The Republic of the Maldives
Ministry of Home Affairs

Data Collection Survey

on

Digital Terrestrial Television Broadcasting

in

the Republic of the Maldives

Final Report

March 2015

Japan International Cooperation Agency (JICA)

Yachiyo Engineering Co., Ltd.

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MBCo: TV Station Building

MBCo has TV and radio station buildings on Malé island. Each building has an antenna tower.

MBCo: Analogue Transmitter

The left transmitters are currently in operation. The centre transmitters coloured blue are not in use now.

MBCo: ISDB-T Transmitter

This transmitter was provided by Japan for the DTTB trial transmission and is currently in operation.

Pictures of Survey

MBCo: TV Studio 1

MBCo has three TV studios. The TV Studio 1 has an area of 50 square meters.

MBCo: Antenna Tower

Antenna for digital broadcasting is additionally installed on the upper part of the tower.

MBCo: OB Van

A small sized OB Van is suitable for Malé island with full of narrow roads.

MBCo: OB Van (inside)

Equipment is installed compactly in the OB Van.

MBCo: Transmitting System for TVRO

Signals are transmitted through TVRO to the area where terrestrial signal cannot be reached.

MBCo: Satellite Antenna

TVRO uses the Ku-band.

Pictures of Survey

Communications Authority of Maldives (CAM)

CAM is responsible for comprehensive frequency planning and allocation of frequencies.

National Disaster Management Centre (NDMC)

This organisation was established after the 2004 Indian Ocean Tsunami.

Maldives Meteorological Service (MMS): Hotline

This hotline enables rapid communication with MBCo, NDMC, police etc.

MMS: Weather Studio

A VTR tape that the weather programme recorded is delivered from the weather studio in Hulhule Island to MBCo in Malé island once a day.

Antenna Tower on Villingili island (150 m)

This antenna tower is owned by Medianet, the largest CATV operator in Maldives.

Malé island

More than 100,000 people equal to a third of the Maldivian population live on Malé island.

ABBREVIATIONS

ABU	Asia-Pacific Broadcasting Union
ADB	Asian Development Bank
ADRC	Asian Disaster Reduction Center
AIBD	Asia-Pacific Institute for Broadcasting Development
ARIB	Association of Radio Industries and Businesses
ASO	Analog Switch Off
AWS	Automatic Weather Station
BML	Broadcast Markup Language
CAM	Communication Authority of Maldives
CATV	Cable Television
CG	Computer Graphics
CIF	Cost, Insurance and Freight
CSR	Corporate Social Responsibility
DBNO	Digital Broadcasting Network Operator
DiBEG	Digital Broadcasting Experts Group
DSO	Digital Switch Over
DTTB	Digital Terrestrial Television Broadcasting
DVB-C	Digital Video Broadcasting – Cable
DVB-T/T2	Digital Video Broadcasting – Terrestrial
EIA	Environmental Impact Assessment
ENG	Electronic News Gathering
EPG	Electronic Program Guide
ERP	Effective Radiated Power
EWBS	Emergency Warning Broadcasting System
GDP	Gross Domestic Product
HD	High Definition
IDA	International Development Association
IMF	International Monetary Fund
IPTV	Internet Protocol Television
ISDB-T	Integrated Services Digital Broadcasting -Terrestrial
ITU	International Telecommunication Union
MBCm	Maldives Broadcasting Commission
MBCo	Maldives Broadcasting Corporation
MDP	Maldivian Democratic Party
MMC	Maldives Media Council
MMDS	Multichannel Multipoint Distribution Service

MMS	Maldives Meteorological Service
MoHA	Ministry of Home Affaires
MPEG	Moving Picture Experts Group
NDMC	National Disaster Management Centre
NOC	Network Operation Centre
NRT	National Roadmap Team
ODA	Official Development Assistance
OTA	Over the Air
PA	Power Amplifier
PAL-B/G	Phase Alternating Line
PPM	Progressive Party of Maldives
PSB	Public Service Broadcaster
SD	Standard Definition
SNAP	Strategic National Action Plan for Disaster Risk Reduction and Climate Change Adaptation
SOP	Standard Operating Procedure
STB	Set Top Box
STL	Studio to Transmitter Link
TTL	Transmitter to Transmitter Link
TVRO	Television Receive Only
UHF	Ultra High Frequency
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
VHF	Very High Frequency

Chapter 1　　Outline of the Survey

Chapter 1   Outline of the Survey

1.1   Background

The Republic of the Maldives (hereinafter referred to as the "Maldives") is an island nation in the Indian Ocean-Arabian Sea area, consisting of 1,190 small islands with a population of 341,848 (Department of National Planning, Ministry of Finance and Treasury, 2012). The penetration rate of household television sets was 56.7 % in 2000 and surged to 85.0 % in 2006 as television became an important media providing news and information.

In October 2011, His Excellency Mr Thoyyib Mohamed Waheed, Maldives Minister of State for Tourism, Arts and Culture, decided to migrate to digital terrestrial broadcasting (hereinafter referred to as DTTB) and adopt Integrated Services Digital Broadcasting - Terrestrial (hereinafter referred to as "ISDB-T") for the Maldives Broadcasting Corporation (hereinafter referred to as "MBCo"), the public service broadcaster. After that, His Excellency Mr Abdulla YAMEEN Abdul Gayoom, President of the Maldives, on his official visit to Japan, announced his decision to adopt Japanese digital terrestrial TV standards, ISDB-T, as his country's standards. The government of the Maldives is hoping for improvement of the information environment, which benefits people in the Maldives, through the Data Broadcasting System and Emergency Warning Broadcasting System (hereinafter referred to as "EWBS"). Though the government of the Maldives has decided to shift to DTTB, the Maldives needs knowledge including preparation of a master plan for DTTB and equipment to proceed with the shift.

Under such circumstances, Japanese Prime Minister Shinzo Abe announced the dispatch of a survey team to the Maldives for the purpose of finding measures to help the smooth migration to DTTB. The announcement was made in a joint statement by the President and the Prime Minister.

As a result of the above, it is necessary to understand the present situation and need for DTTB in the Maldives, and also to examine the issues and find appropriate measures for the smooth migration to DTTB when considering assistance in the form of Japanese ODA grant aid.

1.2   Objective

The objective of the survey is to confirm the future direction of ODA projects to ensure the smooth migration to DTTB by collecting information on the broadcasting sector in the Maldives. The information includes the current situation, issues, related laws, competent authority, and activities by public service and private broadcasters towards DTTB migration. Based on the collected information, the Survey Team will analyse the need for DTTB migration and confirm the direction of Japanese ODA projects.

1.3   Work Schedule

The work schedule of the survey is shown in Figure 1.3-1 below.
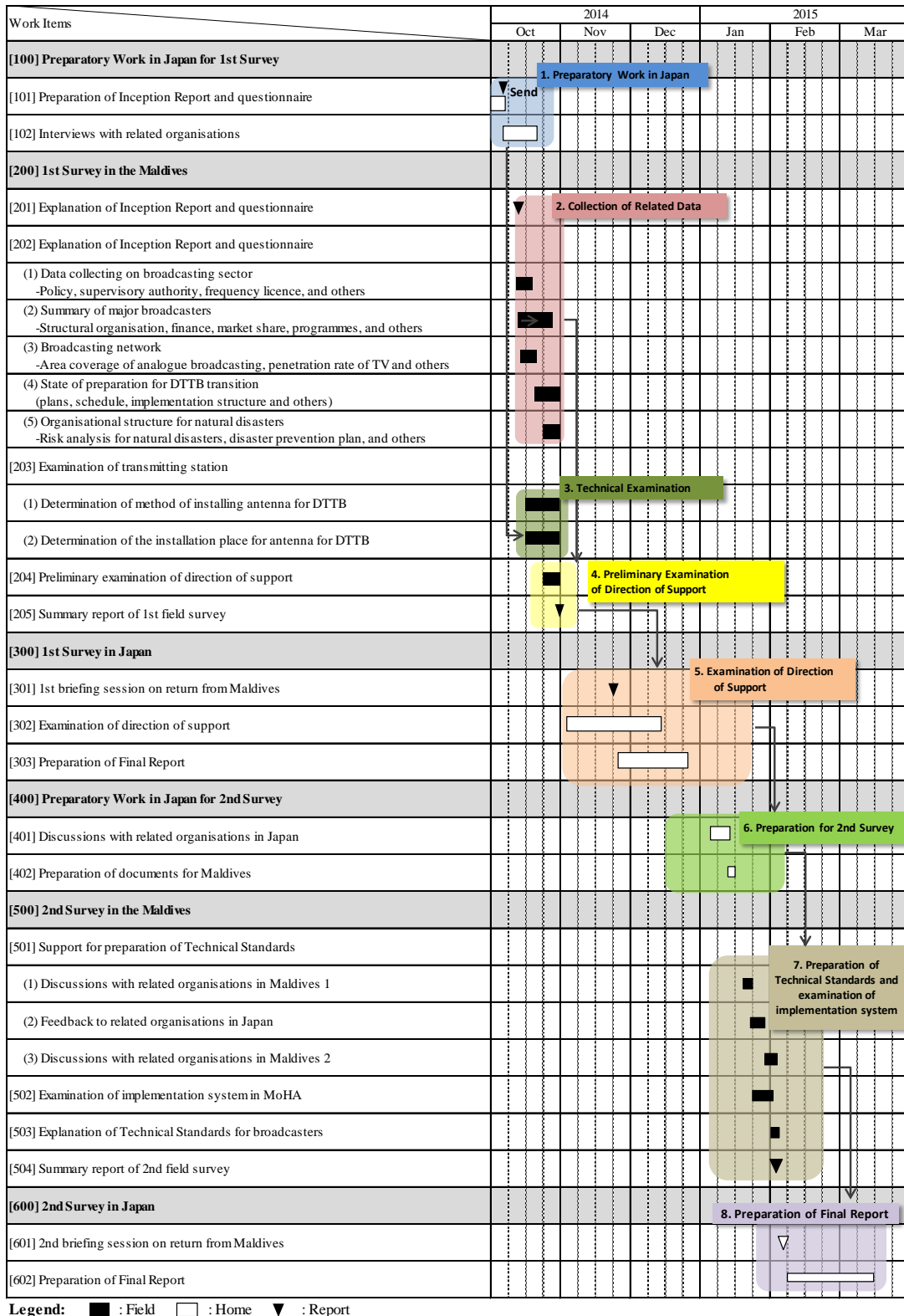
Figure 1.3-1 Work Schedule

1.4 Main Activities of the Survey Team in the Maldives

Table 1.4-1 shows the responsibilities and dispatch period of the Survey Team members and Tables 1.4-2 and 1.4-3 show the main activities in the Maldives.

Table 1.4-1 Responsibilities and Dispatch Period of the Survey Team Members

Name	Firm	Responsibility	Dispatch Period
Naoaki NAMBU	YEC	Chief Consultant / Broadcasting Business Planning	12 -31 Oct 2014, 20 Jan-6 Feb 2015
Akira SAITO	YEC	Transmitting and Relay Network System	19-31 Oct 2014, 20 Jan-6 Feb 2015
Keiko UCHIUMI	YEC	Disaster Prevention / Disaster Communication	12-31 Oct 2014
Yoshitaka IKEDA	YEC	Studio Equipment	12-31 Oct 2014, 23 Jan-6 Feb 2015

Table 1.4-2 Main Activities in the Maldives (First On-Site Survey)

Date		Activities
10/12	Sun	Travel to Sri Lanka, internal meeting
10/13	Mon	Colombo: Courtesy calls (Embassy of Japan, JICA Sri Lanka Office) Transfer to Malé
10/14	Tue	Malé: Courtesy calls (JICA Maldives Office, MBCm, MBCo)
10/15	Wed	Malé: Courtesy calls (CAM, NDMC) Malé: Meetings (Raajje TV, VTV)
10/16	Thu	Malé: Meeting (DTV)
10/17	Fri	Analysis of collected data
10/18	Sat	Analysis of collected data
10/19	Sun	Malé: Meetings (MBCo, Medianet)
10/20	Mon	Malé: Meetings (MBCo, MBCm)
10/21	Tue	Malé: Meetings (NDMC, MBCm) Malé: Courtesy call (Ministry of Home Affairs)
10/22	Wed	Malé: Meetings (CAM, MBCo, MBCm, Atoll TV)
10/23	Thu	Malé: Meeting (Maldives Meteorological Service) Malé: Signing of Minutes (Ministry of Home Affairs)
10/24	Fri	Analysis of collected data
10/25	Sat	Analysis of collected data
10/26	Sun	Analysis of collected data
10/27	Mon	Analysis of collected data
10/28	Tue	Malé: Meetings (MBCm, MBCo)
10/29	Wed	Analysis of collected data
10/30	Thu	Transfer to Colombo
10/31	Fri	Colombo: Reporting (JICA Sri Lanka Office) Return to Japan

(Note)
CAM: Communications Authority of Maldives
MBCm: Maldives Broadcasting Commission
MBCo: Maldives Broadcasting Corporation
NDMC: National Disaster Management Centre

Table 1.4-3 Main Activities in the Maldives (Second On-Site Survey)

Date		Schedule
1/24	Sat	Travel to Malé, internal meeting
1/25	Sun	Malé: Meeting (JICA Maldives Office), Joint meetings (MoHA & CAM, MBCm & MBCo)
1/26	Mon	Malé: Joint meeting (CAM, MBCm & MBCo)
1/27	Tue	Malé: Joint meeting (MoHA & CAM)
1/28	Wed	Malé: Joint meeting (CAM, MBCm & MBCo)
1/29	Thu	Malé: Meeting (MBCo)
1/30	Fri	Malé: Modification of draft Technical Standards of Maldives
1/31	Sat	Malé: Modification of draft Technical Standards of Maldives
2/1	Sun	Malé: Modification of draft Technical Standards of Maldives
2/2	Mon	Malé: Explanation of draft Technical Standards of Maldives (MoHA, CAM, MBCm, MBCo, private broadcasters, etc.)
2/3	Tue	Malé: Submission of final draft of Technical Standards of Maldives (MoHA, CAM, MBCm), Reporting (JICA Maldives Office)
2/4	Wed	Malé: Tour of MBCo studio facilities Transfer to Colombo
2/5	Thu	Colombo: Reporting (JICA Sri Lanka Office)
2/6	Fri	Return to Japan

(Note)
MoHA: Ministry of Home Affairs
CAM: Communications Authority of Maldives
MBCm: Maldives Broadcasting Commission
MBCo: Maldives Broadcasting Corporation
NDMC: National Disaster Management Centre

Chapter 2　Survey Result

Chapter 2　Survey Results

2.1　General Information on the Maldives

(1)　Geographic Features

The Maldives is an island country in the northern part of the Indian Ocean southwest of the Indian Peninsula. It consists of two chains of approx. 1,200 islands oriented north-south in the area between 0º40' S and 7º07' N and between 72º E and 74º E. It is the smallest country in Asia area-wise. It is a member of the British Commonwealth. Approx. 200 of the 1,200 islands are inhabited. The 1,200 islands form 20 atolls. Many of these islands have island-specific functions with some being residential islands and others being tourism islands, airport islands or landfill islands. The president appoints atoll chiefs and island chiefs to the atolls and islands, respectively.

The Maldives is at risk of losing land to the rising sea level and death of coral reefs caused by global warming in recent years because the highest points on approx. 80 % of the islands are less than 1 m above sea level and the islands have flat terrain. In 2009, the former president, Mohamed Nasheed, announced a plan to purchase land in foreign countries with part of the revenue from tourism, a key industry in the Maldives, to secure land to which Maldivians can migrate in future. A plan to protect the land with earth embankments is also being considered.

(2)　Climate

The Maldives has a hot and humid subtropical climate. The average temperature is between 26ºC and 33ºC throughout the year. It has dry and rainy seasons. The period between December and April is the dry season when the influence of the dry northeast monsoon is predominant. The period between May and November is the rainy season when the influence of the wet southwest monsoon is predominant. The transition period from the dry season to the rainy season between March and May is the hottest season of the year. Despite the division between the dry and rainy seasons, it sometimes rains in the dry season. Although it does not rain constantly or continuously during the rainy season, it is generally cloudy and rain may continue for a week once it has started to rain. However, spells of rain squalls in the dry season and spells of fine weather in the rainy season have been observed in recent years presumably because of climate change.

(3)　Society and Population

Cultural and linguistic studies suggest that the Dravidians who settled in India in ancient times were the ancestors of the current Maldivians. At present, the population of the country is approx. 340,000 (Department of National Planning, Ministry of Finance and Treasury of the Maldives, 2012), which makes it the smallest country in Asia in terms of population.　A quarter of the population resides on Malé Island where the capital, Malé, is located, while the majority of remote islands are inhabited by a few hundred to a few thousand people.　Most of the administrative, educational and health services are provided on Malé Island and people on the remote islands depend on the central government for services.　While the official language of the Maldives is Dhivehi, English is also widely used. German and Italian may be understood on some of the tourist islands.　Sunni Islam is the national

religion and almost all the people in the Maldives are Muslims.

Table 2.1-1 shows the population size and the number of households on each atoll in the Maldives.

Table 2.1-1 Population and Number of Households on Each Atoll

Area*	Atoll	Population	Households
	Total	**298,968**	**46,194**
	Malé	**103,693**	**14,107**
	Atoll Total	**195,275**	**32,087**
Upper North	Haa Alifu	13,495	2,425
	Haa Dhaalu	16,237	2,988
	Shaviyani	11,940	2,099
North	Noonu	10,015	1,811
	Raa	14,756	2,538
	Baa	9,578	1,552
	Lhaviyani	9,190	1,449
North Central	Kaafu	15,441	1,526
	Alifu Alifu	5,776	774
	Alifu Dhaal	8,379	1,060
	Vaavu	1,606	260
Central	Meemu	4,710	793
	Faafu	3,765	567
	Dhaalu	4,967	768
Upper South	Thaa	8,493	1,454
	Laamu	11,990	1,970
South Central	Gaafu Alifu	8,262	1,472
	Gaafu Dhaalu	11,013	2,145
South	Gnaviyani	7,636	1,332
	Adu	18,026	3,104

Note)   The province system was abolished in 2012 though this report uses provinces as "area" for the sake of convenience.

Source: Department of National Planning, Department of National Registration (2006)

(4)   Economic Trends

The economy of the Maldives depends on the key industries of tourism and fisheries. The revenue from the tourism industry accounts for approx. 28 % of GDP and more than 60 % of the foreign exchange revenue of the country. Fisheries have supported industry in the Maldives for centuries and still employ a large number of Maldivians. Therefore, the government regards it as an important industry. The revenue from fisheries accounts for 15 % of GDP and 30 % of all the workers in the country are engaged in fisheries.

The scale of agricultural and manufacturing activities is small because of the limited availability of land and labourers.   The 2004 Indian Ocean Tsunami affected the tourism industry adversely and the net GDP growth rate dropped to -8.7 % in 2005.   However, the economy of the country has been recovering steadily from the disaster since 2005 with the recovery of the tourism industry and the implementation of tsunami rehabilitation projects and new resort development projects. The economy

grew at an annual rate of more than 10 % in the three year period between 2006 and 2008 and the country graduated from LDC (least developed country) status in 2011. A floating exchange rate system between the local currency and the US dollar has been in use in the Maldives since April 2011. The prices of goods and services have been on the increase partly because of the introduction of a commodity/service tax in October 2011.

(5) Political Trends

The first multi-party presidential election in the Maldives after democratisation was held in October 2008.   The candidate of the Maldivian Democratic Party (MDP), Mr Mohamed Nasheed, was elected as president in this election.   However, the Nasheed Administration resigned in February 2012 amid political turmoil caused by a three-week-long anti-government demonstration in which the armed forces and the police participated.   The next presidential election was held in September 2013. However, the result of the election was nullified by a Supreme Court decision.   The second round of the presidential election between Mr Nasheed and Mr Yameen, the candidate of the Progressive Party of Maldives (PPM), was held on 16th November 2013.   The election was won by Mr Yameen by a small margin and he assumed power for the next five years.   The candidate of the opposition MDP, Mr Mohamed Nasheed, conceded defeat on the same day.

In the local council elections held on 18th January 2014, while the opposition MDP won in urban areas including Malé and Addu, the ruling coalition won in the majority of the constituencies.   The ruling coalition won a majority of the seats in Parliament in the general election held on 22nd March 2014.   Therefore, the political situation in the Maldives is stable at present.

2.2   Current State of the Broadcasting Sector

2.2.1   Organisations Involved in Broadcasting Services

The Communications Authority of Maldives (hereinafter referred to as "CAM") has the authority to allocate frequencies in all the frequency ranges in the Maldives.   The Maldives Broadcasting Commission (hereinafter referred to as "MBCm"), meanwhile, has sole authority to issue broadcasting-related licences and supervise the operations of licence holders. As shown in Figure 2.2-1, MBCm is neutral to the influence of political parties as it is an independent commission whose members are appointed by the President with endorsement by Parliament. While CAM used to be under the jurisdiction of the Ministry of Transport and Communications (MoTC), it has been under the jurisdiction of the Ministry of Home Affairs (MoHA) since the abolition of MoTC in June 2014. Likewise, the entire communications and broadcasting sector is under the jurisdiction of MoHA.

Three broadcasters, one public and two private, which have both frequencies and terrestrial broadcaster licences, provide contents produced by themselves through terrestrial broadcasting services in the Maldives. In addition, a great variety of cable TV and satellite TV services are available in the Maldives and many people subscribe to these services to watch TV programmes produced abroad. (See Chapter 2.3.2 below.)

The Maldives Media Council (hereinafter referred to as "MMC") protects the freedom of expression

of journalists. MMC is an independent agency like MBCm. While the activities of MMC do not have direct relevance to the broadcasting sector, it is the regulator of some of the laws governing broadcasting services.
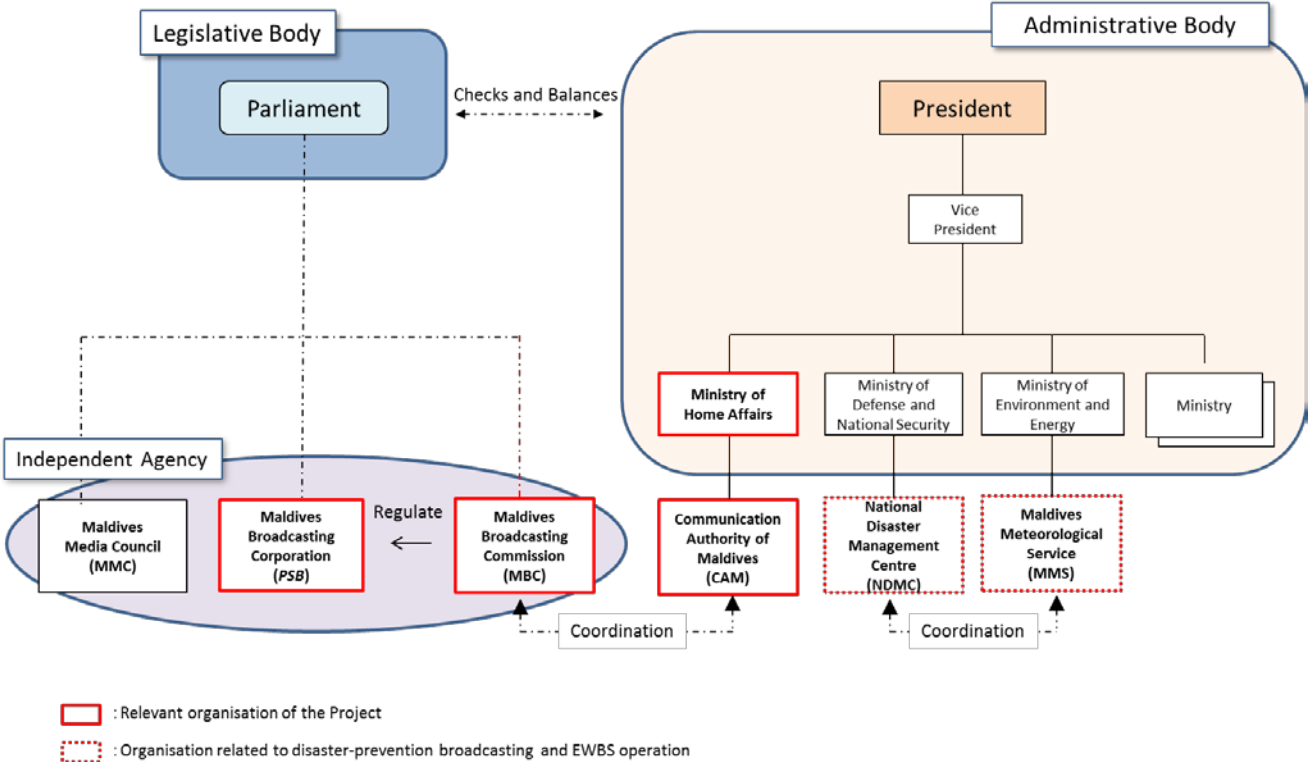
Source: JICA Survey Team

Figure 2.2-1 Organisations Involved in the Broadcasting Sector and Relationships among them

The National Disaster Management Centre (hereinafter referred to as "NDMC") which is responsible for overall disaster prevention and management in the Maldives has its own information network and there is little cooperation between NDMC and the broadcasters. There is a need to establish a cooperative relationship between them and the Maldives Meteorological Service (hereinafter referred to as "MMS") for use of the digital terrestrial television broadcasting system (hereinafter referred to as "DTTB") in the Emergency Warning Broadcasting System (hereinafter referred to as "EWBS") and for data broadcasting after the migration to DTTB, because such use of DTTB is considered an effective means of disaster management.

Table 2.2-1 below shows the services to be provided and presumed work to be performed by the organisations involved in the broadcasting sector in the migration to DTTB.

Table 2.2-1 Organisations Involved and their Roles in DTTB Migration

Name	Jurisdiction	Service	Presumed Work for DTTB Migration
Ministry of Home Affairs	-	- Establishment of mid-to-long term policies for communication and broadcasting sectors	- Preparation of DTTB migration plan - Establishment of DBNO
Communications Authority of Maldives	Ministry of Home Affairs	- Executing agency for telecommunications, IT, and postal services - Preparation of comprehensive frequency plan - Arrangement of radio frequencies internationally - Issue of frequency licences excluding TV and radio - Radio wave monitoring - Creation of technical standards for transmitters and receivers	- Preparation of comprehensive frequency plan - Support for creation of technical standards for DTTB transmitters and receivers - Creation of technical standards for one-seg mobile phones
Maldives Broadcasting Commission	Independent (Controlled by Parliament)	- Management and regulation of broadcasting - Assignment of frequencies for TV and radio - Issue of frequency licences for broadcasters and rebroadcasters - Surveillance of programmes based on rules	- Creation and assignment of TV Channel Plan - Issue of frequency and multiplex licences for DBNO - Issue of broadcasting licences - Creation of technical standards for DTTB transmitters and receivers (excluding one-seg mobile phones) - Management of DSO and ASO
Maldives Broadcasting Corporation	Independent (Controlled by Parliament)	- PSB - Broadcasting of TV and radio nationwide	- Provision of equipment and facilities for DBNO - Transfer of engineers to DBNO

Source: JICA Survey Team

(1)   Ministry of Home Affairs (MoHA)

Since the abolition of MoTC in the cabinet reform of June 2014, all the departments involved in communications and broadcasting which used to be under the abolished ministry have been under the jurisdiction of MoHA.

The Minister of Home Affairs, assisted by three state ministers (only one state minister is currently appointed and the remaining two state ministers' posts are vacant), one deputy minister and one permanent secretary, supervises the Department of National Registration, the Department of Juvenile Justice (proposed), the Maldives Customs Service, the Maldives Police Service, the Maldives Correctional Service (proposed) and the Communications Authority of Maldives (hereinafter referred to as "CAM").   MoHA is comprised of the following divisions: Community Empowerment, Policy Affairs, Corporate Affairs and Inspectorate of Correction Services. MoHA does not have an internal department responsible for communications and broadcasting.   CAM implements the practical work in the communications and broadcasting sector. (See Figure 2.2-2.) CAM is under the direct

supervision of the deputy minister of MoHA and CAM reports all the work that it has performed to the deputy minister. In principle, the deputy minister is not involved in any work other than that related to the communications and broadcasting sector in MoHA.

It is assumed that regulation of the digital broadcasting network operators (hereinafter referred to as "DBNO") to be approved after DTTB migration shall also be under the jurisdiction of MoHA and one of the state ministers or the deputy minister will supervise their activities.
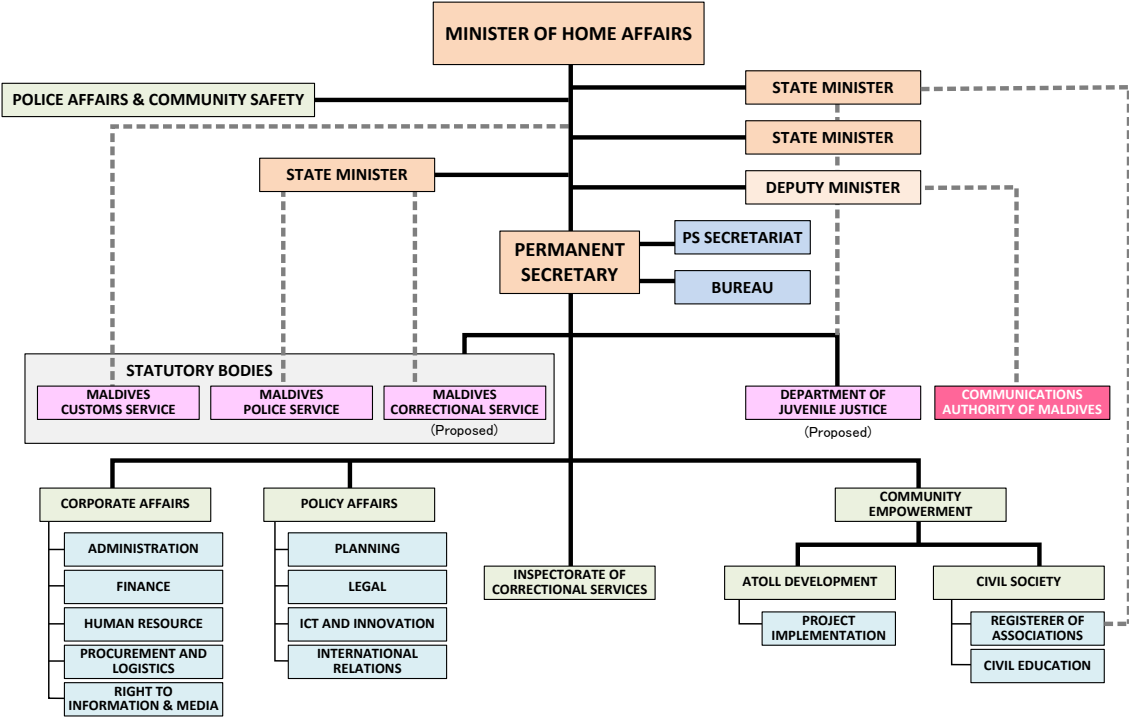
Source: Ministry of Home Affairs

Figure 2.2-2 Organogram of the MoHA

(2) Maldives Broadcasting Commission (MBCm)

MBCm was established in April 2011 for the supervision and development of the broadcasting sector in the Maldives. It is an independent agency and is engaged in overall supervision of TV and radio broadcasting services. It intends to establish a cooperative relationship with international organisations as a member of the Asia-Pacific Institute for Broadcasting Development (AIBD) and the Asia-Pacific Broadcasting Union (ABU). MBCm is also responsible for facilitating the development of the media in the Maldives.

The main duties of MBCm are as follows:

- Preparation of frequency plans for broadcasting;
- Approval and issuance of broadcasting-related licences; and
- Monitoring of broadcasters

MBCm consists of the president, vice president, five commissioners, secretary general and four service departments. Each service department performs its duties with approx. ten staff members. The sections responsible for monitoring and licensing of broadcasting services, which are among the

most important work in supervising broadcasting services, are each run by a director and five staff members. At the time of migration to DTTB, introduction of simulcast will be considered. However, since the human resources currently available in MBCm are limited, support by CAM for frequency monitoring and management will be essential.

Figure 2.2-3 below shows the organogram of MBCm.
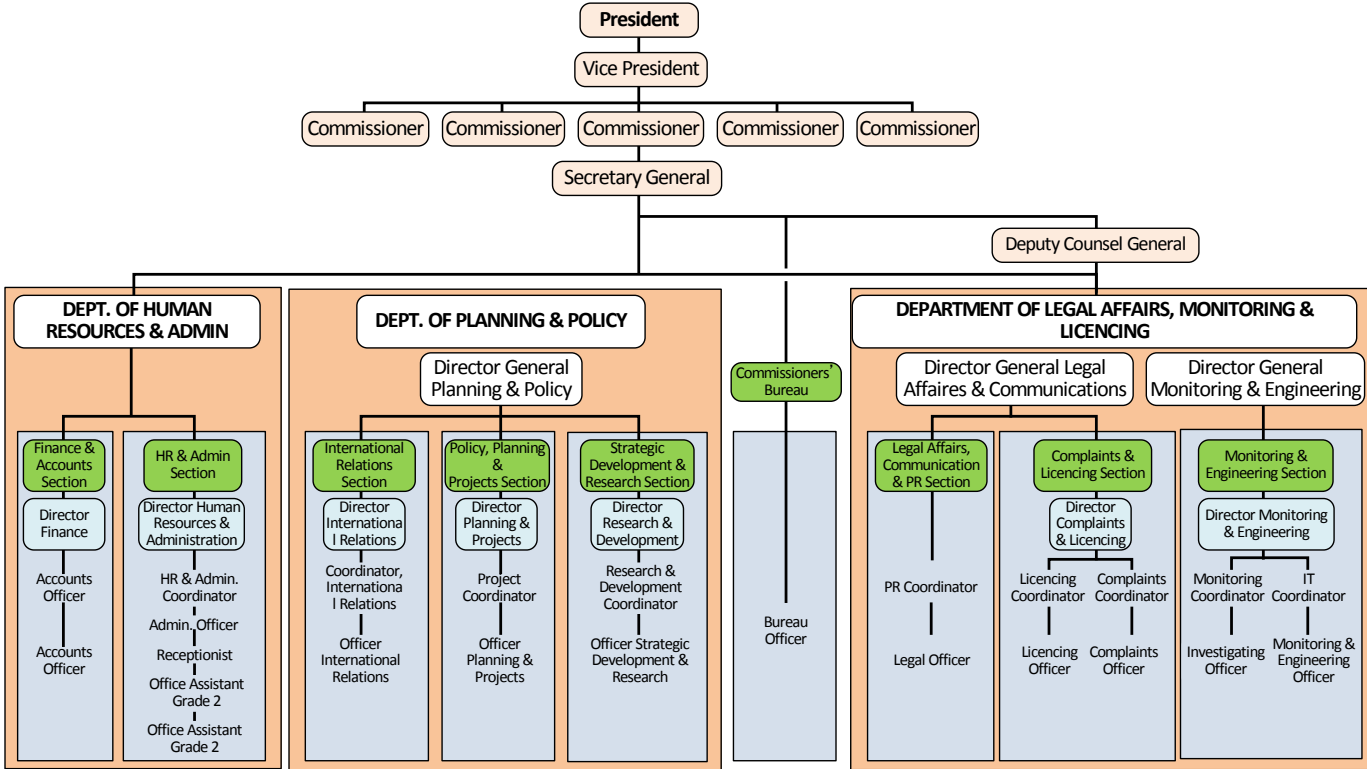
Source: MBCm

Figure 2.2-3 Organogram of the Maldives Broadcasting Commission

(3)   Communications Authority of Maldives (CAM)

CAM supervises telecommunications services including electronic communications and postal services. CAM is responsible for comprehensive frequency planning and allocation of frequencies. MBCm notifies the TV and radio broadcasters and mobile phone service providers of the frequencies available for their use in the frequency bands allocated by CAM for their respective services and issues the licences for frequency use. It provides comprehensive services through two departments, the Corporate Services Department and Regulatory Services Department. While MBCm is the supervising agency for TV and radio broadcasting, CAM supervises and issues all the frequency licences for services other than broadcasting.

CAM intends to use Ch 32 – Ch 37 in the UHF band for DTTB for the time being. However, DBNO may create a DTTB platform and many broadcasters will be able to provide DTTB services through this platform in future. Therefore, CAM intends to decide the TV broadcasting frequencies in future taking the above-mentioned possibility into consideration. In such a case, CAM intends to use Ch 21 to Ch 48 for TV broadcasting services.

There is a plan to make CAM an independent organisation and a bill for such purpose has been submitted to Parliament. However, an independent organisation in this case means an organisation which is financially independent from the government and has the power to decide its own personnel matters, which are transferred from the government, and CAM will have to continue to follow the policy of MoHA on frequency management. As it manages the radio frequencies used by the armed forces and the police, it will purportedly be difficult for CAM to become fully independent.

Figure 2.2-4 below shows the organogram of CAM.
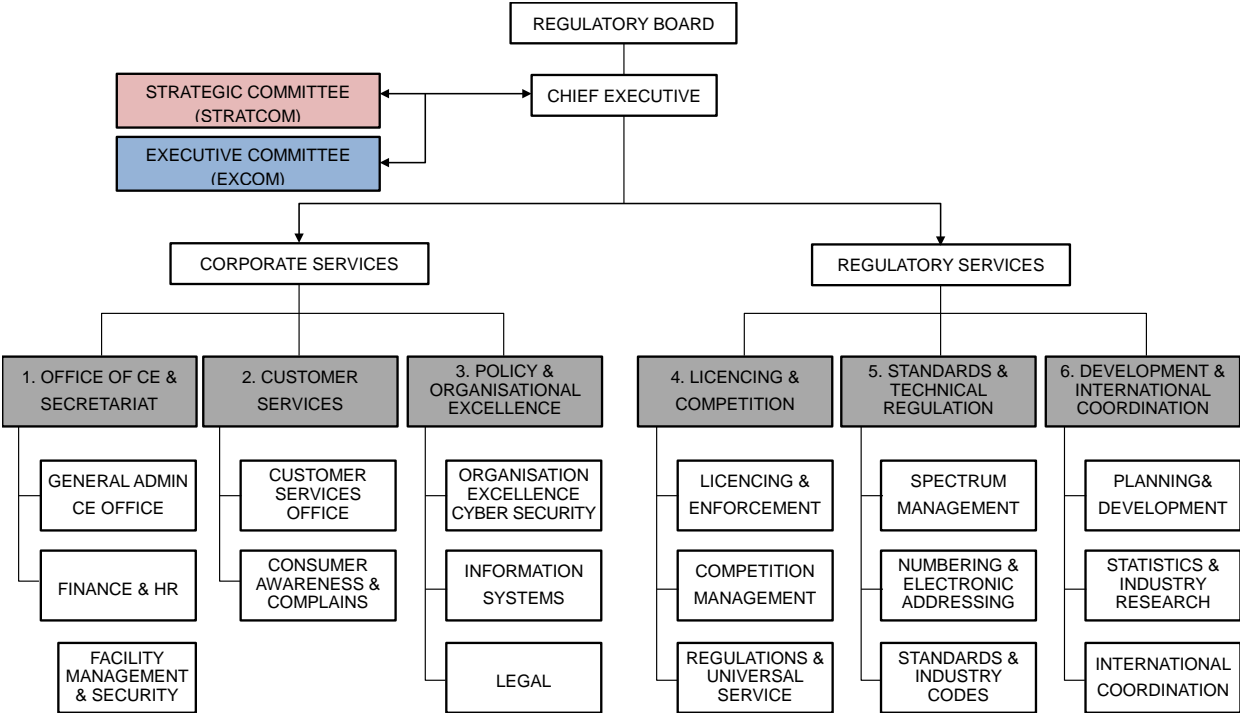
Source: CAM

Figure 2.2-4 Organogram of CAM

(4) Maldives Broadcasting Corporation (MBCo)

The Maldives Broadcasting Corporation (hereinafter referred to as "MBCo") is a public TV broadcaster established in 1978. It was operated as a state-run broadcaster after its establishment. When problems arose such as financial interference in local stations and corrupt financial management, it became a public service broadcaster (PSB), independent from the influence of the government, under the newly enacted Establishment of Maldives Broadcasting Corporation Act 6/2010. The state-run radio station, Voice of Maldives, became part of MBCo under the same law.

The president of MBCo is supervised by the Advisory Panel and the Board Committee. The committee appoints persons to be in charge of governance and remuneration, content and complaints, and finance and auditing from among its members in order to regulate the activities of the broadcaster and prevent inappropriate financial management. MBCo consists of nine departments: Human Resources and Administration, Finance and Accounting, Corporate Affairs, News, TV Programmes, Radio Programmes, Engineering, Infrastructure Planning and Development, and Procurement.

DBNO, which will be established after the migration to DTTB, will have to not only procure

equipment but also employ engineers. Since it is difficult to train people in the technical skills required for DTTB in a short period of time, measures such as transfer of engineers skilled in transmission and network management from the existing broadcasters to DBNO may have to be taken. MBCo is the only broadcaster in the Maldives which has a nationwide terrestrial TV broadcasting network and engineers with ample experience in the management of transmitting stations and TV network work. Therefore, it is expected to be the source of human resources for DBNO.

Figure 2.2-5 shows the organogram of MBCo.
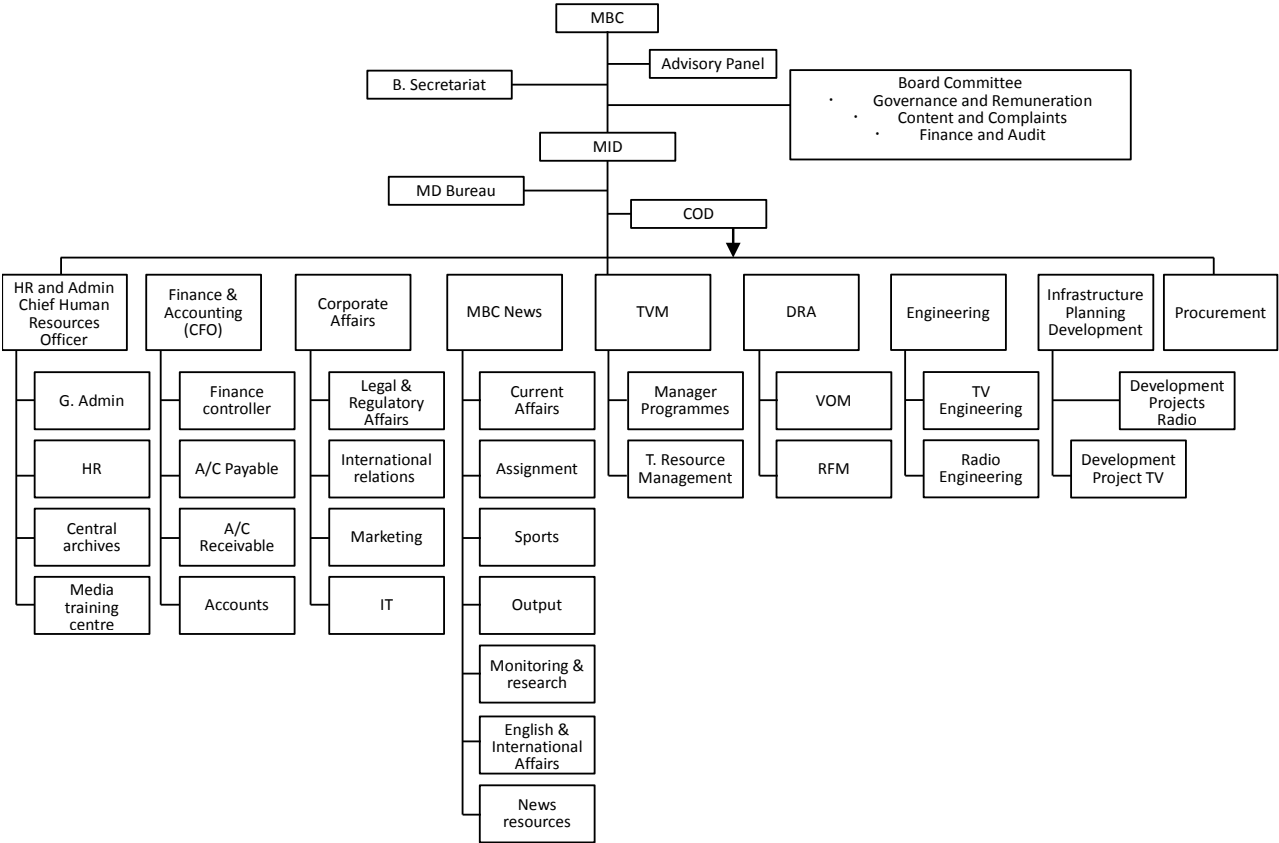
Source: MBCo

Figure 2.2-5 Organogram of the Maldives Broadcasting Corporation

(5) Maldives Media Council (MMC)

Maldives Media Council (hereinafter referred to as "MMC") was established by the implementation of the Maldives Media Council Law as an organisation to protect the freedom of expression of journalists. MMC consists of eight members from the media and seven ordinary citizens. The purpose of MMC is to enhance the awareness of people involved in journalism of their responsibility when transmitting information, the spirit of public service, ethics and professionalism and to protect the freedom of expression of the media. MMC also provides training courses for journalists.

Figure 2.2-6 below shows the organogram of MMC.
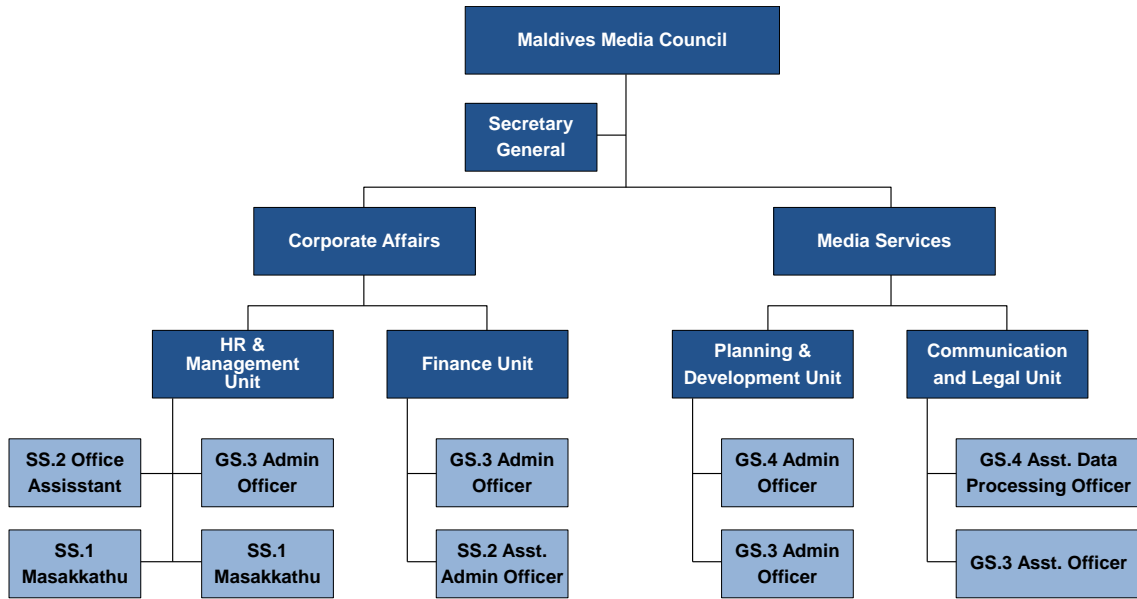
Source: MMC

Figure 2.2-6 Organogram of the Maldives Media Council

2.2.2 Policies and Legal Framework of the Broadcasting Services

As seen in Figure 2.2-7 and Table 2.2-2, while MBCm enforces the laws and regulations governing the broadcasting services, CAM regulates the use of frequencies in general in the Maldives.

As the print media is regulated and controlled by MMC, the two types of media, *i.e.* the print media and broadcasting/communications, are regulated by different organisations in the Maldives. However, MMC monitors the media to ensure that the freedom of the press and the freedom of expression of journalists are protected in all the media.

MBCm and MMC are completely independent from the government and are operated under the control of Parliament. CAM, meanwhile, is under the jurisdiction of MoHA and is financed from the budget of MoHA. A bill to make CAM independent from the government with regard to budget implementation and personnel affairs has been submitted to Parliament.
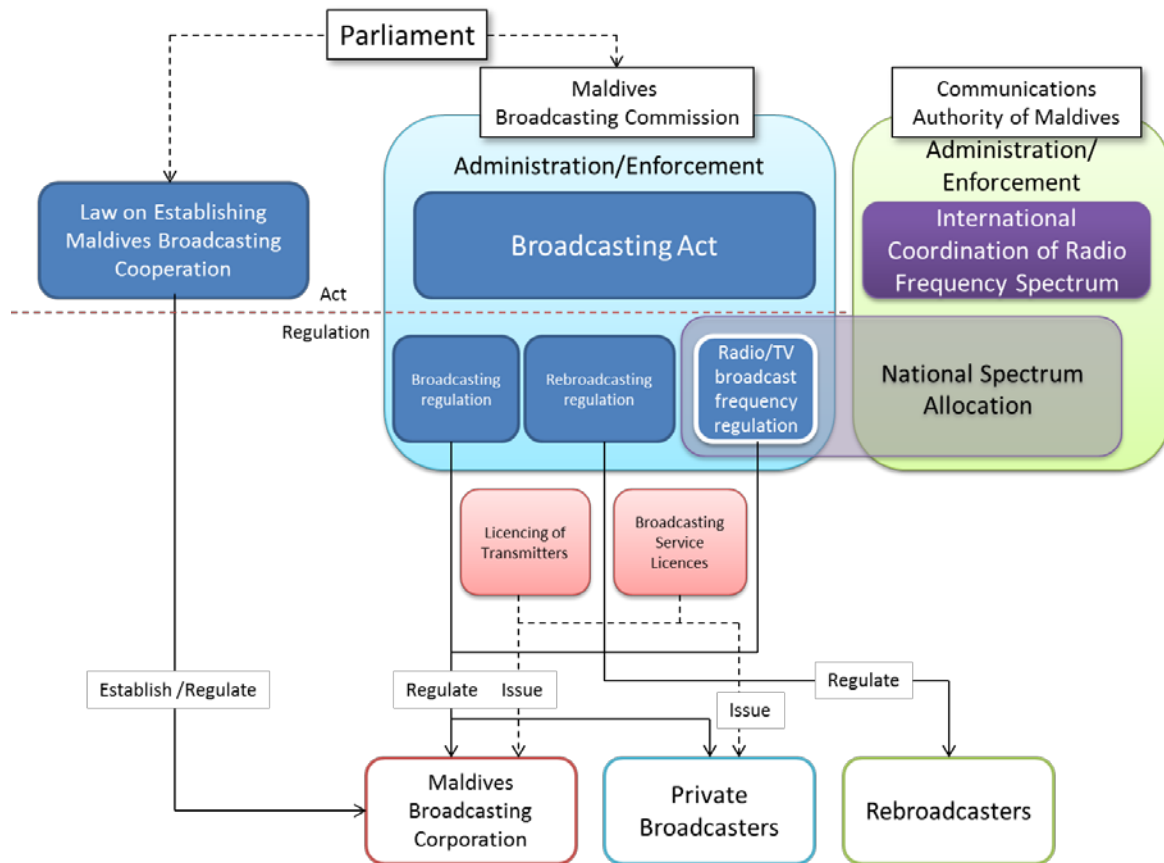
Source: JICA Survey Team

Figure 2.2-7 Legal Framework of the Broadcasting Sector in the Maldives

The Broadcasting Act 16/2010 contains provisions on TV broadcasting. MBCm was established in accordance with this Act and began service in April 2011. MMC, which was established in accordance with the Maldives Media Council Act 15/2008, protects the press freedom of journalists and freedom of expression including contents of expression.

Because the Maldives is an island nation consisting of approx. 1,200 coral islands in an area 860 km-long in the north-south direction and 118 km-long in the east-west direction, private broadcasters have constructed rebroadcasting facilities on the main atolls. These rebroadcasting facilities are regulated by the Rebroadcasting Regulation 2012/R-20."

The government of the Maldives has established Disaster Guidelines for broadcasters as they suffered serious damage in the 2004 Indian Ocean Tsunami and natural disasters such as floods occur every year in the Maldives.

Table 2.2-2 shows the laws and regulations related to broadcasting, telecommunications and other media.

Table 2.2-2 Laws and Regulations Related to Broadcasting and Telecommunications

Classification	Name	Applicable Organisation	Jurisdiction
Policy	Media/Telecommunications Legislation Development	All Media	MBCm / CAM
	Media/Broadcasting Policy	All Media	MMC / MBCm
Broadcasting	Broadcasting Act 16/2010	Broadcasters / Rebroadcasters	MBCm
	Establishment of Maldives Broadcasting Cooperation Act 6/2010	Broadcasters	N/A
	Broadcasting Regulation 2012/R-11	Broadcasters	MBCm
	Rebroadcasting Regulation 2012/R-20	Rebroadcasters	MBCm
	Decisions on Issue of Broadcasting Service Licences	Broadcasters	MBCm
	Terrestrial Broadcasting Service Planning	Broadcasters / Rebroadcasters	MBCm
	Radio/TV Broadcast Frequency Issuing Regulation 2012/R-10	Broadcasters / Organisations related to issue of broadcasting frequencies	MBCm
	Licencing of Transmitters	Broadcasters / Rebroadcasters	MBCm / CAM
Communication	Media/Telecommunications Legislation Development	All Media	MBCm / CAM
	International Coordination of Radio Frequency Spectrum	Broadcasters / Rebroadcasters / Telecom carriers	CAM
	National Spectrum Allocation	Broadcasters / Rebroadcasters / Telecom carriers	CAM
	Communications/Telecommunications Policy	Broadcasters / Rebroadcasters / Telecom carriers	CAM
Guidelines/ Regulations	National Technology Standards (e.g. Television Receivers, Transmission Standards, Safety Standards etc.)	Broadcasters / Rebroadcasters / Telecom carriers	MBCm / CAM
	Code of Practice	Broadcasters	MBCm
	Disaster Guidelines	Broadcasters	MBCm
	Woman Protection Guidelines	Broadcasters	MBCm
	Child Protection Guidelines	Broadcasters	MBCm
Other policies and laws	National policy on the archiving and preservation of media and broadcasting content such as still and moving images, sound etc., and archives preservation	All Media	MBCm
	Print Media Law 47/1978	Publication Business	MMC
	Maldives Media Council Law 15/2008	MMC	MMC

Source: MBCm and MMC

2.2.3 Broadcasting Market in the Maldives

(1) Overview

Three broadcasters including MBCo have licences for both frequency and terrestrial broadcasting in the Maldives. Of the three, MBCo and a private broadcaster, Broadcasting Maldives Pvt. Ltd. (which operates Dhi TV, hereinafter referred to as "DTV"), have terrestrial TV broadcasting networks on Malé and some of the other islands. While the coverage of MBCo's network is nationwide, that of DTV is limited. (See Chapter 2.3.2 for details.) MBCo provides terrestrial TV services on two VHF channels. In addition, it also provides a test ISDB-T broadcasting service to Malé Island with technical assistance from the Ministry of Internal Affairs and Communications of Japan.

Meanwhile, as if to supplement the underdevelopment of the private terrestrial TV broadcasting network, cable TV (hereinafter referred to as "CATV") operators provide a variety of broadcasting services in the Maldives. At present, there are 77 CATV operators and 98 retransmitting stations for CATV in the country. Their TV programmes can be viewed on almost all the atolls except Alifu Alifu Atoll. If the CATV services provided by Internet Protocol TV (hereinafter referred to as "IPTV") are included, CATV services are available on all the atolls in the country. Many of the programmes available on CATV are produced in foreign countries. Programmes in Dhivehi such as news programmes are preferably viewed in areas where terrestrial TV broadcasting services are available. Therefore, there is a demand for nationwide broadcasting of domestically produced programmes.

(2) Market for Broadcasting Equipment

MBCo operates 26 transmitting stations to provide terrestrial TV broadcasting services nationwide. A private broadcaster, VTV, has procured 20 Chinese-made analogue transmitters. (However, there is no verifiable evidence that VTV has used these transmitters to broadcast programmes. See Chapter 2.3.2 below for details.) Another private broadcaster, DTV, has procured 12 Japanese-made transmitters. As these three are almost the only buyers in the market, the market for transmitters in the Maldives is by no means a large market.

A market for video and audio distributors and transmission equipment such as link systems for programme feed has been established in the Maldives. There are TV programme producers on Malé Island which supply programmes to CATV operators. They purchase filming equipment including cameras. New models of filming equipment (though for business use), many of which are capable of filming HD-quality images, are available on the market.

Analogue transmitters manufactured by NEC Corp. and Hitachi Kokusai Electric, Inc. of Japan and by manufacturers in China have been delivered to and are operated by the various broadcasters. Digital transmitters manufactured by NEC, Rohde & Schwarz of Germany and Screen Service Broadcasting Technologies of Italy have been delivered and are used in test transmissions. However, there is neither a manufacturing base nor specialised service centre for repair of any of the transmitters mentioned above in the Maldives.

Since there are neither manufacturers nor workshops for broadcasting equipment in the Maldives as mentioned above, only simple repair of broadcasting equipment is performed in the Maldives.

Japanese-made equipment which needs repair beyond the technical capacity available in the Maldives is sent back to Japan for repair. Some equipment manufacturers have agents in Singapore, India and Sri Lanka. However, as these agents are for product sales, the head factories in Japan are relied upon for repairs and technical advice on maintenance including operating methods and system modification. Figure 2.2-8 shows examples of maintenance services provided by Japanese manufacturers of transmitters. In many cases, it takes more than one month to repair malfunctioning broadcasting equipment and resume operation. In order to avoid disruption of broadcasting services during this period, a backup system or stock of spare equipment needs to be established.

Technical innovations in recent years which have furthered digitisation and scaling down of parts and use of ICs in parts have made it more difficult to repair equipment on site. Sufficient attention needs to be paid to this fact when planning procurement of equipment for DTTB.

The following are among the practical measures to be considered:

- Procurement of backup equipment for important broadcasting equipment
- Reduction in types of spare units by standardisation of broadcasting equipment (especially for equipment to be procured in large quantities such as transmitters)
- Elimination of inefficiency by the selection of an appropriate storage site (in an urban area) and centralised management of spare units
- A request to manufacturers to establish new maintenance centres (*e.g.* establishment of maintenance centres in cities where they have affiliate companies or agents, including Singapore)
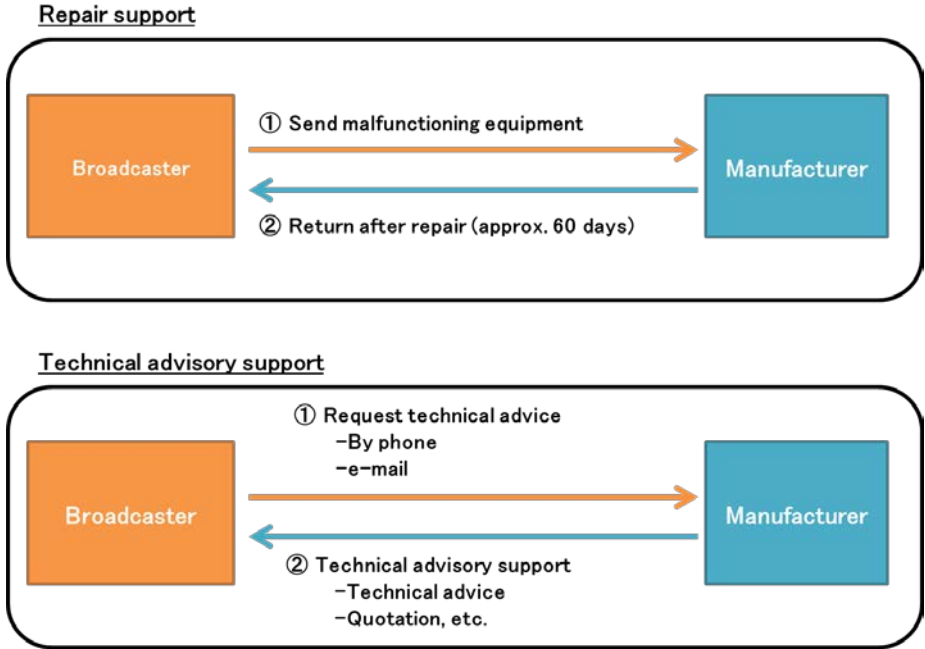
Figure 2.2-8 Examples of Maintenance Services Provided by Japanese Manufacturers

(3)　Market for TV Sets

While the population of approx. 340,000 is small, the proportion of households owning TV sets is

approaching 90 % (85 % as of 2006) in the Maldives. Figure 2.2-9 shows the total number of TV sets imported into the Maldives and the number of TV sets imported from the three largest supplier countries in the last three years. Data from the Maldives Customs Service shows that the largest number of TV sets was imported from Singapore. Although Singapore's share of the number of imported TV sets　declined from 80.0 % in 2012 to 71.3 % and 68.3 % in 2013 and 2014, respectively, the number is still on the increase and there is a huge gap between Singapore and other supplier countries including China, the second largest supplier country, and the United Arab Emirates (UAE). While import of 163 TV sets directly from Japan is recorded in 2012, there is no record of direct import of TV sets from Japan in 2013 or 2014.　However, a certain number of TV sets of　Japanese manufacturers are imported into the Maldives through Singapore.
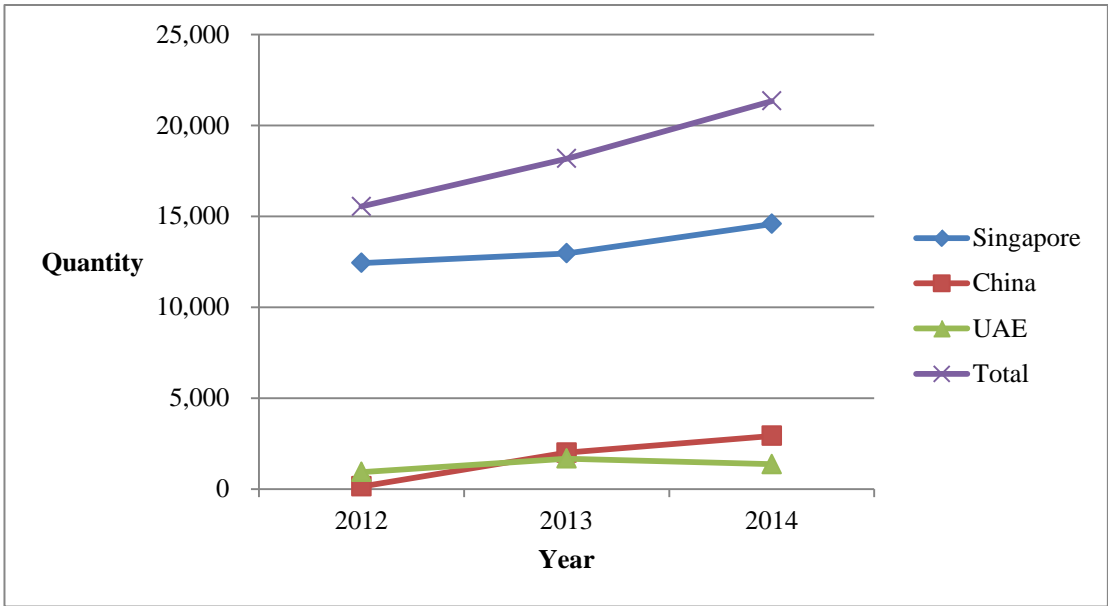
Source: Maldives Customs Service

Figure 2.2-9 Changes in the Number of TV Sets Imported into the Maldives
(total number and numbers from the three largest supplier countries)

As the total number of households in the Maldives is approx. 46,000, more than 40,000 TV sets are in use in ordinary households. There are many households with more than one TV set on Malé and some of the other islands. Each guestroom in the hotels on the tourist islands is equipped with a TV set. The largest CATV operator in the Maldives, Medianet, has set a short-term target for the sale of set-top boxes (STBs) at 50,000. (See Chapter 2.3.2.) According to MBCm, people enjoy a variety of CATV services at home by installing five or six STBs per TV set (or connecting the STBs to a TV set). MBCm estimates that 215,000 STBs have already been sold in the Maldives. In the Maldives where there are few options for recreational activities, watching TV is one of the most popular recreational activities and the number of subscribers to pay TV services is on the increase.

On Malé Island, 32" and 40" HD TV sets sell for around USD 600 and USD 840, respectively, and large-screen (55" and other) HD TV sets are priced at over USD 2,000.　In addition to Japanese-made sets, many Korean- and Chinese-made sets are sold in the Maldives.　Ordinary electrical appliance

stores provide simple repair services. While STBs sell for around USD130, most are sold in the price range of USD 60 to USD 80.

The price of TV sets imported from each supplier country was calculated from the total cost of importing TV sets (C.I.F. including freight and insurance). While the price of imports from China and the UAE were more than MVR (Maldivian Rufiyaa) 1,000, imports from Singapore were approx. MVR 500 in the period between 2013 and 2014. Of the imports from the three largest supplier countries, the unit import price of Chinese-made TV sets was the lowest.
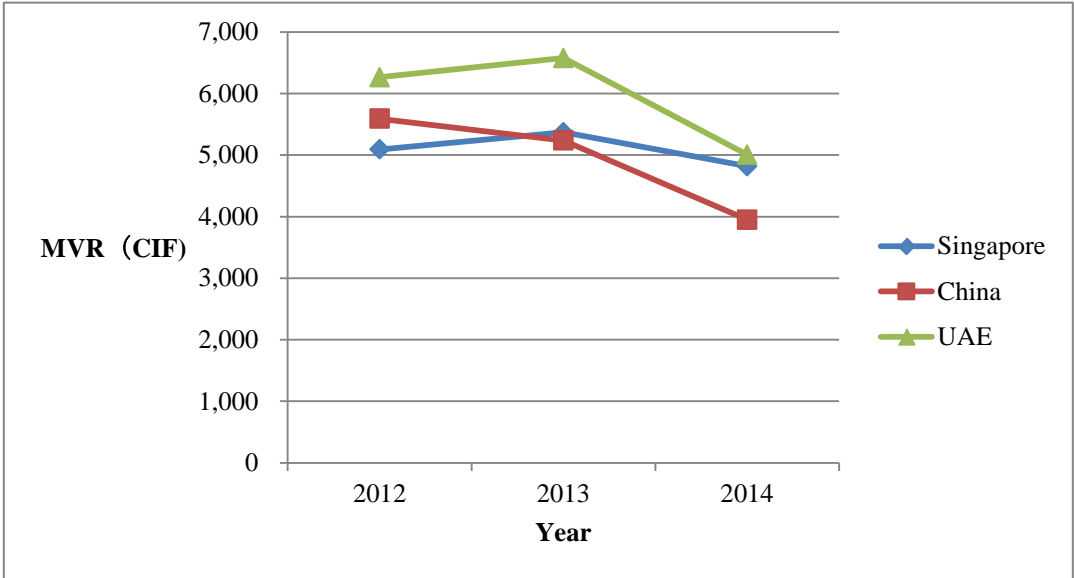
Source: Maldives Customs Service

Figure 2.2-10 Unit Price of Imported TV Sets (average CIF price) by Importing Country

2.2.4   Assistance Provided by Other Donors

Before the 1980s, the Maldives received assistance mostly from Arab countries including Saudi Arabia and Kuwait.   This assistance was mainly provided not for comprehensive development programmes but for individual projects.   However, assistance to the Maldives by loans and grants gradually increased after the then president, Mr Maumoon Abdul Gayoom, issued a statement on the development programme.   The Maldives received a total of approx. USD 11.6 million of assistance from international organisations including the World Bank, the Asian Development Bank and donor countries including Japan in 1992.   The provided assistance was not limited to humanitarian assistance.   It was also provided in a wide variety of sectors including education, health, transport and fisheries.   Tables 2.2-3 and 2.2-4 show the economic assistance provided to the Maldives by international organisations and by donor countries, respectively.

Table 2.2-3 Economic Assistance Provided to the Maldives by International Organisations

(on a net expenditure basis)

(in million USD)

Year	1st	2nd	3rd	Total
2007	EU 7.33	Asian Development Bank (ADB) 4.30	International Development Association (IDA) 4.06	20.31
2008	IDA 303	ADB 1.61	EU 1.15	4.21
2009	IDA 4.43	ADB 4.16	EU 3.77	16.12
2010	ADB23.38	IDA 15.66	EU 5.62	49.20
2011	IDA 4.56	ADB 4.46	OPEC 2.19	19.47

Source: OECD/DAC

Table 2.2-4 Economic Assistance Provided to the Maldives by Donor Countries

(on a net expenditure basis)

(in million USD)

Year	1st	2nd	3rd	Total
2007	Holland 4.97	Japan 3.89	Canada 2.93	18.11
2008	Japan 9.32	Holland 5.90	Australia 2.32	20.67
2009	Japan 17.99	Australia 1.71	Canada	18.50
2010	Japan 37.30	Denmark 11.40	Australia 4.95	56.57
2011	Denmark 9.39	Japan 4.55	Australia 4.13	21.09

Source: OECD/DAC

Japan is practically the sole assistance provider to the Maldives in the broadcasting sector. In the past, the government of Australia provided grant-aid assistance for the procurement of a 5 kW middle-wave transmitter for the public radio broadcaster and UNICEF assisted in establishment of a regional radio programme production centre. However, donors other than the government of Japan provide little assistance in this sector. The government of Japan, however, has provided assistance in the broadcasting sector for a long period of time. The assistance began with the provision of radio receivers for educational programmes in 1979, followed by the provision of equipment for educational broadcasting to the Ministry of Information and Broadcasting in 1980 and the provision of equipment to Television Maldives in 1996.

Meanwhile, a private TV broadcaster, VTV, and Xinhua News Agency of China have concluded a memorandum allowing VTV to use the vast contents of Xinhua freely. This may be considered as a sign of increasing assistance from China in the broadcasting sector.

Table 2.2-5 below shows the assistance provided to the broadcasting sector in the Maldives.

Table 2.2-5 List of Assistance to the Broadcasting Sector in the Maldives

Year	Donor	Support Content
Unknown	UNICEF	Construction of radio programme production centres on remote islands
1980	Japan	Provision of educational broadcasting equipment for Ministry of Information and Broadcasting
1981	Australia	Provision of 5kW middle wave transmitter for Voice of Maldives
1986	Japan	Provision of TV programme production equipment for TV Maldives
1995	Japan	Provision of broadcasting equipment for Voice of Maldives
1996	Japan	Provision of equipment for TV Maldives

Source: Voice of Maldives and Department of Information

2.2.5 Consistency with the National Development Plan of the Maldives and the Country Assistance Policy of Japan

The government of the Maldives prepares a national development plan every five years. The government is preparing a draft of the 8th National Development Plan. Under the 7th National Development Plan 2006–2010, the guidelines for development in the period between 2006 and 2010, the government took measures to achieve public commitment to the media sector: 1) improvement of the quality of broadcasting and provision of equitable access to the media, especially on the atolls, 2) strengthening of the human resources capacity to enhance the provision of quality media services in the country, 3) enhancement of the technical capability to expand equitable access to the media, particularly on the atolls, 4) development of E-infrastructure and 5) improvement of the efficiency and quality of the media and promotion of the right to freedom of expression. In close connection with the achievement of 5) in particular, measures to establish the independence of the media have been taken, MBCm has been established as a new independent regulatory body in the broadcasting sector and the state-run TV and radio broadcasters have been integrated into PSB.

The 8th National Development Plan is expected to adopt strategies for the media sector similar to those in the 7th plan. The draft mentions 1) alleviation of the disparity in access to information between atolls by establishing a nationwide broadcasting network with promotion of the migration to DTTB, 2) improvement in technologies for human resources development by the development of content-rich information services and 3) contribution to disaster management and mitigation of climate change by active use of new technologies, as the strategies for the media sector. The draft is expected to be approved later.

Meanwhile, MBCm which was established in 2011 is preparing policies for the broadcasting sector in accordance with the medium- and long-term guidelines prepared by the government. The Strategic Action Plan published by MBCm in September 2011 describes the policies for the broadcasting sector that are compliant with the concept of the sector which is to be included in the 8th National Development Plan that is still in preparation. The policies described in the MBCm plan are 1)

establishment of a mechanism in the media through the establishment of reliable and accountable freedom of speech, 2) provision of broadcasting services throughout the Maldives, 3) creation of a broadcasting industry totally committed to local human resources/products and culture/uniqueness of the Maldives, 4) provision of broadcasting services at affordable prices, 5) establishment of an environment for fair competition by all investors and 6) creation of awareness of the importance of broadcasting services among public and private broadcasters.

Establishment of multiple TV broadcasters is recommended in particular to enable dissemination of high-quality information based on the culture and uniqueness of the country to all the atolls. As mentioned in the roadmap of the International Telecommunication Union (hereinafter referred to as "ITU"), establishment of a DTTB platform is considered the best tool to provide broadcasting services to the entire country where the required human resources are not available on the remote islands.

In addition, the country report on achievement of the Millennium Development Goals prepared by the Department of National Planning in 2010 mentions that ICT can play a vital role in linking dispersed communities and reducing the impact of geographical isolation and physical separation that exists between the country's island communities. Establishment of a platform enabling multiple broadcasters to provide programmes to every island in this country which consists of many small atoll islands is consistent with the policies and strategies of the government of the Maldives and is expected to contribute positively to alleviation of the information gap between the islands which is hindering the development of the country.

Establishment of DTTB will enable constant dissemination of the data acquired by the Maldives Meteorological Service (hereinafter referred to as "MMS") to the entire country through data broadcasting services. While MMS is sufficiently equipped with observatories and disaster monitoring facilities, it does not have the means to transmit live data. Therefore, establishment of a means to provide warning of imminent meteorological phenomena and imminent risk of disaster is urgently required by MMS. Forecasters are on duty at MMS 24 hours a day though the National Disaster Management Centre (hereinafter referred to as "NDMC") which issues evacuation advisories and directives based on MMS warnings or advisories does not have enough capacity in respect of human development and organisational structure. (See Chapter 2.5.3 for details.) Instantaneous dissemination of accurate and relevant information created by forecasters to the entire country through broadcasting services is necessary when occurrence of severe weather is forecast. DTTB signals are more stable than those of satellite broadcasting because they are not affected by rainfall attenuation. As CATV is basically a service for transmitting foreign TV programmes, it is not likely to broadcast disaster information in the Maldives. Furthermore, private broadcasters do not have the ability to broaden their broadcasting area either financially or technologically. The establishment of a platform which can provide stable terrestrial TV broadcasting services will be effective for the development of the Maldives.

As mentioned above, implementation of the project for migration to DTTB is expected to contribute not only to alleviation of the information gap between islands and establishment and development of a means of human resource development in many fields, but also to promotion of the implementation of measures to combat the vulnerability of the island country to climate change. Thus, this project is

expected to contribute to improvement of the basic social infrastructure, one of the priority areas for assistance from the government of Japan to the Maldives.

2.3 Broadcasting Service Provision

2.3.1 Frequency Licencing and Use

The state-run radio broadcaster began broadcasting in 1962 and the state-run TV broadcaster (Television Maldives – TVM) began broadcasting in 1978 in the Maldives. As mentioned in Chapter 2.2.1, these broadcasters were integrated into the Maldives Broadcasting Corporation (hereinafter referred to as "MBCo"), a broadcaster independent from the government, in 2012.

In 2007, more than 40 years after the state-run broadcaster began broadcasting, the private sector was allowed to operate broadcasting services in the Maldives for the first time. Since then, the broadcasting industry has grown rapidly and private and public broadcasters broadcast radio and TV programmes on 28 and 3 channels, respectively.

The Maldives Broadcasting Commission (hereinafter referred to as "MBCm") allocates frequencies within the broadcasting frequency bands specified by the Communications Authority of Maldives (hereinafter referred to as "CAM") and issues licences to use these frequencies to individual broadcasters. In total, eight licences for terrestrial broadcasting frequencies have been issued to five TV broadcasters. Three are not in use at present. According to MBCm, MBCm may revoke frequency licences which have not been used for broadcasting for one year or longer.

MBCo provides public broadcasting services using 27 transmitting stations (one of which is not in operation) nationwide. MBCo is the most influential broadcaster, providing programmes on two VHF frequencies (one of which is not used currently), and it is conducting trial ISDB-T digital broadcasting.

PAL-B and PAL-G Systems are used for analogue broadcasting on VHF and UHF frequencies, respectively. All the terrestrial broadcasting services are free of charge.

Table 2.3-1 below shows the list of frequency licences issued for TV broadcasting.

Table 2.3-1 List of Frequency Licences for Terrestrial Broadcasting

	Ch	Frequency (MHz)	Licence No	Organisation	Usage
VHF	5	174 – 181	TAM/BT-FREG/2009/01	MBCo	Analogue Broadcasting
	6	181 – 188			
	7	188 – 195	TAM/BT-FREG/2009/01	MBCo	Not in Use
	8	195 – 202			
	9	202 – 209			
	10	209 – 216			
	11	216 – 223			
	12	223 – 230			

	Ch	Frequency (MHz)	Licence No	Organisation	Usage
UHF		494 – 518	This frequency is not for TV broadcasting		
	27	518 – 526	427-LCM/FRQ(TV)/2012/06	Sun TV	Not in Use
	28	526 – 534	427-LCM/FRQ(TV)/2012/02	DTV	Digital Broadcasting (DVB-T)
	29	534 – 542	427-LCM/FRQ(TV)/2012/04	VTV	Digital Broadcasting (DVB-T2)
	30	542 – 550	TAM/BT-FREG/2008/15	Atoll TV	Not in Use
	31	550 – 558	TAM/BT-FREG/2008/15	Atoll TV	*Digital Broadcasting (DVB-T)
	32	558 – 566	427-LCM/FRQ(TV)2012/08	MBCo	Trial Digital Broadcasting (ISDB-T) / (Reserved for DBNO)
	33	566 – 574			Digital Broadcasting (Reserved for DBNO)
	34	574 – 582			
	35	582 – 590			
	36	590 – 598			
	37	598 – 606			
		606 – 790	This frequency is not for TV broadcasting		

*5 programmes are multiplexed in this frequency though not all the programmes are produced by Atoll TV (See Chapter 2.3.2 for details)

Source: MBCm

As seen in Table 2.3-1, digital broadcasting using DVB-T/T2 standards has already begun in the Maldives. The current situation is that broadcasters with frequency licences began digital broadcasting using standards other than ISDB-T before standards or laws on digital terrestrial TV broadcasting were established. Such confusion was created by the fact that the frequency licences do not specify the digital broadcasting standards to be used.

A rebroadcaster is defined in the Maldives as a broadcaster that retransmits programmes produced by foreign broadcasters. There are no laws regulating retransmission by domestic broadcasters of programmes produced by other domestic broadcasters. Therefore, programme multiplexing in terrestrial broadcasting is already practiced with the premature introduction of European digital terrestrial TV broadcasting standards by private broadcasters. As viewers already watch multiplexed programmes, the licences of broadcasters which retransmit domestically produced programmes using programme multiplexing have not been revoked. Nonetheless, laws regulating the retransmission of domestically produced programmes will have to be enacted before the platform for DTTB is

established and retransmission of multiplexed programmes from the platform begins.

2.3.2 Outline of the Major Broadcasters

(1) Overview

It is possible to classify the broadcasters involved in terrestrial TV broadcasting in the Maldives as described below. Table 2.3-2 summarises the classification.

  i) Broadcasters which have both a Terrestrial Broadcasting Licence and a Frequency Licence

  ii) Broadcasters which have both a Terrestrial Broadcasting Licence and a Frequency Licence but which do not produce and transmit programmes for terrestrial broadcasting

  iii) Broadcasters which have only a Frequency Licence but not a Terrestrial Broadcasting Licence

  iv) Broadcasters which have only a Terrestrial Broadcasting Licence but not a Frequency Licence

Table 2.3-2 Classification of Terrestrial Broadcasters in the Maldives

Type*	Frequency	Terrestrial Broadcasting Licence	Currently Engaged in Terrestrial Broadcasting	Name of Broadcaster	Total
A	○	○	○	MBCo, VTV, DTV	3
B	○	○	×	Atoll TV	1
C	○	×	×	Sun TV	1
D	×	○	○	Raajje TV, Channel 9, etc.	6
			×	Channel 13, MVTV, etc.	3

Note) The above-mentioned classification is not used in the Maldives. It is an ad hoc classification made by the Survey Team for the preparation of this report.

Source: Created by JICA Survey Team based on MBCm documents

Type-A broadcasters are ordinary terrestrial broadcasters like Japanese broadcasters. Although Atoll TV, a type-B broadcaster, has frequency and terrestrial broadcasting licences, it does not produce and transmit programmes. Instead, it multiplexes and transmits programmes produced by type-D broadcasters. Sun TV, a type-C broadcaster, has a terrestrial frequency licence. However, somehow it does not have a terrestrial broadcasting licence. It also has licences for CATV and satellite TV broadcasting. It is transmitting programmes on CATV. Type-D broadcasters are further divided into those transmitting terrestrial TV programmes, those transmitting programmes not using terrestrial TV but the CATV system and those not transmitting programmes. The work carried out by these broadcasters is equivalent to that to be carried out by programme suppliers after the establishment of the DBNO.

In the Maldives, broadcasting licences are approved and issued for terrestrial TV, CATV and satellite TV broadcasting. Of the 14 broadcasters which can be classified into types A – D, 11 have a licence

for CATV broadcasting. Of the 77 registered CATV operators, 11 conduct business related to terrestrial broadcasting.

Most of the programmes of the private broadcasters are in Dhivehi, except for the news which is broadcast regularly in English. Some broadcasters are owned by politicians and are often used for political activities.

An outline of the major broadcasters, mostly terrestrial broadcasters, is described below.

(2) Maldives Broadcasting Corporation (MBCo) (Type-A broadcaster)

1) Outline

MBCo operates a TV broadcaster established 34 years ago (TVM) and two radio broadcasters established 50 years ago.   It is a broadcaster with a history of guaranteed political and financial independence.

However, an MBCo report mentions that it faces the problem of lack of human resources in areas such as programme production and news reporting because of the lack of opportunity for human resource development required by a public service broadcaster.

In principle, a public service broadcaster is required to transfer all kinds of information to people in such areas as education, health, environment, disasters, agriculture, forestry and fisheries, tourism, economic growth and community development.   However, the report mentions that MBCo has not been able to satisfy this requirement.   The report also mentions that its engineers do not have sufficient knowledge of or experience in new digital broadcasting technologies including digital transmission, archiving, use of nonlinear servers for saving programmes on HD and editing and transmitting them for appropriate frequency allocation, because most of the broadcaster's equipment is old analogue equipment.

2) Composition of the Broadcasts

The composition of the broadcasts of MBCo by genre is described in the following and in Figure 2.3-1.   The news and current affairs programmes make up the largest proportion of the broadcasts at 35 %.   They are followed by infotainment programmes which make up 25 %. These two types of programmes alone make up almost two thirds of the broadcasts. Advertisements and public service announcements account for 12 % of broadcasting time, higher than the 8 % for educational programmes.

- ・ News and current affairs programmes: 35 %
- ・ Infotainment programmes: 25 %
- ・ Entertainment programmes: 12 %
- ・ Advertisements and public service announcements: 12 %
- ・ Educational programmes: 8 %
- ・ Religious programmes: 6 %
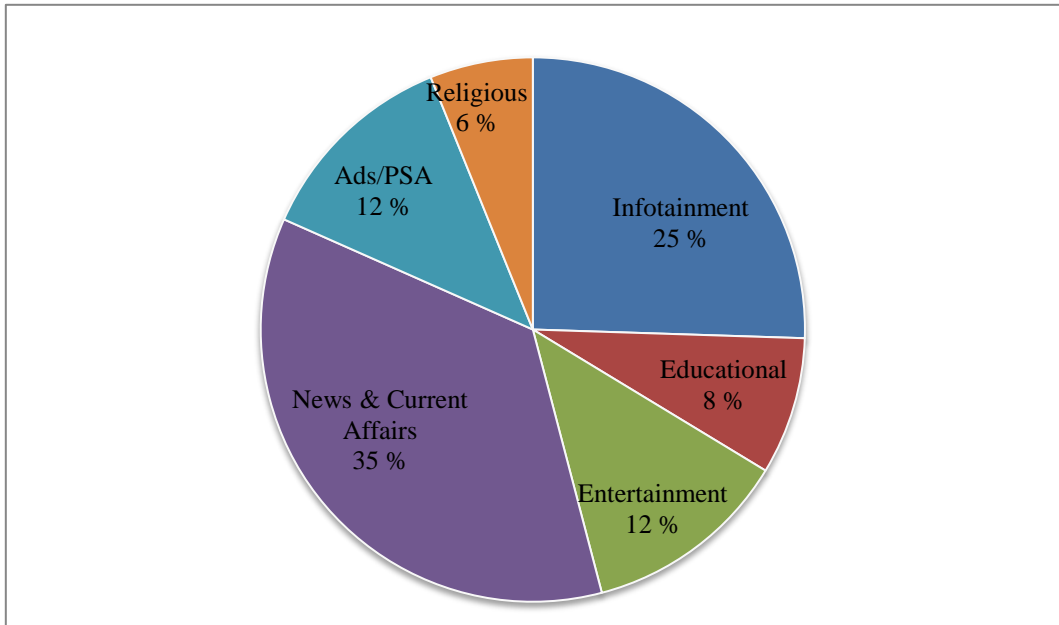
Figure 2.3-1 Composition of MBCo Broadcasts

3) **Percentage of the Population with Broadcasting Service Coverage and Number of Viewers**

MBCo mentions that the percentage of the population with combined coverage by analogue TV broadcasting services via terrestrial, CATV and satellite systems is 95 % and 68 % of the total population watches its programmes. The percentage coverage of terrestrial broadcasting services alone is 77.3 %, which is considered by MBCo as the minimum target for coverage by the DTTB to be established.

4) **Broadcasting Equipment**

The main production facilities and equipment of MBCo includes three TV studio systems, SD/HD cameras, switchers, recorders and OB vans.

MBCo owns two 1kW VHF analogue transmitters, one 500W digital UHF transmitter, and 26 analogue transmitters with output between 10W and 500W installed at various locations in the country. It has seven branch offices which inspect the transmitters and respond in the event of malfunction. The image on the TV screen is monitored at the branch offices and, if a problem is detected, staff members from the office go to the transmitting station concerned and, if the problem is serious, request the dispatch of experts from the head office.

Some of the analogue transmitters and production equipment was procured with assistance from Japan. The above-mentioned ISDB-T digital transmitter was also provided by the Ministry of Internal Affairs and Communications in Japan for the trial transmission. The transmitter is currently in operation.

(3) **Island Broadcasting Company Pvt. Ltd. (VTV) (Type-A broadcaster)**

VTV was established by a Maldivian politician/businessman, Mr Qasim Ibrahim, in 2008. It is

operated by Island Broadcasting Company Pvt. Ltd. (V Media Group) and is the second largest private broadcaster in the Maldives.   The V Media Group is a general media company that manages not only the TV broadcaster but also a radio broadcaster, magazine publisher and on-line media.   It is also actively involved in CSR (corporate social responsibility) activities aimed at the synergetic development of private companies and markets as the social responsibility of the company and it implements various projects and events to fulfil CSR.

VTV owns one frequency licence for terrestrial broadcasting which it has been using for digital terrestrial TV broadcasting in and around Malé using 500W DVB-T2 standards since last year.   The broadcast is called Veekly or Vnews at different time periods depending on the type of programme. VTV also operates VFM, a teletext broadcasting service, on the frequency for FM radio transmissions. VTV mainly airs community-based sports programmes and political programmes, under the slogan "My TV."   The Chief Operating Officer (COO) of VTV is a former head of the state-run Maldives National Broadcasting Corporation (currently MBCo) and some of the managing officers worked at MBCo for many years.

VTV transmits programmes that it has produced not only through the terrestrial broadcasting services on and around Malé Island, but also through CATV operators and MBCo.   VTV uses a satellite link for transmission of the programmes.   It pays USD 10,000 to MBCo as satellite uplink fees every month.   All VTV programmes are also transmitted to India and Sri Lanka via satellite.

VTV has purchased 20 Chinese-made transmitters to expand its broadcasting services.   VTV is said to have a plan to donate these transmitters to island committees and use them for broadcasting services in the islands concerned.   However, MBCm does not have any information about this plan and the details of the plan are not available.

(4)   Broadcasting Maldives Pvt. Ltd. (DTV) (Type-A broadcaster)

DTV was the first private TV broadcaster in the Maldives.   It began service on 1st July 2008.   It is one of the local TV channels with the largest number of viewers in the Maldives.   Its broadcasts consist of international and local news, sports programmes and a weekend show.   DTV is aired between 14:00 and 24:30.

DTV provides DTTB of four multiplexed programmes by the DVB-T system on Malé Island. It transmits its programmes from 130W analogue transmitters installed at seven locations outside Malé Island. DTV purchased 12 analogue transmitters from Hitachi Kokusai Linear in 2012. It has not found locations to install the remaining five analogue transmitters. DTV uses the satellite uplink of MBCo for broadcasting on the seven islands. It pays approx. USD 10,000 per month as the fee for the uplink.

DTV supports the idea of establishing a digital broadcasting network operator (hereinafter referred to as "DBNO") on condition that it is established in the near future. It seems to have no specific objections to MBCo acting as the DBNO. It has been confirmed that DTV intends to offer its equipment and human resources to the DBNO when it has been established.

Establishment and use of the platform will accelerate multiplexing of programmes.   Maldives policy on multiplexing for DTTB, including how many programmes can be allocated to broadcasters who

already provide four-programme-multiplexing DTTB services like DTV, needs to be established as soon as possible.   As the number of multiplexed programmes and image quality are inversely related, the government of the Maldives is conducting a study on policy by the strategy of transmitting SD programmes together with HD programmes, instead of transmitting only HD programmes.

(5)   Raajje Television Pvt. Ltd. (D-Type broadcaster)

Raajje TV is a private news broadcaster.   It also broadcasts sports news.   It is on the air 15 hours a day from 10:00 till 25:00.   It produces its own programmes and outsources production of documentary programmes to external production companies.   Raajje TV has a contract with AFP (L'Agence France-Presse, the French news agency) on provision of international news and pays USD 1,200 per month for such provision (including news manuscripts).

As Raajje TV does not own its own terrestrial or satellite transmitting facilities, it outsources transmission of its programmes to MBCo and Atoll TV (which has coverage on Malé Island).   It uses fibre optical cables to transmit its programme contents to contractors and the contractors transmit the contents using their own transmitting facilities.   Raajje TV also uses rebroadcasters for services outside Malé Island.   It pays a fee of USD 2.3 per minute for the use of a satellite to transmit programmes to rebroadcasters on remote islands.

Raajje TV has a studio in the building adjacent to its administration office.   Although it used to own two TV studios, at present it uses only one studio equipped with four cameras for programme production.   Raajje TV uses eight ENG cameras for reporting.   It has no OB van because the roads on Malé are too narrow to use a van for outdoor reporting.

Raajje TV has 41 production staff members and approx. 15 reporters.   In principle, each staff member performs multiple tasks.   Approx. 12 camera operators work at Raajje TV.   Programmes are produced in the studio by a maximum of six staff members in charge of camera operation, sound engineering, switching and computer graphics (images and superimposing).   The number of production staff members is kept low by, for example, two camera operators operating four cameras for studio recording, with two of the four cameras used as fixed cameras.

Raajje TV prioritises human resource development.   It has a system for sending its employees on various training courses abroad such as CG training courses in Malaysia, Sri Lanka and India.   Two or three employees are given the opportunity for overseas training every year.   Every new employee is employed under a three-month probationary employment contract so that his/her aptitude for the work can be assessed before a full employment contract is offered.   Raajje TV adopts a flexible attitude to personnel affairs and it is possible for employees to move between sections.   While part of the employees' salaries is paid at a fixed rate, a performance-based remuneration system is also used. The monthly wage of a newly employed employee is approx. 4,000 Maldivian Rufiyaa.

Advertising, broadcasting fees (sales of broadcasting time) and financing from political parties are the sources of its revenue.   The broadcasting fee is between 17,000 and 20,000 Maldivian Rufiyaa per hour.

(6) Atoll Investment (Maldives) Pvt. Ltd. (Atoll TV) (Type-B broadcaster)

Atoll TV has frequency licences for Ch 30 and Ch 31.　However, Ch 30 is not in use.

Atoll TV provides DTTB of a total of five programmes: Channel 9 (entertainment/music channel), 7 Media (entertainment/music channel), Raajje TV (news), Channel ONE (news) and Channel M (entertainment), multiplexed on Ch 31 by the DVB-T system on and around Malé Island.　While Atoll TV is a holder of frequency licences, all the programmes that it broadcasts are produced by other broadcasters.　Therefore, it is in principle a rebroadcaster.　Since there is no law prohibiting the leasing of a frequency licence to another company in the Maldives, it will be necessary to establish a legal basis to distinguish the DBNO platform from this type of rebroadcasting.

Programmes produced by other broadcasters on the frequency issued to Atoll TV are aired on Ch 31 for 12 hours a day starting at 14:00.　The set-top boxes for SD and HD reception of Atoll TV cost USD 30 and USD 60, respectively.　A total of 3,000 STBs and TV sets for the DVB-T system to watch Atoll TV have already been sold.　Finding an appropriate way to deal with these STBs and TV sets is one of the many problems to be solved before migration to DTTB with the ISDB-T system.

Atoll TV uses a 50 W transmitter manufactured by Rohde & Schwarz, using a model which does not allow switching from DVB-T to ISDB-T. The broadcaster plans to replace the existing transmitter with a 300 W transmitter. The president maintains the transmission equipment.

The broadcasting services of Atoll TV cover a radius of approx. 50 km of Malé Island.　It is operated by five staff members.　Three are full-time employees and the others are temporary workers.　The president provides training for the employees.

Atoll TV is financed by Mr Ahmed Hamza, a former member of Parliament and owner of a tourist island.

(7) Medianet Pvt Ltd (CATV operator)

Medianet is the largest private CATV operator in the Maldives.　It was formed in 2005 by the merger of J-SAT Cable Vision and CableNET.　It transmits both analogue and digital TV programmes on approx. 100 channels.　Eighty percent of the programmes transmitted by Medianet are produced abroad.　It began broadcasting DVB-C-standard HD programmes in 2010.　It has approx. 120 employees including approx. 40 engineering staff.

Medianet has a 150m-high antenna tower on Villingili Island next to Malé Island.　A US-made transmitter and an Australian-made transmitting antenna manufactured by Radio Frequency Systems (RFS) are installed on the tower.　Medianet is willing to allow the use of its tower on Villingili in the DTTB network on condition that such use does not interfere with its business.

Medianet transmits programmes from Malé Island to other islands on a frequency in the 2.3 GHz band using a type of radio broadcasting service called multichannel multipoint distribution service (MMDS) instead of a satellite link. MMDS was launched on Malé Island by CableNET, one of the predecessors of Medianet, in 2000. The signal in the 2.3 GHz band is converted to the 300–400 MHz band after it is received on each island and is retransmitted by rebroadcasters. Therefore, Medianet does not have a broadcasting network on any islands other than Malé Island and, in this way, it keeps investment in

facilities at a low level.   Some rebroadcasters are able to retransmit DVB-C system HD programmes. Medianet broadcasts six multiplex DVB-C programmes in Malé. At present, Medianet programmes can be viewed on 50 to 60 islands. It aims to extend the coverage of its programmes to the entire country by mid-2015.

Sales of STBs and subscription fees are Medianet's main sources of revenue.   Medianet also broadcasts terrestrial TV programmes of both private and public broadcasters.   It does not charge transmission fees to MBCo, while it does to private broadcasters.   Medianet prepares conceptual designs of STBs, asks Spanish and Chinese companies to design and assemble the STBs and sells the manufactured STBs under its own brand name.   Medianet STBs have a wide variety of functions including recording, electronic programme guidance (hereinafter referred to as "EPG") and automatic software updating (over the air, OTA).   Medianet plans to add a function to allow recoding programmes directly in smartphones to its STB.

Medianet has already sold 30,000 STBs and has ordered the manufacture of another 20,000 STBs. Medianet considers that it is undesirable if the launch of the ISDB-T system forces TV viewers to purchase multiple STBs and is aware of the need for hybrid STBs compatible with both the ISDB-T system and the transmission standards used by Medianet.

2.3.3　Broadcasting Networks in the Maldives

(1)　Transmission Methods for Broadcasting

Four major methods, analogue terrestrial TV broadcasting, digital terrestrial TV broadcasting, CATV broadcasting and satellite broadcasting, are used for the transmission of TV programmes.

1)　Analogue Terrestrial TV Broadcasting

The existing analogue terrestrial TV transmission networks are composed of transmitters with various outputs ranging from 10 W to 1 kW. All the broadcasters have installed their main transmitters on Malé Island where one third of the total population of the Maldives resides. They transmit programmes from their TV studios and master control rooms on Malé Island to remote islands via satellite or optical fibre cable. The signals received on the remote islands are either transmitted by broadcasters with their own transmitters like MBCo or retransmitted by outsourced rebroadcasters (CATV operators) to the islands.

2)　Digital Terrestrial TV Broadcasting (DTTB)

DTTB is still at the test stage. Transmission of a test digital signal from the transmitting station on Malé Island is the only activity regarding DTTB. The DTTB network has not been extended to other parts of the country.

3)　CATV

PSB programmes are transmitted to all the CATV operators via optical fibre cable or satellite. All the rebroadcasters in the Maldives are CATV operators with the exception of one IP TV operator. There are no rebroadcasters using terrestrial TV broadcasting. Some broadcasters

which have introduced European-standard DTTB such as DVB-T and DVB-T2 use it for retransmission.

4) Satellite Broadcasting

Terrestrial TV broadcasters and broadcasters without transmitting facilities often use a satellite to establish a link with the islands. The links are connected to rebroadcasters (CATV operators) with the exception of MBCo. A Chinese communication satellite Apstar-7 is used for establishing the links.

(2) Terrestrial TV Broadcasting Networks

A total of four broadcasters, three private broadcasters, *i.e.* DTV, VTV and Atoll TV, and MBCo, transmit terrestrial signals. MBCo provides terrestrial TV broadcasting services to the entire country. Table 2.3-3 shows the analogue transmitting stations currently operated by MBCo. MBCo broadcasting services are available on all the atolls except Lhaviyani Atoll through a total of 27 transmitting stations (Lhaviyani Transmitting Station is not in operation). The percentage of the population with coverage by MBCo analogue TV broadcasting services, estimated from the results of a telephone interview survey conducted by MBCo, is 77.3 % (this figure is for all the islands except tourism islands and industrial islands where the interview survey was not conducted). On the atolls and islands where MBCo terrestrial broadcasting services are not available, services are provided by direct reception of satellite signals (Television Receive Only, TVRO) or by rebroadcasters.

Operation of MBCo's Naifaru Transmitting Station on Lhaviyani Atoll was suspended because the demand for terrestrial TV broadcasting declined as the number of subscribers to CATV increased. However, according to MBCo, it intends to resume terrestrial TV broadcasting on the atoll because demand has increased as residential areas have expanded to areas where CATV services are not available because of population growth.

In order to have the same coverage, the transmission output required for digital transmission is half to a third of the transmission output for analogue transmission. Therefore, an output of 200 W or less is considered sufficient for the transmitters to be installed at the transmitting stations on islands other than Malé Island. The output of the transmitters shall be determined after conducting radio wave propagation simulation taking into account the transmitting antenna gain so that an efficient broadcasting network is developed.

Table 2.3-3 MBCo Analogue Transmitting Stations

No.	Atoll	Island	Output Power (W)	Height of Antenna Tower (m)
1.	Haa Alifu	Horafushi	300	40
2.		Dhidhoo	300	40
3.	Haa Dhaalu	Kulhudhufushi	250	40
4.		Makunudhoo	20	20

No.	Atoll	Island	Output Power (W)	Height of Antenna Tower (m)
5.	Shaviyani	Funadhoo	300	40
6.	Noonu	Manadhoo	250	40
7.	Raa	Ungoofaaru	300	40
8.	Baa	Eydhafushi	300	40
9.	Lhaviyani	Naifaru	Not in Use	40
10.	Kaafu	Gaafaru	20	15
11.		Malé	1000	60
12.	Alifu Alifu	Rasdhoo	250	40
13.	Alifu Dhaal	Mahibadhoo	300	40
14.		Maamigili	20	28
15.	Vaavu	Felidhoo	250	40
16.	Meemu	Mulaku	300	40
17.	Faafu	Nilandhoo	300	40
18.	Dhaalu	Kudahuvadhoo	300	40
19.	Thee	Guraidhoo	300	40
20.		Vilufushi	100	25
21.	Laamu	Fonadhoo	300	40
22.	Gaafu Alifu	Villingili	350	40
23.		Kolamaafushi	50	25
24.		Dhevvadhoo	10	25
25.	Gaafu Dhaalu	Thinadhoo	250	40
26.	Gnaviyani	Foammulah	100	40
27.	Adu	Hithadhoo	500	40

Source: MBCo

(3)   Broadcasting Networks of Rebroadcasters

Rebroadcasters receive programme sources through satellite link, MMDS and optical fibre cable. Only one licence for CATV operation can be issued for each island.   A rebroadcaster which has acquired the licence for a specific island broadcasts multiple programme channels from the acquired sources to the island.   (A single broadcaster may acquire multiple licences for different islands.)

A total of 77 rebroadcasters are registered in the Maldives.   These rebroadcasters, excluding one that uses IP TV, operate 98 retransmitting stations and provide services even in areas where terrestrial broadcasting services are not available.   Table 2.3-4 shows the number of CATV stations (a total of 98), as well as the population size, availability of an optical fibre cable connection with Malé and the

number of MBCo transmitting stations on each atoll. CATV stations are found on all the atolls except Alifu Alifu Atoll. The atolls which have an optical fibre cable connection with Malé or which have a large population tend to have a large number of CATV stations.

Table 2.3-4 Numbers of CATV Stations and MBCo Terrestrial TV Transmitting Stations on each Atoll

Area	Atoll	Population	Optical Fibre from Malé	No. of CATV Stations	No. of Transmitting Stations (MBCo)
Upper North	Haa Alifu	13,495		8	2
	Haa Dhaalu	16,237	○	4	2
	Shaviyani	11,940		7	1
North	Noonu	10,015		5	1
	Raa	14,756		7	1
	Baa	9,578	○	7	1
	Lhaviyani	9,190		4	1
North Central	Kaafu	119,134	○	12	2
	Alifu Alifu	5,776		0	1
	Alifu Dhaal	8,379	○	4	2
	Vaavu	1,606		1	1
Central	Meemu	4,710		5	1
	Faafu	3,765		2	1
	Dhaalu	4,967		5	1
Upper South	Thee	8,493		1	1
	Laamu	11,990	○	7	2
South Central	Gaafu Alifu	8,262		4	3
	Gaafu Dhaalu	11,013	○	6	1
South	Gnaviyani	7,636	○	1	1
	Adu	18,026	○	8	1

Source: MBCo

Table 2.3-5 shows the rebroadcasters which own multiple CATV stations.

As seen in the table, Medianet owns a much larger number of CATV stations than other rebroadcasters and the others mainly operate on atolls where Medianet does not operate. This observation suggests that rebroadcasters in the Maldives share the rebroadcasting market without much competition. Some rebroadcasters have more than one retransmitting station on a single atoll, presumably because there is more than one island with a population of sufficient size to generate ample rebroadcasting demand on these atolls. On some islands, more than one rebroadcaster provides services. Further study is needed to understand the details of what systems and networks rebroadcasters other than Medianet use for their rebroadcasting services.

Table 2.3-5 Rebroadcasters with More than One CATV Station

Rebroadcaster	No. of CATV Stations	Atoll	Optical Fibre from Malé
Medianet Pvt Ltd	14	Kaafu, 8	○
		Adu, 6	○
Sat link Pvt Ltd	5	Haa Alifu, 1	
		Gaafu Dhaalu, 2	○
		Adu, 2	○
X-Power Maldives Pvt Ltd	3	Kaafu, 3	○
J-Tack Pvt Ltd	2	Lhaviyani, 1	
		Laamu, 1	○
Network Entertainment Pvt Ltd	2	Alifu Dhaal, 1	○
		Laamu, 1	○
Sact Company Pvt Ltd	2	Raa, 1	

Source: MBCm

2.4 Status of Preparation for Migration to DTTB

2.4.1 National-level Plan for Migration to DTTB and Implementation System

(1) Development of a Roadmap for DTTB

MBCm was considering migrating from analogue to digital broadcasting in order to improve the quality of TV broadcasting throughout the country, increase the number of programmes and improve the coverage of broadcasting. ITU has developed roadmaps for over 20 countries in the Asia-Pacific region and, therefore, MBCm asked ITU to develop a national roadmap for migration from analogue to digital broadcasting. Also, the government of the Maldives established a National Roadmap Team (hereinafter referred to as "NRT") and decided to develop a roadmap with support from ITU and the Asia-Pacific Broadcasting Union (hereinafter referred to as "ABU"). NRT not only has the participation of MBCm but also includes major private broadcasters.

NRT members and organisations are shown in Table 2.4-1 below.

Table 2.4-1 NRT Representative Organisations

Organisation	Designation
MBCm	Commissioner (Chair of NRT) and Director General
CAM	Deputy Director
MBCo	Director (Infrastructure Planning)
V Media	CEO
DTV	Engineer
Atoll TV	Chairman/CEO
Transparency Maldives (NGO)	Project Coordinator

Source: ITU Roadmap (Draft)

Under this roadmap, it is planned to establish a Digital Broadcasting Network Operator (hereinafter referred to as "DBNO") which will act as the platform operator for DTTB. MBCm recognises that broadcasters will enjoy great benefits if DBNO is established in conjunction with the migration to DTTB. For example, each broadcaster will be able to reduce their equipment procurement and maintenance expenses and labour costs, and MBCm considers that other means than DBNO will be difficult to realise.

The establishment of DBNO will be moved forward under the leadership of MoHA. Consideration is being given to the establishment of DBNO as an organisation that will be fully independent from the government in the future, since it is expected that the general public and broadcasters who will be the users of this platform will increasingly demand that DBNO be fully independent. It has been decided, however, that for the time being DBNO should be established as an affiliated agency of MoHA and operated with a stable government budget. When DBNO becomes an independent organisation later, it will possibly adopt a business model in which it will operate under joint ownership with the government as a shareholder, but cautious consideration should be given to selecting the business model to ensure that operating capital can be obtained stably.

The roadmap is currently under final review by ITU, and MBCm considers that the roadmap now covers almost every necessary component to realise the migration to DTTB, including the timing of ASO and the frequency simulation results. Action plans for the future, however, are unclear and decisions need to be made on some elements of the migration to DTTB, including what should be done by which organisation until when and who will manage the plans. (See Chapter 3.1.)

(2)   Analogue Switch Off (ASO) Plan

According to the roadmap, ASO will be completed by the end of 2020 after a four to six-year period of simulcast. Although MBCo has examined the period of simulcast, the timing of the digital switch over (hereinafter referred to as "DSO") and ASO in general based on the roadmap, examination of the detailed requirements for implementing ASO has not been made. It is necessary to carry out such examination by also looking at the past experience of other countries.

(3)   Development of Technical Standards

Adoption of the ISDB-T system has already been announced, but MBCm has not issued detailed technical standards and, therefore, it is unclear what kind of specifications will be applied to the migration to DTTB. As a result, the migration process has not made much progress, but the technical standards have now been drafted jointly by MBCm and CAM. (For details, see Chapter 3.1.8.)

(4)   Penetration of Receivers

Currently, broadcasting using DVB-T/T2 standards is offered by private broadcasters in the Maldives and viewers have TV sets or STBs for DVB-T/T2. The largest CATV operator in the Maldives, Medianet, has already started manufacturing and selling its own brand of STBs for DVB-C HD and is focusing on increasing HD broadcast subscribers. Meanwhile, Medianet and Atoll TV are interested in the manufacture and sale of hybrid STBs, as digital broadcasting by the ISDB-T system is about to be

implemented. Under such circumstances, it is desirable to hold discussions on the penetration of receivers with the participation of MBCm, private broadcasters and CATV operators. It is also necessary that MBCm issues technical standards for TV sets and STBs, while technical standards for mobile phones that can receive one-seg broadcasting will probably be examined by CAM. As mentioned above, a draft has been developed for examining future technical standards.

2.4.2   Status of Preparations at Major Broadcasters

(1)   Maldives Broadcasting Corporation (Type-A broadcaster)

In September 2011, it was decided that ISDB-T transmitters would be introduced at MBCo and later in October 2011, an announcement was made that an agreement had been reached between Japan's Ministry of Internal Affairs and Communications and the Maldives' Ministry of Tourism, Arts and Culture. In this way, adoption of the ISDB-T system was formally determined.

Later, a 500 W transmitter for the ISDB-T system was installed at MBCo by Japan's Ministry of Internal Affairs and Communications. Since 2011, test broadcasting of five SD programmes and one "one-seg" programme has been carried out to date. As seen from the roadmap developed in 2011 by MBCo shown in Figure 2.4-1, progress is already significantly behind schedule and the roadmap needs to be revised promptly.

  Although adoption of the ISDB-T system has already been decided, MBCm has not presented a detailed action plan and the entity to be in charge of the adoption is not known. Meanwhile, migration to DTTB has not progressed at MBCo which considers that the migration process should be accelerated from now. MBCo has examined the period of simulcast and the timing of DSO/ASO in general as shown in Figure 2.4-1, but has not examined the detailed requirements for implementing ASO. Examination should be carried out by drawing upon past examples of other countries.

In addition, there is more than one tall building in Malé, and therefore, it is expected that some areas behind such buildings will be unable to receive signals. With respect to current analogue broadcasting, small outdoor antennas have been installed in areas that have difficulty in receiving signals. For digital broadcasting, these areas will also be covered by outdoor antennas to catch reflected signals. MBCo has already implemented a reception test using test signals from the ISDB-T system and it has confirmed that signals can be received properly using outdoor antennas that can catch reflected signals.

In the migration to DTTB, it is predicted that either the antenna tower installed on the MBCo site or the 150-meter tall antenna tower owned by a private broadcaster, Medianet, on Villingili Island will be utilised to cover Malé and the surrounding area.

According to persons involved in the broadcasting business in the Maldives, MBCo antenna towers are unreliable in terms of aging and strength. MBCo maintains the towers annually but says there is a potential idea to rebuild the towers in preparation for the future. MBCo has one antenna tower each on the TV and radio studio buildings used for productions, but the tower on the TV station is better in terms of location. The broadcaster considers it possible to temporarily move the analogue transmitting antenna presently located on the TV station to the radio station, build a new antenna tower on the

former and later relocate the antenna from the radio station to the new tower. In any case, it is necessary to secure an antenna tower that will last for several decades from now.

Year / Atoll	2012	2013	2014	2015	2016	2017	2018	2019	2020
Kaafu	DSO	Simultaneous Broadcast			ASO-Digital Broadcast				
Addu	Analogue Broadcast	DSO	Simultaneous Broadcast		ASO-Digital Broadcast				
Gnaviyani	Analogue Broadcast	DSO	Simultaneous Broadcast		ASO-Digital Broadcast				
Haa Dhaalu	Analogue Broadcast	DSO	Simultaneous Broadcast		ASO-Digital Broadcast				
Haa Alif	Analogue Broadcast	DSO	Simultaneous Broadcast		ASO-Digital Broadcast				
Gaafu Dhaalu	Analogue Broadcast	DSO	Simultaneous Broadcast		ASO-Digital Broadcast				
Shaviyani	Analogue Broadcast		DSO	Simultaneous Broadcast		ASO-Digital Broadcast			
Laamu	Analogue Broadcast		DSO	Simultaneous Broadcast		ASO-Digital Broadcast			
Noonu	Analogue Broadcast		DSO	Simultaneous Broadcast		ASO-Digital Broadcast			
Raa	Analogue Broadcast		DSO	Simultaneous Broadcast		ASO-Digital Broadcast			
Baa	Analogue Broadcast		DSO	Simultaneous Broadcast		ASO-Digital Broadcast			
Gaafu Alif	Analogue Broadcast			DSO	Simultaneous Broadcast		ASO-Digital Broadcast		
Thaa	Analogue Broadcast			DSO	Simultaneous Broadcast		ASO-Digital Broadcast		
Lhaviyani	Analogue Broadcast			DSO	Simultaneous Broadcast		ASO-Digital Broadcast		
Alif Dhaal	Analogue Broadcast			DSO	Simultaneous Broadcast		ASO-Digital Broadcast		
Meemu	Analogue Broadcast			DSO	Simultaneous Broadcast		ASO-Digital Broadcast		
Dhaalu	Analogue Broadcast				DSO	Simultaneous Broadcast		ASO-Digital Broadcast	
Alif Alif	Analogue Broadcast				DSO	Simultaneous Broadcast		ASO-Digital Broadcast	
Faafu	Analogue Broadcast				DSO	Simultaneous Broadcast		ASO-Digital Broadcast	
Vaavu	Analogue Broadcast				DSO	Simultaneous Broadcast		ASO-Digital Broadcast	
Filling	Analogue Broadcast					DSO	Simultaneous Broadcast	ASO-Digital Broadcast	
Filling	Analogue Broadcast						DSO	Simultaneous Broadcast	ASO-Digital Broadcast

Source: MBCo

Figure 2.4-1 Roadmap for DTTB (developed in 2011)

(2)   VTV (Type-A broadcaster)

VTV has already installed one DVB-T2 digital transmitter manufactured by Screen Service Broadcasting Technologies of Italy. This transmitter has a 600 W output and is a multi-format transmitter capable of operating as an ISDB-T transmitter with the flip of a switch. In order to migrate to the DTTB platform, VTV needs to newly install an encoder or multiplexer and other interface equipment to transmit signals to the DBNO Network Operation Centre.

VTV plans to build a 12-story building in Malé, since its current station building has deteriorated. As seen from the above-mentioned circumstances, VTV is creating an environment to substantially renew its equipment and realise the migration to DTTB.

VTV's opinions about DBNO are as follows and VTV agrees in general with the idea of establishing DBNO.

- ・ DBNO should be an entirely independent organisation and maintain a neutral position.
- ・ VTV can provide equipment (DVB-T2 transmitter) and personnel to DBNO.
- ・ With respect to the provision of personnel, however, VTV personnel lack adequate knowledge and will have to receive training in digital broadcasting.
- ・ If VTV has the chance to offer training in digital broadcasting to its personnel, the significance of its personnel provision to DBNO will increase.
- ・ With respect to an antenna tower for the platform, consideration should also be given to the antennas of mobile phone companies, as the MBCo antenna tower is unlikely to be strong enough.

The output of the analogue transmitter presently owned by VTV is 10 W, which is relatively small considering the fact that MBCo's transmitters mostly have an output of 200 to 300 W and, hence, VTV's transmitter has a smaller service coverage. By using the platform, VTV will be able to reduce its expenses for transmitting facilities while expanding its service coverage, which is considered to be a major benefit for VTV.

(3)   DTV (Type-A broadcaster)

DTV has installed a DVB-T transmitter manufactured by Rohde & Schwarz of Germany. The transmitter does not have a multi-format transmission function and it will need to be upgraded by the manufacturer when the broadcaster implements the migration to ISDB-T. In the building where its office is located, DTV has two studios and one room concurrently used for master control and studio sub-control. The cameras used by DTV are all SD cameras and preparations for migration to DTTB including a shift to HD cameras have not progressed.

DTV multiplexes and broadcasts programmes from its subsidiary, D24 (type-D broadcaster that operates with licences for terrestrial, CATV and satellite broadcasting), after starting DVB-T broadcasting. Similarly, DTV has Dhi Extra (type-D broadcaster that operates with licences for terrestrial and satellite broadcasting) as its subsidiary, although Dhi Extra does not broadcast programmes.

DTV positively intends to use the DBNO platform, since, through the use of DBNO, DTV can reduce

the initial investment necessary for migration to DTTB, continue to outsource the transmission business to independent operators, which is a basic business model for DTV, and, hence, will not need to purchase and maintain transmitters, etc. DTV also considers it necessary that DBNO is established at an early stage so that the migration to DTTB is carried out without delay and trouble.

DTV also positively intends to provide equipment and engineers to DBNO. With respect to transmitters, detailed discussions will be held concerning whether or not the transmitters owned by DTV can be improved and who will pay the improvement costs. DTV considers it indispensable that, before providing its personnel, training in operation of the digital broadcasting equipment is given to such personnel.

For DTV to be ready for the migration, it needs to newly install encoders and a multiplexer and other interface equipment to transmit signals to the DBNO Network Operation Centre.

Of a total of 12 analogue transmitters purchased in recent years, five systems have not been installed at all. The cost of improving these analogue transmitters to meet digital broadcasting requirements will be nearly the same as purchasing new digital transmitters. DTV needs to examine how to deal with these unused analogue transmitters.

(4) Raajje TV (Type-D broadcaster)

With respect to equipment, Raajje TV has purchased four studio cameras and eight ENG cameras in total, all HD-capable, as the broadcaster is looking ahead to the migration to digital and HD broadcasting. Currently, these newly purchased cameras are used by switching to SD. The broadcaster's TV studio switcher is also HD-capable and, therefore, the equipment owned and maintained by Raajje TV is ready for HD broadcasting. In short, Raajje TV has almost completed preparing its studio equipment for digital broadcasting.

Meanwhile, Raajje TV is now considering setting up a new TV studio and is looking for a place for the studio. It is difficult, however, to find a property suitable for development of a TV studio in Malé in terms of floor space, and in fact Raajje TV has not succeeded in finding a suitable property. The broadcaster, however, is preparing for migration to DTTB and is promoting its own business expansion step by step.

As already described in the previous chapter 2.3.2 (), Raajje TV outsources transmission business to MBCo and Atoll TV and does not own its own transmitting facilities. As a result, Raajje TV does not need to change its transmission system to meet digital broadcasting requirements but it still needs to newly purchase encoders and a multiplexer and other interface equipment to transmit signals to the DBNO Network Operation Centre.

It should be noted that Atoll TV multiplexes five programmes and transmits them in DVB-T format targeted at Malé and the surrounding area, and Raajje TV programmes are offered through the services of Atoll TV.

(5) Atoll TV (Type-B broadcaster)

Atoll TV was the first private broadcaster to start broadcasting with the DVB-T system in the Maldives and since 2009 it has offered HD broadcasting. Currently, Atoll TV uses a 50 W transmitter

manufactured by Rohde & Schwarz and the transmitter is unable to be switched from DVB-T to ISDB-T. Atoll TV has obtained licences for two frequencies, but it does not produce programmes and instead multiplexes and broadcasts programmes from Raajje TV, Channel 9, 7 Media, Channel M and Channel ONE.

According to Atoll TV, the broadcaster plans to replace its 50 W transmitter with a 300 W one in the future.

Atoll TV considers that broadcasting will be differentiated between two standards as DVB-T offers pay TV and ISDB-T offers terrestrial broadcasting, and therefore, the broadcaster expects there will be no impact on its business by the government's decision to adopt ISDB-T.

In the Maldives, CATV is widely subscribed to and as a way of coping with the coexistence of different standards for ISDB-T and CATV, Atoll TV is interested, and sees a business chance, in the development of a hybrid STB which can be used for both terrestrial and CATV broadcasting standards. This is because Atoll TV considers that if viewers purchase a second STB to deal with the migration to DTTB, Atoll TV will be able to increase the number of CATV subscribers because such an STB will allow viewers to watch CATV too, rather than making unwilling viewers spend money on it.

(6)   Medianet (CATV operator)

Medianet already offers digital broadcasting under the DVB-C system. In 2002, Medianet started to offer SD broadcasting and in 2010 it also started to offer HD broadcasting with the DVB-C system. Medianet has the country's tallest antenna tower, with a height of 150 meters, on Villingili Island, a neighbouring island to Malé, where an MMDS transmitter manufactured in the U.S. and a transmitting antenna manufactured by RFS of Australia are located. Medianet offers MMDS and presently covers about 50 to 60 islands in total. It plans to cover the entire land area of the Maldives within six months.

As mentioned above, Medianet sells STBs under its own brand together with subscriptions and the number of STBs manufactured and sold so far totals 50,000, which exceeds the total number of households in the Maldives.

Since it prepared for migration to DTTB at an early stage before the law related to migration was passed, Medianet is now lobbying the government of the Maldives on its own initiative to ensure that its past investment will not be wasted. The government should announce its policy and guidelines necessary for successful migration to DTTB as soon as possible and then accelerate the legislation process in order not to create a market dominated by a few companies.

2.5   Natural Disaster Response System

2.5.1   Natural Disaster Risk in the Maldives

The Maldives is located on average 1.5 meters above sea level and ongoing climate change may submerge the land area entirely. Countermeasures to climate change, therefore, are a major agenda for the government of the Maldives. Low areas are easily affected by high waves and such high waves caused by storm winds pose a large risk of natural disaster. In the 2004 Indian Ocean Tsunami, a total of 108 people were killed or went missing in the Maldives mainly on the islands facing the Indian

Ocean and about 10 % of the total population, 27,214 people, were affected by the disaster (according to the Asian Disaster Reduction Center: ADRC and the International Monetary Fund: IMF). Learning lessons from the tsunami disaster, the government of the Maldives established the National Disaster Management Centre (hereinafter referred to as "NDMC"). However, a disaster prevention information system has not been set up and no effective information communication has been secured in the Maldives. To establish such a system is another important issue for disaster prevention procedures in the Maldives.

One kind of major disaster the Maldives often faces is the storms that are typical of a tropical climate. Storms are the cause of secondary disasters such as high waves and flooding. As mentioned above, the Maldives's low land areas are vulnerable to high waves. The country also has another serious issue, water shortages caused by a rise in the salt density of the groundwater in the aftermath of the tsunami disaster as well as the rapid growth of the population. Also, the water draining capability of the land is poor and brings flood damage every year.

Major natural disasters that have occurred in the Maldives are shown in Table 2.5-1 below.

Table 2.5-1 Major Natural Disasters

	Natural Hazard	**Damage**
1	Storm	· Impossible to secure transportation between islands · Effect on agriculture · Effect on fisheries · Flooding due to high waves caused by storm · Outbreak of diseases such as cholera and dengue fever
2	Tsunami	· Even a small tsunami causes serious damage because the elevation is low. · 27,214 people affected by the Asian Tsunami caused by Sumatra-Andaman earthquake in 2004
3	Sea level rise	· Erosion · Majority of the islands in the Maldives will be underwater by 2100 (UNFCC 2001).
4	Water shortage	· Shortage of fresh water · Damage to farm products
5	Earthquake	· Danger of collapse because buildings are fragile in terms of earthquake resistance. · Danger of collapse because buildings are not designed to withstand an earthquake. · Earthquakes do not occur frequently but the Indian plate is located nearby.
6	Flood	· Drainage is poor and although there is little rain, water collects. · Occurrence of contagious diseases such as cholera and dengue.

Source: Maldives Country Report (ADRC)

2.5.2 Disaster Management Organisations and the Government's Disaster Prevention Programme

(1) Disaster Management Organisations and Disaster Prevention Programme

The Maldives has two major disaster management organisations, the NDMC which is in charge of the

management of all kinds of disasters including man-made disasters and epidemics, information and communication, and disaster response, and the Maldives Meteorological Service (hereinafter referred to as "MMS") which is in charge of monitoring the weather and natural disasters. In addition, a disaster committee established on each atoll plays a role in the country's disaster management and prevention.

As a means of communication when a disaster occurs, the Standard Operating Procedure (hereinafter referred to as "SOP") was established with assistance from the United Nations Development Programme (hereinafter referred to as "UNDP"). Although a system and method of information and communication when a disaster occurs have been implemented based on the SOP, NDMC is a rather new organisation established right after the Indian Ocean Tsunami in 2004 and it has not matured enough to function as a robust disaster management organisation in the Maldives.

As shown in the correlation diagram of organisations in charge of disaster information and communication in Figure 2.5-1, MMS is in charge of monitoring the weather and natural disasters and issues advisories and warnings to NDMC, and such advisories and warnings are also conveyed to related organisations such as MBCo. Evacuation advisories and directives issued by NDMC are communicated to the public through broadcasters and the disaster committees located on each atoll. Evacuation instructions and advisories issued by NDMC, however, are said to be often late. (For details, see the following Chapter 2.5.4.)
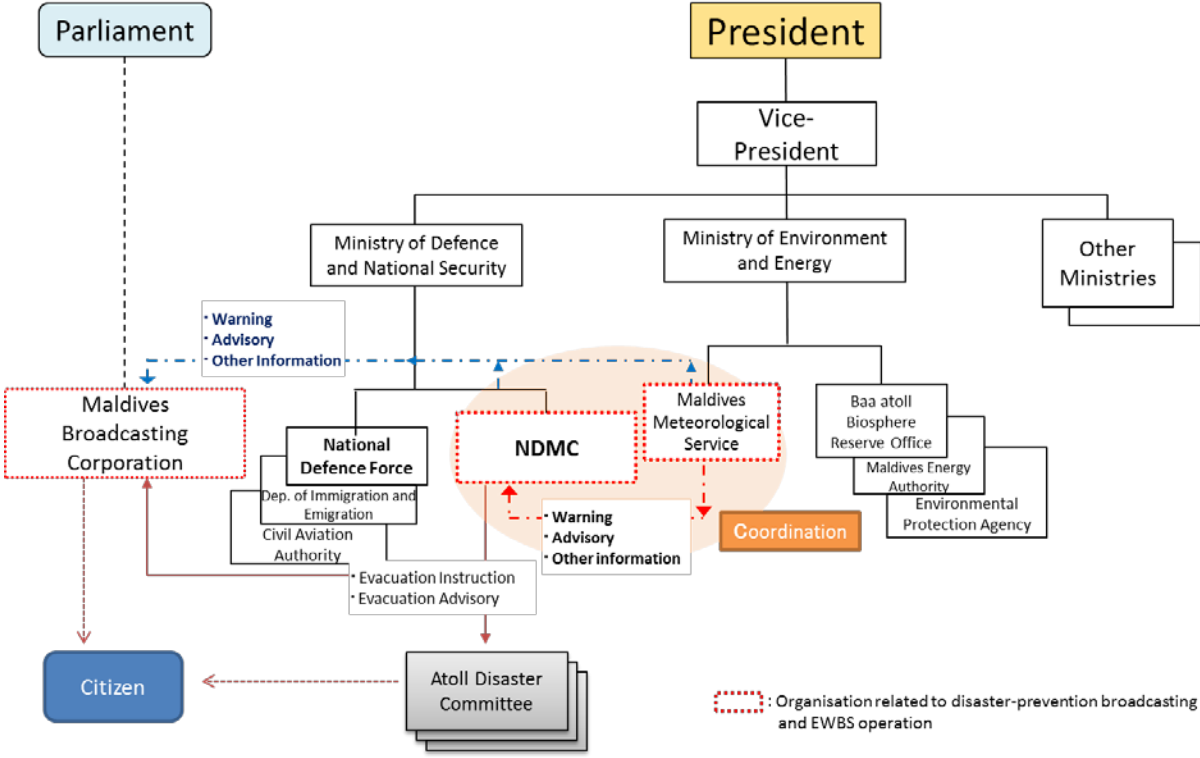
Source: JICA Survey Team

Figure 2.5-1 Correlation Diagram of Organisations in Charge of Disaster Information and Communication

For disaster prevention, the Maldives has established a 10-year plan, the Strategic National Action Plan for Disaster Risk Reduction and Climate Change Adaptation (hereinafter referred to as "SNAP"), in line with the 2005–2015 Hyogo Framework for Action adopted at the United Nations World Conference on Disaster Risk Reduction held in Kobe in 2005 under the United Nations Framework Convention on Climate Change (hereinafter referred to as "UNFCCC"). As shown in Figure 2.5-2, SNAP aims at creating a country and communities resilient to disaster through efforts to reduce disasters and enhance adaptation to climate change, but how far those efforts are carried out is unclear. In addition, for now, the Maldives has no specific policy, strategy or plan for disaster prevention. Already established in the disaster management sector is the Sector Strategies and Plan and the Climate Change Policy and Strategy, and now awaited is the establishment of a National Emergency Operation Plan (hereinafter referred to as "NEOP") which will define the detailed roles and responsibilities of the organisations in charge of disaster management and prevention in general.
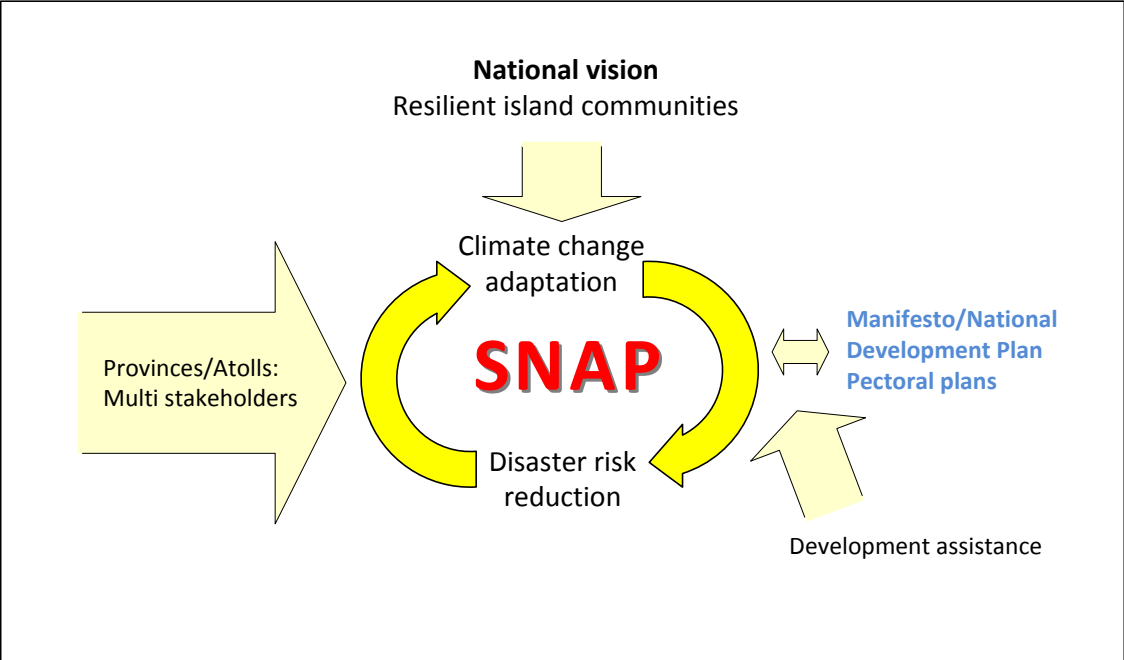
Source: NDMC

Figure 2.5-2 SNAP Framework

(2)   National Disaster Management Centre (NDMC)

Immediately after the Indian Ocean Tsunami, a National Disaster Management Centre was established by Executive Order. NDMC operates under the supervision of the Ministry of Defence and National Security. It is an organisation to set up policies related to disasters and coordinate with other concerned organisations. It is also responsible for the development of human resources to be engaged in disaster prevention activities. The development of human resources, however, is stagnant because of a shortage of personnel who can provide training and the existence of impeding issues such as the lack of a disaster prevention information system.

As shown in Figure 2.5-3, aside from NDMC, a National Emergency Operation Centre is in place under the direct supervision of the State Minister of Defence and National Security who is also the

Chief Coordinator of NDMC, but the National Emergency Operation Centre is not in fact functioning since it is under preparation at present. There is an urgent need to set up the above-mentioned National Emergency Operation Plan and implement efforts based on the plan. Although it was planned to obtain and maintain the necessary equipment by the end of 2014, NDMC considers it will take some time to develop human resources and, therefore, more time will be needed for the National Emergency Operation Centre to start operation on a serious level.

Other than natural disasters, NDMC is also targeting man-made disasters and epidemics such as fires, accidents and contagious diseases.

Figure 2.5-3 shows the organogram of NDMC.
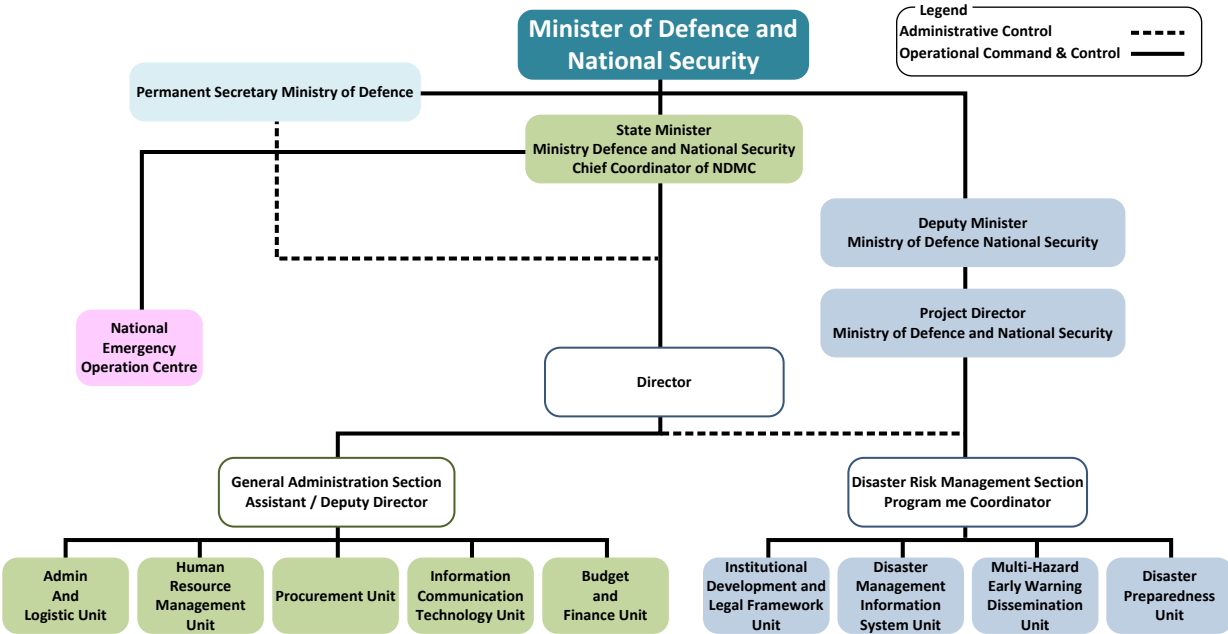
Source: NDMC

Figure 2.5-3 Organogram of NDMC

(3)　Maldives Meteorological Service (MMS)

Since the early 1940s, the Maldives has offered weather services. In the early days, the highest and lowest temperatures and rainfall were measured two or three times a day. Currently, MMS has five manned meteorological observatories in its Operation Headquarters on Hulhule Island where the airport is located and on Hanimaadhoo on Haa Dhaalu Atoll, Kadhdhoo on Laamu Atoll, Kaadedhdhoo on Gaafu Dhaalu Atoll and Gan on Adu Atoll. In addition, the Maldives has unmanned automatic weather stations (AWS) in 20 locations in total and has installed upper air observation equipment to carry out around-the-clock observation. A seismometer and a tide gauge are installed in the northern, southern and central parts of the country.

Numerical model-based weather forecasting is conducted using equipment such as a weather radar and satellite image receiving system, and around-the-clock observation and monitoring using radio communication is also conducted. (See Figure 2.5-4.) The Operation Headquarters located on Hulhule has a reliable system in which two weather forecasters and four other staff members are deployed in

four shifts a day to realise around-the-clock service.
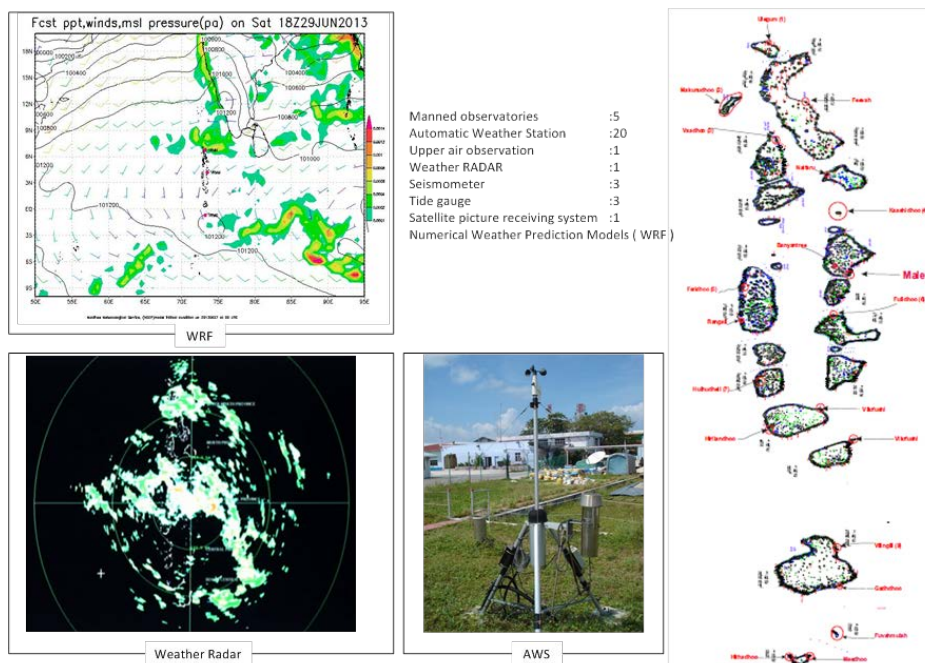
Source: MMS

Figure 2.5-4 Meteorological Observation Network of MMS

MMS operates under the supervision of the Ministry of Environment and Energy. As of October 2014, MMS has a total of 105 employees. The responsibilities of MMS are as follows:

- To conduct accurate weather forecasting in order to protect people's lives and livelihoods. To maintain weather data so that warnings can be issued at an early stage.
- To establish an early warning system that can provide warnings all over the country
- To hold and record workshops on seismology
- To judge the risk of natural disasters and monitor and confirm the threat of natural disasters
- To respond urgently when a natural disaster occurs
- To develop and maintain an effective disaster warning system for people's safety and to promote meteorology in the Maldives
- Responsibilities of the Aviation Weather Service: To contribute to effective aviation navigation and order and to improvement of safety in accordance with the regulations of the International Civil Aviation Organization and the World Meteorological Organization.

2.5.3　Disaster Management/Prevention System and Disaster Response Capacity

As described in Chapter 2.5.2, the development of a disaster prevention information system has not made any progress.

At NDMC, training in the Incident Command System (hereinafter referred to as "ICS") is offered to employees by UN volunteers dispatched by the Republic of Madagascar. There is still no established

disaster management system because the training is given intermittently and no system has been established to make the most of the results of such training due to a shortage of human resources at NDMC. It is planned to build both a human system and a Web information system with the cooperation of a local consultant when the procurement of equipment for disaster prevention information is completed, but the plan for establishment of the system has not yet been approved by Parliament. Under such circumstances, NDMC predicts that it will take some time to develop human resources.

In addition, NDMC has established a disaster committee on each atoll, but there is no such disaster committee on each island. NDMC has a policy to start up an island disaster committee with support from UNDP.

Meanwhile, as mentioned above, MMS Operation Headquarters conducts weather observation and monitoring in four shifts on an around-the-clock basis. There is a hotline connecting NDMC, MBCo (both TV and radio station buildings), the Ministry of Defence and National Security, the police and the airport traffic control offices and it is maintained to enable rapid communication among these organisations. (See Chapter 2.5.4) Using tide gauges set up in three locations around the country, cooperation with University of Hawaii studies is implemented. Based on the experience gained in the 2004 tsunami disaster, a cooperative relationship with other countries has been aggressively established. For example, disaster prevention measures were set up jointly with Sri Lanka. (See Figure 2.5-5)

Although cooperation between MMS and NDMC is in place, communication from NDMC to other organisations is often delayed because enhancement of the organisational capability of NDMC is lagging behind. Considering that MMS has the capacity to monitor natural disasters on an around-the-clock basis, it is expected that NDMC, as the organisation responsible for disaster management, will also be able to establish an effective system for disaster management if it succeeds in further enhancing its capability.

Distribution of PSMSL Stations
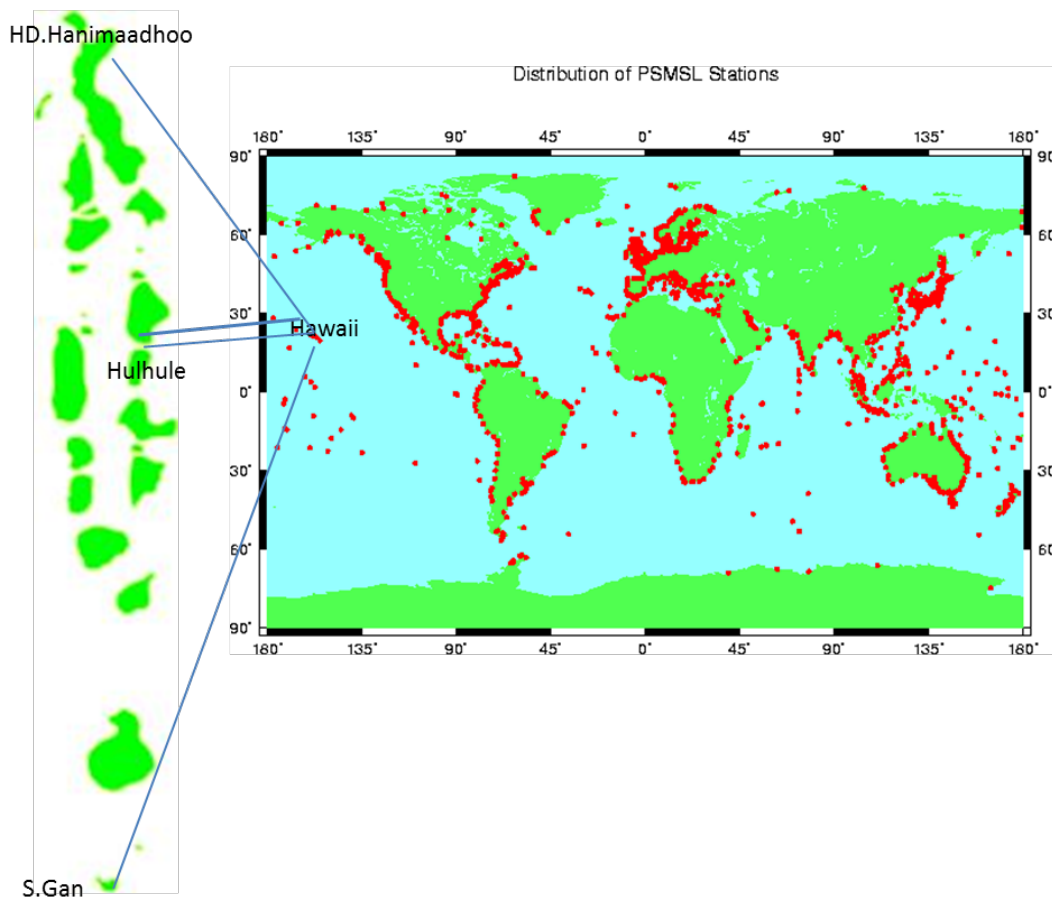
Source: MMS

**Figure 2.5-5 Location of MMS Tide Gauges and Diagram of Collaboration
with University of Hawaii**

2.5.4 System to Communicate and Diffuse Advisory/Warning and other Disaster Information

(1) Summary

Although the Maldives has a system and measures to communicate disaster information, such system and measures are not robust enough at present. Communication among NDMC, MMS, broadcasters and island committees is based on SOP.

For example, disaster or weather-related warnings and advisories are grouped into four classes of alerts for earthquakes and tsunamis and into three classes of alerts for weather phenomena and these warnings and advisories are sent from MMS to other concerned organisations. A hotline connecting MMS and other concerned organisations is in place and NDMC issues evacuation advisories and directives based on MMS warnings or advisories. NDMC, however, has not established a comprehensive disaster prevention information system that is connected with other concerned organisations.

In order to complement the lack of such a comprehensive information system, a priority call system has been put in place based on an agreement between NDMC and MMS. The priority call system

sends disaster information specifically to service subscribers. The number of subscribers is about 100 at present. There is also a service called the activated response system and with this system messages can be sent or received via telephone. The activated response system uses a Motorola-developed system and is operated with fees collected from users. The service is available in several different grades and collects different fees depending on the grade. MMS also sends disaster information directly to a total of 18 NGOs, local governments and specific high-ranking government officials via SMS.

As mentioned above, disaster-related information owned by MMS is sent to specific organisations and contact persons and no means is secured to send advisories and warnings promptly to the public. MMS is highly interested in offering disaster information through EWBS or data broadcasting.

On the other hand, NDMC collects information from local governments using a formal written form and via facsimile or e-mail. After confirming the accuracy of such data, NDMC provides the data to other concerned organisations as required. Communication via written form lacks speed. In addition, when a large-scale disaster occurs and creates confusion, it is doubtful if facsimile or e-mail will function without problem. When a disaster occurs, it is necessary to understand the situation in the affected areas and identify the extent of damage accurately, including making plans to mitigate the risk of secondary disasters and to deliver emergency supplies. To achieve this, there is an urgent need to develop human resources who can make correct judgements, in accordance with the warning issue criteria described below.

(2)   Warning Issue Criteria Based on SOP

There are two kinds of criteria, that is, criteria for issuing earthquake and tsunami warnings and criteria for issuing weather warnings, and the levels of the warnings to be issued are shown in different colours. MMS issues advisories or warnings in accordance with these criteria. Table 2.5-2 shows the earthquake and tsunami warning issue criteria and Table 2.5-3 shows the weather warning issue criteria. Based on the issued advisories or warnings, NDMC examines whether or not it should issue evacuation   advisories and directives.

Table 2.5-2 Earthquake and Tsunami Warning Issue Criteria

Alert Level	Description	Action
1. White	An earthquake occurred with a magnitude of 7.0 or higher on the Richter Scale in the Indian Ocean region but there is no immediate threat from earthquake or possible tsunami.	Earthquake information
2 Yellow	An earthquake occurred with a magnitude of 8.0 or higher on the Richter Scale in the Indian Ocean region. The earthquake has the potential to generate a widely destructive regional tsunami in the Indian Ocean.	Earthquake and Tsunami Advisory. The concerned authorities and people are advised to be on the alert and to be ready to move to safer areas and high-rise buildings.

Alert Level	Description	Action
3. Red	An earthquake occurred with a magnitude of 8.0 or higher on the Richter Scale in the Indian Ocean region. It is confirmed that a widely destructive tsunami has originated at the epicentre.	Tsunami Warning. People at risk are to be evacuated from danger zones.
4. Green	If there is no tsunami threat to the Maldives, a Cancellation Message will be issued immediately.	Cancellation Message. The authorities assume that there is no tsunami threat to the Maldives.

Source: MMS

Table 2.5-3 Weather Warning Issue Criteria

Alert Level	Description	Action
1. White	・ When a mean wind speed of between 23 to 30 mph (approx. 10.3~13.4 m/second) is expected or prevalent. ・ When rainfall of more than 50 mm is expected to occur within 24 hours. ・ When high tidal waves are expected.	Weather Advisory
2 Yellow	・ When a mean wind speed of between 30 to 40 mph (approx. 13.4~17.9 m/second) is expected or prevalent. ・ When torrential rain is expected or heavy rain has occurred for more than 2 hours. ・ When a severe thunderstorm is expected or has occurred. ・ When a tropical cyclone has formed within an area that will affect the Maldives. ・ When significant tidal or swell waves are expected or have occurred.	Weather Advisory
3. Red	・ When a flash flood is expected. ・ When a tropical cyclone is tracked and is moving close to or across the Maldive Islands. ・ When destructive tidal or swell waves or a storm surge is expected or observed.	Weather Warning

Source: MMS

(3) MMS Information Communication System

When a disaster requiring issuance of an advisory or warning occurs, MMS will use the hotline and promptly contact the public TV and radio broadcaster (MBCo), NDMC, the Ministry of Defence and National Security, the police and the airport traffic control offices. MBCo will then transmit the received advisory or warning immediately to the public. NDMC will confirm if the information received is correct or not.

Figure 2.5-6 shows MMS's system to communicate advisories and warnings.

Source: MMS
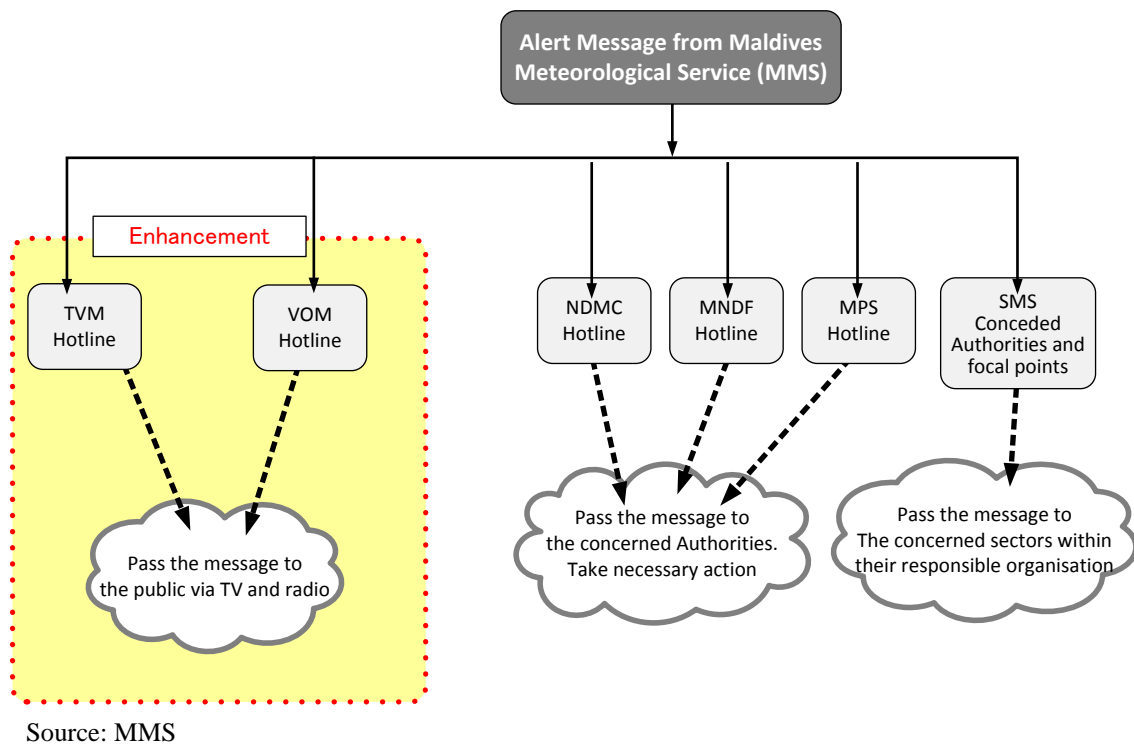
Figure 2.5-6 Advisory/Warning Communication System of MMS

As seen from the figure above, the organisation responsible for transmitting advisories and warnings to the public is MBCo. MBCo communicates advisories and warnings throughout the country through TV and radio broadcasts. When an advisory or warning is issued, however, it is necessary to collect detailed information on an ongoing basis. Presently, however, there is no system that enables real-time sharing of detailed weather/disaster information between MMS and MBCo.

In its office building, MMS has a Weather Studio for producing weather forecast programmes (See Figure 2.5-7), where images are composed using the chroma key effect and weather information programmes are recorded and sent. MMS has a computer graphics (CG) system to combine weather forecast information for various areas and the image of the weather forecaster. These programmes, however, cannot be broadcast live because MMS does not have a transmitter to directly send signals to MBCo. Produced programmes, therefore, are recorded on VTR tape and sent to MBCo in Malé once a day.

Currently, MMS and MBCo are in the process of submitting an equipment development plan to the government in an effort to ensure that weather information can be transmitted in a timely manner from the Weather Studio and weather forecasters can communicate appropriate information to the public when an advisory or warning is issued. For the last few years, however, the purchase of such equipment has been put off due to lack of funds.

It is also possible to convert information available on the existing website into data broadcasting programmes in real time and both MMS and MBCo strongly desire that an information sharing system between MMS and MBCo be established to offer appropriate and timely weather/disaster information to the public and that the communication function between these two organisations be enhanced.

Weather Studio	Camera and Monitor in Weather Studio
There is no background when using chroma key.	The weather forecaster forecasts while confirming the composition on the monitor
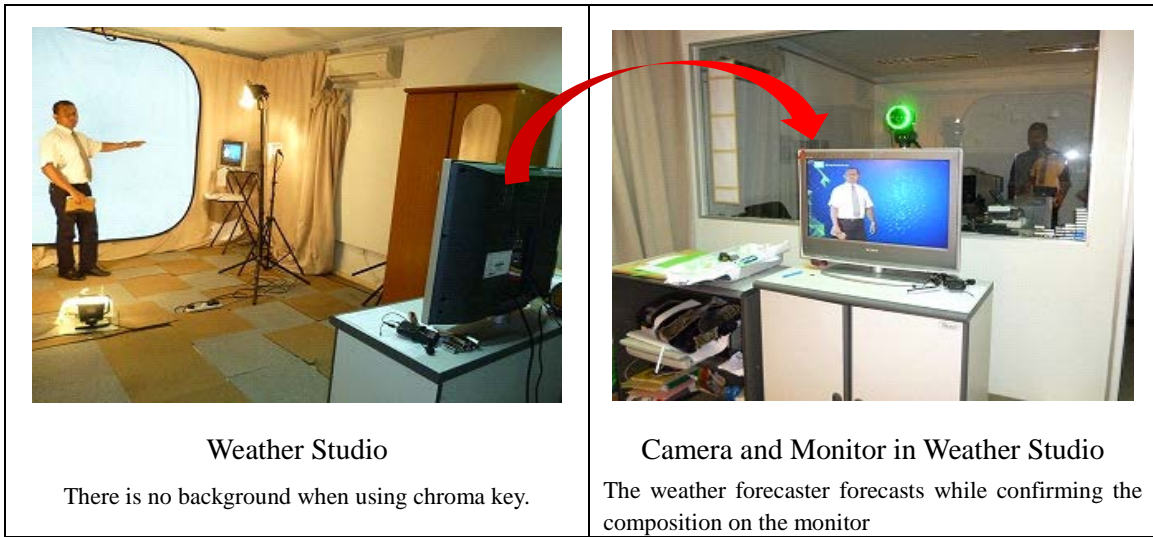
Source: JICA Survey Team

Figure 2.5-7 MMS Studio for Weather Programme Production

Chapter 3   Recommendations

Chapter 3   Recommendations

3.1   Existing Issues and Assistance Needs

3.1.1   Roadmap for DTTB Migration

Figure 3.1-1 below shows the roadmap for DTTB migration showing the work items required for DTTB migration by time course. Since no detailed plan is available and no documented policies such as analogue switch off procedures or digital terrestrial licencing have been approved for DTTB migration, the actual dates are not indicated at the planning and implementation stages of the roadmap. However, the roadmap below, which depicts which work items have to be completed before the next work can be implemented, clearly shows the stages and procedures for DTTB migration. The issues to be studied for DTTB migration are mentioned in Chapter 3.1.2 and thereafter follow the roadmap shown below.

While this roadmap has been prepared on the assumption that DTTB migration will be assisted by a grant aid project by Japan which will support the establishment of the DTTB platform, a final decision has not yet been made on implementation of the grant aid project.   Therefore, a different procedure may be followed if it is not implemented as such.
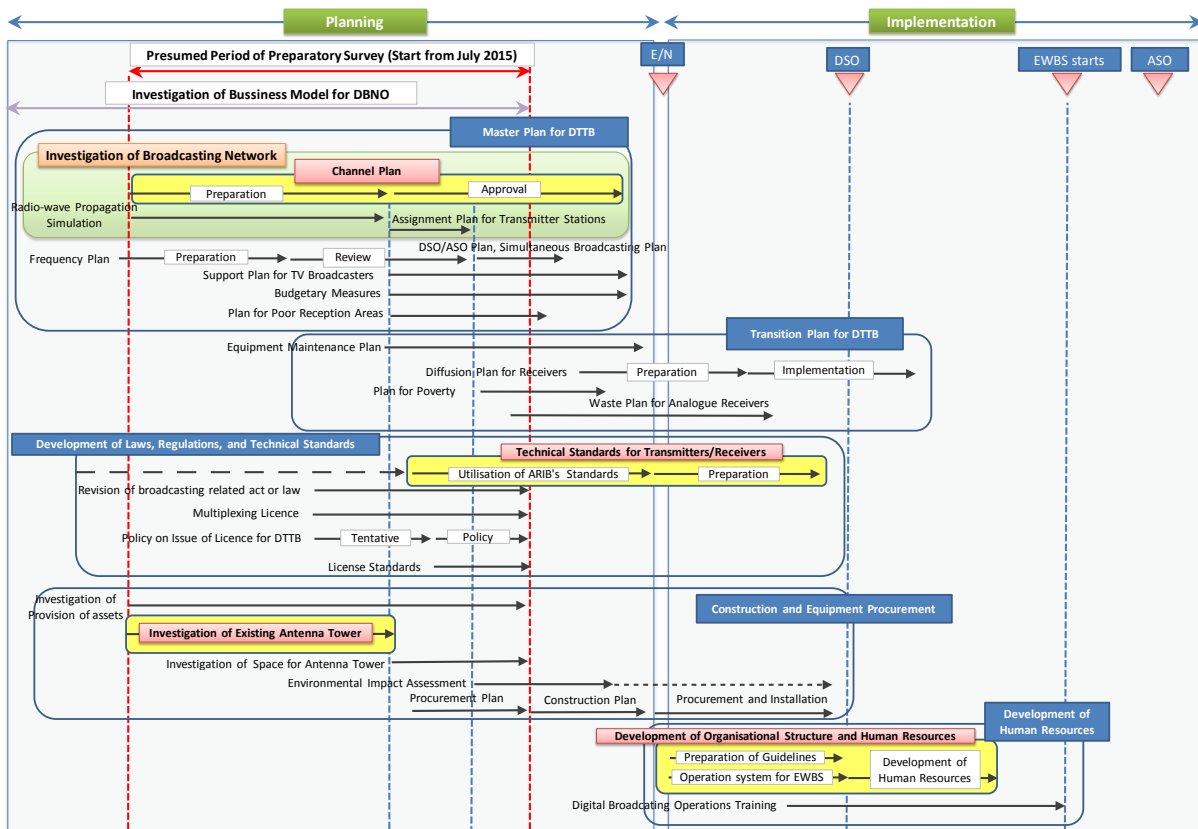
Source: JICA Survey Team

Figure 3.1-1 Roadmap for DTTB Migration

3.1.2 Study on the Business Model for Platform Operation

(1) Study on the Organisational Structure for Platform Operation

The National Roadmap Team (hereinafter referred to as "NRT") has prepared a roadmap for DTTB migration in the Maldives with assistance from the International Telecommunication Union (hereinafter referred to as "ITU"). In the roadmap, NRT recommends development of a DTTB platform during DTTB migration so that a wide variety of terrestrial TV programmes can be broadcast to the entire country. The government is preparing for the establishment of the DBNO in the near future following this recommendation. In the beginning, the idea of establishing the DBNO as an independent organisation jointly held by the government and the private sector was discussed. However, the government has approved the policy to operate the DBNO with a government budget until all the required equipment has been installed and stable operation has been established. Accordingly, it appears that the government has decided to establish the DBNO as an external bureau under the jurisdiction of MoHA. As a government decree will have to be promulgated and implemented for the establishment of an external bureau, the government of the Maldives needs to begin preparation of the decree as soon as possible

The DBNO, which will operate the platform, needs to have engineers who are capable of operating and maintaining the transmitters and various broadcasting equipment used in networks. The DBNO will have the important responsibility of transmitting programmes from various broadcasters in good quality and on schedule. Therefore, its staff members must have high technical capacity. Since it is impossible to train highly capable engineers in a short period of time, MoHA is planning to transfer approx. 10 engineers from CAM and MBCo to the DBNO to form the core group of engineers at the DBNO. MoHA has estimated the number of engineers that need to be employed by the commencement of operation of the DBNO at approx. 40 if the DTTB platform is operated 24 hours a day. MoHA intends to fill the gap between this number and the number of the engineers to be transferred from CAM and MBCo by employing engineers with experience in transmission of TV programmes from private broadcasters and elsewhere. MoHA will have to prepare a plan for employing such engineers including a budget allocation plan.

(2) Study on the Platform User Charge System

Participation by the three Type-A broadcasters (see Chapter 2.3.2) which have licences for terrestrial TV broadcasting and which broadcast programmes on terrestrial TV is essential for the success of the DTTB platform project. While MBCm says that it is not clear whether all six type-D broadcasters that transmit terrestrial TV programmes will continue their broadcasting services after ISDB-T migration, it is desirable that many of them participate in the platform since many viewers watch the programmes that they transmit. Some private broadcasters may hesitate to participate in the platform depending on the operating and user fee systems adopted. Therefore, it is important for the government of the Maldives to play a central role in urging private broadcasters to participate in the platform by informing them of the significance and advantages of the DTTB platform and the benefits expected from the platform and by providing assistance for DTTB migration of their services. The

government must also make public the guidelines for the issuance of DTTB licences. (See Chapter 3.1.5 (2))

The significance of establishing a nationwide DTTB platform lies in the fact that it will enable provision of a variety of domestically-produced TV programmes to remote islands free of charge and it will facilitate schedule management for DTTB migration and lead to smooth migration. The establishment of the platform is expected to alleviate the information gap between islands and promote the active use of broadcast programmes for provision of disaster information, vocational training and education.

Table 3.1-1 below shows the benefits expected from participation in the platform by private broadcasters.

Table 3.1-1 Benefits Expected from Participation in the Platform by Private Broadcasters

	Benefits	Reasons
1.	Nationwide broadcasting network	No private broadcasters have a nationwide broadcasting network. In particular, most of their service areas are limited to around Malé. Participation in the platform will enable them to have a nationwide broadcasting network.
2.	Significant cut in initial investment in DTTB	Transmitters and studio equipment need to be renewed to migrate to DTTB. However, if they join the platform, the cost of the transmitters will be converted into user fees for the platform and the initial investment can be cut significantly.
3.	Effective utilisation of human resources	There is no need to maintain the transmitters any longer if they join the platform. The employees who have been involved with transmitters can be utilised in other areas such as programme production.

Source: JICA Survey Team

The five private broadcasters[1] interviewed in the survey are generally favourable towards the establishment of the DBNO, as establishment of the platform will enable a significant reduction in the initial investment in DTTB migration. Of the three broadcasters which have already purchased European-system digital transmitters and begun digital TV broadcasting services, VTV and DTV are positive towards modifying their digital transmitters to the ISDB-T system and providing them for use by the DBNO. In any case, information on the services to be provided by the platform and the charges for such services is necessary for the private broadcasters to decide whether or not to participate in the platform.

With regard to the operating system, the responsibilities and duties of the DBNO and the duties of the

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[1] Interview surveys were conducted at VTV, DTV, Raajje TV, Atoll TV and Medianet

programme providers, *i.e.* the existing broadcasters, to the DBNO need to be clearly defined. The responsibilities and duties of the DBNO will be described in the government decree for establishment of the DBNO and the decree shall provide the legal basis for the responsibilities and duties of the DBNO. Meanwhile, the programme providers will be responsible for providing programmes of appropriate signal quality in accordance with a pre-determined broadcasting schedule. If an electronic program guide (hereinafter referred to as "EPG") service is to be provided, the programme providers will inform the DBNO of the specific and accurate programme schedules and the DBNO will manage the schedules.

Guidelines on user fees will be announced in the near future and budgeting in accordance with the guidelines will also be required. It is natural to assume that the private broadcasters will not participate in the platform if the user fees are too high. The user fees for a broadcasting channel are considered as the standard for the user charges for a platform. However, there is no record of the existing broadcasters, the potential programme providers to the platform, having paid user fees for nationwide terrestrial TV broadcasting in the Maldives. Therefore, a study must to be conducted to prepare an appropriate user fee system.

The major costs to be considered when setting the user fees are the labour costs for staff members at the DBNO, costs for maintenance of the equipment, user fees for programme transmission links, saving for/repayment of the cost of replacement of equipment and electricity charges. It is expected to be necessary to operate the DBNO with revenue from user fees supplemented with expenditure from the government budget for the time being until the expected increase in advertising revenue from nationwide broadcasting services is realised.

(3)   Study on Ways to Reduce Initial Investment

In addition to the study on the user fee system mentioned above, it may be possible to keep the user fees low by reducing the initial investment. It is worth studying the possibility of reducing the initial investment by the use of properties owned by individual broadcasters and telecommunications carriers for DTTB. Table 3.1-2 shows the organisations which own such properties and the properties concerned. Dhiraagu and Ooredoo mentioned in the table are mobile phone service providers. They both claim 100 % service coverage and Ooredoo says that their antenna towers on various islands may be used as antenna towers for the DTTB platform.

Table 3.1-2 Properties Which Could be Made Available to the DBNO

Organisation	Transmitter	Antenna Tower	NOC Building	Programme Transmission Link
MBCo	ISDB-T transmitter	Malé (Discussion is required)	○	Reception devices for NOC are available
VTV	One Transmitter	×	×	Transmitting devices for NOC are available
DTV	DVB-T transmitter (Modifications are required)	×	×	Transmitting devices for NOC are available

Organisation	Transmitter	Antenna Tower	NOC Building	Programme Transmission Link
Sun TV	Unknown	Unknown	Unknown	Unknown
Atoll TV	DVB-T Transmitter (Modifications are required)	×	×	×
Raajje TV	×	×	×	×
Medianet	×	○ (Villingili)	×	×
Dhiraagu	-	-	-	○
Ooredoo	-	○	-	○

Source: JICA Survey Team

If the organisations mentioned in Table 3.1-2 allow the use of the properties mentioned in the table for the platform, the cost of the purchase of transmitters and the construction of antenna towers can be reduced. As these costs make up the largest proportion of the cost of establishment of the DTTB platform, a reduction in these costs will reduce the overall initial investment. If the DVB-T transmitters of DTV and Atoll TV can be modified to suit the ISDB-T system, a total of four ISDB-T transmitters will be available for the platform. It will be significant to study whether it is possible to include the modification of the DVB-T transmitters in the scope of the grant aid project, if it is decided that DTTB migration will be implemented as a Japanese grant aid project.

There is also an urgent need to study whether the antenna towers at various locations have the space and load capacity to install the transmitting antennas for DTTB. (See Chapter 3.1.6 (2) for details.) Agreement to the use of the transmitters and other transmission facilities, including modification of the transmitters, by the broadcasters who own the facilities must be obtained by the basic design stage of establishment of the DTTB platform. (See Figure 3.1-1)

(4) Reduction in Operating Cost and Selection of the Programme Transmission Links

MBCo uses a satellite channel to transmit programmes produced by its TV station to transmitting stations at various locations. The monthly user charge for this channel is estimated at one million several hundred thousand yen. Meanwhile, installation of submarine optical fibre cables has advanced in recent years and private telecommunications carriers have established optical fibre connection points at eight locations in the country including Malé Island.

It is assumed that there will be a period of simulcast during the migration to DTTB. The draft ITU roadmap assumes this period to be between four and six years. If satellite channels are used for the transmission of programmes as at present during this period, satellite user charges will have to be paid for the channel for the existing analogue broadcasting and two additional channels for digital broadcasting during the period. At the completion of the analogue switch off (hereinafter referred to as "ASO"), it will be possible to terminate the contract for the channel for analogue broadcasting. However, the contract for the remaining two channels will have to be maintained for platform operation after the completion of ASO.

If satellite channels are used as the programme transmission links for the expansion of DTTB coverage to remote islands other than the main islands in the atolls, differential delay will exceed the

guard interval and, therefore, it will be impossible to expand the network by inexpensive methods such as broadcast-wave relay. User charges for optical fibre links are still high in the Maldives. However, it will be possible to limit the fee of the links for programme transmission by establishing independent microwave links by procuring and installing microwave transmitters. Figure 3.1-2 shows a programme transmission network with microwave transmitters.

It will be necessary to conduct a financial study to keep the user fees for the DTTB platform low and to use the results of the study to enable selection of appropriate programme transmission links when the platform is introduced.
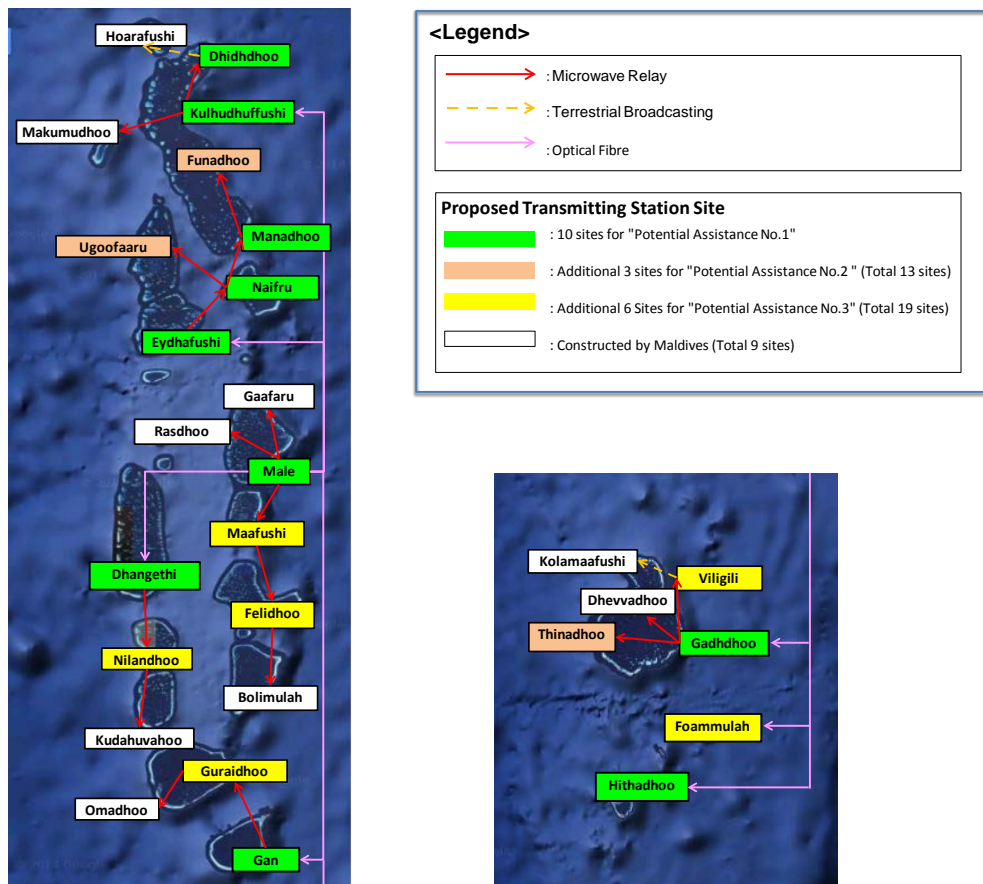
Source: JICA Survey Team

Figure 3.1-2 Programme Transmission Network Plan for the DTTB Platform

3.1.3   Preparation of a DTTB Master Plan

(1)   Study on Establishment of a Broadcasting Network
1)   Radio Wave Propagation Simulation and Channel Planning

MBCo is conducting a study on locations for installation of additional transmitting stations using the list of transmitting stations for the DTTB platform mentioned in the ITU Roadmap. The study is focused on the availability of power sources in remote islands and the possibility of using the existing transmitting stations.   Because of infrastructure development since the time when the locations of the analogue transmitting stations were selected, it is now possible to

select sites for transmitting stations to enable efficient expansion of the coverage area.

However, MBCo has not conducted computer radio wave propagation simulation. Instead, it is using the results of analysis of the data collected in telephone interviews with residents of the islands on the reception of analogue broadcasting as reference. Unlike analogue broadcasting, digital broadcasting images will not be displayed on the TV at all if the signal is below a certain field intensity. In addition, radio waves are propagated over the sea in the Maldives. Therefore, it will be necessary to conduct radio wave propagation simulation to calculate the effective radiated power appropriately and decide the height of the antennas and locations of the transmitting stations.

There will be cases where the conducted radio wave propagation simulation reveals the need to construct a new antenna tower at a different location from the existing tower. In such cases, viewers will have to re-orient their receiving antennas to the new tower. It is desirable to study what impact the establishment of the new broadcasting network will have on viewers and provide them with information on the impact and measures to be taken before DTTB services begin.

On Malé Island in particular, because of the large number of tall buildings in a small area, reflection and diffraction of radio waves by the buildings causes multipath propagation, the phenomenon of a receiver receiving the same radio wave via multiple paths. A study by MBCo has already revealed that such radio disturbance can be eliminated by orienting the receiving antenna in the appropriate direction, such as the direction of the reflected wave.

However, it will be necessary to fully inform viewers of how to install receiving antennas and conduct a study on establishing a contact point for consultation by viewers. (See Chapter 3.1.4 (1))

2) **Study on Coverage Expansion to Remote Islands by Preparation of a Transmitting Station Site Plan**

The ITU Roadmap demands improvement of reception on islands where it is impossible or difficult to receive the existing analogue terrestrial TV broadcasting services. The telephone interview survey conducted by MBCo revealed that the percentage of the population in its coverage area is 77.3 %. (This figure is for all the islands except resort and industrial islands where MBCo did not conduct the survey.) However, the accurate coverage is not known, because it is not clear whether the recommended reception field intensity provided by ITU is met in the entire coverage area. Another study has been conducted on the number of islands where it is impossible to receive radio waves and the population in areas where it is difficult to receive terrestrial TV broadcasting in each atoll. Table 3.1-3 shows the results of the study.

Approx. 7,000 and 6,000 people are unable to receive terrestrial TV broadcasting in Shaviyani Atoll in the Upper North area and Thaa Atoll in the Upper South area, respectively. These numbers are higher than the corresponding numbers in the other atolls. It is impossible to receive terrestrial TV broadcasting on almost all the islands in Alifu Alifu Atoll in the Northern Central area and Gaafu Dhaalu Atoll in the Central South area. It is thought that the mention

of measures to expand the coverage of terrestrial TV broadcasting to these islands in the transmitting station site plan will contribute to participation by private broadcasters in the DBNO. As shown in Tables 2.3-3 and 2.3-4, the coverage areas of the rebroadcasters currently providing CATV services include populous islands and islands with transmission links, such as optical fibre links. Therefore, the installation of terrestrial TV transmitting stations for transmission to the islands with poor reception mentioned above will lead to acquisition of new service areas. However, as there are many islands with few people in the areas concerned, a study needs to be conducted on the cost-effectiveness of the project as a public work including whether to install terrestrial TV transmitting stations or to provide subsidies for the purchase of equipment for direct reception of satellite signals.

Table 3.1-3 shows the percentage of the population with MBCo coverage by atoll estimated by analysis of the results of the MBCo survey on reception conditions by the Survey Team.

Table 3.1-3 Reception Condition of Analogue Terrestrial TV Broadcasting by Atoll

Area	Atoll		Islands Without Reception/Inhabited Islands	People Without Reception	Population Coverage
Upper North	Haa Alifu		4/15	3,280	75.4
	Haa Dhaalu		4/16	2,569	84.2
	Shaviyani		9/14	6,844	42.1
North	Noonu		5/13	4,077	52.3
	Raa		4/12*	4,143	66.5
	Baa		7/13	4,014	54.9
	Lhaviyani		5/5**	8,346	0
North Central	Kaafu	Malé	0/8***	0	100
		Except Malé	1/9	1,696	83.3
	Alifu Alifu		7/8	3,955	18.5
	Alifu Dhaal		5/10	2,014	70.9
	Vaavu		2/5	489	67.4
Central	Meemu		5/8	2,284	50.9
	Faafu		0/5	0	100
	Dhaalu		4/7	2,270	51.9
Upper South	Thaa		9/13	5,944	29.7
	Laamu		5/12	4,531	61.4
South Central	Gaafu Alifu		4/10	1,817	77.3
	Gaafu Dhaalu		6/9	4,816	56.2
South	Gnaviyani		0/1	0	100
	Addu		0/6	0	100

*   There are 14 islands in Raa Atoll.   As two of them were not surveyed, they were excluded from the analysis.

**   The transmitting station in the atoll is currently not in use.

*** The survey was not conducted in this area.   However, as there is good reason to believe that the people in this area receive radio waves transmitted from the transmitting station in Malé, all the islands in this area are considered to have coverage.

Source: Data from the MBCo survey analysed by the JICA Survey Team

(2)   Study on Frequency Plan

Frequency planning should be conducted, in principle, at an early stage of DTTB migration.   The process of deciding which frequency bands will be used for TV and radio broadcasting and mobile phone services will take into consideration frequency use in future.

Revision of the frequency plan associated with DTTB migration will focus on digital dividend after ASO, *i.e.* deciding for what purposes the frequency bands which were used for analogue TV broadcasting will be used.

The three points mentioned below will be considered in the frequency planning.

- ・ Digital dividend of the frequency bands used for analogue TV broadcasting after DTTB migration;
- ・ The number of programmes multiplexed in one channel and the expected number of DTTB licences to be issued; and
- ・ Efficient frequency allocation in future

The government of the Maldives has decided to reserve the channels currently used for analogue TV broadcasting for DTTB use after ASO in order to accommodate the expected increase in the number of DTTB broadcasters in future. The government has also decided to adopt a short-term policy on the number of programmes multiplexed in one channel, *i.e.* two HD programmes, two SD programmes and one one-seg and data broadcasting programme.   The government is studying the possibility of increasing the number of channels from Ch 27 to Ch 37 which are already allocated to TV broadcasting to Ch 21 to Ch 48.   People's expectations of TV broadcasting are greater than imagined as it is the most popular form of entertainment in a country where few recreational activities are available.   The government intends to use neighbouring frequency channels for broadcasting through the DTTB platform so that the same antennas can be used for transmission on all channels.

(3)   Study on the Schedules for DSO/ASO and Simulcast

As mentioned in Chapter 2.4.1, the ITU Roadmap for DTTB migration prepared by NRT mentions that ASO shall be completed by 2020 after a simulcast period of between four and six years.   As this is the only mention of ASO in the roadmap, a practical plan for ASO must be prepared.   As shown in Figure 2.4-1, MBCo has only decided the time of the digital switch over (hereinafter referred to as "DSO"), the simulcast period and the ASO time for each atoll.

The plan is to begin DSO first in populous atolls such as Kaafu and Addu.   While a three-year period is set aside for the simulcast period in Kaafu Atoll where DSO is expected to begin first, for all the other atolls, the period will last for two years, in principle, and ASO will have been completed by 2019 in all the atolls in the roadmap.   The roadmap shows that DSO and ASO in Kaafu Atoll will occur in 2012 and 2016, respectively.   If DTTB migration is implemented as a grant aid project by Japan, DSO is expected to take place in 2017 at the earliest.   Therefore, the roadmap will have to be modified significantly.

When planning ASO, it is important to study the conditions to be met before commencing ASO.   If the conditions are set at levels which broadcasters can achieve easily, ASO may take place before

many people have purchased TV receivers for DTTB and, thus, they may be unable to watch terrestrial TV programmes until they have purchased a new TV receiver.   Meanwhile, if the conditions are set at levels which are difficult for broadcasters to achieve, the simulcast period is likely to be long and the burden on broadcasters will increase.   The government of the Maldives needs to set appropriate conditions for commencing ASO taking into account the balance between the burden on viewers of purchasing new TV receivers and the burden on broadcasters mentioned above.   It is recommended that planning for DSO/ASO and for simulcast is completed by the stage of planning the roadmap for DTTB migration, as shown in Figure 3.1-1.

(4)   Assistance Plan and Budgetary Measures for TV Broadcasters

The government of the Maldives is planning to operate the platform by basic programme multiplexing of two SD programmes and two HD programmes for the time being.   The government has chosen this particular multiplexing because it gives special consideration to existing stations which are slow in shifting to HD programme production.   As many terrestrial TV broadcasters in the Maldives operate with advertising revenue and contributions from political parties, it is difficult for them to purchase several transmitters at one time for expansion of their TV networks.   Therefore, they are positive towards use of the DTTB platform operated by the DBNO.

Against this background, what the government of the Maldives must consider in terms of the content of the assistance for TV broadcasters for DTTB migration is not financial assistance for equipment procurement but technical assistance to improve their technical capacity to absorb new technologies such as data broadcasting.   However, such technical assistance should not be restricted to creation of training opportunities such as technical guidance.   Even provision of subsidies for outsourcing data broadcasting services to foreign companies should be considered as technical assistance.

Creation and purchase of test streams for data broadcasting (sample data to confirm whether a data broadcasting programme is always displayed normally on the TV screen) is also a significant step in the establishment of data broadcasting.

The plan for the above-mentioned assistance including the required budgetary measures shall preferably be prepared at the stage of planning the roadmap for DTTB migration.

(5)   Plan for Areas of Poor Reception

The percentage of MBCo coverage by current analogue TV broadcasting is 77.3 %.   The islands outside the coverage are divided into two groups: islands where the Island Councils subscribe to CATV operators as the representatives of their residents and the CATV operators transmit TV programmes to the residents, and islands where residents watch TV programmes by TVRO of satellite signals. MBCo is said to maintain 100 % population coverage by terrestrial and CATV broadcasting and TVRO services combined.

Households watching TV programmes through CATV have to pay a subscription fee to the CATV operator.   Households watching TV programmes by TVRO have to purchase an antenna and a TV receiver for TVRO.   Expansion of free terrestrial TV broadcasting service coverage to these households will require expansion of the TV broadcasting network by the construction of new

transmitting stations.   However, it will require a significant amount of time and money to achieve 100 % coverage by terrestrial TV broadcasting. Constructing a transmitting station may not meet the cost-effectiveness criteria for public works at certain locations.

Preparation of a plan of action for areas of poor reception will be required to provide equal opportunity to watch terrestrial TV programmes, or an alternative means to do so, to all the people under such circumstances.

It is recommended to select the best measure, whatever it may be, to provide terrestrial TV programmes to people in areas where coverage by terrestrial TV broadcasting cannot be expanded, after conducting a detailed study on the cost-effectiveness of potential measures.

3.1.4   Study for Preparation of DTTB Migration Plan

(1)   Study on Plans to Promote Purchase of New TV Receivers, Assist Poor Households and Dispose of Disused Analogue TV Receivers

Penetration of DTTB TV receivers is expected to be a precondition for implementation of the ASO Plan and a key component of smooth DTTB migration.   Viewers will have to be convinced of the reason why they have to purchase a new TV receiver for DTTB.   It is assumed that a certain number of households in the Maldives watch TV programmes using indoor antennas or reception antennas with insufficient gain.   Although they are able to watch programmes with these antennas, though poor in quality, because the programmes that they watch are analogue, they may no longer be able to do so when ASO is completed, because no image will appear on the TV screen when the signal intensity is below a certain level in the DTTB system.   Therefore, it will be necessary to provide them with assistance so that they can make the right decision on whether or not to install a reception antenna when they purchase a new DTTB TV receiver.

According to MoHA, the ministry is studying use of the customer care centres of mobile phone service providers established on various islands for provision of viewer services including advice on STB connection and poor reception.   Smooth service provision is expected from use of the centres as they have already established their presence in the communities for service provision.

Meanwhile, it will be essential to implement awareness raising activities about DTTB migration for viewers continuously and with ample input.   Such continuous and ample activities will promote the purchase of DTTB TV receivers by viewers.   Financial measures will have to be prepared to assist poor households in purchasing new TV sets.

As the number of viewers who purchase new TV receivers increases, many analogue TV receivers will become solid waste.   The government of the Maldives must prepare a plan for the disposal of analogue TV receivers before it commences DTTB migration in order to prevent unlawful dumping of the TV receivers from causing problems such as degradation of the environment.   In the plan, the government will have to provide practical methods for the collection of disused TV receivers and a budget for disposal of a large quantity of solid waste using projections of the number of households with DTTB TV receivers as reference.

According to MoHA, the ministry is studying the possibility of the DBNO conducting a study on free

distribution of new TV receivers and promoting their purchase.　MoHA will have to decide the details of the DBNO's services and promulgate a government decree for the establishment of the DBNO urgently.　Although the disposal of disused TV receivers does not come under the jurisdiction of MoHA, the ministry is expected to duly coordinate with the relevant government offices and Island Councils on the matter.　It will be necessary to complete preparation of a plan to promote the purchase of new TV receivers, a plan to assist poor households and a plan for the disposal of analogue TV receivers before DSO.

(2)　Promotion of the Purchase of TV Receivers and Import of DTTB-compatible Equipment

It is expected to be difficult to manufacture DTTB TV receivers, STBs and personal digital assistants in the Maldives immediately after DTTB migration begins.　Therefore, measures such as customs duty-free import of DTTB TV receivers for a fixed period of time may be implemented as a means of facilitating the purchase of TV receivers.

(3)　Study on Platform Equipment Plan

Preparation of a platform equipment plan will have to be completed by the end of the planning stage shown in the roadmap for DTTB migration in Figure 3.1-1.　In the preparatory survey to be conducted as part of the study on the feasibility and relevance of providing a grant aid project for DTTB migration, a study will be conducted including procurement and installation of the equipment within the scope of work of the grant aid project.　However, it will be better to conduct a comprehensive study on the equipment required for the platform, including procurement and installation of equipment outside the scope of the grant aid project, such as equipment for transmitting stations, in the survey.　This comprehensive study is expected to yield an accurate estimate of the initial investment cost.

3.1.5　Study on Legal Framework and Guidelines

(1)　Amendment of Broadcasting Laws and Regulations
1)　Study on Amendment of Broadcasting-related Laws and Introduction of Multiplexing Licence

The legal framework required for DTTB migration has not yet been developed in the Maldives. NRT was established and a roadmap for DTTB migration was prepared with assistance from ITU, as mentioned above.　As the final draft of the roadmap has already been prepared, the remaining steps in the preparation of the roadmap are final confirmation by ITU and publication.

The ITU Roadmap only describes the outline of the work to be implemented for DTTB migration.　It does not provide actual action plans or implementation schedules.　The relevant organisations will have to prepare their own implementation schedules and establish the legal framework required for DTTB migration under the leadership of MBCm.

At present, some broadcasters provide DTTB services based on European standards, such as the

DVB-T and DVB-T2 system, and some large-scale rebroadcasters transmit programmes via the DVB-C system in the Maldives. STBs compatible with these systems have been sold to subscribers to these broadcasters. TV sets for European-standard DTTB are on the market in large quantities and many people have already purchased them.

In order to prevent further expansion of European-standard DTTB, MBCm and CAM have prepared draft technical standards to adapt the ISDB-T system with assistance from the Ministry of Internal Affairs and Communications of Japan and the Association of Radio Industries and Businesses (hereinafter referred to as "ARIB") as mentioned in Chapter 3.1.8 "Assistance for Preparation of Technical Standards". The standards need to be officially approved and made public immediately after approval and at the latest before the procurement of equipment begins. Meanwhile, the definition of the DBNO as a programme multiplexing broadcaster will have to be added to the Broadcasting Act in force before the DTTB platform is introduced. Clauses will need to be added to the broadcasting regulations or clauses in the regulations will need to be amended to include provisions on the authority granted to the DBNO when EWBS is in use.

2) Decree on Establishment of the DBNO

The government of the Maldives intends to enact a decree which will provide the duties and responsibilities of the DBNO as the operator of the DTTB platform and the methods for the collection of user fees for the platform. The DBNO will be issued with a licence for rebroadcasting terrestrial TV programmes and a frequency licence, and it will be regulated by MBCm in accordance with the Broadcasting Act and regulations.

A detailed study will be conducted on collection of the user fees before the DBNO is established in order to ensure that the DBNO is able to broadcast stably and in a manner appropriate for a public organisation. If the DBNO does not have sufficient funds for maintenance, operation of the transmission system may be compromised.

The decree needs to be promulgated before a procurement plan including basic designs is prepared.

(2) Study on Guidelines for Issuance of DTTB Licences

There are five terrestrial TV broadcasters, including MBCo, which have frequency licences in the Maldives, as mentioned in Chapter 2.3.1. Four of the five broadcasters were interviewed in the survey. All of them supported DTTB migration. However, as there are broadcasters like Raajje TV which transmit their programmes through the TV broadcasting networks of other broadcasters (through terrestrial, CATV and satellite broadcasting), it is not known how many broadcasters intend to participate in the platform when it has been established.

MBCm has not prepared guidelines for the issuance of licences for DTTB. MBCm will have to prepare and publicise guidelines, including guidelines on issues such as whether the licences will be issued preferentially to existing analogue terrestrial TV broadcasters or whether the licences will be selected by auction in which all the broadcasters which wish to obtain a licence may participate as equal bidders. MBCm intends to make a decision urgently on whether assessment of applicants'

business proposals, auction or both will be used for the selection of licences, because there are two types of broadcasters, those providing HD programmes and those providing SD programmes, and only one one-seg broadcasting licence and one data broadcasting licence can be issued for each channel.

The number of available multiplex broadcasting channels will be limited because only a limited number of channels will be used for DTTB. Therefore, programme channels in the broadcasting channels will not be allocated to organisations when there is any doubt concerning the stable and reliable provision of broadcasting services. Some existing broadcasters which have licences for the use of terrestrial TV broadcasting frequencies do not provide any broadcasting services. A detailed study should be conducted in order to prevent recurrence of the above-mentioned situation before the licences for use of the channels are issued. At the least a provisional draft of the guidelines will have to be prepared before preparation of the equipment plan to be implemented as part of the basic design begins.

(3)   Study on Licencing Standards

With DTTB migration, the conditions for the issuance of frequency licences will change. The standards to be met for the opening of transmitting stations by broadcasters are provided in the Act and regulations and the assessment criteria, including the field intensity of the radio waves and signal forms transmitted from each station and procedures for opening a new transmitting station, are clearly stated. These conditions will be revised and made applicable to DTTB. In addition, a clause on segment partitioning of the standards will have to be added in order to incorporate the licences for data broadcasting and one-seg broadcasting.

3.1.6   Study on Equipment Procurement and Construction Work

(1)   Study on Use of Existing Properties

As mentioned in Chapter 3.1.2, it is worth studying the use of properties offered for use in the platform by private broadcasters and telecommunications carriers as a measure to keep initial investment in the DBNO low and set the user fees of the DTTB platform at affordable prices. It has been revealed so far that several transmitters may be used after modification and that the towers of mobile phone service providers may be used as antenna towers for establishment of the DTTB platform.

MoHA, which will promote establishment of the DBNO, will have to prepare an inventory of the offered properties urgently and, if a preparatory survey for a grant aid project is conducted, it needs to select the private properties to be used for the establishment of the platform and reached agreements on their use with their owners before completion of the survey.

(2)   Study on Availability of Antenna Towers for DTTB

MBCm and CAM say that they have decided to operate with two multiplex programme channels, in each of which two HD programmes, two SD programmes, one one-seg broadcasting programme and one data broadcasting programme will be multiplexed, as the basic operating mode of the DTTB platform for the time being, in view of the scale of the advertising market for terrestrial TV

broadcasting and the current technical capacities and organisational structures of the existing broadcasters. A four-face four-bay stacked loop or dipole antenna is considered as an example of appropriate antenna composition for the operation mode mentioned above. Installation of this antenna is expected to require a height of approx. 11 m and create a load of approx. 600 kg on the transmitting tower.

According to MBCo, the antenna towers currently in use on islands other than Malé are not four-leg self-supporting towers (constructed with L beams), but pole antennas or three-leg simple self-supporting antennas (constructed with pipe trusses) with small load bearing capacity. All the towers lack sufficient strength and some of them are deformed by their own weight because of insufficient load bearing capacity. Some of them are also seriously corroded by rust. Therefore, a new tower will have to be constructed at each transmitting station for the DTTB platform. As the tower at the TV station on Malé Island was built more than 30 years ago, it is also recommended to replace it with a new one at the time of establishment of the DTTB platform.

The Maldives Telecommunications Regulation 2003 stipulates that the permission of CAM and the Island Councils concerned must be obtained for the construction of communications and broadcasting towers. As towers may not be constructed in environmental protection areas designated by the Environmental Protection Agency (EPA) under the jurisdiction of the Ministry of Environment and Energy, sites outside of those areas will be selected for tower construction at the stage of preparation of the construction plan. The Environmental Impact Assessment (hereinafter referred to as "EIA") Regulation was implemented in 2007 in accordance with the Environmental Protection and Preservation Act of the Maldives (Act No. 4/1993). The EIA Regulation stipulates the EIA application procedures and EIA exemptions and mandates submission of EIA reports to the competent authorities.

The EIA Regulation clearly states the conditions for EIA exemption which applies to construction in an area smaller than 4,000 square feet (approx. 372 m^2). Construction of an antenna tower is generally exempt from EIA so long as an ordinary environment-friendly construction plan is submitted, because it satisfies this area condition. However, the EIA Regulation stipulates that confirmation by CAM and the Island Council concerned, instead of EIA, is required at the stage when a practical study on location is conducted by radio wave propagation simulation and other means of tower construction which is exempt from the requirement for EIA. CAM must inform EPA of the details of applications for tower construction, whenever it approves such an application.

Meanwhile, two mobile phone service providers have achieved 100 % coverage in the country. According to CAM, many of their towers have sufficient strength and rigid structure. The largest rebroadcaster, Medianet, owns a 150 m-high tower on Villingili Island and it is planning to construct an approx. 200 m-high tower in another atoll. If it is found that such towers owned by private companies can be used for DTTB in the study on use of private property, migration to DTTB will be implemented smoothly as the use of these towers will eliminate the need for a study to find new locations to construct antenna towers and a study on the need for EIA. The use of these towers for DTTB will also enable reduction of the overall cost for tower construction, which shall lead to affordable levels of user fees for the platform. In order to conduct radio wave propagation simulation

and prepare an appropriate channel plan, a decision on whether the existing towers can be used for the DTTB platform and the locations of the transmitting stations will have to be made at the basic design stage.

(3) Study on Sites for New Towers and Environmental and Social Considerations

If the above-mentioned study on the existing towers reveals that they can be used in the DTTB platform, it is preferable to prioritise their use in the preparation of the site plan for the transmitting stations.   However, as it is impossible to establish the platform with only the existing towers, a study on sites for new towers will have to be conducted in addition to the study on the existing towers. Table 3.2-2 below shows the candidate sites for the transmitting stations.   First, plots which can be used for tower construction will be identified at each candidate site and examined for their suitability for tower construction.

Existence of enough space to construct the tower and a station building in which the transmitter will be installed and ease of extending the commercial power supply will be the criteria for identification of the plots.   If a site is on an island with an optical fibre cable connection, ease of extending the cable will be the criterion for identification of potential plots.   Plots at locations where there are no obstructions to microwave transmission will be selected for the construction of private microwave transmitting stations.

Meanwhile, it is desirable to conduct a preliminary study on the plots for new tower construction to confirm that there will be no environmental or social concerns over the construction of the new towers on the plots.   As EIA is not required for construction work conducted on a plot with an area of 372 m^2 or less, in principle there will be no need for EIA for the establishment of the platform. Nonetheless, it will be necessary to select plots outside the designated environmental protection areas declared by EPA and with sufficient preliminary consultation with the Island Councils.

(4) Study on Equipment Procurement Plan and Work Schedule

The equipment procurement plan and work schedule will be prepared in accordance with the equipment plan for the DTTB migration project.   A practical study on the specifications of the equipment will be conducted for preparation of the procurement plan and the specifications, prices and procurement methods of the selected equipment will be provided in the plan.   Another study will be conducted on the availability of a budget for equipment procurement to prepare the procurement schedule.

As the schedule for establishment of the transmitting station at each site will be decided according to the site plan for the transmitting stations and the DSO/ASO plan, the work schedule will be prepared by drawing up the schedule for transportation of the equipment to remote islands and all the necessary work to be implemented at the site in chronological order.

These plans will be prepared at the planning stage in the roadmap for DTTB migration shown in Figure 3.1-1.

3.1.7   Study on Organisational and Human Resource Development

(1)   Study on Disaster-Prevention Broadcasting and Development of Organisational Structure and Human Resources for the Operation of EWBS

NDMC, the organisation responsible for disaster management, and MMS, the organisation responsible for disaster monitoring, have great expectations of the emergency warning broadcasting system (hereinafter referred to as "EWBS"), one of the functions of the ISDB-T system.   CAM also considers EWBS to be the best information dissemination means in the Maldives, superior to mobile phone networks, when the communication systems available in the country are compared.

In the system for the issuance of disaster information and evacuation directives, MMS is responsible for the monitoring of disasters and issuance of advisories and warnings and NDMC issues evacuation advisories and directives on the basis of the advisories and warnings issued by MMS, as mentioned in Chapter 2.5.4.

In the disaster information dissemination system in the Maldives, the Island Councils are the organisations closest to the island residents.   As all public activities in the island-based communities are operated by the Island Council of the island, it is assumed that the council will play a significant role in dissemination of information such as evacuation directives.   Meanwhile, atoll disaster committees established with assistance from UNDP are planning to establish committees at island level.

Introduction of EWBS will require not only installation of a mechanical system in the broadcasting systems, but also establishment of information flow routes from the organisation monitoring disasters to the organisation issuing evacuation directives and from there to the people with solid legal backing and people's understanding of the system.   The people will also need a full understanding of what the warnings transmitted through EWBS mean.

In Japan, EWBS is used for transmitting warnings issued by the Japan Meteorological Agency, implementing the disaster mitigation and the disaster monitoring organisation of Japan, to TV viewers. Meanwhile, administrative organisations with the authority to issue evacuation directives, such as local governments, issue advisories and directives while maintaining constant contact with the disaster monitoring organisation.   They use such means as disaster radio systems operated by local governments and house-to-house visits for dissemination of advisory information and instructions. Broadcasters are informed of the issuance of advisories and directives and they immediately transmit the information in their programmes.

Many developing countries do not have well-developed disaster information dissemination systems because of the shortage of human resources and equipment.   Therefore, it will be necessary to conduct preliminary assessment/verification to confirm whether EWBS can function in such countries in the same way as it does in Japan before introducing the system, if the operating method used in Japan is to be used there.   A study on the readiness of broadcasters to incorporate EWBS will be also included in this preliminary assessment/verification.

Another study will be required to decide whether EWBS will be used by all the terrestrial TV broadcasters or centrally by MBCo.   In the case of centralised operation of EWBS by MBCo, the

channel on the TV receivers will automatically be switched to the MBCo channel when EWBS is activated for transmission of disaster information, regardless of what channel viewers are watching at the time.   In this case, the signal to change the channel is transmitted from the Network Operation Centre of the DBNO.   As it is currently unlawful for rebroadcasters such as the DBNO to change the channel on TV sets or edit programme content or suspend the programmes of other broadcasters, the authority will have to be granted to the DBNO to allow it to do the above-mentioned when EWBS is activated for issuance of disaster information.

Studies will have to be conducted on the matters mentioned above which require special attention and guidelines will have to be prepared and an organisational structure established for the operation of EWBS based on the results of the studies.   The techniques required for the operation of EWBS cannot be mastered in a short period of time.   The most effective way of operating the system for the time being is to focus on developing the capacity for disaster information broadcasting by improving the quality and quantity of disaster reporting and provision of disaster-related information.   A clear strategy on how to prepare the guidelines and what structure is required for the system will emerge when disaster information broadcasting is provided continuously.   Alternatively, EWBS may be introduced in stages: For a certain period of time, the system will be operated only for evacuation practice and on a trial basis.   During this trial period, problems and tasks which are expected to emerge after full-scale operation has begun will be identified and, when solutions to the problems and tasks have been found, full-scale system operation will begin.   In Japan, EWBS was operated on a trial bases for years from the time of analogue TV broadcasting.   What is most important in the early stages is to convince people that TV broadcasting is a reliable resource for obtaining disaster information at any time.

Human resources for disaster information broadcasting and EBWS operation will have to be developed after the guidelines and organisational structure for the operation of EWBS have been developed.   Human resources will have to be developed comprehensively not only at the DBNO and broadcasters but also at NDMO and MMS.   Staff members of these organisations will be required to acquire the skill to respond rationally to emergency situations through simulation and training in information transmission.

(2)   Training of Personnel in DTTB

A significant proportion of the equipment which is in use will be replaced after DTTB migration. Some broadcasters have already begun using HD equipment.   While there is little difference in the manipulation of HD and SD equipment, data broadcasting, one-seg broadcasting and EPG are new technologies for broadcasters in the Maldives.   In order to operate these services appropriately and stably, operators will have to be trained.   Production of data broadcasting programmes, in particular, is completely different from conventional programme production because it requires programming and designing with the Broadcast Markup Language (hereinafter referred to as "BML"), the programming language for data broadcasting.

Highly reliable and stable operation of transmitters will be essential for the DBNO to operate DTTB. The best way to ensure such reliable and stable operation will be to conduct thorough regular

inspections of the transmitters as a measure to prevent breakdowns. In the worst case of breakdown, countermeasures such as switchover to a backup transmitter or replacement of a defective part will be taken immediately.

Training of personnel capable of responding appropriately to such situations will be required in the transition from analogue to DTTB.

3.1.8　Assistance for Preparation of Technical Standards

(1)　Background to Assistance for Preparation of Technical Standards

Medianet, a large-scale rebroadcaster, provides rebroadcasting services using MMDS in the Maldives. Medianet only has frequency licences for trunk transmission lines issued by CAM and has no permission to use MMDS as a communication means.　Medianet claims that the legal framework currently in force does not require the specification of communication standards for the issuance of frequency licences of trunk transmission lines.

Medianet sells the STBs required for watching its rebroadcast programmes. It is considering making them HD-compatible and incorporating new technologies.　A remote-control function and programme recording function performed by coupling smart phones and STBs used in Singapore are examples of such new technologies under consideration.

However, some of what Medianet is considering is beyond what a private broadcaster may be allowed to do on its own.　For example, it overlooks the possibility of infringement of copyrights on broadcast programmes by the use of the programme recording function.

Meanwhile, CAM and the recently established MBCm do not have sufficient technical capacity or engineers to prepare appropriate technical standards adapted to ISDB-T.　Because the members of CAM and MBCm do not have sufficient knowledge or understanding of the new technologies used in DTTB, it will be difficult for them to prepare the standards for DTTB by the time the government and broadcasters that wish for early DTTB migration hope the migration will be completed.　Since concrete technical standards and guidelines for licencing will have to be available by the stage at which the basic design for the establishment of the DTTB platform is drawn, the Ministry of Internal Affairs and Communications of Japan and ARIB have decided to jointly assist in the preparation of technical standards.

(2)　Work Process in Assistance for the Preparation of Technical Standards

The Survey Team held discussions with the organisations concerned with DTTB migration on the adoption of the preliminary draft ISDB-T Technical Standards for the Maldives prepared by the Digital Broadcasting Expert Group Task Force (hereinafter referred to as the "DiBEG Task Force") in the Digital Broadcasting Expert Group (hereinafter referred to as "DiBEG") established jointly by the Ministry of Internal Affairs and Communications of Japan and ARIB.

The Survey Team provided the relevant organisations with a detailed explanation of the preliminary draft, received comments on it from the Maldivian side and asked the DiBEG Task Force to incorporate these comments in the draft.　Then, the team submitted the revised draft standards to the

government of the Maldives and relevant organisations as the final draft after explaining the details of the revised standards to the stakeholders including private broadcasters. Figure 3.1-3 illustrates the above-mentioned process.
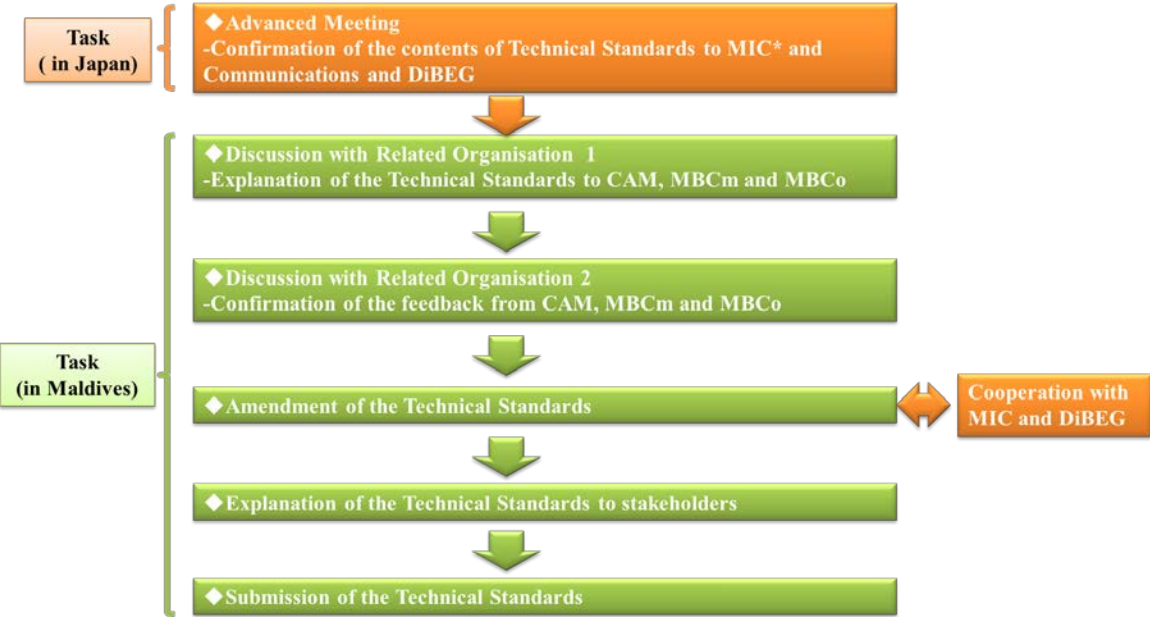
* Ministry of Internal Affairs and Communications

Figure 3.1-3 Work Process in Assistance for the Preparation of Technical Standards

(3)   Requirements for the Technical Standards

Technical standards play one of the following two major roles.

One is to provide criteria for type approval certification of the equipment for DTTB at the time of manufacture/import as a legal document and the other is to provide guidelines for the manufacture and import of equipment for DTTB.   It has been decided that the technical standards to be prepared will be the guidelines.   The Broadcasting Regulations will be used to regulate the transmission of broadcasting waves and to confirm whether an applicant satisfies the technical requirements for appropriate radio frequency radiation at the time of issuance of the licence to the applicant.   In addition, radio wave transmission will be controlled by regular monitoring of the radio waves for interference.   Thus, it has been decided that the technical standards will describe all the technical requirements and specifications required for manufacturing broadcasting equipment in detail.

As type approval certification is institutionally required in the Maldives, a standard form specifically for certification by MBCm and CAM will be prepared.   With the use of the technical standards as guidelines, the certification form concerned is expected to be simple and user-friendly.

(4)   Method of Assistance for Preparation

The DiBEG Task Force prepared the draft technical standards by identifying the provisions in the ARIB Standards, ABNT standards – the Brazilian version of ISDB-T standards - and ISDB-T Harmonisation Documents which had to be changed or revised to make them applicable in the

Maldives by means such as setting appropriate parameters.

Even though the same ISDB-T system will be used in the three countries, the transmission bandwidths, video compression systems and description languages for data broadcasting to be used in the systems of the three countries are different, as shown in Table 3.1-4 below.   Therefore, the existing ARIB and ABNT standards may not be applied in the Maldives without revision.   If the entire ARIB and ABNT standards are revised for use in the Maldives, thousands of pages of standards will have to be maintained in the Maldives in future.   On the other hand, the Maldivian side will in practice have to maintain less than 100-page long standards if only those provisions in the ARIB and ABNT standards which have to be revised for use in the Maldives are identified and revised accordingly and, for those provisions in the two standards which are applicable in the Maldives without revision, the original standards can be referred to.   It should be noted that, when a provision in the ARIB or ABNT standards which is applicable in the Maldives without revision is revised, the corresponding provision in the Maldivian standards will have to be revised by the Maldivian side.   Figure 3.1-4 illustrates the above-mentioned procedure.

Table 3.1-4 Comparison of the ISDB-T Systems (to be) Used in the Three Countries

	Japan	Brazil	Maldives
Main applied standards	ARIB Standards	ABNT Standards	Maldives Standards
Transmission bandwidth	6 MHz	6 MHz	8 MHz
Method of compression of video digital data	MPEG-2	MPEG-4	MPEG-4
Data broadcasting	BML	GINGA	BML
Maximum multiplexed-programmes in one frequency	SD+HD: total 8 One-seg: 3 Data: 16	SD+HD: total 8 One-seg: 3 Data: 16	SD+HD: total 8 One-seg: 3 Data: 16
Current operation in one frequency (recommended operation for the Maldives)	SD: 3 or HD: 1 One-seg: 1/2 Data: 1	SD: 2/3 or HD: 1/2 One-seg: 1/2 Data: 1	SD: 2 + HD: 2 One-seg : 1 Data: 1

Source: JICA Survey Team based on reference materials provided by ARIB
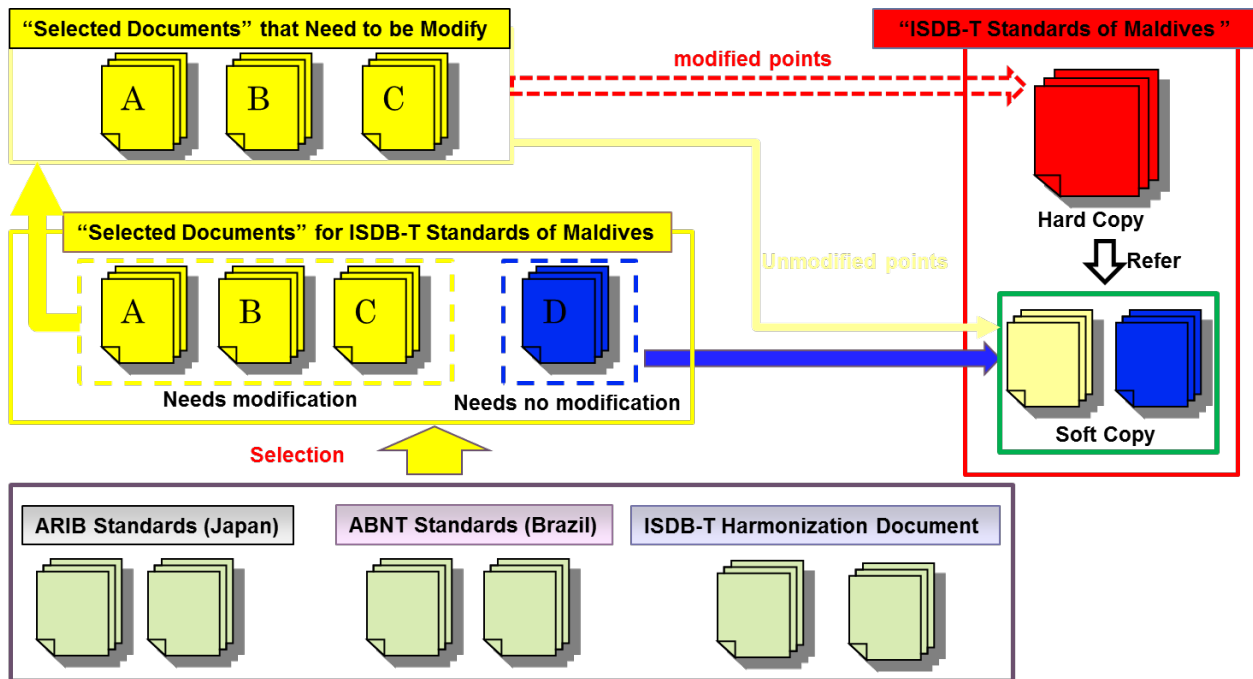
Source: JICA Survey Team

Figure 3.1-4 Procedure for Preparation of the Technical Standards

(5) Matters to be Decided by the Maldivian Side

The Maldivian side will have to decide the following during preparation of the technical standards:

   i)   Number of HD programmes multiplexed in each channel;

   ii)   Whether or not to multiplex SD programmes in the channels and their number of SD programmes;

   iii) Number of data broadcasting programmes to be multiplexed in each channel;

   iv) Number of one-seg broadcasting programmes to be multiplexed in each channel;

   v)   Selection of providers of data broadcasting and one-seg broadcasting programmes; and

   vi) Programme channel allocation.

Only the maximum number of programmes which can be multiplexed in each channel is described in the technical standards for flexible and independent application in future.   However, a study will have to be conducted on various issues expected to emerge when the actual DTTB platform is in operation. As the number of programmes multiplexed in each channel, in particular, will decide the number of frequencies required and affect the business strategies of broadcasters which provide programmes via the platform, the operating rules will have to be prepared at the beginning.

MBCm and CAM plan to operate two physical channels with two HD programmes, two SD programmes, one one-seg broadcasting programme and one data broadcasting programme multiplexed in each channel for DTTB, taking into consideration the possibility of an increase in the number of broadcasters using terrestrial TV broadcasting in future.   It will be possible to transmit two data programmes using the two channels.   MBCm and CAM plan to allocate one channel for broadcasting content prepared by MBCo and allocate the remaining data broadcasting channel and two one-seg

broadcasting channels to broadcasters selected either by assessment of proposals or by auction. Because the programme on the logical channel with the smallest channel number in the physical channel automatically appears on the screen when the said physical channel is selected, programmes on the said logical channel are likely to be viewed by more people than those on the other logical channels. Therefore, MBCm and CAM also intend to find an appropriate method of allocating logical channels.

Figure 3.1-5 below illustrates the multiplex operation to be used in the Maldives.
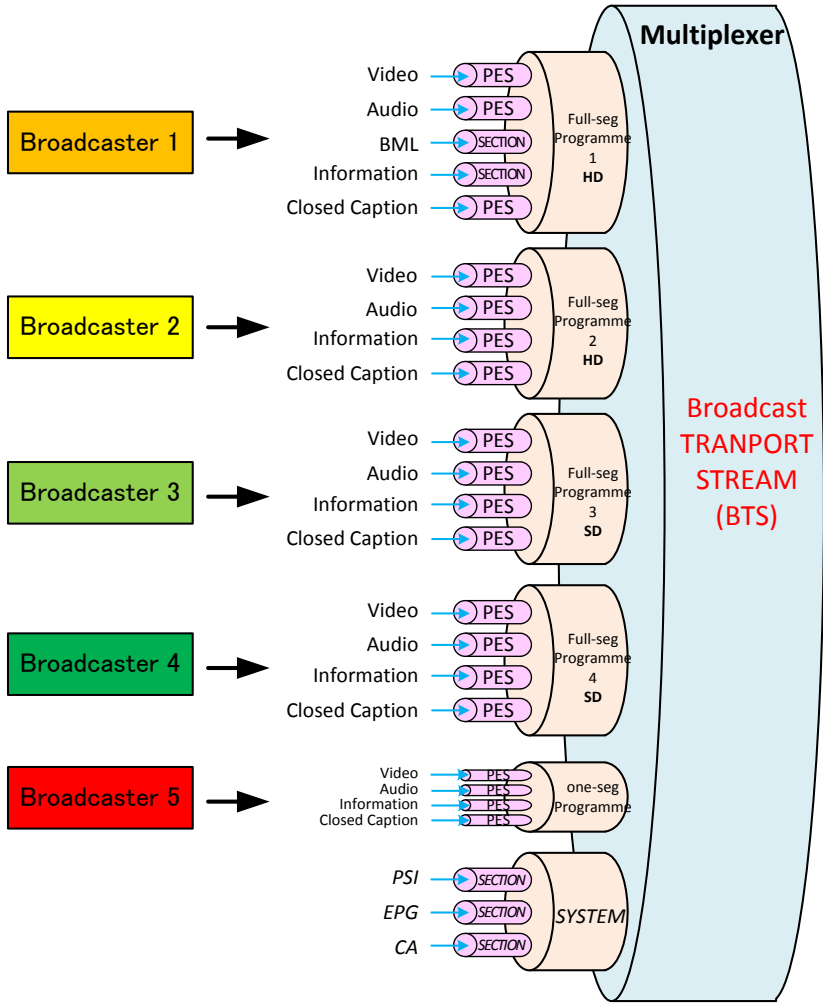
Source: JICA Survey Team

Figure 3.1-5 Multiplex DTTB Operation in the Maldives

(6)   Output of Assistance for the Preparation of Technical Standards

As shown in Figure 3.1-3, the Survey Team provided a detailed explanation of the preliminary draft technical standards in the discussions with the three organisations (CAM, MBCm and MBCo) and they understood the contents of the standards in general. The team received several questions on frequency bandwidths and multiplex operation and provided a detailed supplementary explanation. The Survey Team received comments on the preliminary draft technical standards from the Maldivian side in discussions with the relevant organisations held two days after the first discussions. In

principle, the Maldivian side agreed to the contents of the presented draft with the exception of the frequency channels to be allocated to TV broadcasting. Then, the Survey Team held an explanation meeting for stakeholders including private broadcasters. The meeting was attended by 27 people including participants from 11 private broadcasters and they agreed to the contents of the draft.

After the conclusion of the explanation meetings, the Survey Team delivered the final draft of the Technical Standards in person to CAM and MBCm in the presence of the Deputy Minister of Home Affairs of the Maldives. The team also submitted the ARIB and ABNT Standards and ISB-T Harmonisation Documents as attachments to the draft.

CAM will officially approve the said draft technical standards as the ISDB-T technical standards of the Maldives and utilise them as guidelines for the specifications of the equipment. CAM plans to complete the approval process shortly and publicise the standards. As it is a rule in the Maldives for CAM to certify type approval of equipment such as transmitters and receivers, CAM intends to prepare a form in a simple format for type approval and use it for certification. The form will be prepared by excerpting the required parts in the draft technical standards. MBCm will issue frequency licences to applicants when application for use of a frequency is submitted with a plan to use appropriate equipment which has been granted product type certification for broadcasting.

3.2　Direction of Future Assistance

3.2.1　Policy on Examination of the Direction of Assistance

To determine the direction of future assistance, examination was conducted of the following:

i) Prioritisation of Expansion of the DTTB Service Area

MBCo and private broadcasters can procure most of the studio equipment with their own funds. However, they have difficulty in procuring a large quantity of transmitters at one time and, therefore, transmitters will be procured on a step-by-step basis.

As a result, if private broadcasters' networks for the platform are constructed with their own funds, it will take many years until the platform itself is completely established.

CATV services are not available uniformly in all areas of the country and on distant islands the programmes that residents can see other than MBCo's programmes are limited. As indicated in the ITU roadmap, the primary purpose of establishing the DBNO is the provision of a wide variety of programmes to distant islands. In view of this purpose, when examining how to provide assistance, it was decided to place priority on the installation of as much transmission equipment and as many facilities as possible. It is deemed difficult, however, to offer assistance for the installation of all the necessary transmission equipment/facilities and, therefore, it was decided to prioritise mother stations that cover a wider area based on the ratio of coverage and population and that are required to function as mother stations to transmit high quality signals through their own microwave networks to be used in programme transmission.

ii) Establishment of Project Benefits by Drawing on the Population Coverage by Analogue Terrestrial Broadcasting

According to the ITU roadmap, one of the issues that should be examined when implementing the migration to DTTB is securing at least the same level of population coverage as analogue broadcasting. The details of the assistance will be examined in order to promote the migration to DTTB by prioritising the coverage of as many households as possible and also by focusing on the realisation of greater benefits.

iii) Creation of Assistance Content that is Effective in Preventing DBNO Operational Costs from Increasing

When creating the project content, consideration should be given not only to ensuring a wider service area and realising a population coverage equivalent to that of analogue terrestrial broadcasting, but also to developing an effective project with components that will prevent DBNO operation costs from increasing. In this way, migration to DBNO will be more appealing to a number of broadcasters.

iv) Creation of Assistance Content that Promotes Efforts towards Disaster Information Broadcasting

In order to ensure that EWBS, which is one of the distinctive characteristics of the ISDB-T system, functions effectively, efforts should be made to enhance the organisational capability of the disaster management organisation, NDMC. It is, however, expected to take time. Meanwhile, to promote EWBS, it is essential that viewers understand disaster information broadcasting on a daily basis and that viewers' understanding of the important need for disaster information is promoted.

The Survey Team will, therefore, examine the project components that will further promote efforts towards disaster information broadcasting.

3.2.2 Possible Assistance Components for the Establishment of the DTTB Network

(1) Transmitting Stations to be Targeted in the Project

When examining the direction of assistance, it is necessary to study the benefits of project implementation. The benefits of this project can be obtained most appropriately by calculating the population of the broadcasting service areas using the channel plan (including the frequencies to be used, location of the transmitting stations, transmission output and effective radiation power (ERP) and antenna height). To determine the direction of assistance, therefore, the Survey Team examined three different assistance plans based on different population coverages as shown in Table 3.2-1 below.

Table 3.2-1 Comparison of Project Plans

	Possible Assistance Plans		
	Plan 1	Plan 2	Plan 3
Summary	Total Expenses: 1,689 million yen Transmitting Stations: 10	Total Expenses: 2,050 million yen Transmitting Stations: 13	Total Expenses: 2,627 million yen Transmitting Stations: 19
Criteria for Selection of Transmitting Stations	1. Coverage of more than 2,000 persons and possession of optical fibre points Or	(In addition to "Plan 1" stations) Coverage of more than 1,000 persons with transmitters with over 100W output power	(In addition to "Plan 2" stations) Coverage of more than 1,000 persons or mother stations

	Possible Assistance Plans		
	Plan 1	Plan 2	Plan 3
	2. Coverage of more than 1,000 persons and mother stations with transmitters with over 100W output power		
Coverage	People: 204,704 (71.1%)	People: 232,684 (80.8%)	People: 253,562 (88.0%)
	Islands:105	Islands: 130	Islands: 151
Advantages	- Major transmitting stations are included - DTTB network base is built	- Population coverage is larger than existing analogue broadcasting coverage (77.3%) - Accordance with development plans in the Maldives - Increase in choice of programmes on remote islands	- Population coverage is larger than existing analogue broadcasting coverage (77.3%) - Accordance with development plans in the Maldives - Most of the large power transmitting stations are included
Disadvantages	- Population coverage is lower than existing analogue broadcasting coverage (77.3%) - Not in accordance with development plans in the Maldives	- Central part of the Maldives is not covered compared to other areas	- Most cost effective of the three potential assistance plans - Relatively larger than other Japanese grant aid projects implemented so far in the Maldives

Source: JICA Survey Team

Currently, the Maldives has no channel plan developed specifically for the DTTB platform. The Survey Team, therefore, prepared a list of candidate transmitting stations for the DTTB platform, based on a list of transmitting stations for DTTB which was under examination by MBCo and referring to analytical results and the opinions of the Survey Team. The project plans shown in Table 3.2-1 were prepared assuming that the candidate transmitting stations listed for the DTTB platform will be selected as the target sites. These candidate stations are also shown in Table 3.2-2 below.

To determine the benefits of the project, the Survey Team obtained the transmission outputs and service areas to be achieved using an antenna height of 45 metres which is standard for MBCo and calculated the number of inhabited islands, population and households within the area. In this calculation, the Survey Team used data collected in the latest version of the population statistics developed for each island (2006 Census). Data such as the location of transmitting stations, transmission output and ERP and antenna height will be determined formally after the radio wave propagation simulation is carried out.

Although the frequencies to be used are not yet determined formally, MBCm wishes to allocate six frequencies from Ch 32 to 37 to DTTB.

Table 3.2-2 List of Candidate Transmitting Stations for DTTB Platform

Plan	No.	Atoll	Island name	Service area No. of islands	Service area Population	Service area Households	Transmitting power (W)
-	1	HA	Huvarafushi	6	5,538	874	100
1	2	HA	Dhidhdhoo	9	7,776	1,547	200
1	3	HDh	Kulhudhuffushi	15	15,169	2,787	100
-	4	HDh	Makunudhoo	1	1,045	198	2
2	5	Sh	Funadhoo	10	9,456	1,665	200
1	6	N	Manadhoo	13	10,015	1,811	200
2	7	R	Ungoofaaru	12	12,349	2,154	100
1	8	B	Eidhafushi	13	8,893	1,546	200
1	9	Lh	Naifaru	5	8,346	1,438	200
1	10	K	Malé	15	103,693 7,653	14,1075 1,031	500
-	11	K	Gaafaru	2	2,496	402	100
3	-	K	Maafushi (Micro station only)	N/A	N/A	N/A	N/A
-	12	AA	Rasdhoo	3	2,714	422	200
1	13	Adh	Dhangethi	10	6,921	1,043	200
3	14	V	Felidhoo	5	1,502	255	200
-	15	M	Mukah	8	4,710	793	100
3	16	F	Nilandhoo	5	3,662	565	100
-	17	Dh	Kudahuvadhoo	7	4,967	768	100
3	18	Th	Guraidhoo	5	3,455	580	200
-	19	Th	Omadhoo	7	4,798	825	100
1	20	L	Gan	12	11,743	1,963	500
3	21	GA	Viligili	4	4,623	814	200
-	22	GA	Kolamaafushi	1	1,087	189	20
-	23	GA	Dhevvadhoo	1	480	105	1
2	24	GDh	Thinadhoo	3	6,175	1,066	200
1	25	GDh / GA	Gadhdhoo	8 / 4	6,633	1,428	500
3	26	Gn	Foammulah	1	7,636	1,332	10
1	27	S	Hithadhoo	6	17,862	3,094	200

* Plan= 1: Plan 1; 2: Plan 2 which is Plan 1 plus Plan 2; and 3: Plan 3 which is Plan 1 plus Plan 2 plus Plan 3.
Source: JICA Survey Team

(2)   Study of Project Plans

1)   Plan 1

The first plan, Plan 1, targets a total of 10 transmitting stations shown in Table 3.2-2 (transmitting stations indicated as 1 in the Plan column in Table 3.2-2).

These 10 transmitting stations were selected as they will be the mother stations for their own private microwave networks (See Figure 3.1-2) as well as being expected to cover more than 2,000 households and they are fibre optical base stations with optical fibre connecting points or are expected to cover more than 1,000 households and have more than 100W transmission output.

MBCm and MBCo aim to expand the coverage basically starting from islands with larger populations. As optical fibre and private microwave networks will be used to expand the areas where the stations are installed, it is necessary to ensure that the transmitting stations with optical fibre connecting points or mother microwave stations (signals are sent to other stations from the mother station and other stations use the signals received from the mother station to transmit broadcast waves) are operated stably and transmit high-quality signals. As a result, it is planned to target base stations with a larger number of households.

- Benefit

  It is expected that 204,704 people will benefit (obtained based on the 2006 Census), which corresponds to a population coverage of 71.1 %.

- Advantages

  Because a larger number of households will be covered and the transmitting stations that will function as mother stations for optical fibre and major microwave networks will be constructed, the foundations of a TV broadcasting network which the Maldives will continue to expand will be established. Of a total of 27 candidate transmitting stations, about a third will be constructed under this project. When calculating the cost-benefit-effectiveness based on the amount of budget spent in this project (for the project budget, see (4) in this section) in relation to the population within the target area, the cost-benefit-effectiveness will be approximately 8,300 Japanese yen per person who has reception of DTTB, which can be said to be the highest of the three plans.

- Disadvantages

  While currently the population coverage of analogue terrestrial broadcasting offered by MBCo is 77.3 % (estimated by the Survey Team), the projected coverage to be obtained through this project will be 71.1 % at the highest. Of these three plans, therefore, this plan is the lowest in terms of the degree of contribution to rapid migration to DTTB.

2)   Plan 2

This plan targets a total of 13 transmitting stations shown in Table 3.2-2 (those indicated as 1 and 2 in the Plan column in Table 3.2-2).

These 13 transmitting stations include the 10 planned stations selected in Plan 1 and three other

stations that are expected to cover more than 1,000 households and have a capacity of 100W transmission output or more.

As in Plan 1, priority was placed on islands with a larger population and then transmitting stations expected to have a transmission output of 100W or more were selected additionally. As a result, islands with an expected coverage of more than 1,000 households except for Foammulah Atoll are included in the scope of this project. The transmission output of the station on Foammulah Atoll is projected to be 10W. The larger the output, the higher the price of the transmitter and, therefore, transmitting stations with higher transmission outputs were prioritised in order to lower the financial burden.

- Benefit

  It is expected that 232,684 people will benefit (obtained based on the 2006 Census), which corresponds to a population coverage of 80.8 %.

- Advantages

  Of a total of 27 candidate sites for construction of the digital transmitting stations, 14 cover more than 1,000 households. Of those 14, if 13 stations are constructed, about 80 % of the total population will be able to watch digital broadcasting programmes through the platform. In addition, on distant islands, programme content other than that of MBCo and pay broadcasters has never been available but viewers on such islands will have more options as six private broadcasters at most will migrate to the platform (if MBCo continues to offer the current two programme line-ups) and use multiplex technology to broadcast programmes.

  By implementing this plan, greater coverage than currently available terrestrial broadcasting will be achieved and the objective of the government of the Maldives to ensure coverage at least at the same level as current broadcasting will be satisfied.

  The cost-benefit-effectiveness will be approximately 8,800 Japanese yen per person who has reception of DTTB, which is not much less than Plan 1.

- Disadvantages

  In this plan, it is expected that at least one transmitting station will be constructed in each area except for the Central area, but the existing information gap will not be reduced in the Central area where the communication infrastructure is not well developed and there are very few rebroadcasters.

3) **Plan 3**

Of the transmitting stations shown in Table 3.2-2, a total of 19 are targeted (those indicated as 1, 2 and 3 in the Plan column in Table 3.2-2).

These 19 sites are selected as they are expected to cover more than 1,000 households or be mother stations of private microwave networks (See Figure 3.1-2).

- Benefit

  It is expected that 253,562 people will benefit (obtained based on the 2006 Census), which

corresponds to a population coverage of 88.0 %.

● Advantages

DTTB will be available in every area of the Maldives.

Of a total of 27 candidate transmitting station sites, the 19 transmitting stations to be constructed will include all the stations that cover more than 1,000 households, the transmitting stations located on the same sites as the optical fibre connecting points and the mother stations of private microwave networks. By implementing this plan, extremely high network stability and reliable signal quality of the DTTB platform will be achieved. In addition, a private microwave station will be constructed at all the sites, making expansion of the network relatively easy if broadcast signal relaying is used. It is also expected that procurement will be easier because smaller size transmitters with smaller transmission output will be purchased for nearly half of the sites.

● Disadvantages

Under this plan, the cost-benefit-effectiveness will exceed 10,000 Japanese yen per person who has reception of DTTB, which is the worst of the three plans. The scale of the project will also be the largest compared to past grant aid projects implemented in the Maldives.

4) Comparison of Three Plans

Table 3.2-3 below is a comparison of the three plans by population coverage and estimated population and ratio in areas where DTTB will not be available even after the grant aid project is completed. Also shown are the population and ratio in other areas where CATV services are currently available or TV broadcasting is available but only through TVRO.

In future, after the completion of the grant aid project, the government of the Maldives will determine the policy for areas other than those listed in Table 3.2-3 below, where DTTB is not available, for example, whether they should offer TV broadcasting services by expanding terrestrial broadcasting or implement different measures to promote CATV subscriptions in poor reception areas.

Table 3.2-3 Estimation for Each Plan

		Plan 1	Plan 2	Plan 3
Analogue reception	Population (coverage)	222,718 (77.3%)		
Digital reception	Population (coverage)	204,704 (71.1 %)	232,684 (80.8 %)	253,562 (88.0 %)
Outside digital reception	Population (coverage)	83,397 (28.9 %)	55,417 (19.2 %)	34,539 (12.0 %)
CATV Service Area	Population (coverage)	43,953 (15.3 %)	25,717 (8.9 %)	12,613 (4.4 %)
TVRO only	Population (coverage)	39,444 (13.7 %)	29,700 (10.3 %)	21,926 (7.6 %)

Source: JICA Survey Team

(3)   Production and Transmission Equipment for Data Broadcasting

The government of the Maldives selected the ISDB-T system partly on the grounds of the high feasibility and quality of the Emergency Warning Broadcasting Service (hereinafter referred to as "EWBS") and value-added services such as data broadcasting and one-seg broadcasting, all of which are distinctively available through the ISDB-T system. As mentioned in Chapter 2.5.4, only a few years have passed since the organisation of NDMC and there are still several issues to be tackled if EWBS is to be introduced at an early stage. In addition, their knowledge and experience are not sufficient to develop EWBS operational guidelines and it is important to construct a mechanism to obtain weather and disaster information on an ongoing basis jointly with broadcasters and other concerned organisations so that EWBS will be operated effectively in the future.

MMS conducts weather and disaster (earthquake, tsunami, etc.) monitoring around the clock and issues advisories and warnings to NDMC and MBCo on a day-to-day basis as necessary. Also, utilising computer graphics, it produces weather forecast programmes at its weather studio in MMS's office located on the island where the airport is located. Such recorded weather forecast programmes, however, are broadcast once a day, because no transmission equipment to send signals from MMS to MBCo can be procured due to a lack of budget.

Information that MMS currently offers on its website can be made available to the public as weather and disaster information on an ongoing basis if data broadcasting is used and in fact viewers' need for such weather and disaster information is high. If data broadcasting is used and transmission equipment is procured to send information in a timely manner from MMS to MBCo, the necessary information can be sent to MBCo in real time.

It is desirable to examine how to utilise and operate EWBS in the future by continuing efforts to realise real-time information provision and, in that sense, it is reasonable to decide to include the procurement of equipment for producing and transmitting data broadcasting in the scope of the project. By so doing, the project is expected to offer a favourable outcome.

(4)   Examination of Project Budget Scale

Examination was carried out of the projected budget scale for each of the above three plans.

To examine the transmission system, an equipment unit price was obtained for each transmission output capacity and, based on this, the projected budget was calculated respectively. The cost of the transmission systems shown in Table 3.2-4 below is the total cost for all the components of such systems. For other equipment, roughly calculated expenses were applied from other similar projects. With respect to the antenna towers, the amounts were calculated based on actual estimates for an antenna tower project to be implemented by MBCo. For the link transmission equipment, the cost of the links that are necessary to transmit programmes to transmitting stations within the scope of the project is included, but the cost of the links to transmit programmes to transmitting stations that are not within the scope of the project is not included even for sites where an independent microwave network will be constructed.

The amounts shown below will need to be further examined, so that the correct project budget can be

determined through more accurate cost estimation when implementing development of the project's basic design.

Table 3.2-4 Comparison of Proposed Project Components

(Unit: Million yen)

	Equipment	Plan 1		Plan 2		Plan 3	
1.	Transmission System	1	240	1	304	1	400
2.	Transmission Link /IF Device	3	81	6	162	9	243
3.	Optical Transmission Apparatus	6	240	6	240	7	280
4.	Transmitting Antenna	10	250	13	325	18	430
5.	Transmitting Station Building /Power Supply	10	120	13	156	18	214
6.	Antenna Tower	9	315	12	420	17	570
7.	Antenna Tower (Malé)	1	35	1	35	1	35
8.	EWBS Server	1	28	1	28	1	28
9.	Equipment for NOC	1	200	1	200	1	200
10.	Data Broadcasting Equipment	1	50	1	50	1	50
11.	Shipping	1	30	1	30	1	50
12.	Consultant Fee	1	100	1	100	1.0	100
	Total		**1,689**		**2,050**		**2,627**

Source: JICA Survey Team

(5)   Future Issues

As mentioned in the section on the policy for examining the direction of assistance, the Maldives aims to promote the migration to DTTB promptly. In order to provide a wide variety of terrestrial broadcasting targeted at distant islands, the migration should be implemented promptly and private broadcasters who have gone ahead in adopting a European system should be encouraged to participate, with due consideration for the willingness of each private broadcaster.

On the other hand, the platform to which broadcasters will migrate needs to have reliable and stable facilities and equipment. If the facilities and equipment are made more stable, the project cost will naturally be higher. As mentioned in the section on design policy, priority is placed on securing as large a service area as possible when constructing the DTTB network. The plans were examined assuming that one transmitter will be employed for each transmitting station and each frequency without any backup equipment. Therefore, not only will a prompt response be needed to deal with possible incidents of transmitter breakdown but also measures to respond to such breakdown incidents should be examined in advance.

As a means of meeting the above requirement, it is desirable to have extra transmitters for common use as backup by the stations, to conduct regular inspections appropriately, implement preventive measures and secure a backup for other equipment such as the power amplifier (PA). As mentioned in Chapter 2.2.3 above, Japanese transmitter manufacturers have no service offices in the Maldives.

Therefore, it takes time for the manufacturers to respond to requests for repair. If the DVB-T/T2 transmitters procured by private broadcasters can be made operable for ISDB-T, the transmitters can be used as extra backup for common use or as backup transmitters for major transmitting stations like the one in Malé. It is necessary to examine these measures and responses when planning equipment procurement.

3.2.3   Examination of Other Assistance

(1)   Improvement of Platform Operational Capability of the DBNO

The government of the Maldives started the preparation process by establishing a new organisation, the DBNO, and it is considered necessary for there to be around 40 network/transmission engineers stationed at the DBNO. Although the Survey Team heard that the government was studying the possibility of recruiting personnel from CAM, MBCo and private broadcasters, the engineers' ability seems to vary largely from person to person. In particular, only a few private broadcasters have experience in terrestrial broadcasting and, even if they have some experience, their know-how in operation of a TV broadcasting network is poor as these broadcasters cover only Malé and the surrounding area.

Meanwhile, a critical issue for the DBNO is to offer stable broadcasting. Programmes will be broadcast in exchange for fees and on behalf of programme providers, and risks should be controlled so that compensation can be avoided for damages arising from disruption of broadcasting for reasons of equipment-related trouble. There is a possibility that terrestrial broadcasting will not be viewable in the target areas if the broadcasting network of the DBNO fails to operate. It is, therefore, essential to have highly reliable facilities and equipment.

Although it is vital to train the engineers who will be newly employed by the DBNO, MoHA considers that the country alone cannot offer training in new technologies. In addition, if this grant aid project is implemented, although initial training in operation will be offered, such initial training usually does not cover how to conduct regular inspections or how to replace parts.

It is necessary, therefore, to examine the possibility of offering technical assistance by combining subject-focused training and the dispatch of senior volunteer engineers or by providing technical assistance as a soft component of the grant aid project in order to deepen local engineers' understanding of stable operation of DTTB equipment and to help them prepare manuals on regular inspection, part replacement and on-call response at the Network Operation Centre (hereinafter referred to as "NOC"). If a preparatory survey is implemented, it is desirable that detailed examination be carried out of how to utilise what kind of assistance schemes as well as what will be the actual content of the assistance.

(2)   Improvement of Capability in Data Broadcast Production and Provision of Disaster Information Broadcasting (linked with a technical cooperation project in Sri Lanka)

As mentioned in Chapter 3.2.2 above, it is considered reasonable to select the provision of equipment for data broadcast production and include it in the scope of this project, in order to enhance the

country's weather and disaster information broadcasting, though it is necessary to produce data broadcasts using a broadcast markup language, BML. The Maldives has not used BML in the past and assistance should be given in order to promote their acquisition of data broadcast production techniques.

For data broadcast production, information needs to be provided by organisations involved in the data broadcasting programmes to be offered. If MMS starts providing information on an ongoing basis, weather and disaster information will become rich in content. However, although it is necessary for broadcasters to establish an organisation to offer disaster information on an ongoing basis and prepare and review operation rules and guidelines, MBCo does not have enough experience in disaster information broadcasting.

Meanwhile, when looking at the environment for assistance projects in the Maldives, it is expected to be difficult to launch a technical cooperation project in parallel with a grant aid project. Therefore, it is worth examining a link with a similar technical cooperation project in neighbouring Sri Lanka to be implemented at around the same time (it will be technical cooperation by incidental ODA loan) and expanding the experts' activity in Sri Lanka to the Maldives. As the timing of implementation of the ODA loan project in Sri Lanka is unclear, however, it is necessary to pay attention to the timing of implementation of projects both in Sri Lanka and the Maldives.

Additionally, it should be noted that an institutional review is necessary concerning, for example, whether a technical cooperation project implemented in an ODA loan project and a grant aid project can be implemented as one and the same project or not.

3.3 Possibility of Japanese Companies Penetrating the Market by Adoption of Japanese Standards and Market Size

(1) Broadcasting Equipment

Since private broadcasters opened stations in the Maldives in 2008, the market for broadcasting equipment in the country has grown rapidly mainly due to the growth of CATV operators. In the Maldives, there are four broadcasters including MBCo that produce programmes on their own. It is reasonable to assume from the current situation of the country's advertising market that there will be many more broadcasters producing programmes in the future. Basically, however, private broadcasters operate with funds donated by political organisations. Especially when an election is close, the opinions of political organisations are conveyed to the public through TV programmes.

Private broadcasters have a certain level of funding ability to purchase equipment for themselves and it is thought that they will manage to upgrade the equipment they currently have in order to satisfy the requirements for HD broadcasting on a regular basis. It is predicted that Japanese companies will benefit from the sale of studio equipment in which Japanese companies excel, including cameras.

Meanwhile, in the past, the main customer for transmitters was MBCo, but some major private broadcasters have recently purchased several Japanese-manufactured analogue transmitters. This recent move occurred because private broadcasters consider that they will need to use analogue

transmitters for some years ahead as there will be a digital and analogue simulcast period for a while.

When the grant aid project is implemented, it is highly possible that a remote monitoring system will be introduced because it will reduce operating costs and maintenance of the transmitters installed on distant islands will be easier. Japanese companies particularly excel in the technology for remote monitoring systems and these systems are not used very actively in other countries. It is expected that the DBNO will operate transmitting stations at around 27 sites. The grant aid project will be unable to fund the procurement of transmitters for all these sites and the transmitters unable to be procured under the project will likely be procured separately by the government of the Maldives or the DBNO. In doing so, they will procure transmitters that comply with the specifications of the already installed remote monitoring system, which means that Japanese companies will naturally have an advantage.

For Japanese companies with a potential advantage based on the specifications of transmitters mentioned above, the construction of a TV broadcasting network in which two frequencies are used at one station and a total of about 30 transmitters will be installed including back-up transmitters can be considered appealing. As more frequencies will be used in the future, the Maldives is said to be a favourable market in which a large volume of orders will possibly be placed by a single entity.

In addition, to enable transmission from private broadcasters to the NOC in the DBNO and from NOC to each transmitting station, a key issue is how to compress the broadcasting transport stream (hereinafter referred to as "BTS") signals to curb the cost of the transmission links. Japan is also strong in compression technology and has special patented technologies in this field. Whether it will be reasonable to utilise these technologies should be examined in the preparatory survey, but it can be said that Japanese companies will also have an advantage in network transmission equipment if compression technology is introduced in the basic design.

(2) Receivers

Major Japanese electrical appliance manufacturers including Panasonic, Sony, Sharp and Hitachi have established sales channels in the Maldives. Japanese-manufactured receivers are relatively expensive but they are recognised as delivering stable operation and being relatively breakdown-free. In the Maldives, many people who are financially secure like to buy Japanese products. The reason is that it is difficult to have electrical appliances repaired in the country. Users have to send the broken appliance themselves to have it repaired or send it through the retail store. In any case, they have to spend large sums for repairs. Sometimes, purchasing a new TV set is less expensive than having a broken one repaired.

Meanwhile, the Maldives does not offer many kinds of entertainment and watching TV is the most popular pastime. It is said, therefore, that many households subscribe not just to one or two CATVs but to six or seven. This can be seen from the fact that while the Maldives has a total of less than 50,000 households, the number of CATV subscribers exceeds 210,000 (source: MBCm).

Currently, a large number of DVB-T/T2 TV sets are sold in the country's market. So, in the future, people will deal with the migration to DTTB with the ISDB-T system by buying an STB. According to a Japanese manufacturer, it is not easy to give a green light to the development of a new STB product if they cannot expect demand of more than a hundred thousand units or more. In the Maldives, the

market for CATV STBs is larger than that for terrestrial STBs and in that sense, if an STB compatible with both DTTB and CATV is developed, a certain level of market share can be retained by the developer.

3.4   Matters to be Examined in Next Phase Survey

3.4.1   Preparation of Channel Plan and Radio Wave Propagation Simulation

When developing the basic design, it is essential to prepare a detailed channel plan and the plan should cover such matters as ERP, antenna height, antenna pattern, accurate position of the transmitting stations and frequencies. In addition, when implementing the construction of the DTTB platform under a grant aid project, reasonable benefits need to be achieved. When examining the benefits, it is necessary to project the population coverage.

When preparing the channel plan and calculating the expected coverage, it is also necessary to conduct a computer-assisted radio wave propagation simulation. According to the concerned parties on the Maldivian side including MBCo, they do not have the know-how or equipment to conduct such a simulation.

When examining in detail measures to implement the grant aid project, it is expected that a preparatory survey will be carried out and it will also be necessary to prepare a channel plan and conduct radio wave propagation simulation in the preparatory survey.

3.4.2   Possibility of Utilising Existing Antenna Towers and Examination of Construction Sites for New Antenna Towers

From information obtained in this survey, it was found to be difficult to utilise the existing antenna towers owned by MBCo as antenna towers for the DTTB platform because of their poor durability. Also, it was found that stakeholders such as telecommunications carriers and rebroadcasters could provide some of their own existing antenna towers to use as antenna towers for the platform. The use of such existing towers will contribute to containment of the initial investment for construction of the DTTB platform and examination should be carried out taking into account not only organisations and companies that own such towers, their weight load and the space required for installing the transmission antenna, but also the policy on operation of the platform itself in the future.

Furthermore, the sites for the transmitting stations where the antenna towers need to be newly constructed have not yet been determined. Even when the existing towers cannot be used, there is the possibility of using the transmitter huts instead or renovating the huts to meet the requirements. Although it will be necessary to judge whether the candidate tower construction sites are appropriate for use as transmitting stations for the DTTB platform, the possibility of utilising the existing towers should be examined in the preparatory survey as the Maldives lacks adequate understanding of the requirements for installing digital transmission equipment.

3.4.3 Examination of DBNO Business Model and Financial Analysis

The basic business model of the DBNO to operate the DTTB platform will be something similar to what is shown in Figure 3.4-1. Basically, the DBNO collects user fees from each broadcaster that migrates their programmes into the platform, manages the equipment operation and maintenance expenses for which a budget is provided by the government, reserves funds for new equipment procurement and upgrading and pays labour costs and other expenses such as the projected business licence fees, multiplexing broadcasting licence fees, user fees for optical fibre links and user fees for broadcast waves, and frequency user fees for private programme transmission links such as microwave links (with respect to optical fibre links, there is the possibility of each broadcaster being responsible for paying).
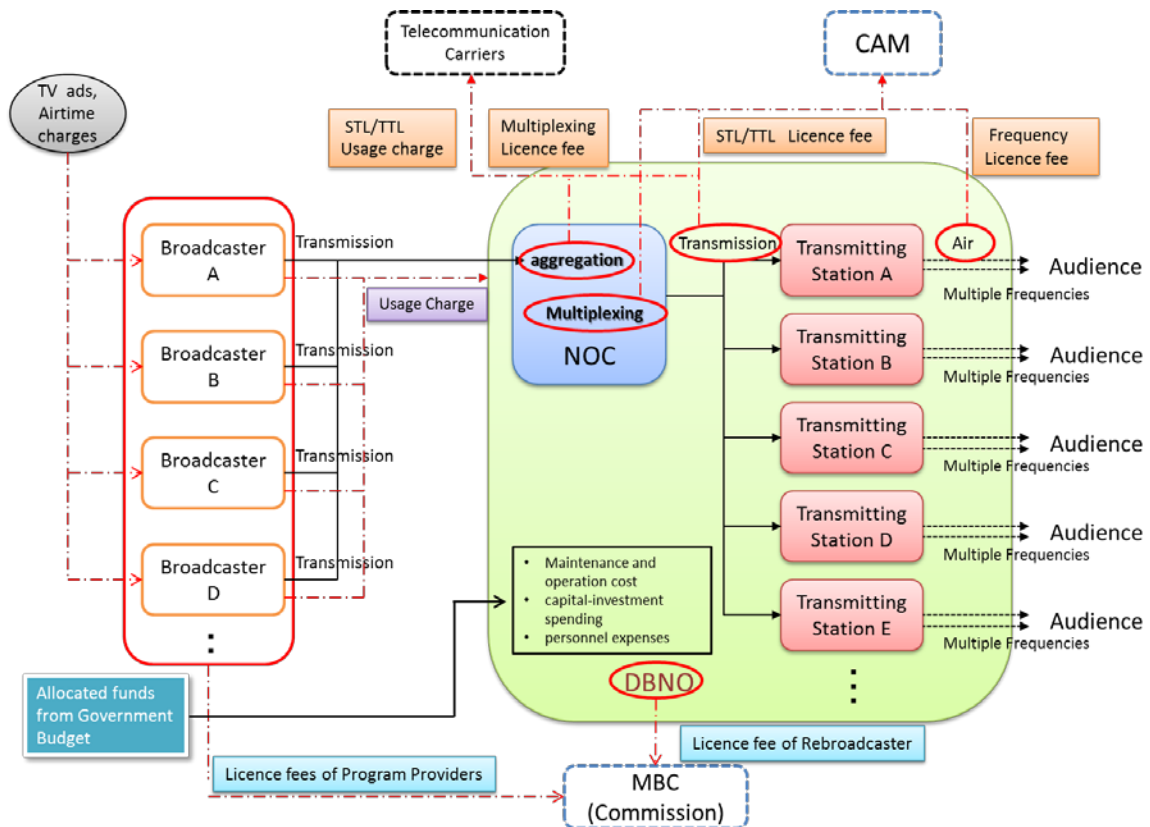
Source: JICA Survey Team

Figure 3.4-1 Basic Business Model for Platform Operator (DBNO)

On the other hand, each broadcaster pays licence fees for outsourcing broadcasting to the DBNO as well as user fees to the DBNO which is financed by funds obtained through advertising sales and collection of broadcast subscription fees. Each broadcaster will be able to allocate the frequency usage fees, which it had to pay previously, to cover both the user fees for the DBNO platform and the cost of producing programmes and provide further improved or value added services.

MoHA intends to allocate a government budget to keep the DBNO fully effective until the DBNO can operate stably both financially and technically. However, the operational costs of the DBNO will be a new expense not included in the previous government expenditure. It seems that MoHA plans to make

the DBNO operate with its own income including user fees in the future so that government expenditure from taxes will be reduced.

This business model for the DTTB platform is a new concept and therefore, the Maldives lacks adequate know-how of how to create operating funds, as no examination has been conducted of user fees and broadcasters do not have enough experience of using TV transmitters except for MBCo. Meanwhile, whether financially stable operation is possible is one of the criteria for deciding whether assistance should be offered for the construction of the platform in the form of a grant aid project. This is why examination needs to be carried out of whether government costs can be reduced as much as possible and equipment procured under the grant aid project can be maintained appropriately later. To this end, a financial analysis and examination of the analytical results should be carried out in the preparatory survey.

Attachment 1　List of Interviewees

1. List of Interviewees

Organisation and Name	Designation

Maldives Broadcasting Commission

Mohamed Shahyb	President
Abdulla Shujau	Vice President
Ahmed Rashid	Director -Human resources and administration-
Ibrahim Ashraf	Commissioner
Mohamed Aslam	Commissioner
Noora Ali	Secretary General
Ahmed Arshad Ali	International Relations Officer
Eyman Anwer	PR Coordinator
Lubna Adam Saleem	Coordinator

Maldives Broadcasting Corporation

Mohamed Saeed	Chief Operating Officer
Mohamed Shafeeg Mahmood	Managing Director
Abdul Latheef Abdul Razzaq	Manager TV engineering
Hussain Shuhad	Director -Infrastructure planning and development-
Hassain Amir Waheed	Manager

Communications Authority of Maldives

Ilyas Ahmed	Chief Executive
Abdulla pasha	Deputy Director General
Mohamed Thaufeeq	Deputy Director
Abdullah Shiham	Deputy Director

Ministry of Home Affairs

Umar Nasser	Minister

National Disaster Management Centre

Fathimath Thasneem	Deputy Minister
Hisan Hassan	Project Director
Ahmed Siyah	Local Consultant
Mohamed Inayath	Director, Programs
Farooshe Ali	Senior Programs Officer

VTV (Island Broadcasting Company Pvt. Ltd.)

Ibrahim Khaleel	Chief Executive Officer

Ahmed Irshan	Chief Technical Officer
Mohamed Zafin	Deputy Director
Mohamed Asif	Chief Operating Officer

Medianet (Medianet Pvt Ltd.)

Ahmed Shafeeu	Chief Executive Officer
Moobeen Jaleel	Head of Sales Commercial Division
Mohamed Ahmed	Manager

DTV (Broadcasting Maldives Pvt. Ltd.)

Midhath Adam	Chief Executive Officer
Ahmed Imad	Head of Technical Engineers

Atoll TV (Atoll Investment (Maldives) Pvt. Ltd.)

Hisan Hassan	Project Director r

Raajje TV (Raajje Television Pvt. Ltd.)

Ismail Jinah	Chief Technical Officer
Ibrahim Waheed	Deputy Chief Executive Officer

Maldives Meteorological Service

Ahme Rasheed	Senior Meteorologist
Abdul Muhusina	Director

Embassy of Japan in Sri Lanka

Nobuhito Hobo	Ambassador Extraordinary and Plenipotentiary
Yasuaki Ito	Second Secretary

JICA Sri Lanka Office

Kiyoshi Amada	Chief Representative
Hisoshi Hidaka	Senior Representative
Hiroyuki Abe	Senior Representative
Toshiyuki Shimano	Representative

JICA/JOCV Maldives Office

Tadashi Ikeshiro	Resident Representative
Aishath Nafuma	Program Officer

Attachment 2　List of Collected Materials

2. List of Collected Materials

Data Collection Survey on Digital Terrestrial Television Broadcasting in the Republic of the Maldives

No.	Name of Material	Type	Issued or Presented by	Year
1	Broadcasting Network	PDF	MBCo	2014
2	Dhiraagu Domestic Submarine Cable Network	Print	CAM	2014
3	Frequency Holders	Print	MBCm	2014
4	ITU Maldives report - DRAFT	PDF	MBCm	2014
5	Licensed Broadcasters Details	PDF	MBCm	2014
6	Licensed Rebroadcasters Details	PDF	MBCm	2014
7	Answer of Questionnaire (Maldives Broadcasting Commission)	PDF	MBCm	2014
8	Answer of Questionnaire (Maldives Broadcasting Corporation)	Word	MBCo	2014
9	Answer of Questionnaire (Maldives Meteorological Service)	PDF	MMS	2014
10	Maldives Telecommunications Regulation 2003	Book	CAM	2003
11	Maldives Broadcasting Corporation Act	PDF	MBCo	2002

No.	Name of Material	Type	Issued or Presented by	Year
12	MBC Signal Coverage details	Excel	MBCo	2014
13	Organisation Chart (Communications Authority of Maldives)	PDF	CAM	2014
14	Organisation Chart (Maldives Broadcasting Commission)	PDF	MBCm	2014
15	Organisation Chart (Maldives Broadcasting Corporation)	PDF	MBCo	2012
16	Organisation Chart (Ministry of Home Affairs)	PDF	MoHA	2015
17	Organisation Chart (National Disaster Management Centre)	PDF	NDMC	2014
18	Report of Field Strength Measurement at Male Maldives	PDF	MBCo	2014
19	The UHF Broadcasting Band 470 to 790 MHz plan	Word	CAM	2014
20	Tower Statuses	PDF	MBCo	2014

CAM: Communications Authority of Maldives

MMS: Maldives Meteorological Service

MBCm: Maldives Broadcasting Commission

MBCo: Maldives Broadcasting Corporation

MoHA: Ministry of Home Affairs

NDMC: National Disaster Management Centre