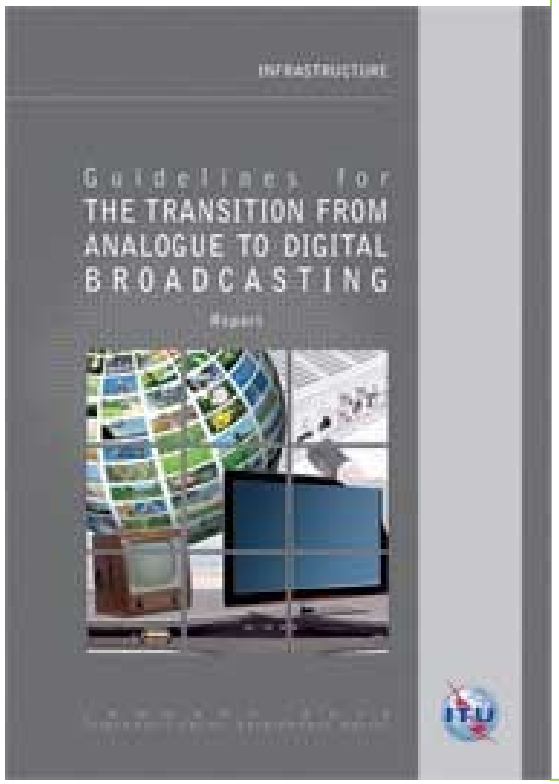
Broadcasting

ITU-D and BDT activities

Broadcasting - summary

- Broadcasting
  - Guidelines for Transition to Digital Broadcasting (E, F, S)
  - Assistance for the preparation of national roadmap (more than 40 countries since 2009)
  - DSO database
- Others
  - ITU-D Study Group Questions (Q8/1, Resolution 9)
  - WSIS Action Lines (C2, C3, C7 e-science, C9)

The Guidelines for Transition to Digital Broadcasting



- Intended to provide information and recommendation
  - On policy, technologies, network planning, customer awareness and business planning
  - for the smooth transition to Digital Terrestrial Television Broadcasting (DTTB) and introduction of Mobile Television Broadcasting
- Prepared in 2010 for Africa
  - 1st Revision (2012) for ASP adding a section on archives migration
  - 2nd revision (2014) for global including Satellite TV, Cable TV, IPTV

National Roadmaps for Digital Broadcasting

- Assisted a number of Member countries in developing roadmap for transition from analogue to digital broadcasting
- ITU has helped more than 40 countries since 2009 for establishing national goals, strategies, key activities and so forth
  - Africa Region: Angola, Ethiopia, Mali, Gabon, DRC, Equatorial Guinea
  - ASP Region: Afghanistan, Bangladesh, Bhutan (*also an update*), Cambodia, Fiji, Indonesia, Kiribati, Lao PDR, Maldives, Micronesia, Mongolia, Myanmar, Nauru, Nepal, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Timor-Leste, Tonga (*also revision of the roadmap*), Vanuatu and Vietnam
  - AMS: Guyana, Haiti, 12 others (8 from CAF)
  - Projects funded by Republic of Korea, Japan, Australia, CAF (Latin-American Development Bank)
  - Palestine
  - BDT direct assistance

Broadcasting Related Activities

- Projects
- Country assistance
- Country case studies and reports
- Others

Projects

Projects funded by

- Republic of Korea, Japan
- Australia
- Latin-American Development Bank (CAF)

Australian Project

- **Kiribati, Nauru**
  - Roadmaps
- **Tonga**
  - Update, draft Cabinet submission (Recommendations for regulatory changes to the Communications Act 2000 for digital television)
- **PNG**
  - ASO and DTTB regulatory review
- **Interactive Multimedia Services in Asia Pacific**
  - Released

Latin-American Development Bank (CAF)

- **Colombia, Paraguay**
  - Expert: Julián Seseña (Spain)
- **Bolivia, Venezuela**
  - Expert: Andrés Navarro Cadavid (Colombia)
- **Panama, Costa Rica**
  - Expert: Angel Garcia Castillejo (Spain)
- **Dominican Republic**
  - Expert: Alonso Llanos (Ecuador)
- **Jamaica**
  - Expert: Peter Walop (The Netherlands)
  - One visit followed by Skype conference with NRT

Country assistance

- Within BDT Operational Plan, direct assistance
  - Africa Region: Burkina Faso, Equatorial Guinea
  - Americas region: 5 countries
  - Summary: AMS and ASP

Working method

- Questionnaire
- NRT (National Roadmap Team) requested
- First mission for presentation of the roadmap Guideline, fact finding, meeting with stake holders
- Preparation of the first draft roadmap
- Comments
- Second mission
- Finalization of the Roadmap
- Worskhop on presenting the results and discussing country experiences

Country case studies and reports

Country Case Studies

- **Australia,**
- **Thailand**
- **Japan**

Reports

- **Report on Interactive Multimedia Services in ASP**
  - see earlier
- **ITU-R SG1 Report on Digital Dividend**
  - ITU-R Rep SM.2353-0 http://www.itu.int/pub/R-REP-SM.2353

  The challenges and opportunities for spectrum management resulting from the transition to digital terrestrial television in the UHF bands
- **DSO database –**
  - updates from AFR, ARB, ITU-R SG6, other sources

Other activities

- **ITU-Forum Global Conference**
  - 2016,
    - Bangkok

      http://www.itu.int/en/ITU-D/Regional-Presence/AsiaPacific/Pages/Events/2016/Apr-ASPSMC/index.aspx
    - Mexico City
    - Dakar
  - 2017
    - Dubai
    - Bangkok
    - Colombia (planned)
    - Yerevan (planned)

- **ITU-R SG6 WP6A – Handbook**
  - Extension of the Digital TV Broadcasting Transition Guidelines of the BDT


Digital Terrestrial
Television
Broadcasting
(DTTB)
DSO database

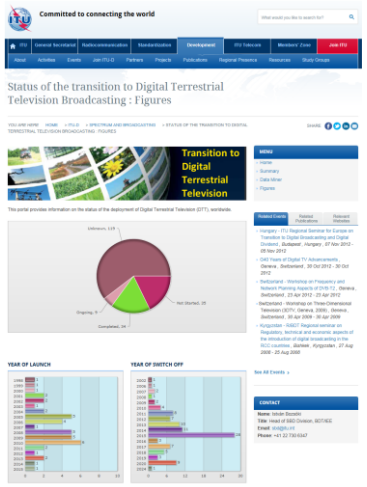
Background

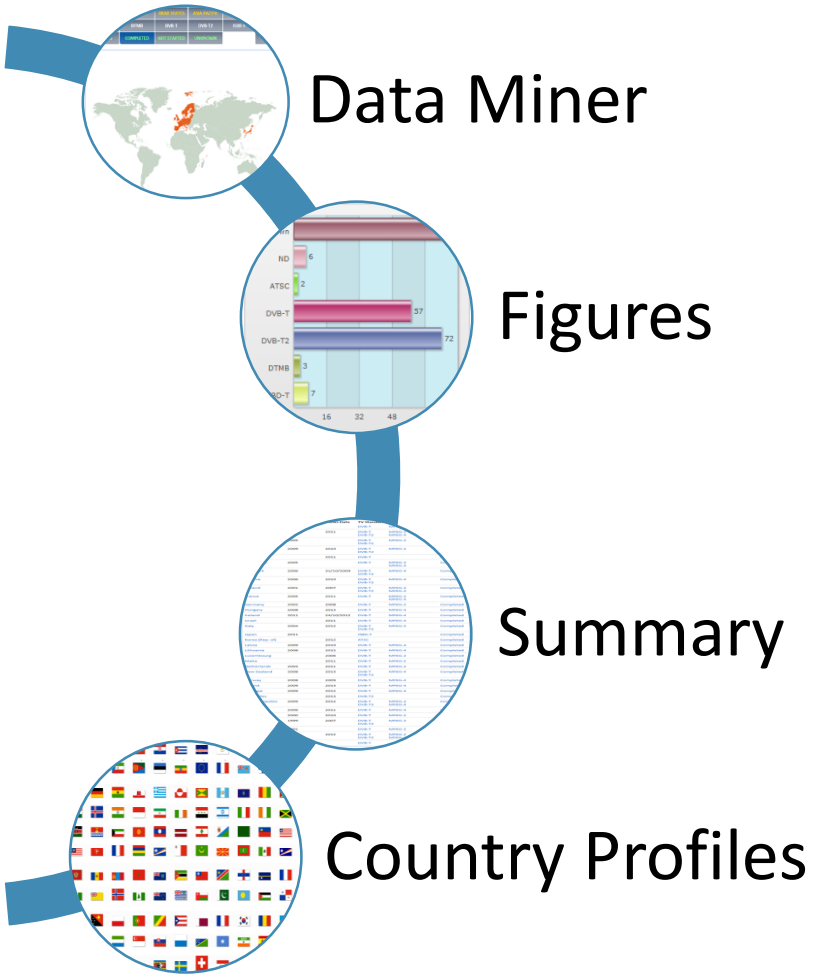
- Council 2014, 7 May, request from Kenya:

  ITU to provide an analogue to digital switchover stocktaking for assisting the Member States in their migration process.

- Information from relevant surveys, questionnaires of the ITU-D and ITU-R and other sources
  - ITU-D Question 11-3/2 Questionnaire, 2012;
  - ITU-D Question 11-3/2 Final report, 2014;
  - ITU-D Questionnaire to European countries, 2013 and a follow-up in 2014;
  - ITU-D Questionnaire to Arab Countries, 2013;
  - ITU-D and ITU-R meetings, workshop, seminars, frequency coordination meetings;
  - ITU-R SG6 Questionnaire, 2014, results published in Report ITU-R BT.2302-0;
  - African Union Commission Survey, 2013;
  - DIGITAG, 2014.
- Entered to the database

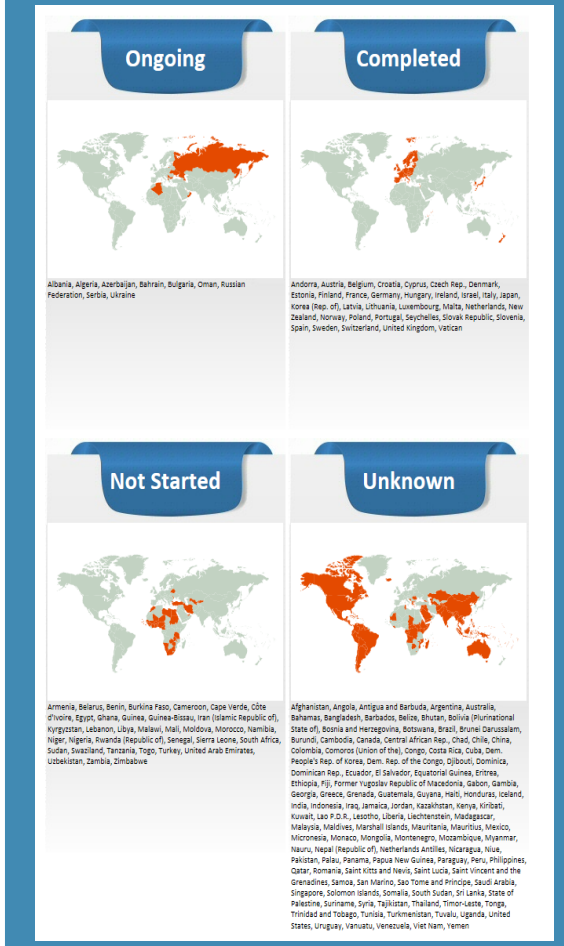
Public Website





ITU Workshop,
Bangkok, 3-4 May

Website features



Website demonstration

http://www.itu.int/en/ITU-D/Spectrum-Broadcasting/Pages/DSO/Default.aspx

ITU Assistance to ASP countries in DTT transition

ITU Assistance to ASP Region countries

- ITU assisted a number of Member countries in ASP region developing roadmap for transition from analogue to digital broadcasting
- More than 25 countries since 2009 for establishing national goals, strategies, key activities and so forth
  - Afghanistan, Bangladesh, Bhutan *(also an update)*, Cambodia, Fiji, Indonesia, Kiribati, Lao P.D.R, Maldives, Micronesia, Mongolia, Myanmar, Nauru, Nepal, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Timor-Leste, Tonga *(also revision of the roadmap)*, Vanuatu, Vietnam
- Mongolia carried out ASO in 2015

What is ASP?

- Asian region
- ASEAN - 10 countries
- SAARC - 8 countries
- Pacific region - 13 countries
- Central Asia

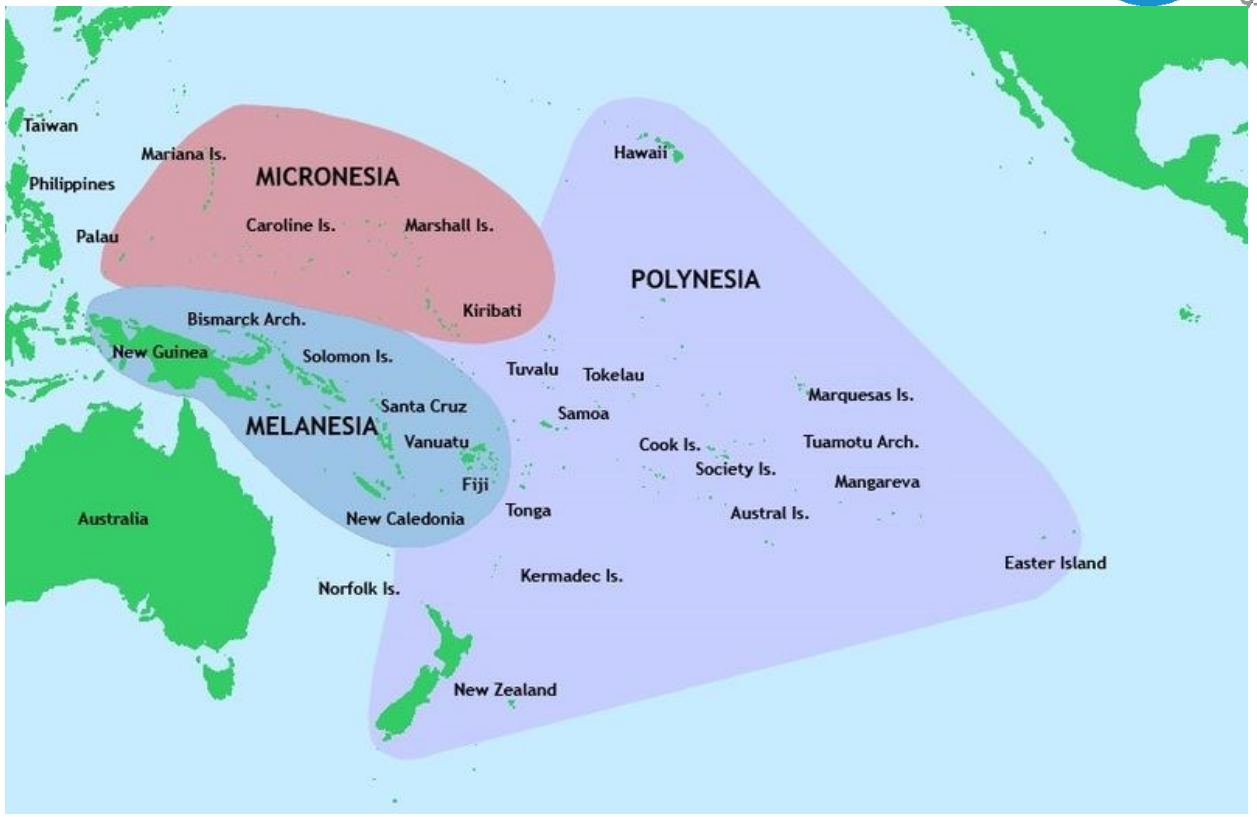
ASEAN Countries

SAARC Countries

- Afghanistan
- Bangladesh
- Bhutan
- India
- Maldives
- Nepal
- Pakistan
- Sri Lanka

Pacific Countries

- Tonga
- Samoa
- PNG
- Fiji
- Kiribati
- Nauru
- Vanuatu
- Micronesia
- Timor-Leste
- Norfolk Islands
- Solomon Islands
- Tuvalu
- New Caladonia



ASO Dates of ASP beneficiary countries

Country	Year Launch	DTTB	ASO	Revised or year of possibility
Cambodia		DVB-T, DVB-T2, DTMB	2020	Ongoing
Mongolia	2014	DVB-T2	05/10/2015	Completed
Fiji	2015	DVB-T2	2018	Ongoing
Indonesia		DVB-T2	2018	Ongoing
Kiribati		ND	2017	
Lao P.D.R.		DVB-T, DTMB	2020	
Maldives		DVB-T2, ISDB-T	2020	
Myanmar	2013	DVB-T2	2020	Ongoing
Micronesia		ND		
Thailand	2014	DVB-T2	2020	Ongoing
Nauru		ND		
Nepal (Republic of)		DVB-T2	2017	
Philippines		ISDB-T	2018	
Papua New Guinea	2014	DVB-T2	2017	Ongoing
Samoa	2014	DVB-T2	2018	Ongoing
Sri Lanka		DVB-T2, ISDB-T	2017	
Timor-Leste		ND	2024	
Tonga	2015	DVB-T2		
Vanuatu	2016	DVB-T2	2017	Ongoing

DTTB standards adopted by ASP countries

- DVB T Australia, in legacy of MPEG-2
- DVB T2 Singapore, PNG, Mongolia, India, Vietnam, ..
- DVB T & DVB T2 New Zealand, Myanmar,
- ISDB T - Japan, Philippines, Maldives, Sri Lanka
- DTMB - China, Hong Kong, Macau
- DVB T2 & DTMB – Cambodia, Lao
- No decision – Timor Leste, Micronesia, Nauru
- Follow the region - Kiribati DVB-T2

ASO Dates of Pacific beneficiary countries

Country	Year Launch	DTTB	ASO	Revised or year of possibility
Fiji	2015	DVB-T2	2018	Ongoing
Kiribati		ND	2017	
Micronesia		ND		
Nauru		ND		
Papua New Guinea	2014	DVB-T2	2017	Ongoing
Samoa	2014	DVB-T2	2018	Ongoing
Timor-Leste		ND	2024	
Tonga	2015	DVB-T2		Commercial TV
Vanuatu	2016	DVB-T2	2017	Ongoing

ASO in ASP countries

- Japan - 2011
- Korea - 2012 (Case study in ABU TR)
- Australia – Dec 2014
- New Zealand - 2014
- Mongolia - Oct 2015
- 5 countries have completed analogue switch off
- 45 countries yet to do ASO

Two common models

- Broadly, there are two models considered for all ITU assisted road maps as per ITU guidelines; Model A and Model B.

- For Model A, the broadcasters would be free to adopt any business model. For the DTTB services this is basically the choice between pay-tv services or FTA services (or any combination). It is recommended to set standards for the CA system.

- Model B is more prescriptive and ecommended that National Roadmap Teams have to develop a business model in collaboration with the common multiplex operator and industry. This model was applied in countries like Germany, Sweden and Sri Lanka.

Two common models

The second model operator can offer:

- Distribution (or network) services only: the broadcasters (or any other service provider) would pay a distribution fee for the service of broadcasting their programme(s) in specified areas (against a set of agreed service levels), the right to obtain carriage should be established directly in the content licence as well as the multiplex licence terms and conditions, access arrangements must be clearly defined in legislation and in the multiplex licence, and access for all should be on an equal and transparent basis.

- In general, transparency and equity require the common multiplex operator to be at arm's length from any broadcaster. In the case of a consortium of broadcasters providing the multiplex the consortium should be a separate “independent” entity. In the case of a single broadcaster providing the service, the multiplex operator should at least be a separate subsidiary of that broadcaster. The rights of any new content licensee in the future to access multiplex space should be clearly defined in the legislation and reflected in licence conditions.

Summary of TV market in the beneficiary countries

- TV market in each of the countries is quite different to each other. This is mainly driven by population, economic development and disposable income, cultural, social and geography of each country.

Objectives for the ASO & DSO

- Some of the common objectives among beneficiary countries are:
  - An increase in the capacity of broadcast transmission networks by improving spectrum efficiency (i.e. more data can be transmitted per unit bandwidth).
  - Provision of better signal quality which increases robustness to interference and picture degradation.
  - The ability to support HD services and interactivity.
  - A potential reduction in transmission network energy usage.
  - The implementation of single frequency networks (SFNs) instead of the independent parallel networks which are common in analogue broadcasting.

Objectives for the ASO & DSO

- In addition there are other factors that drive DSO
  - The take-up of digital TV is likely to boost sales of TV sets and digital video recorders.
  - Digital TV could lead to positive upstream benefits in terms of increased time spent watching TV and greater demand for digital content.
  - In a competitive multi-channel, multi-platform environment, DTT provides opportunities for terrestrial broadcasters to address the challenges posed by pay TV operators and the Internet.

Standards for DTT

Standard	Modulation	Description in Report ITU-R BT.2140[6]	Recommendation ITU-R BT.1306[7]	Applicable standards
ATSC	Single carrier 8-VSB	Brief: part 1 section 2.6.2.1 Detailed: part 2, section 1.5	System A; annex 1 table 1a	A/52,A/53, A/65, A/153
DTMB (also referred to as ChinaDTV)	Multi carrier OFDM	Brief: part 1, section 2.6.2.2 Detailed: -	-	GB 20600-2006
DVB-T	Multi carrier OFDM	Brief: part 1, section 2.6.2.4 Detailed: part 2, section 1.6	System B; annex 1 table 1b	EN 300 744
ISDB-T	Multi carrier Segmented OFDM	Brief: part 1, section 2.6.2.5 Detailed: part 2, section 1.8	System C; annex 1 table 1c	ARIB STD-B31 ABNT NBR 15601

[Source: Guidelines for the Transition from Analogue to Digital Broadcasting", ITU, page.186, 2010. Please study reports from the ITU website - http://www.itu.int/publ/D-HDB-GUIDELINES.01-2010/en]

Deadlines of ASP Beneficiary Countries

Country	Deadline ASO	Year Launch	DTTB	Revised or year of possibility
Mongolia	2015-10-05	2014	DVB-T2	Completed
Papua New Guinea	2017	2014	DVB-T2	Ongoing
Samoa	2018	2014	DVB-T2	Ongoing
Fiji	2018	2015	DVB-T2	Ongoing
Indonesia	2018		DVB-T2	Ongoing
Myanmar	2020	2013	DVB-T2	Ongoing
Thailand	2020	2014	DVB-T2	Ongoing
Cambodia	2020		DVB-T, DVB-T2, DTMB	Ongoing
Lao P.D.R.	2020		DVB-T, DTMB	
Maldives	2020		DVB-T2, ISDB-T	
Nepal	2017		DVB-T2	
Philippines	2018		ISDB-T	
Sri Lanka	2017		DVB-T2, ISDB-T	
Tonga				
Vanuatu	2017		DVB-T2	
Kiribati	2017		ND	
Micronesia			ND	
Nauru			ND	
Timor-Leste	2024		ND	

Deadlines of Pacific Countries

Country	Deadline ASO	Year Launch	DTTB	Revised or year of possibility
Papua New Guinea	2017	2014	DVB-T2	Ongoing
Samoa	2018	2014	DVB-T2	Ongoing
Fiji	2018	2015	DVB-T2	Ongoing
Tonga				
Vanuatu	2017		DVB-T2	
Kiribati	2017		ND	
Micronesia			ND	
Nauru			ND	
Timor-Leste	2024		ND	

Key Findings and Recommendations

- Among the countries which received ITU assistance, only one country has completed ASO and others are progressing slowly.
- There are a number of challenges in digital migration.

Key Findings and Recommendations

There are a number of challenges in digital migration

1. **The costs involved and the enormity of task**

For certain countries with larger geographies and wide spread population, the deployment of the transmission networks are capital intensive. Having a large transmission network, from hundreds to in some cases over a thousand of analogue transmitter sites, converting these to digital and in a reasonable time period is seen as a challenging task. Not only does the setup of infrastructure for digital but also carrying out a simulcast service for a given period involve a lot of money and resources. On top of these the need to subsidise set- top-boxes to masses is an additional burden.

2. **Not seen as a national priority**

Many governments still do not see the move to digital as a priority hence the move is not fully endorsed or supported by the necessary authorities and the necessary initiative and push is not available.

Key Findings and Recommendations

3. Lack of cooperation among stakeholders

In many countries the move to digital is not initiated as a collective effort by all the stakeholders involved. This includes public as well as private broadcasters, regulators and others. This is also partly connected to the previous point on government priority areas.

4. Technology standards and ever evolving technologies

The technologies are evolving at a rapid pace. However, digital terrestrial transmission technologies are matured with a number of providers and supporters readily available. However, there are still cases where some still feel it may be better to wait for the next technology or next standard. But many of the experts have already shared their views that a major change or upgrade is not possible as current standards are providing performances close to the theoretical limits in current form. In some countries there is still the debate on which Digital Terrestrial Television Broadcasting (DTTB) standard to choose from DVB-T2, ISDB-T, ATSC or DTMB.

Key Findings and Recommendations

5. Spectrum is not an issue for certain countries

This means that the benefits of digital dividend can immediately be initiated. It is not necessary for broadcasters to vacate the spectrum for government to explore these benefits. This leads to no drive or initiative from policy makers and authorities.

6. Availability of alternate options other than terrestrial TV

In certain countries, Direct to Home (DTH) services from the satellite and cable services have gone digital and are readily available especially in main cities and population centres at reasonable costs. These options provide many of the benefits of that digital could offer to viewers. Hence, there is little demand for digital terrestrial from the public which makes digital terrestrial propositions being delayed.

Some practical and essential guidelines in planning the digital migration

Some of the lessons learnt from the experience of those who have completed the digital migration and possible approaches that will help broadcasters to make a successful transition are;

1. Digital switchover works well when Governments are committed to the digital migration.

2. It is important to have legislations, regulatory framework and a coordination body setup to drive and monitor the process and its progress.

Some practical and essential guidelines in planning the digital migration

3. Close coordination and cooperation with receiver manufacturers/providers is necessary for a smooth ASO process. Without such cooperation it is not possible to ensure that consumers have access to new receiver equipment with necessary compliance at the right time.

4. Digital broadcasting enables more programme channels and content but this is only of use if there appealing content that audiences demand.

Some practical and essential guidelines in planning the digital migration

5. The right content to attract viewers and for them to experience the benefit of digital is necessary for quick transition.

6. Adequate funding across the industry is an essential requirement.

7. This includes capital and operational expenses on the broadcasters' part as well as government subsidies for viewers to help them get receive devices such as set- top-boxes.

What are the impediments?

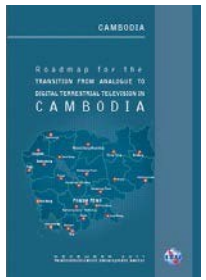
- Funding
- Commitments from the governments and regulators
- Poor legislative and regulatory framework

Recommendations to stakeholders

- DSO works well when Governments are committed
- Legislative and regulatory framework
- Close coordination among four stakeholders
- Need a driver such as content - appealing to audience
- Financial incentives to introduction

Roadmaps

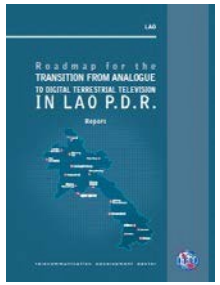
- National Roadmaps for Transition from Analogue to Digital Terrestrial Television Broadcasting (24 countries in the APAC region, **10 in Pacific**)
- http://www.itu.int/en/ITU-D/Spectrum-Broadcasting/Pages/DSO/Summary.aspx



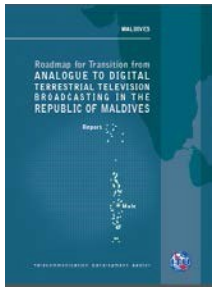
Cambodia

Fiji

Indonesia

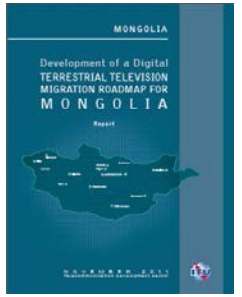


Lao PDR

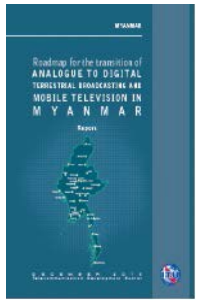


Maldives

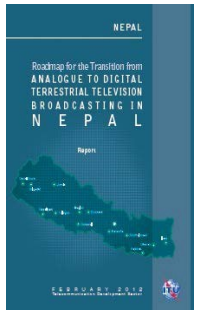
Micronesia



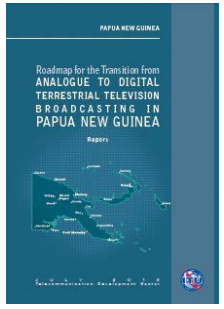
Mongolia



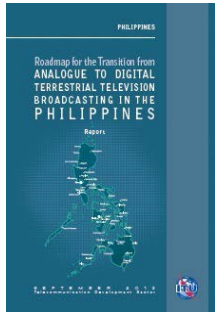
Myanmar



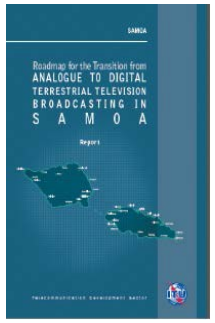
Nepal



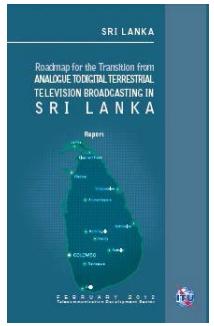
Papua New Guinea



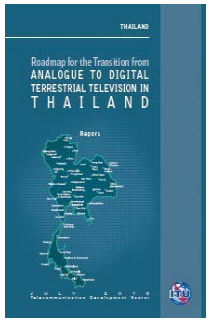
Philippines



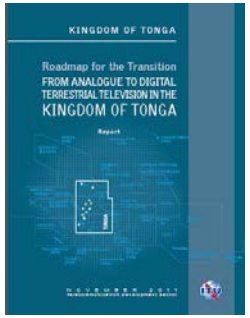
Samoa



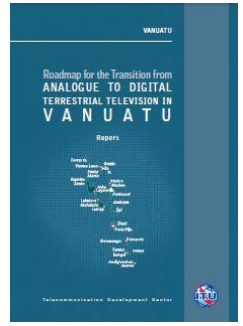
Sri Lanka



Thailand



Tonga



Vanuatu

- Afghanistan
- Bangladesh
- Bhutan
- Kiribati
- Nauru
- Solomon Islands
- Timor Leste
- Viet Nam

Key Learning For The Pacific

- Driven by Government
- Investigate the STB marketplace
- Involve many types of stakeholders – radio, satellite, PayTV, cable Ensure
- Broadcasters work together, plan ahead
  - Common Standards/Parameters
  - Equal Coverage
  - Share Content within Multiplex
  - Enables shared distribution costs
  - Single message for viewers
- Work with neighbouring countries systems (Aus, NZ, Pacific)

ITU: Regional Office for Asia and the Pacific

38 Member States

134 Sector Members, Associates

17 Academia

Land Locked Developing Countries (5)

Least Developed Countries (12)

- Afghanistan
- Bangladesh
- Bhutan
- Cambodia
- Lao, PDR
- Nepal
- Myanmar
- Timor Leste

Small Islands Developing States (12)

- Kiribati
- Solomon Is.
- Tuvalu
- Vanuatu
- Fiji
- Maldives
- Marshall Islands
- Micronesia
- Nauru
- Tonga
- PNG
- Samoa

Low-Income States (10)

- D.P.R. Korea
- India
- Indonesia
- Mongolia
- Pakistan
- Philippines
- Sri Lanka
- Vietnam

The Rest (10)

- Australia
- Brunei
- China/Hong Kong
- Iran
- Japan
- Malaysia
- New Zealand
- R.O. Korea
- Singapore
- Thailand

Trends in broadcasting: An overview of developments

1. Trends in broadcasting
Structure of the report

Section 1 Introduction	• Increasing Internet access • Evolution of broadcast technology
Section 2 Broadcasting into the next decade	• Trends in TV viewing • Growth of broadband Internet • DSO milestones and timeframes
Section 3 Service concepts	• Linear and on-demand services, anywhere and at anytime
Section 4 TV broadcasting technology	• HDTV and UHDTV • More efficient compression and transmission systems
Section 5 Audio broadcasting technology	• Several transmission systems • More efficient compression
Section 6 Conclusions	• Summary of conclusions and main trends

Revised and updated edition of report published by ITU in February 2013

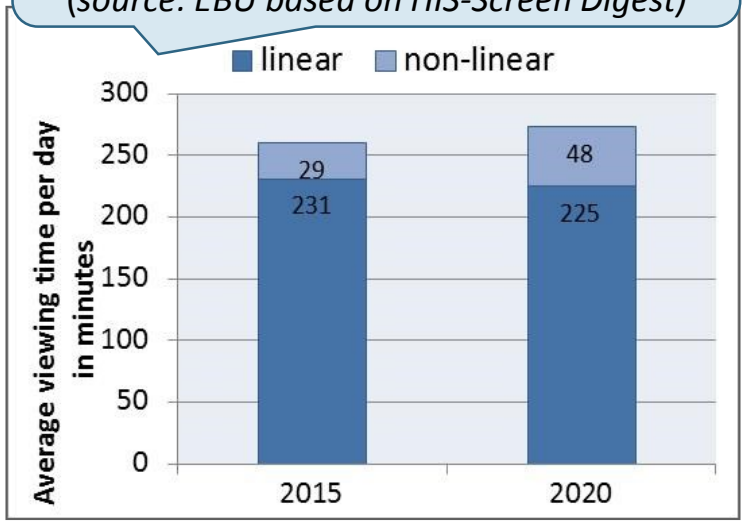
2. Broadcasting into the next decade (1)

Trends in TV viewing

Linear and on-demand services

- Total TV viewing time per day will slightly increase
- On-demand viewing grows faster at expense of linear TV viewing, depending on country and age
- Linear TV broadcasting will continue to be the primary way of TV viewing

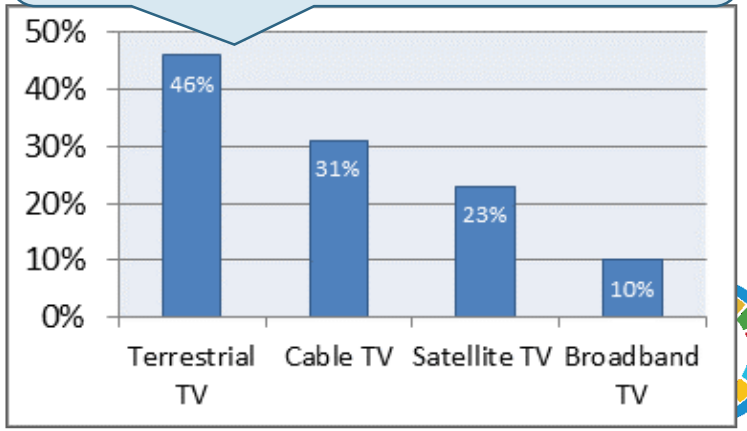
Example TV viewing in 5 large western European countries
(source: EBU based on HIS-Screen Digest)



Delivery of linear services

- Broadcasting (terrestrial, satellite, cable)
- Broadband, IPTV and streaming on the open Internet
- The use differs per country
- In most countries terrestrial broadcasting is considered very important

Example TV platforms in the EU in 2013
(source: Special Eurobarometer 396, Nov 2013)



2. Broadcasting into the next decade (2)

Broadband delivery

Broadband delivery	• Data speed of fixed and mobile broadband will increase • HD and UHD will make up 82% of Internet video traffic by 2020 • Internet does not guarantee quality of service and may not be able to serve large audiences at the same time
5G prospects	• Specification of broadcasting requirements in 4G and 5G is in progress, such as free-to-air, large cells and guaranteed quality of services • In the long term 5G networks may include distribution of broadcasting for rooftop and indoor reception with all types of receivers (ranging from large UHD screens, tablets and smart phones)
Broadband and broadcasting	• Broadband is competitive means of delivery compared to broadcasting networks • Broadband is supportive means of delivery for offering enhanced radio and television services.

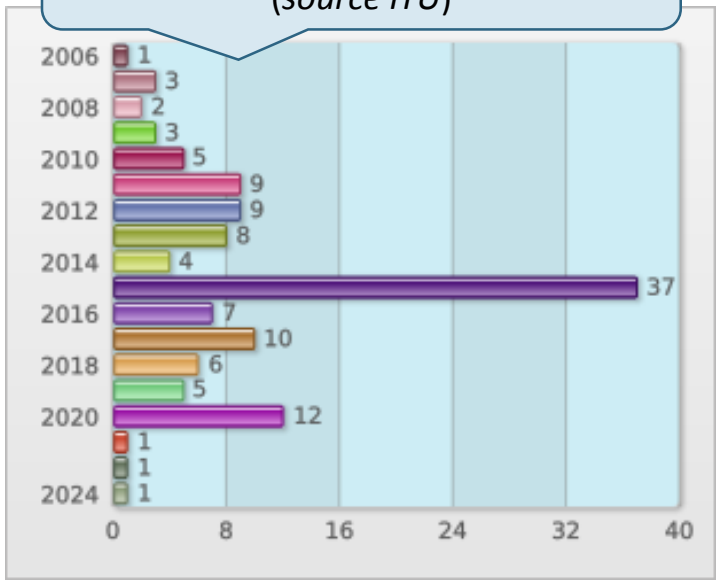
2. Broadcasting into the next decade (3)

Transition to digital broadcasting

DTTB

- Completed analogue TV switch-off in many countries in all regions
- Reduced DTTB frequency range due to allocation of Digital Dividend to IMT, according to WRC-15 decisions

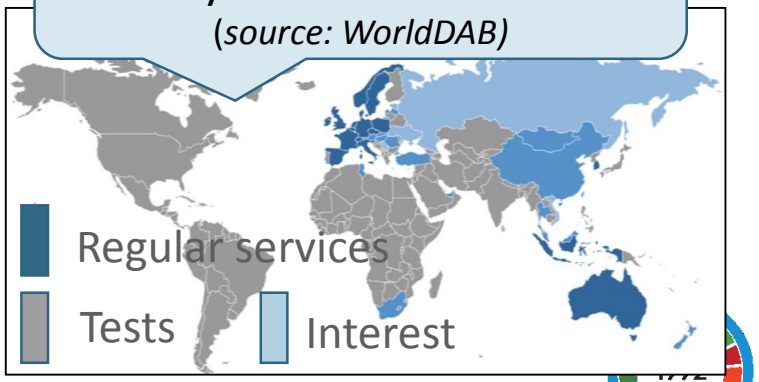
Year of analogue TV switch-off (*source ITU*)



DTAB

- Uptake of DTAB services is much slower than with DTTB
- DTAB services in many countries
- In general FM switch-off far ahead
- Analogue switch-off is planned in a few countries

Example T-DAB status by the end of 2016 (*source: WorldDAB)*



3. Service concepts (1)
Enhanced broadcasting at anytime and everywhere

Enhanced broadcasting	• Linear services delivered by broadcasting networks • Complemented with non-linear (on-demand) services delivered by the Internet

Anytime	• Time shifted viewing by means of:
	  ○ Recorded programmes from linear services
	  ○ Catch-up services via the open Internet, or as part of a video-on demand offer

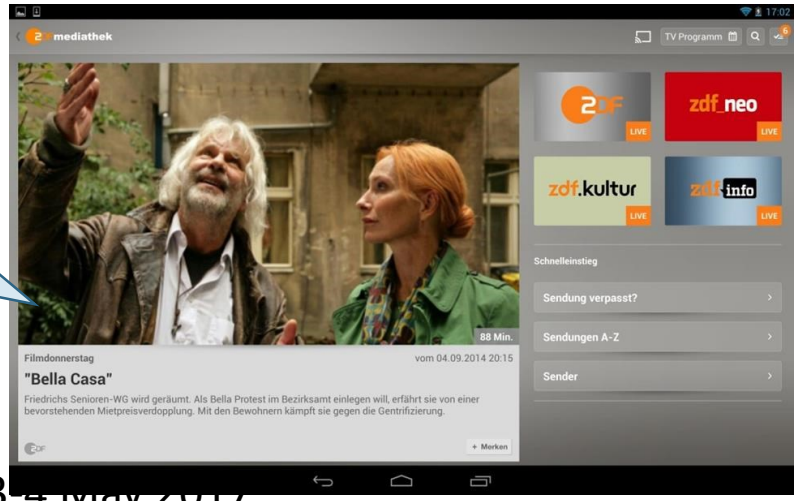
Anywhere	• Watching broadcast services in the living room, in other rooms, on the move • Smart phones and tablets are increasingly used as second screen in the house and elsewhere

3. Service concepts (2)
Interactivity

Interactivity

- Contributing or reacting by the viewer to a specific programme
- Demanding for additional information regarding a programme
- On-demand reception of programmes or information
- Interactivity by means of “middleware” in the TV receiver
  - Example is the HbbTV system
  - HbbTV is in use in several European countries and expected to replace MHEG5 and MHP in the UK and Italy respectively
  - HbbTV is the basis for interactivity in the ATSC 3.0 system

Example catch-up service from ZDF by HbbTV (*source hbbtv.org*)



4. TV technology (1)

HDTV and beyond (1)

HDTV	• TV services in HD quality in many countries • It is expected that in future all TV services will be in HD
Improved image parameters	• Higher spatial resolution: more pixels per image • Higher temporal resolution: more images per second • Wider colour gamut: more colours • Higher bit-depth: more bits per pixel • Higher image dynamic range: more detail in light and dark areas
HRD-TV	• Combination of wide colour gamut and high dynamic range • Contrary to higher spatial resolution, also visible at larger viewing distances
UHDTV	• UHDTV 1 (4k) includes all improved image parameters ○ May be implemented in a phased way • UHDTV 2 (8k) includes all improved image parameters with double spatial resolution compared to 4 k

4. TV technology (2)

TV formats

TV format	Spatial resolution	Temporal resolution	Wider colour gamut	Higher dynamic range	Envisaged roll-out in DTTB
HDTV	1920 pixels 1080 lines	30 or 25 Hz interlaced	no	no	Widely in use
Advanced HDTV, incl. HDR	1920 pixels 1080 lines	60 or 50 Hz progressive	yes	yes	2017 In some countries
UHDTV 1, incl. HRD	3840 pixels 2160 lines	60 or 50 Hz 120 or 100 Hz progressive	yes	yes	2017 to 2019 In some countries
UHDTV 2, incl. HRD	7680 pixels 4320 lines	60 or 50 Hz 120 or 100 Hz progressive	yes	yes	?

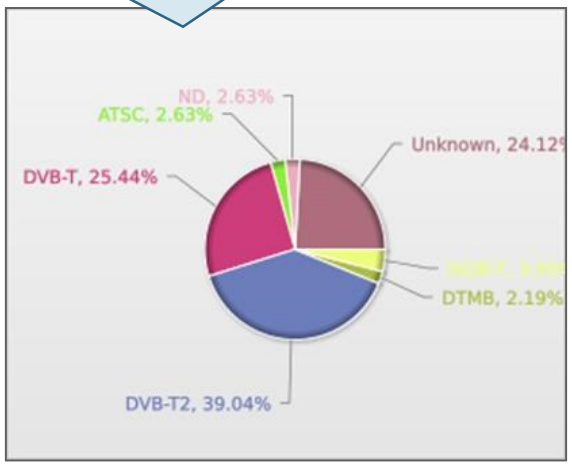
4. TV technology (3)

More efficient systems

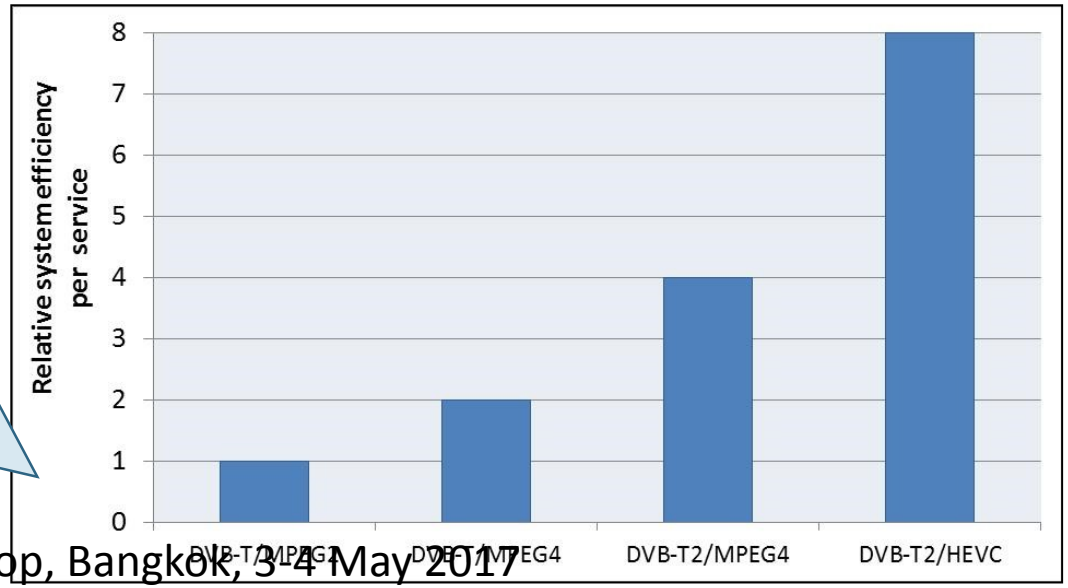
More efficient compression and transmission systems

- New compression system HEVC
  - 2 x more efficient than MPEG4
- 2nd generation DTTB systems
  - Payload up to > 50 Mbit/s
  - DVB-T2 : widely used
  - ATSC 3.0: roll-out in 2017
- Roll-out DVB-T2/HEVC started in 2016

Use of DTTB systems by the end of 2016 (*source ITU*)



Example of relative system efficiency per service of DVB-T(2) with MPEG2, MPEG4 and HEVC (*source TNO*)



5. Audio technology

Several systems for several bands

DTAB in VHF and LF/MF/HF

- In many countries DTAB for national and regional coverage in 174-230 MHz (Band III), when vacated by analogue television
- In addition in some countries DTAB in LF, MF and HF for
  - Coverage in low populated areas
  - International broadcasting
  - Local broadcasting
- Several systems are specified in ITU-R recommendations for several bands
  - Not in all bands DTAB systems are implemented in practice
- Multi-standard DTAB receivers are not widely available

Overview of DTAB systems (*source ITU*)

Standard	Frequency range
DAB	VHF-Band III 1.5 GHz
DAB+	VHF-Band III 1.5 GHz
ISDB-TSB	VHF-Band III 2.6 GHz
IBOC	Band II
IBOC	MF
DRM30	LF/MF/HF
DRM+	VHF-Band I VHF-Band II VHF-Band III
Ravis	VHF-Band I VHF-Band II

6. Main conclusions (1)
Broadband and broadcasting

Increasing capacity of fixed and mobile broadband	• Linear broadcasting will continue to be the primary way of television viewing
	  ○ Consequently DTTB continues to be an important means of distribution
	• The Internet will be an increasingly important means of delivery of audio-visual content, including linear broadcasting and on-demand services
	• Application of 4G networks for a large scale TV distribution is not envisaged
	  ○ as long as broadcast requirements such as free-to-air, large cells and guaranteed quality of services are not implemented
	• In the long term 5G networks may include distribution of broadcasting, for rooftop and indoor reception with all types of receivers, ranging from large UHD screens to tables and smart phones

6. Main conclusions (2)
Evolution of DTTB technology

More efficient DTTB systems	• More efficient compression system and 2nd generation transmission systems enable a considerable increase of capacity in the transmitted bandwidth
	  ○ Enabling more services, better picture quality (HDTV) and improved coverage
	• Following WRC-15 decisions IMT networks will be implemented in the UHF band. In order to broadcast more services and HDTV, many countries will:
	  ○ Implement 2nd generation transmission systems with advanced compression systems
	  ○ Perform major frequency re-planning to accommodate the transmission of the services into a reduce frequency band
	  ○ Carry-out re-engineering of transmitting stations

ITU-D Question 8/1 of SG1 – Final Report

Examination of strategies and methods of migration from analogue to digital terrestrial broadcasting and implementation of new services

- The migration from analogue to digital broadcasting technologies has already been completed in some countries and is underway in several other countries and regions. In the transition process to digital television, important decisions have to be made and actions need to be thoroughly planned and implemented. Along with that, the use of the "Digital Dividend" is an important issue, and continues to be widely debated by broadcasters and operators of telecommunication and other services operating in the same frequency bands. In this regard it is crucial for regulatory authorities to balance the interests of users with the demands of growth in all branches of the industry.

- The Final Report of the Q8/1 discusses best practices for the transition from analogue to digital television, communication strategies to accelerate the process of public awareness about digital broadcasting, spectrum issues related to the Analogue Switch-Off (ASO), and the use of the released spectrum (digital dividend) to implement new services and applications.

ITU-D Question 8/1 of SG1

1 CHAPTER 1 – Best practices to accelerate the transition from analogue to digital television broadcasting and bridge the Digital Divide with the deployment of new services
2 CHAPTER 2 – Communication strategies to accelerate the process of public awareness about digital broadcasting
3 CHAPTER 3 – Spectrum issues related to the Analogue Switch-Off process
4 CHAPTER 4 – Use of released spectrum to implement new services and applications
5 CHAPTER 5 – Countries case studies on the transition to digital broadcasting and the use of the digital dividend frequency bands

References/Glossary/Abbreviations

Annexes (Case studies, experiences)

ITU-D Question 8/1 of SG1 - Guidelines

Guidelines on Communications Strategies for the Transition from Analogue to Digital Terrestrial Broadcasting

- The migration from analogue to digital broadcasting has already happened in some countries and is on-going in several others. In the digital transition process, important decisions have to be made and actions need to be thoroughly planned and implemented. The role of the regulatory authorities is crucial to balance the interests of users with demands of growth in all branches of the industry.

- The Guidelines at analysing communication strategies to accelerate the process of public awareness about digital broadcasting and the whole process involved in the digital switchover. Strategies on issues related to communication channels used in a coordinated communication strategy and also the planning activities related to a successful Analogue Switch-Off (ASO) communication plan are addressed.

ITU-D Question 8/1 of SG1 - Guidelines

Guidelines on Communications Strategies for the Transition from Analogue to Digital Terrestrial Broadcasting

- Communication planning to accelerate the process of public awareness about digital broadcasting
- Information campaigns for the general public
- Media communication campaigns
- Communication strategies targeted to low income population
- References/Glossary/Abbreviations

Thank you !

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