



Consultative Document

on the

**Framework for Free-to-Air Digital
Terrestrial Television Broadcasting
in Trinidad and Tobago**

(Single Round)

(Version 0.3)

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Abbreviations

API	application programming interfaces
ATSC	Advanced Television Systems Committee
ATSC 3.0	Advanced Television Systems Committee Standard Version 3.0
BWA	broadband wireless access
CA	conditional access
CCN	Caribbean Communications Network TV6
CITEL	Inter-American Telecommunication Commission
CNC3	CNC3 News Trinidad and Tobago
CPE	customer premise equipment
DSO	digital switchover (analogue to digital)
DTT	digital terrestrial television
DTV	digital television
DVB	digital video broadcasting
DVB-H	digital video broadcasting – handheld
DVB-T	digital video broadcasting – terrestrial
DVB-T2	digital video broadcasting – Terrestrial Version 2.0
EMA	Environment Management Agency
EPG	electronic programming guide
FHD	full high definition
FTA	free-to-air
GIS	Government Information Services
HD	high definition
HDTV	high-definition television
HEVC	high efficiency video coding
IBOC	in-band on-channel
ICT	information and communications technology
IP	Internet Protocol
IPTV	Internet Protocol television
ISDB	integrated services digital broadcasting

ISO	International Organization for Standardization
ITU	International Telecommunication Union
ITU-R	International Telecommunication Union Radiocommunication Sector
kHz	kilohertz
MDS	multichannel distribution services
MHz	megahertz
MFN	multiple frequency network
MPEG	Moving Picture Experts Group
MPEG-4	Moving Picture Experts Group standard 4
NTSC	National Television Systems Committee
PBS	Public Broadcasting Service
PMTS	public mobile telecommunications service
QoS	quality of service
RF	radio frequency
RRC-06	Regional Radiocommunication Conference (2006)
SD	standard definition
SDTV	standard-definition television
SFN	single frequency network
STB	set-top box
TTBS	Trinidad and Tobago Bureau of Standards
TTFAT	Trinidad and Tobago Frequency Allocation Table
TV	television
UHD	ultra high definition
UHF	ultra high frequency
USF	Universal Service Fund
VHF	very high frequency

1 Introduction

1.1 Background

The Trinidad and Tobago government's *National Policy on Broadcast and the Broadcasting Industry* seeks to create an environment for the advancement of a fully modernised and dynamic broadcasting sector that contributes to the economic, social and cultural development of the nation. Free-to-air¹ (FTA) television broadcasting is an important component of information and communications infrastructure because its operations are guided by safeguarding public interest. FTA television broadcasting is a medium of information to the public that, critically, is freely accessible. Therefore, FTA television broadcasters have a special obligation to serve the needs and interests of their communities – an obligation that in the past has distinguished them from telecommunications service providers.

FTA television has been analogue since its introduction into Trinidad and Tobago in the 1960s. The transition to digital television broadcasting (which uses digital rather than analogue waveforms to carry content over assigned radio frequency bands) is imperative to ensure the sustainability of the FTA television broadcasting sector.

Many countries have completed the transition of FTA television broadcasting from analogue to digital, including Canada, Mexico, the United States and several South and Central American countries, and some have commenced the transition from first-generation to second generation digital television standards. For other countries, such as Jamaica, the transition is well underway, having selected ATSC 3.0 as the DTT standard, launched a DTT broadcasting service and are currently working on the uptake by consumers. In Trinidad and Tobago, the transition from analogue to digital television broadcasting is only now beginning.

The benefits of transitioning from analogue to digital terrestrial broadcasting include:

1. additional services such as interactive features, closed-captioning, personalisation and electronic programme guides (EPG).
2. higher video and audio quality.
3. greater spectrum efficiency due to advanced digital modulation and coding techniques, which accommodates more programme channels in one radio frequency (RF) channel.

¹ Free-to-air refers to the mode of providing broadcasting services which is unencrypted and where content can be received without payment of subscription fees.

4. the availability of the digital dividend² for other services
5. reinvigorating broadcasting by improving programming and reception capabilities, which reduces problems such as ghosting³ and interference.

In support of the government's *National Strategy for a DigitalTT 2023–2026*, the Telecommunications Authority of Trinidad and Tobago (the Authority) is facilitating the transition by a process called the FTA television digital switchover (DSO). The Authority will adopt an FTA digital terrestrial television (DTT) broadcasting standard and establish when analogue FTA television broadcasting will be switched over to digital.

1.2 Purpose

The purpose of this *Framework for Digital Terrestrial Television Broadcasting in Trinidad and Tobago* (the Framework) is to outline the key policy positions to be adopted and guide the planning and implementation of FTA DTT broadcasting in Trinidad and Tobago.

1.3 Objectives

This Framework:

1. identifies the key issues surrounding the introduction of digital terrestrial broadcasting into Trinidad and Tobago.
2. introduces the concept of signal distribution and the shared signal distributor.
3. outlines an effective and efficient approach for the transition to digital broadcasting.
4. establishes the transition timeframe and key milestones.

² The digital dividend is the amount of radio frequency spectrum made available by the transition of terrestrial television broadcasting from analogue to digital.

³ In television, a ghost is an unwanted image on the screen, appearing superimposed on the desired image. In a more specific sense, a ghost is a replica of the desired image appearing fainter and offset in position with respect to the primary image.

1.4 Scope

This framework provides direction and guidance for the successful transition from analogue to digital FTA television broadcasting in Trinidad and Tobago by selecting an appropriate DTT standard, determining the relevant network configurations and other technical parameters for the adoption and implementation by the broadcasting community.

The Framework does not include direction and guidance on digital audio broadcasting, repurposing of spectrum made available after the transition, spectrum pricing and television content and production policy matters.

1.5 Review Cycle

After the DSO is completed, and as the television broadcasting sector evolves, the need may arise to revise and update this Framework and, as such, this document will be modified as the Authority deems appropriate.

1.6 The Consultation Process

In 2010, the Authority published the first draft of this Framework (version 0.1) and invited comments and recommendations from key stakeholders in the industry. The first consultation period ended on 30th September 2010. The Authority received comments from the following parties:

1. Trinidad & Tobago Publishers & Broadcasters Association
2. Telecommunications Services of Trinidad and Tobago
3. Independent Cable Network of Trinidad and Tobago
4. Columbus Communications Trinidad Limited
5. Green Dot Limited
6. CNC3 News Trinidad and Tobago (CNC3)
7. Caribbean Communications Network (CCN) TV6

In 2011, the second draft of the Framework (version 0.2) was published, which took into consideration the comments and recommendations received in the first consultation round. A decision on recommendations (DORs) matrix was also published with all the comments and recommendations and the Authority's decisions in response.

The second consultation period ended on 23rd September 2011. The Authority received no comments from stakeholders. Both rounds of consultation were conducted in accordance with the

Authority's Procedures for Consultation in the Telecommunications Sector of Trinidad and Tobago.

Although the Framework completed two rounds of public consultation and was issued on the Authority's website, a final version (1.0) was not published as two key milestones were still required for the implementation of the DSO, – the selection of the DTT standard and the adoption of a signal distribution approach. Since the completion of the public consultations, several meetings were held with the industry during the period 2012-2016. In 2016, the Authority at the request of the industry, conducted two studies to determine an appropriate DTT standard and signal distributor approach. Discussions on these studies were held between 2018 and 2022. Both milestones were realised in September 2022. Given the time that has elapsed since the Framework was first drafted, it was revised and will undergo a single round of public consultation, which shall be six weeks in duration. Comments received will be reviewed and incorporated where necessary and relevant.

2 Key Issues in Digital Terrestrial Television Broadcasting

2.1 Impact on Broadcasters

The rollout of a new broadcasting system and, more so, transitioning from analogue to digital, requires the planning and dedication of the FTA television broadcasters. There are several components that will have to be addressed to ensure a successful transition. The components, discussed below, present several challenges that broadcasters may face, which include financial, technical, resource and time.

The following is an overview of the main areas involved in the transition to providing digital broadcasting services:

1. Content – broadcasters may be faced with the challenge of changing formats or multiple content conversions during the purchasing and selling of content to and from suppliers from countries with different digital broadcasting standards.
2. Archiving – as with content production and content play-out systems, the archives storage technology will have to be adapted to match the new requirements and may involve upgrading or replacing equipment.
3. Multicasting – broadcasters may have additional technical constraints for signal distribution for both analogue and digital transmitters over the transition period.
4. Marketing – broadcasters may have to plan a marketing budget to inform and educate audiences on the DSO. There may be an associated cost impact in re-branding and regaining a market presence.
5. Training – broadcasters may have to embark on intensive training programmes for staff who will operate and maintain the digital broadcasting equipment and systems.
6. Equipment – capital budgets will have to be planned in advance, to cater for the purchase of digital broadcasting equipment and systems.
7. Resource allocation – due to the work required in the various areas discussed above, broadcasters may have to carefully plan for increased investment in human resources and time, especially given the constraints of a firm switchover date.

Figure 1 illustrates the stages through which broadcasting services are typically provided. The relevant issues surrounding the transition from analogue to digital television are summarised in processes 3 through 6.

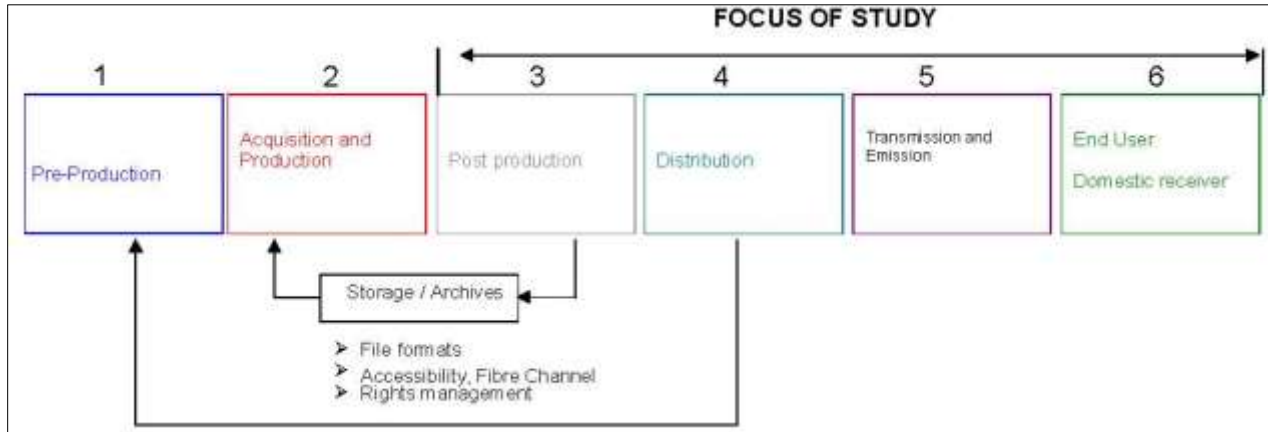


Figure 1. Processes involved in providing broadcasting services
(Source: Southern African Digital Broadcasting Association (SADIBA))

1. Stage 1– Pre-Production

Researchers, producers and commissioning editors use computer-based systems to initiate the programme cycle. Advanced scheduling and offline preparation are done on standard information processing equipment. Most video archive material is in a digital format at present.

2. Stage 2 – Acquisition and Production

The production process uses a wide variety of analogue and digital equipment, usually manually controlled in real-time, with varying degrees of automated assistance. It is typically a digital process.

3. Stage 3 – Post-Production

At present, most post-production is already in digital. However, additional systems will need to be added to ensure the service packaging and signalling requirements of the selected standard are incorporated in this stage. Elements of personalisation in the delivery of DTT service may also lead to changes to the post-production process of the broadcasters.

4. Stage 4 – Distribution

The majority of video distribution in this region is done using the North American analogue video standard developed by the National Television System Committee (NTSC). Distribution systems will have to be upgraded to digital links either via the Internet or a wired or wireless medium.

5. Stage 5 – Transmission and Emission

FTA television broadcasters provide their analogue service via the North American analogue NTSC transmission standard. The majority of analogue transmission components will become obsolete after the transition. The main transmission components – the exciter, amplifier and antenna – will have to be upgraded to accommodate the selected DTT standard.

6. Stage 6 – End-User Domestic Receiver

For analogue television service, viewers only require the use of an indoor or outdoor antenna and a TV set. In transitioning to DTT, viewers may either change their television set to one that has a digital receiver/tuner circuit for the selected standard or use a set-top box (STB) with the current TV set.

2.1.1 Coverage Requirements and Spectrum Allocation for Analogue FTA Television Broadcasting

The topography of Trinidad and Tobago varies between mountain ranges and flood plains. With the majority of the country's population situated on plains and foothills, broadcasters have taken advantage of the elevation provided by the mountain ranges to achieve coverage. As a result of this, there has been limited build-out of sites for broadcast transmitters (two primary sites in Trinidad and one primary site in Tobago).

Tobago faces many challenges with respect to the offering of broadcasting services. Even though there are four national FTA television broadcasters, various areas in Tobago do not have adequate coverage or receive services. A key contributing factor to this challenge is the topography of Tobago, which consists of a central mountain range spanning the length of the island. Most of the population of Tobago resides in the foothills and valleys.

Unlike Trinidad, where a single main transmitter site may feed the majority of the population, broadcasters must configure transmitters such that there is coverage into the valleys on either side of ridges. The use of multiple transmitter sites utilising frequency re-use and directional coverage patterns is a means of ensuring that Tobago is adequately provided with broadcasting services. It should be noted that there is a higher cost associated with this method due to the infrastructure and equipment associated with each transmitter station.

The Authority has carefully analysed the coverage provided by existing broadcasters. Using the present coverage, transmitter site configurations and propagation models developed, one main or primary transmitter site using a very high frequency (VHF) channel may provide 50%–

90% population coverage. Increasing this figure may be achieved by utilising additional ultra high frequency (UHF) channels at one or more secondary transmitter sites, in a frequency re-use configuration, to fill underserved areas or dead spots.

To ensure that the currently authorised television service providers can meet their coverage requirements based on their concession type, the Authority has assigned channels to the various concessionaires, as follows:

1. National⁴ – 3 channels (1 VHF, 2 UHF)
2. Major territorial⁵ – 2 channels (UHF)
3. Minor territorial⁶ – 2 channels (UHF)
4. Niche⁷ – 1 channel (UHF)

2.1.2 Revocation of Allocated Frequencies

A key resource required for the provision of terrestrial broadcasting services is RF spectrum, which is recognised as a scarce national resource. The assignment to a licensee confers neither ownership nor an absolute right to a particular RF channel. Since digital technology makes it possible for one RF channel to accommodate more than one programme channel, it is in the public interest to ensure that the RF spectrum is used efficiently.

Digital television is planned in the same frequency bands used by analogue television. Therefore, the full introduction of digital television broadcasting services will necessitate an eventual switch-off of the existing analogue television broadcasting services in the UHF/VHF frequency bands.

As seen in other countries where the DSO process has been completed, the digital dividend was placed as a high objective for a timely switchover. The upper UHF television band (700 MHz) was

⁴ A national network/service provider will have the right to provide its network and/or service to 100% of the geographical area of both Trinidad and Tobago.

⁵ A major territorial network/service provider will have the right to provide its network and/or service to 100% of the geographical area of the island of Trinidad.

⁶ A minor territorial network/service provider will have the right to provide its network and/or service to 100% of the geographical area of the island of Tobago.

⁷ A niche network/service provider will have the right to provide its services to specific geographic regions identified by the Authority in either island of Trinidad or Tobago.

unassigned during the first wave of global DSO and Trinidad and Tobago capitalised on that by making this spectrum available for broadband wireless access (BWA) services. This spectrum has since been re-farmed and allocated for public mobile telecommunications services (PMTS).

Policy Statement on DTT

- 1. The Authority shall allocate spectrum recovered from free-to-air analogue broadcasters to DTT broadcasting services, where required*
- 2. Spectrum made available through this process shall be primarily used for expanding the capacity for DTT. Any unused spectrum will be used for other services as required. This shall be identified in the Implementation Plan for the Free-to-Air Television Digital Switchover in Trinidad and Tobago and shall be consistent with the Trinidad and Tobago Frequency Allocation Table (TTFAT) (8.3 kHz – 3000 GHz)*

2.2 Impact on Consumers

In the context of digital broadcasting, the challenge will not be in convincing the public of the need for televisions and radios but rather for the appropriate technology to receive digital programming on those media. This could be televisions (with a built-in tuner for the adopted DTT standard) that can receive digital programmes or STBs that change the digital broadcasts into a format that is compatible with the existing television sets. One of the major challenges in digital switchover is to raise awareness of the transition to digital and ensure consumer buy-in.

Importantly, consumers with subscription television service will continue to receive FTA television channels without the need to change their television set or add an STB, as the “must-carry”⁸ requirement will remain in place, i.e., all subscription service providers will continue to carry FTA television channels.

Globally, the issue of STB costs and its impact on the lower-income groups in society is one that requires intervention. One of the more direct approaches taken to ensure that this group is ready for the DSO is by introducing a subsidy for STBs. A subsidy can be provided in various ways such as direct payouts, coupons, tax reductions or incentives, and rebates. Regardless of the method

⁸ “A concessionaire who operates a public domestic fixed telecommunications network which is used for the provision of television broadcasting services shall ensure that all national and major territorial free to air television broadcasting channels are carried on its network” (B18 of the *Concession for the Operation of a Public Telecommunications Network and/or Provision of Public Telecommunications and/or Broadcasting Services*)

chosen, it should not be onerous or an administrative burden. The task of identifying how many people require and qualify for a subsidy may be carried out using an appropriate means test.

Policy Statement on DTT

- 3. The Authority may recommend suitable fiscal incentives to encourage the adoption of DTT broadcasting in an affordable manner, including the reduction or waiver of duties and taxes on relevant DTT receiver equipment*

2.2.1 Continuity of Service to the Public

As the FTA analogue broadcasters transition to digital, there is the concern of ensuring that the persons are not adversely affected by having their access to the FTA television service discontinued. There are two modes in which DTT broadcasting services may be provisioned:

1. Service as FTA – in this mode, the public can still enjoy television broadcasting services in the same way as analogue FTA television is currently viewed, except that the relevant STB or television set will be required that conforms to the selected DTT standard. This mode does not cater for any encryption system and, typically, any STB that complies with the chosen DTT standard should be able to receive the signal. The advantage of such STBs is that they reduce the barrier to entry for the market. The disadvantages are that broadcasters have no control over the viewer base; will not know exactly how many viewers are watching; and only limited additional services may be offered. In order to ensure that the market is not flooded with low-quality equipment, it is proposed that STBs be subject to some form of quality control. A minimum standard for the equipment will have to be set.
2. Service as free conditional access (CA) – this option offers broadcasters the ability to protect content and provide additional services. The public does not pay for viewing programmes but is required to have an STB or television set capable of decoding the encrypted signal. With this mode, viewers will have to acquire an STB as well as a smart card to be able to watch the programmes at no additional cost.

With both of these modes, the Authority shall ensure that the FTA television broadcasting content received prior to digital switch-on shall continue to be accessed via FTA and without restriction during the phases of the DSO.

Policy Statement on DTT

4. The Authority shall ensure that:

- a) there is no disruption in service to the public during digital switch-on and analogue switch-off for the transmission of programmes from analogue FTA broadcasters who have transitioned to digital.*
- b) conditions under the following clauses of the concession (the “must-carry” obligation) are upheld for analogue FTA television broadcasters who transition to DTT broadcasting:*
 - i. B.18 “A concessionaire who operates a public domestic fixed telecommunications network which is used for the provision of television broadcasting services shall ensure that all national and major territorial free to air television broadcasting channels are carried on its network”*
 - ii. D.10 “A provider of subscription television broadcasting services who operates a public domestic fixed telecommunications network that is used for the provision of this broadcasting service shall ensure that all national and major territorial free-to-air television broadcasting channels are carried on its network”*

2.2.2 Consumer Education

It is important to ensure that there are strategies for disseminating relevant information to consumers regarding the requirements and benefits of the transition to digital broadcasting. Public understanding and acceptance are crucial to the success of the transition from analogue to digital television broadcasting. A comprehensive public education campaign will therefore be required, which emphasises the benefits of the DSO to the consumer. The content of such a campaign must include:

1. simple, clear explanations of the difference between analogue and digital services.
2. the type of service and channels that will be available.
3. the STBs and television sets available (the types of receivers and estimated costs).
4. concise descriptions of the changes to existing home connection set up that will be required (aerial configuration, connection with other equipment, etc.)
5. the period of the transition that is to be expected.
6. the switchover dates.
7. policy issues.

8. financial implications to the consumer with the DSO.
9. the possible issues with reception and troubleshooting steps.
10. coverage.
11. the environmental impact, and guidelines for proper disposal, of unwanted devices.
12. incentives which may be available to consumers, for example, waiver of customs duties.

The public may contact the Authority for information on the points above. The approach to addressing each point shall be identified in the DTT stakeholder awareness plan.

A well-prepared consumer education programme is key to any successful switchover plan, and lessons learned from switchover activities in other regions underline the importance of the following approaches in consumer communications:

1. The use of existing analogue services to communicate the benefits of new digital services is an extremely powerful mechanism. It is to be noted that the sale of digital receivers can be enhanced using promotions during analogue broadcasts.
2. Communication through broadcast media should be complemented with corresponding written information handed out at the point of sale.
3. Industry and trade must support the market education programme by providing consumers with information on how to use and derive maximum value from the new equipment.

At the initial stages of the DSO, the Authority will collaborate with government agencies on the rollout of consumer education and public awareness programmes. However, the spearheading of public awareness initiatives by the Authority and the government does not preclude any consumer educational programmes that broadcasters may wish to implement in the delivery of their services. Consumer education should involve all broadcasters, retailers and other key players in the broadcasting industry, in order for it to improve usability and accessibility to digital broadcasting and yield the expected benefits of DTT.

2.2.3 Consumer Protection

The priority during the transition must be the consumers who are likely to be the most affected. The decisions of consumers will affect the success of the DSO. The education plan must prioritise consumer protection, to prevent customer exploitation through unfair market practices.

Two key aspects of consumer protection are:

1. the provision of adequate time to switch. The proposed transition period must be sufficient and the new medium attractive enough to encourage people to buy the appropriate digital equipment. This will also increase the up-take rate. Additionally, consumers who do not wish to abandon their analogue television set immediately will have STBs, which will allow them to receive digital signals on their current television set.
2. relevant consumer complaints procedures. As the Authority puts in place measures to end analogue broadcasting, it will be necessary to ensure that suitable procedures are implemented for consumers to lodge complaints, and that intervention mechanisms exist to address consumer concerns.

2.2.4 Vulnerable Groups

The needs of vulnerable groups must be evaluated and addressed in the transition strategy. For instance, people with disabilities often face more challenges in using new technologies and their special needs are often forgotten. Some of the challenges they face range from visual, hearing and dexterity impairment, so efforts must be directed at:

1. creating awareness and understanding nationally.
2. identifying products suitable for vulnerable groups, particularly those with disabilities.
3. ensuring the accessibility of ancillary services and their availability on the digital television platform.

Policy Statement on DTT

5. *The Authority shall establish a DTT stakeholder awareness plan which shall ensure that the public is fully apprised of the key issues relating to the analogue to digital switchover. The implementation of this plan shall be a collaborative effort between the Authority and the relevant stakeholders, with the role and responsibilities of each party identified*

2.3 Environmental Concerns

With the global activities to advance the transition from analogue to digital, the consumer electronics market faces yet another change. As the new end-user equipment is developed and deployed, older and less suitable equipment will have to be replaced and/or discarded. This presents a twofold problem for countries that do not have an electronics manufacturing industry. Firstly, outdated analogue and older digital receivers may be shipped out in very large quantities from countries implementing DSO to countries dependent on the importation of electronic equipment, commonly referred to as “dumping”. Secondly, a lack of understanding may cause consumers to discard their current television sets, adding to the crisis in electronic waste disposal and the resulting environmental hazards. This too is referred to as dumping but in the literal sense. Appropriate regulations relating to specifications and standards of the relevant consumer equipment (STBs and TV sets) and the disposal of e-waste will be required in order to prevent both forms of dumping.

Policy Statements on DTT

6. *The Authority shall establish the relevant standards for the end-user equipment required for DTT broadcasting, so as to reduce the possibility of the importation of uncertified equipment in this country*
7. *The Authority shall collaborate with other agencies such as the Environmental Management Agency (EMA) and the Solid Waste Management Company Ltd (SWMCOL) to develop solutions to address environmental concerns, including those which address the dumping of older television sets in the market and provide proper e-waste disposal*

3 Service Provision and Signal Distribution

Signal distribution is the process of conveying content to a target area using a broadcasting transmission system. It involves the construction, operation and maintenance of transmission infrastructure.

3.1 Shared Signal Distribution

In Trinidad and Tobago, FTA television broadcasters own and operate transmission facilities. Broadcasters are essentially individual signal distributors as well as broadcasting service providers. Broadcasters have invested heavily in the infrastructure for distributing their signal. The investment in a transmitting station includes access roads, electricity, buildings, security, air conditioning, generators, tower/mast with common transmitting antennas, and satellite uplink and receiving facilities. There is also the associated cost of employing staff to manage and maintain facilities in the field.

The transition from analogue to digital will introduce set-up costs for infrastructure. This could be a limiting factor in the number of broadcasters willing to become signal distributors. The cost burden could be reduced if a common infrastructure is used to provide digital transmission services to broadcasters. This is done through a common carrier company that makes its infrastructure available for hire for broadcasting transmission services. This entity is usually referred to as a “multiplexer” and is a common or shared signal distributor. This arrangement ensures optimal utilisation of national resources.

With the introduction of a shared signal distributor, the broadcaster can concentrate on content development and will no longer be involved in site acquisition, transmission, infrastructure development and operation. While broadcasters will incur additional costs during the simulcast period, it is expected that after the analogue switch-off, there will be no further costs incurred for analogue transmission.

A shared signal distributor is beneficial for the following reasons:

1. Lower transmission costs per broadcaster
2. Greater efficiency in spectrum management
3. Lower set-up costs for new broadcasters
4. Reduced environmental impact

5. Lower cost to the consumer vis-à-vis the receiving equipment, for example, one common receiving aerial antenna
6. Uniform coverage of the broadcast signal
7. Less signal interference

3.2 Obligations of Shared Signal Distributors

The Authority proposes the following obligations for shared signal distributors:

1. Provide services to broadcasters on an equitable, reasonable, non-preferential and non-discriminatory basis
2. Adhere to the licence conditions, as provided by the Authority
3. Provide quality delivery of broadcasting services, in accordance with the quality of service (QoS) standards set by the Authority
4. Ensure that the digital transmission coverage is in accordance with the concession and licence requirements
5. Inform the Authority of all modifications to the network
6. Provide rates, terms and conditions to users of the network as approved by the Authority

Policy Statements on DTT

8. *The Authority shall authorise entities as signal distributors, in accordance with this Framework for Digital Terrestrial Television Broadcasting in Trinidad and Tobago, where existing free-to-air broadcasters will be eligible to become signal distributors.*
9. *Shared signal distributors shall comply with the obligations set by the Authority, which include the following:*
 - a) *Provide services to broadcasters on an equitable, reasonable, non-preferential and non-discriminatory basis*
 - b) *Adhere to licence conditions, as provided by the Authority*
 - c) *Provide quality delivery of broadcasting services, in accordance with the standards set by the Authority*
 - d) *Ensure that the digital transmission coverage is in accordance with the concession and licence requirements*
 - e) *Pursuant to the concession, inform the Authority of all modifications to the network*
 - f) *Provide rates, terms and conditions to users of the network as approved by the Authority*
10. *The spectrum allocations, assignment principles, and number of signal distributors allowed for authorisation will be detailed in the Implementation Plan for the Free-to-Air Television Digital Switchover in Trinidad and Tobago.*

4 The Transition to Digital Television Broadcasting

Broadcasting greatly impacts the economic, social and political aspects of society. It affects content production, transmission and reception, policymakers, broadcasters and, ultimately, consumers. Since the analogue to digital transition should cause minimal disruption to viewers, a cautious and gradual execution of the transition plan is imperative.

There are two possible approaches to the transition to digital broadcasting:

1. Market driven – a technological transition that involves the progressive replacement of analogue technology with digital technology, governed completely by market forces for entrance and survivability
2. Policy driven – a transition guided by established processes and plans that have been agreed upon by all stakeholders, with the goal of ensuring a timely implementation. This approach focuses primarily on FTA terrestrial broadcasting services.

It is critical to implement the transition in a manner that mitigates the effects of the costs, develops attractive services to drive demand, and overcomes resistance from the public and industry players who may see risks in the changes in the broadcasting sector.

4.1 Market-Driven Approach to the Transition

This approach introduces digital broadcasting with market forces shaping entry and existence. This was the method used for the introduction of analogue broadcasting services into this country. With a market-driven approach, the government facilitates the introduction of new digital television services and the granting of licences. This approach, while attractive to broadcasters seeking to provide digital TV services, is not directed by a policy that influences the shape of digital broadcasting.

4.2 Policy-Driven Approach to the Transition

This approach has been predominantly adopted to promote the orderly transition to FTA DTT broadcasting. Establishing a policy will guide the transition process and ensure that a timely switchover is achieved. Procedures and standards are detailed and contribute to properly managing the switchover process.

Within this approach, there are three options, which are discussed below:

1. Staged Digital Broadcasting

A managed approach induces economies-of-scale benefits, the most obvious of which is the driving down of costs through greater market penetration. Subsidised receiver equipment for consumers could be used as an incentive and catalyst for this approach.

This option creates an opportunity for the future licensing of both analogue and digital broadcasters. The Authority has completed a process that may be considered as the first component of this option. Two concessions were granted for additional FTA television broadcasters and, although not under any mandate, these broadcasters have chosen to provide analogue broadcasting services.

The second part of the option may enable the use of the available spectrum in the upper UHF band (channels 40–50) for simulcasting. These channels will be distributed selectively to existing analogue broadcasters to deploy digital transmission infrastructure. This option identifies certain broadcasters first, with a plan to later expand to the rest of the broadcasters as frequencies become available. Such a transition plan should bear in mind the interests of the existing analogue broadcasters.

The protection of existing analogue services in terms of interference levels will be of utmost importance. This method would be feasible even for the allocation of spectrum in the event of scarcity. The drawback of this option is the unequal playing field created for certain broadcasters in having some services deployed ahead of others. Crucial market penetration can be achieved by those in the first phases of switchover, which would lead to an unfair advantage in capturing revenue.

2. Digital Broadcasting with Restrictions on New Analogue Broadcasters

The Authority would impose a moratorium on future analogue rollout and announce a fixed switch-off date for analogue. This option makes use of all the available VHF/UHF channels for simulcasting and creates a feasible path toward switchover. Although not an approach that is spectrum efficient, broadcasters can rely on the market being a fair and competitive one.

As discussed, broadcasters have the challenge of providing coverage, given the topography of the country and the limited transmitter sites available. Allowing each broadcaster to simulcast on additional RF channels worsens the overcrowding at antenna sites, resulting in the increased possibility of interference.

3. Digital Broadcasting Using a Combination of Delivery Platforms

Similar to option two, the Authority would impose a moratorium on analogue rollout and announce a fixed switch-off date for analogue. The introduction of DTT broadcasting will be via the authorisation of individual and/or shared signal distributors, utilising the spectrum allocated for this process, as identified in the *Implementation Plan for the Free-to-Air Television Digital Switchover in Trinidad and Tobago*. This will provide the fastest adoption of digital broadcasting services, as new entrants geared towards DTT broadcasting will introduce the technology, driving the market into the uptake of services.

The deployment of a common DTT transmission platform (shared signal distributors) will offer a valuable opportunity for the introduction of digital television services in the country. These digital platforms or signal distributors require the same licensing and regulatory conditions as the analogue television broadcasters.

Existing analogue television broadcasters will be allowed to become signal distributors, owning and operating the transmission facilities. Alternatively, analogue television broadcasters may choose not to be a signal distributor and only provide services through an already established signal distributor. This creates the opportunity for the broadcaster to focus on content production, while meeting coverage obligations will now become the responsibility of the signal distributors.

This option is the most spectral efficient approach and gives existing analogue broadcasters the fastest and most feasible path towards digital transmission. A fair and competitive market is created, which fosters the development of more content providers, value-added services and enhanced quality of service delivery.

It should be noted that a moratorium has been in place since 2009 on applications for FTA television broadcasting services on a first-come first-served basis.

Policy Statements on DTT

11. The Authority shall use a policy-driven approach, using a combination of delivery platforms, for the introduction of DTT broadcasting services

12. The introduction of DTT broadcasting will involve the authorisation of individual signal distributors, shared signal distributors operating the transmission facilities, and broadcasters seeking to use these facilities to provide services or a combination of both

4.3 Broadcaster Network Configurations

DTT broadcasting can be achieved in the following two ways:

1. Multiple frequency networks (MFNs) which allow the same programme to be carried by individual transmitters using different frequencies
2. Single frequency networks (SFNs), in which coverage is provided by multiple transmitters operating on the same frequency and carrying the same programmes

The network configurations for digital terrestrial broadcasting services can be implemented as MFNs, SFNs, or mixed networks consisting of both. The type of network implemented depends on the availability of frequencies, the type of coverage required, topography, and the number of signal distributors.

4.3.1 Multiple Frequency Networks (MFN)

This network configuration has been adopted for existing analogue television broadcasting, as identified in the channel assignment principles in section 2.1.1. Each transmitter uses a different frequency channel, acting independently and having its own coverage area. The re-use of channels is possible if there is sufficient geographical separation. In providing coverage utilising this mode of operation, the consumer now has to determine the best received signal or channel in a particular service area. This can potentially lead to confusion and misconception for the consumer in relation to the station name and identified TV channel(s).

Consistent with the fee structure and the Telecommunications (Fees) Regulations 2006, any broadcaster utilising more than one frequency must pay for the use of that spectrum. This approach will therefore result in higher fees for providing a TV broadcasting service when compared to a network using one frequency, as in an SFN.

A typical configuration for an MFN is shown in Figure 2, illustrating how coverage is achieved utilising multiple frequencies and frequency re-use.

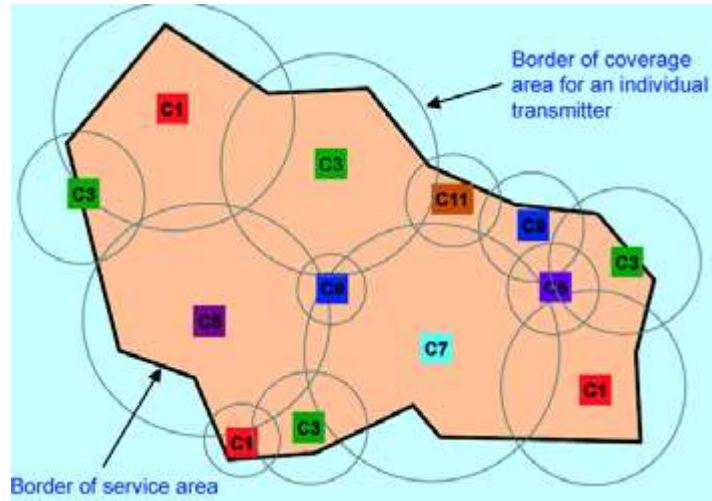


Figure 2: MFN showing coverage and spectrum assignment

4.3.2 Single Frequency Networks (SFN)

Analogue FM and AM radio broadcast networks, as well as digital broadcast networks, can operate in the SFN configuration. Analogue television transmission has proven to be more difficult, since SFNs result in “ghosting” due to echoes of the same signal. A simplified form of SFN can be achieved by using a low-power, co-channel repeater, booster or broadcast translator as a gap-filler transmitter.

The aim of SFNs is the efficient use of the radio spectrum, allowing a higher number of radio and TV programmes/broadcasters compared to traditional MFN transmission. An SFN may also increase the coverage area and decrease the outage probability compared to an MFN, since the total received signal strength may increase to positions midway between the transmitters.

In an SFN, all transmitters are usually synchronised using GPS or a signal from the main station or network as a reference clock. A typical configuration for an SFN is shown in Figure 3, identifying how coverage is achieved with frequency re-use.

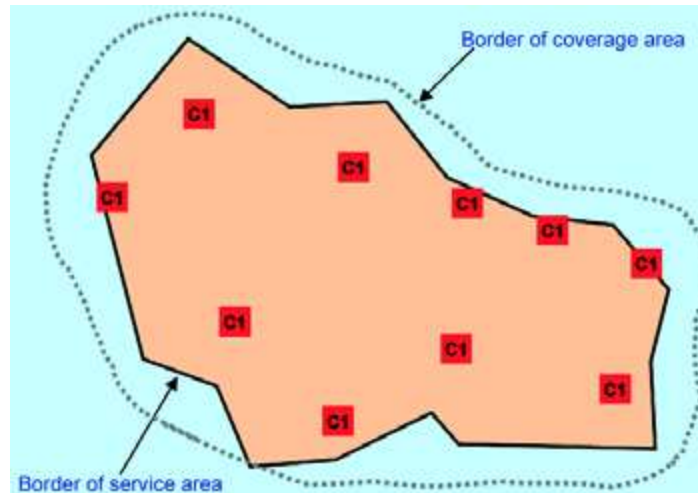


Figure 3: SFN showing spectrum allotment

Policy Statement on DTT

13. The Authority shall adopt single frequency network (SFN) configurations, as far as is feasible, for the provision of digital terrestrial television services in Trinidad and Tobago

4.4 DTT Broadcasting Standards

DTT is the implementation of digital technology to provide more channels when using standard-definition television (SDTV) and better quality picture high-definition television (HDTV). The main technology standards used are digital video broadcasting (DVB-T and DVB-T2) in Africa, Asia and Europe; Advanced Television Systems Committee (ATSC and ATSC 3.0) in North America; and integrated services digital broadcasting (ISDB-T) in Japan and South America. Figure 4 is a map showing the worldwide deployment of DTT standards.

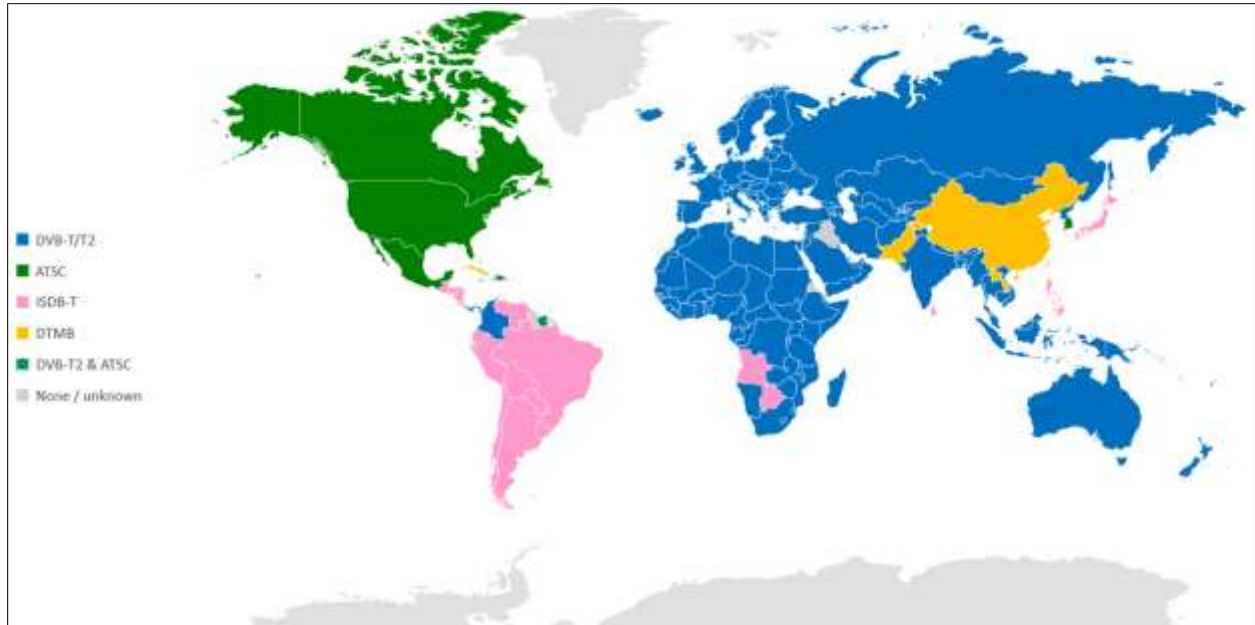


Figure 4: Worldwide deployment of DTT technologies (as of March 2023)

The Regional Radiocommunications Conference in 2006 (RRC-06)⁹ adopted the DVB-T standard for digital terrestrial television broadcasting for the ITU Radiocommunications Sector (ITU-R) Region 1 countries. To date, there has been no adoption or recommendation by ITU for an ITU-R Region 2 DTT standard. This is a result of the low need or priority required for cross-border coordination, as was necessary for ITU-R Region 1 countries.

ITU-R Region 2 countries, which include the Caribbean islands and North, Central and South America, are permitted to adopt any DTT standard. In addition to the absence of a recommendation by ITU for a DTT standard for ITU-R Region 2, there has been no standardisation for DTT by the Inter-American Telecommunication Commission (CITEL), which is the regional radiocommunications body.

The European-standardised DVB standard has variants relating to terrestrial, satellite, cable multichannel distribution services (MDS), and even disk and the Internet. The North American ATSC 3.0 is the most recent and advanced standard. It is the only standard that uses the Internet Protocol (IP), which facilitates the provision of enhanced features to receivers also connected to the Internet.

⁹ The Regional Radio Conference 2006 (RRC-06) is the conclusion of a major spectrum re-planning exercise for frequency plan for digital broadcasting in bands III (174-230 MHz) and IV/V (470-862 MHz) for 120 countries in Africa, Europe, and the Middle East. The RRC-06 culminated in the drawing up of a new spectrum plan for these bands, which is now referred to as GE-06, which stands for Geneva 2006. This plan, which is meant to facilitate the move from analogue to the digital broadcasting of TV and radio, replaces the previous Stockholm Plan, which was drawn up in 1961. These plans are meant to last over the very long term.

Caribbean countries that have chosen a DTT standard are identified in Table 1:

Table 1: DTT standards adopted in the Caribbean (as of August 2023)

COUNTRY	DTT TECHNOLOGY		
	DVB	ATSC	ISDB
The Bahamas		√	
Bermuda (United Kingdom)	√		
Dominican Republic		√	
Guadeloupe (France)	√		
Jamaica		√	
Martinique (France)	√		
Puerto Rico (United States)		√	
Trinidad and Tobago		√	

In some Caribbean countries, the adoption of a DTT standard has been influenced by their relational dependency on former territory owners, as seen in Martinique, Puerto Rico and others, indicated in the table.

The Authority and the FTA TV broadcasters have discussed extensively the selection of a standard and, in 2022, agreed that the most advanced standard, ATSC 3.0, should be adopted for DTT in Trinidad and Tobago.

Policy Statement on DTT

14. The Authority, after extensive consultation with the free-to-air television broadcasting sector, has adopted the ATSC 3.0 standard for DTT. The standard shall be applied to service providers in the allocated spectrum for broadcasting services, as identified in TTFAT

4.4.1 Comparison of Digital Picture Quality

Digital television supports many picture formats, defined by the combination of size, aspect ratio (width to height ratio) and interlacing. With DTT broadcasting, the formats can be broadly divided into four categories: ultra-high definition (UHD), full-high definition (FHD), high definition (HD), and standard definition (SD). These terms by themselves are not very precise, and many subtle, intermediate formats exist.

UHD is used to define two formats – 2160 x 3840 pixels and 4320 x 7680 pixels – in progressive scan mode (4K and 8K), both utilising a 16:9 aspect ratio. FHD uses 1920 x 1080 pixels in progressive scan mode (1080p) with a 16:9 aspect ratio. HD uses 1280 x 720 pixels in progressive scan mode (720p) with a 16:9 aspect ratio. UHD, FHD and HD cannot be transmitted over current analogue standards.

By comparison, SD may use one of several formats, taking the form of various aspect ratios, depending on the technology used in the country of broadcast. For 4:3 aspect-ratio broadcasts, the 640 x 480 format is used in NTSC countries, while 720 x 576 is used in PAL countries. For 16:9 broadcasts, the 704 x 480 format is used in NTSC countries, while 720 x 576 is used in PAL countries.

Figure 5 shows a comparison of the video quality and picture size of digital broadcast signals. SD picture quality is shown by the areas marked in red and yellow; FHD is represented by the area coloured purple (1080p); HD is in the green area (720p); and UHD is represented by the blue area.

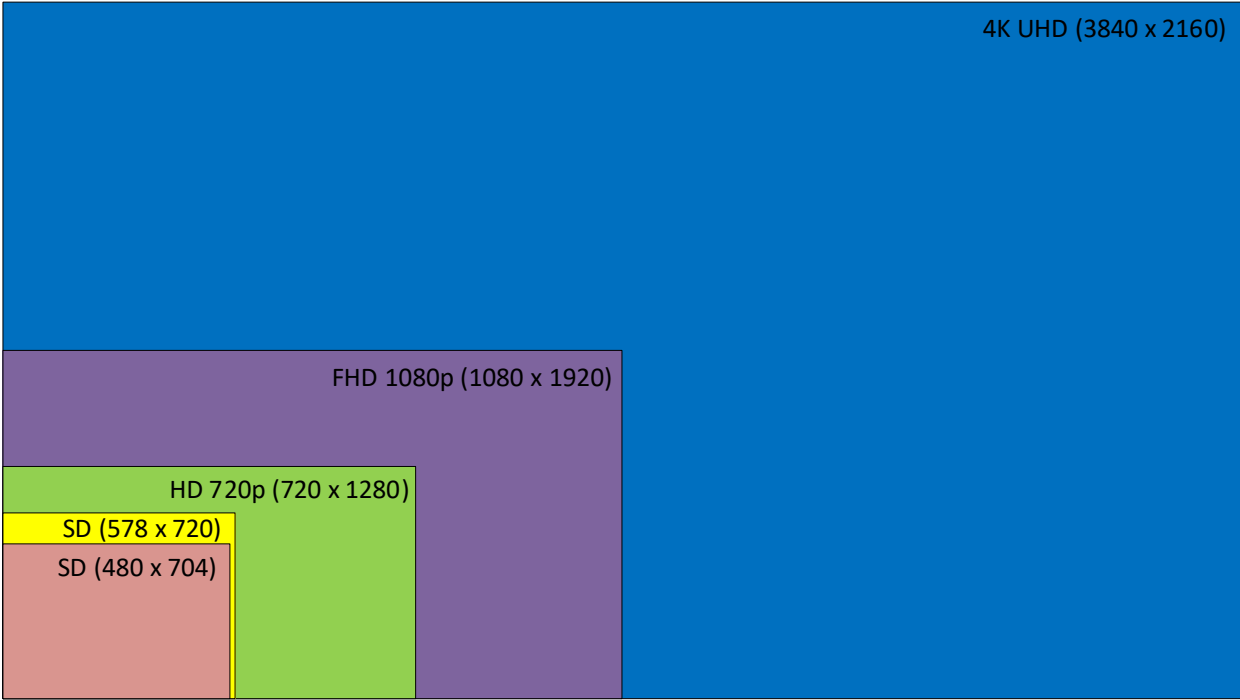


Figure 5: Comparison of digital picture quality

4.4.2 Video Standards for Digital TV

There are many factors to consider when selecting the codec in a digital video system. The most important ones are the visual quality requirements for the application; the environment (speed, latency and error characteristics) of the transmission channel or storage media; and the format of the source content. Also highly important are the desired resolution, target bitrates, colour depth, the number of frames per second, and whether the content and/or display are progressive or interlaced.

There have been two primary standards organisations driving the definition of video codec. ITU is focused on telecommunications applications and has created the H.26x standards for low-bit-rate video telephony. These include H.261, H.262, H.263, H.264 and H.265. The International Organization for Standardization (ISO) focuses more on consumer applications and has defined the MPEG standards for compressing moving pictures. MPEG standards include MPEG-1, MPEG-2 and MPEG-4.

Figure 6 illustrates the history of video codec standardisation.

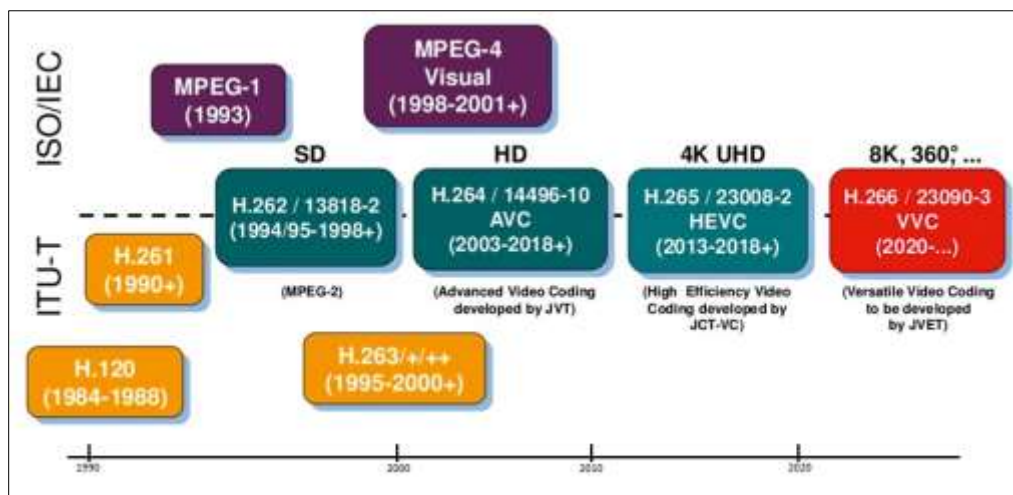


Figure 6: Chronological progression of video-coding standards for digital TV

Standards have been critical for the widespread adoption of codec technology. Consumers find products based on standards affordable because of economies of scale. The broadcasting industry is willing to invest in standards, given their assurance of interoperability between vendors of consumer electronics. Content providers are attracted to standards, given the long life and broad demand their content would see. While almost all video standards are targeted for a few specific applications, they are often used to advantage in other applications when they are well suited.

Policy Statement on DTT

15. The Authority shall adopt the following minimum technical standards in relation to digital terrestrial television broadcasting:

- a) HEVC (the Authority may revise this specification at the appropriate time)*
- b) Video picture aspect ratio of 16:9*
- c) HD picture quality during digital switch-on*

4.5 Digital Mobile Television

Digital mobile television is a television broadcasting service where the content is broadcast or streamed to mobile phones or other portable devices, but not to traditional television sets.

There are currently three main technology families for delivering broadcast content to mobile phones or other portable devices, namely:

1. In-band cellular broadcast techniques
2. Terrestrial digital broadcast networks and their extensions, such as DVB-H, which is generally considered part of the DVB-T standard that has fixed, mobile and portable reception modes
3. Hybrid satellite/terrestrial systems

4.6 Other Broadcasting Technologies

Market forces have determined the uptake of other broadcasting technologies, such as digital satellite broadcasting, IPTV and cable TV. A clear advantage of cable TV and IPTV transmission is that they can provide an integrated return channel via a modem, thus enabling broadband Internet access alongside digital broadcasting.

In many countries, the moderate capacity is still controlled by regulation that considers must-carry considerations. The switchover of the cable networks in many countries is thus linked to the terrestrial switchover.

As of June 2023, the total number of subscriptions to pay TV services stood at approximately 212,000. Of this number, there were 800 analogue subscriptions, or less than 1%, whilst digital subscriptions contributed 211,000, or over 99.6%.

4.7 End-User Equipment

The availability of digital receiving apparatus at affordable prices is crucial to the early uptake of digital broadcasting technology by the mass market. Pricing of this receiving equipment could be the single biggest obstacle or enabler to the introduction of digital broadcasting in this country. As with most technologies and services, its rollout is highly dependent on the availability of the customer premise equipment (CPE), i.e., STBs and digital-ready television sets. It is to be noted that, in the Caribbean, and Central and South America, a significant portion of end-user equipment is sourced from Asia and North America, which are the major electronics market manufacturers for this region. It has been widely observed that Asia produces equipment at a lower cost compared to electronics manufacturers in North America, Europe and, of late, Africa.

A recommended minimum specification receiver should be adopted, to allow for the reception and decoding of DTT television services. Standardised interoperable system parameters create mass markets for terminals, which reduces costs and accelerates the penetration of digital devices.

Policy Statement on DTT

16. The Authority shall develop minimum specifications for digital terrestrial television end-user equipment and CPE in relation to the DTT broadcast standard adopted. These specifications shall be prescribed in the document Implementation Plan for the Free-to-Air Television Digital Switchover in Trinidad and Tobago

4.8 Interactive Services

The use of interactivity in television programmes is growing continuously. Interactivity is an important way to enhance the service offering in the digital television environment.

Real interactivity between a service provider and a digital TV terminal device needs both a two-way connection and an application running in the terminal, for which special software (middleware) containing application programming interfaces (APIs) is needed.

Modern STBs and television sets can connect to the Internet via Wi-Fi or the ethernet. Via the Internet is one approach to achieve the two-way connection required by the interactivity features of digital television. Another approach is a dedicated return RF channel.

Policy Statement on DTT

17. Broadcasters may utilise various forms for the return path to enable interactive services, subject to the Authority’s approval

4.9 Spectrum Allocations for Television Broadcasting Services

Table 2 summarises the spectrum plan used in ITU-R Region 2 countries for FTA television services:

Table 2: Spectrum plan for ITU-R Region 2 countries

Band	Channel No.	Operating Frequency Range
Lower VHF	2–6	54–88 MHz
Upper VHF	7–13	174–216 MHz
UHF	14–83	470–806 MHz

Trinidad and Tobago’s television broadcasting sector is developing in the same manner as the sectors in other ITU-R Region 2 countries. The band plans and standards previously adopted in Trinidad and Tobago, as well as the equipment used in deploying broadcasting stations, originate from the North American region. One of the major evolutions in television broadcasting in ITU-R Region 2 is the reallocation of television channels 52–69, i.e., 698–806 MHz to mobile services.

ITU-R Region 2, channels 52–69, i.e., 698–806 MHz have been allocated to commercial mobile services, to support the deployment of international mobile telecommunications services. It is envisaged that the advancements in digital television broadcasting will reduce the number of FTA television broadcasting channels, thus allowing further reallocation of the television UHF channels to other radiocommunication services.

4.9.1 Spectrum Plan for Terrestrial Television Broadcasting

Subsequent to an analysis of the following:

1. Frequency allocations and footnotes in the *Trinidad and Tobago Frequency*

Allocation Table (TTFAT)

2. The Authority's Frequency Assignment Register Records
3. Frequency Allocations within the Authority's *Spectrum Plan for the Accommodation of BWA Services*
4. Agreement between the administrations of France and Trinidad and Tobago on the use of the VHF Band and the UHF Band for Terrestrial Broadcasting

the frequency ranges that can be considered for the accommodation of FTA television services are identified in Table 3 below.

Table 3. VHF and UHF Spectrum Allocations in Trinidad and Tobago

Channel No.	Frequency Range	Licensing Status
2–6	54–88 MHz	Available for the accommodation of analogue FTA television services
7–13	174–216 MHz	Available for the accommodation of analogue FTA television services
14–36	470–608 MHz	Available for the accommodation of analogue and digital FTA television services
37–51	608–698 MHz	Allocated to BWA services (600 MHz band)
52–69	698–806 MHz	Allocated to public mobile telecommunications services (700 MHz band)
70–83	806–890 MHz	Allocated to land mobile and public mobile telecommunications services (800 and 850 MHz bands)

Policy Statement on DTT

18. The Authority shall license DTT broadcasting network operators' channels in the frequency band 470–608 MHz. This shall be consistent with the frequency bands allocated for broadcasting services in the TTFAT and its coordination agreements with other administrations. Services other than broadcasting shall not be introduced in that frequency band until the analogue to digital transition has been completed

5 The Analogue to Digital Switchover Process

The transition to digital can be divided into three distinct phases:

1. Digital switch-on – the introduction of digital broadcasting services involving the development of the digital broadcasting infrastructure, including the deployment of individual and shared signal distributor networks, and the availability of STBs and/or digital-ready television sets.
2. Simulcast period – to ensure that television viewers without digital-ready television sets or STBs are not deprived of services, analogue and digital must be broadcast simultaneously for a particular period, i.e., the “simulcast” period.
3. Analogue switch-off – the termination of analogue transmissions. This will not occur before digital coverage and other targets are achieved.

Various activities will be necessary during the three phases of the transition. Consumer awareness, in particular, is a cross-cutting issue that will be undertaken in all phases.

5.1 Transition Timeframe

Taking into consideration the three phases identified above, the following are the main milestones and timeframes, which may be impacted by external factors as the transition progresses:

1. Digital switch-on: mid-2025
2. Simulcast period: 18 months
3. Analogue switch-off: December 2026

Key to the entire process of the analogue to digital switchover is an implementation plan, which shall comprise:

1. a spectrum plan for the accommodation of existing and new broadcasters.
2. the authorisation process for the introduction of signal distributors and FTA TV broadcasters.

3. the technical requirements, equipment and standards related to the provision of DTT broadcasting services.
4. the regulatory and other requirements necessary for achieving a successful DSO.

Further to the Framework, an implementation plan for the FTA television DSO in Trinidad and Tobago will be developed and approved by the Authority. This plan is scheduled to be completed by the end of the first quarter of 2024.

It is expected that the process for the rollout of DTT services will commence in mid-2025 with the launching of digital broadcasting services using shared or individual signal distributors. From this point onwards, both analogue and digital TV services will be experienced in the simulcasting phase. It is proposed that the transition of all analogue TV broadcasting services will be completed at the end of 2026, which will mark the end of analogue switch off.

The switchover timeframe and milestone dates have been derived taking into consideration:

1. the availability of television sets and STBs at digital switch on.
2. implementation by countries with electronics manufacturing markets.
3. the readiness of existing analogue TV broadcasters in this country to transition.

Approval of this Framework will signal the end of any future authorisation of analogue terrestrial television broadcasting services.

Policy Statement on DTT

19. The Authority proposes:

- a) a digital switch-on date in mid-2025.*
- b) a simulcast period of 18 months.*
- c) an analogue switch-off date of December 2026*