



Commission for
Communications Regulation

Strategy for Managing the Radio Spectrum 2019 to 2021

Response to consultation on ComReg's
draft Radio Spectrum Management Strategy
Statement for 2019 to 2021

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Chapter 1

1 Introduction

- 1.1 The Commission for Communications Regulation (“ComReg”) is responsible for, among other things, the management of the radio frequency spectrum (‘radio spectrum’ or ‘spectrum’) in the State. ComReg is required under section 31 of the Communications Regulation Act 2012 (as amended) to draw up and adopt a strategy statement reflecting its statutory functions every 2 years.
- 1.2 In August 2018, ComReg set out and invited comments on its draft radio spectrum management strategy for the period 2019 to 2021 (“Consultation 18/74”).¹ In Consultation 18/74, ComReg, among other things, reviewed the previous strategy period (2016 to 2018) and set out its draft radio spectrum work plan for the period 2019 to 2021, while also being reflective of ComReg’s current ECS Strategy Statement.²
- 1.3 Twelve interested parties responded to Consultation 18/74. ComReg is grateful for these responses, non-confidential versions of which are published alongside this document (in Document 18/117s).³
- 1.4 Having carefully considered same, along with other relevant information, this response to consultation document sets out ComReg’s assessment of, and views in relation to, the matters raised, which have informed the final Radio Spectrum Management Strategy Statement for the period 2019 to 2021, which is also published alongside this response to consultation (in ComReg Document 18/118).

1.1 Respondents to Consultation 18/74

- 1.5 The interested parties who responded to Consultation 18/74 are:
 - Carlson Wireless Technologies (“Carlson”);
 - Eircom Limited (“Eir”);
 - Electricity Supply Board Networks (“ESBN”);
 - Inmarsat Ventures Limited (“Inmarsat”);

¹ ComReg Document 18/74: Proposed Strategy for managing the radio spectrum 2019 – 2021: Consultation on ComReg’s new Radio Spectrum Management Strategy Statement – published 3 August 2018

² ComReg’s ECS strategy statement is available at: <https://www.comreg.ie/publication/electronic-communications-strategy-statement-2017-2019-summary/>

³ ComReg Document 18/117s – available at ComReg.ie

- The Irish Radio Transmitters Society (“IRTS”);
- JCI Europe Communications Ltd (“JCIEU”);
- Joint Radio Company (“JRC”);
- Microsoft Corporation (“Microsoft”);
- Nominet UK Limited (“Nominet”);
- Ruckus Networks (“Ruckus”);
- Three Ireland (Hutchison) Limited (“Three”); and
- Vodafone Ireland Limited (“Vodafone”).

1.2 Structure of this document

1.6 The remainder of this document is structured as follows:

Chapter 2: considers issues related to matters discussed in chapter 2 of Consultation 18/74, namely spectrum policy and management in Ireland.

Chapter 3: considers issues related to chapter 4 of Consultation 18/74, namely:

- harmonisation of radio spectrum and European Commission harmonisation decisions;
- end-user demand for mobile data;
- technology changes and advancements; and
- licences expiring in the near future.

Chapter 4: considers issues related to chapter 5 of Consultation 18/74, namely the Proposed Radio Spectrum work plan for 2019 – 2021.

Chapter 5: considers issues related to chapter 6 of Consultation 18/74, namely the economic contribution of radio spectrum to Ireland.

Chapter 2

2 The Framework for Spectrum Management in Ireland

- 2.1 Chapter 2 of Consultation 18/74 discussed spectrum policy and management in Ireland, including the importance of radio spectrum, an overview of spectrum policy and management in Ireland, and ComReg's spectrum management activities.
- 2.2 Chapter 2 also discussed how increased demand from many different services and users requires an effective spectrum management system, and that spectrum management requires careful consideration of a broad range of factors (e.g. administrative, regulatory, social, economic and technical) with a view to ensuring that radio spectrum is efficiently used.

2.1 Spectrum Policy and Management in Ireland

- 2.3 In Section 2.1.1 of Consultation 18/74, ComReg outlined the role of the Department of Communications, Climate Action and Environment ("DCCA") in relation to the development of policies for the regulation and optimal use of Ireland's radio spectrum.
- 2.4 In Section 2.1.2 of Consultation 18/74, ComReg outlined the functions, objectives, powers and duties that are relevant to ComReg's management of the radio spectrum. It also outlined that one of ComReg's primary spectrum management objective is to ensure the efficient management and use of the radio spectrum, while having regard to relevant government policy statements and international developments.

Views of respondents

- 2.5 Two respondents (ESBN and Microsoft) commented on matters generally relevant to spectrum policy and spectrum management in Ireland.
- 2.6 ESBN submits that ComReg's spectrum management role is well-defined and fit for purpose, and that ComReg executes this function very well. ESBN also encouraged the DCCA to engage with stakeholders to establish its own spectrum strategy to enable all spectrum users to contribute to national policy decisions.
- 2.7 Microsoft expressed support for ComReg's objective of promoting and creating conditions for effective competition in the provision of electronic communications networks ("ECN") and electronic communications services

(“ECS”). Microsoft also submits that ComReg can leverage spectrum management tools, such as spectrum sharing, licence-exempt access, and dynamic spectrum access, to achieve its radio spectrum management objectives.

ComReg’s assessment and position

2.8 ComReg notes and is appreciative of ESBN’s positive comments.

2.9 In relation to Microsoft’s submission regarding spectrum sharing and licence-exempt access, ComReg is of the view that:

- it will continue to facilitate the sharing of spectrum between different uses/users in a manner that improves the efficient use of spectrum, subject to the normal spectrum management and competition considerations; and
- it will continue its practice of issuing all authorisations (licence exemptions and individual licences) on a non-exclusive basis, including, of course, where such an approach in respect of specific spectrum bands is required by law.

2.10 In relation to dynamic spectrum access, ComReg sets out its views on same for TV white space (“TVWS”) operations in section 4.2.3 of this document.

2.2 Spectrum Management

Summary of Consultation 18/74

2.11 In Section 2.2 of Consultation 18/74, ComReg outlined the importance of radio spectrum, including how it is a limited and valuable national resource that permeates all areas of communications. ComReg also outlined how increased demand for radio spectrum requires an effective system of spectrum management to ensure the efficient assignment and subsequent use of scarce frequencies among competing uses and users.

2.2.1 Spectrum Management Process

Summary of Consultation 18/74

2.12 In Section 2.2.1 of Consultation 18/74, ComReg discussed international aspects to spectrum management, the allocation of radio spectrum and the assignment of radio spectrum in Ireland. ComReg also discussed the importance of international planning of radio spectrum and outlined how it:

- a) along with the DCCA, plays an active role in international fora to ensure that decisions relating to the international radio spectrum regulatory

framework accommodate Ireland's specific requirements; and

- b) participates in technical compatibility studies and in the development of technical standards to support more efficient and flexible use of the spectrum.

2.13 Section 2.2.1 also discussed how spectrum should be efficiently used, thereby providing access to a combination of uses and users that maximises economic activity, taking into account other legitimate public policy concerns.

Views of respondents

2.14 ESNB encourages ComReg's continuing work at international fora representing the interests of spectrum users in Ireland. ESNB also believes it is necessary for spectrum users and ComReg to engage regularly on key issues in order for ComReg to be best informed of the interests of industry in Ireland, which could inform representations made by ComReg at such fora.

2.15 Vodafone is of the view that high spectrum prices combined with other high costs are not compatible with the desire to continue the roll-out of new technologies and improved coverage. Maximising state revenues from spectrum pricing risk much greater costs to society if competition in communications markets is undermined and network investment is stifled as a result.

ComReg's assessment and position

International Fora

2.16 ComReg notes ESNB's views, and will continue to play as active a role as it can in international fora to ensure that, as far as possible, decisions and recommendations relating to the international radio spectrum regulatory framework take due account of Ireland's specific requirements.

2.17 ComReg also notes that it regularly engages with different stakeholder groups and interested parties in a number of ways, including bilateral meetings, formal consultations and the publication of proposals. This regular engagement assists ComReg in its work at an international level.

Spectrum fees and investment

2.18 In relation to concerns around spectrum fees, ComReg notes that it does not "*seek to maximise revenue*" and does not have any revenue raising objectives in relation to the assignment of the radio spectrum. Rather, in pursuing its objective to promote competition, ComReg takes all reasonable measures to encourage efficient use and ensure effective management of radio frequencies. In that regard, the spectrum fees referred to by Vodafone are not determined

by ComReg but rather the interaction of bidders themselves in an award process. ComReg refers readers to Chapter 3 of Document 15/140 which discusses this process in detail. In summary:

- When downstream competition is effective, the objective of achieving the greatest overall benefit from spectrum can be achieved by assigning the spectrum to whoever values it the most.
- An auction allows this value and the efficient assignment of spectrum to be established based on information and valuations provided by market players.
- The efficient assignment of spectrum requires winners to pay at least the opportunity cost of spectrum to the losers otherwise the losers would be prepared to outbid the winners.

2.19 Absent such a process, a number of award outcomes including the optimum service provider/s would have to be determined administratively which is subject to large information asymmetries and, in so doing, would also likely lead to the inefficient assignment of the radio spectrum, creating distortions to competition and harm consumers as referred to by Vodafone.

2.20 Finally, the radio spectrum is one of a number of inputs used to deliver the services provided by operators. For example, Vodafone Ireland has operating expenditures of close to €1 billion annually in Ireland of which spectrum fees accounts for a small proportion.⁴

2.2.2 Promotion of effective competition in management of spectrum for ECS and spectrum management tools

Summary of Consultation 18/74

2.21 In Section 2.2.2 of Consultation 18/74, ComReg discussed the promotion of effective competition in its management of spectrum for ECS, and the spectrum management tools available to ComReg. ComReg also outlined that:

- it takes a proactive approach to ensuring the efficient assignment and use of the radio spectrum while promoting effective competition and producing an optimal outcome for society; and
- its spectrum management plans are aligned with a number of goals as reflected in ComReg's ECS Strategy Statement.⁵

⁴ Vodafone Annual Report 2018.

⁵ ComReg Document 17/31 – ComReg's Electronic Communications Strategy Statement 2017-2019 – published 13 April 2017.

2.22 In relation to ComReg's spectrum management plans and actions, ComReg provided information on a number of its work streams and, among other things, noted that:

- a) in June 2018 it issued a preliminary consultation on a proposed multi-band award of spectrum rights in the 700 MHz Duplex, paired 2.1 GHz, 2.3 GHz and 2.6 GHz bands;⁶
- b) studies have been initiated to obtain information to inform future award proposals, including:
 - *"Meeting Consumers' Connectivity Needs"* - a report and accompanying infographic from Frontier Economics Ltd, which provides an overview of the challenges in providing connectivity for consumers in Ireland and outlines actions that can be taken by all stakeholders, including consumers, industry, Government and ComReg, to optimise the levels of connectivity given these challenges;
 - *"Future Mobile Connectivity in Ireland"* - a report from Oxera Consulting LLP, with Real Wireless Ltd, which considers the future mobile connectivity services likely to emerge in Ireland and the estimated costs of providing connectivity to such services at high coverage levels in Ireland; and
 - *"Coverage obligations and spectrum awards"* - a report from DotEcon Ltd, which considers options as to how appropriate coverage and rollout obligations could be included in future spectrum awards.

Views of respondents

2.23 Four respondents (Eir, ESBN, Three and Vodafone) submitted views on issues related to the information presented in section 2.2.2 of Consultation 18/74. These views are presented below under the following topics:

- current level of spectrum assignments for Mobile Fixed Communications Networks ("MFCN") / Wireless Broadband ("WBB") in Ireland; and
- considerations for upcoming spectrum awards.

Current level of spectrum assignments for MFCN/WBB in Ireland

2.24 Vodafone commented on the current level of spectrum assignments in Ireland for MFCN/WBB and, in summary, submits:

⁶ ComReg Document 18/60 – Proposed multi band spectrum award - preliminary consultation on which bands to award – published 29 June 2018.

- that there exists a disparity in “mobile spectrum”⁷ assignments between Ireland, and other EU Member States in which Vodafone operates;
- in particular, there is a delay in assigning the 2.6 GHz band in Ireland and the assignment of the 700 MHz band is happening quicker elsewhere in Europe; and
- a disparity in spectrum assignment drives additional cost in network build, which can in turn lead to higher costs for customers.

Considerations relevant to upcoming spectrum awards

2.25 Four respondents (Eir, ESBN, Three and Vodafone) commented upon considerations relevant to upcoming spectrum awards, which have been grouped under the following topics:

- “start from fresh” when considering upcoming spectrum awards;
- 5G network deployment; and
- coverage and roll-out obligations.

“Start from fresh” when considering upcoming spectrum awards

2.26 Three submits that, while it supports the use of auctions, they are not necessarily suitable in all cases, and that the auction mechanism and rules must be chosen to suit the award in each case. In that connection, Three recommends that, for the next multi-band award, ComReg should “start from fresh” and consider all options for the award mechanism, and that these mechanisms should be examined against the auction objective and consulted upon before the final rules are set.

5G network deployment

2.27 Eir submits that very high-capacity networks (“VHCNs”), such as 5G, will be a key asset for Ireland to compete in the global market, and noted the EC’s ambitious goals in this regard.⁸

⁷ ComReg understands “mobile spectrum” assignments to be spectrum harmonised and assigned for MFCN or WBB.

⁸ Eir indicates the goals set out in the EC’s communications “Towards a Gigabit Society” and “5G for Europe: An Action Plan” which are:

- Early 5G network introduction by 2018, moving towards commercial large scale introduction by the end of 2020 at the latest; and
- Commercially available 5G mobile communications systems in all urban areas and major transport corridors in Europe by 2025

2.28 When designing upcoming spectrum awards, Eir submits that:

- it will be important to take 5G network deployment and building market momentum into account; and
- the focus should not be on raising public revenues, but rather on market outcomes including investment incentives and diffusion rates.

Coverage and roll-out obligations

2.29 Three respondents (Vodafone, Eir and ESNB) provided comments on the consideration of coverage and roll-out obligations in spectrum awards.

2.30 In summary Vodafone submits that:

- while Consultation 18/74 acknowledges the need to be mindful of the needs of Ireland's rural population, the overall focus of said document is largely on the promotion of competition, and that this may steer ComReg towards promoting increased competition in high population areas, while not serving the needs of rural areas;
- a more balanced approach would, in its view, be to recognise that competition should be balanced by the social advantages of ubiquitous services and pricing, and that building coverage in very low populated areas without measured demand may be expensive without a proportional return in benefit for consumers;
- given the strong desire of government to promote rural coverage as a means of supporting rural communities and business, Vodafone would like to see a broader discussion on the further roll-out of mobile services in rural areas, including high site costs, more moderately-priced spectrum rights of use, state subsidies and the easing of planning applications.

2.31 In relation to ComReg's reference in Consultation 18/74 to the publication of a future report on appropriate coverage and roll-out obligations in future spectrum awards:

- Eir submits that it would expect this report to be published by ComReg in the form of a formal consultation, and in this regard, it observed that such a consultation does not appear to be currently included in ComReg's annual plan; and
- ESNB encouraged ComReg to engage with interested parties prior to conducting the report and to refrain from being overly definitive in relation to the setting of coverage and roll-out obligations.

ComReg's assessment

Current level of spectrum assignments for MFCN/WBB in Ireland

2.32 In relation to Vodafone's submission in relation to this issue, ComReg observes the following:

- the EC's 2018 Digital Economy and Society Index ("DESI") report indicates that Ireland is above the EU average in relation to assignment of the spectrum harmonised at EU level for WBB. It states that Ireland has assigned 69.72% (or 760 MHz) of such spectrum which is just above the EU average of 69%⁹;
- the material provided by Vodafone only considers sub-3 GHz spectrum assignments and therefore does not include other spectrum bands that can be used for MFCN/WBB. In particular, spectrum rights in the 3.6 GHz band (which is an important spectrum band for MFCN/WBB and is identified by the RSPG as the primary band for 5G in Europe¹⁰) is omitted from Vodafone's analysis. As Vodafone will be aware, in 2017 Ireland awarded 350 MHz of spectrum in this band in accordance with EU harmonisation measures and, in doing so, readied the band for any future 5G deployments¹¹. It is worth noting that within its Annual Report for 2018, Vodafone states that it has been awarded 105 MHz of 3.6 GHz spectrum in cities, 85 MHz of 3.6 GHz spectrum in regions;¹²
- in relation to the 700 MHz and 2600 MHz bands, ComReg notes that the potential release of these bands is under active consultation by ComReg (see Document 18/60¹³); and
- in relation to the general observation that a disparity in spectrum assignment can drive additional cost in network build, ComReg notes that this would depend on the spectrum bands in question and the extent to which existing networks are already capacity constrained. Vodafone has

⁹ See DESI Report 2018, Telecoms Chapter for Ireland, available at: http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=52264

¹⁰ RSPG Opinion on spectrum related aspects for next-generation wireless systems (5G) |Final|09 November 2016 [Document RSPG16-032 FINAL](#)

¹¹ ComReg [Document 17/38](#) and [Document 17/46](#). Vodafone was a successful bidder in this award and secured a considerable assignment of spectrum across all nine areas for which its licence is now commenced (see ComReg [Document 17/46](#).)

¹² See page 6 of https://www.vodafone.com/content/annualreport/annual_report18/downloads/Vodafone-full-annual-report-2018.pdf

¹³ See Consultation Document [18/60](#). In this document, and to which Vodafone has responded, ComReg sets out its preliminary view that both the 700 MHz and 2600 MHz bands (as well as the paired 2.1 GHz and 2.3 GHz bands) should be included in the next spectrum award. This proposal if adopted would result in the release of an additional 350 MHz of harmonised spectrum for MFCN/WBB and would represent a 46% increase in this spectrum (increasing from 750 MHz to 1100 MHz).

not submitted that it is capacity constrained or provided any evidence that it has built additional base stations to alleviate same. ComReg agrees that consumer demand for data is increasing and this will require additional spectrum resources to prevent capacity constraints arising in the future. In that regard, ComReg is developing award proposals for the release of an additional 350 MHz of both coverage and capacity spectrum in the proposed multi-band award process (as being consulted upon in ComReg Document 18/60).

Considerations for upcoming spectrum awards

5G network deployment & “Start from fresh” when considering upcoming spectrum awards

2.33 In relation to the comments from Eir and Three on the general considerations to take into account for upcoming spectrum awards, ComReg notes that each potential spectrum award is considered on a case-by-case basis having regard to, among other things, ComReg’s statutory functions, objectives and duties, relevant EU measures, international experience, other relevant information and the specifics of the award under consideration. In addition, ComReg notes Eir’s view that raising public revenues should not be a focus for upcoming spectrum awards, and recalls that such a focus is not consistent with ComReg’s functions, objectives and duties in any event.

2.34 As noted above, ComReg has recently issued a consultation relating to a future award of spectrum for MCFN/WBB (Document 18/60). Although Document 18/60 is focused on the potential spectrum bands to include in the award, it also:

- demonstrates that 5G WBB is being considered in relation to this award (see for example section 2.3); and
- outlines that detailed award proposals would form part of the following consultation document, including considerations relating to the appropriate award mechanism.

2.35 Finally, in relation to the EC’s goals for 5G, as referenced by Eir, ComReg notes that:

- licensees in the 3.6 GHz band already have spectrum assignments that are particularly suitable for 5G deployment. As identified previously, the 3.6 GHz band has been identified by the RSPG as the primary pioneer band for 5G in Europe, and Ireland was one of the first countries in Europe to award rights of use in this band in a manner that supports any future 5G deployment; and
- in the future other spectrum bands may become suitable for 5G. This could be as a result of a future spectrum award (e.g. in Document 18/60

where the 700 MHz band is proposed for release – noting that the 700 MHz band has been also identified by the RSPG as a key pioneer band for 5G) or suitable changes to the harmonisation measures for existing frequency bands. In relation to the latter, ComReg observes that CEPT ECC PT1 is currently reviewing the existing ECC Decisions for the 2.1 GHz band (ECC Decision (06)01), the 2.6 GHz band (ECC Decision (05)05) and the 900/1800 MHz bands (ECC Decision (06)13) bands to take account of 5G.

Coverage and rollout obligations

2.36 In relation to coverage and roll out obligations, ComReg notes that:

- each spectrum award, including potential licence conditions such as coverage and/or rollout, is considered on a case-by-case basis, having regard to ComReg’s statutory functions, objectives and duties, relevant information and the specifics of the award under consideration;
- it has recently published the results of three studies which provide advice on different aspects of improving connectivity in Ireland (which were referred to in paragraph 2.35 of Consultation 18/74) (“Connectivity Reports”). The Connectivity Reports will inform ComReg’s development of award proposals for its forthcoming spectrum awards and, in particular, its consideration of appropriate coverage and/or roll-out obligations. Further, it is hoped that the Connectivity Reports will inform interested parties views on the wider connectivity discussion, including the appropriate use of policy or regulatory interventions to secure extensive coverage outcomes;
- The Connectivity Reports, and the accompanying ComReg information notice, are published on ComReg’s website, and briefly identified below:
 - *“Meeting Consumers’ Connectivity Needs”* by Frontier Economics (Document 18/103b)¹⁴ – a report and accompanying infographic from Frontier Economics Ltd, which provides an overview of the challenges in providing connectivity for consumers in Ireland and outlines actions that can be taken by all stakeholders, including consumers, industry, Government and ComReg, to optimise the levels of connectivity given these challenges;
 - *“Future Mobile Connectivity in Ireland”* by Oxera Consulting and Real Wireless (Document 18/103c)¹⁵ - which considers the future mobile connectivity services likely to emerge in Ireland and the

¹⁴ Document 18/103b - <https://www.comreg.ie/publication/meeting-consumers-connectivity-needs/>

¹⁵ Document 18/103c - <https://www.comreg.ie/publication/future-mobile-connectivity-in-ireland/>

estimated costs of providing connectivity to such services at high coverage levels in Ireland;

- *“Coverage obligations and spectrum awards”* by DotEcon (Document 18/103d)¹⁶ - which considers options as to how appropriate coverage and rollout obligations could be included in future spectrum awards; and
- *“Improving connectivity in Ireland¹⁷ – Challenges, solutions and actions”* – ComReg Information Notice (Document 18/103); and
- In Document 18/60, ComReg has indicated that its detailed award proposals, including on coverage and/or rollout, would form part of the following consultation document.

2.37 In light of the above, ComReg observes that:

- the publication of the Connectivity Reports addresses the comments of Eir and ESNB in relation to same; and
- the Connectivity Reports provides information on the general subject matters raised by Vodafone and the ESNB in their submissions to this consultation, namely the policy or regulatory tools available to improving coverage in uneconomic areas and the setting of appropriate coverage and rollout obligations. Relevant information on these matters will be considered by ComReg in its development of award proposals.

2.38 Notwithstanding the above, and noting the comments of Vodafone and ESNB, ComReg adds that it is aware:

- of the wider connectivity context and the work of government and other stakeholder to improve connectivity in Ireland in rural and indoor locations. As explained in Document 18/103b (the “Frontier Report”) all stakeholders (government, ComReg, industry and consumers) have a role in improving connectivity;
- there are a range of government and regulatory tools that can be used to reduce or remove barriers to improving connectivity (see for example the work of the Mobile Phone and Broadband Taskforce¹⁸);
- there can be specific factors relating to particular spectrum bands which influence the setting of appropriate coverage and rollout obligations;

¹⁶ Document 18/103d - <https://www.comreg.ie/publication/coverage-obligations-and-spectrum-awards/>

¹⁷ Document 18/103 - <https://www.comreg.ie/publication/improving-connectivity-in-ireland-challenges-solutions-and-actions/>

¹⁸ <https://www.dcae.gov.ie/en-ie/communications/topics/Broadband/mobile-phone-and-broadband-taskforce/Pages/Mobile-Phone-and-Broadband-Taskforce.aspx>

- an understanding of what the market is likely to deliver in terms of coverage is an important factor in the setting of appropriate coverage and rollout obligations. See Document 18/103c (the “Oxera Report”) for further details; and
- there are policy or regulatory interventions that could be used to secure more extensive coverage outcomes than would result from marketplace competition alone. Document 18/103d (the “DotEcon Report”) adds that these would need to be carefully designed, and based on an assessment of the costs and benefits to society of the additional coverage sought.

Chapter 3

3 Factors informing ComReg's proposed work plan for 2019-2021

3.1 In Chapter 4 of Consultation 18/74, ComReg discussed various factors which have informed its draft radio spectrum work plan for 2019 to 2021, including:

- International harmonisation of radio spectrum;
- World Radiocommunication Conference of 2019;
- European Commission harmonisation decisions;
- End-user demand and for mobile broadband in particular;
- Technology changes and advancements (service specific); and
- The expiry of existing licences in the near future (e.g. within the next 5 years).

3.1 International harmonisation of radio spectrum

Summary of Consultation 18/74

3.2 Section 4.1 of Consultation 18/74 discussed the key role that international harmonisation plays in determining the demand for and supply of radio spectrum as well as the benefits for countries with a small population such as Ireland.¹⁹

Views of respondents

3.3 Two respondents (Carlson and the IRTS) submitted views on this topic as follows:

- Carlson welcomes ComReg's engagement with international harmonisation of radio spectrum and encourages this policy as it is an important contributor to radio spectrum in the internal market; and
- IRTS believes that Recommendation 34²⁰ from WRC-12 is relevant to the international harmonisation of spectrum because it recommends, among other things, that future ITU world radiocommunication conferences should:

¹⁹ In Ireland, harmonised spectrum bands support a wide range of services, include those provided by mobile operators.

²⁰ https://www.itu.int/dms_pub/itu-r/opb/act/R-ACT-WRC.9-2012-PDF-E.pdf

- wherever possible allocate frequency bands to the most broadly defined services with a view to providing the maximum flexibility to administrations in spectrum use, taking into account safety, technical, operational, economic and other relevant factors; and
- wherever possible allocate frequency bands on a worldwide basis (aligned services, categories of service and frequency band limits) taking into account safety, technical, operational, economic and other relevant factors.

ComReg's assessment

- 3.4 In relation to the benefits of harmonised spectrum bands, ComReg observes that spectrum bands subject to harmonised measures are typically the ones which deliver the most benefits to end-users, given factors such as increased economies of scale and equipment availability. ComReg notes that the requirement for harmonisation is not an absolute rule because, for example, there may be local circumstances which support the release of non-harmonised spectrum rights, or a band may already benefit from economies of scale and equipment availability because of equivalent use of a band outside Europe.

3.1.1 The World Radiocommunication Conference of 2019

- 3.5 In Section 4.1.1 of Consultation 18/74, ComReg detailed the Irish preparations for World Radiocommunications Conference 2019 ("WRC-19") and ComReg's assistance to the DCCA to meet objectives and goals that will be established in the national preparatory process.

Views of respondents

- 3.6 Three respondents (ESBN, IRTS and Ruckus) raised the following matters in respect of the position that Ireland will adopt at WRC-19:
1. ESBN submits that, in preparing Ireland's position for WRC-19, a form of public consultation should be held. This consultation could be in the form of a formal written consultation or more informal workshops and this would provide a process for spectrum users to contribute to the overall strategy Ireland takes, noting that the NRA in the UK conducts such a process;
 2. the participation of industry/sector representatives in the national delegation (IRTS);
 3. that ComReg has not detailed any position in respect of the agenda items that will be dealt with at WRC-19 (Ruckus, IRTS);
 4. the view that utilities should be recognised as spectrum users (ESBN);

5. limited attendance at the CEPT project teams that assist in forming the CEPT Common Positions for WRC agenda items, leading to the neutral stance been taken by smaller administrations (IRTS); and
6. the lack of priority given to Amateur Radio Services in ComReg's assessment of major items of interest to Ireland at WRC-19 (IRTS).

ComReg's assessment and position

3.7 In relation to **bullet points 1, 2 and 3**:

- ComReg refers to paragraph 4.9 of Consultation 18/74 and reiterates that the national preparations and final decision on all matters relating to the ITU, including WRCs, rests with the Government of Ireland and not ComReg;
- In the area of radio spectrum management, the management of the national preparatory group, the composition of that group, attendance at meetings and processes to be followed are currently the responsibility of the DCCAIE. ComReg is a key contributor to the national preparations as are other regulatory and sector bodies, such as the Irish Aviation Authority, the Irish Meteorological Service and the Defence Forces, to name a few; and
- ComReg will bring these views of respondents to the attention of the national preparatory group that will deal with Ireland's input to WRC-19.

3.8 In relation to **bullet point 4**, ComReg accepts that in the international sphere utilities are not individually recognised in the same manner as, for example, the maritime and aviation sectors are recognised. However, ComReg notes that utilities are recognised in the same manner as all other industry players are recognised as spectrum users.

3.9 In relation to **bullet point 5**, given that ComReg has finite and limited resources, operational activities in respect of licensing, compliance and spectrum awards, for example, are required to be prioritised over international activities.

3.10 In relation to **bullet point 6**, ComReg recalls that at WRC-15 40 topics were covered by the agenda and 678 documents containing 2888 proposals were tabled. With a similar scale expected for WRC-19, and noting the small delegation expected to be fielded by Ireland, interested parties will appreciate that only the highest priority items can be given the necessary attention. For this reason, the Radio Amateurs did not appear on ComReg's list of expected major items of interest. Nationally, the requirements of Radio Amateurs will continue to be taken into account and balanced against the needs of all spectrum users in Ireland.

3.1.1.1 Specific WRC-19 Agenda Items

3.11 In this section ComReg addresses respondents' input on specific WRC-19 agenda items.

WRC-19 Agenda Item 1.16 - Wireless Access Services / Radio LANs in the bands between 5 150 - 5 925 MHz

Views of respondents

3.12 In respect of the band 5150-5250 MHz, Ruckus advocates the removal of the indoor-only restriction (which protect Mobile Satellite Service (MSS) links operational in this band in Europe) on the basis of:

- mitigation techniques such as antenna elevation angle restriction;
- registration/notification of deployments greater than 1000 access points; and
- keeping the power level at 200 mW EIRP (as currently allowed for indoor usage in Europe) instead of alignment with the power levels authorised in North America (1 watt EIRP).

3.13 In respect of the band 5725-5850 MHz, Ruckus considers that this band should be opened to accommodate Wi-Fi type operation for reasons including that:

- while Ofcom in the UK has recently started to allow indoor operation at up to 200 mW, Ruckus suggests that increased power levels of 1 Watt should be allowed;
- the use of dynamic frequency selection (DFS) has shown that sharing is possible with the radiodetermination service (which have primary allocation in this band), especially as the radars operating in this sub-band also operate below 5725 MHz;
- the broadband fixed wireless access (BFWA) systems operating in this band are also required to implement DFS, thus further demonstrating the ability of DFS to mitigate against interference to the radiodetermination service; and
- in the Irish context, there was the issue of the limited use of this band by radars within the State.

ComReg's assessment

3.14 Regarding the 5150-5250 MHz band, ComReg notes that the current position within the CEPT (as set out in the Conference Preparatory Group's Draft CEPT

Brief on WRC-19 Agenda item 1.16²¹), is that an outdoor relaxation to Wireless Access Systems/Radio Local Area Networks (“WAS/RLAN”) would affect the operation of MSS feeder links, aeronautical radionavigation and aeronautical telemetry systems. However, CEPT continues to study usage restrictions (e.g. in-vehicle use) combined with appropriate mitigation techniques to achieve co-existence with incumbent services to enable outdoor WAS/RLAN use in this band.

- 3.15 Regarding the 5725-5850 MHz band, ComReg notes that the current position²¹ within the CEPT, is that the CEPT would support a new mobile allocation to accommodate WAS/RLANs use if sharing and compatibility studies can demonstrate the effectiveness of any new proposed interference mitigation techniques to ensure the protection of radars, the fixed service and fixed satellite services (“FSS”) space station receivers. However, as current studies have shown difficulties in achieving co-existence with other incumbent services without imposing any additional constraints on existing services, such as FSS (space station receivers) and existing applications under the mobile service such as intelligent transport systems (“ITS”) (including urban rail), the CEPT is supporting no change to the International Radio Regulations in this band.
- 3.16 Furthermore, at the time of drafting this response, proposals have been made to the relevant CEPT project team pointing out that allowing RLAN usage at the higher level of power will not cause more interference to frequency hopping-type radars than other devices already permitted in the band such as transport and traffic telematics (“TTT”), BFWA and wireless Industrial Applications (“WIA”).
- 3.17 With regard to Ruckus’ comment regarding the limited use of this band by radars within the Irish Republic, ComReg notes that Met Éireann operates two C-band type radars at Shannon and Dublin Airports, and that EC Decision 2005/513/EC²² states that *“there is an essential need for the operation of military and meteorological radars in the bands between 5 250 and 5 850 MHz which requires specific protection against harmful interference by WAS/RLAN”*.
- 3.18 Finally, ComReg notes that the use of wideband data transmission systems (including WAS/RLAN) in Ireland is already permitted at 2W EIRP requiring only

²¹ Draft Brief on WRC-19 Agenda item 1.16 – https://cept.org/Documents/cpg/44872/cpg-18-043-annex-iv-16_draft-cept-brief-on-ai-116 - 29th June 2018.

²² Commission Decision of 11 July 2005 on the harmonised use of radio spectrum in the 5 GHz frequency band for the implementation of wireless access systems including radio local area networks (WAS/RLANs): <https://www.ecodocdb.dk/download/d5507b80-0125/2005513EC.PDF>

registration²³ – these details are set out in Table 3 of ComReg Document 02/71R11.

3.19 Given the above, ComReg will continue to monitor the work on this WRC-19 agenda item and will be guided by the outcome of WRC-19 prior to making any changes to the technical conditions for the operation of WAS/RLANs in the bands between 5150 – 5925 MHz.

WRC-19 Agenda Items raised by the IRTS

3.20 In its submission, the IRTS comments on WRC-19 items of interest (agenda items 1.15, 1.16 and 10) as well as directly seeking support from ComReg, as part of the national preparatory group for WRC-19, on the following WRC-19 agenda items:

- Agenda item 1.1 – consider allocating 50 – 54 MHz to the amateur service in region 1;
- Agenda item 1.13 – consider the identification of frequency bands for the future development of International (IMT); and
- Agenda item 9.1.6 – urgent studies concerning wireless power transmission (WPT) for electric vehicles and the impact of WPT for electric vehicles on radiocommunications services.

3.21 Each of these items is under consideration in the CEPT and ComReg will bring each of these inputs to the national preparatory body for its consideration.

3.2 European Commission harmonisation decisions

3.22 Section 4.2 provided an overview of existing and forthcoming EC harmonisation decisions.

3.2.1 Existing EC harmonisation decisions

Summary of Consultation 18/74

3.23 In Section 4.2.1, ComReg identified that a number of harmonising decisions had been implemented in relation to M2M cellular IoT technologies, the 700 MHz band Duplex Gap and the 1.4 GHz Band.

3.24 ComReg also observed that there would not appear to be impediments to Eir, Three and Vodafone deploying the M2M technologies defined in ECC Report 266²⁴ in the 800 MHz band. In relation to the 900 MHz and 1800 MHz bands,

²³ <https://www.comreg.ie/industry/licensing/5-8-ghz-registration/>

²⁴ <https://www.ecodocdb.dk/download/61d8e0fa-8bcf/ECCRep266.pdf>

ComReg identified the implementation of Decision (EU) 2018/637 as a work plan item for the 2019-2021 strategy period.

3.25 ComReg also stated its intention to address the issue of engaging with stakeholders with a view to obtaining greater clarity on national policy on the use of the 700 MHz Duplex Gap in Ireland.

3.26 ComReg also considered it appropriate to include a work plan item for 2019-2021 to monitor developments in the 1.4 GHz Band and to consider the current and future use of the band, subject to the ongoing ComReg consultation (Document 18/60)²⁵.

Views of respondents

3.27 In relation to these matters, ESNB submits that:

- the 700 MHz Duplex Gap should be made available for PPDR and that DCCAIE should enact a policy decision with regards to this spectrum if necessary;
- neither the 1.4 GHz Centre Band nor 1.4 GHz Extension Bands should be included in the proposed award (ComReg Consultation 18/60); and
- ComReg should consider the release of 1.4 GHz Centre Band in the medium term, and that the 1.4 GHz Extension Bands not be changed from current usage in the long term.

ComReg's assessment and position

3.28 ComReg notes ESNB's view regarding the 700 MHz Duplex Gap and, as proposed in Consultation 18/74, ComReg will engage with the relevant stakeholders with a view to obtaining greater clarity on national policy on the use of the 700 MHz Duplex Gap in Ireland.

3.29 ComReg also notes ESNB's views in relation to the 1.4 GHz Band (both the 1.4 GHz Centre Band and the 1.4 GHz Extension Bands). As ESNB will be aware, ComReg's preliminary view in Consultation 18/60 is that the 1.4 GHz Band should not be included in the proposed award. ComReg will, however, continue to monitor developments in the 1.4 GHz Band for MFCN and consider the current and future use of the band in Ireland.

²⁵ See section 3.2 of ComReg Document 18/60 – Proposed Multi Band Spectrum Award: Preliminary consultation on which spectrum bands to award.

3.2.2 Forthcoming EC Harmonisation Decisions

Summary of Consultation 18/74

3.30 Section 4.2.2 discussed forthcoming implementation decisions in relation to the 3.6 GHz and 26 GHz bands to support the introduction of next generation wireless systems in those bands. ComReg also observed that the RSC is currently drafting a mandate to CEPT to develop harmonised technical conditions for the 900 MHz, 1800 MHz, paired terrestrial 2 GHz and 2.6 GHz bands suitable for next-generation (5G) terrestrial wireless systems. In addition, ComReg stated that it had made provision for the implementation of forthcoming decisions in its draft work plan for the forthcoming strategy period.

Views of respondents

3.31 Three submits that 1.2 GHz of spectrum within the 26 GHz band should be targeted for release for future 5G services and, to achieve this, Three believes that individual licensed fixed links in the 26.285 – 26.453 GHz frequency range should be relocated to a different part of the band or to a different band. Three also submits that ComReg should begin the process to remove the fixed links that are currently licensed in the 26.285 – 26.453 GHz frequency range.

ComReg's assessment and position

3.32 ComReg notes Three's views and would highlight the following matters:

- first, that the RSPG has recommended that Member States make a sufficiently large portion (e.g. 1 GHz) of the 26 GHz band available for 5G by 2020;²⁶
- a large portion of contiguous spectrum (1.075 GHz) is current unused in the 24.25-27.5 GHz frequency band;
- Article 4 of the current draft of the implementing decision for the 26 GHz band provides that "*Member States shall ensure that the systems referred to in Article 1 give appropriate protection to terrestrial fixed wireless links within the 24.25-27.5 GHz frequency band, to the extent that co-existence with such terrestrial fixed wireless links cannot be ensured through managed shared spectrum use*";
- CEPT Report 68²⁷ provides technical conditions for the co-existence of terrestrial WBB ECS (including 5G) with existing satellite services and

²⁶ RSPG18-005 final of 30 January 2018

²⁷ CEPT Report 68 Report B from CEPT to the European Commission in response to Mandate "to develop harmonised technical conditions for spectrum use in support of the introduction of next-generation (5G) terrestrial wireless systems in the Union. Review of the harmonised technical conditions applicable to the 24.25-27.5 GHz ('26 GHz') frequency band.

fixed links within the 26 GHz band as well as with services in adjacent bands; and

- there are 270 individual radio link licences in the 25.277-25.445 MHz/26.285-26.453 MHz frequency range to meet the front-haul and backhaul requirements for large and small operators.

3.33 In light of the above, ComReg does not agree that a process should be commenced to remove the fixed links that are currently licensed in the 26.285 – 26.453 GHz frequency range. That being said, ComReg intends to continue to monitor use of the 24.25-27.5 GHz band, including the evolution of co-existence between the services currently using same and potential future services.

3.3 End user demand for mobile data

Summary of Consultation 18/74

3.34 Section 4.3 discussed the growth of mobile data traffic in Ireland and highlighted that further increases in the demand for mobile data is expected, with an average annual growth of 32% predicted to 2022²⁸. ComReg also observed that the increase in the demand for mobile data is driven by a number of factors, including:

- on the demand-side, the growing use of mobile devices for audio-visual content and sending data-rich content via social networks; and
- on the supply-side, increased availability of 4G services and sophisticated devices entering the market along with the declining cost of data plans (including “all you can eat” plans) continue to impact consumption patterns.

Views of respondents

3.35 ESNB submits that:

- small cell solutions will be needed to provide localised capacity for users which may not be considered by MNOs as part of their future network investments; and
- it is keen to work with ComReg to ensure that the needs of other users / sectors (e.g. utilities) are not overlooked when establishing spectrum release mechanisms.

²⁸ Document 18/35: https://www.comreg.ie/?dln_download=mobile-data-traffic-forecast-in-ireland

ComReg's assessment

3.36 ComReg notes ESBN's views and recalls that, when considering how to appropriately address end-user demand for mobile data, ComReg employs a number of approaches including:

- its Spectrum Management Strategy consultation - which allows ComReg to conduct a strategic review of work plan items for spectrum bands in order to identify appropriate priorities;
- public consultations on the potential award of band(s) – which allow ComReg to gather and consider relevant information;²⁹ and
- having regard to international developments and its participation in international fora (such as the RSPG).

3.37 ComReg therefore encourages all interested parties to respond to its consultations, which assists its considerations of the demand- and supply-side factors impacting mobile data usage.

3.4 Technology changes and advancements

Summary of Consultation 18/74

3.38 Section 4.4 discussed how technology changes and advancements³⁰ (which can take many forms including the use of improved modulation or sharing techniques, and the ability for one service to use multiple spectrum bands at the same time using carrier aggregation) affect both the demand for, and supply of, radio spectrum. ComReg also observed how technology changes and advancements have had an impact in areas, such as M2M and IoT, spectrum for 5G, and the fixed link frequency bands.

ComReg's assessment

3.39 No comments were received regarding section 4.4. Nevertheless, ComReg would add that:

²⁹ Determining whether to include certain band(s) in an award process will typically include a consideration factors including: availability of spectrum; degree of harmonisation; technical constraints on the use of the spectrum; third party assessments of spectrum use (e.g. RSPG Opinions); type of potential use/users; assessment of existing demand internationally; and prorogation characteristics. ComReg consultations also typically assess other factors which could influence demand such as equipment availability, spectrum packaging, licence duration, licence conditions, award format, caps and fees.

³⁰ Technology changes happen on a less frequent basis than technology advancements. For example, analogue terrestrial television technology operated for over 50 years in Ireland before this technology was replaced by digital terrestrial television technology.

- it will continue to monitor technology changes and advancements that affect both the demand for and supply of radio spectrum;
- an example of such changes or advancements could be in the area of internet of agriculture (“IoA”). For example, a 2016 report by TEAGASC³¹ outlines the role of IoA technologies, alongside other technological advances such as genomics, in boosting Ireland’s agricultural success.³² With the advent of 5G, additional capabilities might be enabled such as autonomous farm vehicles and AI-enabled crop planning and management; and
- where such changes can lead to a more efficient use of the radio spectrum and result in faster or higher quality services, ComReg will consider conducting consultations, as appropriate, to facilitate such technology changes and advancements.

3.4.1 Technology developments in the fixed link frequency bands

Summary of Consultation 18/74

3.40 Section 4.4.3 discussed how mobile networks are expected to achieve data throughputs in the region of gigabit-per-second (“Gbit/s”) to end-users in the future, and how this can have a significant bearing on backhaul capacity requirements in both existing and new fixed link microwave bands.

3.41 ComReg observed that due to technology evolution and availability of wide channel bandwidths at higher frequencies, the use of frequency bands in the V-Band (57 – 64 GHz), E-Band (71 – 76 GHz and 81 – 86 GHz), W-band (92-114.25 GHz) and D-Band (130 – 174.8GHz) appear to be of interest for the future needs of backhaul networks as they are promising in term of providing multi-Gbit/s channels.³³

³¹ <https://www.teagasc.ie/>

³² <https://www.teagasc.ie/media/website/publications/2016/Teagasc-Technology-Foresight-Report-2035.pdf>

³³ There is some confusion about microwave frequency band letter definitions, since there is no unique view in literature and the satellite industry and fixed-link industry designators do not align. Each letter definition is widely variable depending on the standardisation / development body that first used the designation.

For the purpose of fixed links:

- the V-band is characterized by a continuous block of 9 GHz of spectrum between 57 and 66 GHz (however, the lower portion spanning from 48.5 GHz to 57 GHz is generally included in the V- band definition). In this band oxygen absorption can aid link designers in providing additional resistance to radio interference as well as enhanced frequency reuse;

Views of respondents

3.42 Two respondents (Microsoft and Ruckus) provided the following views in relation to these matters:

- Microsoft supports ComReg's consideration of a review of the licensing regime for the V-band (57-64 GHz) and notes the work being done by CEPT PT SE19 to assess the feasibility of establishing a common set of technical conditions under which fixed service applications and other outdoor envisaged uses/applications may coexist within the 57-66 GHz range³⁴;
- Microsoft submits that a similar assessment could be considered for the 64-71 GHz band to provide technology-neutral support for 5G services; and
- Ruckus believes that a licence-exempt regime would be the most appropriate to facilitate further development of the V-band because it would enable the broadest possible usage.

ComReg's assessment

3.43 ComReg notes the above views and intends on implementing, if required, an appropriate licensing regime to facilitate the future use of the V-band. ComReg will also continue to monitor the SE19's work programme and will consider its outputs regarding the V-Band.

3.44 Regarding the E-Band (71 – 76 GHz and 81 – 86 GHz), ComReg intends to amend its Radio Links Guidelines once the revised ETSI standards are in place for the E-Band, which would allow for the accommodation of longer links with lower modulation and availability below 99.95%.

3.45 ComReg also notes that ETSI is currently preparing technical material for possible deployment of high capacity links in 130 GHz to 174.8 GHz range. ComReg therefore intends to amend the Radio Links Guidelines once the revised ETSI standards are in place.

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- The E-Band (which covers 71 - 76 GHz and 81-86 GHz) enables Gbit/s data rates given the large amount of available spectrum (10 GHz) without any oxygen absorption, thus allowing longer distances compared to the V-Band.
 - The W-band (92-114.25 GHz) has been indicated as the possible complement for the E-Band when the latter reaches saturation; and
 - The D-band (130 – 174.8GHz) has been suggested as a possible additional band to the V-band.

³⁴ <https://eccwp.cept.org/default.aspx?groupid=45>

3.5 Licences expiring in the near future

Summary of Consultation 18/74

3.46 Section 4.5 discussed that where existing spectrum rights of use are due to expire within the near future (e.g. the next five years) ComReg endeavours to set out its proposals on the future use of such bands significantly in advance of expiry including, where appropriate, defining and carrying-out an assignment process for same.

Views of respondents

3.47 ESNB submits that ComReg should make a determination on the future of the national telemetry licensing regime soonest.

ComReg's assessment

3.48 ComReg intends to continue monitoring the national telemetry licensing regime as part of the 2022 – 2024 strategy period, and will consider conducting consultations, as appropriate, to facilitate any technology changes and advancements.

Chapter 4

4 Radio Spectrum work plan for 2019 - 2021

4.1 In chapter 5 of Consultation 18/74, ComReg outlined its draft spectrum management work plan for the period 2019–2021 for specific radiocommunication services, whilst observing the need for appropriate prioritisation of same

4.1 Appropriate prioritisation of spectrum work activities

4.2 In section 5.1, ComReg noted that its spectrum workload is driven by a wide range of factors and, while it strives to meet the spectrum demands of all users, inevitably this is not possible given, among other things, often multiple competing demands for the same spectrum resource and practical considerations, such as resourcing. To manage its workload in a pragmatic manner, ComReg outlined a number of relevant considerations that affected its prioritisation, including that spectrum bands which are subject to harmonisation measures are typically the ones which will deliver the most benefits to end-users, given factors such as increased economies of scale and equipment availability.

4.2 ComReg's spectrum work plan 2019 to 2021

4.3 In section 5.2, ComReg outlined its indicative spectrum work plan for the period 2019 to 2021, which covered areas such as: MFCN; Broadcasting Services; Terrestrial Fixed Services; Licence Exempt Short Range Devices; Satellite Services; Business Radio Services; Radio Amateur Services; Aeronautical, Maritime and Scientific Services; and Defence Forces Use of Spectrum.

4.2.1 ComReg's spectrum management function (i.e. programmatic work)

Summary of Consultation 18/74

4.4 In Section 5.2.1, ComReg out its work plan proposals for its spectrum management function, including its licensing and compliance activities.

Views of respondents

4.5 Two respondents (Microsoft and Three) provided views regarding ComReg's programmatic work.

- 4.6 Microsoft encourages ComReg to embrace and utilise strengthened powers under the European Electronic Communications Code (“EECC”) to make greater use of spectrum sharing in the forthcoming strategy period.
- 4.7 Three states that it has been a supporter of ComReg’s Test and Trial licensing process and considers that when new services or technologies have been tested and are ready for market deployment, ComReg can play a vital role in its success or failure. Three also submits that new technologies cannot only be considered to be included as part of ComReg’s work plan when ComReg consults on its radio spectrum management strategy statement, there needs to be other opportunities too.
- 4.8 Three notes that it proposed in 2015 that ComReg should allow the deployment of LoRa technology in its 900MHz spectrum rights licensed to Three under its Liberalised Use Licence. While Three received assistance from ComReg in this matter, the fact that it was not identified on ComReg’s work plan for the period 2016 – 2018 meant that it was difficult to have the matter prioritised. Three also notes that it is still waiting for ComReg to consult on the possibility to allow deployment of LoRa technology in the 900MHz band.
- 4.9 Three also believes ComReg should deploy adequate resources to investigate and review cases of interference caused by illegal radio equipment, as Three itself is limited in the steps it can take to eliminate interference. Three suggests ComReg should engage with operators and provide feedback when cases have been closed, as this would help operators to recognise future sources of interference and would help speed up the process of eliminating the cause of interference.

ComReg’s assessment

- 4.10 In relation to Microsoft’s point regarding spectrum sharing, ComReg refers to section 2.9 of this document.
- 4.11 In relation to Three’s submissions, ComReg would firstly highlight that it consults on its radio spectrum management strategy statement every 2 years to ensure that it can appropriately plan and prioritise work items for the forthcoming period. In addition, ComReg would stress that that its programmatic work is subject to resourcing and, therefore, some work items cannot be addressed during specific periods. In relation to Three’s request to consult on the possibility of deploying LoRa technology in the 900MHz band, ComReg intends to conduct a consultation on this matter during the period 2019 – 2021.

4.12 While ComReg notes and agrees with Three's view as to the importance of its role in terms of interference investigation and proactive compliance activities, it also observes that:

- it has limited resources and, accordingly, is required to appropriately prioritise its workload;
- historically, circa 20% of all cases of interference experienced by mobile operators arose as a result of self-interference. This is wasteful of limited resources and so ComReg urges all spectrum users to be proactive in conducting an initial analysis of the interference before contacting ComReg;
- while illegal mobile phone boosters are a common source of radio interference to mobile network operators, ComReg's recent decision to permit the use of certain mobile phone repeaters in Ireland³⁵ should reduce the demand for illegal boosters and consequently the number of cases of interference going forward. ComReg is also taking proactive steps to inform the public on the use of legal phone repeaters.^{36 37}

4.13 In relation to Three's suggestion that ComReg should deploy adequate resources to investigate cases of interference, ComReg notes that in 2017 it outsourced Class 3 and 4 interference cases, via competitive tender, to Butler Technologies. This arrangement allows ComReg to concentrate its limited resources on matters of highest priority, being those with significant levels of interference and impact, and on proactive tasks such as market surveillance and radio spectrum monitoring. These new arrangements have had a significant positive impact on ComReg's ability to respond to interference complaints.

4.14 With regard to suggestions that ComReg provide regular briefings or updates on its Spectrum Compliance activities, ComReg will continue to positively engage with all stakeholders via the publication of its Spectrum Intelligence & Investigations Annual Report³⁸ as well as through bi-lateral meetings where appropriate. Notwithstanding, all cases investigated by the Spectrum Intelligence & Investigations Unit have the potential to come before the courts and, in this context, ComReg is limited in its ability to discuss such matters.

³⁵ <https://www.comreg.ie/publication/mobile-phone-repeaters-response-to-consultation-and-final-decision/>

³⁶ <https://www.comreg.ie/mobile-phone-repeaters-faqs/>

³⁷ <https://www.siliconrepublic.com/comms/national-broadband-plan-ballinasloe>

³⁸ <https://www.comreg.ie/publication/spectrum-intelligence-investigations-annual-report-2017-2018/>

4.15 Finally, ComReg notes that it has previously assisted in the training of mobile network operators' staff on recognising and resolving interference issues, and remains happy to assist subject to its resourcing.

4.2.2 MFCN

Summary of Consultation 18/74

4.16 Section 5.2.2 of Consultation 18/74 identified the work plan items for MFCN for the period 2019 – 2021 including to:

- develop and finalise award proposals for the release of spectrum in the proposed multi-band award process (as being consulted upon in ComReg Document 18/60), and implement same;
- monitor developments in the 1.4 GHz band for MFCN and consider the current and future use of the band in Ireland; and
- continue to examine the overall effect of different materials on all elements of the construction of buildings and consider how to best establish the aggregate effect of building materials on signal propagation, including via collaboration with other research bodies.

Views of respondents

4.17 Two respondents (ESBN and Ruckus) submitted the following views in relation to MFCN:

- ESBN encourages ComReg to exclude the 1.4 GHz band from the Multi-Band award, whilst in the long term ensure that the 1.4 GHz Extension Bands continue to be available for the reasons outlined in ESBN's response to ComReg Consultation 18/60.
- In the event that ComReg is to consider releasing the 1.4 GHz Extension Bands, ESBN is of the view that as much notice (at least 5 years) is provided to fixed link users of the spectrum band. Further, and in line with other spectrum users (e.g. TV broadcast), ESBN considers that if ComReg is to move fixed link users from this band, a compensation fund should be made available to existing licences and a substitutable spectrum band made available for deployment.
- Ruckus believes there is a need for an alternative solution for in-building, campus and industrial site usage. It also believes that a suitable solution would be to deploy a network of MNO-agnostic small cells in the 3.4 – 3.6 GHz band and encourages ComReg to explore the possibility of making spectrum available in this band accessible either on a local licence or dynamic access basis.

ComReg's assessment

- 4.18 In relation to ESNB's views regarding the 1.4 GHz Extension Bands, ComReg notes that the 1.4 GHz band is being considered as part of an ongoing consultation (Document 18/60).³⁹ As stated earlier, ComReg will monitor developments and consider the current and future use of the band in the event that it is not ultimately included in the proposed award.
- 4.19 In relation to Ruckus' view for the need for an alternative solution for in-building, campus and industrial site usage, ComReg firstly notes that it has previously acknowledged that Wi-Fi networks are an effective mechanism by which to improve indoor mobile phone reception. ComReg also notes the following:
- ComReg published a technical report (Document 18/73)⁴⁰ that presents the measurement results of tests carried out on the effect of building materials on indoor mobile performance. These tests found that the use of some modern building materials, in particular those containing metals such as foil-backed thermal insulation or windows with aluminium or metallic frames, can have a significant detrimental effect on the propagation of radio waves as they penetrate a building. The losses suffered by radio waves penetrating these materials is in the order of 20db up to 60 dB. That is, a reduction in signal strength of 100 up to 1,000,000 times. Further, while many consumers currently receive some level of mobile signal while indoors, this may not be the case going forward as building and insulating materials used become even more energy efficient; and
 - A further problem associated with providing in-building coverage is not so much the increase in the average path loss, but the great increase in the variability of path loss that must be accounted for. In particular, mobile operators and regulators are not able to specify one loss parameter that could guarantee indoor coverage. Therefore, depending on the chosen materials, type and age of the building and the frequency of the radio wave, the resulting total attenuation could easily be sufficient to make it impossible for mobile handsets to operate effectively. These constraints also make accurate indoor coverage predictions problematic as there could be significant room to room variation within the same building itself.
- 4.20 ComReg therefore agrees that there is a need for an alternative solution for in-building coverage. ComReg had identified in its Radio spectrum

³⁹ See section 3.2 of ComReg Document 18/60 – Proposed Multi Band Spectrum Award: Preliminary consultation on which spectrum bands to award.

⁴⁰ Document 18/73 - <https://www.comreg.ie/publication/the-effect-of-building-materials-on-indoor-mobile-performance/>

management strategy statement (Document 16/50)⁴¹ a number of potential means of addressing the mobile consumer experience, two of which focus on the indoor reception issue:

- first, the use of mobile repeaters to address indoor reception issues, noting that such repeaters would have to be CE-certified and for which ComReg has recently taken steps to make such devices licence-exempt to use the cellular radio frequencies (see Document 18/58 at www.comreg.ie); and
- The ability to use fixed broadband connections (e.g. native Wi-Fi calling) for the provision of mobile services (both voice and data) which is likely to be the most effective mechanism to improve indoor reception issues. Eir is the only Irish mobile network operator (MNO) to have rolled out native Wi-Fi calling on its network to date and ComReg is actively encouraging all mobile operators to follow suit.

4.21 Finally, in relation to Ruckus' view regarding the 3.4 – 3.8 GHz band, ComReg notes that the Radio Spectrum Committee has developed a draft implementing decision to amend Decision 2008/411/EC to ensure that the technical conditions, as set out in the annex to that decision, enable the roll out of 5G technology in the 3.6 GHz band. While ComReg cannot currently make spectrum in this band accessible in the manner suggested by Ruckus as spectrum rights in this band were assigned in 2017, ComReg notes that some or all of a right of use granted under a 3.6 GHz Band Liberalised Use Licence can be leased by the Licensee to another party for a period less than the entire remaining duration of the right of use.⁴²

4.2.3 Broadcasting Services

Summary of Consultation 18/74

4.22 In Section 5.2.3 of Consultation 18/74, ComReg identified the proposed work plan items for the broadcasting service for the period 2019 – 2021.

Views of respondents

4.23 Three respondents (Microsoft, Carlson and Nominet) provided views as follows:

- Microsoft submits that ComReg should initiate a process for licence-exempt TV white space (TVWS) operations in the VHF/UHF TV band on a non-interference and non-protection basis because this would allow for

⁴¹ Document 16/50 - <https://www.comreg.ie/publication/radio-spectrum-management-strategy-2016-2018/>

⁴² S.I. No. 532/2016 - Wireless Telegraphy (3.6 GHz Band Licences) Regulations 2016: <http://www.irishstatutebook.ie/eli/2016/si/532/made/en/print> .

secondary and opportunistic access of this band for broadband services;
and

- Carlson and Nominet submit that the 700 MHz band could be used for TVWS to enhance rural broadband connectivity by enabling currently poorly connected communities to access high speed broadband, thereby creating significant social and economic benefits.

ComReg's assessment

- 4.24 By way of background, the 470 – 790 MHz band in Ireland is assigned to the broadcasting service for the provision of DTT. In most locations, only a certain number of channels in the 470-790 MHz band are used for the delivery of DTT services. Accordingly, and subject to certain conditions at a given geographical location, the unused channels (i.e. TVWS) could be used by lower-power devices. In that regard, ComReg recalls that the interleaved spectrum within 470 - 790 MHz is currently available for temporary assignment for Programme Making and Special Events.⁴³
- 4.25 In relation to white space devices (“WSDs”), for these to operate efficiently they require the assistance of a dynamic white space database (“WSDB”) - which holds information regarding the location and technical characteristics of WSDs, incumbent use of the spectrum, and calculates what channels and power levels are available for use by WSDs at any particular location.
- 4.26 In 2015, the ECC published ECC Report 236 - which drew on experience from the US and UK TVWS pilots - in order to set out the various issues that needed to be considered by administrations wishing to implement TVWS regulations. The following are some of the key observations from that report:
- not enough TVWS is available in locations when/where it is needed – TVWS may become congested because several WSDs are trying to access the resources at the same location;
 - availability of TVWS cannot be relied upon – there is the possibility that a frequency channel that has been available for WSDs for some time could, at any time, be assigned to a PMSE user;
 - TVWS spectrum may not be available indefinitely – harmonisation of the 700 MHz band will involve moving parts of DTT and PMSE services from the 700 MHz band to the lower parts of the TV band which could result in a material change to TVWS availability; and

⁴³ <https://www.comreg.ie/industry/radio-spectrum/licensing/search-licence-type/programme-making-and-special-events-pmse/>

- the costs incurred by the NRA could be higher than usual because, in addition to the usual policy making work, TVWS operation requires a database.
- 4.27 In light of the above, there does not appear to be sufficient merit for the introduction of an authorisation regime to licence-exempt TVWS operations in the VHF/UHF TV band at this juncture (i.e. as part of its work plan for 2019-2021). Nevertheless, ComReg will continue to monitor regulatory and technology developments in this area and may revisit this matter as part of the 2022-2024 strategy period.

4.2.4 Terrestrial Fixed Services

Summary of Consultation 18/74

- 4.28 Section 5.2.4 of Consultation 18/74 identified the following work plan items for fixed services for the period 2019 – 2021:
- consider opening up the 130 – 134 GHz, 141 – 148.5 GHz, 151.5 – 164 GHz and 167 – 174 GHz frequency bands for fixed links in accordance with ECC Recommendation (18)01;
 - consider amending the radio links guidelines to enable longer link path lengths with lower modulation and availability requirements;
 - consider the future of the continued licensing of fixed links in the E-band in the Dublin area;
 - following a call for inputs on the future use of the V-band (57-64 GHz), consider further if a review of the licencing regime currently in place for this band is required and if so to consult on this matter;
 - consider adding a number of bands in the 5 – 30 MHz for HF fixed links to the radio link licensing list of bands; and
 - consider the publication of fixed link data on Siteviewer.

Views of respondents

- 4.29 Two respondents (ESBN and Microsoft) submitted views as follows:
- ESBN supports ComReg’s proposal to amend the radio link guidelines to enable longer link path lengths with lower modulation and availability requirements and will engage with ComReg on consultations in relation to fixed radio links; and
 - Microsoft submits that ComReg should conduct a call for inputs on the future use of the 57-71 GHz band and initiate a consultation to allow licence-exempt operations across the entire frequency range.

ComReg's assessment

- 4.30 ComReg notes ESNB's submission and looks forward to its engagement.
- 4.31 In relation to Microsoft's submission, and as identified in section 3.4.1 above, ComReg intends on implementing, if required, an appropriate licensing regime to facilitate the future use of the V-band. ComReg will also continue to monitor the SE19's work programme and will consider its outputs regarding the V-Band.

4.2.5 Licence-Exempt Short Range Devices

Summary of Consultation 18/74

- 4.32 Section 5.2.5 of Consultation 18/74 identified the following work plan items for Short Range Devices ("SRDs") for the period 2019 – 2021:
- continuing to facilitate the use of SRDs in Ireland in accordance with international harmonisations measures and, where necessary, revise ComReg Document 02/71 on foot of EC and ECC harmonisation updates to facilitate the introduction of new SRDs;
 - monitor, contribute to and promote Ireland's spectrum management position in relation to IoT;
 - monitor the outcome of CEPT studies on the feasibility of extending the use radio local area networks ("RLANs") to the 5925 – 6425 MHz band for the provision of wireless broadband services.

Views of respondents

- 4.33 Microsoft submits that enabling licence-exempt RLAN operation in the 6 GHz band can be an effective solution in addressing increased congestion in the existing Wi-Fi bands. Microsoft also urges ComReg to continue monitoring the ECC working groups examining the feasibility of licence-exempt RLAN operations across the 6 GHz band.

ComReg's assessment

- 4.34 ComReg notes Microsoft's views and recognises that licence-exempt SRD operations are a useful means by which to maximise spectrum benefit. ComReg will continue to enable the use of various technologies during this strategy period and intends to undertake the work identified in section 5.2.5 of Consultation 18/74 during this strategy period, including monitoring the outcome of the CEPT studies on the feasibility of extending the use RLANs to the 5925 – 6425 MHz band.

4.2.6 Satellite Services

Summary of Consultation 18/74

4.35 Section 5.2.6 identified the following work plan items concerning satellite networks and services for the period 2019 – 2021:

- continue to facilitate the licensing of satellite earth stations (SES) operating in spectrum above 3 GHz; and
- pending any authorisation of Inmarsat and Echostar, to monitor MSS with CGC operators to ensure compliance with conditions of EC Decision 2007/98/EC.

Views of respondents

4.36 Inmarsat submitted that:

- ComReg may need to consider authorising the use of satellite earth stations (“SES”) below 3GHz, specifically with regard to MSS systems in the “extended L-band” (1518-1525 MHz and 1670-1675 MHz);
- these bands are designated to the MSS in CEPT and are used by Inmarsat for its MSS services in Europe; and
- while these bands are already allocated to the MSS in the national frequency allocation table, a modification to the licence exemption regulations may be needed to permit authorisation of MSS operations in these frequency bands in Ireland.

ComReg’s assessment

4.37 ComReg notes Inmarsat’s submission and recognises that Ireland has a number of exemption orders in place for satellite services which may need to be amended to reflect certain recent ECC Decisions. ComReg therefore intends to conduct a review of the existing exemptions orders and will update, amend and/or implement new exemptions as appropriate. ComReg also intends to, subject to the availability of resources, consider authorising the use of SES below 3GHz during the strategy period 2019 -2021.

4.2.7 Business Radio Services (including Public Safety Services and PMSE)

Summary of Consultation 18/74

4.38 Section 5.2.7 of Consultation 18/74 identified the following work plan items for Business Radio for the period 2019 – 2021:

- conclude the consultation process and if appropriate proceed to the award for the use of the 400 MHz band;
- consult on a business radio licensing regime to permit the use of national channels on a technology and service neutral basis;
- monitor and contribute to the spectrum management considerations of PMSE and take appropriate actions to implement harmonisation decisions;
- monitor and contribute to the spectrum management considerations in respect of broadband PPDR; and
- to relaunch the Third Party Business Radio Licensing scheme prior to the expiry of existing licences in 2021 having consulted on keeping the TPBR licensing scheme open on an ongoing basis.

Views of respondents

4.39 One respondent (ESBN) submitted the following views:

- ComReg should continue with its consultation process regarding the 400 MHz spectrum band;
- ComReg should fulfil its proposal to permit the use of national Business Radio channels on a technology and service neutral basis;
- ComReg should contribute to spectrum management considerations regarding BB-PPDR; and
- ESBN strongly agrees that ComReg should relaunch the TPBR scheme prior to licences expiring.

ComReg's assessment and position

4.40 ComReg welcomes ESBN's support for its proposed work plan items for Business Radio (including Public Safety Services and PMSE).

4.41 With regard to the 400 MHz band, ComReg refers to its further consultation document on the release of the 410 - 415.5 / 420 - 425.5 MHz sub-band (Consultation 18/92) which was published on 24 October 2018.⁴⁴ ComReg is currently considering the responses to same and intends to publish its response to consultation document in Q1/2019.

4.42 Regarding the spectrum management consideration for BB-PPDR, ComReg agrees that this is an important work item and notes that:

⁴⁴ ComReg Document 18/92 – Further Consultation on the Release of the 410 - 415.5 / 420 - 425.5 MHz Sub-band – published 24 October 2018.

- there are three generic service-provision options available for delivering BB-PPDR services⁴⁵ namely (i) use a commercial network, (ii) build and use a dedicated network using dedicated spectrum; and (iii) employ a hybrid solution, being a mixture of dedicated and commercial networks; and
 - each of the generic service-provision options are employed or being actively considered by other countries.⁴⁶
- 4.43 In relation to the frequency bands that could be used for deploying a BB-PPDR service, ComReg also observes that there are a number of harmonised frequency bands options listed in ECC Decision 16(02)⁴⁷, including the 700 MHz Duplex band, the 700 MHz Duplex Gap and Guard Bands, and the 450-470 MHz band. In engaging with stakeholders to obtain greater clarity on the national policy for BB-PPDR, ComReg will investigate further the availability of each of these harmonised frequency band options in Ireland.
- 4.44 In relation to the other work plan items for Business Radio, ComReg considers that these remain appropriate and intends, subject to the availability of resources, to undertake these items during the period 2019 – 2021.

4.2.8 Radio Amateur Services

Summary of Consultation 18/74

- 4.45 Section 5.2.8 of Consultation 18/74 identified the following work plan item for the period 2019 – 2021 for Radio Amateur Services:
- consider allocating the 76-81 GHz, 134-141 GHz and 241-250 GHz bands to the Amateur Service in Ireland – which would align the Irish Table of Frequency Allocations with the European Common Allocation table and the ITU Radio Regulations.

Views of respondents

- 4.46 One respondent (IRTS) submitted the following comments and proposals:
- the applicability of the Wireless Telegraphy Act to spectrum below 8.3 KHz and above 3 THz;

⁴⁵ See section 2.4 of the RSPG 2013 Report on Strategic Sectoral Spectrum Needs, available at: https://www.cept.org/files/9421/RSPG13-540rev2_RSPG_Report_on_Sectoral_needs.pdf:

⁴⁶ For example, in the US and the UK a commercial model is being pursued. In France and Germany, a dedicated network using spectrum in the 700 MHz Duplex Gap and Guard Bands is being considered, and in Belgium and Slovenia a hybrid model is under consideration

⁴⁷ [ECC Decision \(16\)02](#), “Harmonised technical conditions and frequency bands for the implementation of Broadband Public Protection and Disaster Relief (BB-PPDR) systems”, approved 17 June 2016.

- radio amateur use of frequency bands at circa 500 GHz, 700 GHz and 1 – 3 THz;
- Adding the Amateur Service to frequencies above and below 8.3 kHz (on a non-interference basis) in the Radio Frequency Plan for Ireland;
- Change in respect of spot frequencies in the 5 MHz band from requiring additional authorisation to general use;
- Allocation of spectrum between 75.5 GHz and 3 000 GHz to the Amateur Service.

ComReg's assessment

The applicability of the WT Act to spectrum below 8.3 KHz and above 3 THz.

4.47 ComReg observes that in a number of jurisdictions that there is doubt or ambiguity in the applicability of licensing regimes to spectrum below 9 kHz and above 3 000 GHz and notes that there is no allocation or licensing regime for the use of spectrum below 8.3 kHz in Ireland.

4.48 For the avoidance of doubt:⁴⁸

- any wireless telegraphy equipment operating at or below a frequency of 3 000 GHz requires a licence under the WT Act unless such equipment is specifically exempted from such a requirement; and
- any wireless telegraphy equipment operating above 3 000 GHz is not subject to the WT Act and ComReg has no legislative function in respect of any such equipment. Therefore, ComReg is not in a position to comment on the issue of exempting any equipment operating above 3 000 GHz.

Radio Amateur use of frequency bands at circa 500 GHz, 700 GHz and 1 – 3 THz

4.49 ComReg does not plan, at this time, to deviate from either the ITU radio Regulations or the European Common Allocation table, both of which make no allocations to any services above 275 GHz.

4.50 ComReg notes that at WRC-19, Agenda item 1.15 is to consider the identification of frequency bands for use by administrations for the land-mobile and fixed services applications operating in the frequency range 275-450 GHz. At present the Amateur Service have not been considered for additional allocations in this frequency range.

⁴⁸ See definition of “wireless telegraphy” and “apparatus for wireless telegraphy” in the WT Act.

Adding the amateur service to frequencies above and below 8.3 kHz (on a non-interference basis) in the Radio Frequency Plan for Ireland

4.51 ComReg does not plan, at this time, to deviate from either the ITU radio Regulations of the European Common Allocation table, both of which make no allocations below 8.3 kHz for any service(s).

4.52 That being said, ComReg's Test and Trial Ireland programme may be suited to experimentation in this area. ComReg notes that it has previously issued a test licence to the IRTS for experimentation around 500 kHz.

Change in respect of spot frequencies in the 5 MHz band from requiring additional authorisation to general use

4.53 The six additional spot frequencies in the 5 MHz band that require additional authorisation for usage are limited to special events and temporary experimental usage. The allocation of spot frequencies to the IRTS in the 5MHz band is on a secondary basis. The primary user in this band is the Defence Forces. Given the needs of the Defence Forces, ComReg does not consider it necessary to change the requirement from additional authorisation to general use.

4.54 In 2008, four 3 kHz channel spot frequencies were agreed with both ComReg and the military authorities. In its RSMSS 2011 – 2013, ComReg made a further allocation of three channels in the 5 MHz band, on a secondary basis, to the Amateur Service. This was following a consultation with current users of that spectrum, bringing the total to 6 spot frequencies. As there has been a limited demand for the number of authorisations granted since then, ComReg does not see any justification for this proposal.

Allocation of spectrum between 75.5 GHz and 3 000 GHz to the Amateur Service.

4.55 In respect of making addition allocations to the Amateur Service, ComReg intends to align the Radio Frequency Plan for Ireland (ComReg Document 17/34) with the European Common Allocation table and the ITU Radio Regulations.

4.56 This work item will cover some but not all of the proposals made by the IRTS in relation to the WARC-79 Microwave bands and spectrum above 275 GHz. In the event that the international allocations and/or CEPT allocations are modified, then subject to availability of resources, ComReg will take the necessary actions to ensure appropriate alignment.

4.2.9 Aeronautical, Maritime and Scientific Services

Summary of Consultation 18/74

4.57 Section 5.2.9 set out ComReg's proposed strategy for the period 2019 – 2021 for these services as follows:

- continue to liaise with relevant stakeholders including IAA, MRAU, Met Éireann and the Irish defence forces to encourage and ensure efficient use of spectrum to promote Ireland's interest at international fora;
- continue to liaise and assist relevant stakeholders including Universities and other Third Level institutes to encourage and ensure efficient use of spectrum to promote Ireland's interest at international fora;
- consider developing an appropriate licensing mechanism to licence apparatus used for scientific services by third level institutes; and
- consider whether it is possible to promote and potentially establish "quiet zones" for particular frequency bands around specific areas of radio spectrum research such as Birr Castle.

Views of respondents

4.58 The IRTS notes ComReg's proposal to consider the possibility to promote and potentially establish "quiet zones" and seeks clarity from ComReg as to how amateur licensees would be impacted by this development.

ComReg's assessment

4.59 ComReg will take into account any potential impact to existing licensees and engage with them as part of any consideration to promote and potentially establish "quiet zones".

4.2.10 Defence Forces Use of Spectrum

Summary of Consultation 18/74

4.60 Section 5.2.10 set out ComReg's work items regarding the Defence Forces Use of Spectrum for the period 2019 – 2021 as follows:

- 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 across Europe to address issues of mutual interest;
- ComReg will continue to liaise with the Irish Defence Forces as required to resolve issues of mutual concern; and
- ComReg will explore with the relevant authorities opportunities to further

enhance spectrum efficiency.

ComReg's assessment and position

4.61 No comments were received on ComReg's work items regarding the Defence Forces Use of Spectrum. Therefore, ComReg envisages that it will undertake these work items during this strategy period.

4.2.11 Other views submitted by respondents

4.62 ComReg also received views in relation to Test and Trial Ireland, the 1880 – 1920 MHz band, and the 3.6 GHz band and the following section sets out ComReg's assessment of these views.

Test and Trial Ireland

Views of respondents

4.63 Three respondents (Microsoft, Carlson and Nominet) submitted views in relation to Test and Trial Ireland:

- Microsoft submits Test and Trial Ireland be utilised for experimenting with TVWS radios, geo-location spectrum databases and the broader dynamic spectrum access (DSA) model; and
- Carlson and Nominet welcome ComReg's commitment to promoting test and trial, in particular to test or trial wireless products and services in a real world environment.

ComReg's assessment

4.64 Regarding Microsoft's view that ComReg's Test and Trial Ireland programme be utilised for experimenting with TVWS operations, ComReg notes that Test and Trial Ireland provides opportunities to conduct research into wireless technologies, products and/or services, and is an enabler of competitiveness. ComReg has also previously issued Test and Trial licences to enable research into cognitive radios and dynamic access services.⁴⁹

4.65 Noting the activities and achievements in terms of innovation in radio spectrum use by clients of Test and Trial Ireland, ComReg will continue its support in this important area and will continue to work with fellow State agencies (particularly IDA Ireland, Science Foundation Ireland and Enterprise Ireland),

⁴⁹ In 2012, the national telecommunications research centre in Ireland (CTVR) was issued a test licence to facilitate radio propagation tests for Dynamic Spectrum Access services.

Government, commercial organisations and research institutions to promote the benefits of Test and Trial Ireland to potential new clients

1880 – 1920 MHz band

Views of respondents

4.66 JCIEU requests that ComReg allow usage of 40MHz of spectrum in Band 39 (1880MHz-1920MHz) for the provision of TDD-LTE services on a licence-exempt basis and considers that licence-exempt LTE access will drive innovation, competition and lead to the creation of new industries.

4.67 JCIEU proposes that to avoid interference with any existing licensed services in band 39, a license exemption could commence with 20MHz from 1880MHz-1900MHz with the remaining 20MHz added in two subsequent tranches. JCIEU is of the view that licence-exempt LTE services could cohabit the spectrum with legacy digital European cordless telecommunications (“DECT”) systems and would support the technical conditions of DECT to ensure minimal interference.

ComReg’s assessment

4.68 In relation to the 1880 – 1900 MHz band, ComReg notes that S.I. No. 168/1994⁵⁰ has designated this band for the exclusively use of for DECT, therefore it is currently not possible to allocate this band for any other type of service, including TDD-LTE services.

4.69 The 1900-1920 MHz band is currently being considered as part of Consultation 18/60.⁵¹ While ComReg’s preliminary view is that the 1900-1920 MHz band⁵² should not be considered for inclusion in the proposed award, ComReg notes that Three Ireland Hutchison Limited currently holds the rights of use for the 1910–1915 MHz frequency range until 1 October 2022.

4.70 ComReg also notes that while the 1900 – 1920 MHz band is not currently harmonised within Europe, the band is being considered by a number of CEPT project teams for uses such as unmanned aerial vehicles³⁸ and next generation radio system for railways.⁵³

⁵⁰ S.I. No. 168/1994 - European Communities (Digital European Cordless Telecommunications -Dect) Regulations, 1994 – <http://www.irishstatutebook.ie/eli/1994/si/168/made/en/print>

⁵¹ ComReg Document 18/60 – Proposed Multi Band Spectrum Award: Preliminary consultation on which spectrum bands to award – published 29 June 2018.

⁵² <https://www.comreg.ie/media/2017/02/M3G1012.pdf>

³⁸ https://eccwp.cept.org/WI_Detail.aspx?wiid=686

⁵³ <https://eccwp.cept.org/default.aspx?groupid=65&go=true>

4.71 For the reasons set out above, ComReg cannot currently facilitate the usage of 40 MHz of spectrum in Band 39 (1880 - 1920 MHz) for the provision of TDD-LTE services on a license-exempt basis.

3.6 GHz Band

Views of respondents

4.72 Three submits that it wrote to ComReg in January this year setting out its concerns with the approach being taken to the transition of Existing and New Licensees in the 3.6GHz band. Three believes that the delay in completing the transition process undermines the confidence of bidders in entering auctions, and prevent consumers in Ireland from being served with the latest wireless broadband technologies which are critically lacking in this country.

ComReg's assessment and position

4.73 ComReg notes that it subsequently written to Three and addressed the substantive points raised in Three's letter of 25 January 2018 as follows:

- ComReg does not agree with Three's view that the transition process set out by ComReg in its letter of 18 December 2017 is substantively different from the process ComReg outlined in its consultation documents and the 3.6 GHz Information Memorandum;
- the development of localised Transition Plans on a staged basis was required because:
 - Transition Parties were still in the process of formulating the detail of their Transition Plan Proposals;
 - there were information gaps in relation to Transition Activity milestones for both New Licensees and Transition Licensees;
 - it would not be not feasible or, indeed, practical to seek to develop a single overall Transition Plan encompassing the large number of Transition Service Areas and consult with all Transition Parties on same, including in light of the extent of commercial sensitivity claimed by Transition Parties over many of their specific circumstances; and
 - not all such Transition Service Areas would be immediately affected by the proposed deployments of New Licensees.
- ComReg does not agree that there has been a material delay in developing Localised Transition Plans, either generally and vis-à-vis Three, because:
 - the development of localised Transition Plans for a New Licensee's proposed roll-out depends, clearly, on the state of development of said Licensee's roll-out plans and, secondly, on the provision by said

Licensee of sufficient information to ComReg to enable it to determine the appropriate milestones and deadlines in the development of the localised Transition Plans for same;

- all participants in the 3.6 GHz Award Process agreed to be bound by and to comply with the Transition Rules which, among other things, provide for the development and finalisation of a Transition Plan by ComReg in consultation with interested parties. Therefore, all participants understood that Transition Unprotected Licences (TUL)⁴⁰ could be issued to Existing Licensees for up to five years; and
- in participating in the Award process, participants consequently understood that there was a potential for delayed access to any and all Lots in the 3.6 GHz Band, as ComReg expressly put Interested Parties on notice of this and stipulated that, in submitting an Application, Applicants acknowledge and accept same;
- In relation to Three's view that the Transition process is unnecessary and not practical, ComReg observes that the Transition process decided upon and being implemented by ComReg entails:
 - detailed understanding of the current use of the 3.6 GHz Band by Existing Licensees and their proposed Transition Activities on foot of proposed deployments identified by New Licensees (including progress to date on Transition, milestones, proposed sequencing for transitioning Transition Service Areas and site interference contours and technical parameters if appropriate);
 - detailed understanding of the proposed deployments by New Licensees (including obtaining sufficient detailed information on same); and
 - developing Localised Transition Plans (if necessary – noting again that a New Licensee can access spectrum rights in those parts of a Region not affected by a Transition Service Area if it so chooses) having regard to and in the context of, *inter alia*, the Transition licensing framework, Transition Principles, and Transition Rules.

4.74 Finally, ComReg notes that it has to-date commenced 3.6 GHz Band Liberalised Use Licences for Eir, Imagine, Three and Vodafone, and is

⁴⁰ <https://www.comreg.ie/publication/s-no-5322016-wireless-telegraphy-3-6-ghz-band-licences-regulations-2016/>

engaging with Existing Licensees and New Licensees on an ongoing basis with a view to completing the transition process soonest.⁵⁴

⁵⁴ <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/3-6ghz-band-spectrum-award/>

Chapter 5

5 The economic contribution of radio spectrum to Ireland

Summary of Consultation 18/74

- 5.1 Frontier Economics ('Frontier') was commissioned by ComReg to estimate the economic contribution of radio spectrum to Ireland. Frontier identified six approaches that could be used to estimate the contribution of spectrum to the Irish economy (Document 18/74a). Chapter 6 of Consultation 18/74 assessed each of these approaches before outlining ComReg's preferred approach.
- 5.2 Frontier recommended a combination of Method One (Micro) and Method Two (Macroeconomic) to measure the direct economic impact of spectrum on the economy. The direct economic contribution approach measures the "value added" in the production of goods and services which use spectrum, using both Micro and Macroeconomic approaches. Separately Frontier recommended an approach to estimate the impact that investments in Spectrum related technologies have had on the Irish economy. ComReg agreed with this approach for reasons including that it uses available, accurate and reliable data from relevant companies and national macro-economic aggregates from the CSO and CRO which is not suitable for other approaches.
- 5.3 The preferred approach included the following five steps:
- Step 1 defines the target sectors to be sectors in which spectrum is "core"⁴¹ to the supply or demand of goods or services.
 - Step 2 identifies the target sectors⁴² for the analysis.
 - Step 3 identifies the target companies within each target sector by reference to their spectrum related activities.
 - Step 4 obtains financial information for the target companies.⁴³

⁴¹ These are economic activities where in the absence of spectrum, economic output would be zero or close to zero. Therefore, the analysis excludes the contribution of sectors where spectrum is not "core" to their supply.

⁴² Identified Target Sectors: Operation of mobile services; Manufacture, Sale and Distribution of Mobile Devices; Satellite Communications Services; Fixed Wireless; Professional Mobile Radio; Aviation; Radio and Television Broadcasting, and Mobile Content Creation and Advertising.

⁴³ Main sources of information were from the Companies Registration Office Ireland and the Central Statistics Office

- Step 5 estimates the economic contribution of spectrum to the Irish economy. This comprises calculating the “direct economic contribution”⁴⁴ of the target companies, as well as the wider “spillover” or “multiplier effect” of these activities on the wider economy.⁴⁵
- 5.4 The preferred approach results in a quantitative estimate of the contribution that sectors that rely on the radio spectrum make to the Irish economy.

Views of respondents

- 5.5 Three respondents (ESBN, JRC and Eir) submitted views in relation to the proposed methodology as follows:
- ESBN stated that it is the tenth biggest user of fixed links in Ireland. However, as a secondary spectrum user, it does not believe that the proposed approach will factor in the economic benefits generated by ESBN’s spectrum use;
 - ESBN and JRC submitted that ComReg should consider:
 - sectors/industries which are secondary users of spectrum, where spectrum is used as an enabler of their operational capabilities; and
 - the social impact of services which do not directly generate economic value;
 - Eir agrees with ComReg’s preferred approach and suggests that ComReg may also wish to consider whether commissioning a survey to capture the views of firms and suppliers which use spectrum as an input might be beneficial in terms of augmenting the results of the assessment.

ComReg’s assessment

Secondary Users of Spectrum

- 5.6 First, ComReg wishes to clarify that the quantitative estimate includes the contribution from ESBN’s telecommunications activities that rely on spectrum. For example, provision of fixed wireless, and services which rely on its management of its network of transmission towers.
- 5.7 Second, the quantitative estimate does not, however, directly estimate the contribution that spectrum makes to “secondary” users of spectrum (i.e. where spectrum is an input, but not a core input). Secondary users are those uses that

⁴⁴ Measured as Gross Value Added, which is calculated as Gross Operating Surplus + Compensation of Employees + Mixed Income + (Taxes on Products - Subsidies on Products)

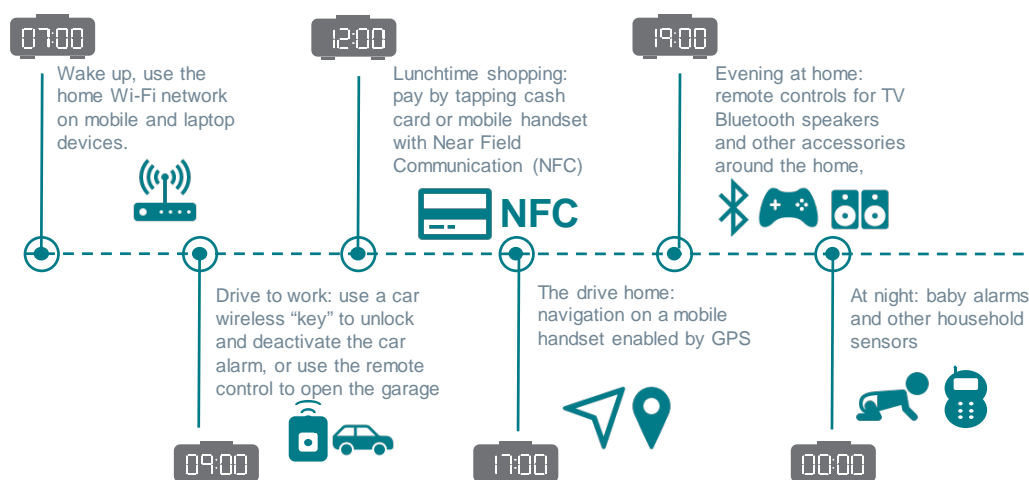
⁴⁵ The “multiplier effect” will be calculated using input-output tables provided by CSO.

use spectrum as an input in supplying goods and services which are not directly related to wireless communications. These cases refer to situations where spectrum is not a “core” input or where spectrum is used to improve consumer welfare. In that regard, Frontier considers that there is no robust way to either exhaustively identify all secondary users of spectrum, nor to weight the gross value add (“GVA”) created by secondary users according to the contribution that spectrum makes to their economic output (as distinct from other inputs). Accordingly, ComReg observes that the estimates provide by Frontier are likely to be conservative in this context.

5.8 ComReg agrees that such use cases should not be included in the quantitative assessment because sufficient data on the importance of spectrum in generating economic activity from those use cases is not available and, further, the inclusion of same could compromise the data provided by the CRO and CSO. That being said, and in recognition of the importance⁵⁵ of such uses, Frontier has provided a qualitative assessment of those use cases in Chapter 4 of its report (Document 18/118a).

5.9 For example, a variety of consumer applications used in a typical day are enabled through the use of the radio spectrum as illustrated in Figure X below.

The wireless day: how we use spectrum throughout the day



5.10 Business applications are also likely to be enabled through the use of the radio spectrum across a variety of sectors, including:

- Utilities – which uses wireless technologies to properly monitor and measure activity, and provide security in a widely distributed set of

⁵⁵ In the absence of spectrum, costs of providing such uses would significantly increase as providers would have to rely on more expensive alternatives.

network assets. In the future, Smart Grids will connect many more devices and equipment to electricity networks;

- Agriculture – which uses wireless applications to measure various aspects of animal husbandry and arable farming to improve yield and reduce costs; and
- Logistics – which uses wireless technologies to enable more efficient supply chains and enhanced customer value.

5.11 Further, Frontier's assessment of the productivity enhancements provided by the radio spectrum will partly⁵⁶ reflect the incremental economic value that is derived from secondary users of spectrum services (i.e. those that invest in spectrum-related ICT capital). This approach recognises that spectrum use by "core" as well as secondary users provide productivity enhancements to the economy.

Social impact of spectrum

5.12 In relation to the social value created through the use of the radio spectrum, Frontier observe that there are a number of sources of social value arising from the use of the radio spectrum. However, there are methodological challenges with accurately quantifying the social value attributed to a resource which is an enabler of good and services rather than a good or service in its own right. Further, for those goods and services that it does enable, value measurements are highly subjective and are likely vary according to different demographics and social groups. While the value of such spectrum may be difficult to quantify, Frontier notes that the social benefits of spectrum can be qualitatively described. In that regard, section 4.3 of the Frontier Report provides a high level assessment of such benefits, including, social capital, security and culture.

5.13 ComReg agrees with the approach taken by Frontier. The use of the radio spectrum provides important social benefits that improves the lives of citizens either through the use of good and services enabled by spectrum or through the provision of important public services such as defence, emergency services and broadcasting. Notwithstanding, such benefits are difficult to quantify and any relative assessment against broader macroeconomic aggregators would not be possible. In that regard, ComReg considers that a qualitative assessment is appropriate in order to highlight the social value created through the use of the radio spectrum.

⁵⁶ This identifies *economy wide productivity impacts*, which may not reflect contribution to private value of secondary users of spectrum.

Use of a Survey

5.14 ComReg notes Eir's suggestion to commission a user survey to obtain the contribution of firms and suppliers which use spectrum as an input. Whilst the use of surveys is an important way of establishing the views of users, its use in this instance is not necessary to estimate the added value provided by firms who use spectrum as a core input because such detailed information is already available from the CSO and CRO.

5.15 That being said, ComReg recalls that it has conducted a number of recent surveys to take account of the interests of all users of the radio frequency spectrum, including:

- commissioning Behaviour and Attitudes to survey residential consumers in Ireland to provide insights into the usage, perceptions and experiences of mobile phones users⁵⁷; and
- commissioning Ipsos MRBI to survey consumers and businesses about their use and experiences of telecommunications in Ireland.^{58 59}

5.16 ComReg will consider the use of surveys in the future in order to update its views on same and other developments as may arise.

⁵⁷ Document 17/100a – Mobile Consumer Experience Survey.

⁵⁸ Document 18/23a – 2017 Ireland Communicates Survey.

⁵⁹ Document 18/23b – 2017 Ireland Communicates Survey.