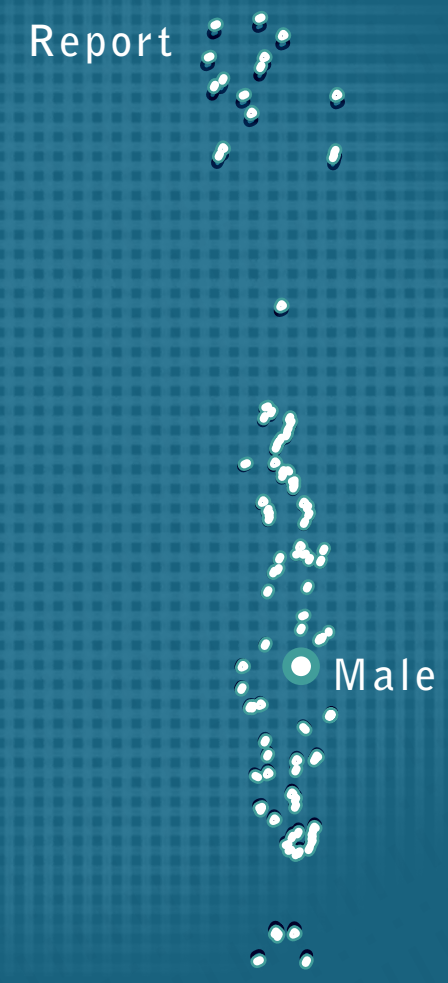
MALDIVES

Roadmap for Transition from ANALOGUE TO DIGITAL TERRESTRIAL TELEVISION BROADCASTING IN THE REPUBLIC OF MALDIVES

Report



Telecommunication Development Sector

Roadmap for transition from analogue to digital terrestrial television broadcasting in the Republic of Maldives

May 2014

This roadmap has been prepared by the Maldives national roadmap team (NRT), which was set up by the Maldives Broadcasting Commission (MBC) and ITU with the support of the Asia-Pacific Broadcasting Union (ABU).

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Executive summary

The Maldives television market has national TV services and a wide choice of TV platforms including analogue and digital terrestrial as well as cable television. The Maldives Broadcasting Commission (MBC) considers the transition from analogue to digital terrestrial television broadcasting as a priority to increase the coverage of multiple channels and to improve the quality, choice and efficiency of services. MBC requested ITU to assist in the development of a national roadmap for the transition from analogue to digital terrestrial television in Maldives. This roadmap has been prepared by the National Roadmap Team (NRT) set up by MBC and ITU with the support of the Asia-Pacific Broadcasting Union (ABU). It is based on the ITU Guidelines for Transition from Analogue to Digital Broadcasting[1]. The main observations and conclusions of the roadmap are summarized below.

Scope of the roadmap

The roadmap for transition from analogue to digital television in Maldives covers the short term and long term digital switch-over (DSO) and analogue switch off (ASO) objectives as well as the activities that need to be managed by the NRT. The roadmap does not include:

- introduction of mobile TV as the NRT did not envisage sufficient demand at this stage and the business case was not clear;
- digital radio;
- recommendations on choosing any particular digital terrestrial television standard.

The DSO objectives comprise of short term (about 1 year after analogue switch-off) and long term (5 to 10 years after analogue switch-off) objectives, compiled in Table 1.

Table 1: DSO objectives for Maldives

No	Objective	Short term 2013-2015	Long term 2016-2020
1	Smooth transition from analogue to digital terrestrial television providing multiple channels nationwide to enhance coverage, choice and quality. Target timeline of ASO	Same coverage areas for all existing broadcasters Simulcasting of analogue and digital television	All analogue services converted to digital
2	Issue facility licence for content distribution for the network Operator Summary of the DBNO Introduce Digital Broadcast Network Operator (DBNO) to provide content delivery service to the viewers.	Assigning one frequency to the DBNO	Assigning the second frequency to the DBNO depend on the market demand
3	The DBNO should set up the digital terrestrial television transmission network.	DBNO established and functional	Additional DBNO based on need.

[1] www.itu.int/ITU-D/tech/digital_broadcasting/project-dbasiapacific/Digital-Migration-Guidelines_EV7.pdf

No	Objective	Short term 2013-2015	Long term 2016-2020
4	Issuance of TV licences to the broadcasters. Based on conditions relating to the content, the broadcasters should make use of the services of DBNO for the delivery of their television programmes to the viewer.	All necessary licences issued to television broadcasters	
5	Solution to issues arising out of practical difficulties in implementing the policy.	Timely resolution of practical issues arising in implementation of the policy with the target date in view. The satellite and cable television transmission to fall in line with the digitalization plan must be addressed. The expansion for current analogue transmission infrastructure should not be recommended with immediate effect.	
6	Tax policy to incentivize introduction of cost effective digital television.	To consider: • Providing import tax concessions for broadcast quality digital production, transmission and customer premises equipment (CPE) for a specific period of time. • Need for subsidizing CPE, such as digital TV receiver and set top boxes.	Revisit the concessions in 2016.
7	Timely availability of frequencies for analogue and digital transmission	Frequency planning to be completed	Analogue frequency released on or before first quarter, 2020.
8	Better picture quality	Introduction of SDTV and HDTV quality subject to market conditions	Introduction of 3D TV based on the market conditions
9	More digital broadcasting services		MTV and/or Digital Audio Broadcast to be considered
10	Digital dividend		Availability and redeployment of digital dividend.
11	End of transition in < 2020	Exact date to be decided	
12	Extended population coverage	Additional locations	All locations same services
13	Type approvals for all un licensed platforms	Type approvals to be completed for all unlicensed platforms	
14	Pricing of DTTB package	A pricing framework to be developed for DTTB Services.	Pricing framework is reviewed.

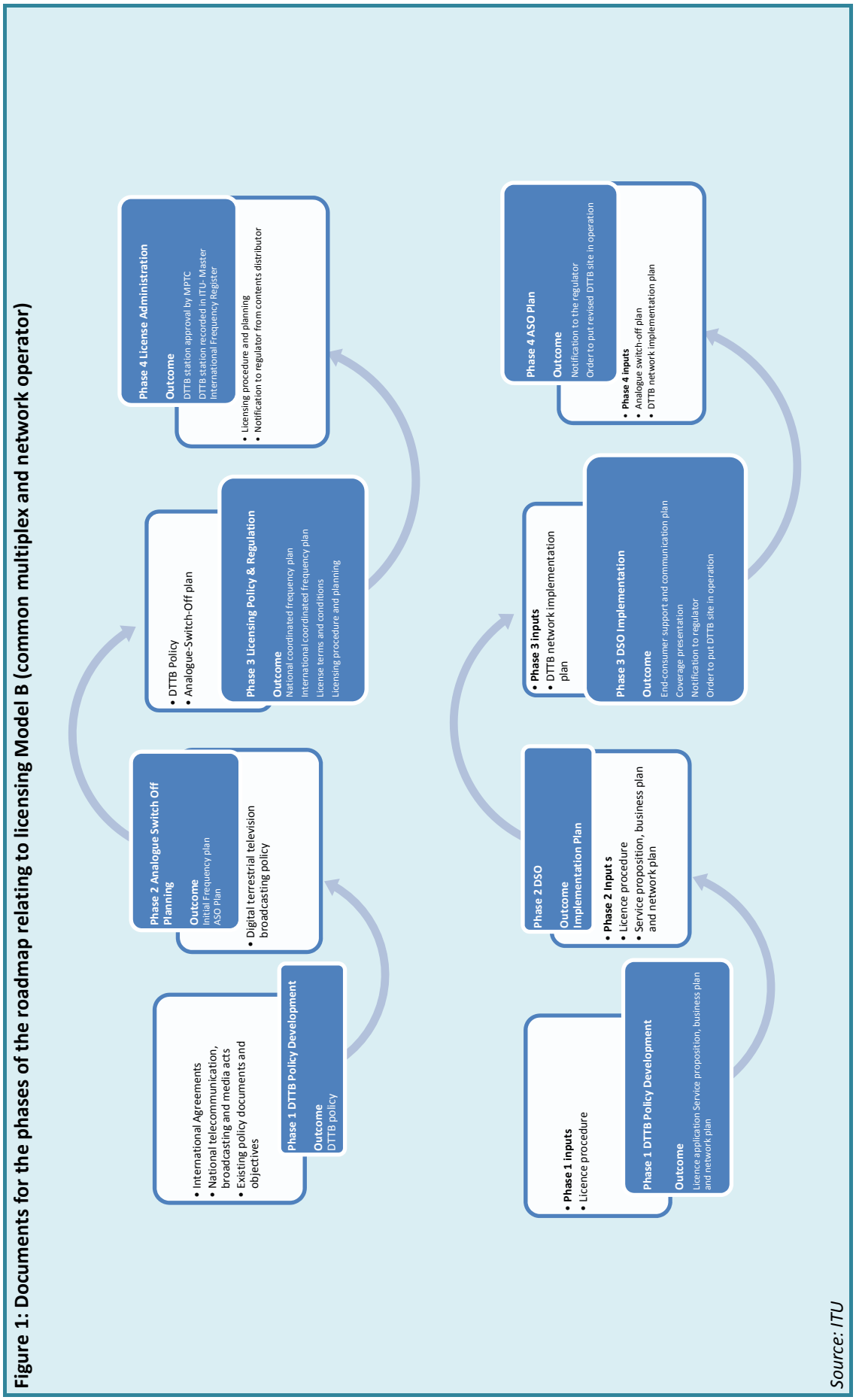
Source: NRT

The duration of the transition process from analogue to digital television was discussed and the NRT agreed to switch-off all analogue terrestrial television services in early 2020.

The NRT discussed the two models stipulated in the ITU Guidelines; namely Model A (separate multiplex and broadcasting network for each broadcaster) and Model B (common multiplex and network operator) in this report. The NRT was in favour of Model B, which is more cost effective for Maldives given the large number of islands and market size. The relevant documents for the phases of the roadmap relating to licensing Model B (common multiplex and network operator) are summarized in Figure 1. In case licensing Model A is adopted, the output documents indicated in Phase 4 (planning and implementation DTTB networks) will not be managed by the NRT, but by individual broadcasters.

The status of decisions taken/required on the key issues, the choices available, and the activities required are detailed in Annexes 1 to 6.

Figure 1: Documents for the phases of the roadmap relating to licensing Model B (common multiplex and network operator)



Summary of recommendations

The national roadmap team of Maldives took the following decisions:

- discuss the DTTB standard for Maldives and take a decision at the national level;
- focus on the roadmap for DTTB only and not to consider Mobile TV at this stage;
- use MPEG4 as the compression standard;
- have one multiplex operator with open access, preferably owned by a consortium (Model B);
- use one common infrastructure: sharing rules will be determined by NRT and/or regulator;
- launch digital terrestrial television services in early 2015;
- complete ASO in or before 2020 with a 4 to 6 year simulcasting period;
- use multiple media to communicate to consumers and industry including: broadcasting, press, door to door etc.: in order to develop the strategy, the NRT should consider the lessons learnt from other countries, the possibility of a cost sharing mechanism amongst stakeholders, and a survey on the potential impact of the transition on viewers;
- have a minimum coverage equivalent to the existing coverage.

Recommendations on the next steps

Continuing the momentum, it is recommended that NRT considers the following steps for a smooth transition from analogue to digital terrestrial television broadcasting:

1. To get the roadmap including the choice of DTTB standard approved at appropriate policy making level e.g. Parliament/Cabinet/Ministry.
2. After approval of the roadmap, prepare the outcome documents (Phases 1, 2, and 3) in order to prepare and issue system licences to the first DBNO, and plan and implement the ASO process in accordance with phase 2 of the roadmap (see Figure 3.12) for the NRT and the regulator .
3. In order to assign island-wide frequency channels to the DBNOs, MBC is recommended to complete an initial DTTB frequency plan in consultation with the Communications Authority of Maldives (CAM).
4. After the licensing framework is finalised, determine the exact DSO and ASO dates and the date of the first DTTB transmissions.
5. To undertake the initial feasibility study for site infrastructure sharing between current TV broadcasters at the proposed 28 DTTB sites and undertake design of SFN transmission networks and coverage planning. The NRT and the proposed consortium under the broadcasting authority are recommended to undertake the feasibility studies before the licensed DBNO prepares a detailed DTTB transmission network design. In particular:
    a) undertake market research covering the key elements (as indicated in 3.4.5 Phase 1 DTTB policy development for the regulator - item 2 of the roadmap - Conducting market research on the current television and future DTTB market in Maldives);
    b) carry out a consumer survey in cooperation with other institutions (e.g. a University) to estimate the awareness and impact of DSO and ASO and develop a detailed consumer communication plan;
    c) check the feasibility of using the existing carriage licence regulatory framework for DBNO.

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1 Introduction

ITU has developed guidelines for the transition from analogue to digital broadcasting[2] with support from the Republic of Korea Ministry of Science, ICT and Future Planning (MSIP), to provide assistance to member countries to smoothly migrate from analogue to digital broadcasting. In addition, ITU has assisted several countries in developing a national roadmap for transition from analogue to digital terrestrial television broadcasting and Mobile TV as part of projects supported by partners. In the Asia-Pacific region, ITU has assisted more than 20 countries in developing their national roadmaps.

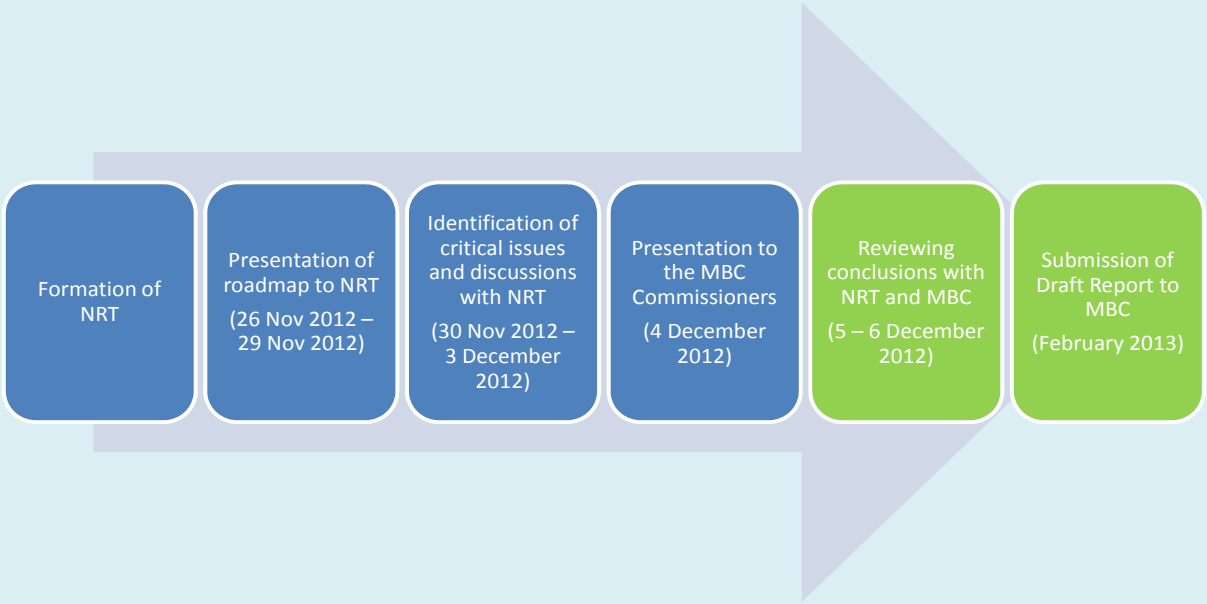
The Maldives Broadcasting Commission (MBC) considers the transition as a priority to increase the coverage of multiple channels in the country and to improve the quality, choice and efficiency of services. The Commission requested ITU assistance for development of a Maldives national roadmap for transition from analogue to digital terrestrial television in Maldives, and this roadmap report has been prepared jointly by ITU expert Mr Tharaka Mohotty and the Maldives national roadmap team (NRT) based on the ITU Guidelines and the local circumstances, with inputs from ITU and Asia-Pacific Broadcasting Union (ABU) staff. The NRT was set up by the Maldives Broadcasting Commission (MBC) and comprises of representatives from the organisations in Table 1.1

Table 1.1: NRT representative organizations

Organisation	Designation
Maldives Broadcasting Commission	Commissioner (Chair of NRT) and Director General
Communications Authority of Maldives	Deputy Director
Public Service Broadcaster	Director (Infrastructure Planning)
V Media	CEO
Dhi TV	Engineer
Atoll TV	Chairman/CEO
Transparency Maldives (NGO)	Project Coordinator

[2] The guidelines for transition from analogue to digital broadcasting can be found at: www.itu.int/en/ITU-D/Spectrum-Broadcasting/Pages/Broadcasting.aspx

Figure 1.1: Maldives DTTB roadmap assistance timeline



Source: ITU

Section 2 of this report addresses the current situation and digital switch-over (DSO) objectives for Maldives. Section 3 shows the draft national roadmap for achieving the DSO objectives. Section 4 considers the key issues in Maldives and the decision choices available. Annexes 1 to 6 detail the decisions taken, partly taken and not yet taken on the key topics while highlighting the choices available. Activities required for taking the decisions are also mentioned.

Maldives: An overview

The Maldives archipelago is located 300 miles southwest of the tip of India and 450 miles west of Sri Lanka is a string of 1 190 islands scattered across the equator in the vast expanse of the Indian Ocean. The archipelago is 823 km in length and 130 km wide, with a total area of 90 000 km. There are 20 administrative atolls, the largest atoll is Huvadhu (6486 sq miles) and smallest atoll is Gnaviyani (4.81 sq miles). The capital is Male, and in 2012, the Maldives population reached 328 536 spread over 50 000 households inhabiting 200 of its 1 192 islands.

Table 1.2: Maldives population distribution in islands

Rank	City name	Division	Population
1	Male	Male	103 693
2	Addu City	Addu Atoll	35 000
3	Fuahmulaku	Gnaviyani Atoll	11 140
4	Kulhuduhfushi	Haa Dhaalu	8 215
5	Thinadhoo	Gaafu Dhaalu	6 376
6	Hinnavaru	Lhaviyani	5 000
7	Naifaru	Lhaviyani Atoll	4 720
8	Dhidhdhoo	Haa Alif	4 500
9	Eydhafushi	Baa	2 808
10	Mahibadhoo	Alif Dhaal	2 156
11	Vilufushi	Thaa	2 077
12	Maroshi	Shaviyani	832

The Maldives Gross Domestic Product (GDP) per capita was estimated at USD 6 499 in 2010[3], and it continues to grow rapidly. This is a relatively high GDP figure in the region. However, the small size of the market poses a great challenge for its development and also for carrying out the digital switch over.

2 Current situation of broadcasting in Maldives

2.1 Market structure

The average household size is 4.2 persons and the number of households with television in 2012 reached 95 per cent. The Maldives TV market is mainly a terrestrial TV free-to-air (FTA) market with five analogue terrestrial TV programme services and pay digital cable TV. Table 2.1 lists the registered broadcasting licensees in Maldives.

Television started in Maldives with the establishment of Television Maldives on 29 March 1978. This government owned entity, now called Maldives National Broadcasting Corporation (MNBC), has served as the only terrestrial television channel in Maldives for more than three decades. Significant changes occurred in 2007, when the government permitted the establishment of private television networks.

In May 2005, Atoll Investment (Maldives) Private Limited was permitted to broadcast in the name of "Atoll Television" using the Thailand Thaicom satellite global beam. They broadcast promotional tourism advertisements, documentaries, music, songs, news and commercial advertisements.

The Ministry of Legal Reform, Information and Arts opened Maldives to private/commercial broadcasting on 28 March 2007, and on 14 June 2007, three private broadcasters were issued licences. Atoll TV signed an agreement, which allowed them to operate TV nationwide and internationally. The second broadcaster was Dhi FM 95.2 that provided FM radio services nationwide. The third to acquire licence was Capital Radio 95.6 that signed an agreement to operate FM radio in Male.

Table 2.1: Licensed private broadcasters under broadcast agreement 28 May 2007

#	Company	Station Identification	Licence Issued Date	Coverage Area
1	Asna Maldives Private Limited	Capital Radio 96.5	June 14, 2007	Nation-wide
2	Maldives Media Company Private Limited	DhiFM 95.2	June 14, 2007	Nation-wide
3	Atoll Investment (Maldives) Private Limited	ATV	June 14, 2007	Nation-wide/ international
4	FarAway Holidays Private Limited	96.6 Faraway.FM	July 3, 2007	Male region
5	Island Broadcasting Company Private Limited	V – TV	August 20, 2007	Nation-wide/ international
6	Media Unlimited Private Limited	HOT FM	August 26, 2007	K. Atoll
7	Broadcasting Maldives Private Limited	Dhitv	December 6, 2007	Nation-wide
8	Wave Networks Private Limited	HFM 92.6	21 February 2008	Male region
9	Seven Continents Private Limited	Radio 7	21 February 2008	Male region, B, Q, R, S
10	Business Image Group Private limited	BIG FM	17 March 2008	Nation-wide

[3] The World Bank: http://data.worldbank.org/country/Maldives

#	Company	Station Identification	Licence Issued Date	Coverage Area
11	Atoll Wave (Maldives) Private Limited	Radio Atoll	19 March 2008	Nation-wide/ international
12	Picture Land FM Private Limited	SUN FM	24 April 2008	B, R, S
13	Tropic Media Group Private Limited	Orange Radio	08 May 2008	H, S
14	Media Ring Private Limited	Future Television	04 June 2008	Male region
15	Maldives National Broadcasting Cooperation	TVM / Youth TV	12 August 2009	Nation-wide

FM Radio

Sound broadcasting started in Maldives in the late 1940s with amplitude modulated (AM) signal on medium wave (MW). As technology evolved, FM stereo was introduced in the late 1990s to enhance the sound quality and to add extra features and quality to the service. Later, radio data services were added within the FM bandwidth to provide radio text and automatic tuning.

Television

The country entered the television age with the state-owned Television Maldives in 29 March 1978.

The country has at present five terrestrial TV stations. MNBC serves as the public service broadcaster with 25 transmitting stations. TVM (MNBC) is the dominant player having two channels, using two VHF frequencies. They were testing ISDB-T for digital terrestrial television.

Private broadcasters are on UHF frequencies. There are four TV stations licensed all over the country out of which one operator is currently in operation and is testing DVB-T for digital terrestrial television. Details of the operations such as channels, power etc. of all the TV channels in Maldives is provided in Table 2.3. The TV services provided in analogue mode are using PAL-B in VHF and PAL-G in UHF. All the terrestrial transmissions are free-to-air (FTA).

The major players in television, TVM the Public Service Broadcaster as well as the commercial broadcasters VTV and Dhi TV (see Table 2.2) have their studios in the heart of Male city.

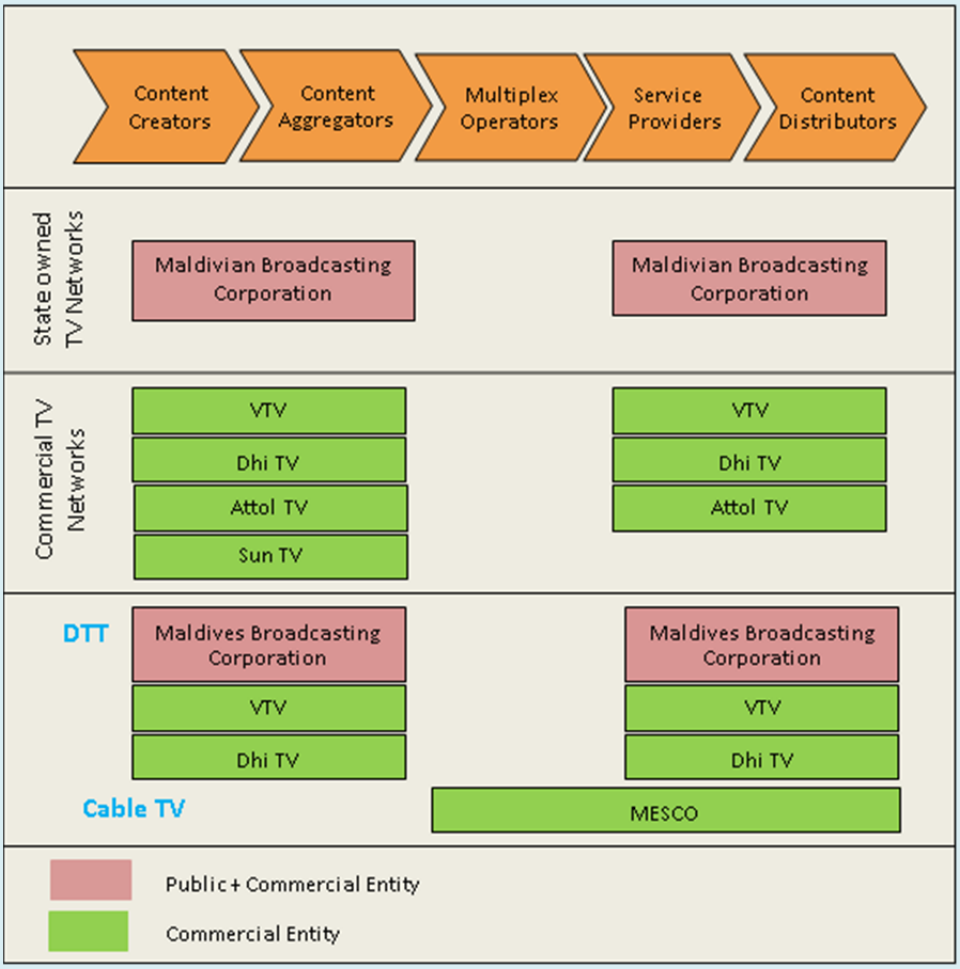
Table 2.2: TV channels in operation in Maldives

#	Company	Station Identification
1	Media Ring Private Limited	Future Television
2	Broadcasting Maldives Private Limited	DhiTV
3	Island Broadcasting Company Private Limited	V – TV
4	Maldives National Broadcasting Cooperation	TVM/Youth TV

Source: NRT

The value chain of Maldives TV market including the key players is shown in Figure 2.1.

Figure 2.1: Maldives TV market structure



Source: NRT Maldives

Figure 2.2: H.Dh Kulhudhuffushi re-transmitting station of MNBC

Source: ITU

Figure 2.3: One of the retransmission stations of MNBC

Source: ITU

Figure 2.4: MNBC re-transmitting tower at H. Dh Kulhudhuffushi re-transmitting station

Source: ITU

Figure 2.5: Analogue transmitter at MNBC

Source: ITU

Figure 2.6: Digital transmitter at MNBC

Source: ITU

Table 2.3: Transmitting site details – Maldives Broadcasting Corporation

	ATOLL	ISLAND	TX POWER	TOWER HEIGHT
1	Sh	Funadhoo	300W	40m
2	N	Mandhoo	250W	40m
3	R	Ungoofaaru	300W	40m
4	B	Eydhafushi	300W	40m
5	*Lh*	*Naifaru*	*Not in Use*	*40m*
6	A.A	Rasdhoo	250W	40m
7	A.Dh	Mahibadhoo	300W	40m
8	V	Felidhoo	250W	40m
9	M	Mulaku	300W	40m
10	F	Nilandhoo	300W	40m
11	Dh	Kudahuvadhoo	300W	40m
12	Th	Guraidhoo	300W	40m
13	Th	Vilufushi	100W	25m
14	L	Fonadhoo	300W	40m
15	G.A	Villingili	150W	40m
16	K	Gaafaru	10W	15m
17	K	Male'	1000W	70m
18	A.Dh	Maamigili	20W	28m
19	H.Dh	Makunudhoo	20W	20m
20	G.A	Kolamaafushi	20W	25m
21	G.A	Dhevvadhoo	10W	25m
22	G.Dh	Thinadhoo	250W	40m
23	H.A	Horafushi	300W	40m
24	H.A	Dhidhoo	300W	40m
25	G	Foammulah	20W	40m
26	Th	Omadhoo	Sites in plan for transmission	
27	G.Dh	Fiyoree		
28	G.A	Gemanafushi		

Source: MNBC

Cable and satellite

In Maldives, rebroadcasting began on 1 September 2001 when the satellite television retransmitting and distributing regulation formulated by the Ministry of Information, Arts and Culture came into effect. This was the first regulation to allow rebroadcast of any international channel in the history of Maldives. It allowed the operators to rebroadcast real time feeds from only certain programmes of certain channels. Only 5 MVR per connection was charged for the licence fee and 1000 MVR for registration for these operations. The application for the operation was exclusively for Maldives. Once the applicants submit the relevant documents, the operators are given a temporary permit for three to six months in order to do the preliminary works such as digging trenches for the installation of cable TV. Upon completion of installation stage, the operators will then be given a licence to rebroadcast.

On 8 July 2002 Maldives Electronic Services Company (MESCO) commenced cable TV operations in Maldives and became the first Maldives cable television service operator to offer 50 international

channels and two local channels in a bundle. Multi Service Operator Private Limited (now called Media Net Pvt. Ltd) was given licence on 1 June 2005 under this regulation and is currently the country's largest cable TV service provider.

Amendments, improvements and the second regulation – cable TV service regulation 2007

After lengthy consultation with the cable operators, channel providers and focus group of customers, a new Cable TV Service Regulation was enacted by the Ministry of Information and Arts with the aim of further developing cable TV services and its policies. The primary aim of the Regulation was to regulate the tariffs in order to maintain a nominal fee for customers as cable TV programmes became the main source of entertainment and knowledge enrichment. Section 35 of the Regulation states that any licence holder should not charge more than 400 MVR (USD 31.13) for a subscription. The regulation further aims to create a competitive environment for the service providers by ensuring a level playing field. However, it still requires the applicants to be a company with 100 per cent Maldives shareholders. In order to comply with the new regulation, the existing service providers were given six months from the new regulations date to make necessary changes.

On 17 June 2008, Cable TV operators were provided with a list of channels to rebroadcast which was classified by the National Bureau of Classification. Announcements were made on MNBC and several other newspapers stating that rebroadcasting any other channels besides the classified 87 channels was illegal. One particular feature that was new in this regulation was that the fee structure was based on area and the population in that area. It also uses a grading or point system to regulate the cable service operators. The Ministry analyses the service and the performance of cable TV service providers twice every year and each operator begins with 100 points. If the total falls below 50 points, the operator's licence is suspended and it is not authorized to rebroadcast for a certain time or unless they pay a fine.

This regulation was challenged and resisted by cable TV operators, for both the fees and its requirements, as well as the necessity to change the channel packages. Several complaints were filed against the Media Net Pvt. Ltd on to this issue. Operators also questioned the purpose of registration carried out at the Communication Authority of the Maldives (CAM)/Maldives Broadcasting Commission as this was already covered in operator licences.

2.2 Regulatory framework: Maldives Broadcasting Commission, Broadcasting Law and the Rebroadcasting Regulation

Maldives Broadcasting Commission was created as an independent institution on 22 August 2010 under Article 3 of the Broadcasting Act (Act number 16/2010). The Members were appointed by the President of Maldives on 4 April 2011. The Commission has the primary objective to promote the broadcast and rebroadcast industry by providing and guiding broadcasters and operators while establishing a sound regulatory framework to ensure that Maldives media abides by appropriate and applicable laws and regulations. Rebroadcast regulation was published in the Maldives Gazette on the 3 April 2012

Temporary licences were issued in 2011 to the existing rebroadcasters for a year under the 2007 Regulation and these operators were given a notice that their licence would become obsolete once the new regulation came into effect. Existing rebroadcasters were given 60 days to submit relevant documents and to make necessary changes in their service(s) to comply with the new regulation. However, consequently the commission is trying to bring these illegal rebroadcasters under the umbrella of new regulation. The Commission's financial status and the lack of staff has limited its work with regard to this matter as the Commission has to rely on other government authorities in the islands to verify and to notify. Currently there are only 27 licensed rebroadcasters and nine applicants for issue of licence amongst hundreds of temporary licences issued previously.

The main regulatory bodies in Maldives covering broadcasting are the Maldives Broadcasting Commission (MBC) and Communications Authority of Maldives (CAM). The regulatory institutional framework and relevant legislation with regard to television broadcasting is summarized in Table 2.4.

Table 2.4: The regulatory framework of television broadcasting – Laws and Regulations

Relevant legislation	Arranges/Covers	regulatory body	Assigned rights
Broadcasting Act 16/2010	Broadcasters/Rebroadcasters	MBCMBC	
Broadcasting regulation 2012/R-11	Broadcasters	MBCMBC	
Rebroadcast Regulation 2012/R-20	Rebroadcasters	MBC	
Radio/TV broadcast frequency regulation 2012/R-10	Broadcasters Broadcasting frequency aspects	MBC	Spectrum rights
Code of Practice	Broadcasters	MBC	Content/broadcast rights
Disaster Guideline	Broadcasters	MBC	Reporting standards during Disasters
Women protection Guideline	Broadcasters	MBC	
Children's protection guideline	Broadcasters	MBC	
Media/Broadcasting policy	All Media	MMC/MBC	Content
Communications/ Telecommunications policy	Broadcasters/Rebroadcasters/ Telecommunications Operators	CAM	Spectrum
Media/Telecommunications Legislation Development	All Media	MBC/MCA	
International Coordination of Radio Frequency Spectrum	Broadcasters/Rebroadcasters/ Telecommunications Operators	CAM	Spectrum
National Spectrum Allocation	Broadcasters/Rebroadcasters/ Telecommunications Operators	CAM	Spectrum
Terrestrial Broadcasting Service Planning	Broadcasters/Rebroadcasters	MBC	
Licensing of Transmitters	Broadcasters/Rebroadcasters	MBC/CAM	
Decisions on the issue of Broadcasting Service Licences		MBC	
National policy on the archiving and preservation of media and broadcasting content such as still and moving images, sound etc. archives preservation		MBC	
National Technology Standards (e.g. Television Receivers, Transmission Standards, Safety Standards etc.)		MBC/CAM	

Source: MBC

With regard to the transition to digital television the following observations can be made:

1. Two DTTB standards are being tested by the broadcasters, DVB-T and ISDB T; it is up to the NRT to select one of the two. Currently both DVB-T and ISDB T services are under trial.
2. Only two analogue TV channels are in use by the public service broadcaster (see Section 2.1) and five channels are assigned for the four commercial broadcasters.
3. All television broadcasters have a broadcasting licence, with a frequency assignment, from the authorities. However not all broadcasters have started the transmission to date.

2.3 Digital switch over objectives

DTTB short and long term objectives

There was extensive discussion held with the NRT on the drivers for introduction of digital terrestrial television in Maldives. The drivers for the introduction in the order of priority (highest to lowest) set by the NRT are:

- ***Nationwide multi-channel coverage***: Achieving nationwide reach through common infrastructure resulting in cost reduction.
- ***Enhanced choice to customers***: More channels and services are available to the viewers.
- Bundles of services for specific interests.
- ***Sustainability of service providers***: Reduce cost of infrastructure in the island country thereby enhancing the sustainability of service providers.
- ***Improve quality:*** Improve quality of broadcasting.
- ***Continuity of service***: Ensure service continuity in the digital era as analogue switches off worldwide.
- ***Enhance spectrum efficiency:*** Redeploy the digital dividend gained through spectrum savings.

The NRT also recognised some of the key challenges in the digital environment such as the need for maintenance of set-top boxes (STBs), enhanced complexity of decoders, requirements to upgrade the transmitters and the need to undertake the complex transition process. For the process itself, the following short term (2013-2015) and long term (2016-2020) objectives are envisaged.

Table 2.5: DSO objectives

No	Objective	Short term 2013-2015	Long term 2016-2020
1	Smooth transition from analogue to digital terrestrial television providing multiple channels nationwide to enhance coverage, choice and quality. Target timeline of ASO	Same coverage areas for all existing broadcasters Simulcasting of analogue and digital television	All analogue services converted to digital
2	Issue facility licence for content distribution for the network operator Summary of the DBNO Introduce Digital Broadcast Network Operator (DBNO) to provide content delivery service to the viewers.	Assigning one frequency to the DBNO	Assigning the second frequency to the DBNO depend on the market demand
3	The DBNO should set up the digital terrestrial television transmission network.	DBNO established and functional	Additional DBNO based on need.
4	Issuance of TV licences to the broadcasters. Based on conditions relating to the content, the broadcasters should make use of the services of DBNO for the delivery of their television programmes to the viewer.	All necessary licences issued to television broadcasters	

No	Objective	Short term 2013-2015	Long term 2016-2020
5	Solution to issues arising out of practical difficulties in implementing the policy.	Timely resolution of practical issues arising in implementation of the policy with the target date in view. The satellite and cable television transmission to fall in line with the digitalization plan must be addressed. The expansion for current analogue transmission infrastructure should not be recommended with immediate effect.	
6	Tax policy to incentivize introduction of cost effective digital television	To consider Providing import tax concessions for broadcast quality digital production, transmission and customer premises equipment (CPE) for a specific period of time. Need for subsidizing customer premises equipment (CPE), such as digital TV receiver and set top boxes.	Revisit the concessions in 2016.
7	Timely availability of frequencies for analogue and digital transmission	Frequency planning to be completed	Analogue frequency released on or before Quarter 1, 2020.
8	Better picture quality	Introduction of SDTV and HDTV quality subject to market conditions	Introduction of 3D TV based on the market conditions
9	More digital broadcasting services		MTV and/or Digital Audio Broadcast to be considered
10	Digital dividend		Availability and redeployment of digital dividend.
11	End of transition in < 2020	Exact date to be decided	
12	Extended population coverage	Additional locations	All locations same services
13	Type approvals for all un licensed platforms	Type approvals to be completed for all unlicensed platforms	
14	Pricing of DTTB package	A pricing framework to be developed for DTTB Services.	Pricing framework is reviewed.

Source: NRT

MTV objectives

NRT is of the opinion that MTV should be considered later and at present should be subject to a market driven approach. NRT proposed to focus on the roadmap for DTTB only and not to consider Mobile TV at this stage as sufficient demand was not envisaged and the business case for MTV is not clear. MTV networks are not included in this report.

Digital radio objectives

Currently, Maldives has ten radio broadcasters in operation. The NRT considers that digital radio will be reviewed later. Band III for digital radio can be released after ASO. Consequently, this report does not include digital radio.

3 Maldives national roadmap for transition to DTTB

This section describes the roadmap. It includes an introduction to the concept of a roadmap (see 3.1) followed by the detailed construction of the roadmap (see 3.2). Section 3.3 details the selected functional building blocks while Section 3.4 describes the various phases of the Maldives DTTB roadmap.

3.1 What is a roadmap?

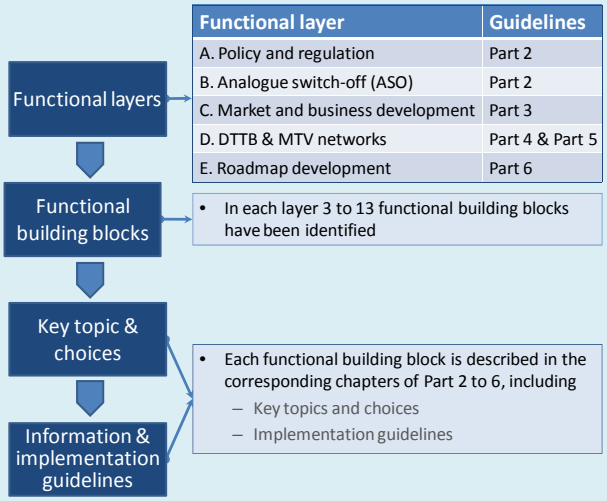
A *roadmap* is a management forecasting tool used for the implementation of a strategy and planning of a project. It matches short-term and long-term goals and indicates the main activities needed to meet these goals. Developing a roadmap has three major uses:

1. it helps to reach consensus about the requirements and solutions;
2. it provides a mechanism to help forecast the key milestones;
3. it provides a framework to help plan and coordinate the steps needed.

A roadmap consists of various phases, normally related to preparation, development and implementation of the strategy and is often presented in the form of layers and bars, together with a time scale.

The roadmap for DTTB is derived from a functional framework consisting of five layers (see Figure 3.1). These functional layers are detailed in the ITU Guidelines.

Figure 3.1: Functional framework



Source: ITU Guidelines

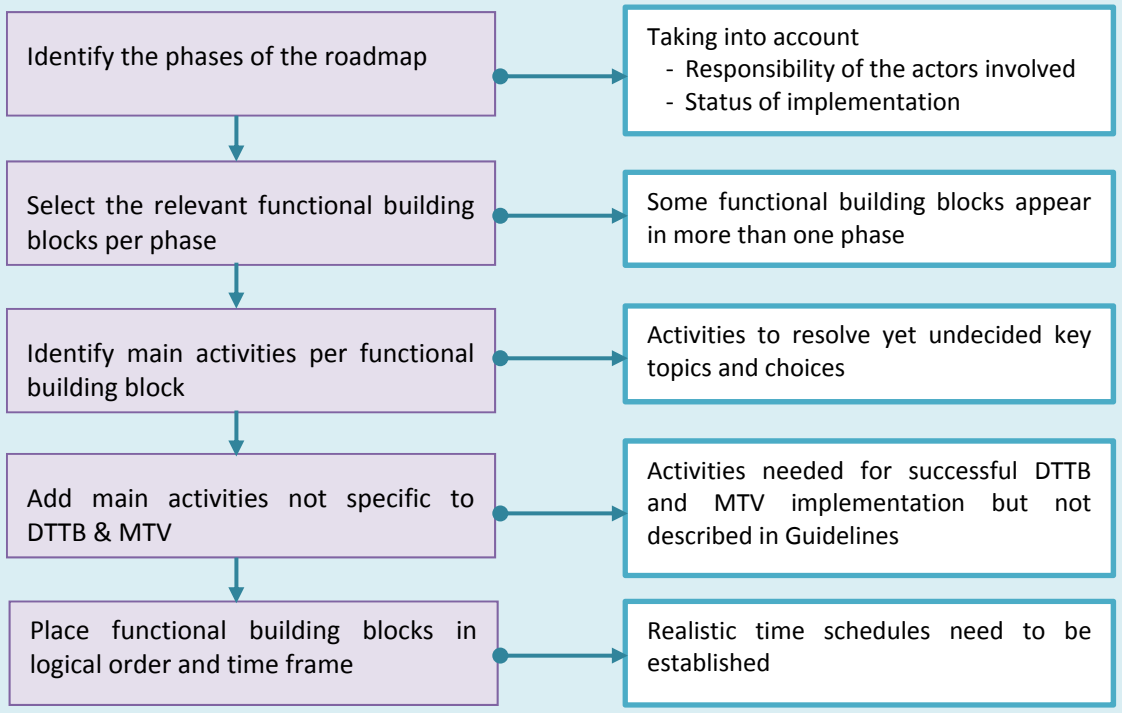
Each layer consists of a number of functional building blocks (see Figure 3.4).

3.2 Roadmap construction

Part 6 of the ITU Guidelines[4] on transition from analogue to digital terrestrial television describes a method for developing the roadmap. Also, a set of generic roadmaps covering the process of transition to DTTB and introduction of MTV is given. This methodology has also been followed in the development of the Maldives national roadmap for transition from analogue to digital terrestrial television broadcasting.

The roadmap is constructed by defining the phases and by placing the relevant functional blocks in each phase in a logical order while stipulating a time frame. For each of the functional building blocks the decisions already taken, the key issues to be resolved and the decisions required are identified. Figure 3.2 illustrates the construction process.

Figure 3.2: Roadmap construction



Source: ITU Guidelines

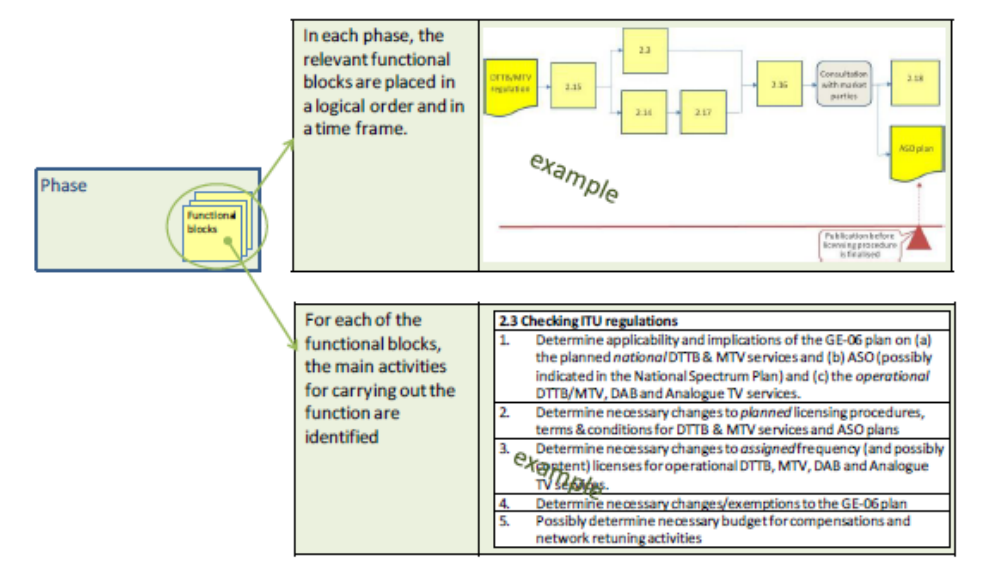
The result is a roadmap that consists of three levels:

1. phases of the roadmap with the selected functional building blocks per phase;
2. for each phase, the functional building blocks are placed in a logical order with a time frame;
3. for each functional building block in a phase, the status of key topics and choices and the main activities to be carried out are identified.

The roadmap structure is illustrated in Figure 3.3.

[4] www.itu.int/ITU-D/tech/digital_broadcasting/project-dbasiapacific/Digital-Migration-Guidelines_EV7.pdf

Figure 3.3: Roadmap structure



Source: ITU Guidelines

The selected relevant functional building blocks for Maldives are shown in Figure 3.4 in Section 3.3. Key topics and choices related to the selected functional building blocks of functional layers A (regulation), B (ASO), C (market and business development), and D (networks) have been considered and the decisions that have been taken, partly taken and those which still need to be taken are identified. An overview of the status of the selected functional building blocks is given in the Annexes 1 to 6.

3.3 Functional building blocks relevant to the Maldives situation

Of the five functional layers shown in Figure 3.1, layer E is the roadmap development and is covered in this report. The functional layers A (policy and regulation), B (ASO), C (market and business development) and D (networks) contain a total of 38 functional building blocks (see Figure 3.4), out of which, 31 blocks were selected to construct the Maldives roadmap.

The roadmap covers:

- the short-term DSO objectives as defined in Table 2.5, and
- activities managed by the NRT.

Figure 3.4 shows the four types of functional building blocks for the regulator while Figure 3.5 illustrates the same for the operators (DBNO). In general, the functional blocks in layer A (policy and regulation) and layer B (ASO) are government led while the blocks in layer C (market and business development) and layer D (networks) are market led.

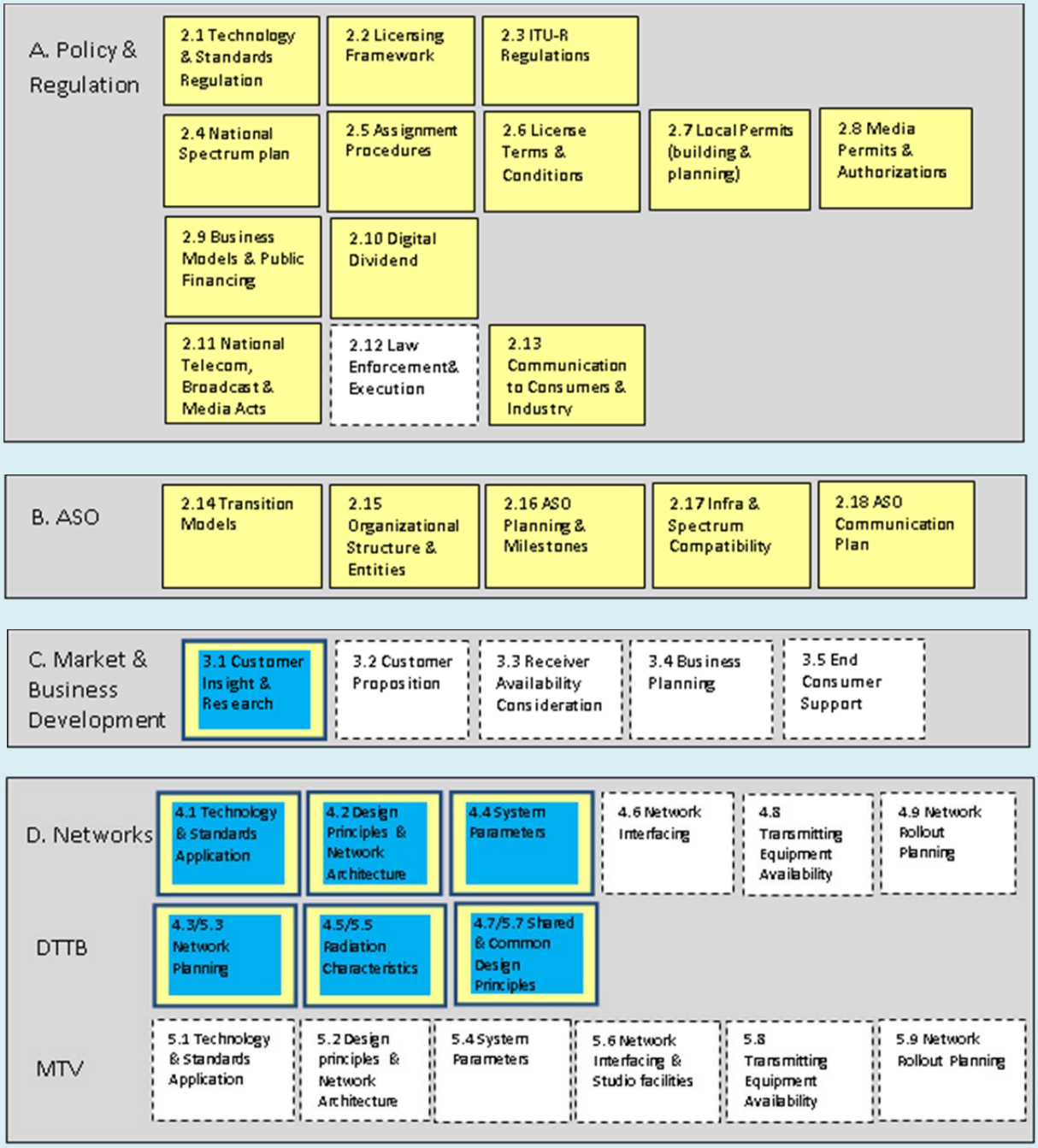
1 White blocks with dashed frame: These blocks are not included in the Maldives roadmap (see Table 3.1 below);

2 Yellow blocks without frame: These blocks are included in the Maldives roadmap and will need to be managed by the NRT;

3 Blue blocks with yellow outline and a blue frame: These blocks are included in the Maldives roadmap and will need to be managed by the NRT before issuing the system licence to the Digital Broadcast Network Operator (DBNO);

4 Blue Blocks with orange frame**:** These blocks are included in the Maldives roadmap and will be managed by the DBNO.

Figure 3.4: Selected functional building blocks in the Maldives roadmap for the regulator (DBNO)



Source: ITU Guidelines

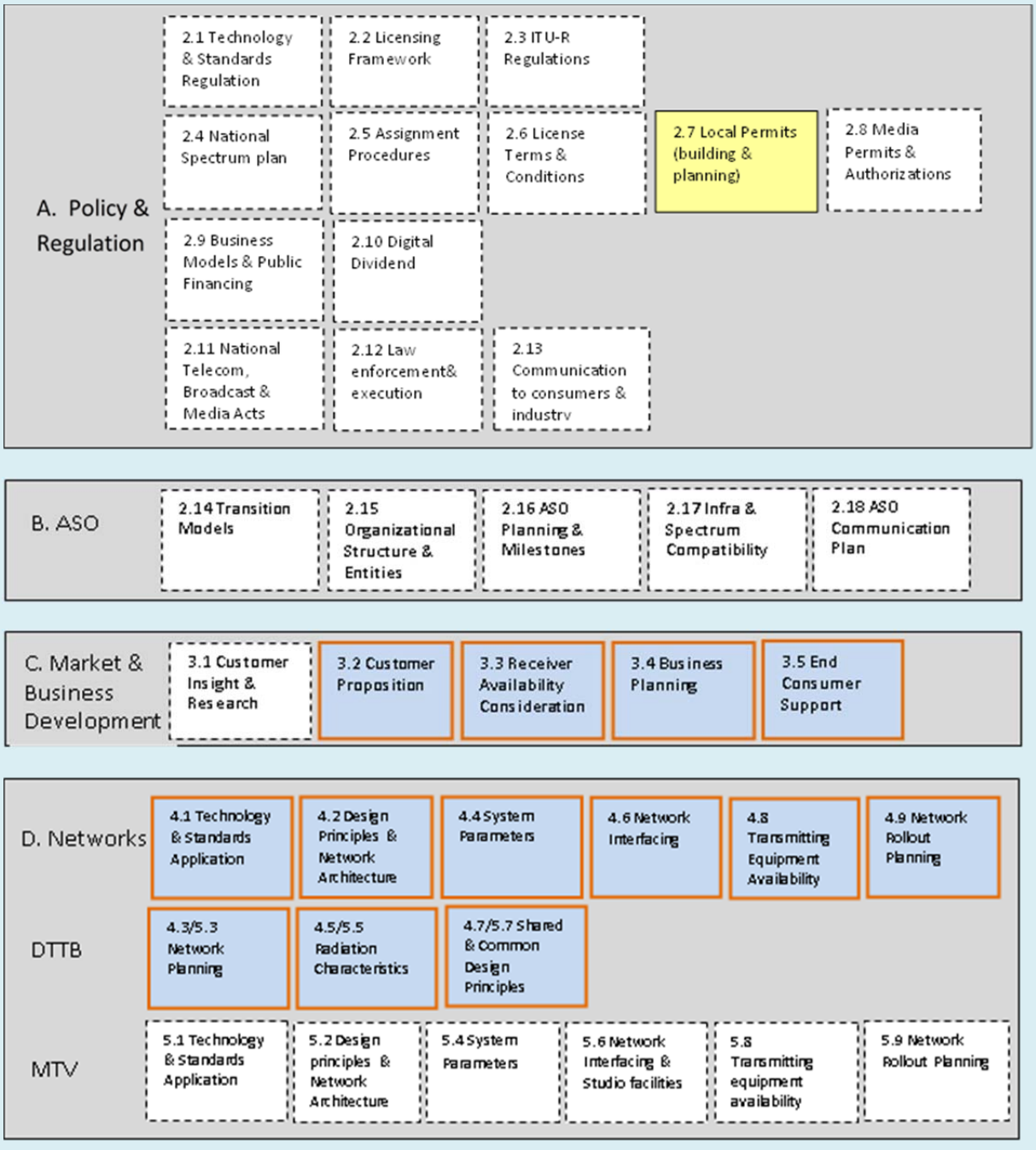
The reasons for not including the white functional building blocks in Figure 3.4 are given in Table 3.1.

Table 3.1: Functional building blocks not included in the national roadmap

Not included in functional building block		Reason
2.12	Law enforcement and execution	Restructuring of the regulatory framework may be considered but is not seen as a necessary condition for the successful transition to digital television in Maldives
5.1 to 5.9	MTV networks (all functional building blocks)	Mobile TV is not considered at this stage as sufficient demand is not envisaged.

Source: NRT

Figure 3.5: Selected functional building blocks in the Maldives roadmap for operators (DBNO)

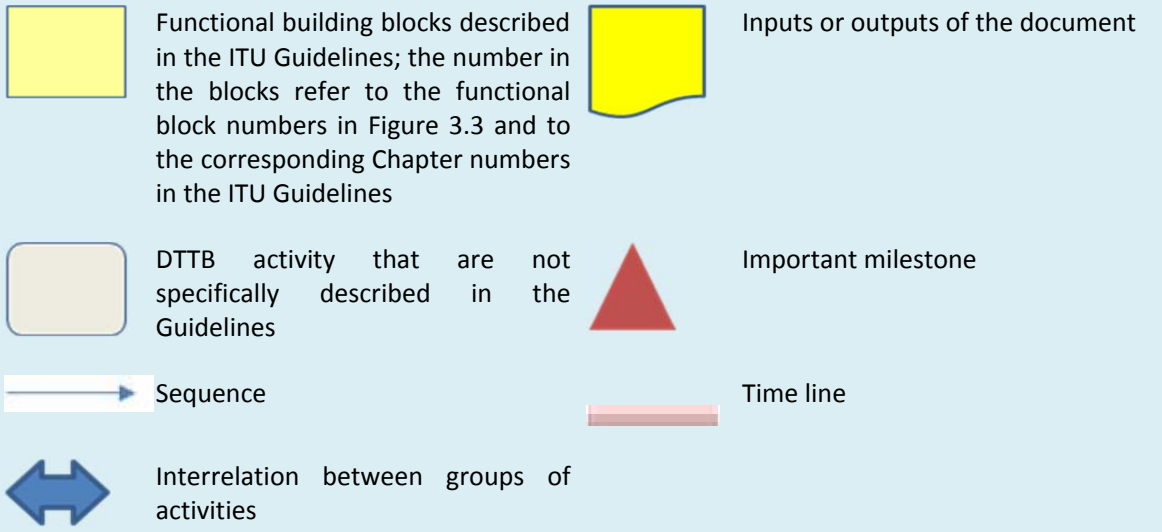


Source: ITU Guidelines

3.4 Description of the Maldives roadmap

The roadmap is divided in several phases. After presenting the overall roadmap outline (subsection 3.4.1), each phase is detailed in the following subsections (3.4.2 and following). The detailed activities and considerations for each phase and its associated functional building blocks are included in annexes of this report. The following subsections contain a number of figures. The symbols used in these figures are explained in Figure 3.6.

Figure 3.6: Symbols used in roadmap figures



Source: Adapted from ITU Guidelines

3.4.1 Overall roadmap

The Maldives NRT aims to switch-off all analogue terrestrial television services by the beginning of 2020 or earlier. As the final switch-off date has not been frozen, the roadmap duration varies potentially from four to six years. The duration of the phases in which the DTTB network is rolled out and the analogue transmitters are switched off can span a considerable number of years. It is important to note that in the Maldives context, the roll out of digital terrestrial television is a more important issue than the analogue switch off. A key decision for the NRT is the selection of the licensing model (either Model A or B)[5].

3.4.2 Model A or B

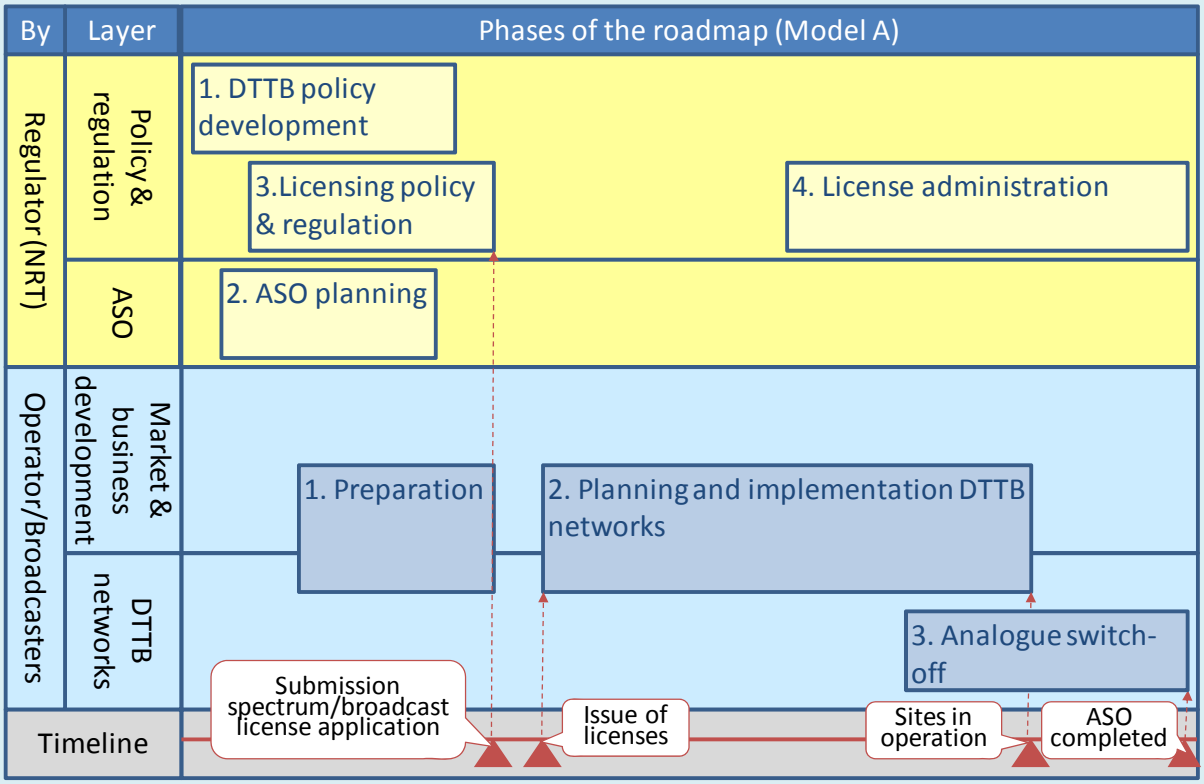
Model A and Model B differ in terms of the licensing rights and the way the broadcasting channels are carried over the infrastructure. In Model B, common multiplex operator(s) termed Digital Broadcast Network Operator (DBNO) carries multiple broadcasting channels coming from various content providers. In Model A, the responsibility for carriage of content is left to the broadcaster.

Figure 3.7 illustrates the various phases of the NRT roadmap for Model A (i.e. the yellow blocks). Phases 1, 2 and 3 are likely to be carried out partly in parallel because of the interrelationships between the issues. It also illustrates that the broadcasters assume the responsibility of the actual DTTB network roll-out (i.e.

[5] See the ITU Guidelines for the transition from analogue to digital broadcasting, p. 26.

the blue blocks). They prepare for acquisition of the necessary spectrum and broadcast licences (phase 1 of the network operator), plan the network roll-out and implement the network (phase 2).

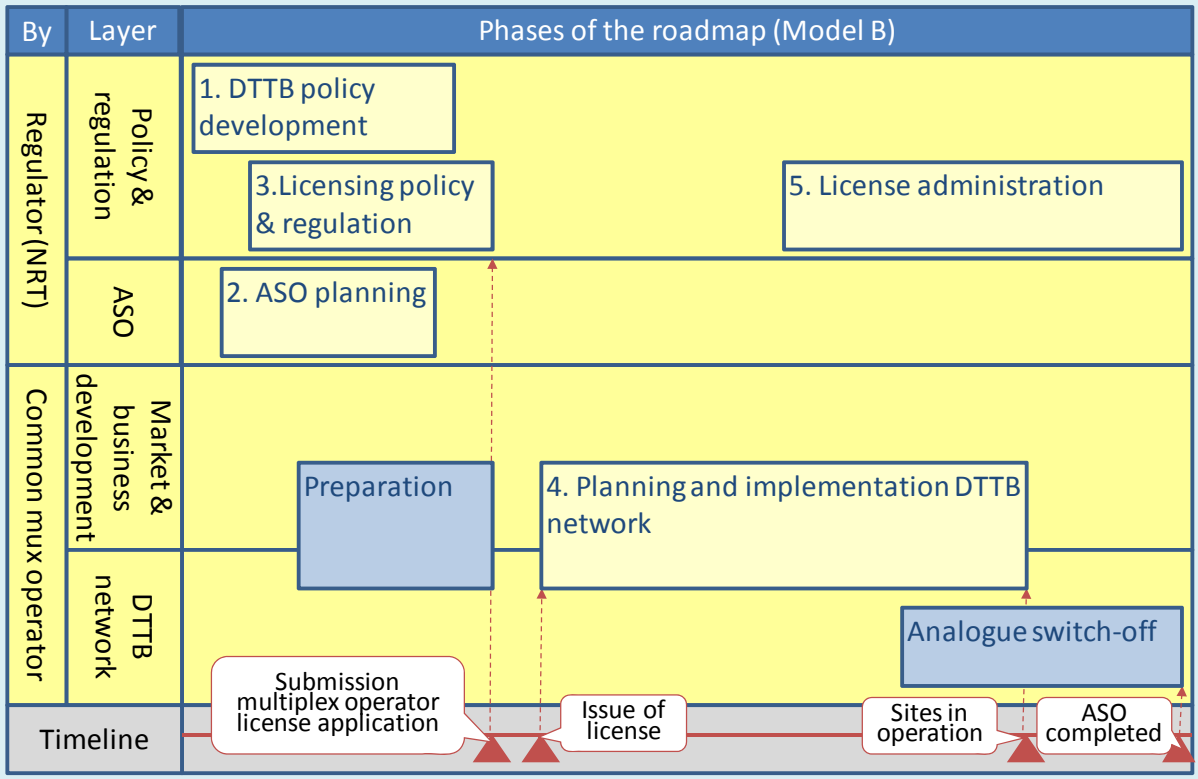
Figure 3.7: Top level roadmap for Model A



Source: ITU Guidelines

Figure 3.8 shows the various phases for the NRT roadmap in case Model B is selected. The first three phases in Model B are the same as in the roadmap for Model A. However, in Model B, the NRT will need to recommend the common multiplex/network operator. After selecting this multiplex/network operator, the NRT will need to develop the network roll-out plan together with this newly selected network operator (phase 4). Also, in close cooperation with the common multiplex/network operator, it will have to assume the responsibility of ensuring the DTTB network roll out.

Figure 3.8: Top level Maldives roadmap for Model B



Source: ITU Guidelines

As sharing infrastructure is one of the main drivers for analogue to digital transition in Maldives, the NRT preferred Model B.

3.4.3 Functional building blocks for Model B

The decision for the licensing model will impact the number of functional building blocks to be included in the roadmap. In Model B, the NRT will have to assume the responsibility for the establishment of a common multiplex/network operator and will have to endorse which services will be offered to the market. In addition, the NRT will need to closely monitor and manage the network roll-out and the associated planning. In such a situation, the Maldives roadmap will include activities and decisions typical for a multiplex/network operator:

1. Market and business development layer:
    a. Customer insight and research (functional building block 3.1): The NRT will have to research and identify what distribution services the multiplex/network operator is going to offer and how they are going to research this market demand.
    b. Customer proposition (functional building block 3.2): The NRT will have to establish the exact attributes of the distribution services, such as coverage areas, number of services, conditional access (in case of pay-tv services) and price tables for the various services (including multiplex capacity reservations).
    c. Receiver considerations (functional building block 3.3): In line with the DSO objective to have a single low cost STB for the Maldives market, the NRT will have to determine what functionality this STB will have. This will include aspects such as the transmission and compression standard as well as the conditional access system (which is likely to be embedded to keep costs down).

   d. Business planning (functional building block 3.4): The NRT will also have to assume the responsibility for an economically viable service offering. Hence the NRT will have to assess the future cash flows of the common multiplex/network operator including what type of financing is required. Also, the ownership composition will need to be determined, i.e. only public or private, or a public private partnership.

2. DTTB network layer:

   a. Technology and standards application (functional building block 4.1) to radiation characteristics (functional building block 4.5): All these five technical functional building blocks have to be included to determine what the required DTTB network will look like. This includes aspects such as the design of the key network elements (i.e. the head-end/multiplex centre, the distribution links and the transmitter sites), the various system parameters (i.e. transmission mode, guard interval, etc.) and the applied frequencies per site (i.e. ERP, antenna height and diagram).

   b. Network interfacing (functional building block 4.6), transmission equipment availability (functional building block 4.8) and network roll-out planning (functional building block 4.9): These three functional building blocks will also have to be included as the NRT will have to directly manage the planning of the network roll-out.

If Model A is selected, the NRT can leave a number of responsibilities to the individual broadcaster:

1. Service offering: The broadcasters can determine the number of services and the coverage areas themselves unless stipulated through regulatory measures (e.g. Universal Service requirements). Consequently, a number of functional building blocks do not need to be included in the roadmap:

   a. Customer insight and research (functional building block 3.1): The broadcasters will carry out their own research to determine which services to offer on the DTTB platform.

   b. Customer proposition (functional building block 3.2): The broadcasters will determine the various attributes, including pricing. It should be noted however, that the NRT can still stipulate some minimum service requirements the broadcasters have to comply to. For example the coverage areas and/or the launch windows (when the additional services have to be on air).

   c. Business planning (functional 3.4): The broadcasters will be directly responsible for making the DTTB services economically viable and hence they will carry out their own business planning.

2. Network roll-out: The broadcasters will assume the responsibility of their respective network roll-out and as a result these blocks are not required to be included in the roadmap:

   a. Network interfacing (functional building block 4.6): For example the broadcasters will determine how the transport streams are distributed to the transmission sites (e.g. satellite or optical fibre).

   b. Transmitter equipment availability (functional building block 4.8): The broadcasters will order their own equipment and will consider the available equipment themselves.

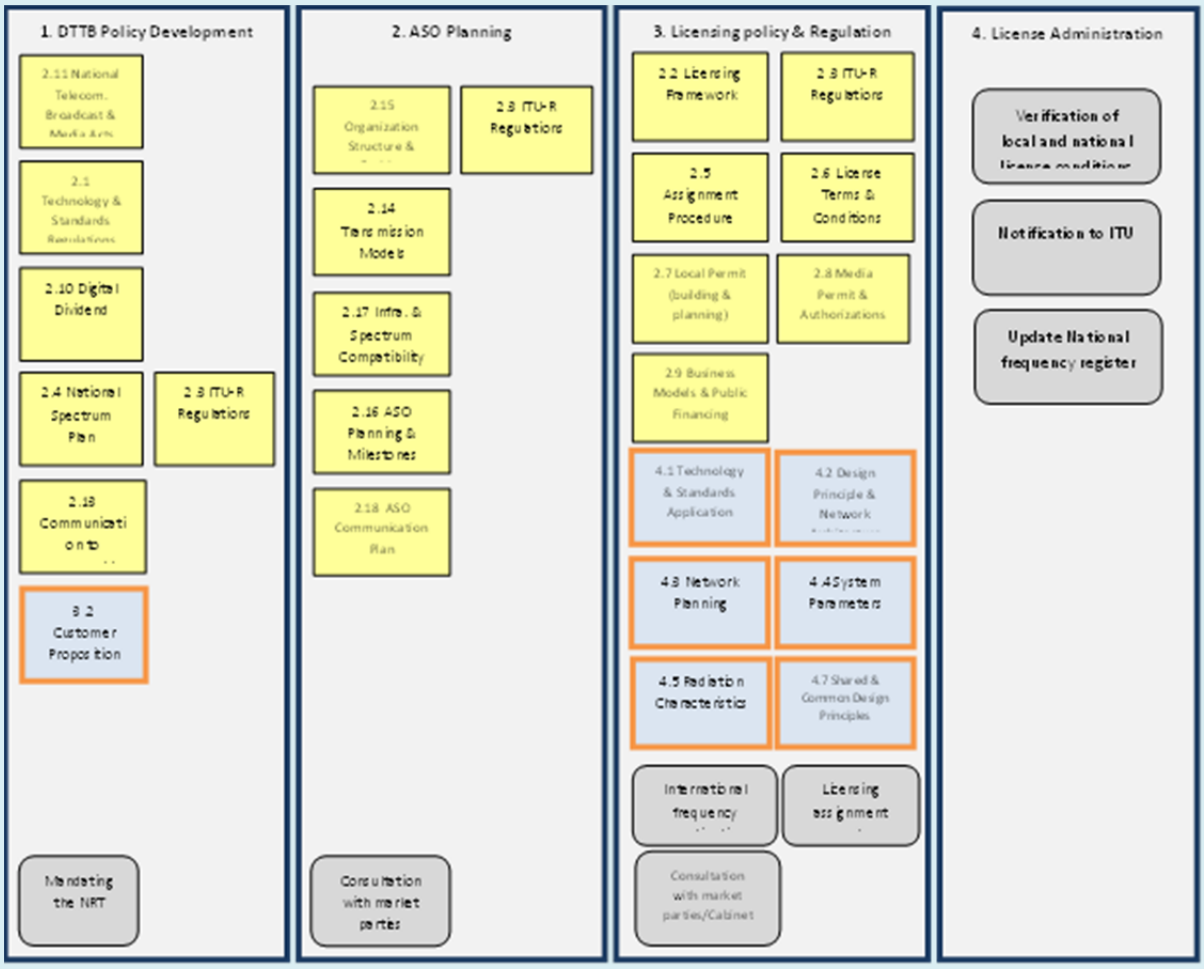
   c. Network roll-out planning (functional building block 4.9): The broadcasters will roll-out their own network and the transmitters will probably be deployed on their existing towers. Although the broadcasters will carry out their own network roll-out the NRT will have to set milestones for them to comply with. The broadcasters will have to follow the ASO planning (especially in the case of a phased simulcast model).

3.4.4 Functional blocks in each phase

Taking into account the need for sharing infrastructure in the limited market size as well as the geography of the country, the NRT agreed on one multiplex operator with open access (Model B), which could be owned by a consortium. The details of the consortium would need to be worked out and be licensed on a non-exclusive basis. The NRT also held the view that DBNO should not have a broadcast (content) licence. There was also discussion on using the existing carriage licence regulatory framework for DBNO.

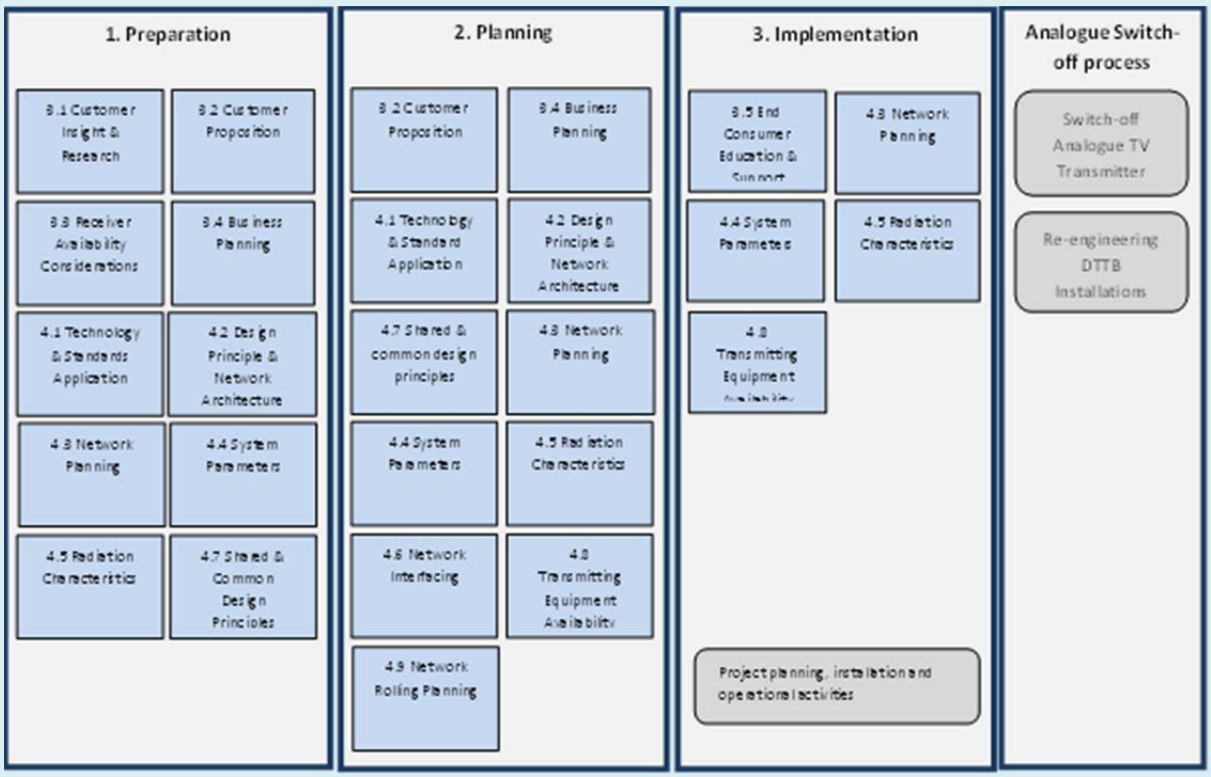
In this context, Figures 3.9 and 3.10 show the functional building blocks for Maldives based on Model B. The yellow blocks correspond to chapters in the ITU Guidelines. The yellow blocks with a blue outline are the functional blocks that the regulator needs to undertake before forming (issuing a system licence) the proposed operator (DBNO). The grey blocks are not described in the ITU Guidelines.

Figure 3.9: Functional blocks in each phase for the regulator



Source: ITU Guidelines

Figure 3.10: Functional blocks in each phase for the operators (DBNO)



Source: ITU Guidelines

To avoid duplication, the remainder of this report will describe the roadmap for Model B and will indicate how and when the roadmap will differ for Model A. For example, when a functional building block and its associated activities will not have to be included or when the output documents of each phase are used for different purposes.

3.4.5 Phase 1 DTTB policy development for the regulator

The DTTB policy development phase of the roadmap is aimed at getting the DTTB policy objectives agreed at a policy level (Ministry, Cabinet or Parliament) as the issue covers citizens at large. Government consensus and commitment lies at the heart of any successful transition from analogue to digital terrestrial television project. Government will have to commit to the DSO targets, ASO objectives, deadlines, necessary budget while endorsing the establishment of NRT with a clear mandate to plan and execute the transition.

Inputs

This phase is designed taking into consideration the existing regulatory framework (see Table 2.4) and objectives (see Table 2.5), and the relevant policy documents (e.g. the acts and policies that currently regulate broadcasting content and the establishment and operation of radio frequency transmitter for broadcasting).

Outputs

The key output of the DTTB policy development phase is a politically endorsed DTTB policy document to be made publicly available (in the 'Official Gazette'). Such a DTTB policy document typically includes:

- policy needs and justification including the benefits and necessities of introducing DTTB services in Maldives (including the allocation of the digital dividend);
- the legal framework which forms the legal basis (and any necessary changes) for the DTTB service introduction as well as the ASO;
- licensing and technical framework detailing the available spectrum for the DTTB services, the current spectrum in use by existing broadcasters and the spectrum assignment framework;
- digital services launch as well as the start and end date of ASO – these dates have to be exact to inform the general public and the industry accurately;
- DTTB services describing at a high level the existing television services and additional content/services that will be distributed on the DTTB platform and on which atolls/islands these service will be made available and when;
- DTTB standards to be deployed in the country (for example the transmission and compression standards);
- financing policy or support, if any, towards the transition of analogue to digital terrestrial television in the country;
- the principles for ASO that could include simulcasting period or other as decided by the NRT;
- communication and plan of action outlining how viewers (and other stakeholders) will be informed about the ASO process and the plan of action including major regulatory and operational milestones (e.g. the composition and role of the NRT, the need /date/time when the Broadcast Act will be changed/updated, the decision on the allocation of the digital dividend, etc.).

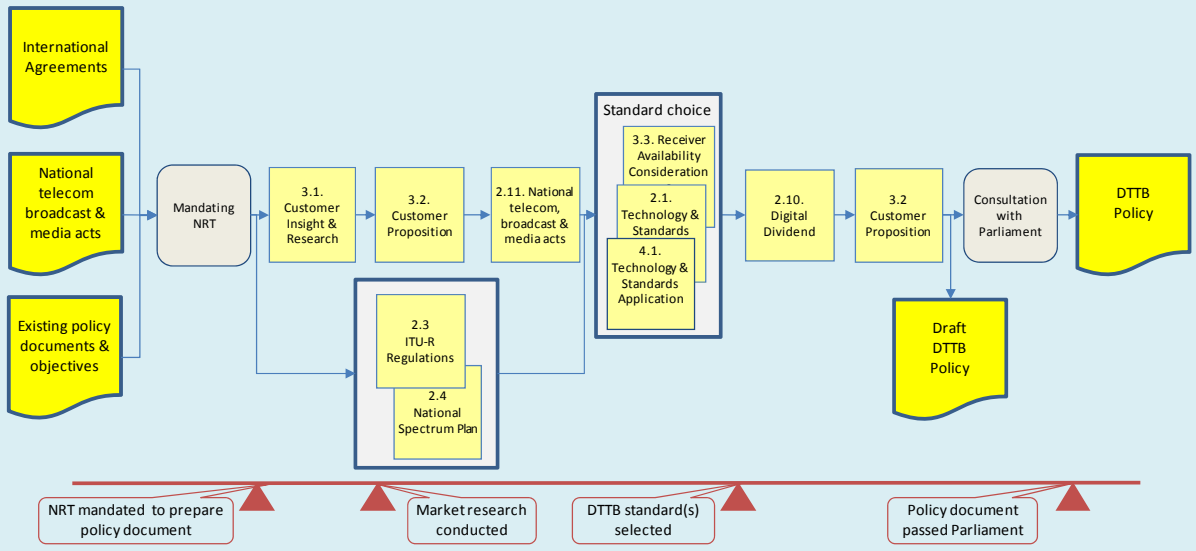
For an example of a DTTB policy document, please refer to "Strategy for Switchover from Analogue to Digital Broadcasting of Radio and Television Programs in the Republic of Serbia" as published in the Official Gazette of the Republic of Serbia, No. 55/05, 71/05 – correction 101/07, the Government of the Republic of Serbia on July 2nd 2009[6].

Roadmap

The roadmap of the DTTB policy development phase and the associated functional building blocks are shown in Figure 3.11. The decisions taken, partly taken and not yet taken on the key topic and choices regarding Phase 1 of the roadmap and the activities required to take the decisions that are still pending, are indicated in Annex 1.

[6] Document can be download from www.itu.int/ITU-D/tech/OLD_TND_WEBSITE/digitalbroadcasting_OLD/Bulgaria_Assistance_Transition/Serbia/Serbia_Web.pdf, and www.irex.rs/attachments/130_Strategy%20for%20Switchover%20from%20Analogue%20to%20Digital%20Broadcasting.Pdf

Figure 3.11: DTTB policy development phase of the roadmap for the regulator



Source: Adapted from ITU Guidelines

The key steps in the first phase of the roadmap include:

1. Mandating the NRT: The NRT has been formally established in Maldives. However, the mandate of the NRT should be clarified and is recommended to:
   a. provide recommendations to the government on DTTB policy matters;
   b. prepare, plan, and monitor the execution of the roadmap under the aegis of Maldives Broadcasting Commission;
   c. provide recommendations to other policy makers, regulators, stakeholders in the transition process.

   At the second phase of the roadmap (i.e. ASO planning), the NRT membership can be extended to include all stakeholders in the DTTB value chain (and structured in line with the implementation guidelines of functional building block 2.15);

2. Conducting market research on the current television and future DTTB market in Maldives: This step includes the functional building blocks 3.1 and 3.2. At this phase of the roadmap, this market research serves the purpose of providing support/justification for the DTTB policy. As the key Maldives broadcasters (i.e. MNBC, V TV Dhi TV, and Atoll TV) are participating in the NRT, some of the research data may be readily available. The market research data is recommended to cover the following elements:
   a. Current television market in Maldives. A profound and agreed understanding of the current television market provides a sound basis for any policy document including:
      i. Current market players including broadcasters, content creators, network operators, service providers etc. Figure 2.1 in this report, provides a good starting point.
      ii. Television viewing 'demographics' that entails the common market parameters like number of television sets deployed, the number of television households, the number of viewing hours per channels (This was not available in Maldives), the number of subscriptions, etc.
      iii. Size of the total television advertising market in Maldives including the impact of the DTTB introduction and ASO on this advertising market should be assessed.

iv. Current signal reception situation and conditions. This includes an insight of what the different viewing groups (including individual viewers, household size, group viewing, hotels, multi-dwelling units, etc.) look like, their numbers and under what conditions is current analogue television received (e.g. the antenna installation and type of television sets). This part should also include the reception from other platforms. Especially the number of viewers/subscribers to the many cable networks in the various atolls.

v. Current analogue service coverage including what service can be received at what location. This might entail an analogue service planning exercise (similar to the DTTB service planning as described in the ITU Guidelines).

vi. Current analogue television distribution to cable head-ends needs to be examined. In Maldives there is one cable network and many of them use the existing analogue television broadcasts to feed their head-end systems. Switching off the analogue television broadcasts will impact this content distribution system. The consequences should be assessed and possible solutions formulated.

vii. Television market logistics and supplies. The current logistic chain for television sets will be important for the distribution of DTTB receivers. An understanding of its structure, volume (e.g. how many outlets where?) and operations will be necessary.

b. *DTTB* market in Maldives. The DTTB policy document should illustrate the need for DTTB. It is important to note that MNBC, V TV and Dhi TV are trialling a digital terrestrial television service in Male. Their customer insight data may be helpful. This part of the market research should provide an insight in what the Maldives viewers and industry players expect regarding:

i. Content: The number and the type of programmes/channels and other service to be broadcasted (for example the EPG, subtitling, theme channels), the willingness to pay for the STB and the television services. Knowledge of this willingness can help to determine any financial support necessary for the Maldives viewers.

ii. Suppliers: The interest amongst Maldives distributors in provisioning DTTB receivers.

iii. Content creators: The expectation of Maldives content creators and distributors (mainly the current broadcasters) in provided dedicated content for the DTTB platform.

3. Determining the *currently available* spectrum for DTTB (functional building blocks 2.3 and 2.4): In Maldives only two frequencies in VHF and five UHF frequencies were allocated to the broadcasters. The spectrum is almost fully available for digital terrestrial television. (see also Sections 4.9 and 4.10), taking into account:

a. spectrum already assigned (not necessarily in use yet) for analogue and/or digital television services (as indicated/to be incorporated in the National Spectrum Plan and Register);

b. spectrum required for future digital radio services (as indicated/to be incorporated in the National Spectrum Plan and Register);

c. spectrum requirements for non-broadcasting services, for example spectrum for IMT services (as indicated/to be incorporated in the National Spectrum Plan and Register).

4. Checking compliance with current legislation and identifying required changes (functional building block 2.11): An assessment needs to be carried out to identify what parts of the current legislation will be impacted by the introduction of DTTB services. Table 2.4 in this report and Table 2.11.1 in the ITU Guidelines provide a good starting point for this assessment. At this first phase of the roadmap, the assessment is focused on identified the areas that might be impacted, how required changes can be achieved (e.g. legal and parliamentary procedures) and

how much time this will take. This assessment will then provide input for the plan of action (as part of the DTTB policy document). During the third phase of the roadmap (i.e. determining the DTTB regulations) when specific DTTB regulations are defined (e.g. the licensing framework and procedures), a further detailed assessment of necessary changes may be necessary.

5. Selecting the transmission standard (or any other system element): Deciding the transmission standard is an iterative process (refer Figure 3.11) amongst the functional building blocks 4.1 on technology and standards application (i.e. addressing the technical performance), 2.1 on technology and standards regulation (i.e. considering regulatory aspects) and 3.3 on receiver availability considerations (i.e. dealing with functionality, price and delivery of receivers). In Maldives two transmission standards have already been tested; DVB-T and ISDB-T. The NRT should decide whether it advisable to have two standards in the ASO process. During the NRT meetings held during the mission in December 2012, the views of the NRT were:

   > *"It was re-emphasized by ITU that the choice of DTTB standard is a national issue and the NRT agreed to discuss and arrive at national level. It was also mentioned that in earlier meetings NRT was of the opinion that only one standard should be used."*

   If concluded that one standard should be adopted, the NRT should balance between technical and regulatory aspects. However, selecting the transmission standard is not only a technical and regulatory evaluation. Given the specific situation in Maldives it should also explicitly include the following elements (further to the considerations provided in the ITU Guidelines):

   a. Affordable and sufficient suppliers of DTTB receivers: Given the public financial resources available and the affordability of the Maldives viewers, receivers (including set-top-boxes and IDTVs) should be made available at the lowest price levels. While doing so, not only short term but also long term pricing and supplier availability should be considered. In Maldives, the DTTB adoption speed might not take a long(er) time and hence the product roadmap of the receiver suppliers should be taken into account. Suppliers should also be committed to provide sufficient quantities in a flexible manner (e.g. according to a rollout forecast). This might need special attention in case a conditional access system (CAS) is stipulated (especially if specific Maldives /Divehi language requirements are required e.g. for the EPG and the user interface of the receiver).

   b. Independent and warranted suppliers: Dependency on one single supplier should be avoided. Any DTTB system (head-end and receivers) will incur many changes (e.g. frequency changes, software updates, additional functionality, etc.) during its life span (i.e. 5 – 15 years) and suppliers should support this. One should be in the position to change providers. Changing suppliers is not uncommon in this industry.

6. Deciding the digital dividend (functional building block 2.11): In this phase, it should also be decided how the Maldives Government would like to deal with the digital dividend i.e., services to which the spectrum saved will be allocated.

7. Determining high level customer proposition: As a result of the DTTB policy document, some of the key transition principles that impact customers need to be detailed at high level.

8. Consultation with Parliament: At this stage, it is recommended that the draft DTTB policy document is offered to the Cabinet/Parliament for their approval. This might entail many consultation sessions, extensive discussions with stakeholders and necessary revisions. Sufficient time should be planned for these activities. It should be noted that in this set-up of the roadmap, the DTTB policy document should leave room for the NRT to further detail the customer proposition, frequency plan (including the service planning process) and ASO plan (including the organizational structure, budget and planning). Once the DTTB policy document (including the customer proposition) is approved/published in the Official Gazette, it would serve as a first communication to the general public and television industry.

3.4.6 Phase 2 ASO planning for the regulator

The second phase of the Maldives roadmap is aimed at providing a detailed insight in the roles and responsibilities of the various involved parties, the process of transitioning from analogue to digital terrestrial television broadcasting, the milestone planning and the communication/support process. The ASO planning phase also serves the purpose of getting support from various stakeholders including public and private entities.

Inputs

An important prerequisite for the ASO planning phase is the DTTB policy document passed by Cabinet/Parliament.

Outputs

The main outputs for the ASO planning phase are

- an initial frequency plan (based on an initial DTTB service planning), and
- ASO plan.

In general terms, an initial frequency plan describes how the available spectrum will be utilized in a deployed network and which service (s) (including the number of frequencies and reception mode) will be provided in what areas and with what quality levels (including picture quality and coverage probability). In more specific terms, the frequency plan details all the decisions and trade-offs as included in the functional building blocks 4.2 to 4.5. It would also include the simulcasting conditions of current free-to-air (FTA) TV programmes including the details on which services can be received, the reception conditions and areas covered.

The ASO plan describes in detail the transition process from analogue to digital and will include at least:

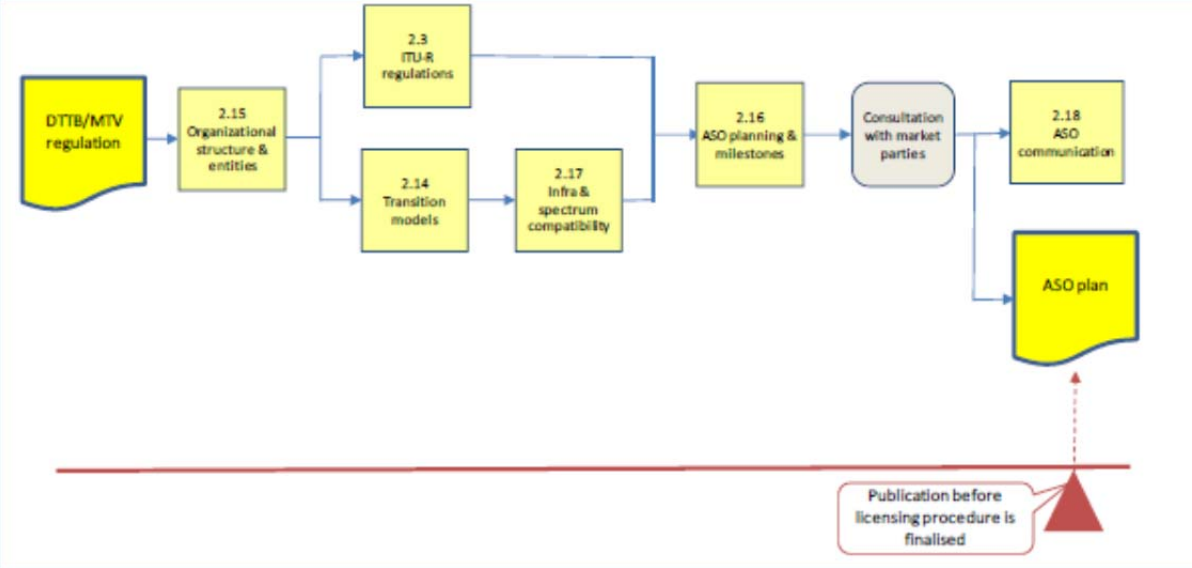
- ASO planning (see functional building block 2.16). This describes the proposition for the customer and how it will be provided. As indicated in the ITU Guidelines it comprises of several streams or result paths including:
    i. communications (further detailed in functional building block 2.18 ASO Communication);
    ii. device producers and delivery;
    iii. network plan and rollout (includes DTTB service delivery details);
    iv. consumer issues and market monitoring;
    v. regulation and licensing (further detailed in phase 3 of the roadmap);
    vi. financial and installation support.
- The business planning and public financing (see functional building block 3.4 and 2.9): The business case should detail what the ASO process will cost (under various scenarios) and what financial resources should be made available. The initial frequency plan will provide the basis for a first estimate of the network costs. It should be noted that, as Table 2.15.2 in the ITU Guidelines illustrates, the network costs are just one item of the overall budget. The need for any financial support to be provided to affected viewers will be an important decision to be made.

In the context of Maldives, the NRT felt that there is no need to include any mandatory customer subsidy for the set top boxes (STBs) given the low prices of STBs.

Roadmap

The roadmap of the ASO planning phase and the associated functional building blocks is shown in Figure 3.12. The decisions taken, partly taken and not yet taken on the key topic and choices regarding phase 2 of the roadmap and the activities required to take the decisions that are still pending, are indicated in Annex 2.

Figure 3.12: ASO planning phase 2 of the roadmap for the regulator



Source: ITU Guidelines

The second phase of the roadmap for the regulators includes:

1. Establishing the organizational structure and participating entities (see functional building block 2.15): Depending on the exact mandate of the NRT in first phase of the roadmap, the participating parties and their responsibilities in the ASO planning process might need revision to reflect any difficulties observed in phase 1. In this step the reporting structure and escalation procedures should also be clarified so that the NRT can efficiently operate and manage the ASO process.
2. Determining an initial transition model (see functional building block 2.14): In the first phase of the roadmap a clearer understanding of the available spectrum was established. In this phase of the roadmap, the NRT needs to take the decisions regarding ASO and is recommended to include ASO with simulcast to ensure smooth transition in Maldives. Subsection 2.14.4 of the ITU Guidelines provides implementation guidelines for the ASO transition models.
3. Balancing DTTB service planning, customer proposition and financing the transition (functional building blocks 4.2 to 4.5, 3.2, 2.9 and 3.4): An iterative process is necessary to balance the three elements (i.e. service proposition, network planning and business case) as illustrated in Figure 3.1.1 in the ITU Guidelines. Although in the ITU Guidelines this process is explained for a commercial DTTB service provider, the process is in essence no different for the NRT. It consists of two parts:
    a. Initial DTTB service planning (which in turn is an iterative process of four functional building blocks 4.2 – 4.5);
    b. Service proposition review and financing (which are also in turn an iterative process of three functional building blocks 2.9, 3.2 and 3.4).

Figure 3.12 provides a flow chart of the two feedback loops that are incorporated in the balancing of these three elements.

4. Drafting ASO planning and milestones (see functional building block 2.16): The above mentioned balancing of three elements will result in one optimum scenario to be selected by the NRT. Based on this scenario the initial ASO planning can be drafted.
5. Consultation with Parliament: At this stage a draft ASO Plan is offered to Parliament/Cabinet/appropriate authority to approve (with several options). Again this might include many consultation sessions, extensive discussions and several revisions. Sufficient time should be planned for these activities.
6. Finalization of ASO Plan and detailing the ASO communication plan (see functional building block 2.18): After having the ASO plan approved by the Cabinet/Parliament/ appropriate authority, the ASO plan can be finalized for the selected scenario. This ASO plan will act as the working document for the NRT which will be continuously revised and updated. It will also form the basis for the ASO implementation. As discussed previously, one work stream or result path of the ASO planning is ASO communication, which includes:
   - communication strategy: including communication messages (related to the communication stage) and target groups;
   - communication tools: the various communication means to reach the listed target groups;
   - implementation guidelines.

The ITU Guidelines (functional building block 2.18) provides detailed guidance on development of ASO communication plan.

3.4.7 Phase 3 Licensing policy and regulation

The objective of this third phase of the Maldives roadmap is to have the required DTTB licences defined and the associated licensing procedure and planning published. This will provide clarity to interested industry players (existing and potential new entrants) to operate services in the Maldives DTTB market. It also serves the purpose of ensuring uninterrupted broadcasts, by minimizing interference from other spectrum users.

Inputs

The input data for this phase are the DTTB policy document resulting from the first phase of the roadmap and the ASO plan resulting from the second phase. As indicated in Figures 3.6 and 3.7 in this report, the third phase can start in parallel with phase 1 and 2. For example, the NRT could start working on the activities in this phase before the DTTB policy document and ASO plan. However, it is important to remember that such an approach might entail some changes/revisions later to align with the final outcomes of phase 1 and phase 2.

Outputs

The third phase is expected to deliver the following outputs, of which the latter two might be considered for publication in the Official Gazette:

- A nationally coordinated frequency plan defining which DTTB frequencies that will be used including the time period and geographical areas. This plan will have to be in line with the National Spectrum Plan or even made part of the National Spectrum Plan (please refer to functional building block 2.4 of the ITU Guidelines).
- An internationally coordinated frequency plan: As indicated previously this may require bilateral/multilateral coordination. However these administrative procedures may not need to be part of the critical path of the ASO planning.

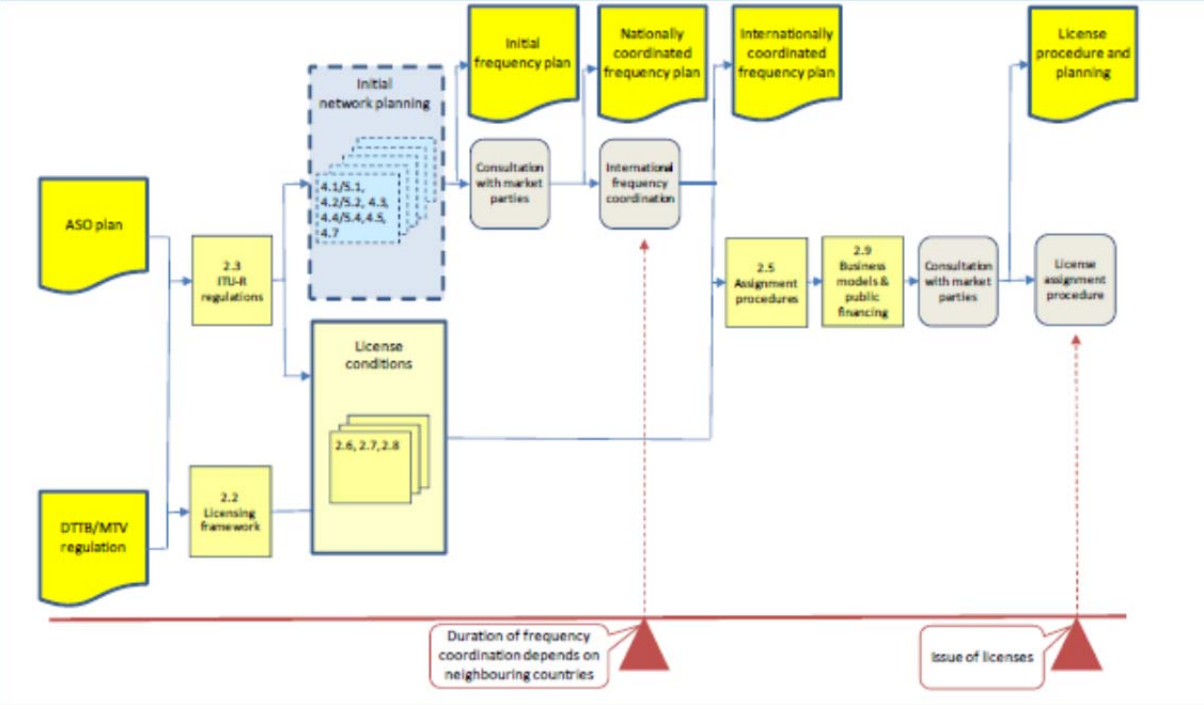
- The DTTB licence conditions and terms: In Model B (See 2.2 licensing framework), the service licence will need to be developed and assigned to the proposed DBNO (multiplex/service operators and contents distributor). Again to ensure spectrum efficiency and compatibility, this licence or a separate spectrum licence will have to specify details of frequency use. The NRT may have to recommend qualification and appropriate entity to form the proposed DBNO. The MBC in consultation with CAM can decide the assignment of this system licence. It might also be useful to consider the possibility of the DBNO obtaining a licence for its infrastructure roll out under existing telecommunication licensing framework.
- A document describing the assignment procedure and planning in Model B: The NRT will have to organize the procedure for selecting the best party to fulfil the role of common multiplex/network operator. It will have to stipulate what entities are allowed to bid (for example consortia of existing broadcasters, foreign partnerships and public private partnerships) and what will be the criteria for selection of DBNO. In addition it will have to publish Open Network Provisioning (ONP) rules (including capacity access and pricing rules) for this common multiplex/network operator. For re-using existing infrastructure (like towers or antennas) it may be necessary to impose site sharing rules to ensure cooperation from broadcasters or other infrastructure providers. The tender procedure is covered in Appendix 2.5 B of the ITU Guidelines. This Appendix shows the elementary steps in any assignment procedure. For a practical example of an invitation to apply for a multiplex licence, refer to an Independent Television Commission (now part of Ofcom) document" Multiplex Service Licenses: Application Documents"[7].

Roadmap

The roadmap of the licensing policy and regulation phase and the associated functional building blocks is shown in the Figure 3.13 below. The decisions taken, partly taken and not yet taken on the key topic and choices regarding phase 3 of the roadmap and the activities required to take the decisions that are still pending, are indicated in Annex 3.

[7] Multiplex Service Licences: Application Documents" can be downloaded from link www.ofcom.org.uk/static/archive/itc/latest_news/multiplex_licence/dtt_multiplex_licence_tender.asp.html

Figure 3.13: Licensing policy and regulation phase 3 of the roadmap for the regulator



Source: ITU Guidelines

The third phase of the roadmap includes:

1. Detailing DTTB service planning (see functional building blocks 4.1 – 4.7): After having agreed on the ASO plan (including the initial DTTB service planning), a detailed service planning need to be drafted. The planning should be detailed enough to enable ordering of equipment including head-end, distribution and transmitter equipment. It will have to consider the specific site locations (no fictive locations) and its characteristics (what antenna and transmitter space is available), the available distribution possibilities and the ASO plan (in which order will sites have to be put into operations). It will also have to provide the details for the communication plan so that viewers know exactly what services they will receive where and what they need to do (e.g. instructions for retuning their exiting rooftop antenna or acquiring a new one). The detailed planning is a working document, and on the basis of this planning, the network roll-out plans will be further detailed. During the roll-out changes will take place and the detailed planning will need updating also impacting the ordering of equipment (a rolling forecast system is also advised here).
2. Coordinating the required spectrum with national and international users: Based on the detailed planning, stipulating the exact spectrum use, the DTTB frequencies need to be coordinated with other spectrum users. Coordination should take place at a national and international level. At a national level this is carried out by matching the detailed DTTB spectrum plan with the National Spectrum Plan (NSP) or conversely the NSP should be aligned with this detailed spectrum plan. For example, this might entail changing frequencies in the detailed planning and/or changing existing digital spectrum rights. The spectrum usage needs coordination with neighbouring countries spectrum usage too. However these activities do not have to be on the critical path of the ASO planning.
3. Determining the licensing framework (see the functional building blocks 2.2): The NRT has already selected licensing Model B. The licensing framework typically comprises of spectrum rights, broadcast rights and operating rights, which can vary depending on the type of service provided (see Table 3.2).

Table 3.2: Model B licensing framework

Type of right	License/permit reference
Spectrum rights	Frequency/Spectrum license
	Multiplex license
	Platform license
	Broadcast license
	Network operator license
Broadcast rights	Media/broadcast authorization/ permit (program level)
	Broadcast license (platform level)
Operating rights	Building/Planning permit
	Transmitter/EMC license/permit
	Broadcast license
	Platform license

Type of right	DTTB and MTV Value Chain					
	Content Creator	Content Aggregator	Multiplex Operator	Service Provider	Content Distributor	Device Creator
Spectrum rights			X	X	X	
Broadcast rights		X	X	X		
Operating rights				X	X	

Source: ITU Guidelines

While determining the appropriate licensing framework, it is necessary to consider the national objectives relating to spectrum management, competition rules, market structure and environmental issues as well as media rules. (See sections 2.2.1, 2.2.2, 2.2.3, and 2.2.3 of the ITU Guidelines for details).

Apart from the implementation guidelines, the following aspects are also recommended to be considered specifically for Maldives:

a. The business model needs to be reconsidered as currently the broadcaster television services are free-to-air. This may not be sustainable in the case of an independent multiplex operator (which in principle does not generate any advertising and pay-tv revenues). The business model should also be aligned with any formulated open network provisioning (ONP) rules 17.

b. The financial requirements for rolling out a DTTB network e.g. support from other industry, investors other than the current broadcasters, may need to be explored.

4. License conditions and procedures (see functional building blocks 2.6, 2.8 and 2.5): A clear decision on the licensing model, the licence conditions and procedures are a must for network roll out.

5. Consultation with the industry and the Government: Before actually deciding the licensing regime (to include licensing framework, conditions and procedures), the NRT should organize a wide consultation to seek comments for its plans. Given the number of directly involved market players on the Maldives television market (see also Figure 2.1 in this report), it might be useful to organize informal discussions in pre-consultation phase with key stakeholders. After taking into account the comments from pre consultation and open consultation, the NRT may need, based on the issues, approvals from relevant authorities including regulators (broadcasting, telecommunications, etc.),

cabinet, parliament, etc. Sufficient time should be incorporated in the ASO to plan for this endorsement.

3.4.8 Phase 4 Licensing administrations for the regulator

The objective of the licence administration phase is to check compliance with the issued licences, to update the National Frequency Register and to notify the ITU of any new DTTB station put into operation. These notifications are also important for the MBC and CAM to commence its task of verifying compliance with the terms and conditions of the DBNO system licence.

The same procedure also applies for changing the station characteristics (e.g. when restrictions on the digital transmissions have been lifted after switching off analogue transmitter stations) and when taking stations out of operation. The NRT will have to approve any analogue television transmitter to be switched off to ensure technical compliance and protect consumer interest.

Inputs

The input data for this phase is the notifications from the DBNO to the MBC.

Outputs

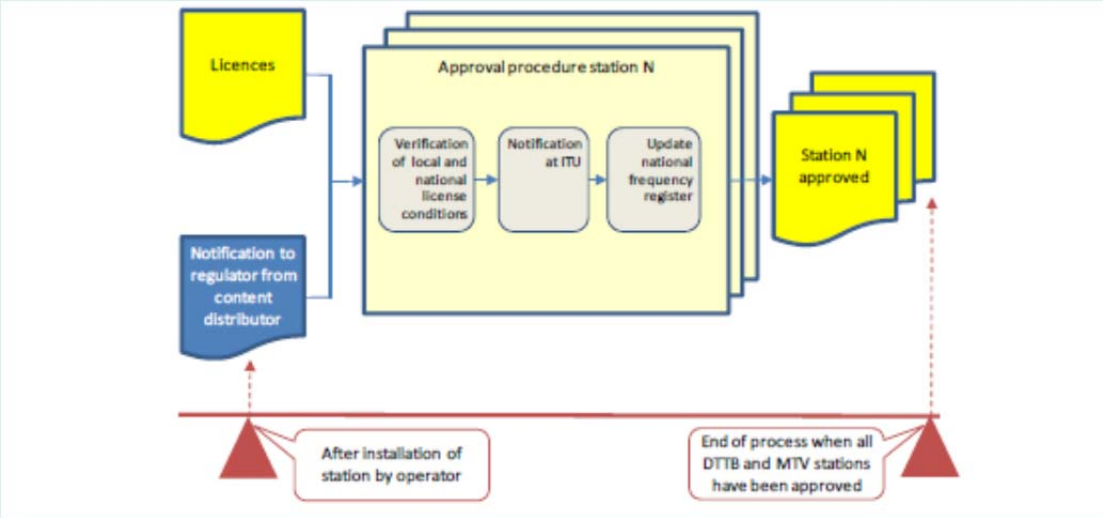
The phase will have two outputs:

- Approval by MBC of the stations: After having checked whether the transmitter station is compliant with the DTTB spectrum licence terms and conditions, the MBC will provide an official approval.
- Recording of the assignment (i.e. station) in the Master International Frequency Register (MIFR).

Roadmap

The roadmap of the licence administration phase and the associated activities is shown in Figure 3.14.

Figure 3.14: Licensing administration phase 4 of the roadmap for the operator



Source: ITU Guidelines

As can be observed from Figure 3.14, the following are included in phase 4 of the roadmap for the regulator:

1. Verification of station characteristics with licence conditions: After licences have been granted and the operator has informed the regulator that a station is in operation, the regulator should verify that the station operates in accordance with the licence conditions, including:
   - station characteristics
   - roll-out obligations
   - media permits
   - local permits
2. Send notification to ITU: Recording of the assignment (i.e. station) in the Master International Frequency Register (MIFR). In turn the MBC/CAM will notify ITU (i.e. Radio communication Bureau) of the new DTTB station. ITU will check the station conformity and will, after approval, record the station/assignment in the MIFR.
3. Update national frequency register at MBC for each station after obtaining approval.

3.4.9 Phase 1 Preparation for the operator (DBNO)

The preparatory phase for operators starts when the regulator is preparing the licensing policy and regulation framework. The aim is to apply successfully for a DTTB licence.

Inputs

The input for this phase is licence procedure from the licensing policy and regulation phase 3 of the roadmap for the regulator. In some cases, the potential DBNO may also wish to provide comments to the regulator in the consultation phase. The system licence will be assigned to the proposed DBNO (multiplex/service operators and contents distributor).

Outputs

The output of the preparation phase of the roadmap for the operator includes:

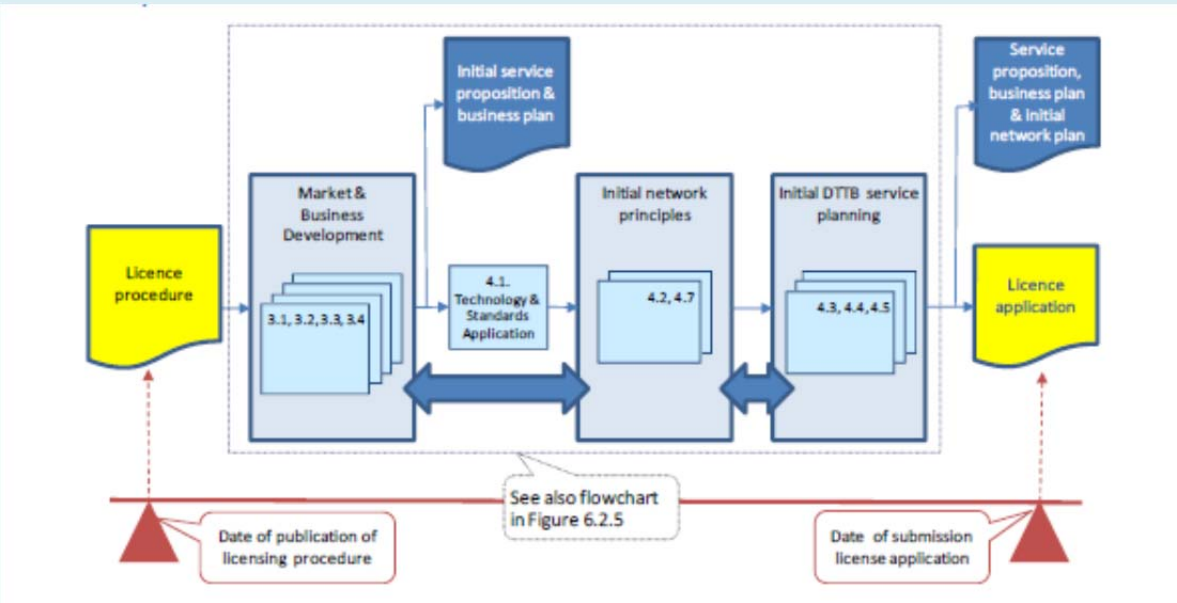
a. licence application document;

b. service proposition and business plan.

Roadmap

The roadmap for preparation in phase 1 for the operator (DBNO) is mentioned in the associated functional building blocks shown in Figure 3.15. The decisions taken, partly taken and not yet taken on the key topic and choices regarding phase 1 of the roadmap and the activities are indicated in Annex 4.

Figure 3.15: Phase 1 Preparation of the roadmap for the operator (DBNO)



Source: ITU Guidelines

As can be observed from Figure 3.15, the following steps (i.e. functional building blocks and non-DTTB specific activities) are included in this phase for preparation of the roadmap for the operator (DBNO):

1. Market and business development: Four functional building blocks 3.1 (customer insight and research), 3.2 (customer proposition), 3.3 (receiver availability consideration) and 3.4 (business planning) deal with key business issues and choices that the DBNO faces when planning the commercial launch of common DTTB transmission platform with multiplex services. It includes a set of business activities and tools for defining the DTTB service proposition and associated business case and plan, taking into account identified demand drivers, service barriers, financial feasibility and more specifically receiver availability and customer support issues.

   The DBNO major customer would be the current TV broadcasters and the DBNO would be responsible for meeting the operational cost of the transmission network. DBNO revenue can come from the content providers/broadcasters through a monthly fee or fees based on per transmission site. The business model needs further study by the NRT and a suitable framework of regulation implemented. Price regulation on the rentals may be required as DBNO would have dominance.

2. Technology and standard application: The transmission network in Maldives would be based on NRT recommendation on DTTB standard selection. The functional building block 4.1 provides guidance on compression systems, specifications on SDTV and HDTV, etc. One of the important technical issues to consider is the required bit rate to satisfy the simulcast of the current and future TV programmes using DTTB multiplexes using a SFN/MFN transmission network to provide island-wide coverage. The choice of the video bit rate for a large number of SDTV programmes is a trade-off between picture quality and multiplex capacity.

   The trade-off can only be made after multiplex composition and (see ITU Guidelines section 4.2.5 of the functional building block 4.2) network planning (see functional building blocks 4.3 Network Planning) has been considered. In order to achieve an acceptable picture quality, MPEG4 ≥ 4 Mbit/s is recommended for flat screens. Details can be found in Table 4.1.1 of ITU Guidelines (reproduced below) in functional building block 4.1 dealing with technology and standards.

Table 4.1.1: Video bit rate requirements

Format	Screen	Compression	Average bit rate	Remark
SDTV	CRT	MPEG2	≥ 3 Mbit/s	
SDTV	Flat screen	MPEG2	≥ 6 Mbit/s	
SDTV	Flat screen	MPEG4	≥ 4 Mbit/s	
HDTV 720p	Flat screen	MPEG4	≥ 10 Mbit/s	When MPEG4 technology is mature ≥ 8 Mbit/s is expected to be sufficient
HDTV 1080i	Flat screen	MPEG4	≥ 12 Mbit/s	Depending on content and application of horizontal sub sampling

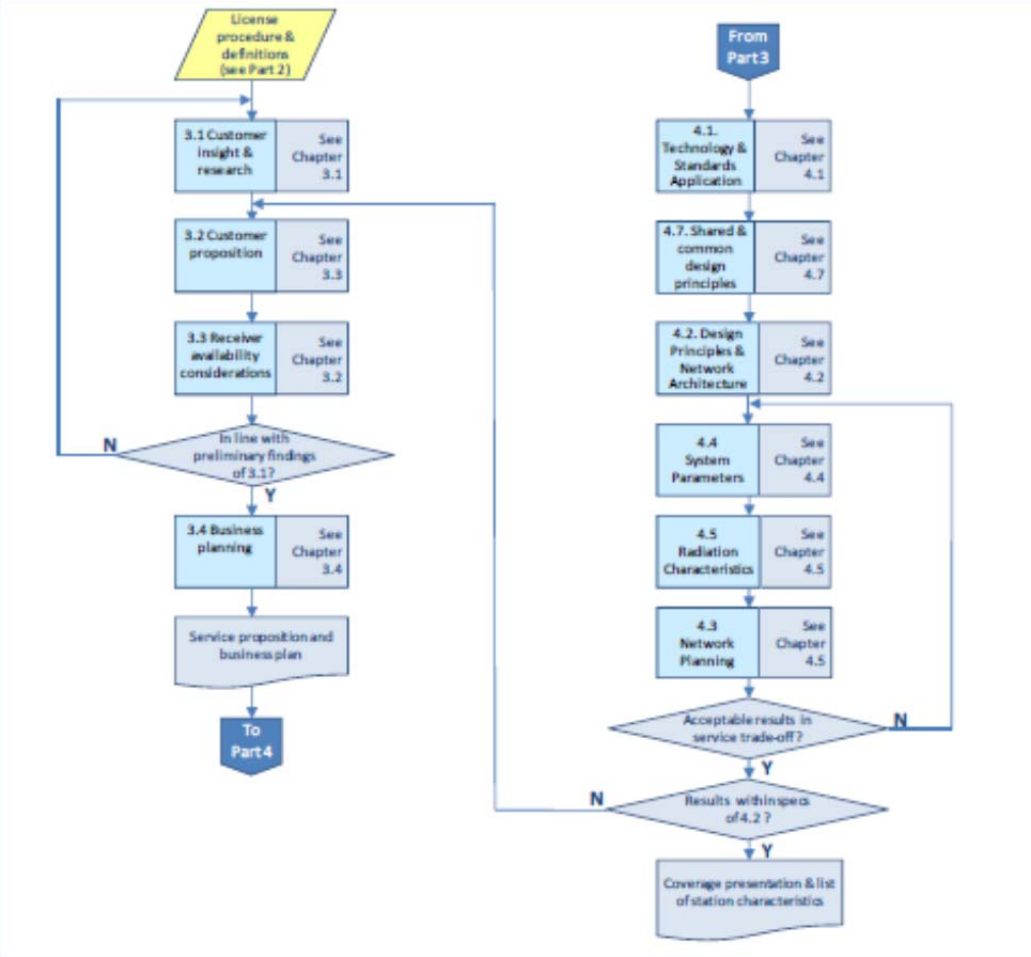
3. Initial network planning: In phase 3 of the roadmap for licensing policy and regulation, the NRT and MBC have to undertake initial network planning for functional building blocks (4.1, 4.2, 4.3, 4.4, 4.5 and 4.7). The DBNO would be responsible for the preparation tasks for functional building blocks 4.2 (design principles and network architecture) and 4.7 (shared and common design principles) in detail. The ITU guidelines provide useful information for these blocks.

4. Initial DTTB service planning: The DBNO would be responsible for the preparation tasks for functional building blocks 4.3 (performance network planning), 4.4 (determining system parameters) and 4.5 (assessing radiation characteristics). In the preparatory phase not all station characteristics are known in detail, nor is it necessary to achieve a detailed initial network plan. The purposes are:

   - to verify the business plan and customer proposition; and
   - to be able to react to proposals from the NRT and regulator in the studies during phase 3 roadmap of licensing policy and regulation that have been undertaken by the regulator MBC.

5. The functional blocks 3.1 to 3.4 include some iteration as shown on the left hand side of the flowchart in Figure 3.16. The activities indicated above result in an initial customer proposition and business plan and in having sufficient information for a successful licence application.

Figure 3.16: Flowchart for developing the service proposition and initial network plan



Source: ITU Guidelines

3.4.10 Phase 2 Planning for the operator (DBNO)

The planning phase starts on the date of issue of the licence and ends with the adoption of the network implementation plan. This plan describes station characteristics and a time schedule for implementation.

Inputs

The detailed planning phase starts once the licence has been issued. License conditions and the service proposition, business plan and initial network plan, resulting from phase 1, are the key inputs for phase 2.

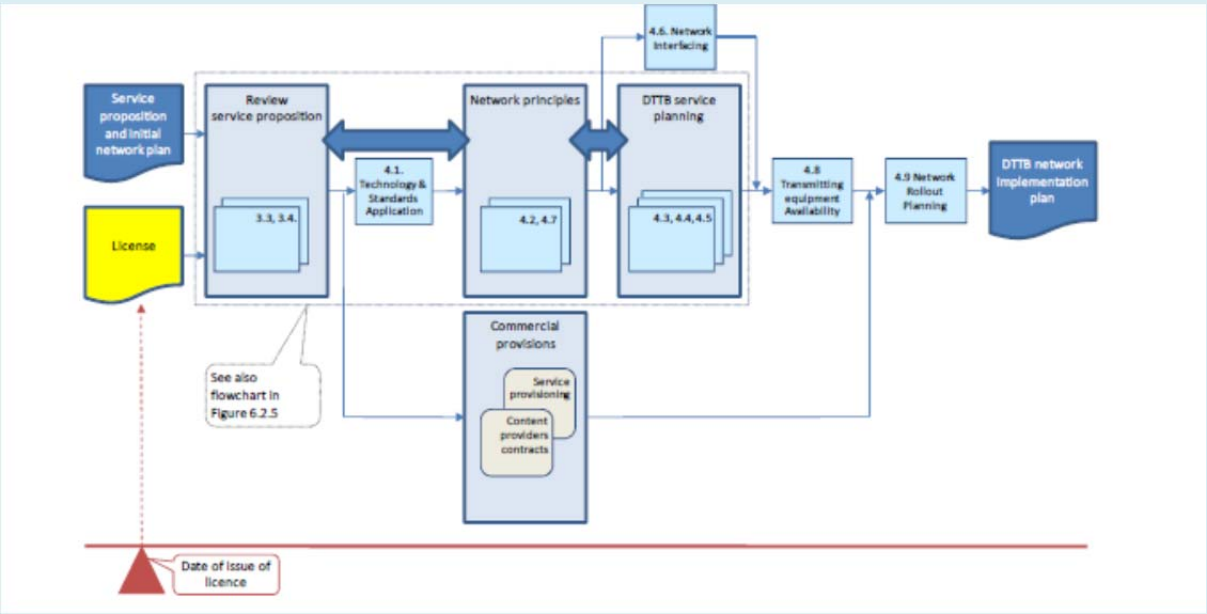
Outputs

The output of phase 2 of the roadmap for operator is DTTB Network implementation plan.

Roadmap

The roadmap of planning in phase 2 for the operator (DBNO) and the associated functional building blocks is shown in the Figure 3.17. The decisions taken, partly taken and not yet taken on the key topic and choices regarding phase 1 of the roadmap and the activities are indicated in Annex 5.

Figure 3.17: Phase 3 implementation of the roadmap for operators (DBNO)



Source: Adapted from ITU Guidelines

The following steps (i.e. functional building blocks and non-DTTB specific activities) are required for phase 2 planning of the roadmap for the operator (DBNO):

1. Review service proposition: Depending on the licence conditions, customer proposition and business plan (functional blocks 3.2 and 3.4) may need to be reviewed.
2. Commercial provisions: After review of the customer proposition and business plan, the network operator will commence the following commercial activities:
   - contracting content providers/current TV broadcasters;
   - service provisioning.
3. In parallel with the commercial activities, the initial technical choices will be reviewed and defined in more detail by carrying out appropriate activities related to functional blocks:
   - technology and standards application;
   - design principles and network architecture;
   - shared and common design principles.
4. DTTB service planning: Following the review of technical choices the DTTB service planning will be reviewed and defined in more detail by carrying out the activities related to functional blocks:
   - network planning;
   - system parameters;
   - radiation characteristics.
5. As in the preparatory phase, this includes several iterative steps and possibly a review of the service proposition. The order of steps is similar to those in Figure 3.17.
6. Network interfacing: In parallel to service planning, the activities related to functional block 4.6 (network interfacing) will be carried out.

7. Transmitter equipment availability: When the optimum network plan has been achieved and network interfaces have been specified, transmitting equipment availability will be considered and network roll out will be planned by carrying out the activities related to functional blocks:
   - transmission equipment availability;
   - Network roll-out planning.

3.4.11 Phase 3 Implementation for the operator (DBNO)

The implementation phase is a follow-up of the planning phase and it ends when all DTTB transmitters are operational.

Inputs

The implementation phase of the DTTB network starts once the network implementation plan resulting from phase 2 of the roadmap has been adopted. A number of DTTB stations contained in this plan probably have temporal restrictions and it is necessary to protect the analogue TV during transition.

Outputs

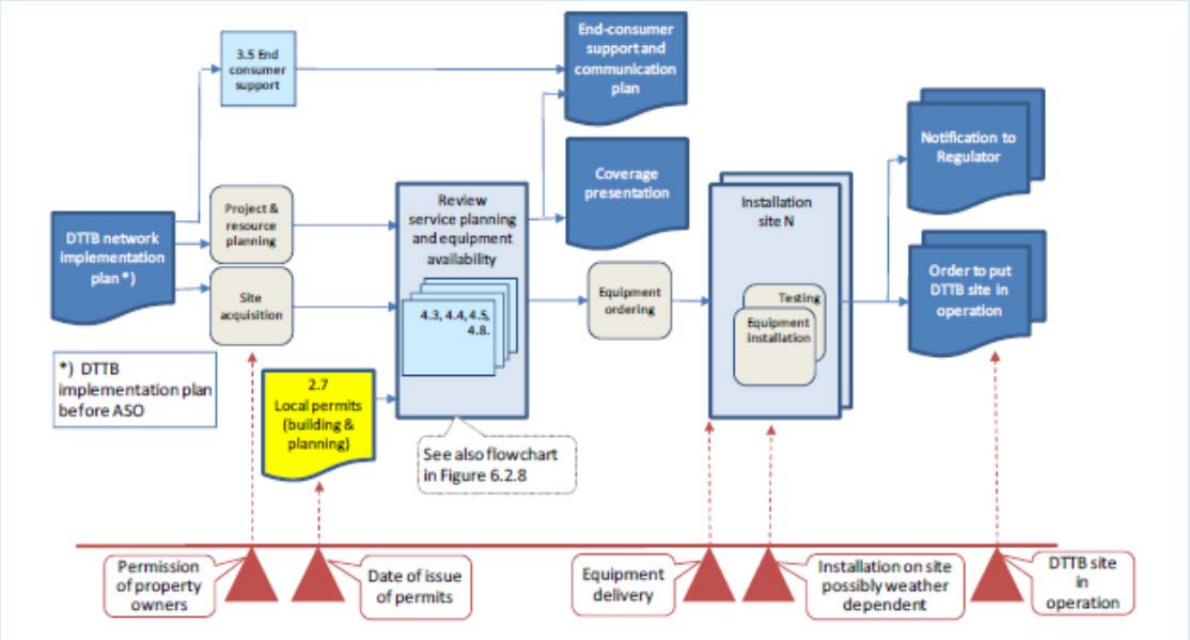
The phase 3 output documents of the roadmap for operators include:

- end-consumer support and communication plan;
- coverage presentation;
- notification to regulator;
- order to put DTTB site in operation.

Roadmap

The roadmap of the implementation in phase 3 for operators (DBNO) and the associated functional building blocks is shown in the Figure 3.18. The decisions taken, partly taken and not yet taken on the key topic and choices regarding phase 3 of the roadmap and the activities are indicated in Annex 6.

Figure 3.18: Phase 3 implementation of the roadmap for operators (DBNO)



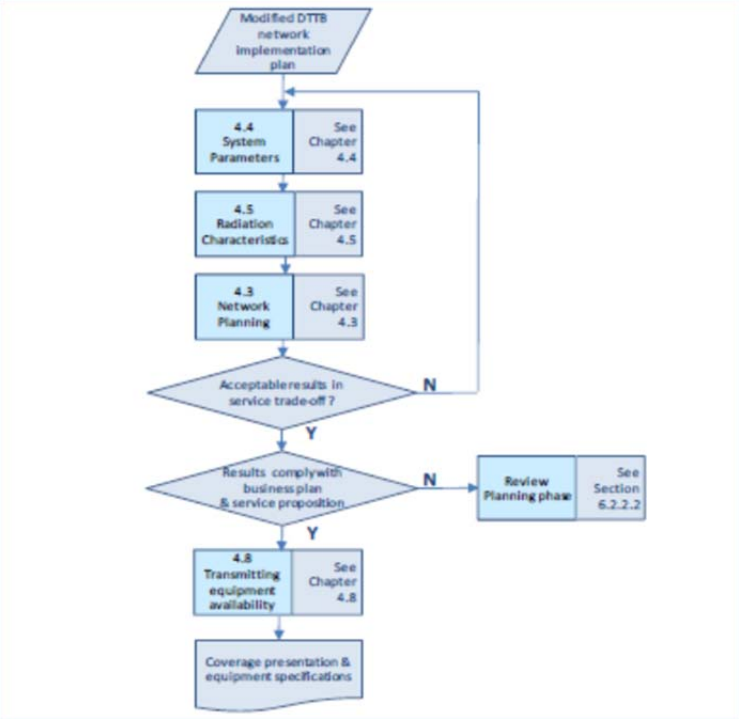
Source: ITU Guidelines

The following steps (i.e. functional building blocks and non-DTTB specific activities) are included in the phase 3 of the roadmap for operators (DBNO):

1. Project and resource planning and site acquisition: On the basis of the DTTB network implementation plan, project and resources planning, site acquisition will need to be carried out and local building and planning permits need to be acquired.
2. Review of service planning and transmission equipment availability: In carrying out the above mentioned activities, modifications to the network implementation plan may need to be accepted in case site acquisition may not be successful or a new site may be included at a different location than set out in the DTTB network implementation plan. In the detailed project planning, antenna heights or diagrams would need revision and the following functional blocks would need to be revisited:
    - network planning;
    - system parameters;
    - radiation characteristics;
    - transmission equipment availability.

    This includes several iterative steps as shown in Figure 3.19.

Figure 3.19: Flowchart for reviewing service planning and transmission equipment availability



Source: ITU Guidelines

If the results of the review of the service planning no longer comply with the customer proposition or business plan, the planning phase would also need to be reviewed. When the optimum set of station characteristics has been obtained, the equipment specifications will be reviewed and detailed coverage presentations will be made. The latter will be used for communication to the public and content providers to show the coverage at various implementation stages. Flowcharts for reviewing service planning and transmitting equipment availability would also need to be prepared.

3. Equipment ordering: On the basis of the equipment specifications, equipment tender procedures will be initiated. After comparing several offers, suppliers will be selected and equipment ordered.

4. End-consumer support: Before a site is brought into use, the end-consumers in the related coverage area should be informed about the new digital services and the prerequisites to receiving the signal (e.g. equipment etc.) as mentioned in functional block 3.5 (end-consumer support).

5. Installation: When the equipment has been delivered, installation of transmitting equipment starts, followed by site acceptance tests. During the installation stage it could happen that, for unexpected reasons, stations cannot be installed as planned. In that case, the DTTB implementation plan may need to be reviewed in order to provide information on the consequences of the changes and to prepare amended coverage presentations. The installation work should be planned in such a way that the transmitters can be put into operation at the agreed date, taking into account that some sites may be inaccessible during certain periods of the year. When installation of a station has been completed, the regulator should be notified that the station will be put into operation in accordance with the licence terms and conditions.

3.4.12 Phase 4 Analogue switch-off processes (DBNO)

The time schedule of the analogue switch-off phase is determined by the ASO plan of the regulator. Although the analogue transmission is stopped by the ASO date in accordance with the ASO plan, the engineering work on DTTB sites is likely to continue after analogue switch-off.

Inputs

The analogue switch-off phase starts during the simulcast (transition) period in accordance with the ASO plans and the milestones therein. The DTTB station characteristics during and after simulcasting are contained in the DTTB network implementation plan resulting from phase 2 of the roadmap.

Outputs

The output document of this phase 4 of the roadmap for operator listed below:

- DTTB Network implementation plan;
- notification to regulator;
- order to put revised DTTB site in operation.

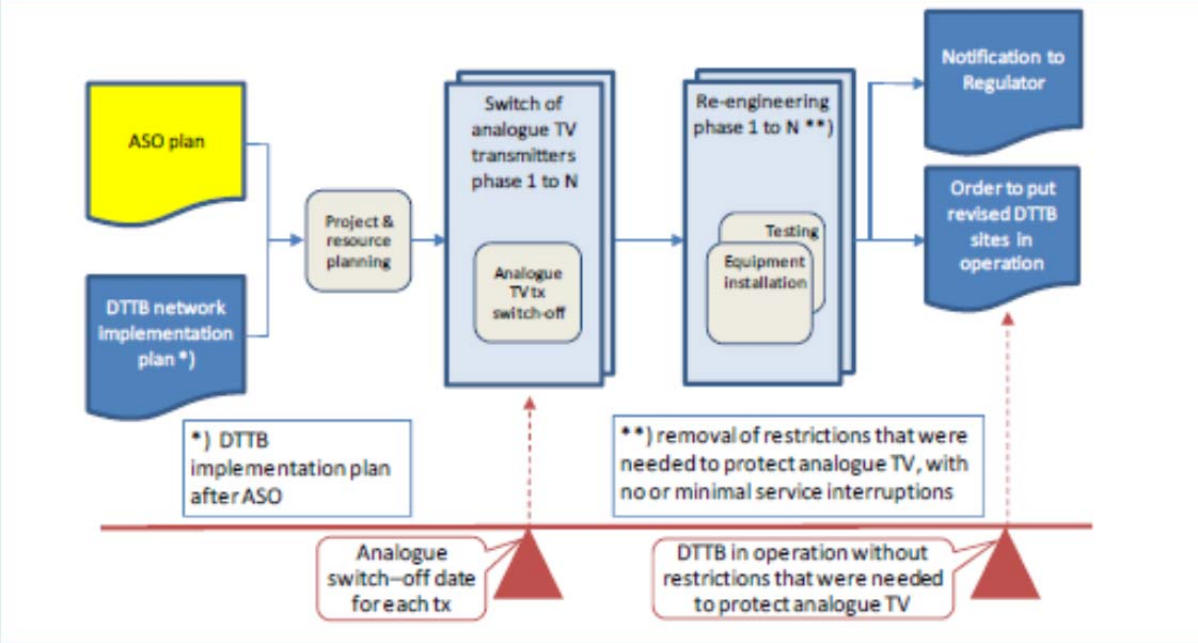
Roadmap

The roadmap of the analogue switch-off in phase 4 for operators (DBNO) and the associated functional building blocks are shown in Figure 3.20. As can be observed from the figure, the following steps are included in the analogue switch-off phase of the roadmap for operator (DBNO):

1. Project and resource planning and analogue switch-off: Switching-off analogue TV transmitters will be carried out in accordance with the ASO plan provided by the regulator.
2. Re-engineering: After switch-off, re-engineering of the sites begins. These activities may consist of three parts:
    - removal of superfluous analogue TV equipment;
    - modification of radiation characteristics in order to remove restrictions that were needed to protect analogue TV;
    - installation of additional DTTB transmitters that are licensed after analogue switch-off.

Normally it is necessary to carry out these activities with minimal interruption of the DTTB services. When the re-engineering work has been completed, the regulator will be notified that the station has been modified in accordance with the licence terms and conditions specified for the post analogue switch-off situation.

Figure 3.20: Phase 4 analogue switch-off of the roadmap for operators (DBNO)



Source: ITU Guidelines

4 Consideration of the critical issues concerning transition to DTTB in Maldives and views of NRT

During the ITU mission, the most critical issues concerning the transition to DTTB and the possible choices were identified by the NRT and discussed. Figure 4.1 lists these issues in order of priority, which were determined keeping in view the criticality of the impact on the ASO plan. It should be noted that these issues are based on the situation in Maldives and do not necessarily correspond to the complete scope mentioned in the functional building blocks of the ITU Guidelines.

Figure 4.1: Consideration on the key topics, issues, and views of NRT

❖	Choice of DTTB Transmission and Compression Standard
❖	Issue of digital broadcast network operator (DBNO)
❖	Common/shared infrastructure at DTT sites
❖	Capex requirements
❖	Digital terrestrial television launch date and process
❖	Analogue Switch Off date and process
❖	Communication to end consumers and industry
❖	Customer proposition (services and coverage)
❖	DTT reception related issues, e.g. retuning direction of current receiving antenna for optimizing DTT reception
❖	Business model and conditional access systems

4.1 Choice of DTTB transmission standard

The ITU Guidelines (Chapter 4.1) provide background information on key topics and choices regarding the selection of DTTB transmission standards and associated systems. The key issues include:

- technical tests to evaluate system performance;
- SDTV and HDTV specifications;
- selection of DTTB transmission standard;
- compression system;
- encryption system;
- additional services;

Appendix 4.1 A of the ITU Guidelines contains HDTV considerations.

Determining the TV presentation formats is important before making the actual selection of a transmission standard and system. TV presentation formats, Standard Definition TV (SDTV) and High Definition TV (HDTV) are independent of the transmission standard as part of the programme production process. However, the choice on the presentation format has an impact on the broadcast delivery process.

HDTV services provide viewers with a significantly enhanced television experience. HDTV services are attracting considerable attention worldwide and are expected soon to become the norm for television viewing. Appendix 4.1A of ITU Guidelines gives more information on HDTV transmission via DTTB networks. Worldwide, four DTTB standards are in use including DVB-T family, ISDB-T, ATSC and DTMB. The systems related to compression and encryptions are, in principle, independent of the transmission standard. However, a number of systems for additional services are standard dependent.

The choice of the TV presentation format (SDTV, HDTV), transmission standard, compression system, conditional access system and systems for additional services should be made within the framework of relevant legislation and regulations and market and business development decisions. In addition, policies and regulations regarding the analogue switch-off (ASO) process can also affect choice. It was re-emphasized by ITU that the choice of DTTB standard is a national issue and the NRT agreed to discuss.

Compression standard

Currently the key choice for a compression system is the choice between MPEG2 and MPEG4. It is expected that in the future even more efficient compression systems will be standardized. MPEG-4 advanced video coding (AVC), also known as ITU-T H.264, is a standard for video compression that can provide good video quality at substantially lower bit rates than previous standards (for example, half or less the bit rate of MPEG-2, H.263, or MPEG-4). MPEG-4 AVC can be applied to a wide variety of applications on a wide variety of networks and systems, including low and high bit rates, and low and high resolution video in broadcast.

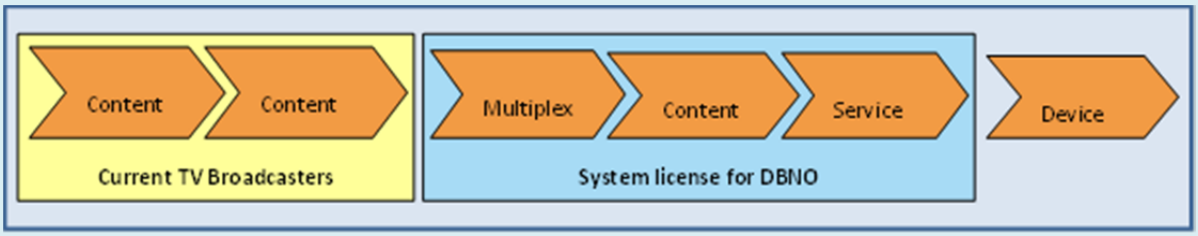
The Maldives NRT has decided to use MPEG4 as a compression standard in the country.

4.2 Digital broadcast network operator

The Maldives NRT agreed on having one multiplex operator with open access licensed on a non- exclusive basis, preferably owned by a consortium. The reason for having just one network is in line with the core driver for the transition to DTTB in Maldives of achieving nationwide reach through common infrastructure resulting in cost reduction. The details of the consortium would need to be worked out and. To curtail dominance, the DBNO should not have a broadcast (content) licence. There was also discussion on using the existing carriage licence regulatory framework for DBNO. The relevant authorities (MBC/CAM) shall issue required licences to facilitate the operation of DBNO.

In accordance with the DBNO concept, the digital value chain (see Figure 2.2.1 licensing framework of the ITU Guidelines) has been modified to meet local circumstance of Maldives in Figure 4.2.

Figure 4.2: Current TV broadcasters and proposed new DBNO players in the digital value chain



Source: ITU Guidelines

The key advantage of the DBNO concept is that the infrastructure cost will be shared among all users. Non-exclusive licensing basis has been proposed for the DBNO to avoid any adverse impact on competition in the market and retain and encourage the possibility of alternate broadcast network operators. It would also provide existing broadcasters with the option of building and/or continuing their own network if necessary.

It is vital that all current programme channels be accommodated in the initial digital terrestrial television broadcast to achieve similar coverage to the existing analogue television. Eight to 16 programme channels can be facilitated in an 8MHz frequency channel.

Duties and responsibilities

The NRT also discussed the duties and responsibilities of various stakeholders in the digital terrestrial television value chain, which is summarised here.

Duties and responsibilities of the Government of Maldives/Maldives Broadcasting Commission/Communications Authority of Maldives:

- develop policy framework for DTTB introduction, operations and analogue switch off;
- develop regulatory framework for digital terrestrial television in Maldives including infrastructure licence, spectrum licence, content licence, universal service conditions, price and charges, infrastructure sharing conditions, customer protection amongst others;
- facilitate formation of consortium with respect to DBNO;
- align the satellite and cable television operations in line with the digitalization plan.

Duties and responsibilities of DBNO:

- rollout the transmission network with island-wide coverage, required reliability and technical quality;
- facilitate all existing television broadcasters to share infrastructure at reasonable rates considering the capital, operational and maintenance costs of the network;
- collect content from the Master Control Room (MCR) of each broadcaster;
- deliver broadcaster content to viewers;
- provide specified quality of service level to the television broadcaster;
- facilitate requests from licensed television broadcasters;
- maintain a backup transmission facility to ensure minimum down time;
- provide an electronic programme guide (EPG) of all programme channels to viewers;
- maintain a round the clock help desk for viewers and broadcasters.

Duties and responsibilities of television broadcasters:

- content to be provided up to the hand-over point of MCR preferably in digital format (SDI with audio embedded);
- provide metadata whenever possible for EPG to DBNO.

4.3 Common infrastructure at DTT sites

NRT agreed on the use of a common infrastructure in light of limited market potential. It was also agreed that the sharing rules be determined by NRT or the concerned regulator (MBC and/or CAM).

During the discussions of the NRT, it emerged that a minimum of 28 principal transmission sites is recommended covering the islands based on experience of existing broadcasters. It is recommended to have a 500W transmitter tower at Male. The probable locations were identified in Table 4.1. The optimal locations of transmission sites can be finalized using coverage simulation methods.

Table 4.1: Transmitting site details – Maldives Broadcasting Corporation

	ATOLL	ISLAND	TX POWER	TOWER HEIGHT
1	Sh	Funadhoo	300W	40m
2	N	Mandhoo	250W	40m
3	R	Ungoofaaru	300W	40m
4	B	Eydhafushi	300W	40m
5	Lh	Naifaru	Not in Use	40m
6	A.A	Rasdhoo	250W	40m
7	A.Dh	Mahibadhoo	300W	40m
8	V	Felidhoo	250W	40m
9	M	Mulaku	300W	40m
10	F	Nilandhoo	300W	40m
11	Dh	Kudahuvadhoo	300W	40m
12	Th	Guraidhoo	300W	40m
13	Th	Vilufushi	100W	25m
14	L	Fonadhoo	300W	40m
15	G.A	Villingili	150W	40m
16	K	Gaafaru	10W	15m
17	K	Male’	1000W	70m
18	A.Dh	Maamigili	20W	28m
19	H.Dh	Makunudhoo	20W	20m
20	G.A	Kolamaafushi	20W	25m
21	G.A	Dhevvadhoo	10W	25m
22	G.Dh	Thinadhoo	250W	40m
23	H.A	Horafushi	300W	40m
24	H.A	Dhidhoo	300W	40m
25	G	Foammulah	20W	40m
26	Th	Omadhoo	Sites in plan for transmission	
27	G.Dh	Fiyoree		
28	G.A	Gemanafushi		

Source: MNBC

The use of existing infrastructure should be to encourage through bilateral agreements between existing broadcasters and the DBNOs with the involvement of regulators, as and when necessary.

Key issues and checklist for site facility sharing

Table 4.2 lists some key issues and the checklist regarding site facilities sharing at the proposed 28 DTTB sites.

Table 4.2: Checklist of key facilities for transmitter sites that need to be considered for sharing

No	Key Areas	Check List	
		Existing Facility	New facility
1	Infrastructure for road/footpath accessing the site		
2	Station site boundary		
3	Transmitter station building		
4	Power supply from the city power		
5	Emergency power generator system		
6	UPS system		
7	Air-conditioning system		
8	Lightning protection system		
9	Remote control and monitoring supervision system		
10	Distribution links system		
11	Security system		
12	Fire extinguishing system		
13	Fuel store for emergency		
14	Transmitting Towers		

Source: ITU Guidelines

4.4 Required available budget for Capex

The NRT estimated the approximate budget for the required capital investment to start the DBNO operations on a standalone basis. These approximations exclude site specific details. Standalone DBNO with all new infrastructure must take into consideration the following combinations:

- SDTV (10 channels),
- HDTV (10 channels), and
- a combination (SDTV 6 channels and HDTV 4 channels).

A summary of the estimated budget for different combinations of SDTV and HDTV is provided in Table 4.3. The standalone cost is estimated between USD 13 million and USD 15 million[8] (For detailed costing, see Annex 7, Annex 8 and Annex 9). However, these would be significantly reduced once the sharing of existing infrastructure is accounted for.

A terrestrial broadcaster network operator planning the roll-out of a DTTB or MTV network will have the following key cost categories:

[8] Estimates 2012.

1. *Head-end*: In the head-end the various programme feeds are collected (from the television studios or from satellite feeds), assembled, encoded and multiplexed onto one or more transport streams (please note that the feeds themselves are not included in the costs).
2. *Distribution*: The multiplexed transport streams are distributed (and monitored) to the transmitter sites in the DTTB and MTV network either through fixed wireless links, fibre or satellite links (either rented, purchase or a combination). At each site the transport stream has to be delivered (demultiplexed) in the individual multiplexes.
3. *Sites*: At each site the multiplexes are fed into the transmitters. The transmitter amplifies, modulates and coverts the signal to the right frequency and the combiner section combines the transmitter outputs to one antenna feed. The antenna on top of mast (or other tall construction) will emit the DTTB/MTV signal (onto various frequencies).

For either a DTTB or MTV service these cost categories exist. The key difference between both network types is really the number of sites and the transmitter sizes (i.e. ERPs). For more details see the network sections of the ITU Guidelines.

For each cost category the DTTB/MTV network provider can either incur capital expenditure (Capex) or operational expenditure (Opex) or a combination. A number of cost categories are interchangeable. For example rather than building a distribution network the network provider can choose to rent such distribution capacity. The same applies to building transmitter sites.

Table 4.3 provides sample Capex (excluding replacement investments) and Opex for a DTTB network with 28 sites (three newly built sites), with four multiplexes and with transmitter powers varying between 100 and 3000 kW ERP. The power of the digital television signal is equivalent to 1/4th power of the analogue television signal.

Table 4.3: Summary of estimated budget for the capital investments

No	Item	Quantity for 10 SDTV	Quantity for 6 SDTV + 4 HDTV	Quantity for 10 HDTV
		Units	Units	Units
1	Transmitter			
	300 W	2	4	6
	100 W	19	38	57
	Very Small Transmitters (10/20/100W analogue equivalent)	7	14	21
	Subtotal – Transmitters	28	56	84
	Combiners	-	28	28
2	Feeder +Antenna	28	28	28
3	Linking to Transmitting Sites (Space Segment)	28	28	28
4	Master Control Room	1	1	1
5	Connectivity to Broadcasters	5	5	5
6	Uplink Costs (Earth Station Cost)	1	1	1
7	Downlink costs	28	28	28
8	Installation Cost (10%)	10%	10%	10%
9	Standalone 40 m tower	28	28	28
10	Tower installation	28	28	28
11	Set top boxes	50 000	50 000	50 000
12	Contingencies (10%)	10%	10%	10%

No	Item	Quantity for 10 SDTV	Quantity for 6 SDTV + 4 HDTV	Quantity for 10 HDTV
		Units	Units	Units
	Total Cost	USD 10 922 099	USD 11 891 478	USD 12 508 166
		MVR169 729 421	MVR 189 137 237	MVR 189 689 678
	Total Infrastructure Cost at 28 DTT	USD 1 874 983	USD 2 159 099	USD 2 252 972
		MVR 29 137 231	MVR 33 552 400	MVR 35 011 200
	Grand Total	USD 12 797 082	USD 14 050 577	USD 14 761 138
		MVR 866 652	MVR 222 689 637	MVR 224 710 878

4.5 Opex model

It is ideally the responsibility of the DBNO to bear the operational cost of the transmission network. Revenue to DBNO will come from the content providers/broadcasters by paying a monthly fee on per transmission site basis. Although the exact business model needs further study and a suitable framework of regulation needs to be developed taking into account the dual need to incentivise investment and mandate sharing.

4.6 Digital terrestrial television launch

NRT agreed on the launch of DTTB services under the new framework in Q1, 2014.

4.7 Analogue switch off

NRT decided on ASO completion by Q1 2020 or earlier with a four to six year simulcasting period. A detailed ASO plan needs to be developed. Table 4.4 proposes the activities leading to analogue switch off in Maldives.

Table 4.4: Critical issues identified NRT to achieve the ASO plan

ID	Critical issues	Deadline to complete	Proposed action(s) plan	By	Priority*
1	Selection of DTTB standard	June 2014	Seek direction from NRT and MBCMBC and decide on the DTTB standard for Maldives	NRT, MBC	1
2	Proposal of DBNO as multiplex operator and contents distributor to carry TV contents from current TV broadcasters	October 2014	Seek *direction* from NRT and the MBCMBC to form a consortium on the proposed DBNO in order to enable execution of the ASO plan based on the roadmap for transition from analogue to DTTB in Maldives.	NRT, MBC	1
3	System licence for the first DBNO	Jan 2015	Seek direction from MBC on qualification of the appropriate entity to form the proposed DBNO. Oct 2014: complete system licence drafting in consultation with MBC and CAM. Dec 2014: system licence terms and conditions ready to issue.	MBC and CAM	2

ID	Critical issues	Deadline to complete	Proposed action(s) plan	By	Priority*
4	Establishing the market structure and participating entities in the ASO planning roadmap for the regulator.	Feb 2015	Seek *direction* from MBC/NRT regarding the consortium and start drafting an initial detailed ASO plan and decide on the progress reporting procedures and structures	MBC and CAM	
5	Provision of trial DTTB services under the new framework in Male	On or before Mid 2015	DBNO to set up and trial DTTB services	MBC	2
6	Completion of initial planning for DTTB frequency plan, DTTB network and coverage plan to support the output document of the DTTB policy in phase 1 of roadmap for the regulator	Oct 2014	Seek direction from MBC /CAM initial DTTB network planning before forming the DBNO.	MBC and CAM	1
7	Infrastructure sharing conditions with current TV broadcasters at the proposed 28 DTTB sites finalised.	Jan 2015	To seek direction from MBC for undertaking initial feasibility study and design of SFN transmission network and coverage planning based on DTTB standard	MBC	1
8	Commercial launch of DTTB services	Nov 2015	DTTB services are commercially launched and the simulcast period starts	CAM, MBC, DBNO, broadcasters	1
9	DBNO will undertake DTTB SFN transmission network design, equipment installation and system commissioning.	Jan 2017	DBNO to complete the DTTB transmission network based on the proposed 28 principal DTTB sites before 2015	DBNO, broadcasters	2
10	ASO communication to industry and end user	ASO date (December 2018/December 2020)	ASO communication to be carried out in accordance with ASO plan until ASO		2
11	Analogue terrestrial television to switch off	Quarter 1, 2020 or earlier	Analogue terrestrial television switch off to be completed by Q1, 2020 or earlier	MBC, CAM, DBNO, broadcasters	2

**) Priority: 1=High; 2=Moderate; 3=Low*

4.8 Communication to end consumers and industry

Communication to the end consumer and industry is a very important and critical component of the transition. There are several issues that need clarity in the context including but not limited to:

For consumers and the industry:

- Why, when and how the transition will happen?
- How will the consumers and industry benefit from the transition?

For consumers only:

- What is expected from the consumers to watch digital television?
- Which set top boxes should the consumer buy?
- What will happen to the existing analogue equipment?
- What is the cost implication of the switch over?

For industry only

- How will the broadcasters carry their existing content to the DBNO?
- What is the role of DBNO and content broadcasters?
- How will the set top box supply to consumers work?
- What are the envisaged changes in the regulatory framework?
- Who will bear the cost of consumer education and campaign?

Functional block 2.13 of the ITU Guidelines details the implementation guidelines on government-led communication to end-consumers and the industry. It lays down the following principles:

1. Limit the risks of distorting or confusing the market by communications based on the principles of:
    a. Impartiality and accountability: Ensure that certain market parties or end-consumer groups are not favoured and that the policy decisions are evidence supported and are based on a legal framework.
    b. Responsibility: Only communicate about topics where there is direct responsibility as indicated in section 2.13.1 of the ITU Guidelines. For example, informing the market about available transmitter or receiver equipment might be best left to the market.
    c. Transparency: Keep the customers continuously up-to-date on the regulatory process and decisions (even when there is no progress). Provide timely and complete information so that end-consumers and industry can have a reasonable preparation time.
2. Select appropriate communication tools for the target audiences. Communication tools should be tailored and a one-fits-all approach should be avoided. The following tools are generally applied for the two main audiences:
    a. End-consumers/general public:
        i. consumer associations and interest groups (and they inform their members);
        ii. website (depends on the internet access and availability);
        iii. printed media (official Gazette, newspapers and magazines);
        iv. radio and television channels (for specific events like the ASO, for more details see functional building block 2.18);
    b. Industry:
        i. market consultation and information sessions;
        ii. conferences and fairs (International);
        iii. direct mail (using the regulator licence holder registers);
        iv. website (perhaps with a special login for licence holders);
        v. printed media (official Gazette, newspapers and professional magazines).

The ITU Guidelines functional blocks provide further information on this subject:

- Communication to end-consumers and industry.

- Transition models.
- 2.18 ASO communication plan.

In addition to the guidelines mentioned above, NRT proposed to use multiple mediums including broadcasting, press, door to door etc. Lessons from other countries were considered important. A cost sharing mechanism amongst stakeholders could be considered. Noting the size of Maldives, a survey in cooperation with University/other agencies to estimate the awareness and impact of transition is recommended to be carried out in Maldives before developing a detailed plan.

NRT agreed to have a minimum of existing analogue coverage for digital coverage. No subsidy was considered necessary for set top boxes at this stage.

4.9 Customer proposition (services and coverage)

Customer proposition focuses on determining the competitive advantage and what the related service attributes could look like, based on previous DTTB/MTV service launches around the world.

This section is structured as follows:

1. DTTB competitive advantage and related service proposition attributes;
2. MTV competitive advantage and related service proposition attributes;
3. implementation guidelines.

4.10 DTTB competitive advantage and related service proposition attributes

From a commercial perspective, the competitive advantage of a DTTB offering is solely dependent on the competition landscape of the television market. Hence DTTB launches differ from country to country and are marketed in different ways, emphasizing different competitive advantages. However, from observations of the various DTTB launches, six competitive advantage categories (or marketed reasons for DTTB launch) can be identified:

1. Interactivity/enhanced television services: In markets with only analogue television platforms, DTTB could offer interactive service as a competitive edge for a limited duration (before all platforms will migrate to digital). Without any return path, these interactive services are limited to services like the electronic programme guide (EPG), additional programme information and enhanced teletext. Recent market developments show that (mass produced) receivers are now available with return path capabilities such as integrated IPTV/DTTB set-top-boxes. Also television set producers have launched Internet enabled television sets for browsing and accessing Internet content on the television screen with a normal remote control, which is popularly known as hybrid broadband broadcast (HBB)[9]. This option is relatively expensive hence most developing countries did not want to adopt it in the first phase.
2. Additional pay-tv platform/conditional access and billing facilities: As DTTB platforms can easily be equipped with conditional access and billing facilities, it could provide service providers a platform to launch pay-tv services, such as tiered television packages, pay-per view offerings and pre-paid facilities. Pay-tv services are often launched on the basis of a multi-channel offering and hence this advantage comes very often in combination with additional channels.

[9] HBB defines the convergence between broadcast and Internet content for a coherent experience, it makes possible accessing Internet content on a television display. Manufacturers have demonstrated confidence in the emergence of this new market that allows viewers to watch Internet video content directly on their television sets by making many products available. For more details see www.digitag.org/WebLetters/2009/External-Aug2009.html.

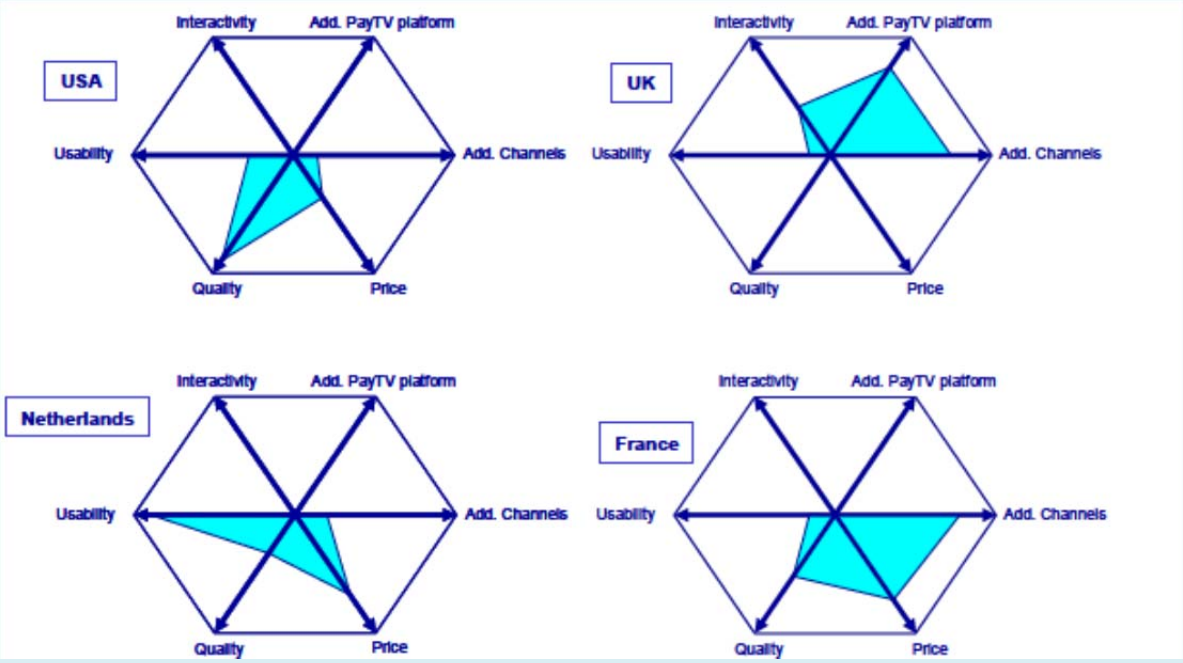
3. Addition channels/multi-channel offering: In markets where the analogue terrestrial television platform is the main platform and is offering only a limited set of channels (e.g. 2 to 5 channels), the introduction of a multi-channel DTTB offering could be a key demand driver. It should be noted however that in most countries a multi-channel (pay-tv) competitive satellite offer is also available that reduces the edge offered by this feature of the DTTB platform.
4. Lower costs (one-off and recurring): A DTTB platform could have the advantage of having lower network costs[10] and receiver costs. For example, if the competing platform is digital satellite, the receiver costs are approximately USD 120 (ex-factory, including receiver dish and installation) while DTTB receiver costs around USD 30 (ex-factory, including antenna and excluding installation).
5. Picture and reception quality: The introduction of DTTB could entail for viewers a significantly better reception and/or picture quality as compared with analogue. A DTTB offer could include HDTV channels. As addressed in section 4.4 of the ITU Guidelines, trade-offs have to be considered between picture quality and reception quality i.e. robustness of the signal).[11]
6. Usability/Portability: DTTB services are wireless and can be received on very compact receivers. Hence DTTB services have the competitive advantage of portability, especially when the receiver comes with a small antenna or an integrated antenna. The latter even allows mobile reception as shown in the market in Germany with the launch of mobile phones with integrated DTTB receivers. None of the regular competing television platforms can offer such functionality. Whether portability forms a demand driver, depends on the local market and should be investigated further (like all the other above mentioned categories).

[10] Benchmark studies have shown that terrestrial networks are in most cases inherently cheaper than cable or satellite networks (except in cases where coverage approaches 100% of the population). A DTTB roll-out can be rolled out quicker and be localized to where the target population is situated. In addition, in the case of re-use of the analogue terrestrial infrastructure (sites and antennas) the cost difference could be even larger.

[11] Technical trials have demonstrated that one DVB-T2 multiplex can facilitate up-to four HDTV channel (in combination with the MPEG 4 compression technology). Commercially available set-top-boxes are expected in 2010 and the additional costs are expected to be around 30% (unconfirmed).

Figure 4.3 depicts the DTTB launches in four different countries, illustrating the wide range in market 'profiles'.

Figure 4.3: Competitive advantage categories for DTTB at time of launch



Source: ITU

In Figure 4.3, it should be noted that the initial launch in the UK was perceived a failure as the service provider ONdigital/ITV Digital went bankrupt. The platform was re-launched on the basis of an advertising model (rather than a pay-tv offering), building on an ITV Digital customer base of 1.25 million subscribers with a set-top-box. The service was re-named FreeView. Clearly this had a competitive advantage of price.

It seems that the DTTB launch in France incorporated these 'lessons learned' into their service offering, as the DTTB platforms offer a free-to-air multi-channel television package with HDTV channels included. Whether a DTTB free-to-air model can work, depends largely on whether (existing) broadcasters on the DTTB platform can reach additional viewers (or increase viewing hours).

In addition to the above mentioned six categories, any DTTB service proposition should always be complemented with the attributes for:

1. Installation and service activation: How viewers can get access to the services and how individual services can be activated, including the following aspects:
   a. *Retail logistics and channel management*: Which outlets (shops/Internet) provide receivers? and smart cards and what are the commission schemes?
   b. *Smart card handling*: Provision of pre-activated smart cards, pre-paid cards, second smart cards (for second screen in the home) and try-out periods.
   c. *Installation aid*: Coverage and reception check (on the internet or via SMS, could include advise on best receiver installation), antenna direction guidance, 'plug and play' instructions and at-home installation aid.
2. Billing and customer care: How to bill the customer and handle service change requests and in the case of a free-to-air DTTB offering, how to promote the platform. The following aspects should be considered:
   a. Television package tiers, service change requests (e.g. service up-grade notices over the phone or via SMS) and discount schemes.

b. Moving house and address changes (might require coverage check/other receiver).
c. Sending invoices (e.g. only over the Internet or broadcasting billing information) and invoice intervals.
d. Collection and bad debt handling.

3. Service deactivation/subscription cancellation and receiver returns: In the case of subscription based DTTB services, how viewers can cancel their service and how to return the rental receiver (the latter not applicable for a purchased receiver)?

Table 4.5 provides an overview of sample DTTB attributes, grouped in the six competitive advantage categories.

Table 4.5: Sample DTTB attributes, grouped in the six competitive advantage categories

Category	Attribute	Example (country)
Interactivity/ enhanced television services	• Programme information/ information channel	• Red button service of the BBC, see www.bbc.co.uk
	• Enhanced teletext, with full colour graphics	• For an example see www.channel4.com • News, weather/traffic information, captioning, etc. are commonplace on most of DTTB platform in Japan
	• Enhanced EPG	• Programme guide seven day ahead and/or automatic recoding in Japan and many European countries
	• Interactive service (DTTB platform only), including push VoD[12]	• For example offering see www.topuptv.com on the basis of the DTTB free-to-air service Freeview in the UK • For example services see www.mirada.tv
	• Hybrid broadband broadcast, requiring return path/Internet connection, including push and full VoD.	• For an example of Internet/DTTB set-top-boxes www.hbbtv.org/ • For Internet enabled Integrated Digital Television sets www.nettv.philips.com/
Additional pay-tv platform/ conditional access and billing facilities	• Tiered service packages	• DTTB pay-tv services in Sweden: Boxer, see www.boxer.se/ • DTTB pay-tv service in Italy, DGTV, see www.dgtvi.it
	• Pay-per-view/event	• DTTB pay-per-view services in Italy: DGTV, see www.dgtvi.it
	• Pre-paid services	• Multichoice scratch card payment service for example in Ghana and Kenya see www.dstvafrica.com
Addition channels/multi-channel offering:	• Multi/premium channel offering	• DTTB pay-tv services in Sweden: Boxer, see www.boxer.se/ • DTTB pay-tv service in the Netherlands: see www.kpn.com
	• Multi-channel free-to-air offerings	• Free-to-air DTTB service in the UK, Freeview, see www.freeview.co.uk • Free-to-air DTTB service in France, TNT, see www.tdf.fr • Dynamic programming, e.g. one HD programme on prime hours and multiple SD programmes on the other hours
Lower costs/one-off and recurring	• low cost offering	• compare DTTB set-top-box prices, especially free-to-air boxes/receivers come as cheap as USD 20-40 retail price
Picture and reception quality	• HDTV offering	• Free-to-air DTTB service in France, TNT, see www.tdf.fr • In Japan most services are broadcasted in HDTV on the DTTB platform
Usability/Portability	• Portable offering	• Digitenne service from KPN in the Netherlands, see www.kpn.com
	• Mobile offering (in-car and mobile)	• Free-to-air DTTB in Germany, see www.ueberall-tv.de • 'One Seg' services offer either the same as or different from main programmes in Japan

[12] Push video on demand is a technique used on systems that lack the interactivity to provide real-time streaming video on demand. A push VoD system uses a personal video recorder (PVR) to automatically record a selection of programming, transmitted over DTTB platform (or the Internet connection). Users can then watch the downloaded programming at times of their choosing.

4.11 DTT reception issue, e.g. retuning direction of current receiving antenna for optimizing DTT reception

In the Maldives TV broadcasting market, there are currently five broadcasters with a TV licence. Due to the high rise buildings in Male, there are some reception difficulties with terrestrial signals. As the transmitting stations from the current broadcasters are not co-located, it is difficult to use one antenna to receive all TV services because of the differences in direction of the transmitting antenna.

It is recommended that the current analogue TV signal reception problem should be solved while making the transition from analogue to DTTB. NRT has recommended careful planning and survey before the launch of digital services to overcome this problem.

4.12 Business model and conditional access

Revenue sharing between DBNO and broadcasters

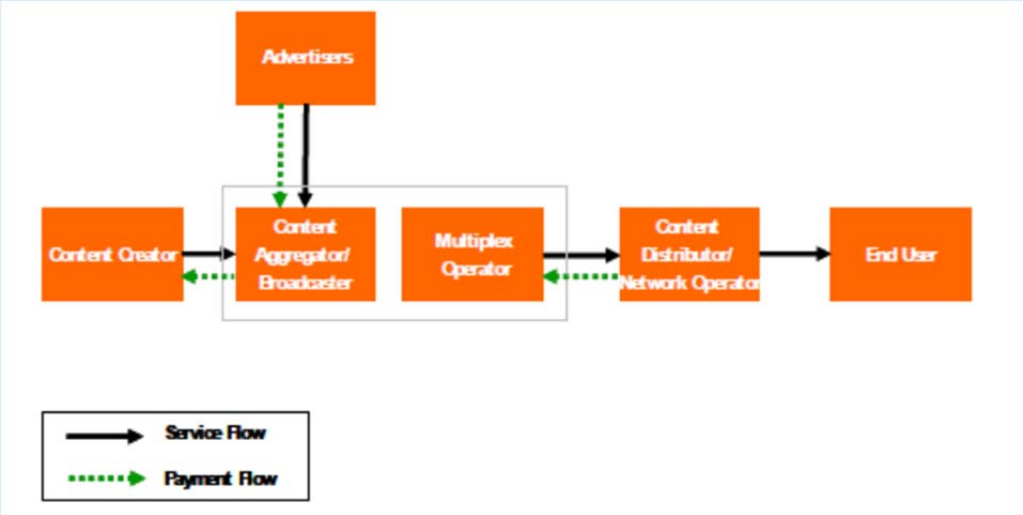
The key question for DTTB Service Providers in Maldives is whether to launch a multi-channel offering on the basis of a free-to-air (i.e. a business model on the basis of advertising income) or a pay-tv model (i.e. a business model on the basis of subscriptions).

In countries with the analogue terrestrial platform as the main delivery platform (i.e. delivering one to four/five television channels) and with a limited pay-tv offering in the market (i.e. a low penetration level) free-to-air (FTA) offering has been the preference. However, whether a FTA or a pay-tv offering can be success depends on various factors, including:

1. Free-to-Air (FTA) models:
    a. **Additional viewers or viewing hours**: Any FTA proposition will have to add additional viewers (or viewing hours) not previously addressed by existing platforms. In most cases, in a FTA model the network transmission costs of the DTTB network have to be financed by the (commercial) broadcasters on the platform. Adding viewers or viewing hours does not necessarily mean adding unserved viewers (e.g. because the channels are not broadcast on widely distributed networks), but can also mean additional (viewing) value for the end consumers. In France for example, new viewers were attracted by offering a multi-channel HDTV offering.
    b. **Absolute volume of the advertising market and market share for television advertising**. Some markets may have limited advertising budgets, which may not cover the additional cost of setting up and running a DTTB services. Another important issue is the advertising budget distribution. In some markets the advertising spend on television might be proportionally larger than for other media (e.g. such as radio or newspapers). As advertisers are known to be conservative, changing these spend patterns might be a lengthy process;
2. Pay-tv models:
    a. **Other existing pay-tv offerings in the market and their bouquet composition**: Existing pay-tv service providers might address only the top segment of the market with relatively expensive packages (very often based on exclusive sport rights). There might be room in the market for offering lower-tier packages without exclusive and expensive content. In addition, existing service providers might provide a (perceived) bad quality of service, generating a driver for viewers to switch to an alternative television offering;
    b. **Existing free-to-air offerings**: The potential market share for pay-tv service might be limited by the existence of widely adopted free-to-air offerings (e.g. satellite channels);
    c. **Existing television content contracts in the market**: Exclusive content deals might limit the possibility of creating attractive pay-tv packages. Conversely, the absence of exclusive contracts might create an opportunity;

d. **Willingness to pay for television content**: The willingness to pay is very often historically and culturally determined. Pay-tv service providers should carefully investigate paying patterns for television services. Many examples exist of viewers refusing to pay for content (e.g. for live sport coverage).

Figure 4.4: DTTB FTA business model with separated multiplex operations



Source: ITU Guidelines

DTTB functional receiver requirements and availability

DTTB receivers can be divided in the following categories:

1. a STB (set top box) is a receiver that is an external unit separate from the TV set (display);
2. an iDTV (integrated digital television set) is a receiver that is integrated in the TV set/display;
3. a PVR (personal video recorder or digital video recorder) is a unit (external) separate from the TV set (display) with capabilities to store and playback broadcast services/programmes;
4. other receivers, such as a PC cards (e.g. PCI), personal media players (PMPs or MP4 players), navigation devices or USB/Firewire external receiver products are bundled together with the PC and can be treated as an iDTV excluding the conditional access (CA) requirements. For each included receiver type the service provider will have to determine the functional requirements based on the defined service proposition.

A service provider focusing on the competitive advantage of a cheaper television service and offering a single free-to-air bundle of television and radio channels will not need all functional elements, such as conditional access, middleware and indoor antenna.

As Figure 4.5 demonstrates, many combinations are possible and in principle all receiver configurations are available on the market. However, uncommon configurations will have an additional price. DTTB service providers with a limited number of forecasted receivers will have to seek receiver production lines existing in the market in order to keep receiver costs down. This might especially be relevant for condition access requirements. Receivers with embedded CA are cheaper than receivers with a common interface (CI), but can only work with the specified CA (which is ordered by individual service providers).

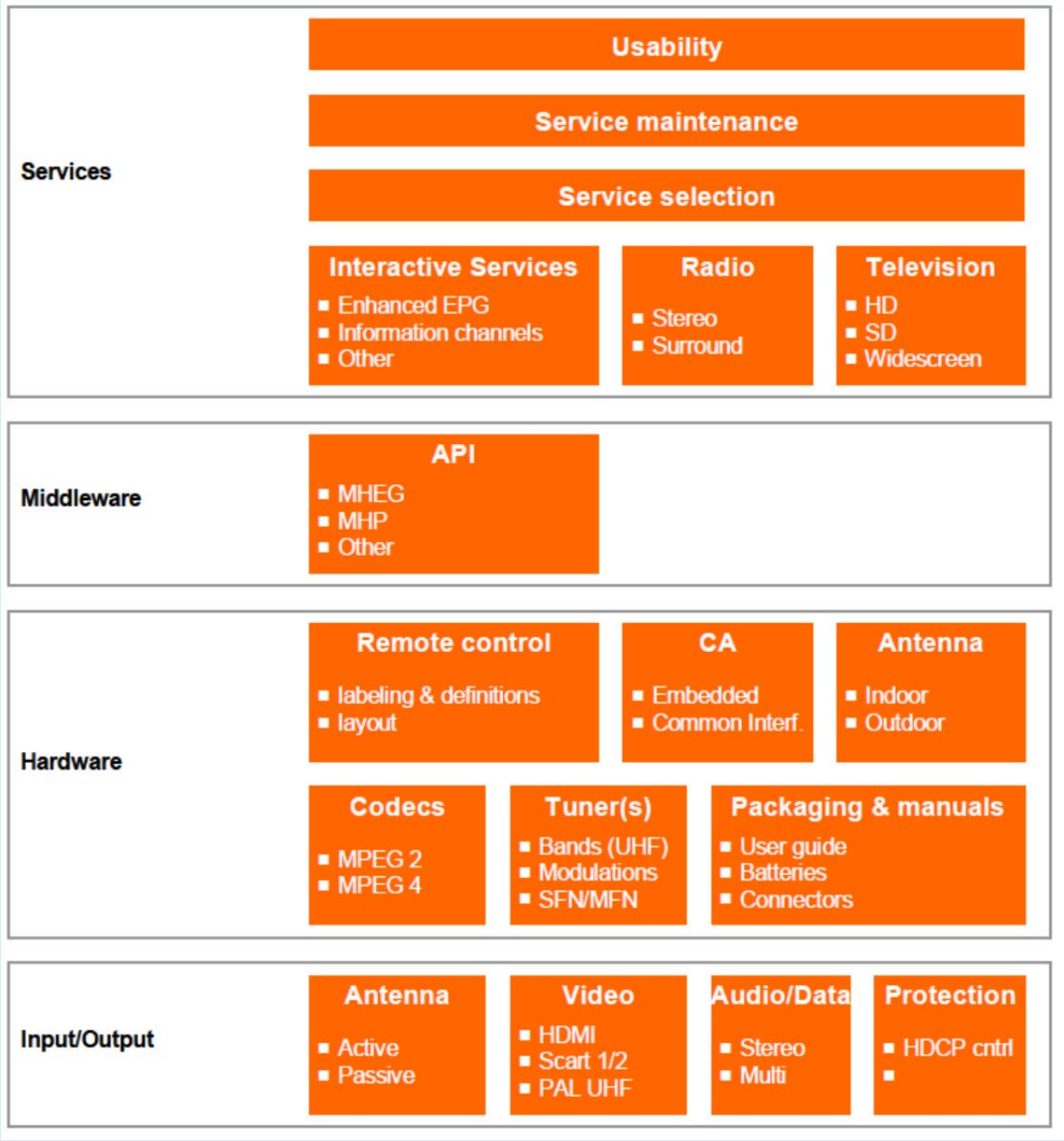
For a few examples of receiver specifications please refer to:

1. Receivers with conditional access (CA) for HD services: For Teracom's minimum receiver requirements for the DTTB networks in Sweden, Denmark and Ireland[13];
2. Receivers without conditional access (CA) for HD services: Freeview New Zealand set-top-box requirements for the DTTB network in New Zealand[14], NRT concluded that these details require further discussion during implementation.

[13] see www.teracom.se/pub/8626/Teracom%20DTT%20receiver%20spec%20v2.0%20Aug%202008b.pdf

[14] See www.freeviewnz.tv/images/uploads/file/FreeView%20DTT%20Receiver%20Spec%20v1_3.pdf

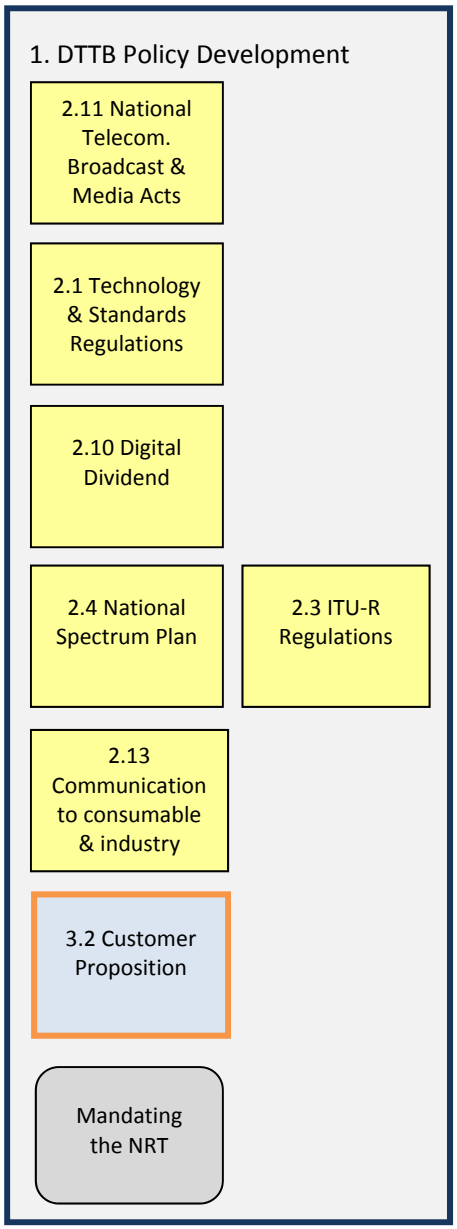
Figure 4.5: Guidelines for the transition from analogue to digital broadcasting



Source: ITU Guidelines

Annex 1: Functional building blocks related to Phase 1 of the roadmap for the regulator

DTTB policy development



The selected functional building blocks related to phase 1 of the roadmap are shown in Figure 10 and are reproduced here.

Section 3.4.2 describes phase 1 of the roadmap. This section provides an overview in form of tables on the status of each of the selected functional building blocks related to phase 1. The selected functional building blocks are presented in the order of the number of the block.

This number refers to the corresponding chapter in the ITU Guidelines, where more information and implementation guidelines can be found.

2.11 National Telecommunication, Broadcasting and Media Acts

Brief description	This section addresses the compliance level of the intended policy decisions with the existing and relevant regulatory framework. Very often this regulatory framework comprises national Telecommunication, Broadcasting and Media Acts. The relevant regulatory framework in Maldives is given in Table 10.
Objective	To be compliant with existing regulations, which might also include regulations on cross and foreign ownership and state aid.

Key topics and choices	Status	Decision
Checking compliance with existing national, Telecommunications, Broadcast and Media Acts:	Need revision	There is no need to introduce a new legislation.
Checking compliance with other legislation, especially related to cross and foreign ownership and State aid:	Not decided	To be reviewed in DTTB policy

2.11	Main activities	Status code	Observation/Advice
1	Make inventory of current legislation	Already decided	
2	Map inventory on DTTB/MTV introductions and compare with 'best practices'	Not decided	
3	Identify gaps and draft proposals for additional and/or changes in legislation (based on 'best practices')	Not decided	
4	Determine planning for changes in the law and determine 'must haves' for launching DTTB/ASO and MTV	Not considered yet	

2.1 Technology and standards regulation

Brief description	In this section the key policy decisions on adopting or promoting DTTB technology and associated standards are outlined.
Objective	This section deals with the question whether a standard should be prescribed/promoted and for what system/network elements.

Key topics and choices	Status	Decision
Television presentation formats: for DTTB platforms either Standard Definition Television (SDTV) and/or High Definition Television (HDTV)?	Decided	At present, SDTV to achieve minimum picture quality
Transmission standard: for DTTB platforms e.g. DVB-T or ISDB-T. Has the standard been decided?	Not decided	Two standards are under consideration. NRT to decide.
Compression technology: for DTTB platforms MPEG2 or MPEG4. Has the standard been decided?	Decided	The NRT decided on MPEG4
Conditional Access (CA) system and Digital Rights Management (DRM): interoperability between deployed systems for DTTB. Has the standard been decided?	Not decided	
Application Programming Interface (API) for additional interactive services: for DTTB platforms e.g. MHP.	Not decided	

2.1	Main Activities	Status Code	Observation/Advice
1	Carry out market research/surveys to identify industry and consumer needs for standardization	Decided	
2	Determine minimum set of receiver standards for the DTTB and MTV market, based on market developments and planned licensing procedures, terms and conditions (not include MTV)	Partly decided	On STB
3	Map on existing standardization policies/rules and determine additional standardization needs	Partly decided	
4	Assess impact on industry and end consumers	Decided	
5	Determine receiver requirements and include in frequency licence terms and conditions and/or media permits and authorizations	Partly decided	DTT receivers before ASO
6	Determine communication messages, planning, standardization/testing bodies and methods (including logos and labelling)	Not decided	(highly recommended) Preference through international test and certification
7	Update, if necessary National Spectrum Plan and legislation	Decided	

2.10 Defining digital dividend

Brief description	The digital dividend is the spectrum in Band III, IV and V that is available after analogue television has been switched over to digital television
Objective	Freeing up spectrum for more valuable services

Key topics and choices	Status	Decision
2.10.1 Determining the size of the digital dividend: has the size been determined?	Not decided	
2.10.2 Digital dividend options: have the allocation to the different service to been determined? (Broadcasting or non-broadcasting).	Not decided	

2.10	Main activities	Status code	Observation/Advice
1	Analyse current and future market developments and possibly conduct market consultation(s) in the broadcast (and telecommunication) industries	Partly decided	
2	Assess current and future market needs for DTTB and MTV services, possibly based on formulated legislation and policies	Not decided	
3	Assess available spectrum after ASO, based on ASO plans, National Spectrum Plan and ITU-R Regulations	Partly decided	
4	Map spectrum needs on available spectrum and determine priorities and assign spectrum to broadcasting	Partly decided	
5	Possibly draft spectrum re-farming plans and compensation schemes (for network and receiver re-tuning activities), reserve budgets	Partly decided	
6	Update National Spectrum Plan and align licence terms and conditions for DTTB and MTV services	Partly decided	

2.4 Update of the national spectrum plan

Brief description	The National Spectrum Plan reflects the long, medium and short-term planning of the available national spectrum resources for DTTB and MTV services in a particular country. It may also include the stipulated assignment procedures for the various services and a national frequency register, including all the assigned licences and licensees.
Objective	With a National Spectrum Plan, the regulator strives to ensure effective and efficient spectrum usage and compliance with international standards. As well as informing market parties on the current and future (intended) use of spectrum

Key topics and choices	Status	Decision
2.4.1 The context of the national spectrum plan: Is the national spectrum plan, covering the broadcast spectrum, available and is it complete?	Decided	For the broadcasting spectrum, it is done
2.4.2 Planning current and future DTTB and MTV spectrum use: Has the national spectrum plan/strategic planning process started/completed? (for process see this section).	Not decided	
2.4.3 National Spectrum Plan publication and DTTB/MTV introduction dates.	Not decided	
2.4.4 General approaches for pricing spectrum usage: (a) One off pricing and/or recurring pricing? (b) cost-based or market based pricing?	Not decided	May need change

2.4	Main Activities	Status Code	Observation/Advice
1	Make an inventory of current spectrum use in the broadcast bands (Bands III, IV and V)	Decided	
2	Register use and provide rules for self-registration	Partly decided	
3	Carry out market analyses and consultations and forecast future spectrum needs	Not decided	
4	Determine re-farming needs and assess impact on existing and future users (including service and financial impact), possibly reserve budget for re-farming efforts and damages	Not decided	
5	Determine publication content, dates and formats for the National Spectrum Plan	Not decided	
6	Determine budget for spectrum management and administrative fees	Not decided	

2.13 Communication to end consumers and industry

Brief description	Providing adequate and timely information ensure and support a rapid service take-up, a profound market development (i.e. content development and receiver supply/availability) and a smooth service transition
Objective	Informing the public and the television industry about the changes in the areas of legislation, policies and regulations is a government led task involving stakeholders.

2.13	Main Activities	Status Code	Observation/Advice
1	Make inventory of communication scope	Not decided	
2	Determining the key communication moments and topics	Partly decided	On PSB platform
3	Determine communication tools for each target group/audience	Partly decided	
4	Instruct communication bodies and committees	Not decided	

2.3 ITU-R regulation

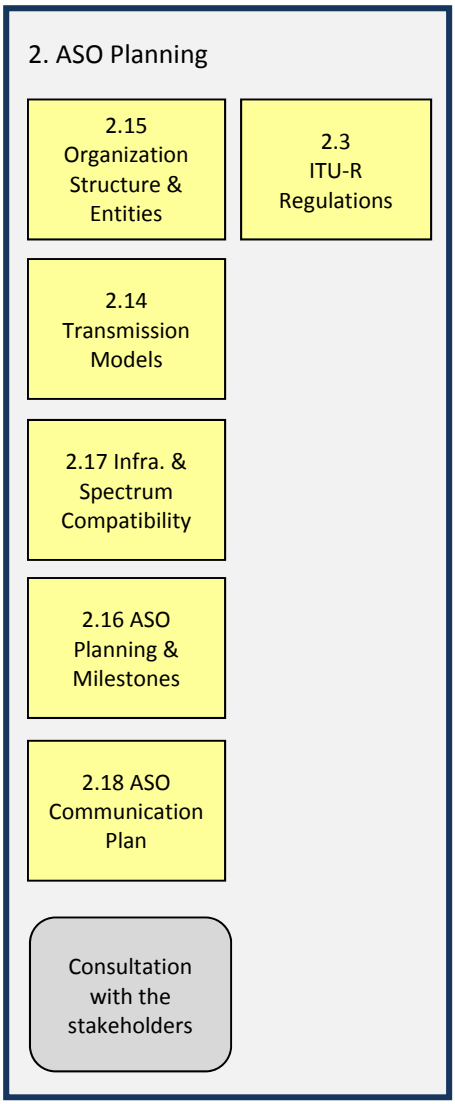
Brief description	ITU-R regulations entail the Radio Regulations (RR) and in particular the table of frequency allocations (Region 3) and the relevant provisions of the World Radio Communications Conference.
Objective	In this phase of the roadmap, to identify at a high level the spectrum availability and requirements for DTTB (and other services)

Key topics and choices	Status	Decision
2.3.1 The international context of the ITU-R regulations: Are the different entries in the GE06 plan considered (allotment/assignment)?	NA	A plan like the GE06 plan is not available for Region 3.
2.3.2 Applicability and implications of ITU-RR: (a) What frequencies or allotments will be assigned for what type of service (for example two allotments/multiplexes for DTTB services and one for MTV services)? (b) In what combinations will these frequencies or allotments be assigned – for example two separate allotments/multiplexes to be licensed to two different licence holders or two allotments to one single licence holder? (c) When will these frequencies or allotments be licensed or taken into operation? To answer these questions, process steps are defined in this section.	Not decided	

2.13	Main Activities	Status Code	Observation/Advice
1	Make inventory of communication scope	Not decided	
2	Determining the key communication moments and topics	Not decided	
3	Determine communication tools for each target group/audience	Not decided	
4	Instruct communication bodies and committees	Not decided	

Annex 2: Functional building block related to Phase 2 of the roadmap for regulator

ASO Planning



The selected functional building blocks related to phase 2 of the roadmap are shown in Figure 10 and are reproduced here. Section 3.4.3 describes phase 2 of the roadmap.

This section gives an overview in the form of tables of the status of each of the selected functional building blocks.

The selected functional building blocks are presented in the order of the number of the block. This number refers to the corresponding chapter in the ITU Guidelines, where more information and implementation guidelines can be found.

2.15 Establishment of organizational structures and entities

Brief description	The ASO process is a complex and time consuming operation and a special purpose entity (e.g. Task Force, Committee or separate company) may coordinate the overall process and planning. In Maldives this task is assigned (not formally yet) to the NRT.
Objective	A coordinated ASO process between all involved parties and stakeholders.

Key topics and choices	Status	Decision
2.15.1 Organizational ASO structures and entities: ASO organization completed and in place?	Partly decided	NRT has been established
2.15.2 ASO costs and support: ASO cost analysed and determined (use table in this section).	Not decided	

2.15	Main Activities	Status Code	Observation/Advice
1	Establish overall coordination needs	Partly decided	
2	Form or extend special purpose vehicle, establish clear mandate	Not decided	
3	Establish budget and communication means (air-time, website, etc.)	Not decided	

2.14 Defining transition models

Brief description	This section deals with the situation that analogue television broadcasts have to be stopped and the existing analogue services are migrated to a DTTB platform in one coordinated effort, led by the national government (i.e. the ASO process). This section deals with what ASO or transition model will be applied where in Maldives.
Objective	Existing analogue services are migrated to a DTTB platform in one coordinated effort and without interrupting service.

Key topics and choices	Status	Decision
2.14.1 ASO objectives and hurdles: What are the ASO objectives (To have a universal television service on the DTTB platform, and/or to securing the future of the terrestrial platform).	Partly decided	NRT would like to see additional services
2.14.2 ASO factors: consider the following factors: (a) Required (PSB) services; (b) The number of analogue terrestrial television viewers; (c) Availability of spectrum; (d) DTTB service uptake.	Not decided	
2.14.3 ASO transition models: Which models is envisioned (a) ASO with simulcast period, with two sub-categories (i) Phased approach to analogue switch-off (ii) National approach to analogue switch-off (b) ASO without simulcast period.	Partly decided	NRT has decided on simulcast model

2.14	Main Activities	Status Code	Observation/Advice
1	Check existing Legislation and policies for Public (and commercial) television service (e.g. FTA) and coverage stipulations (e.g. nationwide coverage)	Decided	Needs revision
2	Check ITU-R Regulations and any existing/formulated receiver regulations for impact on ASO	Not yet decided	
3	Carry out market research on ASO affected	Not yet decided	

2.14	Main Activities	Status Code	Observation/Advice
	viewers/listeners. Identify any hidden viewers/listeners (2nd television sets, regional programming, prisons, etc.), Identify impact and risk areas		
4	Analyse and assess complexity and size of network modifications and receiver transitions	Not yet decided	
5	Involve and discuss ASO with content aggregators (esp. Public Broadcaster) and consumer associations	Partly decided	
6	Decide transition model (simulcast period and ASO phasing)	Need revision	

2.17 Identifying infrastructure and spectrum compatibility

Brief description	This section deal with incompatibility happens in the case of both digital and analogue services in the same geographical area and the digital and analogue frequency cannot coexist.
Objective	Incompatibility can happen in both transmitter infrastructure (e.g. antenna system, equipment space & power/back-up/no break, etc.) and trade off in network design due to spectrum in limited geographical area cannot coexist.

2.17	Main Activities	Status Code	Observation/Advice
1	Check Legislation, ITU-R Regulations, National Spectrum Plan and establish service priorities and acceptable interferences levels	Decided	
2	Assess available antenna space & sites and site/antenna sharing possibilities/options	Partly decided	
3	Calculate inference levels, service coverage and check EMC compatibility	Not yet decided	Conduct evaluation of interference and service coverage-recommend to use radio planning software
4	Develop site transition scenarios (including temporary installations and sites)	Not yet decided	
5	Assess costs, time lines and service impact	Partly decided	

2.16 Setting up ASO planning and milestones

Brief description	Overall ASO planning and its key milestones, managed by the NRT.
Objective	ASO planning respecting the set dates for ASO and providing a progress monitoring

Key topics and choices	Status	Decision
2.16.1 Outlining the ASO planning: when and where to begin the process and how long the entire operation should last.	Partly decided	Switch off date is set to be in Quarter 1, 2020 or earlier.
2.16.2 Overall ASO planning set-up: including the overall programme structure and the key result paths in an ASO plan.	Not yet decided	
2.16.3 ASO planning phases (in a phased approach): the three phases and their key milestones.	Partly decided	

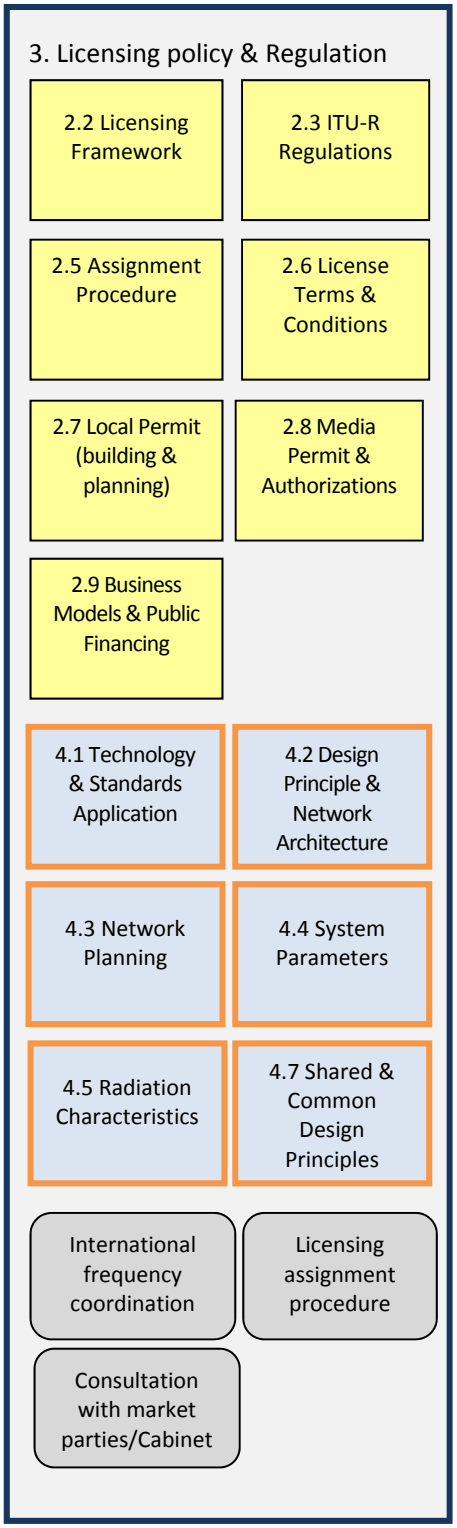
2.16	Main Activities	Status Code	Observation/Advice
1	Draft comprehensive ASO planning (milestones and activities) and assign tasks and responsibilities (including core project management team)	Not yet decided	Have to complete in this
2	Establish ASO project monitoring framework and reporting structure	Not yet decided	
3	Identify ASO project risks and draft risk mitigation plans (including fall back and/or roll back scenarios)	Not yet decided	

2.18 Drafting ASO communication plan

Brief description	This section focuses on communication to the viewers and other stakeholders in the DTTB value chain.
Objective	To help viewers prepare adequately, the whole broadcast community needs to address all viewers relying on the analogue terrestrial platform using targeted communication tools that can reach out to diverse population segments.

2.18	Main Activities	Status Code	Observation/Advice
1	Draft communication plan (including target audiences, timing, means, etc.)	Not yet decided	
2	Continuous alignment with ASO planning	Not yet decided	
3	Determine and establish compensation schemes and systems, include in communication plan	Not yet decided	

Annex 3: Licensing policy and regulation



The selected functional building blocks related to phase 3 of the roadmap are shown in Figure 10 and are reproduced here.

Section 3.4.4 describes phase 2 of the roadmap.

This Section gives an overview in the form of tables of the status of each of the selected functional building blocks related to Phase 3.

The selected functional building blocks are presented in the order of the number of the block. This number refers to the corresponding chapter in the ITU Guidelines, where more information and implementation guidelines can be found.

2.2 Setting up the licensing framework

Brief description	The licensing framework is the comprehensive set of required licences, authorizations and permits for a market and public introduction of DTTB services
Objective	The objective of any licensing framework should be to actually implement the defined policy objectives for the introduction of DTTB services, including the analogue switch-off (ASO).

Key topics and choices	Status	Decision
2.2.1 A licensing framework for any television services comprises of (a) spectrum rights (b) broadcast rights and (c) local/building rights. Need for selection of the licensing model for DTTB services.	Not yet decided	The adoption of the new Telecommunications Law may change the licensing framework for assigning the spectrum rights.
2.2.2 For the additional function of the multiplex operator in the value chain, two basic licensing models choices are available for DTTB; Model A or B. Has the basic model been decided?	Decided	Model B
2.2.3 Has the PBS services and spectrum rights been defined yet (and where) for the DTTB services?	Partly decided	

2.2	Main Activities	Status Code	Observation/Advice
1	Make inventory of current licensing framework and check applicability for DTTB and MTV service introductions	Decided	
2	Assess and evaluate different options for licensing DTTB and MTV services	Not yet decided	
3	Assess compatibility with ASO plans and National Spectrum Plan	Decided	
4	Possibly revise current licensing framework and assess impact	Not yet considered	
5	Draft planning for licence assignment, framework changes and update National Spectrum Plan (and possibly legislation)	Not yet decided	

2.5 Formulation of assignment procedures

Brief description	Assigning spectrum/broadcast rights for DTTB services and the application of common instruments and procedures.
Objective	Assign spectrum/broadcast rights to the PSB, commercials broadcasters or any other entity (such as the common multiplex/network operator) in a transparent manner in line with the ASO plan.

Key topics and choices	Status	Decision
2.5.1 Basic assigned instruments and procedures: What is the preferred assignment instrument (FCFS, auction or public tender) for broadcasting?	Not yet decided	
2.5.2 Assignment procedures for DTTB services: What is the selected assignment instrument (FCFS, auction or public tender) for DTTB services?	Not yet decided	

2.5	Main Activities	Status Code	Observation/Advice
1	Consult stakeholders including industry players and consumers on assignment methods and licence terms and conditions	Partly decided	
2	Evaluate results and select assignment method and procedures	Not yet decided	
3	Draft detailed plans & planning for DTTB and MTV assignment procedures	Not yet decided	
4	Publish assignment planning and procedures and update National Spectrum Plan (and possibly Legislation)	Not yet decided	

2.6 Formulating licence terms and conditions

Brief description	The licence terms and conditions of DTTB frequency or spectrum licences.
Objective	Assigning of DTTB/MTV frequency rights is carried out in conjunction with assigning the other two types of rights as well. The objective is to have all rights in place with clarity on the terms and conditions of the various licence types.

2.6	Main Activities	Status Code	Observation/Advice
1	Check relevant paragraphs/ entries in Legislation/Policies, ASO plans, National Spectrum Plan	Partly decided	To be carried out with this phase when need arises
2	Analyse market conditions and assess 'level-playing-field' requirements/provisions	Not yet decided	Recommend to carry out
3	Determine DTTB/MTV licence terms and conditions and align with local building permit policies and media permits/authorizations and their planning	Not yet decided	
4	Update National Spectrum Plan (and possibly ASO plans)	Partly decided	

2.7 Drafting policies for local permits

Brief description	This section addresses the necessary permits and authorizations from local governments required to establish and operate broadcasts transmitter stations.
Objective	For cost effective roll out of transmitter sites, the regulator and local governments have an important role to facilities transmitter site build-up and site sharing arrangements. Introduction of instruments to facilitate transmitter site erection, e.g. building permit & site sharing rules need to be introduced.

2.7	Main Activities	Status Code	Observation/Advice
1	Check relevant paragraphs/ entries in Legislation/policies and Licensing Framework for DTTB and MTV service Introductions	Not yet decided	
2	Determine and align building permit policies with intended DTTB/MTV licence terms and conditions	Not yet decided	
3	Publish policies for DTTB/MTV planning & building permits (may include waivers)	Not yet decided	
4	Possibly conduct local hearings and/or expert investigations which may result in changes in permitted spectrum usage/transmitter site parameters (and delays)	Not yet decided	Plans to adopt with the process
5	Monitor actual transmitter site operations and check/test emitted radiation	Decided	
6	Possibly update National Spectrum Plan	Decided	

2.8 Drafting of media permits and authorizations

Brief description	The right or permission to broadcast television content on a defined broadcast DTTB platform in a designated geographical area and for a specified period. In this section we focus on granting media/broadcast permits/authorizations for commercial broadcasters (for public broadcasters see subsection 2.2.3 in the ITU Guidelines).
Objective	In regulating access to the DTTB platform and/or to determine content composition on the DTTB and MTV platforms, the regulator can avoid unwanted broadcasts, promote defined broadcasts or avoid duplication of content.

Key topics and choices	Status	Decision
2.8.1 Broadcast licensing framework: the different levels of granting broadcast rights, programme or platform level?	Not yet decided	NRT to introduce with Model B
2.8.2 Broadcast licensing requirements: have all licence terms and conditions been determined and is the list of conditions complete (see list in this paragraph)?	Not yet decided	NRT should consider the current broadcast rights as they are currently technology neutral

2.8	Main Activities	Status Code	Observation/Advice
1	Check existing media legislation, policies and licensing framework	Decided	
2	Check technology and standards regulation (receiver regulations) and include in media permits policies	Not yet decided	Technology neutral
3	Determine media permits/authorizations and procedures and align with DTTB/MTV licence terms and conditions and planning	Not yet decided	
4	Publish policies for media permits & authorizations (may include waivers)	Not yet decided	

2.9 Determining business models and public financing

Brief description	This section addresses the financing models and sourcing of Public Service Broadcasting (PSB) and DTT financing issues.
Objective	Introduce different sources for funding the PSB services and specify financing issues for DTTB, e.g. financing of digital receivers, the simulcast period and revision of TV licensing fee system, etc.

Key topics and choices	Status	Decision
2.9.1 General ASO financing models and sourcing. Has the different sources for DSO/ASO been selected and is the budget fully financed?	Not yet decided	
2.9.2 DTTB specific financing issues: (a) Financing of digital receivers (b) Financing the impact of free-to-air stipulations(c) In case the PSB service is encrypted content rights can be lowered (d) Financing the simulcast period (e) TV licensing fee system might need revision.	Not yet decided	

2.9	Main Activities	Status Code	Observation/Advice
1	Check existing media Legislation, policies and Licensing Framework	Decided	
2	Consult Broadcaster(s) on current/future analogue television, DTTB and MTV transmissions	Not yet decided	
3	Analyse market situation and assess possible market distortions	Not yet decided	
4	Define or complete required public service offering on DTTB and MTV platform (if not defined in Legislation yet)	Not yet decided	
5	Align defined public service offering with other DTTB/MTV licence terms and conditions and media permits, and their planning	Not yet decided	
6	Determine and establish budget for public broadcast service offering and/or subsidizing consumer equipment	Not yet decided	

4.1 Technology and standards application

Brief description	Technical comparison of key DTTB standards and the characteristics of associated systems.
Objective	Technical evaluation of DTTB transmission standard and choice of systems for required services

Key topics and choices	Status	Decision
4.1.1 Technical tests to evaluate system performance	Partly decided	Two standards are been tested (ISDB T and DVB T)by respective operators
4.1.2 SDTV and HDTV specifications	Partly decided	
4.1.3 Selection of DTTB transmission standard	Not yet decided	
4.1.4 Compression system	Decided	MPEG4

Key topics and choices	Status	Decision
4.1.5 Encryption system	Not yet decided	
4.1.6 Additional services	Not yet decided	

4.1	Main Activities	Status Code	Observation/Advice
1	Describing tests	Partly decided	
2	Evaluation of SDTV and HDTV specifications (including sound channels) and estimation of required bit rate	Not yet decided	
3	Evaluation of standards characteristics with GE06 provisions, business plan and receiver Availability	NA	
4	Evaluation of characteristics of compression systems	Decided	
5	Evaluation of conditional access systems	Not yet decided	
6	Evaluation of additional systems (including access systems if needed) and estimation of required bit rate	Not yet decided	

4.2 Developing design principles and network architecture

Brief description	Implementation priorities and network architecture
Objective	Initial technical description of the main network elements in relation to service quality, coverage, costs and timing requirements, serving as input document for preparing the initial frequency plan and ASO plan.

Main topics and choices	Status	Decision
4.2.1 Trade-off between network roll-out speed, network costs and service quality,	Not yet decided	
4.2.4 Frequency plan and network topology	Not yet decided	
4.2.5 Head- end configuration	Not yet decided	
4.2.7 Type of distribution network	Not yet decided	

4.2	Main Activities	Status Code	Observation/Advice
1	Education and training of technical staff	Not yet decided	
2	Evaluation of roll-out options	Not yet decided	
3	Evaluation of type of distribution network	Decided	
4	Evaluation of network topology	Not yet decided	
5	Drafting multiplex composition plan	Not yet decided	
6	Establishing frequency plan per multiplex/network	Not yet decided	
7	Drafting transmitting station lay out	Not yet decided	

4.3 Performing network planning

Brief description	Iterative process of achieving optimal coverage and multiplex capacity using several system parameters and varying radiation characteristics. Several network plans are required (e.g. before and after ASO, for rooftop and indoor reception, with normalized and calculated transmitting antenna characteristics, or for testing different service quality or coverage targets).
Objective	Basis for verifying service proposition and financing (see functional building blocks 2.9, 3.2 and 3.4).

Key topics and choices	Status	Decision
4.3.1 Service trade-off	Not yet decided	
4.3.2 SFN or MFN	Decided	
4.3.3 Fill-in transmitters	Not yet decided	
4.3.4 Feed back to business plan and service proposition	Not yet decided	

Main activities	status	Observation/Advice
1. Planning criteria and planning method	Not yet decided	
2. Coverage analysis Coverage presentations and a list of stations characteristics are the result of a network planning exercise and form the key tools for analysis coverage.	Partly decided	
3. Gap-filler planning Gap-fillers, also called fill-in stations, are fed off-air from a main transmitter. The transmission frequency can be different from the received frequency (MFN operation) or the same as the received frequency (SFN operation).	Not yet decided	
4. Carrying out “service trade-off”, radiation characteristics, multiplex capacity coverage quality are interrelated.	Not yet decided	

4.4 Determining system parameters

Brief description	Parameters related to the DTTB transmission standard
Objective	Selecting system parameter by trading-off between coverage, multiplex bit rate and radiation characteristics, serving as input in the initial network planning

Key topics and choices	Status	Decision
4.4.1 FFT size	Not yet decided	Will decide with the DTTB system
4.4.2 Carrier modulation and code rate	Not yet decided	
4.4.3 Guard interval	Not yet decided	

4.4	Main Activities	Status Code	Observation/Advice
1	Evaluation of FFT size to meet DTT standard	Not yet decided	
2	Evaluation of carrier modulation to meet DTT standard	Not yet decided	
3	Evaluation of code rate to meet DTT standard	Not yet decided	
4	Evaluation of guard interval to meet DTT standard	Not yet decided	

4.5 Assessing radiation characteristics

Brief description	Determination of transmitter power and transmitting antenna gain in order to achieve the required or allowed effective radiated power and configuration of the optimum antenna diagram and polarization.
Objective	Specification of transmitter power, antenna gain and antenna diagram as input for initial network planning.

Key topics and choices	Status	Decision
4.5.1 Transmitter power and transmitting antenna gain	Partly decided	Transmitter power 10W- 500W
4.5.2 Polarization	Decided	Horizontal
4.5.3 Use of existing antennas or need for new antennas	Partly decided	

Main activities	Status Code	Observation/Advice
Evaluation of transmitter power and antenna gain	Partly decided	
Calculation of antenna power budget	Not yet decided	

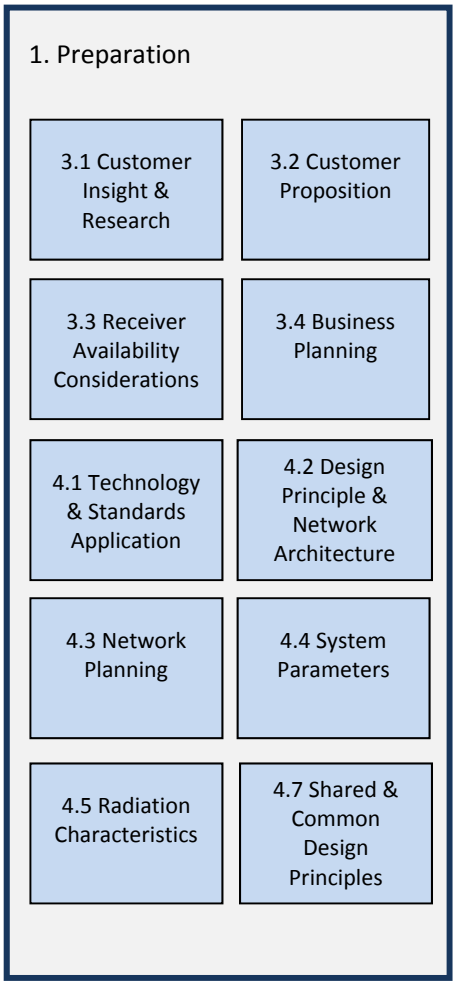
4.7 Deciding shared and common design principles

Brief description	This section consists three parts each containing a sub-part with implementation guidelines, a) application of shared and common design principles; b) Site and antenna sharing; c) multiplex sharing.
Objective	This section provides background information and guidelines on key topics and choices regarding shared and common design principles.

4.7	Main Activities	Status Code	Observation/Advice
1	Investigate national regulations regarding site sharing	Not yet decided	NRT recommending the sharing of sites
2	Determine in principle shared use of DTTB and MTV networks and which elements (sites, antennas, multiplex)	Not yet decided	
3	Determine in principle on common design and planning of DTTB and MTV networks	Not yet decided	
4	Prepare site sharing agreements	Not yet decided	

Annex 4: Functional building block related to phase 1 of the roadmap for operator (DBNO)

Preparation



The selected functional building blocks related to phase 1 of the roadmap are shown in Figure 11 and are reproduced here.

Section 3.4.6 describes phase 1 of the roadmap.

This Annex gives an overview in the form of tables of the status of each of the selected functional building blocks related to phase 1

The selected functional building blocks are presented in the order of the number of the block. This number refers to the corresponding chapter in the ITU Guidelines, where more information and implementation guidelines can be found.

Functional building blocks 4.1, 4.2, 4.3, 4.4, 4.5 and 4.7 can be found in Phase 3 Licensing policy and regulation for regulator.

3.1 Investigation of customer insight and carrying out market research

Brief description	Launching a commercial PSB DTTB service, will require the identification of demand drivers (i.e. customer needs), competitive advantages, service uptake projections and possibly market entry barriers in the local market(s).
Objective	The NRT will have to carry out some form of market research for identifying these demand drivers, competitive advantages and service uptake projections.

Key topics and choices	Status	Decision
3.1.1 Overview of the DTTB markets: market definition, key service and market characteristics.	Partly decided	To use the knowledge of the NRT members on industry market
3.1.2 Market research methods: basic market research approaches and embedding market research in the DTTB business planning process.	Not yet decided	Apply low cost methods to research the Maldives market.

3.1	Main Activities	Status Code	Observation/Advice
1	Determine need, timing and scope for market research	Not yet decided	
2	Analyse competitive offerings, substitutes and technology developments	Not yet decided	
3	Design and develop preliminary DTTB and MTV service propositions	Not yet decided	
4	Draft market research plan, staff and budget market research project	Not yet decided	
5	Carry out market research and analyse results, translate into DTTB/MTV service propositions, if necessary carry out additional market research	Not yet decided	

3.2 Defining customer proposition

Brief description	This section focuses on determining the PSB DTTB competitive advantage and what the related service attributes could look like.
Objective	Finding the best customer proposition in line with the business plan objectives (see initial DTTB service planning in the second Phase of the roadmap).

Key topics and choices	Status	Decision
3.2.1 DTTB competitive advantage and related service proposition attributes.	Partly decided	Picture quality, More channels/services would enhanced the choice to the public nationwide

3.2	Main Activities	Status Code	Observation/Advice
1	Analyse earlier DTTB and MTV service launches and compare with customer research results/local market conditions	Not yet decided	
2	Define DTTB/MTV service propositions and check feasibility/cost levels with key suppliers, i.e. Distributor (broadcast network operator) and Content Aggregators, Content Creators	Not yet decided	
3	Possibly redefine DTTB/MTV service propositions and test in market again, i.e. additional market research	Not yet decided	

3.3 Carrying out receiver availability considerations

Brief Description	The consideration of the many different DTTB receivers commercially available today.
Objective	For a Service Provider it is important to draft the receiver's functional requirements based on the defined service proposition(s). Only those requirements supporting the service proposition should be incorporated. These 'must have' requirements might prove to be too expensive for the business case and therefore iterations may be required on receiver considerations resulting in a revised service proposition.

Key topics and choices	Status	Decision
3.3.1 DTTB functional receiver requirements and availability (see receiver model).	Not yet decided	NRT should include the best approach to obtain the Low cost, affordable set top boxes
3.3.2 MTV functional receiver requirements and availability.	Not discussed yet	

3.3	Main Activities	Status Code	Observation/Advice
1	Analyse earlier DTTB and MTV service launches, assess local substitutes and technology developments	Partly decided	
2	Check any prescribed Technologies and Standards, Receiver regulations and analyse market research results	Partly decided	
3	Assess and make inventory of availability and roadmaps of various receiver types/attributes	Not yet decided	
4	Check network compatibility and interoperability (radio interfaces and API/applications)	Partly decided	Both ISDB T and DVB T are currently operating on trial basis
5	Assess and detail ex-factory and retail pricing for various receivers	Partly decided	
6	Decide key receivers and their attributes, draft receiver/service roadmap	Not yet decided	

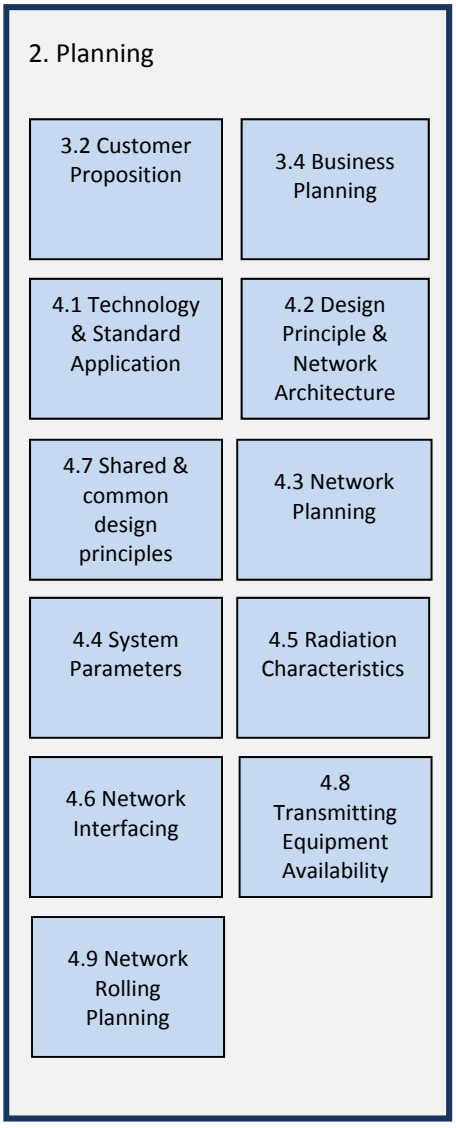
3.4 Performing business planning

Brief description	This section will focus on agreement on business case (budget) for the ASO Plan.
Objective	To detail costs and what financial resources should be made available.

Key topics and choices	Status	Decision
3.4.1 Business models for DTTB services: which model or combination of models is considered (may vary per multiplex).	Decided	Model B
3.4.2 What does the business case look like for the ASO Plan?	Not yet decided	To identify more business opportunities

3.4	Main Activities	Status Code	Observation/Advice
1	Analyse legal/regulatory framework (may include prescribed technologies and standards, assignment procedure, license terms and conditions, business models and public financing), determine impact and opportunities	Not yet decided	
2	Assess market take-up and project revenue streams, based on customer research and proposition	Not yet decided	
3	Assess and calculate associated costs (considering concepts of 'total cost of ownership'), project costs ahead	Not yet decided	
4	Carry out profitability and sensitivity analysis, draft business plan scenarios	Not yet decided	
5	Carry out market research and analyse results, translate into DTTB/MTV service propositions, if necessary carry out additional market research	Not yet decided	

Annex 5: Functional building block related to phase 2 of the roadmap for operator (DBNO)



The selected functional building blocks related to phase 2 of the roadmap are shown in Figure 11 and are reproduced here.

Section 3.4.7 describes phase 2 of the roadmap.

This section gives an overview in the form of tables of the status of each of the selected functional building blocks related to phase 2 by means of the following codes:

The selected functional building blocks are presented in the order of the number of the block. This number refers to the corresponding chapter in the ITU Guidelines, where more information and implementation guidelines can be found. Functional building blocks 3.2, 3.4, 4.1, 4.2, 4.3, 4.4, 4.5 and 4.7 can be found in phase 1 Preparation for network operator (DBNO).

4.6 Specifying network interfaces

Brief description	Interfaces between parts of the network, the studio and the head-end, the transmitting antenna and the receiver and transmitting equipment and the monitoring centre.
Objective	Defining interfaces with network elements in order to obtain satisfactory service delivery.

Key topics and choices	Status	Decision
4.6.1 Interfaces with head-end	Not yet decided	The specifications of the interfaces depend on the chosen transmission standard, type of distributions links and network architecture
4.6.2 Interfaces between parts in the network	Not yet decided	-do-
4.6.3 Radio interface between transmitting station and receiving installation	Not yet decided	-do-
4.6.4 Interfaces between transmitter sites and monitoring system	Not yet decided	-do-

4.6	Main Activities	Status	Observation/Advice
1	Drafting interface specifications between studio and multiplex head end	Not yet decided	
2	Drafting interface specifications between network monitoring system and transmitting equipment	Not yet decided	
3	Describing the radio interface	Not yet decided	

4.8 Considering equipment availability

Brief description	This section includes market research and technical specification in relation to activities, a) specification of the transmission equipment in the DTTB implementation plan; b) verifying if the specification can be met on the market, and c) drafting specifications for tending to purchase equipment.
Objective	This section provides background information and guidelines on key topics and choices regarding transmission equipment availability.

Key topics and choices	Status	Decision
4.8.1 Market research	Not yet decided	
4.8.2 Technical specifications	Not yet decided	This will do once the standard is finalized.

4.8	Main Activities	Status Code	Observation/Advice
1	Drafting interface specifications between studio and multiplex head end	Not yet decided	
2	Drafting interface specifications between network monitoring system and transmitting equipment	Not yet decided	
3	Describing the radio interface	Not yet decided	

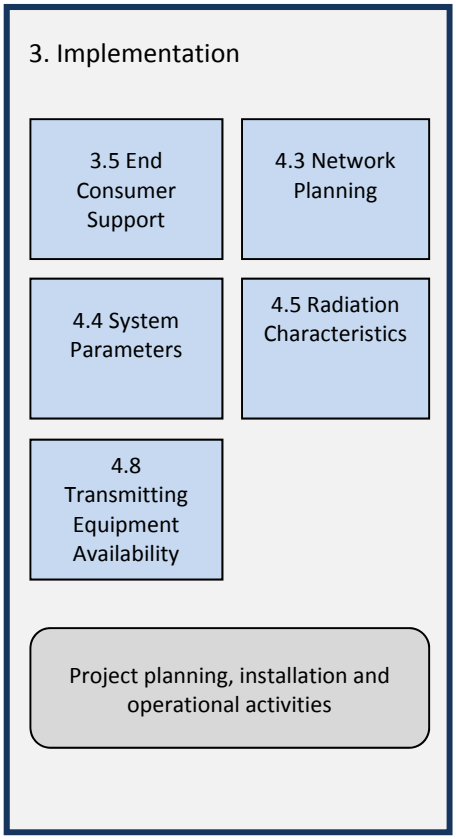
4.9 Network roll out planning

Brief description	Implementation plan taking into account coverage priorities, services priorities, ASO, equipment availability and capacity of the network operator
Objective	To provide implementation schedule for the DTTB services within budget and time constraints

Key topics and choices	Status	Observation/Decision
4.9.1 Test transmissions	Partly decided	
4.9.2 Implementation plan	Not yet decided	
4.9.3 Information to end consumers	Not yet decided	

4.9	Main Activities	Status Code	Observation/Advice
1	Describing pilot tests	Not yet decided	Advice to perform
2	Roll out planning (e.g. main cities, provincial cities, rural areas), before and after ASO	Not yet decided	In phases
3	Agreement with receiver manufacturers to deliver receivers in sufficient quantities, in time	Not yet decided	
4	Coverage assessment at each stage of implementation	Not yet decided	
5	Setting up communication plan and related provisions (e.g. helpdesk, website)	Not yet decided	

Annex 6: Implementation



The selected functional building blocks related to Phase 3 of the roadmap for operators are shown in Figure 11 and are reproduced here. Section 3.4.8 describes phase 3 of the roadmap.

This Annex gives an overview in the form of tables of the status of each of the selected functional building blocks related to phase 3 for the operators.

The selected functional building blocks are presented in the order of the number of the block. This number refers to the corresponding chapter in the ITU Guidelines, where more information and implementation guidelines can be found.

Function building blocks 4.3, 4.4, 4.5 and 4.8 can be found in phase 2 Planning for network operator (DBNO).

3.5 Defining end consumer support

Brief description	The end consumer support comprises normally 1) subscription management, 2) order management and fulfilment, 3) catalogue management, 4) marketing campaign management, 5) customer services and support, and 6) service provisioning.
Objective	This section is part of the DTTB/MTV service provider's customer relationship management (CRM) process.

3.5	Main Activities	Status Code	Observation/Advice
1	Describing pilot tests	Not yet decided	
2	Roll out planning (e.g. main cities, provincial cities, rural areas), before and after ASO	Partly decided	
3	Agreement with receiver manufacturers to deliver receivers in sufficient quantities, in time	Not yet decided	
4	Coverage assessment at each stage of implementation	Not yet decided	
5	Setting up communication plan and related provisions (e.g. helpdesk, website)	Not yet decided	

Annex 7: Estimated cost of DBNO Capex in Maldives for 10 channels SDTV

No	Item	Quantity	Unit Cost USD	Total Cost USD	Duties	Cost including duties	Total Cost MVR	Costs per month USD	Comments
1	Transmitter						15.54		
	300 W	2	24 000	48 000	25%	60 000	932 400		To replace 1000W analogue, 300 W digital cost estimates used (1+1)
	100 W	19	15 000	285 000	25%	356 250	5 536 125		To replace 250W/300W and 5 sites out of 16 are 1+1
	Very Small Transmitters (10/20/100W analogue equivalent)	7	12 500	87 500	25%	109 375	1 699 688		To replace 10W/20W/100W
	Subtotal transmitters	28		420 500	25%	525 625	8 168 213		
2	Feeder + Antenna	28	20 000	560 000	25%	700 000	10 878 000		
3	Linking to Transmitting Sites (Space Segment)	28		1 665 351	10%	1 831 886	28 467 504	36 000	Based on satellite cost per month/5 to 8 channels (13.5 MHz) / 5 years life
4	Master Control Room	1	1 500 000	1 500 000	25%	1 875 000	29 137 500		1 master control room for 5 channels
5	Connectivity to broadcasters	5	10 376	51 881	25%	64 851	1 007 782		Choice of leased circuits, Optical fibre or microwave
6	Uplink Costs (Earth Station Cost)	1	700 000	700 000	25%	875 000	13 597 500		satellite earth station
7	Downlink costs	28	7 500	210 000	25%	262 500	4 079 250		satellite dishes and decoders
	Subtotal 1			5 107 731		6 134 862	95 335 749		
8	Installation Cost (10%)	10%		510 773	6%	541 420	8 413 659		
9	Standalone 40 m tower	28	30 000	840 000	25%	1 050 000	16 317 000		
10	Tower installation	28	30 000	840 000	6%	890 400	13 836 816		
11	Set top boxes	50 000	25	1 250 000	5%	1 312 500	20 396 250		
	Total cost excluding contingencies			8 548 504		9 929 181	154 299 474		
12	Contingencies (10%)			854 850	0	992 918	15 429 947		
	Total Cost			9 403 355		10 922 099	169 729 421		

Annex 8: Estimated cost of DBNO Capex in Maldives for 6 channels SDTV + 4 HDTV

No	Item	Quantity	Unit Cost USD	Total Cost USD	Duties	Cost including duties	Total Cost MVR	Costs per month USD	Comments
1	Transmitter						15.54		
	300 W	4	24 000	96 000	25%	120 000	1 864 800		To replace 1000W analogue, 300 W digital cost estimates used (1+1)
	100 W	38	15 000	570 000	25%	712 500	11 072 250		To replace 250W/300W and 5 sites out of 16 are 1+1
	Very Small Transmitters (10/20/100W analogue equivalent)	14	12 500	175 000	25%	218 750	3 399 375		To replace 10W/20W/100W
	Subtotal transmitters	56		841 000	25%	1 051 250	16 336 425		
	Combiners	28	6 000	168 000	25%	210 000	3 263 400		
2	Feeder +Antenna	28	20 000	560 000	25%	700 000	10 878 000		
3	Linking to Transmitting Sites (Space Segment)	28		1 665 351	10%	1 831 886	28 467 504	36 000	based on satellite cost / month / 5 to 8 channels (13.5 MHz) / 5 years life
4	Master Control Room	1	1 500 000	1 500 000	25%	1 875 000	29 137 500		1 master control room for 5 channels
5	Connectivity to Broadcasters	5	10 376	51 881	25%	64 851	1 007 782		Choice of leased circuits, Optical fibre or microwave
6	Uplink Costs (Earth Station Cost)	1	700 000	700 000	25%	875 000	13 597 500		satellite earth station
7	Downlink costs	28	7 500	210 000	25%	262 500	4 079 250		satellite dishes and decoders
	Subtotal 1			5 696 231		6 870 487	110 357 161		
8	Installation Cost (10%)	10%		569 623	6%	687 048	11 035 716		
9	Standalone 40 m tower	28	30 000	840 000	25%	1 050 000	16 317 000		
10	Tower installation	28	30 000	840 000	6%	890 400	13 836 816		
11	Set top boxes	50 000	25	1 250 000	5%	1 312 500	20 396 250		
	Total cost excluding contingencies			9 195 854		10 810 435	171 942 943		
12	Contingencies (10%)			919 585	0	1 081 043	17 194 294		
	Total Cost			10 115 440		11 891 478	189 137 237		

Annex 9 : Estimated cost of DBNO Capex in Maldives for 6 channels SDTV + 10 HDTV

No	Item	Quantity	Unit Cost USD	Total Cost USD	Duty	Cost including duties	Total Cost MVR	Costs / month USD	Comments
1	Transmitter						15.54		
	300 W	6	24 000	144 000	25%	180 000	2 797 200		replace 1000W analogue, 300 W digital cost estimates used (1+1)
	100 W	57	15 000	855 000	25%	1 068 750	16 608 375		replace 250W/300W and 5 sites out of 16 are 1+1
	Very Small Transmitters (10/20 / 100W analogue equivalent)	21	12 500	262 500	25%	328 125	5 099 063		To replace 10W/20W/100W
	Subtotal transmitters	84		1 261 500	25%	1 576 875	24 504 638		
	Combiners	28	7 000	196 000	25%	245 000	3 807 300		
2	Feeder +Antenna	28	20 000	560 000	25%	700 000	10 878 000		
3	Linking to Transmitting Sites (Space Segment)	28		1 665 351	10%	1 831 886	28 467 504	36 000	based on satellite cost / month / 5 to 8 channels (13.5 MHz) / 5 years life
4	Master Control Room	1	1 500 000	1 500 000	25%	1 875 000	29 137 500		1 master control room for 5 channels
5	Connectivity to broadcasters	5	10 376	51 881	25%	64 851	1 007 782		leased circuits, optical fibre or microwave
6	Uplink Costs (Earth Station Cost)	1	700 000	700 000	25%	875 000	13 597 500		satellite earth station
7	Downlink costs	28	7 500	210 000	25%	262 500	4 079 250		satellite dishes and decoders
	Subtotal 1			6 144 731		7 431 112	111 227 461		
8	Installation Cost (10%)	10%		614 473	6%	687 048	10 676 726		
9	Standalone 40 m tower	28	30 000	840 000	25%	1 050 000	16 317 000		
10	Tower installation	28	30 000	840 000	6%	890 400	13 836 816		
11	Set top boxes	50 000	25	1 250 000	5%	1 312 500	20 396 250		
	Total cost excluding contingencies			9 689 204		11 371 060	172 454 253		
12	Contingencies (10%)			968 920	0	1 137 106	17 245 425		
	Total Cost			10 658 125		12 508 166	189 699 678		

Glossary

720p

720 lines of progressive scan. One of the resolution of High Definition broadcasts.

1080i

1080i lines of interlaced scan. One of the resolution of High Definition broadcasts.

AM

Amplitude Modulation: A modulation method in which the carrier amplitude changes with the input signal amplitude.

Analogue

A type of waveform signals that contains information such as image, voice, and data. Analogue signals have unpredictable height (amplitude) and width (frequency) and can vary infinitely over a given range.

Analogue TV

Analogue television encodes television picture and sound information and transmits it as an analogue signal (one in which the message conveyed by the broadcast signal is a function of deliberate variations in the amplitude and/or frequency of the signal). All systems preceding DTV (e.g. NTSC) are analogue television systems. Analogue technology has been in use for the past 50 years to transmit conventional TV signals to consumers

Aspect Ratio

Picture width to height (4:3 for SD and 16:9 for HD)

ATSC

ATSC is a set of standards developed by the Advanced Television Systems Committee for digital television transmission that replaced much of the analogue NTSC television system on June 12, 2009 in the United States and will replace NTSC by August 31, 2011 in Canada and December 31, 2021 in Mexico. ATSC digital TV standard was widely used in United States, Canada, Mexico, Puerto Rico, etc.

AVC/H.264

AVC/H.264 is the latest ratified video coding standard. It emerged as the result of joint development of International Telecommunication Union Video Coding Experts Group (ITU VCEG) and MPEG ISO. This standard is known as H.264 (ITU-T name), or MPEG-4 part 10 (ISO/IEC 14496-10), or MPEG-4

Bel

A measure of voltage, current or power gain. One Bel is defined as a tenfold increase in power. If an amplifier increases a signal's power by a factor of 10, its power gain is 1 Bel or 10 decibels (dB). If power is increased by 100 times, the power gain is 2 Bels or 20 decibels. 3dB is considered doubling.

Cable Television

is a system of providing television to consumers via radio frequency signals transmitted to televisions through fixed optical fibers or coaxial cables as opposed to the over-the-air method used in traditional television broadcasting (via radio waves) in which a television antenna is required.

Compression

A mathematical method of reducing the amount of digital information needed to re-create a television picture or frame.

Conditional access (CA)

A way of blocking access to programmes so that they can only be viewed by entering the correct code. Used in paid-for on-demand services to avoid accidental purchases or as a parental control.

Coaxial cable

Coaxial cables contain an insulated wire conductor wrapped in another conductor made of metal foil or mesh. Both conductors share the same axis; thus the name. They are used for cable TV transmission

DB or Decibel

One tenth of a bel. See also Bel.

Digital

Information sent as a series of high (1) and low (0) signals separated by a fixed period of time

Digital set-top-box (DSTB)

A device that receives and decodes digital video broadcasts for consumer viewing Digital television (DTV).A device that receives, decodes, and displays digital video broadcasts (in both high-definition and standard-definition formats) for consumer viewing.

Digital dividend

Digital dividend refers to the spectrum of freed up analogue radio frequencies or bandwidth made available to digital services resulting from the analogue to digital switchover

DTMB

(Digital Terrestrial Multimedia Broadcast) is the TV standard for mobile and fixed terminals used in the People's Republic of China, Hong Kong, and Macau. Although at first this standard was called DMB-T/H (Digital Multimedia Broadcast-Terrestrial/Handheld), the official name is DTMB.

DTTB (Digital Terrestrial Television Broadcasting)

It refers to the broadcast of digital television services using terrestrial radio transmission.

DVB-T

Abbreviation for Digital Video Broadcasting Terrestrial, it is the DVB European-based consortium standard for the broadcast transmission of digital terrestrial television. DVB-T digital TV standard was widely used in Europe, Australia, Russia, and some countries of Southeast Asia and Middle East.

Encryption

In cryptography, is the process of transforming information (referred to as plaintext) using an algorithm to make it unreadable to anyone except those possessing special knowledge, usually referred to as a key. In conditional access broadcasts this is used to make transmissions secure and is often found on satellite or cable systems. The result of the process is information. In many contexts, the word also implicitly refers to the reverse process, to make the encrypted information readable again. Encryption and content security are vital to the growth of digital media markets.

EPG (Electronic Programme Guide)

On-screen information telling viewers what's on now, and next, or even coming week on digital terrestrial, cable or satellite

FM

Frequency Modulation: A modulation method in which the carrier frequency changes with the input signal amplitude.

Free to Air

Service by which you can receive free TV and radio channels through your normal TV aerial. There is no contract, just a one-off payment for equipment. The term also refers to anything that is "free to view".

HDTV (High Definition Television)

A television system which provides up to five times the resolution of standard definition television (SDTV) and supports a typical widescreen aspect ratio of 16:9. There are various options on the number of lines and pixels such as 1280 x 720 and 1920 x 1080, etc.

Hybrid Broadcast-Broadband TV

Dual Stream offers technologies to seamlessly deliver media over broadcast and broadband networks.

iDTV

Integrated Digital Television a TV with a built-in digital tuner

Interlaced Scanning:

In a television display, interlaced scanning refers to the process of re-assembling a picture from a series of electrical (video) signals. The 'standard' NTSC /PAL system uses 525/625 scanning lines to create a picture (frame). The frame/picture is made up of two fields: The first field has 262.5/312. 5 odd lines (1 3 5...) And the second field has 312.5 even lines (2 4 6...). The odd lines are scanned (or painted on the screen) in 1/60th/1/50th of a second and the even lines follow in the next 1/60th/1/50th of a second. This presents an entire frame/picture of 525 /625lines in 1/30th/1/25th of a second.

IP TV

Internet Protocol Television is the use of the IP packetized data transport mechanism for delivery of streamed real-time television signals across a network. Data distribution usually uses IP multicast in IP TV.

ISDB / ISDB-T

Integrated Services Digital Broadcasting (ISDB) is a Japanese standard for digital television (DTV) and digital radio used by the country's radio and television stations. ISDB replaced the previously used MUSE "Hi-vision" analogue HDTV system. A derivative of ISDB, ISDB-T International, was developed by the Brazilian government and is being widely adopted in South America. ISDB digital TV standard was widely used in Japan, Brazil, and some South America countries.

Mbit/s

The amount of data transported in a given amount of time, usually defined in Mbps. Bit rate is one means used to define the amount of compression used on a video signal.

Modulation

Modulation is the process of varying one or more properties of a periodic waveform, called the carrier signal, with a modulating signal which typically contains information to be transmitted.

MPEG-4

MPEG-4 is a standard for graphics and video compression that is based on MPEG-1 and MPEG-2 and Apple QuickTime technology. Wavelet-based MPEG-4 files are smaller than JPEG or QuickTime files, so they are designed to transmit video and images over a narrower bandwidth and can mix video with text, graphics and 2-D and 3-D animation layers. MPEG-4 was standardized in October 1998 in the ISO/IEC document 14496.Advanced Video Coding (AVC).

MFN (Multiple Frequency Network)

A network of independent broadcasting transmitters which operate on more than one radio frequency to cover an intended area all transmitters of an MFN carry the same television programme signals.

Mobile TV

Mobile TV is the transmission of on demand, recorded or live audiovisual content to a receiver – at rest or on the move. Transmissions can take the form of broadcast mobile TV similar to the TV signals you receive through your aerial or satellite dish or it can be streamed over the Internet or cell phone networks to individual mobile devices.

Multiplex

The method of blending multiple signals successively to be carried jointly on a communication channel

NTSC

NTSC is the colour television standard established by the National Television Standards Committee in the United States in 1953. The NTSC standard's distinguishing feature was that it added colour to the original 1941 black and white television standard in such a way that black and white TVs continued to work.

PVR

Personal Video Recorder- A unit that records TV programmes onto a hard disk, and usually offers a range of other features, such as the ability to schedule recordings from an on-screen guide, or to automatically record all the episodes of a particular series.

Progressive Scan:

The way a television decodes an image – also known as non-interlaced, the odd and even fields are scanned sequentially (1, 2, 3, 4…) every 1/50 of a second. 50 frames are produced every second, thus creating a smoother, more vivid picture with less flicker. It is the same technology computer monitors use.

PAL

Phase alternate line: A television standard used in most of Europe. Similar to NTSC, but uses subcarrier phase alternation to reduce the sensitivity to phase errors that would be displayed as colour errors. Commonly used with 626-line, 50Hz scanning systems

Standard -Definition Television (SDTV)

Standard definition video format that has 4:3 aspect ratio.

SFN

Single frequency network or SFN is a broadcast network where several transmitters simultaneously send the same signal over the same frequency channel – all are sharing the same radio frequency to achieve large area of coverage.

Simulcast

When a broadcaster joins another feed typically produced by a third-party supplier outside their facility either live or in a prerecorded format. For example, a press conference or event that is simultaneously joined by various non-related broadcasters.

SDTV (Standard Definition Television)

SDTV can be considered as the digitized version of the conventional TV system, both of which have the same screen format and picture resolution. However, SDTV pictures are free from 'ghosting' and 'snowing', which are commonly found on analogue broadcast

Terrestrial television

Television signals broadcast from local radio towers. Homes with antennas capable of picking up the broadcast signals are able to receive the television program.

USB

Universal Serial Bus: A simple connector found on most PCs and on some PVRs, which can be used to connect different devices. Some USB devices are hosts – like PCs – while others, such as hard disks and the Top field PVRs, are designed to be plugged into a host.

VOD

VOD stands for video on demand. VOD is similar to pay per view and offers films and programmes to watch for one off payments.

Abbreviations

ASO	Analogue Switch-Off
C/N	Carrier to Noise ratio
CA	Conditional Access
CAPEX	Capital Expenditure
CABLE-TV	Cable TV Distribution Network
CAM	Communication Authority Maldives
CPE	Customer Premises Equipment
dB	Decibel
DBNO	Digital Broadcast Network Operator
DRM	Digital Rights Management
DSO	Digital Switch Over
DTTB	Digital Terrestrial Television Broadcasting
DTH (TV)	Direct-to-Home Satellite Broadcasting Service
DVB	Digital Video Broadcasting
DVB-T	Digital Video Broadcasting – Terrestrial
DVB-T2	Digital Video Broadcasting – Terrestrial 2nd generation
EPG	Electronic Programme Guide
ERP	Effective Radiated Power
FTA	Free-To-Air (unencrypted)
GDP	Gross Domestic Product
GE06	Geneva Agreement 2006
HDTV	High Definition Television
ISDB T	Integrated Services Digital Broadcasting – Terrestrial
ITU	International Telecommunication Union
ITU-BDT	ITU Telecommunication Development Bureau
ITU Guidelines	ITU Guidelines for the Transition from Analogue to Digital Broadcasting
ITU-R	International Telecommunication Union – Radio communication Sector
MBC	Maldives Broadcasting Commission
MNBC	Maldives National Broadcasting Corporation
MPEG	Moving Picture Expert Group
MUX	Multiplexer
MTV	Mobile Television
NRT	National roadmap Team
OPEX	Operating Expenditure
NSP	National Spectrum Plan
OPEX	Operational Expenditure

OPN	Open Network Provisioning
PPP	Public Private Partnership
PSB	Public Service Broadcaster
QPSK	Quadrature Phase Shift Keying
RR	Radio Regulations
SDTV	Standard Definition Television
SFN	Single Frequency Network
STB	Set-Top-Box
T-DAB	Terrestrial-Digital Audio Broadcasting
T-DMB	Terrestrial-Digital Multimedia Broadcasting
UHF	Ultra High Frequency (frequency range between 300 and 3000 MHz)
VHF	Very High Frequency (frequency range between 30-300 MHz)
WRC	World Radio communication Conference

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