

Under this option, as shown below, all current and fixed services are grouped into the top part of the band, releasing 20 MHz of continuous spectrum at the bottom part of the band. Approximately 50 links would need to be relocated in order to achieve this option. Under this option, existing links which are all operating under one year licences would be relocated over the period of three years. New links would automatically be licensed in the top part of the band.



Option 2 – Fragmented Spectrum

Under this option, (as shown below) all current and fixed services are grouped into the middle part of the band, releasing two blocks of 10 MHz. Approximately 30 links would need to be relocated in order to achieve this option. Under this option, existing links which are all operating under one year licences would be relocated over the period of two years. New links would automatically be licensed in the middle part of the band.

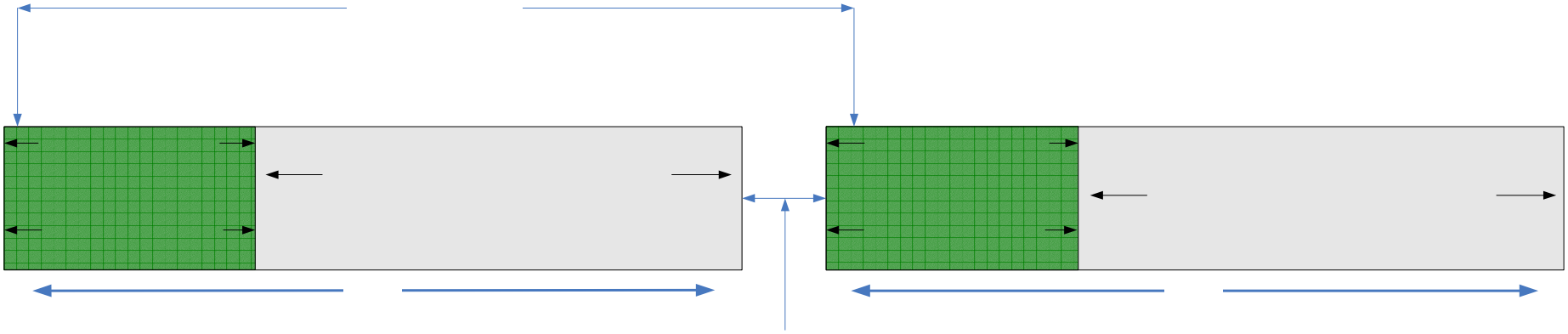


The 1.4 GHz Fixed Link Band.

Currently, the Guidelines to Applicants for Point to Point Radio Link Licences > 1 GHz (ComReg Document 98/14R5) permit the licensing of point-to-point link in the 1375-1385.5 MHz and 1427-1437.5 MHz band. This full band covers 1375 – 1400 MHz paired with 1427 – 1452 MHz.

This band is used for low capacity, long-hop links – typically for private telecom link and telemetry collection. In Ireland the band is not extensively used; there are a limited number of users in the one part of the band and only sporadic demand for new links. ComReg considers that it should be possible to consolidate all of the existing 1.4 GHz Point-to-Point Licensees in this band into a 2 x 10 MHz block, in order to make a part of this spectrum available for future mobile services.

ComReg presents a single option here for consideration that would not require any relocation of existing users. ComReg is seeking comments on this option.



The 2 GHz Fixed Link Band.

This band covers 2025 - 2110 MHz paired with 2200 – 2290 MHz and is used for low capacity, long-hop links – typically for private telecom link and telemetry collection. In Ireland the band is more extensively used than the 1.3 or 1.4 GHz bands and there is more (albeit still relatively low) demand for new links.

ComReg considers that there is scope for existing 2GHz licensees in this band to upgrade their equipment to more efficient technologies. Such an upgrade would lead to greater spectrum efficiency and could potentially release spectrum for more point-to-point fixed links or other use (e.g. mobile, fixed).

Accordingly, ComReg is seeking the comments on the merits of seeking increased spectrum efficiency in this band in order that spectrum can be released for more point-to-point fixed links or other use.

7.4.4 Proposed ComReg Strategy for Fixed Services

While in the long term, fibre infrastructure is the most appropriate medium for emerging broadband services, it is recognised that radio links facilitate the early development of infrastructure and competition in the provision of electronic communications services, especially in rural areas. In this regard, ComReg's short to medium term strategy is to encourage the use of fixed links for infrastructure and competition development, for the maximum benefit of all licensees and in particular new market entrants. As networks develop and congestion in the fixed links bands grow, the strategy will be to encourage established fixed link licensees to migrate to fibre-based infrastructure.

ComReg's strategy for the duration of this plan includes:

- Reviewing on the basis of comments received on this consultation, review the spectrum usage and requirements of users in the fixed link spectrum bands below 3 GHz in order to facilitate both existing links, new links and new mobile services.

- Encouraging operators to use the latest technology and higher order modulation schemes in order to ensure efficient use of the spectrum.

- Introducing administrative incentive pricing, based on bandwidth used and location of terminals, to encourage the use of more bandwidth efficient technologies and the use of alternative platforms in congested bands/areas.

- Studying the potential and demand for new fixed link bands (such as 28 GHz, 31 GHz and 32 GHz) and the method of assigning frequencies (e.g. individual licensing, block licensing, etc.); and

- Examining the extensive use of radio links for CCTV and determining if a new licensing regime in place of the current individual licensing scheme would be more efficient.

7.5 Wireless Broadband Services

Wireless Broadband Services (WBS) refers to the delivery of broadband access services to residential or business users by terrestrial wireless networks (also known as Broadband Wireless Access). WBS provides an alternative to wired solutions such as digital subscriber line (DSL) or cable, providing competition to incumbent operators and extending broadband access in 'the last mile' to areas where wired solutions are technically or economically unviable. In comparison with other European countries, Ireland is advanced in the use of wireless technologies for the delivery of broadband services. This is demonstrated in the figure below which captures the contribution of Fixed Wireless Access (FWA)[47] as a percentage of total broadband subscribers and compares this to a number of other countries. The percentage of wireless broadband subscribers increases to 26% when mobile broadband subscribers are included.[48]

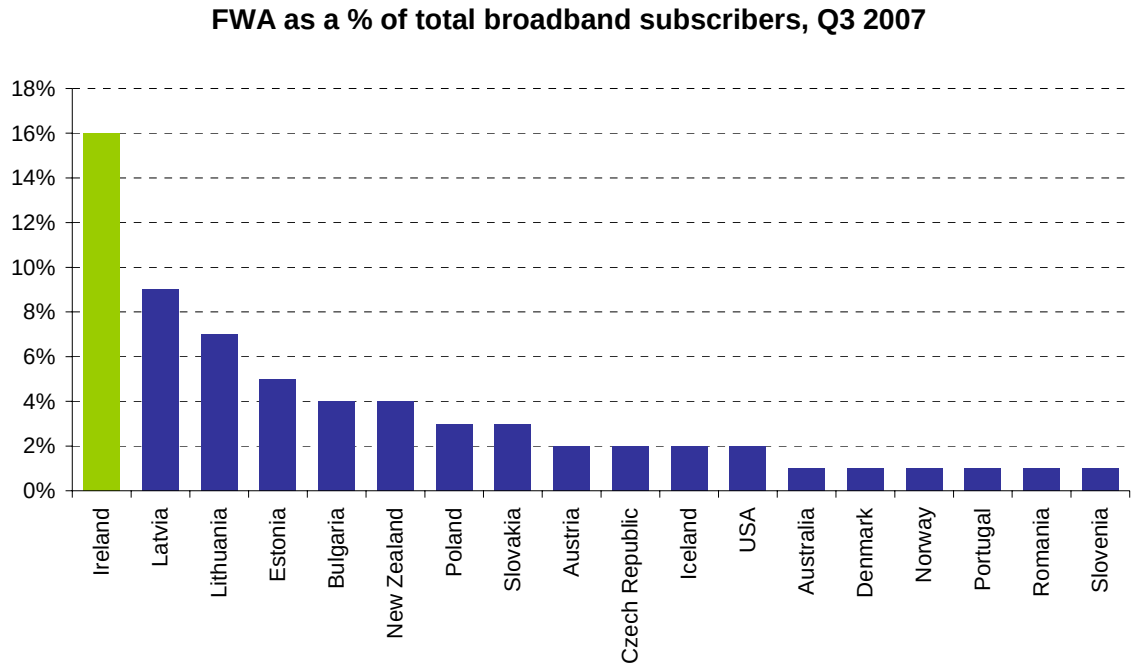


Figure 4. Comparison of FWA as a percentage of broadband subscribers across a number of countries.

[47] Only FWA figures are currently available from other countries. In Ireland, in Q3 07 there were 113 000 FWA subscribers, see ComReg 07/106 pg 26 - "Quarterly Report 2007" http://www.comreg.ie/_fileupload/publications/ComReg07106.pdf

[48] ComReg now collects subscriber levels for Mobile Broadband and in Q307 there were 88 400 such subscribers see ComReg 07/106 pg 26 - "Quarterly Report 2007" http://www.comreg.ie/_fileupload/publications/ComReg07106.pdf

WBS was first licensed in Ireland under the Office of the Director of Telecommunication Regulation's (ODTR) Fixed Wireless Point-to-Multipoint Access (FWPMA) initiative in 1999. Following a public consultation in 2002, ComReg developed the Fixed Wireless Access Local Area (FWALA) licensing scheme. This scheme introduced a novel approach to licensing wireless broadband services by licensing on a local area basis, providing opportunities for operators to deploy scalable networks and lowering barriers to entry. Since March 2003 the FWALA licensing scheme has been introduced in the 3.5 GHz, 10.5 GHz and 26 GHz bands. To date, 192 (122 in 3.5 GHz , 65 in 10.5 GHz and 5 in 26GHz) local area licences have been issued to 15 different operators ranging from those wishing only to provide service in their own locality to those with national roll-out aspirations. For further information relating to the FWALA licensing schemes and the locations of licensed local areas see the ComReg web-site. In order to offer further support to FWALA licensees ComReg has established a FWALA licensee forum to facilitate discussion and resolution of issues of common interest to licensees.

7.5.1 Approaches to Licensing WBS

In Europe, WBS licences have been awarded using a number of different approaches, notably auctions, comparative selection and first-come first-served. Auctions were used in the UK for regional WBA licences in the 26 GHz and 3.5 GHz bands. In the former case, the majority of the licences remained unsold as bidders were unwilling to pay the reserve prices that had been set. However, the 3.5 GHz licences were successfully auctioned and services are now being rolled out in this band. In 2006 the German regulator conducted an auction for spectrum in this band. It made four frequencies available in 28 regions of the country. Three operators gained national licences in this auction. In December 2004, the Norwegian regulator auctioned spectrum in this band in 6 different regions of the country. In total 8 bidders were awarded licences. A first-come first-served approach has been used successfully in Finland and Denmark.

In Ireland, a simplified comparative selection procedure based on tariff commitments and a performance bond was used for the initial award of FWALA licences, with remaining licences being awarded on a first-come first-served basis. This led to the award of 192 licences, and broadband wireless access services currently provide nearly 20% of all broadband connections.

Across Europe WBS spectrum has been packaged differently. For example, a large number of relatively narrow bandwidth licences assigned on an individual county or provincial basis at one extreme, and a small number of relatively large bandwidth licences providing national coverage at the other extreme. Recognising the importance of the easy availability of broadband access in all areas and in order to reduce the digital divide a number of EU Member States have financially supported the provision of WBS in uneconomical rural areas. In Ireland the DCENR is currently running such a scheme, the National Broadband Scheme (NBS) to reach the economically unviable regions of Ireland. In support of this initiative ComReg has set aside 10 MHz of spectrum in the 3.5 GHz band, if required by the winner of the tender process, for use in the NBS identified areas.

Considering the current state of the market for broadband services, the optimum approach to licensing WBS appears therefore to be to match the availability of the spectrum resource to realistic market scenarios and ComReg will continue have regard to this principle in mind when releasing spectrum for WBS services.

The EC is finalising a decision aimed at harmonising conditions of use of the 3.4 – 3.8 GHz band for fixed, nomadic and mobile applications. It is expected that this binding decision will be finalised in the first half of 2008.

7.5.2 Proposed ComReg Strategy for WBS

- Continuing the work of the FWALA Operators Forum, the objectives of which include promoting FWA as a viable & reliable alternative platform for the provision of electronic communications services.

- Identifying appropriate spectrum allocations, both licensed and licence-exempt, for WBS which are supported, or likely to be supported, by ready availability of choice of equipment.

- Implementing the EC Decision on the 3.4 – 3.8 GHz band.

- Consulting on the release of additional spectrum in the 3.5 GHz band for WBS services.

7.6 Licence Exempt Services

Among the most prevalent radio systems in Ireland are Short Range Devices (SRDs). SRDs are generally exempt from licensing and operate in frequency bands shared with other users and services on a non-interference, non-protected basis. Effectively, this means that they should not cause interference to other spectrum users, nor can they claim protection from interference from other spectrum users.

In Ireland, SRDs are licence exempt subject to meeting certain technical criteria, e.g., maximum power levels and reference standards. The technical criteria for the operation of SRDs in Ireland are laid down in ComReg document 02/71. In addition, all SRDs placed on the market are required to comply with the R&TTE Directive.

SRDs are uni-directional (one-way) and bi-directional (two-way) low power radio transmitters that serve a multitude of purposes. For example, car door openers, baby alarms, wireless microphones and wireless local area networks (WLANs). SRDs are deployed in both private and commercial scenarios. Private applications range from medical implants to cordless telephones. Commercial applications include public access wireless hotspots. Additionally, SRDs are used for specialised applications such as Road Traffic and Transport Telematics (RTTT) for the management of roads and traffic (such as automatic road toll collection and traffic information).

SRDs occupy a range of diverse frequencies in the radio spectrum, ranging from very low frequencies (kHz), to extra high frequencies (GHz). Due to their low power and localised usage, SRDs are generally regarded as having a low capability of causing interference. Consequently, they have generally been made exempt from the need for individual radio licences subject to certain technical constraints.

Since ComReg's previous spectrum strategy document was issued in 2005, new Regulations[49] applicable to SRDs have been brought into force in Ireland following an EC Decision harmonising radio spectrum for the use of SRD[50]. In conjunction with the issuing of these Regulations, ComReg updated document 02/71[51] which outlines the requirements for the operation of SRDs in Ireland. The Regulations provide the legal basis for the exemption from individual licensing of a wide range of SRDs, subject to the requirements in 02/71 being met.

The common position on spectrum allocations for SRDs within CEPT is outlined in ERC Recommendation 70-03 (ERC/REC/70-03) available from the ERO website (www.ero.dk). This Recommendation contains the most widely accepted CEPT position with respect to SRDs and provides a useful reference document for Member States.

7.6.1 The Framework for Ultra-Wideband Technology

Ultra-wideband (UWB) technology is typically characterised by very low power radiation over a very large radio bandwidth and promises to provide a host of communications, measurement, location, medical, surveillance and imaging applications. In the European context, equipment using UWB technology is regarded as equipment incorporating, as an integral part or as an accessory, technology for short-range radiocommunication, involving the intentional generation and transmission of radio-frequency energy that spreads over a frequency range wider than 50 MHz (which may overlap several frequency bands allocated to radiocommunication services).

Although UWB signals are typically of extremely low power, the possibility of harmful interference with existing radiocommunication services exists and needs to be managed. Therefore, the regulatory framework for use of the radio spectrum for UWB technology must respect the rights to protection against harmful interference and balance the incumbent services' interests against the overall policy objective of providing favourable conditions for the introduction of innovative technologies for the benefit of society. The technical conditions for the use of UWB in Europe have

[49] S.I. No. 160 of 2006, Wireless Telegraphy Act, 1926 (Section 3) (Exemption of Short Range Devices) Order, 2006.

[50] EC Decision of 9 November 2006 on harmonised use of the radio spectrum by short-range devices (2006/771/EC).

[51] See http://www.comreg.ie/_fileupload/publications/odtr0271R1.pdf

been defined in two Electronic Communications Committee Decisions[52] and in light of the proposed benefits of UWB the EC issued a binding Decision that mandates the use of radio spectrum for equipment using UWB[53]. The Decision stipulates that the spectrum utilised by UWB technology shall be used on a non-interference and non-protected basis. It is therefore appropriate that UWB technology is licence-exempted under S.I. 160 of 2006 and UWB technology that falls within the technical parameters given in the EC Decision will be added to the list of licence-exempt devices in Ireland (ComReg Doc. 02/71R as revised).

The Electronic Communications Committee has also developed a non-binding Decision in response to market demands for Building Material Analysis (BMA) devices using UWB technology[54]. This Decision should ensure that frequency bands are available on a harmonised basis to enable the introduction of UWB devices in a timely manner and ensuring economies of scale. BMA devices will have a direct impact in a number of markets, such as workplace, security, and manufacturing. Compared to generic UWB applications, the market for BMA is not expected to be a mass market and the deployment will be significantly lower.

While it is expected that these devices will operate on a non-interference and non-protected basis, a case could be made that some form of licencing regime is required to protect other services. ComReg is minded to licence-exempt BMA devices[55] and to add the details to the list of licence-exempt devices in Ireland (see ComReg Doc. 02/71).

7.6.2 Economic Contribution

As companies manufacturing licence-exempt equipment are not subject to individual regulatory oversight by ComReg, determining the number of companies that either manufacture or make use of SRD's presents a challenge for estimation of the contribution to GDP that such companies make.

Moreover, as stated in Section 5.1, 'small companies' as defined by the Companies (Amendment) Act 1986 were excluded. Such companies on aggregate may well make a sizable contribution to GDP. However this represents a limitation of the present methodology.

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[52] ECC Decision of 24 March 2006 amended 6 July 2007 at Constanta on the harmonised conditions for devices using Ultra-Wideband (UWB) technology in bands below 10.6 GHz (ECC/DEC/(06)04) and ECC Decision of 1 December 2006 on the harmonised conditions for devices using Ultra-Wideband (UWB) technology with Low Duty Cycle (LDC) in the frequency band 3.4-4.8 GHz (ECC/DEC/(06)12).

[53] EC Decision of 21 February 2007 on allowing the use of the radio spectrum for equipment using ultra-wideband technology in a harmonised manner in the community (2007/131/EC)

[54] ECC Decision of 30 march 2007 on building Material Analysis (BMA) devices using UWB technology (ECC/DEC/(07)01).

[55] See S.I. 160 of 2006 "Wireless Telegraphy Act, 1926 (Section 3) (Exemption of Short Range Devices) (Amendment) Order, 2006"

The medical equipment industry is noted however since companies operating here are large and make extensive use of wireless technology. Although there is no way of ascertaining the extent to which such companies rely on licence-exempt spectrum in their respective business processes, a representative sample of companies manufacturing wireless medical equipment was taken. This was excluded from the conservative estimate as stated in Section 5.1.

	SRD GDP (€m)				
	2002	2003	2004	2005	2006
SRD	574	530	495	481	399
Multiplier effects	57	53	50	48	40
Total	631	583	445	529	379

	Employment				
	2002	2003	2004	2005	2006
SRD	2315	2394	2622	3135	2738
Multiplier effects	232	239	262	314	274
Total	2547	2633	2884	3449	3012

Table 6: GDP Employment impact associated with SRD's

7.6.3 Proposed ComReg Strategy for SRDs

ComReg's strategy for the duration of this plan includes:

- Facilitating new SRD applications by making spectrum available wherever possible for such applications, subject to demand and technical feasibility – bearing in mind that additional spectrum should only be made available to SRDs on the basis of a clear and demonstrable need. Any analysis of the case for new spectrum should include a valid reason why existing SRD spectrum is unsuitable and must fully take into account the impact on radio services.

- Ensuring that only the minimum regulations are specified in ComReg 02/7R as revised and, where appropriate, the application-specific constraints to spectrum use are removed.

- Ensuring that the principles of application and technology neutrality are pursued wherever possible in both changes to the existing regulatory environment and in the assessment of requests for new spectrum.

- Investing the possibility of developing limits below which a new class of generic Ultra Low Power (ULP) SRDs need not be subject to the usual regulatory arrangements (such as channelisation, duty cycles, etc.), and that would ensure the protection of all radio services.

7.7 Maritime Services

The maritime sector is a significant spectrum user, comprising a large leisure component, an extensive fishing industry, a competitive commercial sector and a wide-ranging naval presence. Due to the global nature of maritime services, the management of the radio spectrum is largely governed by national and international regulations (such as those relating to safety of life at sea).

In Ireland, the Maritime Radio Affairs Unit (MRAU) of the Department of Transport is responsible for marine regulation and for ensuring compliance with legislation requiring certain classes of vessels to install a radio[56] which is to be operated by a properly qualified operator. On September 1st 2007, the responsibility for the licensing of radio communications equipment on Irish ships and associated Certificates of Competency was transferred to the MRAU. ComReg remains responsible for spectrum management issues.

The International Convention for the Safety of Life at Sea[57] (SOLAS) now requires Automatic Identification System (AIS) to be fitted aboard international voyaging ships of 300 or more gross tonnage, and all passenger ships regardless of size. An AIS is used by ships and Vessel Traffic Services (VTS) principally for identification and locating vessels and is intended to assist the vessel's watch officers and allow maritime authorities to track and monitor vessel movements. ComReg is developing the necessary framework to ensure the interference free operation of AIS in Ireland and on Irish waters.

7.7.1 International Cospas-Sarsat System

The International Cospas-Sarsat System will cease satellite processing of 121.5/243 MHz beacons from 1 February 2009[58]. All beacon owners and users should begin taking steps to replace their 121.5/243 MHz beacons with 406 MHz beacons as soon as possible. Beginning in 2009, only 406 MHz beacons will be detected by the Cospas-Sarsat satellite system. This affects all maritime beacons (EPIRBs), all aviation beacons (ELTs) and all personal beacons (PLBs).

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[56] Under the Merchant Shipping (Radio) Rules, 1992, every passenger ship or cargo ship of 300 gross Tons or above is required to install a radio in compliance with the Global Maritime Distress and Safety System (GMDSS). Similar requirements apply to fishing vessels under the Merchant Shipping Fishing Vessel (Radio Installations) Regulations, 1998.

[57] See http://www.imo.org/Conventions/contents.asp?topic_id=257&doc_id=647

[58] Further information available at: http://www.cospas-sarsat.org/FirstPage/121.5PhaseOut.htm

7.7.2 Proposed ComReg Strategy for Maritime Services

ComReg's strategy for the duration of this plan includes:

- Continuing to provide support to Ireland at international fora to ensure adequate spectrum is available for maritime services.
- Continuing to prioritise and provide protection from interference to maritime safety of life services.
- Establishing a framework for the licensing of AIS.
- Continuing to work with the MRAU to promote the use of spectrum efficient technologies in the maritime bands, thereby maximising the spectrum available for growth and new applications.
- ComReg will finalise the regulatory framework to licence land based radionavigation and radiolocation stations used by the maritime services. There will be a once-off licensing fee for these services, subject to DCENR agreement, for new stations, to cover co-ordination and notification costs. Existing stations will be licensed without cost.

7.8 Aeronautical Services

The safety and efficiency of air transport is dependent on navigation and communication services that use radiofrequencies. Since the bulk of air travel is international in nature, most of the radio spectrum that is used by the aeronautical sector is planned internationally. The ITU Radio Regulations, the International Civil Aviation Organisation (ICAO)[59], Eurocontrol[60] as well as national and European legislation all set down requirements applicable to aeronautical services. In Ireland, regulation of the aviation industry is the responsibility of the Irish Aviation Authority. ComReg's role in this area is limited to administering the issue of radio licences for on-board aircraft and for ground-based aeronautical transceivers, radar and radionavigation systems.

7.8.1 Economic Contribution

GDP and Employment Impacts

The aviation and aerospace industries are a major contributor to the Irish economy and a major source of employment. Employment and GDP for 2002 to 2006 for Irish airlines is estimated directly and shown in Table 7 below.

[59] See http://www.icao.int/

[60] See http://www.eurocontrol.int/corporate/public/subsite_homepage/index.html

	GDP (€m)				
	2002	2003	2004	2005	2006
Airlines	301	339	486	676	642
Multiplier effects	30	34	49	68	64
Total	331	373	535	744	706

	Employment				
	2002	2003	2004	2005	2006
Airlines	10889	10754	11067	13268	10876
Multiplier effects	1089	1075	1107	1327	1088
Total	11978	11829	12174	14595	11964

Table 7: GDP and employment impacts associated with aviation

7.8.2 Proposed ComReg Strategy for Aeronautical Services

ComReg's strategy for the duration of this plan includes:

- Continue to represent in relevant international fora to ensure adequate spectrum is available for aeronautical services;
- Continue to prioritise and provide protection from interference to aeronautical safety of life services;
- Continue to work with the IAA to promote the use of spectrum efficient technologies in the aeronautical bands, thereby maximising the spectrum available for growth and new applications;
- Finalize the regulatory framework to licence land based radionavigation and radiolocation stations used by the aeronautical services. There will be a once-off licensing fee for these services, subject to DCENR agreement, for new stations, to cover co-ordination and notification costs. Existing stations will be licensed without cost.

7.9 Satellite Services

Satellite radiocommunication networks provide a wide range of applications from mobile and fixed telecommunications, Direct to Home (DTH) multichannel television, broadband services, and satellite news gathering (SNG), to meteorological and Earth exploration service applications. Additionally, satellites play a crucial role in aeronautical and maritime safety by providing services such as navigation, radar and the Global Positioning System (GPS).

ComReg has aggregated the previous two licensing regimes into one new licensing regime[61] which covers both Fixed Satellite Earth Stations (FSES) and teleport installations in the bands above 3 GHz. This licence regime now covers: VSATs typically used for private data communications, Large Earth Stations (LES) such as those used by broadcasters and telecommunication Companies, satellite Earth stations operating as feeder links in the BSS and MSS, Transportable Earth Stations (TES) such as SNG trucks used for outside broadcasts, as well as teleport installations that consist of two or more large 'steerable' co-sited satellite Earth stations which can typically use many different satellites, thus increasing the flexibility offered to the final end user of the satellite communications system in terms of cost and capacity.

In 2007 the EC issued a Decision mandating the use of radio spectrum in the 2GHz band for the implementation of systems providing mobile satellite services.[62] The purpose of this Decision is to harmonise the conditions for the availability and efficient use of the frequency bands 1980 – 2010 MHz (earth-to-space) and 2170 – 2200 MHz (space-to-earth). The Decision requires Member states to designate the band and make it available from 1 July 2007 for the use of systems capable of providing radiocommunications services between a mobile earth station and one or more space stations, or between a mobile earth station by means of one of more space stations, or between a mobile earth station and one or more complementary ground based stations at fixed locations.

Meanwhile the CEPT ECC is considering similar treatment for MSS bands at 1.5GHz and 1.6 GHz.

The Complementary Ground Component (CGC) of a satellite network comprises ground-based stations deployed at fixed locations in order to improve the availability of the mobile satellite service in zones where communications with one or several space stations cannot be ensured with the required quality. For example, due to shielding by vegetation and a requirement for building penetration. It is understood that any complementary ground component shall constitute an integral part of the mobile satellite system and shall be controlled by the satellite resource and network management system. It shall use the same direction of transmission and the same portions of frequency bands as the associated satellite components and shall not increase the spectrum requirement of its associated mobile satellite system.

7.9.1 Proposed ComReg Strategy for Satellite Services

ComReg's strategy for the duration of this plan includes:

[61] Wireless Telegraphy (Fixed Satellite Earth Stations and Teleport Facility) Regulations, 2007. (S.I. No. 295 of 2007).
[62] Commission Decision of 14 February 2007 on the harmonised use of radio spectrum in the 2GHz bands for the implementation of systems providing mobile satellite services. (2007/98/EC)

- Responding to requests for frequency coordination involving satellite services in such a manner as to ensure equitable access to the radio spectrum for both satellite and terrestrial services which share the same or adjacent frequency bands on the basis of applicable national and international regulations;

- Contributing to the current EC initiative to licence a European wide MSS and the subsequent demand for CGC in support of that satellite network;

- Reacting positively to proposals for deployment of satellite-based services in Ireland.

- Developing an authorisation regime for the CGC of MSS networks.

7.10 Business Radio Services

Despite the continued rapid growth of cellular telephony, business radio is still a popular communication system for applications where most traffic is between a control point and one or more mobile terminals, or where groups of mobile terminals need to communicate on a "one to all" basis. Business radio is also attractive where the user requires complete control over network operation and costs. The main uses of business radio are for public safety and security (e.g., the Garda Síochána, fire and ambulance emergency services), public utilities industrial and commercial users (taxis, couriers, warehouses etc) as well as various voluntary organisations, all of whom need reliable means of communicating with personnel and especially personnel on the move.

7.10.1 GSM-R

The ECC Decision (02)05[63] designates the 876 – 880 MHz band paired with 921 – 925 MHz for international and national railway operations (GSM-R). GSM-R systems are intended to provide radio communications to facilitate the managing and operation of railway traffic and increase its safety. Ireland has yet to adopt this Decision as these bands are currently unassigned. ComReg foresees no difficulty in doing so if there is a request for the provision of GSM-R in Ireland. Prospective licensees should be aware of the need to provide guard bands to prevent interference from services in the adjacent bands.

When the spectrum is required ComReg would need to consider the process by which rights of use to this spectrum would be awarded.

7.10.2 Public Safety Services

The Department of Finance is currently seeking to introduce a managed digital radio service for the emergency services and non-commercial public sector. The service

[63] ECC/DEC (02)05 of 5 July 2002 on the designations and availability of frequency bands for railway purposes in the 876 – 880 and 921 – 925 MHz bands. (Available for download from www.ero.dk).

will provide nationally managed digital radio services for voice and data purposes to all public security and emergency services and non-commercial public bodies in the Irish public service.[64]

Bearing in mind ComReg's remit to ensure the effective and efficient use of spectrum ComReg will ensure adequate spectrum is made available and licensed in an appropriate manner to meet the current and future needs of the emergency and law enforcement services and that such spectrum is kept free from interference.

Deployment of the managed digital radio services network on a national basis is expected to result in the release of spectrum in the VHF and UHF bands currently used for analogue services by various State agencies and public bodies. When this spectrum becomes available ComReg will consider how best to optimise its use and this will most likely involve a public consultation.

7.10.3 Temporary Business Radio Licences

The temporary business radio license regime allows individuals or firms to use radio equipment for the purpose of sending and receiving messages for a limited period. This regime covers most types of radio equipment used at special events, for which a licence is required and is issued for the duration of the event in question with a maximum validity of six months. Devices typically licensed under a Temporary Business Radio Licence include:

- Walkie-talkies;
- two-way radio base stations and repeaters;
- wireless cameras;
- wireless microphones;
- miscellaneous data & telemetry devices (e.g. for wireless camera control).

ComReg endeavours to provide as much information as possible for temporary users of spectrum and has recently published revised guidelines and application forms for this service.[65] Terms and conditions vary depending on operational requirements.

7.10.4 Proposed ComReg Strategy for Business Radio

ComReg's strategy for the duration of this plan includes

- Continuing to support the requirements of the business radio industry and users to ensure that spectrum is available to accommodate new

[64] Press Release from the Department of Justice, Equality and Law Reform - "National Digital Radio Service for An Garda Siochana" - http://www.justice.ie/en/JELR/Pages/PR07000269.

[65] ComReg 08/08 – "Radio Licensing for Special Events and Temporary Use in Ireland"

business radio technologies and that existing licences for analogue systems can be upgraded to digital where required.

- Encouraging the development and use of new spectrally efficient technologies.

- Reviewing the business radio frequency bands with a view to ensuring that there is adequate spectrum for the introduction of new and emerging digital technologies.

- Finalizing the regulatory framework for all paging services and phase out the issue of permits during the lifetime of this strategy statement.

- Continuing to monitor Business Radio installations to ensure compliance with licence conditions.

- Implementing a fee structure that takes into account key criteria such as bandwidth used, exclusive use, geographic location and range of coverage.

- In line with EC harmonisation Decision[66] ComReg will license the high power part of the 169.6 – 169.8125 MHz band for the use of high power tracing and asset tracking systems and high power paging systems under its business radio licence scheme. This band is also the preferred band for paging systems.

- In 2009-2010, reviewing the effectiveness of the Third Party Business Radio (TPBR) scheme.

7.11 Radio Experimenters (Amateur Service)

The Amateur Service[67] is specifically recognised by the ITU with a formal service definition in the Radio Regulations and specific spectrum allocated to it within the International Table of Frequency Allocations. Radio Amateurs in Ireland are referred to as Experimenters and are licensed under the Wireless Telegraphy (Experimenter's Licence) Regulations 2002, S.I. 450 of 2002. Overall, about 5% of the radio spectrum is allocated to the amateur service of which approximately two thirds is on a secondary basis, that is to say the sharing some frequency bands with primary services on a non-interference basis.

[66] Commission Decision of 20 December 2005 on the harmonisation of the 169.4 – 169.8125 MHz frequency band in the community (2005/928/EC).

[67] Within this document reference to the Amateur Service should, unless indicated otherwise, be regarded as including the Amateur Satellite Service.

7.11.1 Proposed ComReg Strategy for Radio Experimenters

ComReg's strategy for the duration of this plan includes:

- Implementing a once-off, life-time fee structure for experimenters;
- Updating the current guideline documents and facilitating the short term authorisation of visiting experimenters to Ireland;
- Modifying the format of repeater station callsigns in Ireland in order to differentiate these from personal callsigns;
- Considering the allocation of spectrum around 500 kHz on the basis of a common European position.

7.12 Science Services

The radio spectrum is used for a wide range of applications that operate under the generic description of 'science services'. These include radio astronomy, meteorological satellite and meteorological aids, earth exploration-satellite services, space research and space operation services. Scientific usage of spectrum has significant social and economic benefits. For example, there are more than 160 meteorological radars in Europe that play a crucial role in the immediate meteorological and hydrological alert processes in providing valuable information for society on flash floods or severe storms. Meteorological systems are also used to monitor changes in climate and the environment and gather long-term measurement data in support of studies on changes in climate and the environment and provide essential background information to develop climate scenario's needed for the development of national and global policies concerning global changes in the Earth's environment.

7.12.1 Economic Contribution

In the case of scientific use of spectrum the estimation of the social and economic value is complex. This is because the benefits of scientific use can be difficult to quantify as they can relate to the society as a whole, may be difficult to foresee and may only be realised over a very long period of time.

Direct economic and social benefits can be associated with general benefits deriving from improved weather forecasting capabilities as well as specific benefits such as support to civil aviation, shipping, land transportation, and savings resulting from the timely preparation for adverse weather conditions. An illustration of the value of meteorology was given by the World Meteorological Organisation (WMO): "Studies in the United States have shown that the value of improved seasonal weather forecasts to farming in the south-eastern quarter of the country alone amounts to some US$ 145 million a year." [68] Furthermore, the WMO has estimated that overall

[68] The Sixth World Meteorological Organisation Long Term Plan (2004-2011).

economic benefits of modern meteorological services typically outweigh the national cost of maintaining such services by a ratio of as much as 10 to 1.

The total annual budget of European National Meteorological services and related organisations (EUMETSAT[69] and ECMWF[70]) is roughly between €1.8 and 2 billion. On the basis of the WMO calculation the economic benefits can be estimated between 18 and 20 Billion Euros per year.

Global environmental change is an important item on the international political agenda. The Kyoto protocol has been signed and ratified by 174 countries as of November 2007. The yearly Conference of the Parties (CoP) of the UN Framework Convention on Climate Change (UNFCCC) continues to give worldwide political guidance. Based on inventories and recommendations developed by WMO's Global Climate Observing System, parties are urged to implement climate monitoring systems that are essential to improve our understanding of climate change. The EU, in cooperation with ESA, have initiated the Global Monitoring for Environment and Security (GMES) initiative. Aiming at an operational system in a few years time, GMES is now being developed using EU Framework Programme funding and is seen as the European contribution to GEOSS.[71]

7.12.2 Proposed ComReg Strategy for Science Services

ComReg's strategy for the duration of this plan includes:

- Liasing with Met Éireann[72] and other scientific organisations to ensure that current and future spectrum requirements of the Science Services are fully understood and, wherever possible, incorporated into national plans for future spectrum planning conferences.

- Continuing offer a high degree of protection to meteorological services, in view of their use in the safeguarding of human life and property.

- Continuing offer a high degree of protection to Earth-exploration services in view of the potential impact of interference on passive and active sensors which could severely disrupt scientific research programmes.

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[69] European Organisation for the Exploitation of Meteorological Satellites

[70] European Centre for Medium-Range Weather Forecasts

[71] Global Earth Observation System of Systems

[72] The main user of radiofrequency spectrum for meteorology in Ireland is by Met Éireann, the Irish National Meteorological Service, which is the leading provider of weather information and related services for Ireland with a mission to monitor, analyse and predict Ireland's weather and climate, and to provide a range of high quality meteorological and related information to customers.

- In line with the RSPG opinion to protect the science service by taking into account the provisions of footnote number 5.340[73] of the ITU Radio regulations.

- Introducing in line with the proposal for aeronautical and maritime radar, a licensing regime for meteorological radars, subject to DCENR agreement. A one-off licence fee of around €500 for new stations will apply, to cover co-ordination and notification costs. Existing meteorological radars will not be charged for licensing.

7.13 Defence Forces Use of Spectrum

Defence forces have actively utilised radiocommunications from the earliest days and their use of radio spectrum is considered critical to national security. There are no specific service allocations for defence applications in the International Radio Regulations as defence communications are recognised as the prerogative of each sovereign nation.

The Irish Defence Forces, comprising the army, naval services and air corps, use radio in a variety of ways, most notably in relation to maritime and aeronautical applications. In accordance with the Wireless Telegraphy Act 1926, apparatus for wireless telegraphy kept by or in the possession of the Minister for Defence, for the purpose of the Defence Forces, does not require a licence.

7.13.1 Proposed ComReg Strategy for Defence Forces spectrum

ComReg will maintain awareness of international developments, particularly in CEPT through the Civil - Military Frequency Management Forum which brings together civil and military spectrum managers to address issues of mutual interest. ComReg will continue to liaise with the Defence Forces as required to solve issues of mutual concern.

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[73] ITU RR Footnote 5.340 All emissions are prohibited in the following bands: 1 400-1 427 MHz, 2 690-2 700 MHz, except those provided for by No. 5.422, 10.68-10.7 GHz - except those provided for by No. 5.483, 15.35-15.4 GHz - except those provided for by No. 5.511, 23.6-24 GHz, 31.3-31.5 GHz, 31.5-31.8 GHz - in Region 2, 48.94-49.04 GHz - from airborne stations 50.2-50.4 GHz, 52.6-54.25 GHz, 86-92 GHz, 100-102 GHz, 109.5-111.8 GHz, 114.25-116 GHz, 148.5-151.5 GHz, 164-167 GHz, 182-185 GHz, 190-191.8 GHz, 200-209 GHz, 226-231.5 GHz, 250-252 GHz.

Annex A: Monitoring and Enforcement

ComReg is obliged under the Communications Act 2002 to maintain the integrity of the radio spectrum. ComReg monitors licensed operators to ensure that they are in compliance with their licence conditions and investigates complaints of interference. ComReg is also obliged to ensure that all radio equipment placed on the market is in compliance with the R&TTE and EMC Directives[74]. ComReg also monitors the radio spectrum to ensure that there are no unlicensed operators and continues to take the appropriate enforcement action against any person or business found operating a radio system without a licence.

A.1 Monitoring

Spectrum monitoring is one of the essential tools of spectrum management and assists in promoting the efficient utilisation of the radio frequency spectrum by ensuring licence compliance supporting the spectrum management process in the frequency assignment and planning functions. ComReg has developed its spectrum monitoring techniques to ensure that technical parameters and standards for radiocommunication systems are adhered to and is developing a network of fixed monitoring stations throughout the country to provide an accurate picture of spectrum utilisation in conjunction with mobile monitoring stations used for resolving interference issues.

A.2 Equipment Compliance and Enforcement

The basis for compliance enforcement in relation to equipment the R&TTE and EMC Directives

The R&TTE Directive provides that any person, retailer, wholesaler, distributor, importer or manufacturer may not sell or use any radio or any piece of telecommunications terminal equipment, unless it complies with the essential requirements of the Directive. Investigations under the R&TTE Directive are prioritised, with consumer safety and potential interference driving the workflow. ComReg will continue to take appropriate action against suppliers of non-compliant equipment found on the Irish market up to, and including, a ban on sales or product recall and possible prosecution of persons involved.

The EMC Directive (2004/108/EC) relates to the EMC compliance of products and covers most electronic consumer items not covered by the R&TTE Directive. Under this piece of legislation ComReg has similar powers to the R&TTE directive and investigations are prioritised, with consumer safety and potential interference driving the workflow.

A.3 Operations Compliance and Enforcement (Inspection of Radio Installations)

[74] Article 3(2) of Directive 1999/5/EC Of The European Parliament and of The Council Of 9 March 1999 On Radio Equipment And Telecommunications Terminal Equipment And The Mutual Recognition Of Their Conformity O.J. 7.4.99 L 91/10 (The R&TTE Directive).
Council Directive 2004/108/EC of 15 December 2004 on the approximation of the laws of Member States relating to electromagnetic compatibility OJ L 390/24 (The EMC Directive).

The inspection of radio installations is an effective means of regulating and ensuring compliance with licence conditions and consequently more efficient use of radio spectrum. The basis for radio installation and inspection are:

1926 Wireless Telegraphy Act – S.I. 45 of 1926

The Wireless Telegraphy Act 1926 is primary legislation from which most secondary legislation in the communications sector is derived. The fundamental principle is that all apparatus for wireless telegraphy must be licensed unless specifically exempted. Radio users who operate equipment without possession of the appropriate licence or operate licensed equipment outside the terms of the licence commit offences under the Act.

1988 Broadcasting and Wireless Telegraphy Act – S.I. 19 of 1988

This Act pertains to broadcasting and is the principal act under which enforcement actions is taken against unlicensed broadcast stations. The Act relates to the supply and prohibits the supply of licensed equipment to any person not in possession of a valid licence.

The use of sub-standard equipment, poor installation and maintenance practices can result in unlicensed broadcast stations causing interference to other licensed users including air traffic control (ATC) operations. ComReg has seized unlicensed broadcast equipment on 17 separate occasions in 2006/07. Legal proceedings have been initiated against those identified as being involved.

Communications Regulation Act 2002 - (S.I. 20 of 2002)

Sections 39 to 46 of this Act provides for increased powers for officers of the ComReg who have been designated as “authorised officers” for the purposes of the Act. The powers allow for, among other things, the inspection and testing of apparatus and for the copying and seizure of documents without the requirement for a search warrant.

A.4 Compliance and Enforcement Actions

During the period 2005-07 ComReg initiated 318 compliance and enforcement actions covering a range of services, the breakdown of which is given in Figure 5.

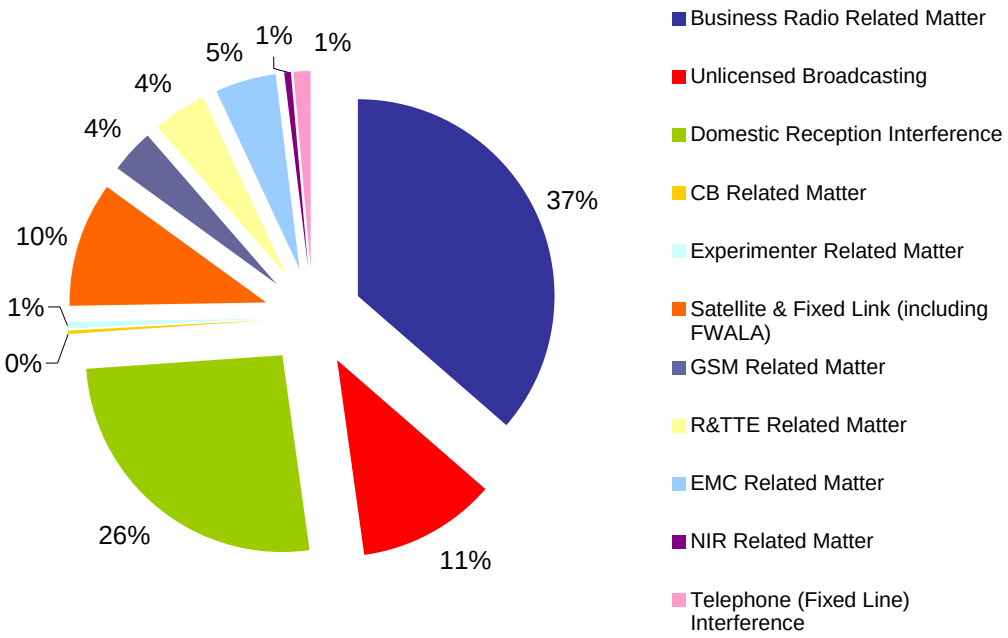

Figure 5. Compliance and enforcement actions undertaken in 2005 -2007.

The evolution of wireless technologies has resulted in an increase in the type of interference investigations undertaken by ComReg. As an example, following complaints of interference to operations in the Fixed Wireless Access Local Area (FWALA) licensing scheme, ComReg uncovered numerous SRDs operating within a specified FWALA frequency band. These SRDs were discovered to have been imported from the UK and operate within a UK licence exempt-band. These products have since been moved to a new frequency band which permits such devices to operate without causing harmful interference.

A.5 Compliance with conditions relating to Non-Ionising Radiation emissions

Non-ionising radiation (NIR) is the term given to electromagnetic radiation which has insufficient energy to cause ionisation (molecular changes) in living matter. It includes static and power frequency fields, radiofrequencies, microwaves, infra-red, visible and ultraviolet radiation. It is a condition of General Authorisations and various Wireless Telegraphy licences issued by ComReg that emissions of non-ionising radiation from licensed and authorised radio transmission installations comply with the limits for public exposure set down in the latest guidelines[75] published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

[75] "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)", International Commission on Non-Ionizing Radiation Protection, Published in 'Health Physics', April 1998, Volume 74, Number 4. Available from www.icnirp.de

ComReg's responsibility and capacity to act in this area is solely to ensure that its licensees comply with their licence conditions relating to non-ionising radiation, such that all NIR emissions from their apparatus are within the levels set down by ICNIRP in 1998. ComReg's current practice to assess compliance with this particular condition is to survey emissions from a sample number of sites each year. The sites to be surveyed are chosen by ComReg. ComReg currently augments its own monitoring by engaging the services of a contractor to conduct most of the surveys. Since 2003, ComReg has commissioned a total of 620 site surveys as follows:

Year	No of Sites Surveyed
2003- 2004	400
2006	80
2007	130

The programme of site surveys is ongoing and it is intended to survey a further sample number of sites and licence types in 2008.

The results of the individual site surveys are published on www.comreg.ie as well as on www.siteviewer.ie, an on-line facility which allows the public to view details of mobile masts throughout Ireland.

Annex B: The Regulatory Framework for Spectrum Management in Ireland

B.1 The National Framework

B.1.1 Role of ComReg

During the liberalisation of the telecommunications sector across Europe in the 1990's many countries established an independent regulator to deal impartially with the sector. In Ireland, ComReg is the National Regulatory Authority (NRA) responsible for the regulation of the electronic communications sector (telecommunications, radiocommunications and broadcasting transmission) and the postal sector.

Established on 1 December 2002, ComReg was preceded by the Office of the Director of Telecommunications Regulation (ODTR).

One of the functions of ComReg is to manage the radio frequency spectrum. In carrying out this role, ComReg must:

- take into account any policy directions issued by the Minister for Communications, Marine and Natural Resources;
- ensure that measures taken are proportionate in meeting its objective to ensure the efficient management and use of the radio spectrum; and
- have regard to international developments with regard to the radio frequency spectrum.

The management of the radio frequency spectrum takes place within a framework which encompasses both national law and international obligations. This framework is detailed below.

B.1.2 Role of the Department of Communications, Energy and Natural Resources

The Department of Communications, Energy and Natural Resources (DCENR) was established following the 2007 general election which resulted in the restructuring of a number of Government Departments. DCENR's remit brings together the communications, broadcasting and energy functions with those of marine and natural resources. The role of the Minister for Communications, Energy and Natural Resources in regard to spectrum management is to develop primary and secondary legislation, develop broadcasting policy, issue policy directions to ComReg as he considers appropriate and in accordance with international law, and to represent Ireland at international decision making bodies such as the International Telecommunication Union (the ITU), the Conference of European Post and Telecommunication Administrations (CEPT), the European Union and their affiliated bodies.

Within these international bodies ComReg is involved, at the invitation of the Minister, to provide specialist expertise on spectrum management issues.

B.1.3 Legislative Framework relating to Spectrum Management

The legislative framework provides the legal basis for the regulation of the communications sector in Ireland. This framework is composed of primary and secondary legislation and is published in the Irish Statute Book.[76]

Acts of the Oireachtas (Parliament) constitute primary legislation in Ireland. The principal Acts applicable to the development of the spectrum management framework, being the Act which established ComReg and the Acts governing the radio and broadcasting sectors in Ireland, are detailed below.

In Ireland, the day-to-day aspects of primary legislation are implemented by secondary legislation in the form of Statutory Instruments – either "Regulations" or "Orders." Statutory Instruments are made by the person or body that has been granted the power to legislate on such matters and they can take five forms: by-laws, orders, regulations, rules and schemes.

In recent years there has been a number of European Parliament and Council Directives and Decisions which have been transposed into Irish law, under secondary legislation, and which establish a new framework for the regulation of the electronic communications sector.

Responsibility for the regulation of the telecommunications sector in Ireland, including the management of the radio spectrum, was transferred to an independent regulator in 1997 under the Telecommunications (Miscellaneous Provisions) Act, 1996 (No. 34 of 1996). This Act established the ODTR, transferred functions from the then Minister for Transport, Energy and Communications to the Director, allowed for the imposition of a levy on telecommunications service providers, and for the regulation of tariffs for some telecommunications services.

In 2002, the Communications Regulation Act, 2002 dissolved the ODTR, established ComReg, extended the role of the regulatory body, and defined its functions and objectives.

The main Acts governing the radio sector are the Wireless Telegraphy of 1926, 1956, 1972 and the Broadcasting and Wireless Telegraphy Act, 1988 (together "WT Acts"). The WT Acts provide for the licensing of radio systems in Ireland. Under these Acts, the possession and use of apparatus for wireless telegraphy[77] requires authorisation – either by a licence or licence exemption.

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[76] http://www.irishstatutebook.ie/

[77] "Apparatus for wireless telegraphy" is defined in the WT Acts as "apparatus capable of emitting and receiving, or emitting only or receiving only, over paths which are not provided by any material substance constructed or arranged for that purpose, electric, magnetic or electro-magnetic energy, of a frequency not exceeding 3 million megahertz, whether or not such energy serves the conveying (whether they are actually received or not) of communications, sounds, signs, visual images or signals, or the actuation or control of machinery or apparatus, and includes any part of such apparatus, or any article capable of being used as part of such apparatus, and also includes any other

The primary legislation applicable to the broadcasting sector comprise the Broadcasting Authority Act 1960 as amended, the Broadcasting and Wireless Telegraphy Act 1988, the Broadcasting Act 1990, the Radio and Television Act 1988, the Broadcasting Act 2001, and the Broadcasting (Amendment) Act 2007. RTE is the national broadcaster in Ireland and is licensed under the 1960 Broadcasting Authority Act. The Broadcasting Commission of Ireland (BCI), which manages the independent radio and television sector, is licensed under the Radio and Television Act, 1988 and is responsible for issuing sound and television broadcasting contracts to the independent sector.

It should be noted that ComReg is not responsible for the regulation of broadcasting content. This responsibility lies with the BCI for the independent television and radio sector and with the Radio Telefís Éireann (RTÉ) Authority for RTÉ programme services.

In July 2003, a new EU regulatory framework for electronic communications came into force. This had a significant impact on the manner in which the communications sector is regulated throughout Europe. The framework is comprised of 5 Directives (Framework, Authorisation, Access, Universal Service and Data Protection) and one Decision (Spectrum Decision) and it aims to promote competition, the interests of the citizen (universal service, consumer protection, privacy, dispute resolution) and the single European market. This framework does not include broadcast content regulation.

In Ireland, the Framework, Authorisation, Access and Universal Service Directives were transposed into law under the following Regulations:

- S.I. 305 of 2003, European Communities (Electronic Communications Networks and Services) (Access) Regulations 2003 ("Access Regulations").

- S.I. 306 of 2003 European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations 2003 ("Authorisation Regulations").

- S.I. 307 of 2003 European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2003 ("Framework Regulations").

- S.I. 308 of 2003 European Communities (Electronic Communications Networks and Services) (Universal Service and Users' Rights) Regulations 2003 ("Universal Service Regulations").

In terms of the radio spectrum, usage is now subject to individual rights of use for radio frequencies and such rights of use continue to be referred to as radio licences in Ireland.

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apparatus which is associated with, or electrically coupled to, apparatus capable of so emitting such energy."

B.1.4 Legislation issued under the WT Acts

For the electronic communications sector, ComReg is responsible for the development of radio licensing Regulations (subject to the approval of the Minister), and licence exemption Orders under the WT Acts. Since 2003, these regulations must conform to the requirements of the EU Framework Regulations described above.

The SI's issued from 1922 are published at http://www.irishstatutebook.ie/. Regulations applicable to the communications sector issued are available at http://www.comreg.ie/publications/regulations_and_si.505.100024.0.0.p.html.

B.2 The Regional Framework

B.2.1 The European Union

The European Union (EU) comprises 27 Member States operating together under a series of international treaties including the Treaty on European Union that established the EC which is responsible for implementation of the treaties, managing EU policy and making proposals for new legislation to achieve the objectives of the various treaties. The EC is able to and has used legally binding regulatory measures to achieve policy objectives, including objectives related to radio spectrum usage and management such as:

- Facilitating technological innovation and competition in radiocommunications, mobile telephony and wireless local networks.
- Pursuing Community objectives with regard to the radio spectrum within a predictable and legally certain regulatory framework.
- Ensuring an appropriate balancing of the interests of the individual Member States, of the European Community and of the different user communities; and
- Safeguarding the Community's interests in the international negotiations on the radio spectrum.

In recent years, the role of spectrum management has increased to a great extent. As an obvious sign of this trend, the EU recently prioritized radio spectrum policy. The EC has in its Communication "i2010 – A European Information Society for Growth and Employment" published in June 2005 as a new strategic framework, set forth its priorities for the information society and policies to be undertaken in the media.

One of these priorities is the completion of a Single European Information Space. In technical terms, represents the digital convergence of communication networks, media, content, services and devices. In order to ensure faster broadband services one of the main challenges posed by digital convergence is speed. Thus, offering affordable and secure broadband communications is declared as one of the objectives. For example, the expansion of new high-speed wireless applications, such as broadband mobile networks, broadband WLAN, WMAN systems (Wi-Fi,

WiMAX) or digital broadcasting calls for easier access to frequencies and more efficient frequency management within the EU.

In order to achieve the Single European Information Space, the EC has announced the revision of the regulatory framework for electronic communications, including the development of an effective frequency management strategy in the years leading up to 2007. The objective of the strategy is to identify bottlenecks delaying the introduction of faster, more innovative and competitive broadband services. It essentially aims to introduce a market-based model that gives greater freedom to market players as to the method of frequency use and makes obtaining frequency rights easier by allowing trading with such rights. An important part of the frequency management reform was the introduction of a new regulatory package of procedures.

The EU has also played a significant role in movement of goods throughout Europe and in the placing of goods on the market throughout the Community. In relation to Radio and electronic communications sector the EMC Directive and R&TTE Directive, which are summarised in Annex A.

B.2.2 CEPT

The European Conference of Postal and Telecommunications Administrations (CEPT) was established in 1959 and consists of a body of policy-makers and regulators currently encompassing 48 European countries covering almost the entire geographic area of Europe (see: www.cept.org).

The CEPT, which deals exclusively with sovereign regulatory matters, has established two committees one on postal matters (CERP) and another dealing with radiocommunications and telecommunications issues: the ECC (Electronic Communications Committee). The committees handle harmonisation activities within their respective fields of responsibility, and adopt recommendations and decisions.

Under the ECC there are a number of working groups and project teams which develop and deal with radio spectrum issues for consideration by the ECC plenary meetings. The ECC also adopts Decisions, Recommendations and Reports aimed at efficient spectrum utilisation and harmonisation. While the implementation of the Decisions and Recommendations by national administrations is on a voluntary basis, as the CEPT and ECC have no legislative power, the ECC has played a significant role in harmonising spectrum use in Europe providing, for example, a table of European frequency allocations which is in effect a long term strategic plan for harmonisation and use of the radio spectrum throughout Europe.

ComReg is actively involved in the most relevant CEPT working groups, project teams and the ECC plenary sessions in order to promote and protect Ireland's interests.

B.3 The Global Framework

Ireland operates within a global economy. International markets and competition must therefore be taken into account in the development and introduction of new services. Spectrum allocation also has to take the international dimension into account. To maintain an effective and responsive regulatory structure there is an ongoing need for participation in appropriate international fora, to track and influence developments in international regulation, harmonisation of standards and new market opportunities, and to monitor developments in technologies and applications.

B.3.1 The International telecommunications Union

The effective integration of each nation into the international community of spectrum users is required to ensure availability of interference free-services such as: International aeronautical and maritime communications supporting air and sea travel; global mobile communications; satellite communications; international broadcasting and public safety services such as search and rescue. Because radio waves do not respect international boundaries and many systems operate on a global basis; the international community has developed a structure for co-operatively managing interference between services and between nations. International co-operation in the field of telecommunications is handled through a single organisation known as the International Telecommunication Union (ITU) that updates and amends the International Radio Regulations.

The ITU Radio Regulations contain technical and procedural provisions related to each of the various radio services and serve as the primary international agreement covering rules and procedures for operating radio equipment, resolving and preventing interference, and contain the international frequency allocation table. While each nation remains sovereign in their use of the radio spectrum the work of the ITU forms the global framework within which regional and national planning is developed.

B.3.2 The World Radiocommunication Conference of 2007

ComReg has been a key participant in Irish delegations to International fora including the Conference Preparatory meeting to prepare for the 2007 World Radiocommunication Conference (WRC) and the World Radiocommunication Conference itself. Lead by the DCENR the Irish delegation included ComReg staff and staff from the Department of Transport who worked to meet objectives and goals established in the national preparatory process. Demands for more spectrum have been submitted by the aviation sector, amateur radio, space sciences, emergency telecommunications, and electronic news gathering. One of the most fundamental issues is reconciling the needs of satellite operators with those of mobile personal communications and broadcasting. As mobile markets approach saturation in developed countries, IMT-2000 (or 3G) systems and those beyond (known as IMTAdvanced) are expected to generate further growth opportunities. Broadband wireless access technologies, particularly those with mobile capabilities such as WiMAX, promise new ways of bridging the digital divide.

Some of the key decisions from WRC-07 included:

- *Extension of the Metrological Satellite Service allocation at 18 GHz*

Region 1 and 3 unanimously proposed an extension of the Metrological Satellite Service (MetSat) allocation in the band 18.3 – 18.4 GHz while Region 2 proposed an extension of the MetSat allocation in the band 18.0 – 18.1 GHz to take into account different allocation and usage situations between the regions. The WRC agreed on both proposals and this extension of the MetSat allocation to 300 MHz, although in different directions between Regions 1/3 and Region 2, satisfies the spectrum requirements for the next generation European geostationary MetSat systems.

- *Upgrading the Radiolocation service to primary status in the 9 GHz bands*

Following technical studies and discussion at the conference a contiguous bandwidth of 600 MHz is now allocated to the Earth exploration-satellite service (active) and the space research service (active), on a primary basis in the 9 300-9 800 MHz band an on a secondary basis in the 9 800-9 900 MHz band.

- *Additional spectrum for IMT and mobile services*

This proved to be a controversial and difficult matter at the WRC and was finally decided as follows in Region 1:

Additional Terrestrial Spectrum	
Band	**Bandwidth**
450 - 470 MHz	20 MHz
792 -862 MHz	72 MHz
2300-2400 MHz	100 MHz
3400-3600 MHz	200 MHz
Total	**392 MHz**

Additional Satellite Spectrum	
Band	**Bandwidth**
1518-1525 MHz / 1668-1675 MHz	2 x 7 MHz
Total	**14 MHz**

The following constraints apply:

- The mobile allocations and IMT identifications in the 790-862 MHz bands and 3.4-3.6 GHz are delayed to 2015 and 2010 respectively. Furthermore, for the use of these bands additional procedures apply. It should also be noted that the identified sub bands and regulatory procedures are partly different between the Regions.

- Further studies for the 790-862 MHz band will be carried out and WRC-11 will consider the results of those studies.
- The proposal to consider the use of the frequency range 6 to 10 GHz for IMT at WRC-11 was not supported.

- *Protection of terrestrial services from satellite services in the 2.5 GHz band*

For CEPT the goal was to provide some adequate protection to terrestrial services including IMT, from satellite services operating in the 2500-2690 MHz band. Ireland's concern was for MMDS operators in this band and to ensure their protection from the same satellite services. The European Common Position (ECP) requested a decrease the satellite transmitting power flux density (PFD) from -113 dBW/m²/MHz (high elevation angles) / -128 dBW/m²/MHz (low elevation angles) to -125 and -133 dBW/m²/MHz respectively.

The WRC-07 concluded by setting these PFD masks at -125/-136 dBW/m²/MHz which provides excellent protection for the terrestrial services in this band, especially the current users in Ireland.

- *Changes to HF spectrum usage between 4 and 10 MHz*

CEPT proposed additional spectrum for broadcasting and radio amateurs in the HF spectrum between 4 and 10 MHz. Unfortunately, the WRC decided that there should be no additional spectrum for broadcasting in the range 4-10 MHz and a proposal for secondary allocation to the radio amateurs in part of the lower 5 MHz band was defeated.

- *Future Conference Agenda*

For the next scheduled WRC in 2011, at least 31 agenda items have been approved. These cover diverse services such as the:

- safe operation of unmanned aircraft systems (UAS);
- worldwide/regional harmonization of spectrum for electronic news gathering;
- fixed service in the bands between 71 GHz and 238 GHz;
- revision of frequencies and channelling arrangements in order to implement new digital technologies for maritime mobile services;
- frequency allocation requirements with regard to operation of safety systems for ships and ports;
- needs of passive systems for lightning detection in the meteorological aids service, including the possibility of an allocation in the frequency range below 20 kHz;
- results of sharing studies between the mobile service and other services in the band 790-862 MHz.

Annex C: Wireless Access Policy for Electronic Communication Services

WAPECS (Wireless Access Policy for Electronic Communication Services) is a framework for the provision of electronic communications services within a set of frequency bands to be identified and agreed between EU Member States in which a range of electronic communications networks and electronic communications services may be offered on a technology and service neutral basis.[78]

The term "WAPECS" has been used to signal a move away from too narrowly specified allocations and applications, for which specific spectrum is designated. Under this definition of WAPECS, digital technologies are stimulated to deliver all electronic communications services within their capabilities, making use of any frequency band and networks. However, this is subject to technical coexistence requirements which need to be tailored to each specific band.

In summary of the main points of the opinion are:

- The availability of radio frequency spectrum and the widespread availability and take-up of broadband has an important role to play in ensuring the achievement of the Lisbon agenda and the e-Europe Action Plan.
- The convergence trend caused by increasing use of digital technologies is putting pressure on spectrum management policies as radio access networks increasingly compete with each other. For those bands used to deliver electronic communications services to the consumer, it is important that spectrum regulation keeps pace with this trend and provides coherent authorisation conditions across all the affected frequency bands.
- Member States have identified a number of constraints which have the potential to limit the use of particular bands for WAPECS. These constraints include:
    - Legacy issues arising from the initial assignment of individual rights to use frequencies. The most important of these is the differing economic values of different blocks of spectrum and categories of networks, where both are used to deliver electronic communications services. In some cases the price has been decided by the Member States, where the spectrum was assigned by a beauty contest or on a first-come, first served basis with a pre-determined licence fee. In other cases, the amount paid was determined by an auction.
    - Lack of flexibility in some existing licences, particularly arising from regional and international agreements. Spectrum rights of use may require spectrum to be used for a particular electronic communications network or service, even though demand may be higher if used for another electronic communications network or

[78] This is provided that certain technical requirements to avoid interference are met, to ensure the effective and efficient use of the spectrum, and the authorisation conditions do not distort competition.

service. The problem can be compounded by long licence durations, which make it difficult to change the rules when appropriate to do so. Also the current framework requires that where radio frequency use has been harmonized, any transfer of rights of use of radio frequencies shall not result in change of use of that radio frequency.

- Excess of technological prescriptions in some licences. Licences or rights of use may prescribe too specific technology or technical conditions to be used in a particular band, thereby hampering innovation (e.g. transition from 2G to 3G). This can result in spectrum being ineffectively used if the licenses can not be broadened in order to adapt to new technological requirements.
- Services pursuing particular public interest objectives (e.g. services of general economic interest, safety-of-life services, etc.) In this respect, Member States may have to fulfil some obligations relating to such services, including when they fall under the WAPECS scope, and to safeguard some spectrum for them.
- Constraints related to the continued use of part of WAPECS bands for non-WAPECS (e.g. governmental) and technical conditions required to ensure the protection of other services and applications used in the same bands or in adjacent bands, including governmental services.

The RSPG identified challenges that European regulators would need to address including:

- Ensuring access to adequate spectrum to meet the needs of consumers and business in the future without disadvantaging services of general interest (such as public-sector broadcasting) and without engaging in technological determinism.
- Balancing flexibility with harmonisation: removing regulatory constraints on the electronic communications services offered and the technologies used wherever possible, while distinguishing between licensed and unlicensed bands, identifying what appropriate minimal technical co-existence requirements to avoid the risk of interference must be met and maintaining the protection of other services and applications (e.g. governmental services);
- Maintaining a stable and predictable regulatory framework.
- Facilitating standardisation through at least the establishment of a harmonised set of technical rules for the usage of certain frequency bands to allow European market to benefit from economies of scale.

The RSPG considered that the general long term policy goal should be to develop approaches which ensures that spectrum issues related to the growing and evolving variety of radio systems comply with the overall policy goal to develop the European Union internal market and European competitiveness, by ensuring an innovation-friendly and coherent regulatory environment which facilitates rapid access to spectrum for new technologies and leads to the provision of a wide variety of wireless electronic communications services and networks. Four principles were given on how to achieve this long term policy goal, namely:

- Facilitating rapid access to spectrum for new technologies in order to promote competitiveness and innovation. Spectrum management should

ensure that spectrum scarcity is not increased by non justified regulatory constraints. A new approach could be to introduce more flexibility in the conditions of use of spectrum resources for wireless electronic communications, while maintaining harmonisation where necessary within a coherent and spectrally efficient frequency management scheme. Wherever possible and appropriate, constraints attached to the usage of specific radio spectrum bands should be removed and spectrum management made more responsive to the rapid development of new markets and services.

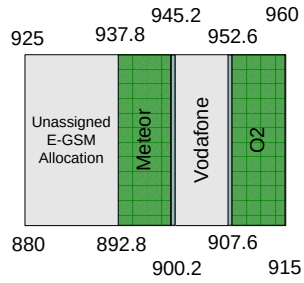
- Ensuring a coherent authorisation scheme. Increasingly, radio access networks convey the same or similar content and are increasingly competing with each other. Therefore, each time the NRA checks that competition remains fair, the market to be analysed encompasses more technologies and systems than in the past.
- Technological neutrality. For each WAPECS frequency band, provided that the associated electronic communications network complies with the relevant spectrum technical obligations, technological neutrality and flexibility in future use of the spectrum should be ensured.
- Service neutrality. Any electronic communications service (ECS) may be provided in any WAPECS band over any type of electronic communications network. No frequency band should be reserved for the exclusive use of a particular ECS.

The RSPG considered that, if implemented overnight in a "big-bang" approach, the move towards WAPECS-friendly spectrum management has the potential to cause disruption in the market and possibly discourage investment in the short term. On the other hand, simply allowing existing licences to run their course, and changing them to more flexible rights of use as they expire, would delay the benefits of innovation and unduly penalise consumers.

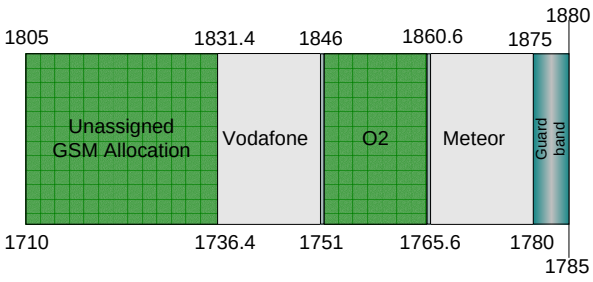
ComReg has moved quickly to take on the challenges of WAPECS to promote innovation in Ireland and to release the benefits foreseen by the RSPG. In April 2007, based on the WAPECS principles, ComReg issued a 15 year technology- and service-neutral licence in the 1800 MHz band.[79]

[79] ComReg PR270407 – "Personal Broadband Wins 1800 MHz Auction."

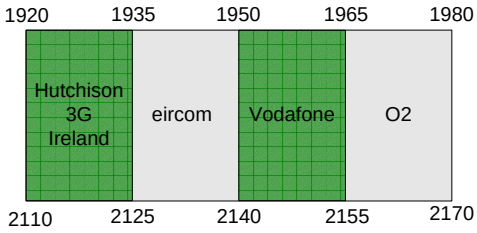
Annex D: GSM and UMTS bands in Detail



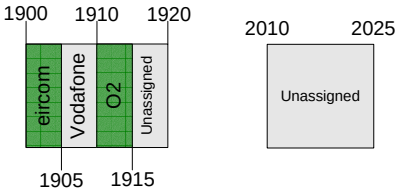
900 MHz GSM Band



1800 MHz GSM Band



UMTS (3G) FDD Band



UMTS (3G) TDD Bands

Figure 4 GSM and UMTS (3G) Bands in Detail

Glossary

Term	Definition
3G	Third Generation
AIP	Administrative Incentive Pricing
ATC	Air Traffic Control
BCI	Broadcasting Commission of Ireland
BSS	Broadcast Satellite Service
CAIRDE	Civil Aviation Integrated Radar Display Equipment
CB	Citizens Band
CCDP	Co-channel dual polar, technique for combining horizontal and vertical polarisation to double capacity of a microwave fixed link
CEPT	Conference of European Telecommunications and Postal Administrations
DAB	Digital Audio Broadcasting
DCENR	Department of Communications, Energy and Natural Resources
DRM	Digital Radio Mondiale
DSL	Digital Subscriber Line
DTT	Digital Terrestrial Television
DVB	Digital Video Broadcasting Standard
DVB-H	Handheld DVB standard, intended for delivery of audiovisual content to mobile terminals
DVOR	Doppler VHF Omnidirectional Radar (ILS component)
EC	European Commission
ECC	European Communications Committee
ECS	Electronic Communication Service
EMC	Electromagnetic Compatibility

Term	Definition
ERC	European Radiocommunications Committee (forerunner to ECC)
ETSI	European Telecommunications Standards Institute
FDD	Frequency Division Duplex, technique where two separate frequencies are used for forward and reverse transmission
FM	Frequency Modulation
FSES **FSS**	Fixed Satellite Earth Station Fixed Satellite Service
FWA	Fixed Wireless Access
FWALA	Fixed Wireless Access, Local Area
FWPMA	Fixed Wireless Point to Multipoint Access
GDP	Gross Domestic Product
GMDSS	Global Maritime Distress and Safety System
GPRS	General Packet Data Service: Packet data transmission standard for GSM mobile phone networks
GPS	Global Positioning System
GSM	Global System for Mobile Communications: European 2nd generation mobile phone technology now in use worldwide
GSM-R	GSM for railways, variant of GSM mobile phone standard that provides communication and signalling functionality for railway use
IAA	Irish Aviation Authority
ICAO	International Civil Aviation Organisation
ICNIRP	International Committee on Non-Ionising Radiation Protection
IEEE	Institution of Electrical and Electronics Engineers (US Standards Body)
IMT	International Mobile Telecommunications.
IRVR	Instrument Runway Visual Range (ILS component)
ITU	International Telecommunication Union
Mbit/s	Megabits per second

Term	Definition
Microwave	Generic terms for frequencies in the range 3 GHz to 30 GHz
MMDS	Multipoint Microwave Distribution System (for multi-channel TV)
MRAU	Maritime Radio Affairs Unit
MSS	Mobile Satellite Service
MSSR	Monopulse secondary surveillance radar
NDB	Non-directional Beacon
NIR	Non-Ionising Radiation
NRA	National Regulatory Authority
PAMR	Public Access Mobile Radio, business radio service that provides services to third party subscribers
R&TTE	Radio and Telecommunications Terminals
Radar	Radiodetermination system based on the comparison of reference signals reflected, or transmitted from the position to be determined. This encompasses meteorological radars and radionavigation systems.
Radio-determination	Determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, be means of the propagation properties of radio waves.
RRC-06	2006 ITU Regional Radiocommunication Conference to address re-planning of broadcast bands for introduction of digital broadcasting
RTTT	Road Traffic Telemetry and Telematics
SI	Statutory Instrument
SIT	Satellite Interactive Terminal
SMR	Surface Movement Radar
SNG	Satellite news gathering
SRD	Short Range Device
SUT	Satellite User Terminal
TCAM	EU Telecommunications Conformity Assessment and Market Surveillance Committee and Market Surveillance Committee

Term	Definition
TDAB	Terrestrial Digital Audio Broadcasting
TDD	Time Division Duplex, technique whereby the same frequency can used for forward and reverse transmission
TES	Transportable Earth Station (satellite service)
TETRA	Terrestrial Trunked Radio, European digital trunked mobile radio standard
UHF	Ultra High Frequency (300 MHz to 3 GHz)
UMTS	Universal Mobile Telecommunications System: European 3rd generation standard, part of IMT-2000 family of standards
UWB	Ultra Wideband
VHF	Very High Frequency (30 MHz to 300 MHz)
VSAT	Very Small Aperture Terminal (satellite earth station)
Wi-Fi	Commercial name for WLAN devices operating in the 2.4 GHz and 5 GHz bands, based on the IEEE 802.11 series of standards
WiMAX	Family of standards under development for broadband wireless access in bands above 3 GHz, also referred to as IEEE 802.16
WLAN	Wireless Local Area Network
WRC	World Radiocommunication Conference