



**Telecom Regulatory Authority of India**



**Recommendations**

**on**

**Issues related to Digital Radio Broadcasting in India**

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## **CHAPTER 1**

### **INTRODUCTION**

- 1.1 Radio remains an integral part of India's rich culture, social and economic landscape. Radio broadcasting<sup>1</sup> is one of the most popular and affordable means for mass communication, largely owing to its wide coverage, low set up costs, terminal portability and affordability.
- 1.2 At present, analog terrestrial radio broadcast in India is carried out in Medium Wave (MW) (526–1606 KHz), Short Wave (SW) (6–22 MHz), and VHF-II (88–108 MHz) spectrum bands. VHF-II band is popularly known as FM band due to deployment of Frequency Modulation (FM) technology in this band. AIR - the public service broadcaster - has established 467 radio stations encompassing 662 radio transmitters, which include 140 MW, 48 SW, and 474 FM transmitters for providing radio broadcasting services<sup>2</sup>. It also provides overseas broadcasts services for its listeners across the world.
- 1.3 Until 2000, AIR was the sole radio broadcaster in the country. In the year 2000, looking at the changing market dynamics, the government took an initiative to open the FM radio broadcast for private sector participation. In Phase-I of FM Radio, the government auctioned 108 FM radio channels in 40 cities. Out of these, only 21 FM radio channels became operational and subsequently migrated to Phase-II in 2005. Phase-II of FM Radio commenced in 2005 when a total of 337 channels were put on bid across 91 cities having population equal to or more than 3 lakhs. Of 337 channels, 222 channels became operational. At the end of Phase-II, 243 FM Radio channels were operational in 86 cities.

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<sup>1</sup> Internationally, the term 'Audio broadcasting' is used. However, in this paper term 'Radio broadcasting' is used in place of 'Audio broadcasting' and has the same meaning.

<sup>2</sup> <http://allindiaradio.gov.in/Profile/Factss%20at%20Glance/Pages/default.aspx>

- 1.4 In Phase-III expansion of FM radio, 966 FM radio channels are to be made available in 333 cities. In the first batch of Phase-III, 135 private FM Radio channels in 69 cities were put to auction in 2015. Out of these, 96 FM Radio channels in 55 cities have been successfully auctioned<sup>3</sup>. In the second batch of Phase-III, 266 private FM Radio channels in 92 cities were put to auction in 2016<sup>4</sup>. Out of these, 66 FM Radio channels in 48 cities have been successfully auctioned<sup>5</sup>. At the end of September 2017, 322 FM radio stations have been made operational in 86 cities by 34 private FM Radio broadcasters.
- 1.5 Along with the public broadcaster AIR and private FM radio, Community Radio Stations (CRS) are present in India, each serving a local and well defined community, with a focus on the day to day concerns of its audience and satisfy their specific information and entertainment needs. At present 280 licenses have been issued in the country for setting up of CRS. Of which 210 community radio stations are operational throughout the nation.
- 1.6 Popularity of Radio is measured by its outreach and hours spend on listening to radio by the audience which has been stable over recent years but now radio is changing. The radio industry is in the midst of a phase of transformation driven by a shift in technology to digital and by changes in the way listeners are consuming music and other content.
- 1.7 Presently radio signals are largely transmitted in analog mode in the country. Analog terrestrial radio broadcasting when compared with digital mode is inefficient and suffers with operational restrictions.

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<sup>3</sup> [http://www.mib.nic.in/WriteReadData/documents/1st\\_Batch\\_FM\\_Phase-III\\_Auction\\_results.pdf](http://www.mib.nic.in/WriteReadData/documents/1st_Batch_FM_Phase-III_Auction_results.pdf)

<sup>4</sup> [http://mib.nic.in/WriteReadData/documents/NIA-\\_E-Auction\\_of\\_Second\\_Batch\\_of\\_Private\\_FM\\_Radio\\_Phase-III\\_Channels.pdf](http://mib.nic.in/WriteReadData/documents/NIA-_E-Auction_of_Second_Batch_of_Private_FM_Radio_Phase-III_Channels.pdf)

<sup>5</sup> [http://www.mib.nic.in/WriteReadData/documents/IIInd\\_Batch\\_FM\\_Phase-III\\_Auction\\_results.pdf](http://www.mib.nic.in/WriteReadData/documents/IIInd_Batch_FM_Phase-III_Auction_results.pdf)

- 1.8 With the advancement in technologies, digital radio technologies around the globe have been developed and adopted by a number of countries in order to offer more choice to listeners along with efficient use of spectrum. Digital Radio broadcasting provides a number of advantages over analog radio broadcasting. The biggest advantage of digital radio is that it is possible to broadcast three to four channels on a single frequency carrier while ensuring excellent quality of audio for all the channels whereas analog mode broadcasts only one channel on a frequency carrier.
- 1.9 In National Frequency Allocation Plan 2011 (NFAP-2011), frequency band 174-230 MHz (VHF-III) has been identified for Digital Radio Broadcasting. However, presently, this frequency band spectrum is in use for analog terrestrial TV broadcasting. AIR has initiated digitization of its analog MW and SW radio broadcast network in three phases. In first phase, AIR has replaced its existing 37 analog transmitters with digital transmitters. However, there appears to be no initiative in FM radio space to digitize by public broadcaster. In a competitive environment, digital radio broadcasting can provide exciting new opportunities to radio broadcasters as well as a host of value-added-services to the listeners.
- 1.10 In order to develop an eco-system, which can facilitate deployment of digital radio broadcasting, the Telecom Regulatory Authority of India (TRAI) had *suo-motu* issued a consultation paper on “Issues related to Digital Radio Broadcasting in India” on 10<sup>th</sup> July 2017 to seek stakeholders’ comments on various issues relating to digital broadcasting. All the comments received were posted on TRAI’s website. Subsequently, an Open House Discussion was also held in Delhi on 25<sup>th</sup> October 2017. The Authority after carefully examining various issues emanating from the written submissions of the stakeholders, Open

House Discussions, International practice and its own analysis has arrived at the recommendations.

1.11 Chapter-2 deals with the digital broadcasting technologies and summarizes the international scenario. The issues related to introduction of digital radio broadcasting with recommendations thereon have been discussed in chapter-3. Summary of the recommendations is available in Chapter-4.

## CHAPTER 2

### DIGITAL RADIO BROADCASTING TECHNOLOGIES AND INTERNATIONAL SCENARIO

2.1 The evolution and adoption of digital radio broadcasting standards by various countries have been influenced by the existing transmission technologies used, chosen standards, and infrastructure available in those countries. Countries around the world have chosen different standards through rigorous trials and examining the suitability of the new technology for various popular applications and ease of implementation. Digital switchover plans have been formulated keeping in view the technological options. Digital radio standards differ in terms of audio formats in addition to the modulation and transmission techniques used.

#### **Standards for Digital Radio Broadcasting**

2.2 A number of digital radio broadcasting technologies have been developed around the world. However, following four digital terrestrial radio broadcasting standards have been recognized by the International Telecommunication Union (ITU):

- a. DAB/DAB+,
- b. ISDB-TSB,
- c. HD Radio (IBOC),
- d. DRM/DRM+

2.3 The evolution of digital radio standards is shown in the figure 1:



#### **A. Digital Audio Broadcasting (DAB/DAB+):**

2.4 During 1980s, DAB was introduced as a research project in Europe and was gradually adopted by the different standardization bodies such as ITU and ETSI. The first country to broadcast a range of radio station through DAB was United Kingdom (UK). DAB uses a wide-bandwidth broadcast technology. It operates on frequency anywhere above 20 MHz, though allocated spectrum band to DAB is Band III (174-240 MHz) and L band (1452-1492 MHz). DAB has country specific modes of transmission, operating in varied bands according to requirements.

2.5 In February 2007, DAB+ standard was introduced as an upgraded version of DAB. The forward compatibility of DAB receivers was not in line with the DAB+ receivers i.e. DAB receivers were unable to receive DAB+ programmes. The compression technique used by DAB standard is MPEG-1 Audio Layer 2 audio codec (MP2) while the newer version, DAB+, has adopted a three times more efficient audio compression technique than MP2 called eAAC+ (HE-AAC version 2 audio codec). This enhanced

the received audio quality with the increase in number of available stations.

2.6 DAB/DAB+ is a popular radio technology around the world which is gaining momentum across Asia Pacific, Europe, Arab nations and South Africa. Today, DAB services reaches out to approximately 418 million people. Presently, there are approximately 2090 on air DAB services spreads across 38 countries. Over 55 million DAB/DAB+ receivers have been sold till 2016<sup>6</sup>.

## **B. Digital Radio Mondiale (DRM)**

2.7 Digital Radio Mondiale (DRM) standard for digital terrestrial radio broadcasting is specially designed for switchover to digital radio broadcasting from the current analog radio broadcasting. It across all the radio frequency bands i.e. AM (SW and MW) and the FM/VHF bands. The two modes of operation in DRM are:

- DRM30: This mode covers the AM broadcast bands below 30 MHz
- DRM+: This mode covers the radio spectrum above 30 MHz till Band III (174-230 MHz) with FM broadcast (Band II 88-108 MHz) at the center.

2.8 DRM30 system uses SW and MW frequency bands and is based on signal bandwidths of 9 kHz or 10 kHz. It also consists of modes which utilize wider bandwidths of 18 kHz or 20 kHz as well as modes requiring 4.5 kHz or 5 kHz of bandwidth. DRM+ requires a narrow bandwidth and is intended to suit FM broadcast band plan with 100 kHz of inter channel frequency gap. DRM allows broadcasting of single or small numbers of audio services together with bit rates ranging from 37 kbps to 186 kbps,

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<sup>6</sup> WorldDAB Global Summary :  
[https://www.worlddab.org/public\\_document/file/876/Global\\_Summary\\_06.04.17.pdf?1491491968](https://www.worlddab.org/public_document/file/876/Global_Summary_06.04.17.pdf?1491491968)

allowing four services simultaneously. This allows DRM to operate parallel to analog transmission.

- 2.9 DRM system provides ability to switch depending on the strength of reception and perceived audio quality. It provides three kinds of audio codecs namely Advanced Audio Codec (AAC), Code Excited Linear Prediction (CELP) and Harmonic Vector Excitation Coding (HVXC), which vary in quality, bit rate requirement, and its application. CELP and HVXC are designed for speech-only services requiring lower bit rates, while AAC provides highest quality. DRM system provides low data rates at high quality by utilizing MPEG xHE-AAC and AAC with PS (Parametric Stereo) and SBR (Spectral Band Replication). The modulation technique and channel coding used are Quadrature Amplitude Modulation (QAM) and Coded Orthogonal Frequency-Division Multiplexing (COFDM) respectively. The DRM+ system is designed for use in any of the VHF Bands I, II and III, each containing its own channel raster<sup>7</sup>.

### **C. HD Radio (In-band on-channel)**

- 2.10 HD Radio is a terminology used for IBiquity's in-band on-channel (IBOC) digital radio technology. A digital signal is embedded "on-frequency" immediately above and below a standard analog signal, and the audio and data is transmitted through the AM and FM radio stations, hence providing to listeners, the same program, with either HD (less noisy digital radio ) or standard analog radio broadcast (a standard sound quality). Through a single radio station, HD radio format offers a simultaneous broadcast of one or more programs additionally to the program being transmitted over the analog channel of the radio stations.

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<sup>7</sup> The channel raster is the basic 'grid' on which the frequency allocations for different services are laid out.

2.11 United States in 2002, designated HD Radio, as a digital radio broadcasting system approved by the Federal Communications Commission (FCC). HD Radio also known as NRSC-5 was the sole system approved for AM and FM radio broadcasting in USA.

2.12 HD radio transmission uses COFDM pooled with codec techniques to compress the sound signals. HD Radio AM hybrid mode can transmit 40 and 60 kbps of data. IBOC can be either combined with analog signal in the same channel or OFDM only. In the LF/MF bands, AM-OFDM mode has bandwidth of 30 kHz while all OFDM modes comprise of 20 kHz bandwidth.

#### **D. Integrated Services Digital Broadcasting for Terrestrial Sound Broadcasting (ISDB-Tsb)**

2.13 The ISDB-Tsb is a standard for digital radio broadcasting developed in Japan to deliver high-quality sound and data broadcasting with high consistency and provide flexibility, expandability, and commonality for multimedia broadcasting using terrestrial networks. It uses OFDM modulation (particularly band segmented transmission (BST) - OFDM), robust two-dimensional time-frequency interleaving and concatenated error correction codes to produce superior sound quality even at low bit rates. ISDB-T system specified for digital terrestrial television (DTT) and ISDB-Tsb have commonality in physical layer. The system has an extensive range of transmission parameters such as carrier modulation scheme, coding rates of the inner error correction code, and length of time interleaving. ISDB-Tsb embraces MPEG-2 systems and can use high compression audio coding methods such as MPEG-2 AAC. It has commonality and interoperability with many other systems which have adopted MPEG-2 such as ISDB-S, ISDB-T, DVB-S and DVB-T. ISDB-TSB can be operated either as a single transmission with a bandwidth of

around 0.5 MHz or 1.5 MHz or as fragment of a full channel ISDB-T transmission in channel bandwidth of either 6,7 or 8 MHz<sup>8</sup>.

2.14 The table 1 shows the comparison between different Digital Radio standards with the bandwidths allocated, frequency bands, Audio compression.

**Table 1: Comparison between Digital Radio Standards**

Standard	ITU-R Recommendation	Audio compression	Transmission technology	RF bandwidth	Frequency range
<b>DAB</b>	Rec. BS.1114-7; System A	MPEG-layer II	Multi-carrier (OFDM)	1.5 MHz	VHF Band III 1.5 GHz
<b>DAB+</b>	Rec. BS.1114-7; System A	HE-AAC	Multi-carrier (OFDM)	1.5 MHz	VHF Band III 1.5 GHz
<b>ISDB-TSB</b>	Rec. BT.1114-7; System F	MPEG Layer II Dolby AC-3 and HE-AAC	Multi-carrier (segmented OFDM)	0.5 MHz or 1.5 MHz	VHF Band III 2.6 GHz
<b>HD Radio (IBOC)</b>	Rec. BT.1114-7; System C	HD-codec	Multi-carrier (OFDM)	400 kHz	VHF Band II
	Rec. BT.1514-2	HE-AAC	Multi-carrier (OFDM)	20 or 30 kHz	MF
<b>DRM30</b>	Rec. BT.1514-2	HE-AAC	Multi-carrier (OFDM)	9 or 10 kHz and multiples	LF/MF/HF
<b>DRM+ (DRM Mode E)</b>	Rec. BT.1114-7 System G	HE-AAC	Multi-carrier (OFDM)	100 kHz	VHF Band I Band II Band III

Source: ITU Report - Trends in broadcasting: An overview of developments

### **International Scenario on Digital Radio Broadcasting**

2.15 In order to avail various benefits of digitization, countries the world over have started undertaking initiatives to accelerate digital terrestrial migration by formulating national plans towards setting up of Digital Radio Broadcasting infrastructure and switching off analog terrestrial

<sup>8</sup> <https://www.itu.int/en/ITU-D/Technology/Documents/Broadcasting/TrendsinBroadcasting.pdf>

services. Many countries viz. Norway, Denmark, Switzerland, USA and Japan have led from the front and launched different radio standards according to the need. Some of them have even announced digital switchover dates. The switchover process has observed a steady advancement with some countries such as Germany, Netherlands being digital embracers while some countries such as Spain, Sweden and Ireland have wait and watch mind-set. USA and Japan have successfully implemented their own digital radio standards.

### **DAB/DAB+**

2.16 In 1995, public DAB services were first launched in Norway and UK. Over the years, the DAB services were expanded to Austria, Germany, Denmark, Switzerland, Malta and Netherlands. Driven through wide variety of programming, not offered in FM radio, countries such as England, Scotland, Wales, Northern Ireland gained substantial listenership by the year 2005. Moreover, with the advent of DAB+, upbringing of new technologies have reduced the transmission costs per programme and also enhanced capacity. In 2009, Australia fruitfully launched DAB+ services. In Hong Kong, five DAB channels were launched in 2012. In Kuwait, regular services of DAB+ were launched in 2014 and now cover 90 percent of the population.

2.17 Norway is the first country which has completed the digital switchover and has shut down the analog FM in December 2017.

### **DRM**

2.18 Several European countries have experimented with DRM. In Germany, UK, Vatican, Sri Lanka and France successful DRM+ trials in frequency band I, II and III have been supported. Currently, DRM+ trials are being held in Sweden.<sup>9</sup>

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<sup>9</sup> The Digital Future of FM

2.19 Brazil has also conducted trials of DRM technology for SW and MW radio broadcasting. It is under test phase and aim is to evaluate equipment behavior, stability and quality of signal<sup>10</sup>.

2.20 In Indonesia, trials of DRM technology were conducted in 2015 and 2016 by Indonesian public broadcaster RRI and DRM Consortium for AM bands. Recently demonstration of DRM in FM band has been conducted<sup>11</sup>.

### **HD Radio**

2.21 In Unites States, HD Radio, also known as IBOC, a trademarked system owned by a consortium of private companies, named iBiquity, has been implemented for digital radio broadcasting on medium wave and VHF band II. In North American countries, iBiquity has successfully achieved high penetration of HD radio technology via automotive OEM (Original Equipment Manufacturer) market.

### **ISDB-Tsb**

2.22 Japan has adopted a standard known as ISDB-Tsb for digital radio. This is related to the ISDB-T television standard and is similar to DAB in operation. However, it has yet to progress beyond test transmissions.

2.23 Status of deployment of digital radio broadcasting in different countries is summarized in table 2. It can be noted that, implementation of digital radio broadcasting has taken place with the participation of both public and private broadcasters. In almost all the countries, number of digital radio stations operated by private broadcasters is more than those operated by public broadcaster.

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<sup>10, 9</sup> [www.worldradio.com](http://www.worldradio.com)

**Table 2: International scenario on deployment of Digital Radio Broadcasting**

Country	Standard	Launch Date	Number of Digital stations		Mode of Transmission		Network coverage (% of population)	Digital Receivers (in %)
			Public	Private	Simul cast	Digital Only		
Norway	DAB+	1995	12	41	27	26	99	71
Denmark	DAB/DAB+	2002	10	36	35	11	98	46
United Kingdom	DAB/DAB+	1995	63	261	213	111	97	57
	DRM+	field trial of the DRM system in the FM band conducted in the central Scotland area, centred on the city of Edinburgh, in the United Kingdom during January to May 2011 <sup>12</sup>						
Switzerland	DAB+	1999	17	84	17	84	99.5	43
Germany	DAB+	2011	69	92	121	40	95	13
Malta	DAB+	2008	9	31	15	25	100	-
Netherlands	DAB+	2013	27	40	40	27	95	6
Belgium	DAB/DAB+	2015	9	9	14	4	95	-
Czech Republic	DAB/DAB+	2011	13	16	20	9	58	-
Italy	DAB+	2012	29	76	88	17	76	-
France	DAB+	2014	7	84	82	9	19	-
Poland	DAB+	2013	30	6	28	8	56	-
Monaco	DAB+	2014	2	16	9	9	100	-
Brazil	DRM	DRM-30 signals have been test-broadcast by Empresa Brasil de Comunicação, Brazil's public broadcaster, on 9.740 kHz shortwave, since the end of October, 2016.						
Indonesia	DRM /DRM+	Demonstration conducted in 2015 and 2016 by Indonesian public broadcaster RRI and DRM Consortium for DRM 30 in AM bands. Recently DRM+ trials have been conducted for FM band.						

2.24 ITU in its report on “Implementation considerations for the introduction and transition to digital terrestrial sound and multimedia broadcasting”<sup>13</sup> published in July 2015; highlighted social, regulatory

<sup>12</sup> BBC Research White Paper: RESULTS OF THE DRM+ HIGH POWER FIELD TRIAL IN THE UNITED KINGDOM

<sup>13</sup> [https://www.itu.int/dms\\_pub/itu-r/opb/rep/R-REP-BS.2384-2015-PDF-E.pdf](https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-BS.2384-2015-PDF-E.pdf)

and technical factors involved while considering a transition to digital radio broadcasting using various digital transmission technologies and provided some successful implementations and field trials of digital radio broadcasting technologies.

## CHAPTER 3

### ISSUES RELATED TO DIGITIZATION OF FM RADIO BROADCASTING

3.1 This chapter analyses the key issues associated with the digital radio broadcasting in light of the comments submitted by the stakeholders during the consultation process and recommendations thereon.

**A. Need to encourage or facilitate introduction of digital radio transmission**

3.2 As already discussed, radio broadcasting in India is available in MW, SW and VHF-II (FM) frequencies. The public broadcaster - All India Radio (AIR) has already initiated digitization of MW and SW radio network. However, the growth is dismal and popularity of such channels is low. Contrary to it, the popularity of FM Radio is high with the participation of private FM Radio broadcasters. Therefore, if digital radio broadcasting is to be encouraged, we must also include private radio broadcasters in the process. Since private radio broadcasters are operating their channels in VHF-II (FM) band, we must consider this band also to permit digital radio broadcasting services. However, there appears to be no initiative in FM radio band to provide digital radio broadcasting services either by public broadcasters or private broadcasters. Accordingly, in the consultation paper comments were sought from stakeholders whether there is a need to encourage or facilitate introduction of digital radio transmission in VHF-II band at present.

3.3 In response, most stakeholders are of the opinion that there is a need to encourage/facilitate digital radio transmission. Some stakeholders mentioned that the government has to be a facilitator and build policy and licensing terms. Some stakeholders suggested that the basic ecosystem of policy framework should be build and incentives should be

provided to commercial broadcasters for digital rollout such as incentives on spectrum auction.

- 3.4 Some stakeholders including private FM Radio broadcasters and their association are of the opinion that there is no urgency to pursue digitalization in radio broadcastings except creating an eco-system and let its evolution take place at its own pace till the time sufficient affordable digital receivers become available and enough listenership is reached. Some of them mentioned that private radio broadcasters must be protected against sudden disruptions in their service as they have made significant investments in FM Phase-III auctions.
- 3.5 One stakeholder is of the view that there is no need to encourage/facilitate digital radio transmission at present as many broadcasters are in favour of broadcasting via World Wide Web (www).
- 3.6 Exhaustion of frequencies for analog Radio transmission in FM band has been one of the reasons for migration to digital radio broadcasting in most of the countries. In India, the policy guidelines for the Phase-III of FM Radio provides for 9 to 11 channels in category 'A+' cities and 6 channels in category 'A' cities, except for Bangalore and Hyderabad where 8 channels are provided. In case of category 'B' and 'C' cities, 4 channels are provided; and for category 'D' cities and cities with population less than one lakh, 3 channels are provided. The industry, since 2011, has been demanding that more number of channels be made available, in order to provide better choice to the consumers, ensure realistic bidding process, better business opportunities for the broadcasters of private FM channels, and higher revenue to the government through efficient use of the FM radio spectrum by reducing the minimum channel spacing. The MIB in August 2011 had requested TRAI to consider the issue of minimum channel spacing within a license

service area in the FM radio sector. On examination of the issue through a consultation process, the Authority recommended that the frequencies for FM Radio channels, within a license service area, may be released with a minimum spacing of 400 KHz instead of 800 KHz. Though Broadcast Engineering Consultants India Limited (BECIL), All India Radio, Doordarshan and Wireless Planning and Coordination (WPC) wing of Department of Telecommunication, had conducted field trials for broadcasting of FM radio channels with a minimum spacing of 400 KHz, but the same has not been implemented. Now the digital broadcasting technologies make it possible to provide multiple radio channels on a single frequency, which would fulfill the demand of additional channels and also lead to efficient utilization of the radio spectrum. In addition to it, digital broadcasting brings a number of benefits including increased choice and better quality of reception, reduced cost of operations, enhanced coverage, and transmission of messages combining text and images. Listeners today demand a greater diversity of audio content as proliferated by on-demand multimedia culture.

3.7 It is noted that the present Phase-III FM radio policy restricts use of allocated frequency in VHF-II band for providing FM Radio services only. Phase-III policy guidelines do not permit use of any other radio broadcasting technologies. Restriction on the use of digital broadcasting technologies would hamper migration to digital radio broadcasting. In order to facilitate smooth migration to digital radio broadcasting, Phase-III policy should permit use of digital radio broadcasting technologies also which can transmit radio signals in VHF-II band.

3.8 The Authority is of the view that introduction of digital radio broadcasting would allow the radio broadcasters to offer a variety of channels which will provide diverse content to the listeners but would also result in increase in the penetration of radio broadcasting in

different markets and would result in growth of the revenue of the broadcasters and the government as well. The Authority is also of the view that in order to bring all the stakeholders - radio broadcasters, transmission equipment manufacturers, and digital receivers manufacturers - on one platform and encourage them to work collectively for developing the ecosystem for digital radio broadcasting, the government should come out with a detailed policy framework for Digital Radio Broadcasting in India which should provide detailed roadmap for rollout of digital radio broadcasting services in a time bound manner.

**3.9 Accordingly, the Authority recommends:**

**3.9.1 There is a definite need to facilitate digital radio broadcasting in India to effectively utilize spectrum in VHF-II band for Radio broadcasting, to provide diverse content and other value-added services to radio listeners.**

**3.9.2 The Government should notify the policy framework for Digital Radio Broadcasting in India in time bound manner with a clear roadmap for rollout of digital radio broadcasting services. It will encourage all stakeholders to work collectively for developing the ecosystem for digital radio broadcasting.**

**B. Frequency bands for Digital Radio broadcasting**

3.10 NFAP-2011 issued by Wireless Planning and Coordination (WPC) wing of Department of Telecommunications has identified the frequency band 174-230 MHz (VHF-III) for digital radio broadcasting. During the year 2011, digital technologies for radio broadcasting were mainly available in this band, and MW & SW bands only. It says that:

*“IND23 Digital Audio Broadcasting (DAB) may be considered in the frequency band 174-230 MHz initially in the four Metro cities and further introduction of DAB could be considered on a case-by-case basis taking into account interference potentiality aspects.”*

However, presently, this frequency band spectrum is in use for analog terrestrial TV broadcasting in the country.

- 3.11 Due to non-availability of additional frequencies required for expansion of analog FM radio broadcasting services in VHF-II band, most of the European countries are operating digital radio broadcasting services in VHF-III band. Subsequently, technologies for digital radio broadcasting have been developed which can operate in frequency band 88-108 MHz (VHF-II) also.
- 3.12 A few Stakeholders are of the view that MW and SW bands are crucial for domestic and overseas coverage today and in future. They must be digitized not only to provide excellent sound quality but also a number of other value-added services. Some other stakeholders suggested that VHF band must also be digitized to utilize the scarce resources (energy, spectrum) optimally, and to provide better and future-ready services to listeners that are in-line with modern media consumption and quality expectations.
- 3.13 While MW and SW bands can provide vast coverage, VHF bands can provide the required capacity. FM Radio services are very popular in vehicles and hand-held receivers. There are large number of mobile handsets which have built-in FM Radio tuners. Further, technology permits that VHF-II band can be used to provide digital Radio broadcasting without any interference with existing FM Radio

broadcasting. This will facilitate easy migration without disrupting present business model of FM Radio broadcasting. Implementation of digital broadcasting in the exiting FM band will result in efficient utilization of this frequency band and additional spectrum will not be required. Presently, the Government has opened only this frequency band for private sector. In order to enable implementation of digital radio broadcasting in MW, SW, and VHF-II frequency bands, WPC would require amending the provisions of NFAP 2011. WPC should also identify the spectrum available including frequency spots in VHF-II frequency bands, which can be allocated to public and private radio broadcasters for providing digital radio broadcasting services, taking into account interference potentiality aspects. Presently, spectrum in the VHF-III band is not available for radio broadcasting.

**3.14 Accordingly, the Authority recommends:**

**3.14.1 The WPC wing of DoT shall carry out necessary amendments in NFAP-2011 for permitting radio broadcasting including digital radio broadcasting in MW, SW, and VHF-II frequency bands also, which are already identified for and being used for radio broadcasting in India.**

**C. Approach for implementation of digital broadcasting**

3.15 In the consultation paper three possible approaches - full conversion, market-based, and managed introduction - for implementation of digital audio broadcasting were discussed and comments of stakeholders were solicited.

3.16 In response most of the stakeholders are in favour of managed introduction approach. Some stakeholders are of the view that managed introduction approach responds to the continued development of the

market and at the same time brings about an orderly transition to digital radio in the desired time frame. Some other stakeholders suggested that in managed approach, several priorities may be established as a part of national objectives and incentives may be earmarked for quick transition to digital radio.

- 3.17 A few stakeholders are in favour of market based approach whereas no stakeholder is in favour of full conversion approach.
- 3.18 The Authority is aware that though full conversion to digital radio is the ultimate goal in the long run, adopting this approach at the beginning would require replacement of all radio receivers and transmitters. Further, the permissions for operating FM Radio channels for a period of 15 years have recently been issued to private radio broadcasters through auction process. Therefore, this approach is not a feasible option.
- 3.19 The market based approach also suffers due to lack of ecosystem for digital radio broadcasting in the country. Unless clear policy framework is defined and unified efforts are made, it may not be possible to develop required ecosystem for digital radio broadcasting. As such, this approach also does not appear to be a feasible approach in near future.
- 3.20 In the present circumstances managed introduction approach is a clear winner. In a managed introduction the regulator/government provides a clear roadmap enabling a conducive environment and ecosystem for deployment of digital radio broadcasting by existing radio broadcasters. In this approach digital transmission can be introduced in simulcast mode initially while reducing the analog transmission gradually based on the availability of digital receivers. This will ensure sustainable revenues for the existing radio broadcasters thereby encouraging them to adopt digital broadcasting.

3.21 The countries world over have undertaken major initiatives to migrate to digital radio broadcasting by formulating roadmaps and switching off analog radio services in a time bound manner. The digital radio migration path adopted by each country has been influenced by national priorities and plans. In several countries managed approach has been adopted for migration to digital radio broadcasting. In Austria, France and Poland, regulators have taken initiatives and acted as a driving force in the deployment of digital radio, even when main broadcasters were not committed. In some countries licenses for analog radio broadcasting are being linked to commitments in digital radio, or their duration is being synchronized with the digital radio roll-out timetable. This clearly indicates that even international deployments favor managed introduction approach for migration to digital Radio broadcasting.

3.22 In view of above developments, the Authority is of the view that the managed introduction approach for rolling out digital radio broadcasting services could be forward looking, and implementable model.

3.23 **Accordingly, the Authority recommends:**

3.23.1 **A managed introduction approach should be adopted for rolling out digital radio broadcasting services in India.**

**D. Roadmap for implementation of digital radio broadcasting**

3.24 In the consultation paper stakeholders were requested to provide comments on the need to frame a roadmap for migration to digital radio broadcasting.

3.25 In response most of the stakeholders emphasized the need to prescribe a roadmap for migration to digital radio broadcasting. Some of these

stakeholders are of the view that a roadmap will act as a catalyst for device manufacturers to launch new and cheap radio receivers. Some stakeholders suggested that a national framework should be set up for introduction and changeover to digital radio in the FM band. According to them it will ensure well-coordinated introduction of new technologies and services, which in turn, brings substantive benefits to the broadcasters and to the industry as a whole while facilitating digital radio broadcasting to provide better services to consumers.

- 3.26 Some stakeholders, who have supported managed approach, are of the opinion that digital broadcasting should be introduced in simulcast mode with analog broadcasting, in order to enable existing broadcasters to sustain their revenues. Some of these stakeholders suggested that an additional frequency in VHF-II band may be allocated without any additional charges for some predefined period, say 5 years, to each of the successful bidders on the condition to implement digital services within a definite period. They further mentioned that in case of failure to rollout the digital broadcasting within specified period, the allocation of the additional frequency for digital radio broadcasting should be cancelled and auctioned-off to third parties. Some stakeholders suggested that digital broadcasting spot frequencies, which are 400 KHz separated from the existing operational FM frequencies, may be allocated for digital radio broadcasting. One stakeholder suggested that initially digital Radio should be introduced in category A+, A & B cities to increase the channel capacity via separate auctioning to understand spectrum efficiency and capacity in first instance. Another stakeholder is of the opinion that prior to deployment of digital radio broadcasting, the spectrum regulator should establish acceptable interference threshold levels, in accordance with ITU-R Recommendations and national spectrum practices.

3.27 Some stakeholders are of the opinion that there is a need to enable private radio broadcasters to migrate to digital broadcasting but proposing a roadmap at present juncture may not be proper. They are of the view that a realistic roadmap could be framed at a later stage after adequate ecosystem has been developed.

3.28 The Authority intends to foster the development of an ecosystem for development of digital radio broadcasting complementing analog services. In order to sustain the revenue of existing radio broadcasters while introducing digital radio broadcasting, it has to be ensured that existing analog transmission remain in operation. At some point of time, the existing analog radio broadcasters should also get opportunity to migrate to digital radio broadcasting. This is possible only if frequencies within existing SW, MW, and FM bands are utilized for digital transmission. However, presently in India, private sector is allowed to provide radio broadcasting services in FM band spectrum only. International experience suggests that the simultaneous operation of analog and digital radio services is likely to continue for a significant period as complete migration to digital radio can be done when required ecosystem is well developed.

3.29 Studies conducted by International Telecom Union (ITU), Electronic Communications Committee within the European Conference of Postal and Telecommunications Administrations (CEPT), Institute of Electrical and Electronics Engineers (IEEE), and European Broadcasting Union (EBU) indicate that new digital transmitters can be introduced within the existing FM environment in following three ways:

- (i) Simulcast operation of digital and analog transmission on the same frequency band allocated for FM radio broadcast
- (ii) Replacing an existing FM transmitter with digital transmitter

(iii) Interleaving of digital transmission within existing operational FM frequencies

- 3.30 In the first option there is simulcast operation of digital radio and analog FM radio on the same frequency allocated to existing radio broadcasters for providing FM Radio broadcasting services. In this option existing infrastructure already in use for FM Radio broadcasting services can be utilized for digital radio broadcasting also. However, this may not be an effective option due to non-availability of digital radio receivers.
- 3.31 In the second option the existing FM transmitter is replaced with new digital transmitter. This option cannot be adopted in the initial stages of development as limited number of digital radio receivers will result in significant reduction in the listenership and hence revenue of existing radio broadcasters. This option may be adopted at a later stage when adequate number of digital radio receivers will become available and ecosystem is well developed.
- 3.32 The third option entails the introduction of digital transmission on new frequencies identified in between the existing operational analog FM frequencies. While doing so, it has to be ensured that transmission of digital radio has no interference with FM radio broadcast and quality of FM radio reception is not compromised. To achieve this, an existing transmission site could be used with a new frequency or a new site could be set up at a completely new location. This will require in-depth study and identification of frequencies in FM band which can initially be used for digital radio broadcasting.
- 3.33 At present in Phase-III of FM Radio, spot frequencies for FM Radio are allocated to Radio broadcasters through auction. In addition, most of the FM radio channels which became operational in Phase-II of FM Radio,

also migrated to Phase-III of FM radio by paying the migration fee prescribed by MIB. The bandwidth allocated to Radio broadcasters for their channels is  $\pm 100$  KHz of the spot frequency i.e. 200KHz. From the perusal of studies conducted by international bodies, it is evident that some technologies have been developed which permit simultaneous transmission of analog FM and digital radio signals within the  $\pm 100$  KHz of the spot frequency already allocated to Radio broadcasters.

- 3.34 It is important to mention that the FM radio frequencies which have already been allocated and are committed for FM radio are not being effectively used to exploit new technological development of digital Radio Broadcasting. Government cannot auction these frequencies before expiry of allocated term. Hence, encouraging optimum utilization will be the best cause of action. After analyzing the stakeholders' comments, for rolling out digital radio broadcasting services quickly using existing infrastructure with minor up-gradation, the Authority noted that one way could be that an offer may be made to the existing FM Radio broadcasters to provide digital radio broadcasting services in their allocated band as also suggested by some stakeholders. For this purpose, they may get their existing frequency bands of  $\pm 100$  KHz, already allocated to them, liberalized free of charge and provide digital Radio broadcasting services in the existing band of  $\pm 100$  KHz in simulcast mode with analog FM radio services. In order to persuade investments in digital radio broadcasting during initial phase of development, liberalization of existing frequencies could be permitted without levying any additional charge. The existing broadcasters would be required to accept or reject this offer within predefined period. If a broadcaster accepts the offer of liberalization, it would have to rollout the digital radio broadcasting service within a period of say two years from the date of acceptance of the offer. In order to ensure timely rollout of digital radio services by existing broadcasters after accepting the offer, they could be

required to furnish a Performance Bank Guarantee (PBG). In case a broadcaster fails to rollout digital radio services within pre-specified time frame, the PBG of such broadcaster could be forfeited, and the permission to deploy digital radio services within existing  $\pm$  100 KHz of the frequency band, without any additional charges, could also be withdrawn. For existing broadcasters who do not accept this introductory offer of liberalization or fail to rollout digital radio services within pre-specified timeframe, a separate scheme for liberalization of spectrum, on charge basis, to be determined at that point of time, can be brought out. This may be a win-win situation for the Government as well as the broadcasting sector. The sector will grow at much faster pace while the Government would get additional license fee due to increase in gross revenue of the service providers.

3.35 While on face of it, above option sounds well, still, adoption of this method has contractual issues favoring FM frequency holders which may tantamount to amending the Grant of Permission Agreement (GOPA), already entered by existing broadcasters with MIB, for providing analog FM radio services, without due considerations for provision of digital radio broadcasting services . One can always argue that by adopting to allow existing FM radio broadcasters to provide digital radio broadcasting services, existing FM radio broadcasters have been given undue favour. Others may also argue that since existing permissions permit only analog FM radio services, hence, no additional service can be provided. It may attract some legal issues and may delay the whole process.

3.36 The other option could be that, at the first stage, the price of spectrum of equivalent bandwidth i.e. 200 KHz in the VHF-II frequency band between the allocated frequencies to FM radio broadcasters and presently spare as guard band is determined through auction process. In this regard, it is pertinent to note here that presently frequencies for FM Radio

channels, within a license service area, are allocated with a separation of 800 KHz and for a FM Radio channel, bandwidth allocated is  $\pm 100$  KHz of the spot frequency i.e. 200 KHz. Accordingly, in between two adjacent FM radio channels, 600 KHz spectrum is vacant in VHF-II band. A frequency of 200 KHz bandwidth within vacant 600 KHz spectrum in VHF-II band can be auctioned to find its market based price for providing digital radio broadcasting services. It may also be pertinent to mention that digital Radio technologies permit multiple channels on the same frequency in VHF-II band as compared to single channel by FM radio technology. Therefore, the auction price of 200 KHz bandwidth in VHF-II band for providing digital radio broadcasting is likely to be higher as compared to auction price of same bandwidth for providing analog FM radio broadcasting.

3.37 Once the market determined price is available for 200 KHz spot frequency for provision of digital radio broadcasting services (number of channels can be specified based on technical feasibility), the same can be used as a yard stick to offer existing FM radio broadcasters. An option could be given to existing radio broadcasters to get their allocated frequency bands liberalized by paying an amount equal to the difference in the auction determined price of 200 KHz band for digital radio broadcasting and the price paid for getting FM radio frequency allocated. It may be noted that in case auction price of 200 KHz band for digital radio broadcasting determined through market mechanism is lower than / equal to that of FM radio frequency allocation price, than no additional money will be charged and FM radio broadcasters will be permitted to provide digital radio broadcasting services also (number of channels to be defined). In addition to FM radio services.

3.38 The Authority is of the opinion that later option would ensure orderly growth of digital radio broadcasting services in the country and enable

more services for the radio listeners. It would also ensure efficient use of available spectrum. Accordingly, deployment of digital radio within existing FM frequency bands would be a win-win for everyone – the Government, Radio broadcasters and listeners.

3.39 As the demand of radio channels is relatively more in category ‘A+’ and ‘A’ cities due to their metropolitan character, and all currently identified frequencies for analog FM radio operations having been already auctioned, the Government should immediately entrust the task of frequency and geographical area coverage planning for operating digital radio channels in the vacant 600 KHz spectrum in VHF-II band between FM radio channels already allocated for category A+ (4 Metro cities), and category A cities (8 cities) to BECIL, AIR, and WPC together. Frequency and geographical area coverage planning for digital radio broadcasting services in this 600 KHz spectrum for rest of the country may be carried out by the same group in second phase. WPC should notify the channel plan for each type of digital radio broadcasting technology. Auction should be carried out by MIB in phases – starting with cities of category ‘A+’ and ‘A’ and subsequently in cities of other categories. TRAI will provide reserve price and other related recommendations once this is accepted by MIB in principal.

3.40 As far as VHF-III (174-230 MHz) band is concerned, presently analog terrestrial TV broadcasting services are provided by Doordarshan in this frequency band. However, Doordarshan has already started digital terrestrial transmission (DTT) services in 16 cities in 2016. The DTT services of Doodarshan are being provided in UHF Band IV (470-585 MHz). TRAI in its recommendations on Issues related to Digital Terrestrial Broadcasting in India dated 31<sup>st</sup> January 2017 recommended that DTT migration and analog switch-off in the country may be completed by 31<sup>st</sup> December 2023. It is expected that once Doordarshan

migrates its analog terrestrial TV broadcasting services to DTT services, spectrum in VHF-III band will get vacated. In that scenario, frequency and geographical area coverage planning for digital radio broadcasting services using VHF-III band of spectrum may also be carried out by BECIL, AIR, and WPC in third phase.

- 3.41 On the issue of whether single technology be adopted for digital broadcasting for entire country or choice of technology should be left to radio broadcasters, most of the stakeholders are of the view that single digital radio technology should be adopted for entire country. Some stakeholders mentioned that a uniform technology enables economy of scales for production of digital receivers and facilitates faster development of ecosystem. Some other stakeholders mentioned that single digital radio technology brings uniform technical parameters & equitable platform for everyone whereas leaving the choice of technology to radio broadcasters will lead to non-uniform platform and chaos from spectrum use / regulatory point of view. One stakeholder has mentioned the in most of the major international markets single digital radio technology have been adopted.
- 3.42 On the other hand, a few stakeholders are of the opinion that choice of technology for digital broadcasting should be left to the market forces and the radio broadcasters should be allowed to choose most efficient and most cost-effective transmission mechanism for satisfying their coverage needs.
- 3.43 However, on the issue of which technology should be used in case of single country wide technology is adopted for digital broadcasting, stakeholders have fragmented opinions. Some stakeholders have suggested DAB+, some have suggested DRM+ and some have suggested HD radio. Some stakeholders including FM radio broadcasters and their

association have not suggested any specific technology. They are of the view that adequate experimentation/evaluation of digital radio and its impact assessment should be carried out with the active participation of existing private FM radio broadcasters before adopting any digital radio technology.

3.44 On careful examination of the issue, the Authority is of the view that in order to facilitate development of digital radio broadcasting in orderly manner, adoption of any one technology could be beneficial. However, the Government mandating a particular technology standard may not be advisable. This can be decided by market forces. Accordingly, adhering to its technology neutral policy, the Authority do not wish to mandate any specific technology for rollout of digital radio broadcasting services and leave it to the market forces to use technology of their choice for rolling out digital radio broadcasting services. It is expected that FM radio broadcasters will be a mature role in deciding most suitable technology considering the interest of listeners and keeping in view the compatibility with available channel frequency.

3.45 The Authority is of the view that the roadmap mentioned above would enable a smooth transition from analog to digital, without disruption of the existing FM Radio services. Furthermore, those broadcasters that have no intention to introduce digital radio services for the time being would not be adversely affected by others wishing to introduce digital systems.

3.46 **Accordingly, the Authority recommends:**

3.46.1 **Private sector should be permitted to provide digital radio broadcasting services within the existing frequency band of 88 – 108 MHz used for FM radio broadcasting.**

- 3.46.2 **The frequency and geographical area coverage planning for digital radio broadcasting for vacant 600 KHz spectrum between two allocated FM frequencies in VHF-II band should be completed by BECIL, AIR, and WPC together within three months for category A+ (4 Metro cities), and category A cities (8 cities) in first phase.**
- 3.46.3 **The frequency and geographical area coverage planning for digital radio broadcasting services in VHF-II band for rest of the country should be completed by BECIL, AIR, and WPC together in second phase.**
- 3.46.4 **Frequency and geographical area coverage planning for digital radio broadcasting services using VHF-III (174-230 MHz) band of spectrum should also be carried out by BECIL, AIR, and WPC together in third phase, after this spectrum get vacated.**
- 3.46.5 **WPC should notify the channel plan for each type of digital radio broadcasting technology.**
- 3.46.6 **200 KHz bandwidth spectrum between two allocated FM frequencies in VHF-II band should be auctioned for providing digital Radio broadcasting services in category A+ (4 Metro cities), and category A cities (8 cities) immediately after notification of the policy for digital radio broadcasting and notification of channel plan by WPC.**
- 3.46.7 **Auction should be carried out in phases – starting with cities of category ‘A+’ and ‘A’ and subsequently in cities of other categories.**

- 3.46.8 **Immediately after the successful auction of spectrum for digital radio broadcasting, an offer should be made to the existing FM Radio broadcasters to get their existing frequency bandwidth of  $\pm$  100 KHz, already allocated to them through auction in Phase-III of FM Radio, liberalized and provide digital radio broadcasting services in simulcast mode with analog FM Radio services.**
- 3.46.9 **For liberalizing of existing spectrum, already allocated to the FM radio broadcasters in Phase-III of FM Radio, they will have to pay an amount equal to the difference of auction determined price of equivalent spectrum for digital radio broadcasting in a city and amount paid for allocation of FM radio frequency.**
- 3.46.10 **In case market determined price of 200 KHz for digital radio broadcasting is less than or equal to the price paid by FM radio broadcasters than FM radio broadcasters will not be required to pay any additional amount and he will be permitted to provide digital radio broadcasting services also for the remaining period of permission.**
- 3.46.11 **The broadcasters should be allowed to make use of any available digital technology, recognized by ITU, within the allocated/liberalized spectrum for providing digital radio broadcasting services subject to adaptation, if any, recommended by MIB/TRAI from time to time.**

**E. Date for digital switch over**

- 3.47 In the consultation paper the stakeholders were asked to suggest a date for digital switch over of radio broadcasting services. After that date the analog radio broadcasting services would be switched off.

- 3.48 In response some stakeholders are of the view that declaration of a digital switch over for radio broadcasting in India will be pre-mature to decide as Phase-III permissions to private FM Radio broadcasters have been granted recently for 15 years. They have suggested that any switch over date can be finalized only after the digital listenership base exceeds analog base or after permission period of 15 years is over. They are of the view that instead of switch over date, a start date for digital radio broadcasting should be declared and the requirement for date of digital switch over should be reviewed after five years from the commercial launch of the digital radio system.
- 3.49 Some stakeholders are of the opinion that digital switchover date should be declared. They mentioned that if switch over date is not declared, spectrum would be occupied by both analog and digital frequencies indefinitely. Some stakeholders have suggested that the digital switch over should be completed by 2020. Some stakeholders are of the view that a start date for digital radio broadcasting should be declared in order to set a common goal that all stakeholders can work towards and commit to.
- 3.50 The Authority is aware that the date for digital switch over for radio broadcasting has to be determined with due care and after adequate studies on the current state of the industry, its ability to invest in infrastructure, availability of digital radio receivers. The Authority is of the view that it will not be plausible to declare any date for digital switch over in the present circumstances. The situation may be reviewed once the ecosystem for digital radio broadcasting is developed and broadcasters start implementing digital radio broadcasting.

3.51 The Authority is also of the view that existing FM broadcasters should be permitted to continue their analog FM Radio channels for their existing Phase-III permission period.

3.52 **Accordingly, the Authority recommends:**

3.52.1 **No date for digital switch over of radio broadcasting services should be declared at this stage.**

3.52.2 **Existing analog FM Radio channels should be allowed to remain operational for the remaining period of their Phase-III permissions.**

3.52.3 **The continuance of operation of existing analog FM Radio channels that do not migrate to digital radio broadcasting, should be reviewed after the expiry of their existing Phase-III permissions.**

#### **F. Auction of remaining channels of Phase-III**

3.53 As mentioned in chapter 1, at the end of Phase-II, 243 FM Radio channels were operational in 86 cities. In Phase-III expansion of FM radio, 966 FM radio channels are to be made available in 333 cities. Auction of FM radio channels for Phase-III were conducted by MIB in two batches in 2015 and 2016, wherein a total of 162 FM Radio channels have been successfully auctioned. This indicates that MIB would be required to auction remaining 804 FM radio channels in future.

3.54 Phase-III policy guidelines mandate radio broadcasting using FM technology and it does not permit use of any other radio broadcasting technology. In the consultation paper, stakeholders were asked to comment whether the permission for operating radio channel be delinked from technology used for radio broadcasting for future auctions of channels.

- 3.55 In response most of the stakeholders agree that for channels yet to be auctioned, the policy should be revised to delink technology used for radio broadcasting. Some of them mentioned that a broadcaster holding FM permission should be given the free option of choosing any technology it wants as listener is unconcerned whether the content is broadcast over FM or digital.
- 3.56 A few stakeholders are of the view that the permission for operating FM channel should be linked with the technology used for radio broadcasting and rigorous specification of technology be specified.
- 3.57 Some stakeholders suggested that though there is a need for eventually moving to digital radio broadcasting, any change in the policy at this stage would delay Phase III implementation and might be resisted by the stakeholders.
- 3.58 In order to facilitate smooth transition to digital radio broadcasting, Phase-III policy should be revised to permit use of any transmission technology, analog or digital or both, for channels yet to be auctioned, which can provide radio broadcasting services in the 88 – 108 MHz. Any restriction in the policy on the use of digital broadcasting technologies would hamper transition to digital radio broadcasting. In telecom sector also telecom service providers are permitted to use any technology on the spectrum obtained by them through auction. A telecom service provider possessing liberalized spectrum in 900 MHz band is free to deploy 2 G, 3G, or 4G services using this spectrum based on its business model. Similarly after revision of the policy, any entity, who successfully bid for a frequency spot in the 88 – 108 MHz band, should be allowed to use any radio broadcasting technology either analog FM broadcasting or digital radio broadcasting or simulcast of the two. Accordingly, the Authority is

of the view that Phase-III auction of remaining channels should be done by delinking them from technology. Broadcasters should be permitted to use any technology (analog or digital) for radio broadcasting on the frequency allocated to them through auction in future. In case Radio broadcasters opt for digital technology, they should be permitted to broadcast more than one channel on single frequency allocated to them.

**3.59 The Authority recommends:**

**3.59.1 The auction of remaining channels of Phase-III should be done by delinking them from technology. Broadcasters should be permitted to use any technology (analog or digital or both) for radio broadcasting on the frequency allocated to them through auction in future. In case Radio broadcasters opt for digital technology, they should be permitted to broadcast more than one channel subject to technical feasibility on single frequency allocated to them.**

**G. Affordability of Digital Receivers**

3.60 Development of an eco-system for availability of affordable receivers for masses is crucial for development of digital radio broadcasting. The stakeholders were asked to suggest the measures required to reduce the prices of digital radio receivers and develop ecosystem for transition to digital radio broadcasting.

3.61 In response stakeholders have given several suggestions. Some stakeholders suggested that the government should offer subsidies to local receiver manufactures, mobile phone manufacturers to integrate the digital radio receiver chips. Some other stakeholders suggested that the government should support standalone digital radio receiver

manufacturers by assuring order for critical volume to bring down cost to affordable level and distribute. One stakeholder suggested that the government should waive off all import duties on finished receivers or on parts that are used to manufacture receivers in India. Another stakeholder suggested that collaboration with IITs and IISc should be made in the process of developing digital radio standards, device development etc. Some other stakeholders suggested that mobile manufacturers and car manufacturers should be mandated to integrate digital receivers in mobile handsets and cars.

3.62 The business model of radio broadcasting service is based on advertisement revenue and the rates of the advertisements are generally linked with the listenership of a particular channel. In absence of availability of digital radio receivers at affordable price, listeners may not be able to experience digital broadcasting services. In the absence of good quality receivers that are affordable and widely available, there are no incentives for broadcasters to provide digital Radio broadcasting services, which in turn may discourage the investments by receiver manufacturers. Therefore, in order to develop the ecosystem i.e. transmission as well as receivers for digital radio broadcasting, it would be necessary that all stakeholders are guided by common goal.

3.63 The Authority is of the view that notification of Digital Radio Broadcasting Policy by the Government will automatically bring all the stakeholders on one platform, encouraging them to make concentrated efforts for ensuring availability of digital radio broadcasting services and adequate number of digital receivers at affordable prices. The Authority is also aware that some car manufactures have started providing digital receivers in new models. In addition App based and dongle based digital receivers are also being developed. Once ecosystem for digital Radio broadcasting is developed, economies of scale will bring down the prices

of digital receivers. However, initially some incentives should be provided for development of affordable digital radio receivers.

**3.64 Accordingly, the Authority recommends:**

**3.64.1 For initial three years after declaration of Digital Radio Broadcasting Policy, the Government should grant fiscal incentives in the form of lower tax rates to manufacturers of digital radio receivers.**

## CHAPTER 4

### Summary of Recommendations

#### Need to encourage or facilitate introduction of digital radio transmission

- 4.1 There is a definite need to facilitate digital radio broadcasting in India to effectively utilize spectrum in VHF-II band for Radio broadcasting, to provide diverse content and other value-added services to radio listeners. (refer para 3.9.1)
- 4.2 The Government should notify the policy framework for Digital Radio Broadcasting in India in time bound manner with a clear roadmap for rollout of digital radio broadcasting services. It will encourage all stakeholders to work collectively for developing the ecosystem for digital radio broadcasting. (refer para 3.9.2)

#### Frequency bands for Digital Radio broadcasting

- 4.3 The WPC wing of DoT shall carry out necessary amendments in NFAP-2011 for permitting radio broadcasting including digital radio broadcasting in MW, SW, and VHF-II frequency bands also, which are already identified for and being used for radio broadcasting in India. (refer para 3.14.1)

#### Approach for implementation of digital broadcasting

- 4.4 A managed introduction approach should be adopted for rolling out digital radio broadcasting services in India. (refer para 3.23.1)

### **Roadmap for implementation of digital radio broadcasting**

- 4.5 Private sector should be permitted to provide digital radio broadcasting services within the existing frequency band of 88 – 108 MHz used for FM radio broadcasting. (refer para 3.46.1)**
- 4.6 The frequency and geographical area coverage planning for digital radio broadcasting for vacant 600 KHz spectrum between two allocated FM frequencies in VHF-II band should be completed by BECIL, AIR, and WPC together within three months for category A+ (4 Metro cities), and category A cities (8 cities) in first phase. (refer para 3.46.2)**
- 4.7 The frequency and geographical area coverage planning for digital radio broadcasting services in VHF-II band for rest of the country should be completed by BECIL, AIR, and WPC together in second phase. (refer para 3.46.3)**
- 4.8 Frequency and geographical area coverage planning for digital radio broadcasting services using VHF-III (174-230 MHz) band of spectrum should also be carried out by BECIL, AIR, and WPC together in third phase, after this spectrum get vacated. (refer para 3.46.4)**
- 4.9 WPC should notify the channel plan for each type of digital radio broadcasting technology. (refer para 3.46.5)**
- 4.10 200 KHz bandwidth spectrum between two allocated FM frequencies in VHF-II band should be auctioned for providing**

**digital Radio broadcasting services in category A+ (4 Metro cities), and category A cities (8 cities) immediately after notification of the policy for digital radio broadcasting and notification of channel plan by WPC. (refer para 3.46.6)**

- 4.11 Auction should be carried out in phases – starting with cities of category ‘A+’ and ‘A’ and subsequently in cities of other categories. (refer para 3.46.7)**
- 4.12 Immediately after the successful auction of spectrum for digital radio broadcasting, an offer should be made to the existing FM Radio broadcasters to get their existing frequency bandwidth of  $\pm$  100 KHz, already allocated to them through auction in Phase-III of FM Radio, liberalized and provide digital radio broadcasting services in simulcast mode with analog FM Radio services. (refer para 3.46.8)**
- 4.13 For liberalizing of existing spectrum, already allocated to the FM radio broadcasters in Phase-III of FM Radio, they will have to pay an amount equal to the difference of auction determined price of equivalent spectrum for digital radio broadcasting in a city and amount paid for allocation of FM radio frequency. (refer para 3.46.9)**
- 4.14 In case market determined price of 200 KHz for digital radio broadcasting is less than or equal to the price paid by FM radio broadcasters than FM radio broadcasters will not be required to pay any additional amount and he will be permitted to provide digital radio broadcasting services also for the remaining period of permission (refer para 3.46.10)**

**4.15 The broadcasters should be allowed to make use of any available digital technology, recognized by ITU, within the allocated/liberalized spectrum for providing digital radio broadcasting services subject to adaptation, if any, recommended by MIB/TRAI from time to time. (refer para 3.46.11)**

**Date for digital switch over**

**4.16 No date for digital switch over of radio broadcasting services should be declared at this stage. (refer para 3.52.1)**

**4.17 Existing analog FM Radio channels should be allowed to remain operational for the remaining period of their Phase-III permissions. (refer para 3.52.2)**

**4.18 The continuance of operation of existing analog FM Radio channels that do not migrate to digital radio broadcasting, should be reviewed after the expiry of their existing Phase-III permissions. (refer para 3.52.3)**

**Auction of remaining channels of Phase-III**

**4.19 The auction of remaining channels of Phase-III should be done by delinking them from technology. Broadcasters should be permitted to use any technology (analog or digital or both) for radio broadcasting on the frequency allocated to them through auction in future. In case Radio broadcasters opt for digital technology, they should be permitted to broadcast more than one channel subject to technical feasibility on single frequency allocated to them. (refer para 3.59.1)**

### **Affordability of Digital Receivers**

**4.20 For initial three years after declaration of Digital Radio Broadcasting Policy, the Government should grant fiscal incentives in the form of lower tax rates to manufacturers of digital radio receivers. (refer para 3.64.1)**

### List of Acronyms

<b>Abbreviation</b>	<b>Description</b>
AAC	Advanced Audio Codec
AIR	All India Radio
AM	Amplitude Modulation
BECIL	Broadcast Engineering Consultants India Limited
BST-OFDM	Band Segmented Transmission Orthogonal Frequency Division Multiplexing
CELP	Code Excited Linear Prediction
CEPT	European Conference of Postal and Telecommunications Administrations
COFDM	Coded Orthogonal Frequency-Division Multiplexing
CRS	Community Radio Station
DAB	Digital Audio Broadcasting
DoT	Department of Telecommunications
DRM	Digital Radio Mondiale
DTT	Digital Terrestrial Television
DVB-S	Digital Video Broadcasting - Satellite
DVB-T	Digital Video Broadcasting - Terrestrial
eAAC+	HE-AAC version 2 audio codec
EBU	European Broadcasting Union
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission
FM	Frequency Modulation
GOPA	Grant of Permission Agreement
HD	High Definition
HVXC	Harmonic Vector Excitation Coding
IBOC	In-band on-channel
IEEE	Institute of Electrical and Electronics Engineers
IISc	Indian Institute of Science
IIT	Indian Institutes of Technology
ISDB-S	Integrated Services Digital Broadcasting - Satellite
ISDB-T	Integrated Services Digital Broadcasting-Terrestrial
ISDB-Tsb	Integrated Services Digital Broadcasting for Terrestrial Sound Broadcasting
ITU	International Telecommunication Union
Kbps	Kilobits per second
LF	Low frequency
MF	Medium frequency

MIB	Ministry of Information and Broadcasting
MP2	MPEG-1 Audio Layer 2 audio codec
MPEG	Moving Picture Experts Group
MW	Medium Wave
NFAP	National Frequency Allocation Plan
NRSC	National Radio Systems Committee
OEM	Original Equipment Manufacturer
OFDM	Orthogonal Frequency-Division Multiplexing
PBG	Performance Bank Guarantee
PS	Parametric Stereo
QAM	Quadrature Amplitude Modulation
RF	Radio Frequency
RRI	Radio Republik Indonesia
SBR	Spectral Band Replication
SW	Short wave
TRAI	Telecom Regulatory Authority of India
UHF	Ultra high frequency
VHF	Very High Frequency
WPC	Wireless Planning and Coordination
WWW	World Wide Web