



Case studies for the award of the 700MHz/800MHz band: Introduction

Prepared for GSMA

11 November 2011

Contents

1	Introduction.....	3
2	Key findings of the case studies.....	5
2.1	Obstacles facing spectrum award in 700MHz/800MHz band.....	5
2.2	Obstacles vary by country and level of challenge.....	6
2.3	Solutions to overcome clearing/award obstacles.....	6
	Annex A: About the authors.....	9

Please note: This document summarises a series of case studies on approaches to awarding the 700MHz/800MHz band¹ for mobile broadband. The countries in this series are Australia, Finland, Germany, Mexico, and UK. Each case study is available as a separate document.²

¹ Across the world, two harmonised UHF bands have been identified for mobile broadband: the 800MHz band (790–862MHz) in ITU region 1 (Europe and Africa) and the 700MHz band (698–806MHz) in the rest of the world.

² The case studies are available for download from the GSMA website at <http://www.gsma.com/our-work/public-policy/spectrum/digital-dividend/>

1 Introduction

An increasing number of countries are looking to make the transition from analogue TV broadcasting to digital. The greater efficiency of digital broadcast networks means that it is possible to release some broadcast spectrum for other uses, notably mobile broadband, whilst at the same time, increasing the capacity of the broadcast networks. This is often referred to as the 'digital dividend'. Across the world, two harmonised UHF bands have been identified for mobile broadband: the 800MHz band (790–862MHz) in ITU region 1 (Europe and Africa) and the 700MHz band (698–806MHz) in the rest of the world.

The economic and social benefits of clearing this digital dividend spectrum (i.e. the 700MHz or 800MHz band, depending on location) have clearly been demonstrated in numerous studies. For example:

- in its study for the European Commission, Analysys Mason concluded that using the 800MHz band for wireless broadband could generate between EUR50 billion and EUR190 billion (discounted value over 25 years) of private value, in addition to social value, across the EU.³
- BCG estimated that deployment of wireless broadband in the 700MHz band would add USD729 billion to the GDP of Asia, as well as bringing significant social benefits such as better access to education, improved healthcare and financial inclusion.⁴

However, the process of clearing and awarding the 700MHz and 800MHz bands in order to achieve the digital dividend is not always straightforward. Regulators and government bodies can face a range of obstacles, from how to justify the release of the spectrum for mobile broadband, to how to clear (and possibly compensate) incumbent users, and how to protect neighbouring spectrum users. At the time of writing, only five countries: USA, Germany, Sweden, Spain and Italy, have been successful in awarding licences in either the 700MHz or 800MHz bands and network deployments have only occurred in USA, Germany and Sweden.

It is in this context that the GSMA appointed Aetha Consulting to develop a series of case studies to investigate how regulators and government bodies in different countries have approached clearing and then awarding the 700MHz/800MHz bands. The objectives of the case studies are to highlight the major obstacles that these countries have faced during this process, as well as the steps that have been taken to find solutions. It is our hope that stakeholders within countries that are currently in the process of awarding the 700MHz/800MHz band can learn from the experiences and actions taken in these countries.

Five countries have been selected for the case studies: Australia, Finland, Germany, Mexico and the UK. The criteria used for country choice was threefold:

- to illustrate a wide range of obstacles that can be faced when clearing and awarding the 700MHz/800MHz bands
- to provide case studies from different regions of the world. We note that, to date, the 700MHz/800MHz band has only been awarded in USA and some European countries, however, we wanted to provide a broader range of the issues that are likely to be faced in other geographical areas.
- to provide case studies from countries at different levels of economic development.

³ Analysys Mason, DotEcon and Hogan and Hartson for the European Commission (August 2009), "Exploiting the digital dividend' – a European approach".

⁴ Boston Consulting Group (BCG) for the GSMA (January 2011), "The socio-economic impact of allocating the 700MHz band to mobile in Asia Pacific".

In the remainder of this introductory report, we summarise the key findings of the case studies, including:

- the obstacles that countries are likely to face when clearing and awarding the 700MHz/800MHz band (Section 3.1)
- which of these obstacles have been faced by each of our case study countries (Section 3.2)
- the solutions that our case study countries have implemented to overcome these obstacles (Section 3.3)

Full versions of each of the case studies can be downloaded from <http://www.gsmworld.com/our-work/public-policy/spectrum/digital-dividend/>.

2 Key findings of the case studies

2.1 Obstacles facing spectrum award in 700MHz/800MHz band

Regulators and government bodies can face a range of obstacles when clearing and then awarding the 700MHz/800MHz band. However, these can be grouped into three main areas: justifying band clearance for use by mobile broadband, obstacles faced by regulators when clearing historic users from the band, and ensuring that other spectrum uses aren't negatively impacted by the introduction of mobile broadband into the 700MHz/800MHz bands. This can either include other uses in neighbouring spectrum bands, or other uses of the 700MHz/800MHz bands in neighbouring countries. Further details of these obstacles are provided below.

Justification of band clearance to facilitate mobile broadband use

- **Economic justification for clearance** – The case for allocating the 700MHz/800MHz band for mobile use can be more or less challenging, depending on the country. Countries where there are strong claims for use of the band from other uses (e.g. Digital Terrestrial TV (DTT), military) often require stronger cases, perhaps including quantitative economic evidence, in order to secure the 700MHz/800MHz band for mobile use.
- **Structural challenges to clearance** – The infrastructure supporting spectrum management can vary between countries. Certain arrangements within the country may make the argument for the 700MHz/800MHz band more complicated, for example, in situations where different entities are responsible for managing broadcasting and mobile spectrum.

Obstacles faced to clear historic users from the band

- **Completion of the ASO⁵** – In some countries, ASO needs to be complete, or nearly complete, in order for the 700MHz/800MHz band to be used for mobile use. In these cases any delay to the ASO represents an obstacle to adopting the 700MHz/800MHz band.
- **Clearing DTT from the band** – In some countries DTT multiplexes may either be in use or planned for the 700MHz/800MHz band. These need to be moved to different frequencies before mobile services can use the band.
- **Clearing PMSE⁶ use from the band** – PMSE is often an existing user of the 700MHz/800MHz band and may require relocating to other bands
- **Clearing military users from the band** – In some countries, the 700/800MHz band is being used by the military. Military applications can and do co-exist with TV broadcasting. However with new mobile broadband services replacing TV in certain bands, these applications have to be moved to other frequencies (unless it can be demonstrated that they can share the band without undue interference).

Ensuring mobile broadband in the 700MHz/800MHz band does not negatively impact other spectrum uses

- **DTT use beneath the 700MHz/800MHz band** – In most countries that adopt either the 700MHz or 800MHz band, DTT use will continue below the band. Measures may need to be taken to prevent interference from the mobile services that are introduced to the continued DTT use.
- **Cable use within the 700MHz/800MHz band** – In some countries cable TV networks also use the 700MHz/800MHz band. Measures may need to be taken to prevent interference to cable TV subscribers' equipment, although such interference has not yet been shown to be an issue in practice.
- **Uses in neighbouring countries** – Ongoing DTT use in neighbouring countries may interfere with mobile use in the 700MHz/800MHz band. Restrictions to prevent interference to military uses in neighbouring countries may also prevent mobile use in the band.

⁵ Analogue switch-off.

⁶ Programme making and special events.

2.2 Obstacles vary by country and level of challenge

The specifics of the challenges facing regulators and government bodies to clear and then award the 700MHz/800MHz band can vary significantly, for example:

- cross-border interference issues are not a concern for a country without neighbours, such as Australia.
- measures to relocate DTT from the 700MHz/800MHz band are not a concern for a country where there is no DTT use in the band, such as Finland.

Figure 2.1, below, summarises the specific obstacles faced by each of our case study countries. This should provide guidance to readers on the selection of case studies that are the most relevant to their country.

Figure 2.1 Obstacles faced by the case study countries [Source: Aetha Consulting, 2011]

	Australia	Finland	Germany	Mexico	UK
Justifying the clearance of the band	Qualitative evidence sufficient to justify 700MHz band	Justification of the 800MHz band straightforward as was not used for TV	Split spectrum responsibility between national government and Länder meant 800MHz band adoption was complicated	Qualitative evidence sufficient to justify 700MHz band	Detailed quantitative assessment of benefits was undertaken
Obstacles faced to clear historic users from the band	Large number of DTT channels in the 700MHz band, which could only be relocated after ASO Large number of PMSE users	No DTT use in the 800MHz band PMSE use in the 800MHz requires relocation	DTT/mobile TV use in the 800MHz band, which could only be relocated after ASO Large number of PMSE users	Legacy analogue TV use prevents mobile use before ASO No planned DTT use in the band	Planned DTT use in Ch61& 62 requires relocation Large number of PMSE users in Ch69 require relocation
Ensuring that other spectrum uses are not negatively impacted	DTT use beneath the 700MHz band required protection No neighbouring countries	Agreement that protected Russian military use (ARNS) prevented mobile use in the 800MHz band nationally, in effect	DTT use beneath the 800MHz requires protection Concerns that mobile could interfere with cable TV	DTT use beneath the 700MHz may require protection Neighbours already / are expected to use 700MHz band for mobile	DTT use beneath the 800MHz requires protection

2.3 Solutions to overcome clearing/award obstacles

The regulators and government bodies in our case study countries have implemented a range of solutions to overcome the obstacles that they have faced when clearing and awarding the 700/800MHz band. This section summarises such notable actions. Full details of the actions taken in each country are provided in the individual case studies, which can be downloaded from <http://www.gsmworld.com/our-work/public-policy/spectrum/digital-dividend/>

Actions to justify band clearance to allow use by mobile broadband

Germany The process to designate the 800MHz band for mobile use was complicated by the fact that the national government is responsible for mobile services' spectrum licensing, whereas licensing of broadcast spectrum lies with each of the 16 federal states (Bundesländer).

In order to designate the 800MHz for mobile use, the government based the case for reallocating the 800MHz band to mobile use on the ability to provide wireless broadband in rural areas. Parliament also put forward proposals to remove the power of the Bundesländer to restrict the use of the UHF band to broadcasting.

Ultimately, the Bundesrat (representative body of both the Federal Government and the 16 Bundesländer) finally adopted the national government's proposals.

UK Together with branches of the UK government, the telecoms regulator Ofcom carried out numerous, extensive and detailed studies into the costs and benefits of both the digital switchover and the award of the digital dividend for telecoms use, including:⁷

- a case for digital switchover, primarily made on the cost savings from the switch-off of the analogue infrastructure compared to maintaining dual transmission systems
- a “Digital Dividend Review” estimated that the value of the digital dividend to be within GBP5–10 billion (net present value over 20 years), based on a wide range of potential alternative uses of the released spectrum, including use for mobile broadband and additional television channels
- a further analysis was undertaken, specifically on the additional benefits/costs of adopting the 800MHz band in the UK, which resulted in an NPV in the range GBP2 to 3 billion, after accounting for the costs of migrating existing users.

Actions to accelerate ASO in order to clear the 700MHz/800MHz band for mobile use

Australia A comprehensive switchover programme was put in place to accelerate ASO. Its initiatives included: a programme of training of retail advisors in electronics stores, labelling of goods into categories of “digital readiness”, a programme of training of TV and antenna installers, and a programme of “endorsed” installers. It also organised a series of targeted subsidies such as free decoders for vulnerable users and subsidies for households located outside of coverage areas to receive TV via satellite.

Mexico The telecoms regulator COFETEL recently called for financial resources to accelerate ASO, estimating the subsidies required to provide decoders, antennas and related costs to be of the order of USD200 million. COFETEL recommended that this be financed by the public.

UK A fund of GBP600 million was secured to provide free/subsidised set-top boxes to older people and people with disabilities.

Actions to relocate historic uses from the 700MHz/800MHz band to other bands

Germany A compensation scheme was put in place for PMSE users affected by interference from mobile and needed to be relocated to channels 51 to 60 (which required the purchasing of new equipment).

UK DTT assignments in channels 61 and 62 were relocated primarily to channels 39 and 40. The cost of this was estimated at between GBP85 million and GBP185 million, which was to be funded by the government.

Actions to protect DTT use below the 700MHz/800MHz band

Australia The telecoms regulator ACMA has implemented an additional 4MHz of guard band (9MHz in total) between the 700MHz band and DTT in order to reduce any risk of interference.

Germany The 800MHz licence conditions specified that licensees are responsible for ensuring there is no interference with users in neighbouring bands.

UK Ofcom undertook investigations into the potential for mobile use in the 800MHz band to interfere with DTT. These stated that mitigation measures could include the deployment of filters for DTT receivers, filters at mobile base stations, reorientation of aerials, reduction in the power levels and migrating users to other TV platforms. Ofcom estimated that these measures could total around GBP100 million, and proposed that this should be borne by the licensees of the 800MHz band.

⁷ References to these, and other key source documents, are provided in the individual country case studies.

Actions to resolve interference issues with neighbouring countries

Finland

Russia currently uses the 800MHz band for ARNS⁸. Existing interference co-ordination agreements with Russia effectively prevented neighbouring countries (including Finland) from using these frequencies for any other use. The Finnish spectrum authority, along with those of several of Russia's other neighbours, entered into negotiations with the Russian authorities regarding the 800MHz band. In mid-2011, the 800MHz band may have been only one element of many in Russia's negotiations with its Western European neighbours. For example, at around the same time, announcements were also made about cross-border co-ordination in the 900MHz band. Eventually an agreement was reached which allowed placement of a full-coverage mobile 800MHz network 55km from the Russian border.

⁸ Aeronautical radio navigation services

Annex A: About the authors

Aetha Consulting helps players in the telecommunications industry develop creative and sustainable solutions to the challenges presented by a changing environment. We undertake rigorous, quantitative assessments to test our ideas, and collaborate with our clients to ensure that our tools and methodologies support their strategic and regulatory requirements.

Aetha provides strategic advice on issues including: market strategy development, radio spectrum policy, spectrum valuation and auction support. We are committed to delivering quality work that exceeds our client's expectations, as shown by our track record of successful assignments with operators, regulators, and manufacturers, as well as financial and legal institutions.

On behalf of the GSMA, Aetha project team members Lee Sanders, Amit Nagpal, Graham Johnson and Marc Eschenburg have pooled their industry knowledge to develop these case studies on the clearance and award of the 700MHz/800MHz bands.



Lee Sanders (Partner) has been at the forefront of spectrum developments across the world helping operators to bid in auctions and regulators to develop spectrum policy. He has over 10 years' experience advising operators, regulators and government bodies with topics, including network sharing, next generation networks and transaction support. Lee has led several high-profile spectrum studies for regulators such as the European Commission, Ofcom and the IDA (Singapore). He has also led numerous projects to develop spectrum strategies and valuations. Lee has supported operators in many European countries to prepare for and bid in spectrum auctions.

Amit Nagpal (Partner) specialises in large and complex strategy projects in the wireless space and is an expert on spectrum valuation. Amit has over 15 years' experience advising fixed and mobile operators, regulators/government bodies, financial institutions and equipment manufacturers on commercial, technical and regulatory issues. He has helped clients win mobile licence bids, such as the third mobile licence in Egypt, supported several multi-billion dollar M&A and debt financing transactions, as well as led numerous high-profile studies in the area of radio spectrum policy.



Graham Johnson (Partner) has delivered sector strategy studies, market reviews, consultation support, expert valuer's reports and service costing models during his 20 years of telecommunications consulting. Graham's other work for governments, regulators, operators and investors worldwide has included regulatory benchmarks, telecommunications policy formation, licence bids, development of strategic plans, technical advisory work, and regulatory audits. Graham has extensive experience of carrying out the technical evaluations required as part of client projects, visiting sites and interviewing operational management. His most recent project have been in for mobile clients, covering a wide range of topics from regulatory strategy to MVNO set-up.

Marc Eschenburg (Manager) is a sought-after expert in spectrum strategies and valuation ahead of auction. Since joining the telecoms sector in 2008, Marc has advised fixed and mobile operators and regulators, and in addition to his European spectrum work, has supported a range of projects, including: next generation broadband, business planning, and TV and media-related topics. Marc's other experience includes detailed, geographically-based cost models of next generation networks, work on public sector interventions in (and economic benefits of) broadband networks, as well as assessments of economic issues within the TV and media market.

