

PRACTICAL GUIDE FOR DIGITAL SWITCHOVER (DSO) IN CAMEROON

Lishan Adam, Mike Jensen, Steve Song, Russell Southwood
Association for Progressive Communications (APC) and Balancing Act



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Project Coordinator

Claire Sibthorpe

Editors

Kris Kotarski

Karine Ducloyer

Publication production

Mallory Knodel

Proofreading

Valerie Dee

French translation

Danielle Elder

Graphic design

MONOCROMO

info@monocromo.com.uy

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Introduction

The digital switchover (DSO) is the commonly accepted name given to the process of changing the underlying radio broadcast technology from the outdated analogue system to a system based on equipment capable of transmitting and receiving digital signals. This guide was produced to help with the process of implementation and is aimed at those involved in the process. Of course, the DSO is a process that affects citizens as part of the broadcasting audience and potential users of mobile broadband, but this guide is aimed at groups and individuals implementing the DSO, including policy makers, regulators, telecommunications operators and service providers, and broadcasters and media professionals.

This guide has four broad aims:

- **To identify the public benefits of the DSO process.** As digital transition is an expensive process which is difficult to change course once in motion, it is important to identify the public benefits, not just for broadcast audiences (such as improved picture quality, widespread access and more channels), but also for internet access (for example, in terms of much improved access to high speed broadband).
- **To offer distilled wisdom from countries in Africa and elsewhere** that have travelled some or all of this road, particularly on contentious topics where there are no universally agreed-on strategies.
- **To identify specific policy choices for government and regulatory bodies,** particularly in relation to the structure of the digital broadcasting sector, and the allocation of frequencies.
- **To identify practical activities that may help to unlock some of the challenges that lie ahead.** In this respect, the guide sets out to identify the details of what needs to be done and in what order, so the transition goes as smoothly as possible.

This guide has five modules:

- **Module 1** provides background, and discusses the costs and benefits of the DSO and the progress already made in Cameroon and around the world
- **Module 2** provides an extensive look at the policy and regulatory issues related to Cameroon's DSO
- **Module 3** discusses spectrum management and related technical issues for Cameroon's DSO
- **Module 4** examines the business planning aspects of Cameroon's DSO
- **Module 5** provides an implementation roadmap for Cameroon's DSO.

MODULE 1

The Context for the DSO in Cameroon

This section provides background, and discusses the costs and benefits of the DSO and the progress already made in Cameroon and around the world.

Globally, the digital switchover has been a lengthy process which began in the late 1990s and a significant number of developed countries have completed it or are close to completing it.¹ Most African countries, including Cameroon, agreed in 2006 through the International Telecommunication Union to complete the digital switchover in broadcasting by 2015.²

Delays in carrying out the DSO would mean that Cameroon will not be able to benefit as quickly from technological developments in the broadcast and telecoms fields, such as additional television channels, higher quality television broadcast images, and ubiquitous broadband internet access. Analogue broadcasting equipment is now rapidly being phased out across the world and much of it is no longer being manufactured. As a result, a slow switchover in Cameroon could also lead to the country becoming a dumping ground for obsolete analogue equipment no longer used elsewhere in the world.

Why Digital Migration is Important

To ensure a smooth and rapid transition it is important that all stakeholders, especially the public, clearly understand the benefits of a switchover in Cameroon. Aside from the advantage of better quality broadcast images and a wider range of programming, the digital migration can free up wavebands for broadband internet use. Cameroon already has many mobile internet users, and this number is increasing rapidly.³ Social media use which was almost non-existent three years ago now involves significant numbers of people in national

conversations.⁴ However, the presently available radio spectrum is not sufficient to cater to growing demand. Higher broadband speeds are needed to support video, which will likely be one of the pillars of the next phase of internet growth in Cameroon and can be used to improve general communications and education. High-speed broadband means nurses can communicate with doctors about issues they face in the field using better communication technologies. Citizens and government can enter into dialogue much more easily, and export businesses can communicate with global markets, becoming more competitive.

The frequencies that are presently allocated to analogue broadcasting are most cost effective for reaching rural areas with broadband. A national broadband strategy that takes into account digital migration opportunities will be better able to ensure that the public and all parts of government including remote municipalities, schools and research centres, have access to the internet.

It will be important for Cameroon to work with neighbouring countries to ensure that issues such as spectrum allocation and switch-off dates do not create cross-border interference. Issues like set-top box specification and electronic waste strategies can be tackled on a regional basis and costs can be lowered for all countries taking part.

More generally, the digital transition in broadcasting will be a key part of Cameroon's shift toward better integration with the global information society, and the challenge for those involved in the process is how to find ways of getting the most out of the transition by lowering costs and obtaining maximum benefits for all of Cameroon's citizens. One of these key benefits will be the creation of a unified communications infrastructure that reaches as many people as possible.

1 For a map showing worldwide progress, see: GSMA *GSMA Digital Dividend Toolkit* Accessed March 1 2012 <http://www.gsma.com/spectrum/wp-content/uploads/DigitalDividend/DDtoolkit/regional-status-map.html>

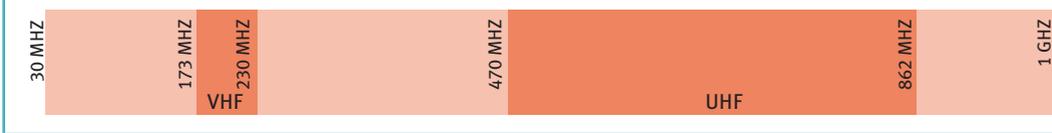
2 International Telecommunication Union "Digital broadcasting set to transform communication landscape by 2015" 16 June 2006 http://www.itu.int/newsroom/press_releases/2006/11.html

3 Interviews with mobile operators, October 2012

4 The social media consultancy Social Bakers estimates that Cameroon has 565,340 Facebook users on 1 March 2013, representing 2.93% of the population. See: Social Bakers "Cameroon Facebook Statistics" Accessed 1 March 2013 <http://www.socialbakers.com/facebook-statistics/cameroon>

FIGURE 1

A Simplified Representation of Spectrum Occupancy



What is the Starting Point?

The old analogue formats used in broadcasting were standardised over 50 years ago and have undergone many changes. The digital switchover in broadcasting involves the change from transmitting video and audio using analogue signals to digital signals.

What is the digital switchover in broadcasting?

The primary purpose of the transition to digital is to use the spectrally more efficient digital signal that requires much less bandwidth than the older analogue methods. On this basis, digital television broadcasts can continue to be enhanced through improved picture quality, such as high definition and 3D broadcasts.

Also, spectral efficiencies allow far more channels to operate within a given amount of available radio spectrum—instead of just a handful of different channels on an analogue network, dozens, if not hundreds of channels can be made available, in a much smaller section of the wavebands than were previously required for analogue distribution. For example, up to twelve standard definition (SD) digital channels can be accommodated in the space previously taken up by one analogue channel. This leads to an outcome of even greater significance—abandoning analogue broadcasting liberates large sections of the radio spectrum which will no longer be required, in what is referred to as the “digital dividend”. This freed-up spectrum can be used for increasing access to high-speed broadband wireless internet, making it possible to reach remote and rural areas.

A straight conversion from existing analogue to digital broadcasting could free up about 80% of current spectrum being used. How much of that 80% goes to digital broadcasting or to mobile broadband or to TV white spaces (TVWS) is an issue to be resolved.⁵ The graphics below are a simplified representation of spectrum occupancy of analogue and digital TV broadcasting. The orange

bands, Very High Frequency (VHF) and Ultra High Frequency (UHF) indicate the spectrum frequencies that have been traditionally allocated for television broadcasting.

The exact occupancy of the radio spectrum varies from one country to the other, but most countries operate below the 470 MHz band. For example, in the United Kingdom, there is no analogue TV broadcasting in the frequency below 470MHz. Meanwhile, in African countries, many analogue TV stations broadcast between 175MHz and 470MHz, mainly in the VHF Band III.⁶ In South Africa, the public TV channel SABC1 occupies the frequency band between 175.25MHz (channel 3) and 247.13MHz (channel 13). Ghana Broadcasting Corporation (GBC), which broadcasts under the GTV brand, occupies channels between five and twelve, which are in the VHF Band III (under 300MHz). In Burundi, the national TV station also broadcasts in the VHF Band III. Broadcasting in Cameroon also mainly falls below the 470 MHz band. (Figure 1)

The exact size of the “digital dividend” will be determined by the amount of spectrum required to accommodate existing analogue TV channels in digital form and the space that may be required for future expansion of TV broadcasting. The digital dividend can provide more TV channels and improved broadband services. In this respect it is important to carry out a spectrum audit and to develop an up-to-date spectrum management plan so that the availability of spectrum in the future can be identified.

These choices are important because the telecoms industry will need some of the freed-up spectrum to roll-out 4G mobile services. Any delay in this process through lack of clarity or disagreements between the telecoms and the broadcast sector will delay this process.

5 TV white spaces refer to frequencies allocated to a broadcasting service but not used locally.

6 Very high frequency (VHF) signals fall between 30–300 MHz. They are used for FM radio, television broadcasts and line-of-sight, ground-to-aircraft and aircraft-to-aircraft communications as well as land mobile and maritime mobile communications, amateur radio and weather radio. VHF Band III covers 174 to 230 MHz.

Who decided the digital broadcasting switchover should take place in Africa?

In order to ensure that both TV broadcasters and broadband operators obtain the spectrum they need, the ITU orchestrated the process through which these overall changes were negotiated and agreed. The World Radiocommunication Conference 2007 (WRC7) agreed on an allocation to Mobile Service and identified 790–862MHz for International Mobile Telecommunications (IMT) in Region 1, which includes Europe, Africa, the Middle East, the western part of the Persian Gulf, states in the former Soviet Union and Mongolia.⁷ Subsequently the European Conference of Postal and Telecommunications Administrations (CEPT) designated the 790–862 MHz as the European digital dividend, and has harmonised a spectrum band plan for IMT⁸. Beside the frequency band 790–862 MHz, the UK regulator Ofcom has identified a second sub-band of the Ultra High Frequency (UHF) spectrum that will be cleared—550–630 MHz (channel ranges 31–40) leaving channels 21–30 and 41–62 for digital television multiplexes.⁹

As with most other African states, Cameroon has adopted the Geneva 2006 Agreement (GE 06) which set 17 June 2015 as the switch-off date beyond which analogue TV broadcasting in these bands will no longer be protected from overspill of signals from neighbouring countries that have completed the transition.¹⁰ Some African countries have asked for an extension of this deadline to 2020. The 2015 date is generally viewed as the internationally mandated analogue switch-off date, at least along national borders (where interference could occur if a switch from analogue to digital was not simultaneous among neighbouring countries). The European Commission recommended that its members should complete the digital switchover before 1 January 2012 in Commission Recommendation 2009/848/EC dated 28 October 2009, but not all members have completed the process.¹¹

GE 06 contains spectrum assignments by contracting countries intended for transmission of DTV after migration. However, each country will need to

look at its own circumstances to see how it will best achieve these contractual commitments.

What is the difference between analogue and digital broadcasting?

An analogue broadcast signal represents the transmitted sound and picture directly through variations in signal voltage and radio frequencies. Analogue signals are continuous. The signal is transmitted from the television station's antenna to the receiving aerial connected to the television, and the amplitude of the signal varies depending on what is happening in the picture. Each broadcaster is assigned a particular frequency and a channel number. A viewer then tunes their television to that frequency by changing the channel on their television set to receive the content produced by the broadcaster that leases that particular frequency.

Analogue signals deteriorate more rapidly over long distances, and interference from other sources is more evident, producing “ghost images”, static and “snow”. Such problems are often experienced in big cities where a signal can bounce between large buildings.

Digital broadcasting works by translating sound and picture into digital data rather than analogue waveforms. Digital links, thanks to the use of data compression, use bandwidth more efficiently than analogue links, which allows a content provider more room for additional services/channels, and/or to provide channels with higher-quality images and audio than had been previously available. Generally, twelve or more digital channels can fit into the spectrum used by a single analogue channel, depending on the quality levels specified.

Viewers with digital signals receive a much clearer picture, and although viewers at the very edge of an analogue coverage area may get some kind of picture, the digital signal simply stops working at the end of the digital coverage area.

In order to receive digital signals, an analogue television will require a radio signal reception and decoding device, most often called a set-top box to translate the digital signals back to analogue for existing TV sets. Alternatively, a viewer can buy a digitally enabled television set. Computer or laptop owners can also watch digital signals by plugging in a USB digital TV tuner to view broadcasts on their screens.¹²

From the user and broadcast industry perspective, another very important aspect of the DSO is the ability to provide conditional access and value-added data services. Conditional access capabilities

7 For more details, see: International Telecommunications Union “World Radiocommunication Conference 2007 (WRC-07) Final Acts” Accessed 1 March 2013 <http://www.itu.int/pub/R-ACT-WRC.8-2007/en>

8 Detailed reports are available for download at: <http://www.cept.org/>

9 For more details, see: Ofcom “Digital dividend: clearing the 800 MHz band” 30 June 2009 <http://stakeholders.ofcom.org.uk/binaries/consultations/800mhz/statement/clearing.pdf>

10 For a copy of the Geneva 2006 Agreement, see: <http://www.itu.int/ITU-R/terrestrial/broadcast/plans/geo6/index.html>

11 For copy of the European Commission recommendation 2009/848/EC, see: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:308:0024:0026:EN:PDF>

12 Such a device should cost no more than USD 10.

of digital receivers allow the provision of a mix of free-to-air, subscription and pay-per-view channels. Digital broadcasting also supports smart devices, sophisticated online programme guides, automated recording of broadcasts, and other data services.

Which African countries have begun the digital switchover in broadcasting and how long will it take?

In a report prepared for the African Telecommunications Union in November 2011, out of the 54 countries and territories in Africa, the majority have not started on the practical implementation of the digital switchover, and only Mauritius has turned off its analogue signals.¹³ Nine countries have formally launched the process: Algeria, Gabon, Kenya, Morocco, Nigeria, Rwanda, Tanzania, Tunisia, and Uganda. However, in a number of these countries (for example, Nigeria), the process began without a formal policy process in place through a private joint venture with the state broadcaster. An additional six countries have launched pilots: Angola (for a short period only), Burundi (commercial), CAR (small-scale), DRC (small-scale), Guinea (small-scale) and South Africa. With the exception of South Africa, most of these pilots are small and are not part of a broader policy process. Cameroon is somewhere in the middle of this field in terms of the DSO process.¹⁴

Elsewhere, in countries that began the DSO earlier, the transition process has taken between five and fifteen years to complete.¹⁵ During the transition, both analogue and digital signals were transmitted and this is known as the dual illumination period. Most countries have made the transition on an area-by-area basis, turning off each area one by one until the process was complete. It would therefore be realistic to imagine that the whole process could take ten years or more to complete in Cameroon.

Why the digital switchover is part of a broader digital strategy that includes broadband access

One of the key outcomes of making the digital switchover is freeing up spectrum which can be used for rolling out the next generation of broadband. This is called the digital dividend.

The digital dividend spectrum is ideal for broadband because it is at a lower frequency than the

current mobile broadband spectrum and requires fewer base stations to cover the same geographic area. This lowers deployment costs and allows operators to provide broader, more affordable rural coverage as well as sufficient capacity for broadband services. By allocating a portion of the spectrum for broadband services, Cameroon's government could help accelerate broadband take-up. The increased speeds available would enable a much wider range of broadband content and services, which is also expected to lead to faster economic growth, as shown by studies conducted by the World Bank and others.¹⁶

In order to obtain the maximum benefit from the changeover, clear timelines for freeing up the spectrum need to be put in place along with a broadband strategy, so that the benefits of the newly available spectrum can be maximised. In this way, the digital switchover and the development of broadband could be integral elements of a broader government policy that can help widen access to both television and the internet, whatever platforms they are carried on.

DSO delivery platforms (IPTV, handheld, cable, satellite digital broadcasting)

The discussions of the digital switchover in broadcasting tend to focus almost entirely on terrestrial transmission systems. In other words, the discussions focus on replacing the network of existing analogue transmitters with digital ones. However, in a world in which digital delivery systems are converging, it is worth considering other forms of broadcast delivery that could play a role in supplementing terrestrial transmission. The key issue is the cost-effectiveness of each delivery platform.

In Cameroon, satellite is probably the most significant additional television delivery platform. For example, there are around 30,000 Canal+ subscribers¹⁷ but also considerably more pirated set-top boxes that have access to the company's broadcasts. Both legal and pirate viewers will be able to watch the local free-to-air digital channels that are expected to be carried by Canal+, thus considerably increasing the number of viewers watching local terrestrial channels from the satellite pay-TV signal.

Satellite is a particularly cost-effective transmission platform for broadcasting. With the right coverage beam, an entire country can be provided with television services. Where fibre is not

¹³ Balancing Act for the African Telecommunications Union *The digital broadcast transition: Changes in spectrum and their implications* (London, December 2011), 30

¹⁴ Ibid.

¹⁵ For an updated list, see: http://en.wikipedia.org/wiki/Digital_terrestrial_television#Analogue_to_digital_transition_by_country

¹⁶ For example, see: Tim Kelly and Carlo Maria Rossotto ed. *Broadband Strategies Handbook* (Washington: The World Bank, 2012) <http://www.infodev.org/en/Publication.1118.html>

¹⁷ Interview with industry source, October 2012

available, satellite can also be used to transmit television signals from the broadcaster to the terrestrial transmission masts. However, because investment has already been made in a mast network, it makes sense in most cases to build on the existing terrestrial network during the digital switchover.

Nevertheless, for scattered viewers in more remote areas, satellite is likely to be more cost-effective than terrestrial transmission, at least in the near-term. In the longer term, terrestrial coverage is expected to increase substantially because broadcasters can share the cost of the digital transmission network as they are no longer required to invest in infrastructure exclusively for their own use.

IPTV¹⁸ is a protocol for delivering television over the internet (usually using fibre, but also using wireless broadband) to households. Like cable, or Wi-Fi, there is a higher installation cost than with a set-top box, although this is now changing with the emergence of more wireless broadband. In the main, IPTV has so far been used by pay TV operators. Because of the high capital costs, it has so far tended to be deployed in Africa in the wealthier parts of dense urban areas.

There is currently no IPTV in Cameroon but it may emerge when the national fibre network is priced at levels related to operating costs, or when competition is allowed in this segment of the market and an operator invests in its own fibre network. Triple play services (voice, data and video in one bundle) tend to emerge under these conditions.

Although cable has been deployed in Angola, Kenya and Mozambique, there are currently only a small number of cable operators in Cameroon, with relatively few subscribers who largely deliver international content.

Does DSO affect radio and television in the same manner?

As part of the digital transition in broadcasting, it is possible to include radio amongst the channels transmitted. If this happens, all those who have either a set-top box or digitally enabled television will be able to listen to the radio stations carried.

Radio is also undergoing a transition to digital but the process is happening much more slowly and there are no globally agreed deadlines for the process. The main countries involved in the process are developed nations including the USA, UK, Australia, Japan and Korea.

The arguments for making a transition from analogue to digital in the radio sector are similar to some of the arguments for television. The digital

radio signal is both clearer and takes up less spectrum than its analogue equivalent. However, there are no equivalents to set-top boxes for televisions so each listener would have to buy a new radio receiver.

In the medium to long term, this process is probably irrelevant to Cameroon, especially as the internet is increasingly used to receive audio broadcasts, and offline broadcasts, known as podcasts.

Who is Affected by the Digital Switchover?

The digital switchover affects almost every member of a society.

Consumers

Almost everyone who has an existing analogue television will have to buy a digital set-top box or a digitally-enabled television. Although prices vary, a set-top box is likely to cost between USD 30–70 (depending on the taxes imposed, the volumes purchased and the features) and a new, digitally enabled television may cost between USD 300–500.

The heaviest impact will fall on those least able to afford the cost of the set-top box. There is no fool-proof method for calculating the number of those who might not be able to afford the cost. However, a mobile phone could be taken as a proxy as the lowest cost handset is on average in the USD 50 range. Therefore, mobile phone users can be understood to represent a category of people in each country that are able to afford a USD 50 device.

Broadcasters

Broadcasters will be affected both on the production and transmission side of their business. Virtually all broadcasters have already started to go digital on the production side (in capturing and storing the multimedia data) and each will be at a different stage in the process of changing their equipment. Because Cameroon's state broadcasters are almost entirely funded by a combination of advertising revenues and direct public funds, it falls to the government to finance this part of the transition for the state broadcaster, CRTV.

The key difference with analogue broadcasting lies in the signal distribution side. Here, digital broadcast transmitters carry far more channels than a single traditional broadcaster, so it is no longer necessary for a broadcaster to always deploy its own equipment. Instead, this task is outsourced to a signal distribution provider (also called a multiplexer) which effectively shares the cost of transmission among multiple broadcasters, who are now more accurately called content-providers. With the separation of the signal

¹⁸ Internet Protocol Television

carriage function and the sharing of transmission infrastructure through one or more signal carriers, all broadcasters could eventually be able to offer a wider coverage area to more citizens. (Table 1)

Wireless broadband providers

The timetable and implementation of the digital switchover will dictate the availability of the spectrum set aside for broadband internet. This will affect the speed with which existing mobile operators are able to put in place bandwidth upgrades. Cameroon has not yet finalised spectrum allocations for 3G, so this may result in a knock-on impact on the implementation of 4G, irrespective of when the spectrum becomes available.

Data operators will bear the cost of investing in the physical infrastructure and buying the spectrum required to run the services. If the cost of spectrum is high, there will be fewer companies willing to pay to offer services and it will act as a barrier to market entry. Similarly, spectrum costs born by operators will ultimately be passed to consumers in the form of higher retail prices, which will put additional constraints on usage levels, especially amongst those with the lowest incomes.

Whilst the newly available digital-dividend spectrum can be seen as a way of paying for the new infrastructure required (both for the signal distribution and consumer set-top boxes), ultimately some part of those costs will be passed to the consumer, thus defeating the objective of making the new services no more costly than they were before.

Government

Policy-makers and regulators are affected by the digital process because they need to provide

leadership in facilitating the process. Their role is discussed in greater detail below.

The DSO Context in Cameroon

Social, economic and political context

Cameroon is a bilingual country with two official languages (English and French). Around 20% of its people speak English while the rest speak French. In addition, there are 247 vernacular languages, all of which, even those which are more widely spoken, are regionally specific.¹⁹ Cameroon has five big cities, the largest of which are the administrative capital Yaoundé and the commercial centre Douala, where most broadcasters are based.

The country has a relatively young population with 60.7% under the age of 25 and an adult literacy rate of 75.9%. Over half (58.%) of the population lives in urban areas.²⁰

It is the biggest country (475,440 sq km) in the Communauté Économique et Monétaire des États de l'Afrique Centrale (CEMAC) and stretches from Lake Chad in the north to Equatorial Guinea in the south, with two areas extending into Nigeria and Congo-Brazzaville. This geography poses particular challenges for terrestrial TV transmission coverage: the country has a land area of 472,710 sq km and stretches from Chad in the North to Equatorial Guinea and Gabon in the South.²¹

Even though the country is an oil exporter, the

19 George Echu "The Language Question in Cameroon" *Linguistik online* 18, 1/04 (2004) http://www.linguistik-online.de/18_04/echu.html

20 United States Central Intelligence Agency "The World Factbook – Cameroon" Accessed March 1 2012 <https://www.cia.gov/library/publications/the-world-factbook/geos/cm.html>

21 Ibid. The land area excludes lakes, rivers and other bodies of water.

TABLE 1

Arguments for Different Digital Broadcast Options

Option	Pros	Cons
Single publicly-owned carrier	<ul style="list-style-type: none"> • Shared infrastructure costs • Potential to maximise coverage footprint • Ability to re-use state broadcaster assets 	<ul style="list-style-type: none"> • Potentially a monopoly with no clear regulatory framework • Unlikely the state has the funds to underwrite it • Doubts about operational efficiency
Public-private-partnership (PPP) carrier	<ul style="list-style-type: none"> • Introduces new investment into the sector • Shared infrastructure costs • Potential to maximise coverage footprint 	<ul style="list-style-type: none"> • Needs a clear regulatory framework • Will private operators trust it? • Fears about fees charged to private broadcasters
Private and public carriers (multiple signal carrier licences)	<ul style="list-style-type: none"> • Maximises investment • Allows consortia to develop amongst those who can work together • Offers highest level of redundancy 	<ul style="list-style-type: none"> • Most operators will focus on existing urban area coverage • Could lead to confusion amongst TV users

mainstay of the Cameroonian economy is agriculture. In 2012, agriculture accounted for 19.8% of GDP as opposed to 49.3% for services and 30.9% for industry.²² Between 2006 and 2011 the transport, storage and communication sectors have grown from 4.8% to 7% of the GDP, while the finance and business services sector has doubled its share of the GDP, from 5.2% to 10.9%.²³ There has also been relatively steady economic growth in the country²⁴ and this has been reflected in the growth of all forms of advertising, but particularly TV advertising.²⁵

ICT access and broadcasting in Cameroon

An Information and Communications Technology (ICT) strategy for Cameroon was drafted under the leadership of the Agence Nationale des Technologies de l'Information et de la Communication (ANTIC) in 2007 and subsequently a committee was set up to oversee its overall implementation in 2009. A separate committee was set up to oversee the e-government element of the strategy in 2010. The mandate of ANTIC has subsequently changed, with a new focus on cyber-security and legislation associated with it.

A Central African Backbone Project has been set up in the region with World Bank support.²⁶ Known as CAB₁ and housed in Cameroon by the ministry of telecommunications, the project has three components:

- To improve the ICT sector in Cameroon by lowering prices, improving regulation and increasing competition
- To connect the capitals of the three neighbouring countries (Cameroon, Chad and Central African Republic) and give the landlocked countries access to the submarine cable landing stations in Cameroon (SAT-3 currently, WACS, ACE by 2013)²⁷
- To promote transparency through the use of e-government services.

Since the project was set up, it has become increasingly clear that Cameroon's ICT strategy is in need of updating along with relevant policy and regulatory reforms. The high price of both international and national bandwidth at both retail and wholesale levels has been a barrier to widening internet access in the country. International bandwidth prices are amongst the highest in the region and there are a number of regulatory issues that still require resolution before a WACS landing station can become fully operational, which should help to lower international capacity prices. Cameroon is also lagging behind many other countries in the region in issuing 3G licences. A process to do so is in place, but there are some challenges that have yet to be resolved. Spectrum management plans need to be updated and a broadband strategy which takes into account the digital dividend is required. The Agence de Regulation des Telecommunications (ART) has received consultancy assistance for some of these areas and this may help address some of these issues.

In the broadcast sector, there are five main free-to-air TV players: the state-run CRTV, and four private providers (Equinoxe TV, Canal 2, STV and Ariane TV). These are the broadcasters with the widest current national coverage footprints, attracting both audiences and advertising at a significant level. Other broadcasters address much smaller audiences. One example is Vision4, which transmits to most of what might be called the greater Yaounde area.

CRTV broadcasts in French and English 24 hours daily, the national radio stations broadcast in French and English (primarily in French), and the provincial and local stations use vernacular languages as well as French and English.

There is no regular or reliable data on audiences for individual TV channels, audiences for different programmes, or advertising expenditure, both overall and by channel.

Industry sources estimate that across all media, there is an annual advertising expenditure of between CFA 20–30 billion (USD 40–60 million)²⁸ and that the overall advertising expenditure has been growing year on year over the last two years at just under 10% each year. According to the same sources, the breakdown of advertising revenues is approximately as follows: television (40%); outdoor (30%); radio (20%) and newspapers and all other media (10%). Discount levels are relatively low, with a 35% discount possible for six months payment in advance

²² Ibid.

²³ African Development Bank, the OECD Development Centre, the United Nations Economic Commission for Africa, the United Nations Development Programme *African Economic Outlook 2012 – Cameroon* (Issy les Moulineaux: OECD Development Centre, 2012), 4 <http://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/Cameroon%20Full%20Country%20Note.pdf>

²⁴ Ibid. 3

²⁵ Interview with industry source, October 2012

²⁶ For more information and most recent documents associated with the Central African Backbone Project, see: <http://www.worldbank.org/projects/P108368/central-african-backbone-ap1a?lang=en>

²⁷ The South Atlantic 3/West Africa Submarine Cable (Sat-3), the Africa Coast to Europe (ACE), and the West Africa Cable System (WACS).

²⁸ Interview with industry sources, October 2012

with one of the main channels and up to 50% for payment one year in advance. Local advertisers tend to use the smaller, more locally focused TV channels.

On this basis, the authors of this study estimate that there is between USD 15.6–23.4 million of TV advertising. Research conducted in other African countries²⁹ indicates that the main players (five in this instance) share 80% of all TV advertising revenues. Therefore, the remaining TV stations attract only between USD 3.12–4.68 million annually. Even if the estimated figures were twice as large as the ones provided here, the same financial weakness amongst the smaller TV stations would still be apparent.³⁰

This limited amount of advertising revenue shows that small independent TV stations must have other non-commercial sources of income. If there is to be an increase in the amount of local content and number of channels, this issue of business models in Cameroon's broadcasting sector will need to be addressed.

The largest subscription/pay TV operator is Vivendi-owned Canal+ which has around 30,000 subscribers.³¹ There is no reliable data on pirate users but most estimates put them at three-to-five times that number.³² The largest local pay TV operator is TV+.

There are a small number of local TV producers generating series programming, largely for CRTV. In terms of film-makers, Cameroon has a relatively small number of Francophone directors who raise production money internationally and a larger number of Anglophone directors who produce the equivalent of Nollywood productions, sometimes dubbed Collywood.

After the broadcasting sector was liberalised in 2000, broadcasters did not pay licence fees due to what were seen as high costs. The government has since required that all broadcasters should have licences and pay for them. Thus far, three TV broadcast licences (Canal2, Spectrum TV and TV+) and one radio licence (Sweet FM) have been issued. The government plans to issue the balance of the licences to the other broadcasters shortly, who currently operate on the basis of an "autorisation."

Section 16 of the 2010 Communications Act³³ stipulates that 30% of TV and 51% of radio must be locally produced. The reality seems to be that most

of this local content is news, talk shows and debates and that the quotas are generally not monitored. According to its mandate, the government broadcaster CRTV has "to promote and develop local content, for example through adherence to minimum quotas"³⁴ and is probably the main generator of local content. It seems likely that CRTV is the largest producer of local TV programmes although no research has been conducted to confirm this view.

The current broadcast transmission structure is a combination of public and private infrastructure. As the state broadcaster, CRTV has the widest reach in terms of national coverage, followed by the main private players identified in this section.

It is estimated that CRTV covers the same 60% of the geographic area of the country connected to the electricity grid, through 64 transmitters.³⁵ Since 2001, it has also offered satellite transmission. In preparation for the transition, it has also installed 14 transmitters that are capable of providing both analogue and digital signals.

While private stations also have their own transmitters, they are also linked together through the satellite subsidiary of the monopoly operator Camtel. The reliability of these links is an issue for broadcasters. Both STV and Canal2 are received in the southern half of the country and are also available over satellite as part of satellite and cable TV bouquets.

The Cameroon Digital Broadcasting Switchover (CAM-DBS) strategy has been approved by the government, which has earmarked a number of projects that will address support for creation of more local content. The same strategy also set targets for extending the transmission coverage area through a single national signal carrier.

In terms of local content, it is important to consider creating funds that can be used to support local production and to examine the levels of funding going to CRTV for this purpose.³⁶ A wider consideration is whether new digital channels should be made available for vernacular languages focusing exclusively or largely on local or African-generated content.

The status of DSO in Cameroon

Cameroon has set up a temporary multi-stakeholder policy committee (CAM-DBS) that drafted a policy that will be approved by the government. As

29 Balancing Act *African Broadcast and Film Markets* (London: February 2012)

30 Interviews with local broadcasters and advertisers, October 2012

31 Interview with industry sources, October 2012

32 Interview with industry sources, October 2012. This seems possible as the last audience survey in 2009 showed Canal+ achieving an audience share similar to the leading free-to-air broadcasters.

33 Law No. 2010/013 of 21 December 2010 Governing Electronic Communications

34 Enoch Tanjong *Cameroon - Public Broadcasting in Africa* (Johannesburg: Open Society Initiative for West Africa, 2012), x <http://www.gsma.com/spectrum/wp-content/uploads/DigitalDividend/DDToolkit/regional-status-map.html>

35 Interview with CRTV staff member

36 All employees, public or private, earning a salary pay a tax named "redevance audiovisuelle" and contribute to CRTV in this way.

part of the strategy, the CAM-DBS committee will be replaced by the Digital Broadcasting Migration Implementation Body (CAM-DTV) as part of the approval of the country's switchover strategy and the membership will be changed. But the difficult part, actually implementing the policy, still lies ahead.

Policy and regulatory framework within the context of DSO

There are a number of policy and regulatory issues that need to be considered as part of the digital switchover. These are discussed in detail in Module 2 and can provide an agenda for many of the key decisions that need to be taken now that the strategy is in place. These include:

- The completion of the licensing process for broadcasters so that all who have successfully been awarded a licence and paid their fees are ready for this new phase of broadcasting
- Offering additional digital channels to existing broadcasters (subject to agreeing carriage costs) Offering channels to new operators
- Creating a spectrum plan that can be used for planning the digital dividend and agreeing future spectrum re-allocations
- Deciding on the structure, governance and financing of the signal carrier
- Creating a framework for a low-cost set-top box including agreeing on its specification as well as deciding on whether there should be subsidies or the removal of taxes
- Creating a switchover plan that provides a timetable for piloting and completing the digital illumination of the country on a region-by-region basis (see Module 5)
- The creation of a public awareness body and a campaign.

Positives and Negatives of the Digital Switchover in Broadcasting

Some of the positives and negatives of the digital switchover flow directly from the DSO like the freeing up spectrum space, while others are indirect benefits or drawbacks that come from using the process to address related issues.

The potential benefits of the digital switchover

Digital broadcasting addresses an inherent problem in analogue transmission. In analogue broadcasting, each broadcaster carries its own signal. Therefore, the combined network management costs for the industry are high. Analogue transmitters are often

scattered while catering for the same coverage target, resulting in poor reception issues such as “ghosting”, blurred images and poor sound. Large masts are also not always welcomed by communities due to environmental aesthetics. Moreover, analogue broadcasting is susceptible to unreliable system performance under mobile reception conditions and interference.

In contrast, digital broadcasting provides opportunities for the sharing of infrastructure facilitating signal distribution at lower costs. Producers have the ability to integrate various content modes in a variety of languages.

The successful implementation of the DSO in Cameroon will have the following advantages:

- **The digital dividend (new spectrum for broadband wireless):** It is evident that spectrum efficiency is one of the major benefits of DSO. The DSO provides an opportunity to free up spectrum to enable the roll-out of more broadband. The spectrum freed will also generate income when it is licensed to operators.
- **More efficient TV transmission signals, cheaper spectrum bills:** The signals carrying the channels of Cameroon's broadcasters will occupy less spectrum and require less bandwidth to transmit. As such, they should be able to take advantage of Camtel's national fibre network. Both of these factors could lower transmission cost if affordable pricing on Camtel's network is set as a policy objective.
- **Greater number of channels, greater diversity (entertainment, sport, vernacular languages and education):** The DSO offers new channel opportunities for both existing broadcasters and new market entrants. There are both commercial and public benefit opportunities. On the commercial side, existing broadcasters could add new channels that either might be targeted at niche audiences (for example, youth or regional vernacular languages) or offer extensions of content they already carry. New free-to-air channel opportunities include entertainment, sports, news and lifestyle. Existing broadcasters and new entrants can use new channels to attract viewers they are not already reaching. On the public side, there are opportunities for learning and addressing consumer issues. For a relatively small amount of money, it could be possible to seed-fund an organisation to carry out regular market research for broadcasters and advertisers. Once value has been demonstrated, these two groups of stakeholders could pay for it to continue. The same approach could be adopted for studying levels of advertising revenues.

- **Extending the TV transmission area to allow more people to watch TV:** The DSO will provide opportunities for extending access to broadcasting. For example, Mauritania has an agency called Agence de Promotion d'Access Universel aux Services that promotes access to water, electricity, telecoms and ICT. This enables a holistic approach to universal service in un-served or under-served areas. Universal access funds can be deployed to assist with this kind of roll-out. The existing CRTV transmission area that reaches 60% of the country more or less mirrors the coverage area for access to electricity. If the coverage area is to be extended beyond this, it will be important to combine extensions to the transmission area with a focus on prioritised areas for electricity roll-out.
- **Increasing availability of local content:** It is difficult to encourage local content in direct competition to international content. For example, it may cost USD 10,000 to produce a local programme but only USD 100–200 to buy in an equivalent amount of internationally produced telenovelas. The latter have all but covered their production costs in their home market and therefore revenues from international sales are simply additional marginal revenues. Thus far, few African television stations have successfully generated sales from programmes they show nationally. This needs to be encouraged so that they can compete for these kinds of revenues.
- **Increasing skills and employment in the broadcast sector:** The DSO provides a golden opportunity to upgrade the skills of existing employees and to expand the overall number of employees in the sector. New channels will mean more personnel and this can be linked with training strategies to skill-up the new entrants.
- **Getting benefits from converged broadcast delivery and channels for feedback:** It is possible to include a return path in the set-top box using a GPRS modem but this will add to the overall cost of the set-top box and undercuts the need to make the set-top box as cheap as possible. However, for market research data, a panel of 1,000+ viewers can be set up with set-top box with a return path that can track , precise viewing times and programmes watched for research purposes.
- **Social feedback:** Broadcasters can also use social media like Facebook and Twitter and more traditional SMS responses to get feedback that can influence their future programming. The state broadcaster can use this kind of social media to

create a conversation around its news and current affairs output that can form a part of its programming. This reinforces the need for the state to have a broadband strategy that will assist in the development of these kinds of feedback loops, both for media and for other parts of the government.

- **An opportunity to review and improve the benefits offered by public broadcasting:** The digital switchover provides an opportunity to review and reconsider the public benefits offered by the state broadcaster relative to its budget. The digital switchover offers a number of new opportunities for it to deliver more to Cameroon's citizens including:
 - ◆ More local content including film, comedy and series, which could lead to a local content channel, acting as an exemplar to other broadcasters.
 - ◆ New vernacular language channels that can either be national or regional, depending on the number of potential viewers.
 - ◆ Education channels aimed primarily at primary and secondary school children that can be used both in schools and by parents for out-of-school learning with their children. Such channels can also be used for university and informal education and teacher training.
 - ◆ A channel that will show the activities and debates of Cameroon's National Assembly.
 - ◆ A consumer affairs channel that can increase consumer awareness and take up individual consumer complaints.

The negative effects of the digital switchover

The potential negative impacts of the digital switchover are summarised below:

- **The cost of the transmission infrastructure:** It has been estimated that the cost of new transmission infrastructure for Cameroon will be USD 82.5 million compared to the USD 60 million for Cote d'Ivoire which is a smaller country (see section 4.7). These cost estimates are for building a single transmission infrastructure. Estimating multiple public and private infrastructures (some of which would only cover urban areas) is much harder to do without a clearer set of assumptions.
- **The cost of set-top boxes:** The Government of Cameroon estimates that there are about 3.3 million households, of which of which about 20% have a

TV, which translates to 660,000 TV sets.³⁷ If 50% of these apply for subsidy, and if the subsidy level is about USD 30 (the current cost of a low-end set-top box), the total cost would be close to USD 10 million.

- **Paying for new channels:** The relatively small size of the current advertising market in Cameroon is an issue. (see section 1.4.2). Put simply, the current advertising revenues do not support the current number of television stations. After the DSO, some of these stations will be able to transmit using a signal carrier and this may reduce their overall capital and operating costs but the financial weakness of the market will still be present.

- **The environmental burden of analogue equipment disposal:** If 75% of the 660,000 televisions that are likely to be discarded are not recycled, this would amount to a national deficit of approximately 10,000 tonnes of CO₂ equivalents, 225 mega litres of water, 175,000 gigajoules of energy and 70,000 cubic metres of landfill space.³⁸ There is also potential for the poisoning of the water table from chemicals that leak out from TV sets in landfills. This could create an additional cost that is hard to calculate at this stage but will be significant in terms of creating a nationwide recycling structure.

³⁷ The 20% figure was chosen on the basis of the authors' previous work for the Open Society Institute in Ghana and Nigeria. That figure is similar to the number of people who could not afford a mobile handset. The figure for the number of households in Cameroon comes from estimates made by Cameroon government officials during interviews conducted in October 2012.

³⁸ Figures based on: Government of Australia — Environment Protection and Heritage Council *Statement on End of Life Televisions* November 2008 http://www.scew.gov.au/archive/product-stewardship/pubs/cmpters_eol_televisions_and_computers_200811.pdf

MODULE 2

Policy and Regulatory Framework for Cameroon's DSO

This section discusses the main policy and regulatory issues under consideration within the framework of the DSO strategy of Cameroon.

The DSO strategy covers the major issues of transitions from analog to digital broadcasting. However, the strategy does not cover post-DSO issues such as the environmental impact of old receivers and how these can be dealt with in concerted manner. The DSO strategy has also not covered content challenges in the digital environment and coordination challenges at national and regional levels.

Introduction to the Issues

The government of Cameroon has adopted a DSO strategy that outlines key interventions in six main areas:

- Institutional and regulatory framework development
- Technical standards and frequency management
- Content development
- Human capacity building
- Financing
- Consumer protection and education.

Cost is a crucial issue during the transition from analogue to digital broadcasting. Therefore, there should be a clear government policy on who bears the cost of the transition and whether or where support should be provided—at the stages of production, transmission and/or reception:

- From the content provider and network operators' point of view, the still-existing analogue studio and transmission equipment needs to be upgraded.
- Content has increasingly been digitised in recent years but broadcasters have a large backlog of analogue content that needs to be converted.
- Digital broadcasting places a burden on consumers since almost everyone currently has analogue TV sets that were not designed to receive digital signals. Policy choices need to be

made on how the average household that owns an analog television set should upgrade to the digital environment. The relative cost of upgrading will be especially high for the poor and people with disabilities.

Visually impaired people need useful interface to browse through digital channels, and any government support needs to be based on a well-researched understanding of the ability to pay of different groups.

Policy choices on the specifications of the set-top box are becoming increasingly important for determining which devices need to be permitted for import or operation. Manufacturers and retailers will not have the incentive to produce and distribute set-top boxes until there is policy certainty around specifications and costs of the set-top box that will go on sale in Cameroon. The specifications need to cover issues such as “conditional access” and electronic programme guides, which in turn raise questions about control of broadcasting, including encryption and piracy.

The government also needs to decide on whether there will be a subsidy scheme covering the set-top box and whether it will remove all or some of the taxes that the set-top box might incur. The aim should be to create a low-cost set-top box that stays within financial reach of as many people as possible.

The decision on the number of “multiplex” operators (signal distributors) is another important policy concern in Cameroon. Multiplexing (fusing various channels onto a single digital signal) can be operated by a signal distributor, a third-party company, a broadcaster, or a coalition of broadcasters. Decisions concerning the signal distributor(s) will affect who will be licensed to use the frequency spectrum and how the public and private broadcasters can be served in a non-discriminatory manner.

The main policy question for Cameroon revolves around the governance of national signal distributor(s), especially the ability of a signal distributor to provide services for private broadcasters on a level playing field. Public models of

RECOMMENDATIONS 1

The government policy commitment should focus on:

- Who bears the cost of the DSO, the government's role in financing DSO and whether and where support will be — at the stage of production, transmission or reception, including who should be subsidised and how
- The minimum set of specifications and labelling for set-top boxes assembled locally or imported
- How the state broadcaster CRTV transforms itself into a public content service provider on the one hand, and a signal carrier on the other, including how public and private partnerships can be forged for smooth multiplexing and signal distribution
- The process for licensing and offering additional channels
- When and how the content, network and spectrum regulations now shared among various institutions will be streamlined
- The role of different actors in implementing the DSO timetable
- Support for public interest content, monitoring what counts as local content and protection of the rights of content holders in the digital environment
- Human capacity development for improving digital content and ensuring a smooth digital switchover
- Allocation of the digital dividend for various services that bring about economic growth and social progress in Cameroon
- Creation of ecosystems that support innovation in multimedia content production.

distribution of signal and allocation of digital channels and multiplexes raise uncertainties about the future audiovisual business practices by the private sector in Cameroon. In the case of a single signal carrier, there is a need for additional networks (multiplexors) to ensure redundancy and resilience. The transformation of the state public broadcaster CRTV into a content service provider and signal distributor is a good step, but it does not necessarily provide private providers with assurance of a level playing field.

The separation of content services from infrastructure/transmission services also calls for the creation of a body responsible for regulatory aspects of content and the rationalisation of the various institutions involved in frequency management such the Ministère de la Communication (MINCOM), the Agence de Régulation des Télécommunications (ART) and the Conseil National de la Communication (CNC).

Another policy decision on digital migration pertains to setting the detailed timetable to switch-off. The period of parallel transmission of analogue and digital TV known as “dual illumination” puts extra pressures on the use of airwaves. A long period of dual illumination (SIMULCAST) gives retailers reasonable time to acquire and market set-top boxes, and consumers to decide to buy them. Yet, a long period of SIMULCAST also

means running two sets of signals simultaneously, analogue and digital, which is expensive for the broadcasters/signal distributor(s). The government has to decide whether—as has happened in Kenya—they will waive the digital transmission fees to broadcasters during the dual illumination period.

Content is another area where policy decisions are required. The development and availability of local content can either be supported through quotas for certain digital channels or through improving the capacity of broadcasters and others that generate relevant content particularly those that stimulate social and economic sectors like health, education, agriculture and trade.

Conversely, content rights holders have vested interests in ensuring that the transition does not enhance unauthorised use and reuse of broadcast content distributed in the digital format. In addition, Cameroon can consider putting in place an agency responsible for the development of local content and its export that can seek to attract international funding for local productions and support the sales efforts of local broadcasters.

There is a need for clarity on the role of state broadcaster CRTV in the DSO. This includes considering the policy issues around the creation of a separate entity that carries out multiplexing and signal distribution, and, more importantly,

RECOMMENDATIONS 2

- The rationale for digital switchover is to promote an information society in Cameroon. The DSO should be seen not just as an add-on to the broadcasting sector. It is an opportunity for building an information society.

leveraging the digital environment to increase the availability of “public interest” content. The public service broadcaster has a major role in pioneering new services such as education and a health channels.

The low level of human resources in the broadcasting sector, especially in generating new digital content, implies that government policy commitment is essential for building the human resources that are required for managing the transmission network and delivering content. Training of journalists, network managers and equipment installers is needed to develop the digital broadcasting sector.

One of the most important outcomes of the transition to digital television is the digital dividend. A policy direction on the allocation of the digital dividend is essential to increase certainty. Main considerations include creating a publicly available spectrum plan that can be used for planning the digital dividend and providing a clear statement of what spectrum allocations will occur and what the timetable is for these reallocations. Additionally, there is a need for agreement on a process through which the spectrum freed up the DSO can be made available to data and voice operators.

Cameroon will face considerable environmental challenges such as avoiding the duplication of transmission sites that expose the population to electromagnetic waves and issues related to the dumping of used analog TV receivers. Other economic, policy and social issues for consideration include competition, consumer protection and licensing of operators and signal distributors. Migration will have also implications for the pluralism of content, media development, cross-border coordination and regional cooperation. RECOMMENDATIONS 1

The Policy Rationale for Digital Switchover in Cameroon

The digital switchover contributes greatly to the realisation of a national information society. The vision of the national ICT policy of Cameroon is to apply “information and communication technologies as

one of the enablers to transform the country into an information and knowledge based society in which individuals, communities, corporate bodies and administrative services make full use of the Internet and other ICT services to facilitate and accelerate the socio economic development of the country.”¹

Digitisation promises the availability of advanced information services to a population segment that does not have easy internet access. The increase in the number of television channels through the digital switchover can diversify the sources of opinion and information available to the population. The transition from analog to digital will also present opportunities in service-oriented sectors, providing significant social benefits in healthcare, e-learning, e-government, e-accessibility and in areas where small and medium-sized enterprises can take advantage of better access to the economy. Finally, the DSO contributes to the development of high-speed broadband infrastructure and the transition to a knowledge-intensive, low-carbon digital economy. RECOMMENDATIONS 2

Institutional Framework for the Implementation of the DSO

The digital switchover involves operators, consumers, content providers and policy makers that have often competing and conflicting interest. Its success therefore depends largely on the ability of these stakeholders to work together. The Government of Cameroon is in the process of establishing a Digital Broadcasting Migration Implementation Body (CAM-DTV), which will act as a special purpose vehicle to oversee the migration process.

The extent to which the government encourages the participation of stakeholders will affect the quality of policy that results. This implies that the Government of Cameroon could broaden the work of CAM-DTV as a multi-stakeholder platform to facilitate discussions and consensus on economic, technical, human capacity and other issues

1 Government of Cameroon *National Policy for the Development of Information and Communications Technologies (September 2007)*, 40 http://www.ist-africa.org/home/files/Cameroon_NationalICTPolicy_2008.pdf

RECOMMENDATIONS 3

The Government of Cameroon should move ahead with the establishment of a multi-stakeholder partnership organ (CAM-DTV) to follow up with the implementation of the DSO. The CAM-DTV needs to be equipped with the necessary financial and human resources. It needs to establish a forum that discusses key DSO policy and regulatory issues on an ongoing basis. Its role would be to:

- Implement the DSO strategy

- Promote discussion on policy, regulatory, business planning, financial and consumer issues and share responsibilities
- Inform, explain, and accompany viewers during the complete switchover to digital broadcasting process
- Propose strategies for subsidising vulnerable groups
- Evaluate and monitor progress towards full DSO.

of digital migration. The South African “Digital Dzonga” is modelled similarly as a platform for addressing legal, technical economic and public awareness issues.² RECOMMENDATIONS 3

Public and Private Partnership on Signal Distribution

The key to achieving the maximum amount of savings in transmission costs is the signal carrier strategy. If each broadcaster has to create a new digital broadcast infrastructure, the process will be costly and will be borne by each individual broadcaster. For this reason, most countries have taken the opportunity to separate the signal broadcast function from the programme making and programming functions. Governments have either created a single signal carrier which is a consortium of all broadcasters (this is being done in Ghana)³ or have allowed several signal carriers (the approach adopted in Kenya⁴ and Tanzania)⁵.

Cameroon’s DSO strategy currently envisages the creation of a single public multiplex operator and signal distributor that will serve both the public and private sector content service providers (broadcasters). The main argument for a single signal carrier is that it will be able to deliver a

wider coverage area, and if there is a wider coverage area, the private broadcasters (along with CRTV) have the potential to attract more advertising because they reach more people. The smaller broadcasters will still be able to pay for the kind of smaller coverage area they already have but will have the potential to upgrade to providing genuinely national coverage.

Because the infrastructure will be shared between a number of broadcasters, the overall cost should be cheaper than for a transmission network run by a single broadcaster. Savings made by the public broadcaster CRTV could be redeployed to increase the overall level of public benefits, including local content.

In the case of a single signal carrier, three key issues need to be resolved. Firstly, the existing broadcasters will have made investments in analogue broadcast infrastructure. The question for them is whether these assets are simply written off or whether they can be redeployed (mainly masts, housing and power generation equipment). Aside from CRTV, private broadcasters in Cameroon have made significant investments in infrastructure. Therefore, there should be a mechanism to make certain that this investment is not wasted but transferred through commercial arrangements to the designated signal distributor. Where the existing infrastructure may not be adequate, upgrades to accommodate digital transmission are needed.

Secondly, if there is to be a single monopoly signal carrier, it is important that it has a transparent mandate, which states that it is not designed for profit-maximisation. In addition, it needs to be an entity that will be at “arms-length” from government and have representatives from the broadcasters it is servicing. To give further confidence, an external company could manage the

2 For more on the Digital Dzonga and South Africa’s digital migration, see: <http://www.godigitalsa.co.za/digitaldzonga/about>

3 For more details, see: Association for Progressive Communications and Balancing Act *Digital Broadcast Migration in West Africa: Ghana Research Report* (APC, 2011) <http://www.apc.org/en/system/files/apcpublicationdigitalmigrationghanaen.pdf>

4 Signet and pan African group are the two signal distributors in Kenya. For more details, see: <http://digitalkenya.go.ke/what-s-digital-transition/signal-distributors>

5 For more details, see: Tanzania Communications Regulatory Authority *Public Consultation Document on Establishment of Cost Based Transmission Fee for Digital Terrestrial Television (DTT) Charged by Multiplex Operators to Content Service Providers* (Dar Es Salaam: November 2012) http://www.tcra.go.tz/consultative_docs/pcd_mux_cbf_2012.pdf

RECOMMENDATIONS 4

To reduce the conflict arising from monopoly of signal distribution, the Government of Cameroon should:

- Create a transparent and independent signal distribution entity through a Private Public Partnership (PPP) based on the principles of accountability, efficiency, equitable distribution of risk, rewards and control, and the preservation of public interest. The creation of a separate entity would enable public and private broadcasters to utilise resources and transfer the various levels of risk to the signal distributors. The establishment and operation of a broadcast signal distribution entity through a PPP would help achieve the following:
 - ◆ Allow public and private broadcasting organisations to accomplish more together than they could separately
 - ◆ Ensure that competition in broadcasting is based on content and not coverage, which in the case of free-to-air broadcasting would serve the public good.

• In addition the government should:

- ◆ Ensure that the available transmission infrastructure is consolidated based on careful assessment of assets and through commercial arrangements to facilitate efficient signal distribution, environmental protection and health and safety
- ◆ Ensure the separation of the signal distribution and broadcasting function of CRTV
- ◆ Explore the possibility of creating a signal distributor catering to private operators and develop a framework for cooperation between public and private signal distributors
- ◆ Assess a phased approach with later introduction of additional signal distributors
- ◆ Take into account possibilities for outsourcing management or sale of mast infrastructure to a specialised mast operator.

network on behalf of the stakeholders involved. All of these issues need to be resolved and agreed upon if the private sector broadcasters are to throw their weight behind the digital switchover.

Finally, there is a need to ensure that the network is redundant and resilient. In the case of single signal carrier, there is a need for a second network that ensures redundancy in the broadcasting services. Some countries have dealt with the problem by setting up two signal distributors—a public signal distributor that utilises the previous public broadcaster's infrastructure and carries public interest content, and a private signal distributor that aggregates private broadcasting content. The private broadcasters are then allowed to form an independent company to run the signal distribution services in order to utilise their existing infrastructure.

A careful assessment of the pros and cons of a single signal distributor and possible institutional models should be made in order to ensure a smooth DSO in Cameroon. Once that has been decided, business plans need to be put in place that show what level of capital and operational financing is required and the level of fees that the signal carrier will charge to broadcasters. RECOMMENDATIONS 4

Institutional Arrangements

Cameroon's broadcasting sector involves a wide variety of government structures that are responsible for content, spectrum and network regulation. The institutions that have stakes in the DSO include the Ministère des Postes et Télécommunications (MINPOSTEL), the Ministère de la Communication (MINCOM), the Ministère de Culture (MINCUL), the Agence de Régulation des Télécommunications (ART), the Agence Nationale des Technologies de l'Information et de la Communication (ANTIC) and the Conseil National de la Communication (CNC).

ART is responsible for assignment and control frequency spectrum, while MINPOSTEL is primarily responsible for managing the spectrum on behalf of the state. MINCOM and MINCUL are responsible for the regulation of content along with CNC and ANTIC, while MINPOSTEL and the MINCOM are responsible for developing policies on the telecommunications sector along with ART and ANTIC.

From a policy perspective, Cameroon needs to harmonise and streamline these varied institutional frameworks in order to separate policy making from regulation, and the separation of regulation of content from that of infrastructure, and to streamline frequency management. A change of

RECOMMENDATIONS 5

To streamline the institutional framework, the Government of Cameroon should consider the following:

- Reviewing the regulatory frameworks pertaining to the broadcasting sector taking the convergence of technologies and DSO into account
- Aligning institutions that regulate the communications and the broadcasting sector, beginning with assigning one regulator to content and another to look after infrastructure and eventually establish a converged regulator
- When established, ensuring that frequency management is regulated by a converged regulator.

the legislative framework that governs the broadcasting sector is likely to be needed to incorporate the tremendous changes that have taken place in the sector and provide a forward-looking legal instrument for managing the emerging digital broadcasting sector.

Streamlining the content and infrastructure regulation is critical for reducing overlaps, grey areas and other inter-ministerial conflicts, while ensuring that operators work through a single content or infrastructure regulatory body. The regulator, ART, needs to emerge as a converged regulator with an authority to regulate the entire ICT sector (communication and broadcasting).

RECOMMENDATIONS 5

Financial Considerations

The DSO involves financial costs for all participants. For network operators, such as CRTV, the digital switchover will entail new digital transmission costs. Broadcasters such as Equinoxe, STV and Canal 2 will have costs in completing the digitisation of analog content and production of new programmes. There are also additional costs associated with policy implementation in the areas of communication and publicity, consumer advice and support and training which may fall on government, the regulator and/or the industry.

For Cameroon's consumers, the cost of digital switchover lies in the replacement or augmentation of the reception equipment. The scale of expenditure will be a matter of individual choice—whether to buy an integrated digital TV, a set-top box, or a USB tuner for a desktop or laptop computer. In some cases, new antennae may be needed for the home. However, the addition of a digital set-top box to adapt each TV set is likely to be the most common requirement.

Generally, there is a segment of the population that cannot afford to purchase set-top boxes during the transition that will in some senses be

forced upon them. This includes low-income families and people with disabilities. The question is: how can this segment of the population be helped in order to increase both the breadth and speed of take-up?

The first set of costs that can be removed from the set-top boxes are taxes. These may include all import duties and VAT (TVA in French). CAM-DTV needs to work out a specification for the set-top box with a range of suppliers at an early stage, and then calculate the full retail value with all taxes in place and the retail value with taxes removed.

A quick survey of households can also help to clarify the proportion of those who can access credit and others who can afford to pay for set-top boxes. Once such estimates have been made, a value for the subsidy can be established and a strategy explored for the best way to deliver it. The “rough-and-ready” methodology described in Module 4 gives the variables but more detailed work needs to be done to establish more accurate estimates of the variables. On the basis of fairly generous subsidy assessment discussed in section 4.2.3 of this report, the sum is still relatively modest at around USD \$10 million. The final subsidy sum could be smaller than this extremely rough estimate.

The problem with financing the subsidy through the sale of digital dividend spectrum is that the set-top box subsidies will likely be needed well before the digital dividend spectrum can be fully freed up. Therefore, it may be necessary to use universal service funding for this purpose.

RECOMMENDATIONS 6

Content and Cultural Diversity

The national DSO strategy envisages a broadcasting coverage of 85% of the population and investment in local content development. Relevant content is an important determinant in the uptake of digital broadcasting services. One of the

RECOMMENDATIONS 6

To address the cost of the DSO, the Government of Cameroon should consider the following:

- Carrying out a study on the extent of a set-top box subsidy needed by the population
- Based on the study, developing a subsidy scheme for the vulnerable segment of the population including rural poor households, the elderly and people with disabilities.

weaknesses in the broadcasting industry is the low investment in local and culturally relevant content production. This weakness can be exacerbated in the digital environment due to ease and low cost of access to international content.

It is essential that the government provide policy guidelines on local content obligations and sets aside funds for production of local content. In addition, a local content agency can be established to support broadcasters in sourcing external international funds and to help sell Cameroonian programmes elsewhere on the continent as well as globally. Commissioning new local programmes externally from independent producers will help broadcasters meet their local quota and the use of external independent producers will expand the range of ideas broadcasters can draw on.

Higher levels of television transmission also require an increase in the overall level of access to

electricity. It is therefore worth considering making universal access to television and to electricity dual objectives of any policy for the digital transition. RECOMMENDATIONS 7

Consumer Policy Issues

Consumers are central to the success of the DSO in Cameroon. Therefore ongoing education and consumer protection is a crucial policy matter. Primarily, the migration period must be long enough, and the new medium needs to be attractive enough to encourage consumers to buy new digital equipment. Consumers need to receive more choice of channels and better picture quality or sound and consumer queries and complaints need to be addressed appropriately. While private sector broadcasters should be expected to shoulder most of the burden for this, the state broadcaster will also need to contribute to a combined effort, and

RECOMMENDATIONS 7

In order to increase plurality, diversity and choice of content, the Government of Cameroon should consider:

- Promoting the generation of content by private enterprises by encouraging locally generated content
- Supporting training programmes in digital content production with attention to upgrading the media training institutes
- Encouraging generators of content such as the health and education institutions to adapt their content for broadcasting through digital television
- Supporting the digitising and distributing of public sector information (weather, geographic data) and improving access to public sector content (digital conversion of archives, museums)
- Reviewing legislation to facilitate the flow of open digital content while also protecting the rights of the copyright holders with a focus on the development of vibrant local content industry that will be competitive at the global levels
- Promoting universal access to electricity as a way for expanding access to content
- Establishing a body entrusted with the responsibility of promoting diverse content development by providing financial and other support to the local content development industry
- Improving the way consumption and production of digital content is measured, developing appropriate indicators and metrics, and improving the systematic collection, research and analysis of content industries.

RECOMMENDATIONS 8

To protect consumers, the government should consider:

- Allowing adequate time for transition
- Committing funds to subsidising the cost of set-top boxes for a vulnerable segments of the population (the poor, the elderly and people with disabilities)
- Committing financial resources to a consumer education campaign
- Carrying out an assessment of the subsidy requirements and developing a scheme for supporting those who require it
- Establishing a unit under the CAM-DTV that will have the responsibility of responding to public concerns
- Ensuring that consumers are well represented in the public and private platform for digital switchover to hear their opinions and address their concerns.

it would be prudent for the government to monitor and evaluate the awareness, uptake and use of the new services in order to adjust the awareness campaign according to needs.

Government should also commit to providing subsidies to vulnerable groups that have limited options for upgrading to the digital environment (for example, those who have disabilities or who are at the bottom of the income pyramid). Efforts should be made in identifying any groups for whom analogue switch-off could be seriously difficult (financially and/or physically) and assessing what measures to take to assist them. Targeting such groups with advice and information, practical help and with charitable or publicly-financed assistance is the key to helping the groups themselves and to winning the consent of the wider population.

RECOMMENDATIONS 8

Environmental, Health and Safety Factors

The digital switchover poses environmental and health risks that need policy decisions at a central level. The DSO strategy did not dwell very much on environmental and health issues, therefore the DSO policy needs to give a greater consideration to environmental and health issues.

Ongoing upgrade of equipment will likely increase the number of analogue TVs, VCRs and DVD players that will be discarded by consumers in Cameroon. Given that quite a number of countries are in the process of implementing the digital switchover, there is also a danger that old TV will be shipped out of these countries in large quantities. This includes relatively obsolete digital TVs and cheap set-top boxes that will not be compatible with the digital broadcasting environment in Cameroon. This will create waste disposal and environmental challenges. Therefore, a waste

management strategy must be considered early in the migration process. The government also needs to look at tightening regulations to prevent the importation of cheap and substandard equipment and designing regulations relating to controls on shipments and disposal of e-waste.

Experience in other countries shows that there are also health risks due to electromagnetic radiation, especially if transmission stations are close to public places and homes. Other complaints concern environmental aesthetics and noise protection.

Digital broadcasting offers an opportunity to overcome some of these challenges, since one transmission network can carry multiple programme channels. In the digital environment, facility sharing is convenient, environmentally friendly and less hazardous. RECOMMENDATIONS 9

Human Resources Development and Capacity Building

Human resources for installing transmission networks, developing content and supporting the public are in short supply in Cameroon. The DSO presents a unique challenge to those operating in the broadcasting sector, because the skills of individuals involved in the development of content and those managing transmission networks need to be upgraded. Broadcasters such as CRTV have been active in upgrading the skills in recent years; however, there is a need to improve technical skills in specific areas such as developing specification and maintenance of decoders. It is also essential to raise the awareness of policy makers, regulatory authorities, broadcasters, equipment vendors and content developers and consumers on technical, economic, regulatory and business issues of digital broadcasting. The government should

RECOMMENDATIONS 9

The government of Cameroon should consider:

- Establishing a working group on environmental and health issues to advise the government on possible options for managing e-waste and electromagnetic radiation risks
- Developing an e-waste strategy for the DSO
- Taking tougher stances in the issuance of permits in order to ensure that transmission sites are erected further away from population centres and radiation limits and guidelines are observed while operators are encouraged to deploy the necessary assets to enhance coverage and quality of service.

therefore consider training and capacity-building programmes aimed at these different groups.

RECOMMENDATIONS 10

Regional Coordination

Broadcasting does not have borders, therefore decisions made in Cameroon will have an effect on neighbouring countries and the region, and vice versa. The allocation of frequency bands will influence not only the way the digital dividend will be used by member states of the Commission de la Communauté Economique et Monétaire de l'Afrique Centrale (CEMAC) and the Economic Community of Central African States (ECCAS), but also the extent of cross-border interference. The allocation of the digital dividend in the International Mobile Telecommunications (IMT) band and its release for mobile services needs regional cooperation and frequency re-planning at regional levels based on the prescription of the World Radio Conference for Region 1.

Moreover, actions by Cameroon's neighbours, especially CEMAC countries such as the Central African Republic, Chad, Gabon, Republic of Congo, Equatorial Guinea, Sao Tome and Principe, will affect economies of scale, fostering innovative

services and bringing down the cost of the equipment. A regional approach towards reforming the radio frequency spectrum, licensing and harmonised timing of transition from analog to digital will be critical for resolving interference problems across borders. It is therefore essential to coordinate with neighbouring countries and to develop a harmonised regional approach to the DSO in central Africa and with Nigeria, to maximise returns and avoid interference. RECOMMENDATIONS 11

Regulating the DSO

From a regulatory perspective the DSO in Cameroon faces inadequate institutional arrangements, since many organisations are involved in overlapping policy and regulatory functions. The institutional framework plays a detrimental role on the quality of the regulatory framework in the country. There is a need for harmonising the functions of the MINPOSTEL, MINCOM, MINCUL, ART, ANTIC and the CNC, and the separation of the policy and regulatory functions of these institutions to ensure that content and transmission networks are regulated by one or two institutions. There is also a need for revising the laws and regulations that govern the entire ICT sector

RECOMMENDATIONS 10

To ensure a smooth transition from analog to digital broadcasting, the government of Cameroon needs to support skills development in various areas. The government should:

- Assess training and capacity building needs
- Support the training (including training of trainers) of a critical mass of qualified and skilled professionals working in public institutions, regulatory authorities and broadcasting institutions
- Facilitate forums that will bring local and international stakeholders together for information sharing, policy discussion and resolution of issues
- Upgrade the curriculum of media training institutions in order for these to provide structured specialised programmes that cater for the emerging digital broadcasting environment.

RECOMMENDATIONS 11

As a regional leader, Cameroon should consider playing a major role in:

- Adopting the international radio frequency recommendations including those from the Regional Radiocommunication Conference 2006
- Promoting a regional approach to the DSO in central Africa leading to the adoption of a common timeframe

- Coordinating a regional frequency allocation plan within central African states
- Promoting bilateral cooperation between Cameroon and neighbouring states (Nigeria, Chad, Gabon, Congo, Equatorial Guinea, Central African Republic) through the creation of joint commissions for coordination of frequencies at the borders.

(broadcasting, telecommunications and IT) to facilitate the smooth transition to converged digital environment.

DSO Regulatory Issues

The regulatory issues most relevant to the implementation of analogue switch-off pertain to licensing, standards, content, consumer protection and spectrum management. The key areas of the regulator's focus will therefore include:

- **Licensing:** Setting or amending the broadcast licence conditions and the completion of the licensing process
- **Standards:** Ensuring that transmission and reception standards are set and met by operators and manufacturers
- **Content:** Promoting local content development
- **Consumer protection:** Ensuring that consumer needs are met and that customers are protected
- **Spectrum management:** Allocation and assignment of spectrum and reserving for future use.

Licensing of operators

Licensing broadcasters and signal distributors is a key regulatory consideration during the DSO. The purpose of licensing is to:

- Secure a future for existing broadcast stakeholders
- Attract investment
- Attract the interest of manufacturers, retailers, etc.
- Attract investment in the provision and production of new content services

- Encourage uptake of digital broadcasting
- Ensure a future for existing services and accommodate new services
- Provide for a mix of free-to-air and pay services.

Generally, there are three categories of licences during digital migration: content service providers, multiplexors and signal distributors. It is recommended that at the inception of digital broadcasting, the broadcasting value chain in Cameroon be segmented only into two: the broadcaster, and the signal distributor operating the multiplex.

This means that the signal distributor should also be allowed to operate multiplexes. It also implies that the relevant laws used for licensing broadcasting needs should be revisited and amended to accommodate the two different operations.

A strict separation between content provision and multiplexing/signal distribution is required to ensure fair competition for all broadcasters. In the long term, the multiplexing function may be separated from signal distribution depending on the dynamics of the market, as well as acquired capabilities and capacities in evolving business models.

Segmenting the licence into content service providers and signal distributors allows for the content service provider to concentrate on production of more content and to enjoy economies of scale through sharing towers and facilitates leading to a reduction in costs. Providing for licensing of signal distributors will ensure that the use of broadcasting infrastructure is maximised.

The completion of the broadcasting licence is an important issue that needs to be addressed to speed up the DSO process in Cameroon. The licensing process for existing broadcasters needs to be completed so that all broadcasters who have

successfully been awarded a licence and paid their fees are ready for this new phase of broadcasting. Policy and regulatory directions are also essential in order to:

- **Offer additional digital channels to existing broadcasters:** Existing broadcasters should be offered additional channels (subject to agreement to carriage costs). Ideally, this should happen on the basis that any existing broadcaster can ask for additional channels.
- **Offer channels to new operators:** There is a need for a transparent and public process through which additional digital channels are offered to new market entrants. These entrants will then need to be licensed through the existing channels.

Licensing the signal distributor

The licensing of a signal distributor allows for consolidation of transmission infrastructure to provide efficient services to broadcasters. Broadcasters no longer need to be vertically integrated organisations that make programmes and manage their own transmission infrastructure to get the signal to the viewers.

The signal distributor will provide carriage and distribution of the signal as well as multiplexing and allow for:

- Lower transmission costs per broadcaster
- Better efficiency in spectrum management
- Lower initial costs for new broadcasters
- Reduced adverse impact on the environment
- Uniform coverage of the broadcast signal
- Reduced signal interference
- Ease of management of broadcast frequencies/ channels
- More focus on quality of content by the broadcasters.

The licensing condition for the signal distributor should cover the operation of multiplex, distribution and transmission of content and frequency licence.

The duration of broadcast licence is usually five years while for signal distribution it is often fifteen years, taking into account the high capital cost for the infrastructure. The licence should specify which signal the signal distributor is responsible for and for how long.

There are two popular methods of determining spectrum and other licence fees for a signal distributor: auctioning and benchmarking. Auctioning can be expensive and counterproductive because of its inherent high costs, which are passed on to consumers. Benchmarking should also be done with much care because of the economic disparities between one country and another. With regards to the licensing fee, experience shows that there should be an initial licence fee for owning and operating facilities and a frequency licence fee. In addition, there should be a payment of a fixed percentage of gross annual turnover.

As indicated by the Cameroon government's DSO Strategy, the signal distributor should have a rollout plan that ensures at least 85% population coverage. The key issue here is the schedule for achieving the target, which should be set out carefully and realistically.

The signal distributor should outline plans for investment and development of the network, provide the regulator with confirmation of the provision of services in a non-discriminatory manner, and demonstrate the ability to provide dual illumination of content during the Simulcast period. In addition, it should:

- Provide services to private broadcasters on an equitable, reasonable, non-preferential and non-discriminatory basis
- Adhere to licence conditions as provided by the regulator
- Provide quality delivery of broadcasting services as per contract between the signal distributor and the broadcaster
- Appraise the regulator on the utilisation of frequency channels on a regular basis.

Licensing of a content service provider (broadcaster)

The separation of licensing into signal distribution and content service provision means that current analog broadcasters in Cameroon should be relicensed as value added content service providers. Current broadcasting institutions need to lodge applications outlining the types of services they render, geographic and service areas, equipment and the proposed multiplex to be used. All content service providers should also meet new licensing requirements such as obligations for local content and ensuring equal access, non-discrimination

RECOMMENDATIONS 12

The regulatory framework for licensing of operators in Cameroon should consider including the following:

- Content service provision and signal distribution as separate market segments
- Multiplexing and signal distribution should be done by the signal distributor
- The regulator needs to develop a licensing framework that will establish different licensing conditions for signal distributor(s) and content broadcasters, licensing fees, content commitments, and the duration of the licenses
- CRTV needs to separate its signal distribution assets into an independent entity that will run signal distribution services in order to avoid conflict of interests or cross subsidies
- Existing designated transmitting analogue sites and infrastructure should be used for digital transmission where feasible to reduce the cost of migration, possibly augmented by additional telecommunication mast infrastructure of the mobile operators
- Existing broadcasters who own infrastructure need to negotiate commercial terms with the licensed signal distribution provider for transfer of ownership of their infrastructure
- A time limit should be set after which broadcasters will not be allowed to operate unlicensed signal distribution services
- There needs to be a transparent and public process through which additional digital channels are offered to new market entrants.

and transparency. In addition, the licence for content service providers should cover:

- Programmes to be aired in the broadcaster's digital network/networks, clearly separating the free-to-air programmes which will be broadcast for the fulfillment of its public service mission, and other limited access programmes (if any)
- The nature and duration of programmes for children
- The nature and duration of programmes on science and technology. RECOMMENDATIONS 12

Deciding on new channels

The DSO opens opportunities for additional development oriented channels focusing on education and health. The digital terrestrial television also provides an alternative platform for the government to deliver e-government services. Other information services such as environmental, agricultural, cultural and sport programmes and

tourism information can also be delivered on demand or through free-to-air using additional channels.

Moreover, digital television viewers are likely to demand more free-to-air channels beyond what is currently available from analog broadcasters. However, each additional channel will need new content, additional staff and equipment. This will have an impact on the availability of advertising funds. One of the key issues is agreeing on a policy goal with regard to the mix of advertising and state support for the provision of free-to-air services. For example, an educational channel would have a cost structure that is very different than a sport channel, and the policy could dictate differing levels of support. RECOMMENDATIONS 13

Regulating technical standards for the DSO

Setting technical standards and ensuring that equipment meets those standards is an important regulatory function during the digital switchover.

RECOMMENDATIONS 13

An adequate assessment of the impact of new channel availability on consumers and the cost to broadcasters is needed

- The regulator should encourage the availability of public interest channels
- The content regulator will be required to develop a digital channel plan (DCP) that determines which channels are allotted to each broadcaster and the technical characteristics of each channel.

RECOMMENDATIONS 14

To promote standards, the regulator needs to:

- Elaborate specifications and standards for digital broadcasting including those of set-top boxes
- Carry out ongoing type approval and certification of digital equipment.

The Government of Cameroon has already adopted a globally agreed transmission standards for Region 1 based on second generation “Digital Video Broadcasting Terrestrial” (DVB-T2).⁶ The DVB standard that is widely used in Region 1 (Europe, and Africa) and has specific configurations for satellite, terrestrial, and for handheld devices like cell phones (DVB-S2, DVB-T2, DVB-T2-Lite) that makes it compatible with diverse modes of broadcasting. Cameroon has chosen the H.264 video compression standard and the “Motion Picture Expert Group of fourth generation” (MPEG-4 AVC) for video and the High Efficiency Advanced Audio Coding (HE-AAC) for sound.⁷

Specifications and labelling guidelines for digital TV receivers and set-top boxes are equally important during the transition. These include standards for all devices capable of receiving DVB-T2 signals. The two main types of digital receivers are Integrated Digital Television (iDTV) sets and set-top boxes, or decoders.

Set-top boxes are the primary means for viewing digital signal at the beginning but integrated digital television receivers will be essential for the long-term success of the migration. The specifications of the set-top boxes need special consideration in Cameroon due to the potential availability of cheap sub-standard set-top boxes that can have short lifespans and could make it difficult to receive signal in the periphery of coverage areas. The specifications for set-top boxes will primarily cover the operating environment and compatibility to DVB-T2. In addition the specifications should include “Conditional Access” where certain channels can be blocked at certain times of day (for example, those unsuitable for children). Conditional access is also related to whether a set-top box can be switched off by the broadcaster for non-payment of subscription TV and/or licence fees, or if it is stolen. Specifications should also include electronic programme guides that display competing programmes.

The regulation should also cover what devices should be permitted for import or operation. The regulator will need to type approve set-top boxes, integrated digital receivers and USB tuners.

Regulatory aspects of content in the DSO environment

Relevant content is an important determinant in the uptake of digital broadcasting services, thus consumer-oriented regulation is an important activity during the DSO process. Digital broadcasting opens various avenues for improvement in the availability and choice of content to consumers. The additional channels created by digitisation provide an opportunity for viewers and listeners to have avenues through which their own stories, concerns and lifestyles are reflected. These channels require the audience to use an electronic programme guide in order to navigate through available programmes. Content production is an important industry for Cameroon with regard to job creation, conservation, promotion and export.

From a regulatory point of view, there is a need to nurture the availability of economically, culturally and socially relevant content and regulation should be put in place to encourage the production and the rights of locally generated content.

Much of the content that will be relevant in key sectors such as health and education needs to be digitised and made available through the broadcast channels. This in turn requires encouraging research and development in content creation, creating the environment for content production, improving broadband coverage, and addressing skills, training, education and human resource development issues. There is a need for establishing training programmes which incorporate digital broadcasting techniques.

New mechanisms are also required to compensate content creators and distributors in an environment where it is easy to make perfect copies. There is a need to protect intellectual property and user rights. This raises questions about the adequacy of the existing legal apparatus for

6 For more information, see: <http://www.dvb.org/>

7 For more information, see: <http://en.wikipedia.org/wiki/H.264> & http://en.wikipedia.org/wiki/High-Efficiency_Advanced_Audio_Coding

RECOMMENDATIONS 15

In order to facilitate the development and availability of content, the regulator should:

- Amend regulation to promote access, use and distribution of content in a diverse digital service environment

- Encourage the availability of value-added development-oriented content covering social and economic sectors such as health, education, agriculture and trade.

the content industry since the legislative framework was designed for an analog environment.
RECOMMENDATIONS 15

Consumer-oriented regulation during the DSO

There are a number of consumer-oriented regulatory issues that need to be addressed during digital transition. Consumers will be confronted with a range of multi-channel services, new costs to purchase set-top boxes, and the pressure to change quickly to digital environment. The greatest impediment for consumers is the financial burden of the digital equipment needed.

It is imperative that the regulator prioritises consumer awareness and education. Public understanding and acceptance are crucial to the success of the migration from analogue to digital broadcasting. Consumers need well-designed information, with sufficient resources for an effective distribution strategy, on the need for, and the benefits of the migration.

Moreover, the proposed migration period must be adequate and the new medium attractive enough to encourage people to buy new digital equipment. Regulations should also be put in place to ensure that consumers are protected from misleading advertising, unacceptable content, substandard equipment, unfair or overly complex subscription service contracts and privacy breaches.

Such regulations should include intervention mechanisms for complaints raised by consumers.
RECOMMENDATIONS 16

Regulation of the allocation of the radio frequency spectrum

A major regulatory issue for the digital transition concerns spectrum management, in particular the spectrum freed as part of the digital dividend. The digital dividend spectrum will become available in the Very High Frequency (VHF) and Ultra High Frequency (UHF) bands. There are also two categories of spectrum: cleared spectrum and interleaved spectrum (white-space).

To take advantage of the digital dividend, the government needs a plan and timetable that will allow it to re-allocate the relevant spectrum as quickly as possible. Elsewhere globally, auctions have been used to sell the spectrum and there has been a broadband plan in place that looks at how demand will be fostered and how under-served communities will be reached.

It is recommended that the Government of Cameroon considers launching a spectrum audit and planning exercise to ensure efficient spectrum utilisation and to facilitate economic and social returns.

A spectrum strategy that shows how the existing spectrum will be re-allocated and the basis for making the spectrum available is essential. The strategy

RECOMMENDATIONS 16

To protect and educate consumers, the regulator should:

- Create a strategy for educating consumers on the DSO costs, benefits, process and timetable
- Create a unit that addresses consumer complaints

- Promote a universal fund that supports the affordability of set-top boxes for consumers
- Carry out a study to determine those eligible for subsidy and others that can obtain set-top boxes through other means such as credit
- Ensure that new digital technologies meet usability and accessibility standards that facilitate their use by disabled people.

RECOMMENDATIONS 17

To facilitate the effective utilisation of the digital dividend, the Government of Cameroon should consider undertaking the following:

- Harmonise the governance of radio frequency spectrum management
- Carry out a spectrum audit and reframing exercise for effective use of the digital dividend
- Establish a frequency management strategy that draws on the audit of the entire band and its economic and social implications
- Promote technologies that make use of efficient broadcasting signal
- Coordinate frequency usage in border areas and regionally.

should also consider economic returns, regional coordination and other factors that may affect the digital dividend, especially in relation to recently emerging radio technologies such as cognitive radios using TV white space. RECOMMENDATIONS 17

The next module on technical issues discusses strategies for actual allocation of broadband frequencies in different regions in Cameroon. It also provides a tentative band and pricing plan for the digital dividend based on an international regime.

MODULE 3

Technical Issues and Cameroon's DSO

This section examines the technical opportunities and constraints that will affect decision-making around the digital switchover and the use of the digital dividend. It also looks at emerging technological trends and their likely impact on the broadcast and broadband markets.

Digital broadcasting allows for consolidating broadcasting programmes into fewer frequency channels. The number of programme channels is a function of the bit rate in a channel. The frequencies in question for digital dividend are in VHF-Band III (174–230 MHz) and UHF-Band IV/V (470–862 MHz).

- **VHF-Band III (174–230 MHz)** has been planned for Digital Audio Broadcasting (DAB) and Digital Video Broadcasting (DVB). A number of countries are considering implementing DVB only in Band IV/V, and to use Band III exclusively for DAB or multimedia applications making use of a DAB based system. There is currently no interest in applying new non-broadcasting services in this band.
- **UHF-Band IV/V (470 - 862 MHz)** is subject to most of the discussions on digital dividend, in both the broadcast and telecommunications sectors. In addition to broadcasting, the band is attractive for use by next-generation mobile broadband networks.

The fundamental reason why the digital dividend spectrum (particularly band IV/V) is so important is due to its physical characteristics. The UHF frequencies reach significantly farther and penetrate buildings much better than frequencies higher up the spectrum band.

While the digital switchover is concerned with the current analogue terrestrial broadcasting spectrum which covers the above bands, it is important to consider this in the context of evolving demand for spectrum throughout the full usable range of communication spectrum.

Spectral Efficiency and Interference Mitigation

There are two key trends that affect the evolution of wireless technologies: the steady increase in spectral efficiency and the ongoing improvement

in technology for the mitigation of frequency interference.

Spectral efficiency is achieved through a range of factors from signal compression technologies to improvements in antenna design and deployment. This efficiency is typically expressed as bits per hertz per square kilometre. Martin Cooper, one of the people credited with having invented the mobile phone, claims that spectral efficiency has increased over a million times in the last 45 years.¹ While the ability to improve spectral efficiency is not infinite,² there is still some way to go in making truly efficient use of spectrum.

Linked to the improvements in spectral efficiency are the remarkable technological strides made in managing wireless interference. It is increasingly possible to design wireless technologies which are sensitive to other radio transmissions and which can adapt themselves accordingly by switching frequencies, adjusting power levels, etc. That is, wireless technologies are getting better and better at operating together in the same frequency band. This opens up tremendous possibilities to increase the efficiency of spectrum use. The range of technologies being developed are often grouped under the “cognitive radio” Umbrella.

The migration to digital broadcasting has been made possible by these technological improvements. Television transmitters that previously had to “shout” to be heard by primitive television sets can now effectively “whisper” and be heard. Further, the guard bands previously required to ensure that television channels do not interfere with each other can be much smaller.

Spectrum characteristics

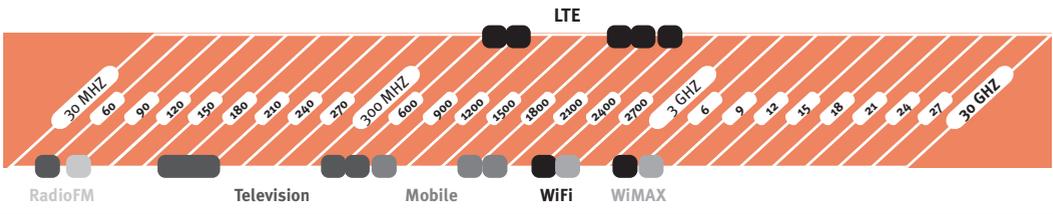
All radio spectrum is not created equal. For the purposes of communication, the practical usable spectrum ranges from about 30MHz to 30GHz. The

1 For a brief explanation of Cooper's Law, see: <http://www.arraycomm.com/technology/coopers-law>

2 The Shannon-Hartley theorem describes the maximum amount of error-free digital data that can be transmitted with a specified bandwidth. For a brief explanation, see: https://www.princeton.edu/~achaney/tmve/wiki100k/docs/Shannon%E2%80%93Hartley_theorem.html

FIGURE 2

The Radio Spectrum



behaviour of radio spectrum changes substantially across the range of that spectrum. Radio frequencies have long wavelengths at the low end of the spectrum range and as frequency goes up, the radio waves become shorter and shorter. This has a direct effect on the ability of those frequencies to carry data. Lower frequencies have better propagation characteristics which allow them to go through obstacles easily dramatically increasing their range. However, there is a trade-off. Low frequencies carry less data per Hz, and as one moves along the spectrum band, the shorter wavelengths can carry more data. This trade-off between reach and throughput makes the UHF band a highly desirable piece of spectrum, occupying a sweet spot in the wavebands below 1GHz. (Figure 2)

The importance of propagation characteristics of spectrum cannot be overstated as this has a direct impact on capital expenditure related to network deployment. Consider the charts below which compare the cost of a mobile operator roll-out at varying frequencies. There is as much a 500% difference between the cost of a roll-out in the UHF band versus higher up in the spectrum bands where spectrum is also being for mobile use. (Figures 3 and 4)

RECOMMENDATIONS 18

Global Trends in Wireless Technology Evolution Affecting Spectrum Management

A brief look at the technology of digital broadcasting, mobile broadband, and other technologies such as existing unlicensed band use, and new trends such as TV white spaces (TVWS).

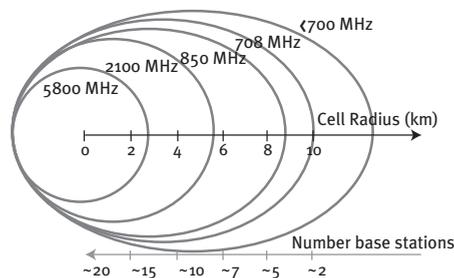
Convergence

As communication technologies continue to evolve at an ever-increasing pace, formerly independent sectors find themselves overlapping. This is most evident in the world of mobile technologies where the once humble phone has begun to overlap with computing and broadcasting. The recent rise of tablet computing offers a perfect example of this overlap, since it is hard to know in what category it falls as mobile device, a computer, and a vehicle for watching video content.

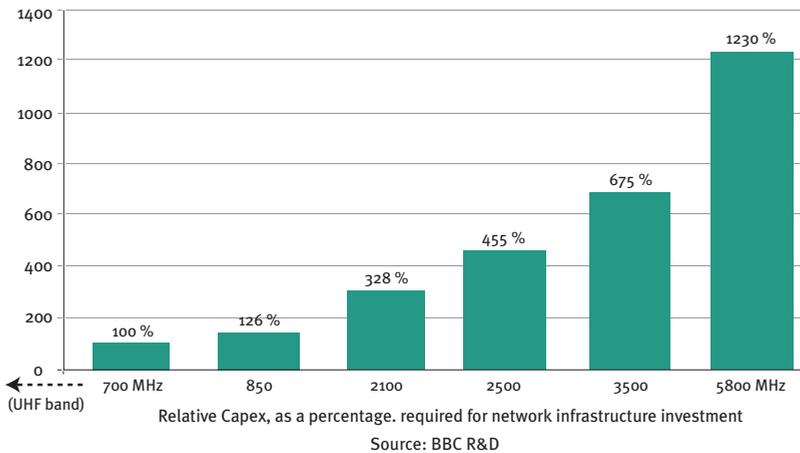
In the industrialised world, recent rapid growth of over the top (OTT) programming has also affected spectrum needs. OTT refers to the delivery of video services (television, films, etc.) over an Internet Protocol (IP) using the customer’s broadband service. In North America, OTT service providers such as Netflix and Hulu have recently gained surprising market acceptance. Netflix alone claimed over

FIGURE 3

The Propagation Characteristics of Spectrum



Source: BBC R&D

FIGURE 4**Lower Frequencies Reduce the Costs of Infrastructure and Communications**

25 million subscribers as of Oct 2012.³ While this is not particularly relevant today for Cameroon as those services are largely dependent on high-speed copper telecom infrastructure and on significantly higher consumer income levels, it points towards the future and it is possible that a separation between content provision and communication infrastructure will continue to develop.

Another possible evolution is the ability of television broadcasters to broadcast directly to mobile devices. This would see mobile devices having both a broadcast reception and broadband function. There have been a few attempts to realise this possibility. In Region 1, the Digital Video Broadcasting-Handheld (DVB-H) standard was approved in 2004 but to date there has been no significant market adoption of the technology. The recently

approved DVB-T2-Lite standard, which operates within the DVB-T2 standard, offers new hope that a successful market for digital terrestrial broadcast to mobile may yet emerge.⁴ However, it is also possible that OTT services delivered over Long Term Evolution (LTE) networks⁵ may compete directly with such an option. It is also worth keeping in mind that no DVB-T2-Lite devices have made it to market yet.

Spectrum sharing and television white spaces

Improvements in the technological ability to manage and mitigate radio interference has led to new possibilities for more than one service and spectrum licensee to exist within the same spectrum band. There are many approaches to spectrum sharing which are typically some combination of administrative, market, and/or technology-based

RECOMMENDATIONS 18

- Prioritise allocation of digital dividend spectrum in enabling affordable rural broadband service delivery
- Adopt a technology neutral stance in spectrum regulation to account for the likelihood that new technologies will emerge
- Design regulation to accommodate technology shifts
- Consider the potential of secondary use of spectrum bands, in particular the potential for the dynamic re-use of television spectrum by secondary users.

3 Netflix *Netflix Q4 12 Financial Statements* (January 2013) <http://ir.netflix.com/results.cfm>

4 Kevin Greene "DVB-T2-Lite profile tech standard approved: Transmissions are go!" *BBC News Online* 22 July 2011 <http://www.bbc.co.uk/blogs/researchanddevelopment/2011/07/dvb-t2-lite-profile-tech-stand.shtml>

5 For more on the Long Term Evolution (LTE) standard, see <https://sites.google.com/site/lteencyclopedia/home>

RECOMMENDATIONS 19

- Promote interoperability of devices and technologies. Avoid attempting to integrate broadcast and broadband technologies into a single solution thus creating a significant single point of failure.
- Pursue a parallel strategy in allowing for the re-use of UHF spectrum with TV white spaces technology to open up opportunities for rural service delivery
- Given that technological evolutions are becoming increasingly difficult to predict, where possible allow for market-driven technology evolution and design regulation for technological neutrality.

mechanisms to manage co-existence. The most promising of these approaches is what has come to be known as television white spaces (TVWS) spectrum.

This approach allows for the dynamic re-use of unused television spectrum. It was originally designed to take advantage of the historically wide guard bands that were left between analogue television broadcast channels. These guard bands are deliberately left unused to protect analogue television channels from interfering with each other. While originally intended to rely on a spectrum sensing technology alone to enable its use, the emerging dominant standard for TVWS relies on a centralised geo-location database to which all TVWS devices must authenticate and confirm the availability of spectrum for use in the area where they are deployed.

This combination of an unlicensed spectrum approach carefully regulated through a database that controls usage offers untapped potential for the delivery of rural broadband services. TVWS regulation has been passed in the United States and the United Kingdom. There are TVWS trials now underway in several countries around the world. In Africa, Google supports a TVWS pilot in South Africa⁶ and in Kenya a TVWS pilot has recently been announced with support from Microsoft.⁷ Elsewhere in the world, trials are underway in Finland, Germany, Ireland, Singapore, the Philippines, UK, and US.⁸ TVWS devices are now commercially available and expected to go into mass production in 2013.

In Cameroon, where less television spectrum is in use than in the USA or UK, and where the need for low-cost rural access solutions is arguably higher, TVWS technology represents a significant opportunity worth exploring. Because TVWS technology is a secondary use of television spectrum, it is not dependent on the completion of the digital switchover. It can be pursued as a parallel strategy.

The potential of TVWS technology was recognised earlier this year at the World Radio Congress (WRC-12) and it was agreed that the introduction of such services did not require any particular regulatory measure at an international level. RECOMMENDATIONS 19

Technological Implications of the Transition to Digital Terrestrial Television Broadcast (DTTB)

Choice of transmission standard for DTTB

The government of Cameroon, through the multi-stakeholder policy committee (CAM-DBS), has selected the Digital Video Broadcasting-Second Generation Terrestrial (DVB-T2) standard for the digital switchover. DVB-T2 is the natural standard for Cameroon as DVB is the dominant digital terrestrial broadcasting standard for ITU Region 1 (Europe and Africa) and the T2 variant represents a significant increase in performance. Experience from the United Kingdom⁹ indicates as much as a 66% improvement over the first generation DVB-T standard. This choice means the digital dividend could be larger than originally anticipated.

6 For more information on the Cape Town TV White Spaces Trial, see: <http://www.tenet.ac.za/about-us/the-cape-town-tv-white-spaces-trial/>

7 Lance Harris "Microsoft eyes White Spaces to Bring Broadband to Rural Kenya" *ZDNet* 6 February 2013 <http://www.zdnet.com/microsoft-eyes-white-spaces-to-bring-broadband-to-rural-kenya-7000010897/>

8 Microsoft Super-WiFi Overview - <http://research.microsoft.com/en-us/projects/spectrum/microsoft-super-wifi-overview.pdf>

9 The Digital Terrestrial Television Action Group *Understanding DVB-T2: Key technical, business, & regulatory implications* (Geneva: DigiTAG, 2009), 7 http://www.digitag.org/DTTResources/DVB-T2_Handbook.pdf

MFNs also have the advantage of easily allowing for the regionalisation of content whereas SFNs typically carry the same signal, although regionalisation has become technically feasible in SFN networks with the DVB-T2 standard. By contrast, SFNs have the advantage of having lower frequency requirements as compared with multiple frequency networks. Interestingly, and in contrast to analogue broadcasting, signal coverage in an SFN network can actually improve where transmission signals overlap.

The DVB-T2 specification increases the appeal of an SFN deployment strategy as it offers improvements of the DVB-T standard. Compared with the DVB-T standard, new carrier modes have been added in DVB-T2 specifically to improve the performance of SFNs. The use of the DVB-T2 standard offers advantages over DVB-T for SFN deployments, allowing for larger SFN coverage areas and smaller guard bands.

In making the choice between an SFN or MFN deployment, geography must be considered as well as the cost/benefit of frequency savings versus upfront capital expenditures on backhaul. The Government of Cameroon's choice of a dual strategy of principal MFN deployments with SFNs as an option where spectrum scarcity may be an issue may offer the best of both worlds, allowing for flexible MFN deployments in areas where spectrum is plentiful with the option of SFN deployments, likely in urban areas, where spectrum may be at more of a premium.

Set-top boxes

DVB-T2 set-top boxes have been in mass production since 2009. All set top boxes should comply with the standard for DVB-T2 set-top boxes developed by the European Telecommunications Standards Institute (ETSI)¹⁰ which addresses frame structure channel coding and modulation DVB-T2 television broadcasting standard. ETSI is an independent, non-profit, standardisation organisation in the telecommunications industry (equipment makers and network operators) in Europe. It is officially recognised by the European Union as a European Standards Organization but also operates globally through regional branches. ETSI is a not-for-profit organisation with more than 700 member organisations drawn from 62 countries across five continents.

Some set-top box manufacturers offer additional features such as the integration of mobile data services which have the potential to offer an interactive experience for digital television viewers. This functionality can also offer feedback channels for gathering market research data. Some countries have considered the possibility of delivering broadcast and broadband services via DVB-T2 set-top boxes. This approach has some significant weaknesses. First it will result in higher priced set-top boxes. Affordability is a key factor in making digital television available to all. Second, the integration of broadcast and broadband within a set-top box creates a single point of failure for access. Finally there are many different existing standards for hybrid service delivery and it would be easy to select a technology that turned out to be a technological dead-end. It would be preferable to allow market forces to determine a successful hybrid standard.

Indeed, set-top boxes represent the very minimum entry point in the world of digital television broadcast. In a short number of years, as digital television sets steadily replace analogue television sets, the need for set-top boxes will disappear. But that is not all, digital television receivers can be built into all different kinds of devices from USB sticks that can be plugged into a computer to mobile phones capable of receiving the DVB-T2-Lite standard. It is impossible to predict which of these combinations of technology will rise to prominence in the market.

Power

An important factor to consider in the choice of network technology is the availability and reliability of electrical power to provision broadcast infrastructure. Network design that is resilient to power outages and which minimises power consumption will have a significant impact on the long-term cost of ownership of the network. It will also affect quality of service delivery. RECOMMENDATIONS 20

Spectrum Requirements for the DSO

Mapping the Terrain

An essential prerequisite for the planning the digital switchover is gaining a full understanding of which spectrum is currently allocated, assigned, and actually in use. To date, details of spectrum allocation and assignment have not been made publicly available in Cameroon. Beyond the requirements of spectrum in use for security purposes, there is no reason that information about this public resource should not be made publicly available. Further, it is essential to go beyond the allocation

10 European Telecommunications Standards Institute *Digital Video Broadcasting (DVB); Frame structure channel coding and modulation for a second generation digital terrestrial television broadcasting system (DVB-T2)* (Sophia Antipolis Cedex, France: ETSI, 2009) http://www.etsi.org/deliver/etsi_en/302700_302799/302755/01.01.01.60/en_302755v010101p.pdf

RECOMMENDATIONS 20

- Focus on affordability while meeting ETSI standards for the importation of set-top boxes
- To the extent possible allow the market to innovate in the integration of broadcast and broadband hybrid services through DVB-T2 set-top boxes
- Focus on standards and interoperability to maximise the potential for innovation in service delivery
- Factor existing power grid resources as well as green technology options into broadcast network design.

and assignment of spectrum on paper to understand by means of a physical scan of frequencies, what spectrum is actually in use. This can reveal spectrum assignments that are now moribund due to technological advancements or changes in strategy. Historically separated information resources from broadcast and telecommunications sources need to be broad into a single harmonised resource.

Number of broadcast channels that can be made available

The DVB-T standard can provide for a multiplex of up to eight television channels in 8MHz bandwidth, where previously only one analogue channel was being broadcast. With the arrival of the DVB-T2 standard, a single 8MHz analogue broadcast channel can hold up to twelve standard definition (SD) or four high definition (HD) digital television channels.

At the World Radio Conference in 2007 (WRC-07), the 800MHz band (790-862 MHz) was assigned to IMT services. This is likely to emerge as a new global standard for mobile services. Further, resolution 232 passed at the 2012 World Radio Conference (WRC-12) indicated that, subject to the completion of relevant technical work, a decision to allow the 700MHz (694-790MHz) band to be used for mobile broadband services in ITU Region 1 (Europe, Middle East and Africa) will be taken at the next World Radio Conference in 2015 (WRC-15).¹¹ The 700MHz band is already in use for IMT services in Region 1 (North America) and Region 3 (Asia). The importance of harmonisation with international standards for mobile services cannot be overstated. It is likely to lead to lower costs for both devices and infrastructure as well as facilitating roaming access.

Given that all current analogue terrestrial broadcasting in Cameroon is in the VHF band with the UHF band largely unused, it is worth considering

whether the emerging 700MHz and/or 800MHz IMT bands might be made available for mobile services in parallel with the digital switchover. Assuming there is sufficient space in the UHF bands to accommodate new digital channels below 700MHz, the transition to digital broadcasting need not be fully completed prior to making the emerging IMT bands in the 700 and 800MHz bands available for service. A parallel approach might take some of the pressure off the DSO, allowing it to proceed at the most economically and technologically efficient pace.

While both the 800MHz and 700MHz bands represent an opportunity to improve telecommunications access by making more spectrum available to mobile operators, many countries in Africa have existing CDMA mobile services at 850MHz.¹² It is possible that a modified band strategy may be required to accommodate existing and future service providers in the 800MHz band. The fact that the 800MHz band is in active use for CDMA services in Cameroon, suggests that targeting the freeing of the 700MHz band for IMT services prior to the 800MHz band may be a strategy worth exploring in Cameroon.

Resolution 232 of WRC-12 proposes that the 700MHz band be designated an IMT band for Region 1 effective immediately after WRC-15, subject to the successful outcome of studies to be conducted in the interim. There is an opportunity for Cameroon to actively prepare for the availability of this spectrum as an IMT band by documenting current use of the spectrum, relocating current spectrum holders, and preparing for an auction (or other assignment method) of the 700MHz band pending the successful ratification of the band following WRC-15.

RECOMMENDATIONS 21

¹¹ Resolution 232 - Use of the frequency band 694-790 MHz by the mobile, except aeronautical mobile, service in Region 1 and related studies [COM5/10] (WRC-12) <http://www.itu.int/oth/RoA0600004B/en>

¹² For more about the code division multiple access (CDMA) method for transmitting multiple digital signals simultaneously, see: www.pcmag.com/encyclopedia_term/0,1237,t=CDMA&i=39462,00.asp

RECOMMENDATIONS 21

- Undertake a comprehensive spectrum audit reviewing both regulatory information on spectrum assignments as well as a physical scan of spectrum use
- Locate information on spectrum allocation and assignment within a single organisation
- Actively investigate the re-farming of the 800MHz band to accommodate the designation of the band as a global IMT standard and establish a working group with Camtel to plan the evolution of their CDMA service in the 800MHz band
- Prepare regulation as well as plans for the auction of the 700MHz band in advance of its expected designation as an IMT band for Region 1 following WRC-15.

Managing the Dividend

Technological implications for balancing demand among broadcasters and broadband providers

For Cameroon, there is more than enough spectrum available in the context of the DSO to provide spectrum for new broadcast and new broadband services. Around the world, the explosive demand for mobile services points to the need to allocate more spectrum to mobile use.

The emerging standards for IMT services in the 800MHz and the 700MHz bands offer an opportunity to address this emerging demand in the context of the DSO. Depending on the existing occupancy of these bands, strategies need to be devised to transition spectrum holders elsewhere within the VHF/UHF spectrum.

The nature of the radio-spectrum is that untested standards, no matter how well-designed, may behave unpredictably when interacting with other standards in the field. As such, particular care needs to be taken at the borders between new spectrum allocations to ensure that new technologies such as advanced mobile services like LTE do not interfere with television broadcast signals. It will be important to work with signal distribution/multiplex operators to examine technical and regulatory changes that may be implemented to safeguard the quality of digital broadcast services. There is an opportunity to learn from early adopters of DVB-T2 services in other countries.

Technical considerations in dealing with uncertain evolving demand for broadcast and broadband as well as yet unforeseen technological innovations

Currently, mobile broadband services are the most unpredictable area of growth. The industrialised world has seen the use of 3G and now 4G services increase rapidly, and ensuring that adequate space for emerging mobile spectrum standards remains will be critical to ensuring the success of a DSO strategy.

One of the biggest challenges to managing innovation in wireless technology is the spectrum allocation process itself. The act of dedicating spectrum for even very general purposes such as mobile services, introduces a level of lock-in to technology evolution. For that reason, the advent of wireless technology such as television white spaces (TVWS) technology which can dynamically take advantage of unused spectrum in any band offer tremendous promise for more efficient use of wireless spectrum. As TVWS technology becomes widely commercially available in 2013/2014, a significant opportunity exists to take advantage of this technology for rural broadband service delivery that can be undertaken with no risk of compromising existing digital broadcast and broadband strategies. Recommendations 22

RECOMMENDATIONS 22

- Propose and carry out a television white spaces (TVWS) pilot project to better understand the potential of this technology to improve rural access.

MODULE 4

Business Planning for Cameroon's DSO

This section examines the DSO business planning considerations for Cameroon.

Public and private stakeholders will need to make significant investments to implement the DSO and a detailed costing of the DSO, along with identification of sources of financing and a sequencing of the steps required to complete the transition.

To set the business planning process in context, the general outcomes expected are outlined below, which can also be framed as the goals, or assumptions, for the DSO:

- **Increased numbers of viewers and longer viewing times:** Driven by more attractive content and more widespread signal distribution, this is linked to minimising the switchover time by maximising the desirability of the new medium.
- **Reduced spectrum needs for broadcasting:** Liberating the digital dividend frequencies, which can be used for additional TV channels, and a higher value for broadband, especially in rural areas. This could provide major support for any broadband objectives and goals which Cameroon may adopt in the future to achieve a knowledge-based society.
- **Reduced broadcasting costs and wider coverage:** Saving of capital investment requirements through infrastructure sharing (masts, radio broadcast equipment and fibre-optic networks) which allows content producers to focus on their core business of creating relevant programming. This also leverages the broader trends toward convergence of technologies in the ICT sector as moving to digital broadcasting makes it simpler and more efficient to transmit information over different media using terrestrial wireless, satellite, copper or fibre. Digital broadcasting will be most cost effective if it can use a pervasive and affordable national fibre-optic backbone.
- **Carry out the DSO as rapidly as possible:** The longer the period of uncertainty, dual illumination and delays in liberating the spectrum, the greater the overall cost of the DSO and the lengthier the constraints on the Cameroonian economy and society.

The DTV Value Chain

For the business planning aspects of the DSO, the key parts of the DTV value chain consist of four main elements:

- The public, which includes the TV audience and television viewing equipment, broadband users and access devices
- Radio spectrum used to carry the TV signals
- TV signal transmission/distribution system
- The broadcast content (channels)/content producers.

Each element will require a detailed cost/revenue analysis in order to maximise the effectiveness of the process. In addition, there is the overall human resource cost of managing the process which includes staff time from the relevant institutions, and commissioned studies. The four main elements are covered in more detail in the following sections.

The Public—TV Audiences and Broadband Users, Television and Internet Access Equipment

Aside from the broader social benefits arising more generally from the DSO, the public are the direct primary beneficiaries of the DSO. The public are often referred to as “the eyeballs,” obtaining value via their television sets, set-top boxes and receiving antennae, and through their mobiles and other broadband links when the digital dividend spectrum becomes available. As indicated above, the DSO is expected to result in increased numbers of viewers and longer viewing times, driven by more widespread signal distribution, connectivity and better content which includes higher quality images, more compelling programming and a greater variety of channels.

The four main challenges for engaging the public are:

- The provision of sufficient amounts of attractive/relevant programming which will justify the switchover in the minds of the public

- The availability of the digital signal which is related to the speed of the digital roll out, as well as its breadth (geographic coverage)
- The cost and features of reception equipment (set-top boxes, digital TV sets, USB tuners for computers)
- The period of dual illumination and how much time is needed to allow the public to make an orderly switchover.

TV viewership

By providing more attractive content, the DSO is expected to increase the levels of TV ownership from the currently estimated 20% household penetration of analogue TV sets (although there is a much higher viewership, probably over 60% of the population¹), and much lower level of penetration in many rural areas. Measuring the extent of this potential increase will be important in order to estimate the demand for digital TV viewing equipment, programming and potential advertising or pay-TV revenues.

Related to this, it is necessary to take into account that digital TV will not be the only delivery platform for the digital content. Satellite and cable already carry the broadcasts of most TV services in the country, and CRTV is already accessible on the internet while CRTV and the major private broadcasters are available on mobile phones.

The extent to which these alternative platforms will have an impact on the uptake of digital TV remains unclear, although as far as mobile TV reception is concerned, the indications are that it is yet to take off as expected. While over-the-top (OTT) programming² is growing rapidly in more developed countries, until broadband gains a much stronger foothold in Cameroon, it is unlikely that IP-based television and triple or quadruple play packages will have a significant impact on demand for digital TV. Nevertheless this picture could change rapidly, given the success of 3G-based triple-play set-top boxes such as Orange's Flybox³ in North Africa, and even its WiMax based Livebox service in Cameroon.

Digital satellite and cable TV subscribers are already a significant segment of the TV market in Cameroon. Although they are a much smaller subset of the total TV viewers in the country, their potential for growth is significant, especially for cable TV (using co-ax cable) in urban areas, which can be supplied in a wide variety of packages along with broadband on the same cable at relatively low cost.

In addition, as discussed further under in section 4.5, due to their higher income levels, existing digital satellite and cable TV subscribers are a particularly desirable section of the population as targets for advertising, and the growth of this segment of the TV market will be likely to reduce advertising income to support free-to-air DTV channels. At the same time however, these are subscription-based services which may not require the same levels of advertising revenue to support. While setup and subscription costs are higher for satellite TV, this option offers immediate access to subscribers distributed virtually anywhere in the country, although viewers are likely to value the service most in rural areas where other alternatives are not available.

So on the one hand, future growth of cable and satellite TV is likely to diminish demand for digital TV, while on the other, satellite can provide a valuable stop-gap to cover deficiencies in terrestrial digital signal distribution, at least in the short to medium term.

These considerations can also help to inform the objectives and obligations in licensing local broadcasters under the new digital TV regime. Considering that a substantial number of existing broadcasters are currently unlicensed, it may be worthwhile to consider scrapping the issue of further broadcast licences under the current policy and use the DSO as an opportunity to revamp and streamline the whole broadcast licensing process. This would need to take place within a clearly-specified timetable to ensure that existing holders obtain licenses.

Access to energy is also a major consideration in determining viewership. Coverage and use of TV in rural areas is largely influenced by the availability of grid power. Viewers outside grid-power areas usually need to use expensive generators or solar power to supply energy to their TVs. Similarly, broadcast coverage areas in Cameroon are currently reflected by the availability of power for transmission equipment, and by the need to meet demand from the public. Access to electricity is thus an important factor to be taken into account when planning the phasing of signal coverage extension since there is little point in erecting a new transmitter in an area without electricity. More proactively, it is worth looking at further

1 In 2009, a Steadman Group Audience Research Survey in Cameroon found that 68% of respondents viewed CRTV in the previous seven days while 66% had watched Canal+, over a third of respondents had watched Canal Horizon (37%) and STV (34%). See: Steadman Group *Audience Research Survey, Final Report Cameroon* (Kampala: 2009)

2 Over-the-top programming refers to delivery of content over networks not under the administrative control of the broadcaster.

3 A set-top box that provides broadband over 3G links and is oriented to providing OTT. For example, see: <http://www.orange.tn/fixe-et-internet/pid382-la-flybox-orange.html>

roll-outs of TV transmission coverage alongside plans for electricity roll-out. Under such circumstances, small extensions of the grid will produce small but significant increases in viewership.

Viewing equipment

There are a variety of related strategies that can be employed to optimise the rapid uptake of digital TV viewing equipment and provide people in Cameroon with the most appropriate viewing tools.

One important aspect is ensuring that a wide range of equipment is available in local markets to meet the varying demands of the public. Cost, resilience and functionality usually lie along a continuum for which people need to determine their own level of need. For example, set-top boxes and digital TVs can have different levels of functionality, such as free-view only, or with pay/conditional access functionality, or built-in video recording (PVR) and video-on-demand (VOD) functions.

Computer-based digital tuners, also offer an important option for those who may not have a TV set but are able to watch broadcasts on a laptop or desktop monitor. For example, USB flash-drive tuners supporting DVB-T are already available for about USD 10 at the retail level. Similarly, some members of the public may even wish to opt for one of the new set-top boxes that also provide internet access via DSL, Wi-Fi, WiMax or 3/4G.⁴

At the same time it is vital to ensure a reliable supply of low-cost set-top boxes and digital TV sets for those who can least afford to purchase digital equipment. Currently it is possible to purchase DVB-T2 set-top boxes for less than USD 30 (in units of 500 or more on Alibaba). Access to low cost options will minimise the subsidies required for the DSO.

If there are relatively large changes in the frequencies used for the digital broadcasts, the possibility that consumers may need to change their TV antennae should also not be overlooked. This may require arrangements to ensure there are supplies of necessary antennae available, prior to the public launch of the dual illumination period. The cost and source of these would need to be identified.

There are three main mechanisms for reducing the cost of equipment:

- **Large-scale procurement (bulk purchasing) of set-top boxes, digital TVs or even USB tuners.** This could even happen on a regional level

if co-operation takes place with neighbouring or other countries in CEMAC or ECCAS, or even anywhere in Region 1. The main issue with bulk purchasing in this situation is how to organise it in a way that does not disrupt the market and disadvantages the existing suppliers of electronic equipment in the country.

- **Local assembly of DTV equipment.** Local manufacture is very unlikely to be competitive with the huge economies of scale available to Asian manufacturers, however local assembly of set-top boxes and digital TV sets using imported components may save some costs and stimulate local industry. This could perhaps be achieved by providing tax breaks or other fiscal incentives to companies interested in manufacturing locally.⁵ The marginal cost saving benefits of this approach are unlikely to be substantial, but could perhaps be increased if a regional centre for assembly was set up to further improve the economies of scale. However the economies of scale for this are likely to be much greater in neighbouring Nigeria (it already has computer and laptop assembly expertise).
- **Import duty and sales tax waivers on DTV equipment.** Import duties and sales tax can significantly increase the cost of electronic equipment. If specific waivers on these taxes can be obtained from the Ministry of Finance, this could substantially reduce the cost of the DSO for the public. This option would also likely need to be applied to the other two options above.

Viewing equipment subsidies

Members of the public who are least able to afford the equipment to watch digital television are likely to require financial assistance to make the switch. A mechanism may be needed to provide financial support to those who require it, combined with the strategies described above to maximise the number of features available while minimising the overall cost of equipment. So far in Africa, only South Africa has announced that it plans to subsidise set-top boxes for about 40% of the households with TV sets.⁶ The specifications adopted by South Africa

4 For example, see: <http://xinyutech.gmc.globalmarket.com/products/details/2012-newest-smart-set-top-box-including-android-market-773530.html> and <http://www.cnx-software.com/2012/06/01/mini-x-android-2-3-network-media-player-based-on-allwinner-a10/>

5 In South Africa the government made a commitment to subsidise set-top boxes for about five million households and plans to manufacture the equipment locally, even though this is expected to make them cost more than imported units. A call for expressions of interest from local companies was announced in 2012 and over 36 bids were received.

Natasha Odendall "Bids Pour in for STB manufacture tender" *Engineering News* 10 May 2012 <http://www.engineeringnews.co.za/article/bids-pour-in-for-stb-manufacture-tender-2012-05-10>

6 "Govt to subsidise Set-Top-Boxes for poor" *South African Government News Agency* 22 October 2010 <http://www.sanews.gov.za/south-africa/govt-subsidise-set-top-boxes-poor>

include a requirement for a return path, so that set-top boxes may be used for internet access, which has increased the price of the equipment.

Providing financial support for low-income groups is likely to require development of selection criteria to determine who is eligible for support (including devising checks for abuse), the decision on the amount of support that will be provided, and selection of the most effective method of providing it.

Subsidising the cost of digital TVs may not be the most effective use of available funds, and ideally, households with existing analogue TV sets should be able to obtain set-top boxes at no cost, allowing them to continue to use their existing TV sets. However the system should be able to accommodate sufficient flexibility so that low-income households wishing to upgrade their television sets while making the switch should be able to apply the funds to their preferred solution.

The mechanisms for providing the support could be selected from the following:

- **Provision of a specific set-top boxes (and antenna if necessary) that is given 'free' to qualifying households.** Advantage: Best chance for maximising economies of scale, especially if combined with bulk purchase as described above. Disadvantage: This option lacks flexibility for the consumer.
- **Provision of a voucher worth a certain amount (ideally to cover the cost of a basic set-top box).** This can be applied to any set-top box, digital TV or USB tuner. Advantage: Gives the consumer flexibility in their choice of equipment. Disadvantage: May not be able to maximise the potential of bulk purchasing and economies of scale, possibly more open to abuse, depending on the level of security measures built into the voucher.
- **A trade-in system for analogue TVs providing households with a subsidy in return for the donation of the old TV set.** This system could be combined with the previous two options. Advantage: Easy security (trade-ins much harder to abuse), makes the disposal of old equipment more reliable and more efficient (old equipment will not be used as landfill and cause environmental problems), could be combined with a recycling scheme. Disadvantage: More complex to administer, requires infrastructure to deal with the old TV sets, will be more costly to the consumer as it will require purchase of a digital TV set, which is more expensive than a set-top box.

If specific equipment is to be subsidised (as opposed to a voucher system which could be applied to any equipment), then setting standards for subsidised

equipment which find the right balance between the level of functionality and the cost is particularly important. Ideally, a low cost minimal function solution (a set top box probably costing less than USD 30) can be found which can be combined with a subsidy so there is virtually no cost to switch for those unable or unwilling to pay to switchover.

To obtain a general indication of the funds that might be required for the subsidy, the following rough calculations can be made. Cameroon is estimated to have about 3.3 million households, of which of which about 20% have a TV, which translates to about 660,000 TV sets. For example, assuming that 50% of these apply for subsidy and that the subsidy level is about USD 30 (the current cost of a low-end set-top box), the total cost would be close to USD 10 million.⁷

Going a step further and looking beyond subsidising existing users and towards reaching new viewers, this "back of the envelope" calculation can be expanded. For example, assuming at least 50% of all households are currently within the TV signal coverage area (1.65 million households in total) and 80% of these apply for the subsidy, then the total subsidy cost (about USD 30 each), the total cost of the subsidy would be just under USD 40 million.

Table 2 shows three different countries with the estimated subsidy required to ensure that everyone is able to buy a set-top box that allows their television set to receive a digital signal. The estimates for South Africa have been made by its government as part of the elaboration of a subsidy scheme but have not yet been confirmed. The subsidy assumed in the case of Ghana and Nigeria is sufficient to lower the cost of the set-top box to an affordable level when taken together with tax reductions; in other words, to a level around USD 30-35 per set-top box. (Table 2)

Raising public awareness

From the consumer perspective, once the new digital broadcasting infrastructure is in place, the DSO can begin with the launch of a public awareness campaign to encourage a rapid switchover, to inform consumers of the availability of subsidy options, and to make them aware that buying an analogue TV is not a good purchasing decision in the light of the planned analogue switch-off.⁸ The main components of this campaign should be:

⁷ See Section 1.5.2

⁸ While not directly related to the public awareness campaign, this aspect can be reinforced by imposing warning labels or outright prohibition on the import of analogue equipment after a certain date, as has already been implemented in Cameroon.

TABLE 2

The Cost of Part-Subsidy in Selected Countries

State	Households unable to afford	Estimated % unable to afford	Overall subsidy cost	Cost of subsidy per household
Nigeria	6.58 million*	37%	USD 69.1 million (estimate)	USD 28.38 (estimate)
South Africa	5 million	37%	USD 5.6 million	USD 3.03
Ghana	1 million	33%	USD 10.5 million (estimate)	USD 31.81 (estimate)

* This figure is based on TV households and those not able to afford a mobile handset. All data compiled by the authors. For sources for other figures see country reports on Ghana, Nigeria and Senegal published by APC: <http://digmig.apc.org/en/resources>

- A website providing the information required by the public.
- Advertising messages on TV, radio and in the printed press (TV advertising would likely be available at no cost)
- Printed materials including posters and pamphlets for distribution at public events
- Call centre with free number that citizens may use to ask questions about the DSO.

Environmental impact

Unless special provisions are made, the DSO is likely to have a considerable environmental impact arising from disposal of analog TV receivers. In addition, some analog broadcasting equipment will also need disposal, but this represents a much smaller quantity of equipment.

Disposing of electronic waste in landfill is not only hazardous to the surrounding environment but is also a waste of valuable materials and resources. Lead and mercury are just two of the many toxic components of a television set that can have extremely dangerous effects on humans and environments when left in landfill to leach into the ground. One TV with a cathode ray tube contains up to four kilograms of lead,⁹ which can potentially leach into groundwater and eventually into drinking water.

If 75% of the 660,000 televisions that are likely to be discarded were recycled,¹⁰ this would amount to a national saving of approximately 10,000 tonnes of CO₂ equivalents, 225 million litres of water, 175,000 gigajoules of energy and 70,000 cubic metres of landfill space.¹¹ Therefore

it is expected that measures will need to be put in place to ensure the public brings all analogue TV sets to a recycling depot where they can be disposed of safely and where valuable materials can be safely removed.

To share the not inconsiderable environmental costs of disposal,¹² this facility could be developed to function for the whole central African region if such facilities do not already exist in a neighbouring countries. Similarly, the recycling centre could be part of a larger facility that includes computer, radio and other electronic waste disposal and recycling.

Radio Spectrum Aspects

As discussed in detail in the previous modules, the DSO is expected to result in reduced radio spectrum needs for broadcasting and this will liberate a large portion of the spectrum currently allocated for TV signals. These digital dividend frequencies are exceptionally valuable for delivery of broadband services and could therefore help Cameroon meet its connectivity goals for the public. Without access to these frequencies it may be economically unfeasible to provide rural areas with broadband for many years. In addition, the sale of digital dividend frequencies to broadband providers could partly help to finance the DSO.

The alternative is that the digital dividend frequencies are used by broadcasters to provide additional programming (especially if a large number of HD channels are envisaged), but even if the frequencies were not going to be used for broadband, this does not appear to be financially viable, given the availability of sufficient attractive programming and market demand.

Until the switchover is complete, the digital dividend spectrum will not all be available for alternative

9 Molten Media Community Trust "CRT Monitors" Accessed 1 March 2013 <http://www.molten.org.nz/crt-monitors>

10 See Section 1.5.2

11 Figures based on: Government of Australia — Environment Protection and Heritage Council *Statement on End of Life Televisions* November 2008 http://www.scew.gov.au/archive/product-stewardship/pubs/cmpters_eol_televisions_and_computers_200811.pdf

12 In New Zealand, the national e-waste disposal network charges about USD 20 to dispose of an analog TV set. For example, see: RCN e-Cycle "Price List" Accessed 1 March 2013 <http://www.e-cycle.co.nz/price-list/>

use, however, there are two interim measures relating to spectrum use that could be considered in order to help smooth the transition process. One is to use the latest cognitive radio technologies which have just recently emerged which offer much promise for using TV white spaces for broadband. The other is to assign the 700MHz band¹³ immediately for broadband, thereby allowing operators to begin rolling out broadband services as soon as possible, while at the same time liberating funds for continuing the DSO.

As a first step, an evaluation will be needed of the digital dividend capacity that will become available, taking into account the present occupancy of the frequencies, the number of planned television channels in SD and HD resolution at the end of transition period, and the needs of broadband providers. This will likely require consultation with broadcasters as well as broadband providers, within the context of an overall broadband strategy for the country, such as plans for the provision of Long Term Evolution (LTE) licenses and other value-added services. The regional co-ordination of frequency-use will also need to be taken into consideration here.

Following this, a decision on spectrum pricing and assignment methods will need to be made. This would ideally require adoption of an efficient assignment mechanism that reflects the cost of spectrum management and the value to the broadband and signal distribution operator(s).

Assuming the digital dividend spectrum is released for broadband, the revenues generated should be in excess of USD 30 million, for just the 800MHz band. This figure is based on a very rough estimate using the reserve pricing given to the 800MHz digital dividend spectrum in France. This was USD 1.8 billion. France's GDP was USD 2.2 trillion (PPP) in 2011, compared to USD 48 billion for Cameroon.¹⁴ Using the two countries' ratio of GDP values, and applying this to France's reserve pricing, indicates that Cameroon should be able to obtain at least USD 30 million for the spectrum.

To more accurately determine the potential revenue generated from the liberation of the digital dividend spectrum, a survey of pricing and spectrum packaging in the countries which have already sold spectrum in the 800 MHz bands for mobile

broadband was carried out. As detailed in the accompanying spreadsheet, and in Table 3 below, the average spectrum price to date is about USD 0.55/MHz/capita. Assuming that three operators in Cameroon would each be allocated blocks totalling 10MHz, this translates to about USD 350 million. However these prices are based mainly on developed countries with more wealthy populations and more competitive telecommunication markets, and this will need to be taken into account when applying the experience to Cameroon.

In addition to these constraints on revenue potential, spectrum prices are generally trending downwards, and even in Europe, recommended spectrum pricing is much lower than the average so far achieved by countries that have sold digital dividend spectrum. A European Commission study¹⁵ indicated that the recommended price should be closer to USD 0.15/MHz/capita, which would translate to a total price for 30MHz in Cameroon of about USD 94 million. This price should be adjusted downwards to reflect local conditions and it also needs to take into account the coverage requirements which may be part of the spectrum licence. Operator willingness to pay will also be influenced by prior payments for 2G/3G spectrum, availability and cost of higher frequency spectrum for more dense urban areas, and a variety of other factors, particularly market stability and transparency. Ideally, Cameroon's digital dividend spectrum plan should be developed as part of an integrated broadband development strategy bringing together different wavebands and access media. (Tabla 3)

The value to broadband operators in Cameroon will depend on the general enabling environment, which will determine their ability to effectively use the spectrum to generate revenue. This is influenced by the openness of the market and the degree to which the playing field is leveled for competition, licence fees, general operating costs (energy, taxes, duties, access to local skills), as well as access to and the cost of backhaul and international capacity. The openness of the market, and therefore the number of broadband operators wanting to purchase spectrum, will also have a large impact on the total funds obtained from the spectrum allocation process.

13 Although the international standards for Region 1 allocate the 700MHz band for analogue broadcasting in Cameroon, this has not actually been used for broadcasting, and so should be free for assignment to broadband.

14 The World Bank *World Development Indicators* <http://data.worldbank.org/data-catalog/GDP-ranking-table>

15 BIPE Consulting *Digital Switchover in Broadcasting, A BIPE Consulting Study for the European Commission (Directorate General Information Society)* (Brussels: April 2002) http://www.krrit.gov.pl/Data/Files/_public/Portals/o/radiofonia%20i%20telewizja%20cyfrowa/cyfr_bipe_b.pdf

TABLE 3

Survey of Existing Digital Dividend Spectrum Auctions and Reserve Pricing to Date

Country	Waveband	Block Size in the Digital Dividend Spectrum (MHz)	Initial Spectrum Fee or Reserve Price* (USD)	Licence Period (Years)	Population	Revenue / Capita / MHz (USD)	GDP/ Capita 2011
Croatia	800 MHz	40	26,000,000	12	4,407,000	0.15	14,180
Denmark	800 MHz	60	132,230,000	22	5,574,000	0.40	59,852
Finland	800 MHz	60	133,500,000	20	5,387,000	0.41	48,823
France	800 MHz	60	3,524,000,000	15	65,400,000	0.90	42,377
Germany	800 MHz	60	4,774,000,000	15	81,800,000	0.97	44,060
Ireland	800 MHz 900 MHz 1.8 GHz	230	642,000,000	18	4,487,000	0.62	48,423
Italy	800 MHz	50	3,950,000,000	18	59,500,000	1.33	36,103
Netherlands	800 MHz	60	280,000,000	17	16,696,000	0.28	50,076
Nigeria	800 MHz	4	3,200,000	5	162,470,000	0.01	1,502
Portugal	800 MHz	60	270,000,000	15	10,637,000	0.42	22,316
Romania	800 MHz	30	280,000,000	15	21,390,000	0.44	8,405
Spain	800 MHz	60	1,730,000,000	19	46,235,000	0.62	31,943
Sweden	800 MHz	60	311,000,000	25	9,453,000	0.55	57,091
Switzerland	800 MHz	60	138,500,000	16	7,907,000	0.29	83,383
UK	800 MHz	30	775,000,000	20	62,641,000	0.41	39,038
USA	700 MHz	65	18,900,000,000	20	311,591,000	0.93	48,112
Average				17		0.56	

* = Reserve Price figures: Australia, Finland, Netherlands, Nigeria, UK, Switzerland, Romania.
All data compiled by the authors.

Source for GDP and population figures: The World Bank World Development Indicators <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD> & <http://data.worldbank.org/indicator/SP.POP.TOTL>

Economic value of the digital dividend

As an indication of the overall value of the digital dividend spectrum for broadband, the charts below show the results of an assessment carried out by the Boston Consulting Group in Asia, comparing the value of the spectrum for mobile broadband versus its use for additional broadcasting services. As can be seen, the impact on the economy, in terms of GDP growth, government revenues and job creation, is far greater if the spectrum is used for broadband. (Figures 6, 7 & 8)

The TV Signal Transmission System

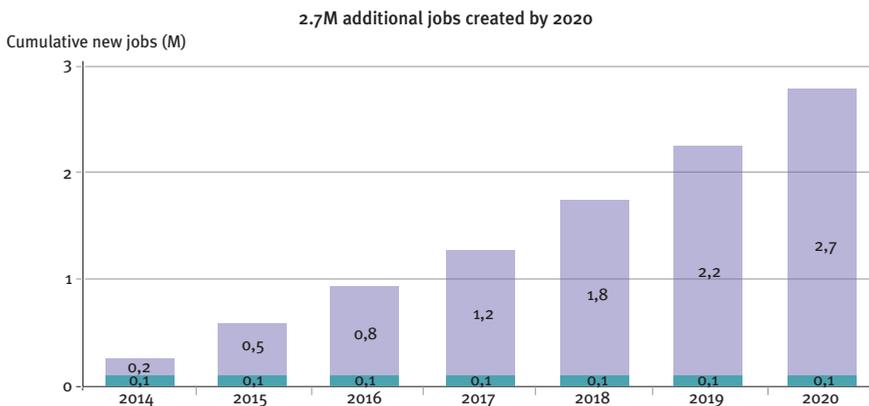
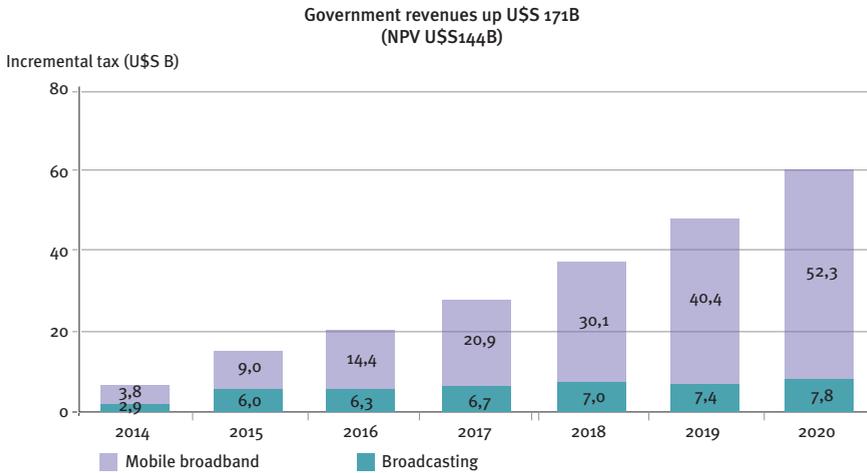
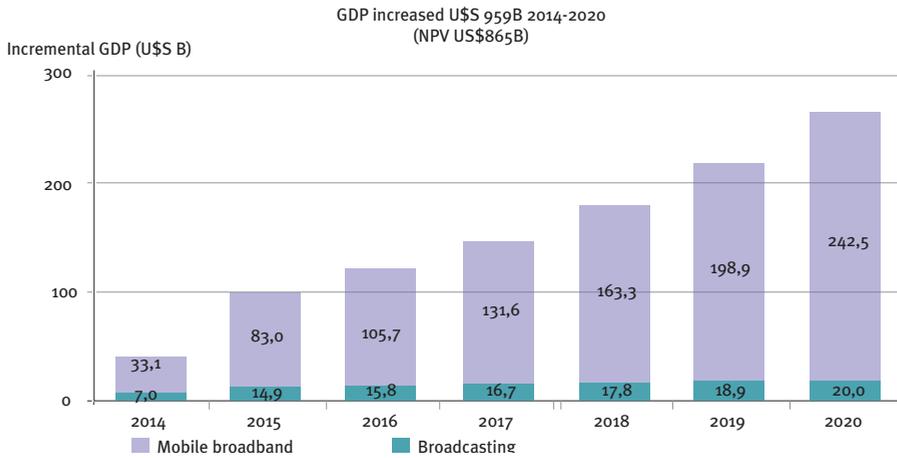
At an administrative level, the digital broadcast transmission system consists of signal distribution and a multiplex operating entity or entities. At a technical level this consists of the masts and associated broadcasting electronics (the radio equipment) and antennae.

The digital signal distributor can re-use most of the existing transmission masts and power supply systems, but the radio electronics will need to be changed to new digital radios. Other existing masts that are currently used for telecom purposes may in some cases also be used for broadcasting, where they meet gaps in the planned digital coverage. New masts will also need to be built to extend to areas currently without coverage, or to better optimise the existing signal coverage. In this area the key issue as compared with the old analogue distribution system is that a new organisation needs to be created which is responsible for receiving the transmissions of the content providers and their delivery as TV signals to the public.

The business model for signal carriers is two-fold: to charge broadcasters regular fees for transmitting their signal (thus saving them the cost of putting up and operating their own infrastructure),

FIGURES 6, 7 & 8

The Estimated Effects of Digital Switchover in Asia



SOURCE: Boston Consulting Group *The Economic Benefits of Early Harmonisation of the Digital Dividend Spectrum and the Cost of Fragmentation in Asia Report on the Asia-Pacific Region* (Shanghai: BCG, June 2012) <http://www.gsma.com/spectrum/wp-content/uploads/2012/07/mae12-ppf-bcg-final.pdf>

and/or to allow the signal carrier to offer pay TV services, either directly or indirectly through another broadcaster. In effect, several broadcasters share the cost of their infrastructure but have a choice of signal carrier provider. The capital cost and the risk is borne by the licenced signal carriers.

The alternative to this competitive model is to create a single national signal carrier, separate from the national broadcaster. Although created before the digital transition, South Africa's Sentech represents an example of this type of separate signal carriage vehicle. In this instance, the government bears the full cost of the signal carriage function but recoups its expenditure through charging all broadcasters for services.

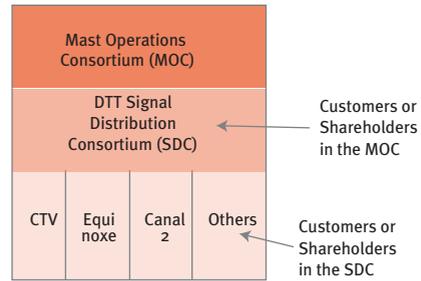
The final option is to simply leave the process of the digital transmission in the hands of the state broadcaster and the private sector players. In this case, everyone builds their own digital infrastructure in a way that will probably mirror the existing transmission coverage pattern. The state broadcaster will have a slightly wider transmission coverage area nationally (financed entirely by the government) and the private sector will be largely focused on urban areas. In this case, there may be no expansion of the overall coverage area and there will not be a diversity of content delivered to a wider range of viewers.

The model adopted by Cameroon for implementing and managing the signal distribution infrastructure is to create a new independent public private partnership (PPP) which would merge the existing infrastructure assets of CRTV (which has about 80% of the infrastructure) and the private broadcasters.¹⁶ The new independent entity is normally obliged to apply equal, non-discriminatory conditions regarding the quality, availability and fees for all broadcasters. Fees are normally cost-based, and are usually not applied during the initial period of dual illumination, which is regarded as the test period.

A refinement of this approach could be to separate mast management from signal distribution. This would build on the experience in the mobile sector which is increasingly moving toward outsourcing in this area. This involves switching from land ownership, mast building and maintenance to rental of space on masts operated as passive infrastructure by specialised mast operators (for example, IHS¹⁷ or Helios) which are responsible for providing mast space for radio equipment, power and security. Aside from the greater efficiencies that this allows, this option has the further

FIGURE 9

The Radio Spectrum



advantage that additional funds to support the DSO could be obtained through the sale of the masts to the mast operator. Implementation of this model may need the adoption of new regulations for operation of passive and shared infrastructure. (Figure 9)

Import duty and sales tax waivers on digital transmission equipment will also help to minimise the initial setup costs.

The phasing of deployment of the digital signal is another important issue, which has three aspects: a possible pilot in one or more specific smaller areas; the roll-out of the digital signal to the existing analogue coverage area; and the extension of digital coverage to new areas. A deployment model could be used to examine the implications of alternative scenarios in rolling out digital transmission infrastructure.

Also part of the broadcasting system, but less important for DSO business planning, is recording equipment in TV production studios. In Cameroon, many of these are already using some digital equipment, and it will be up to the individual content producers to complete this process according to their needs. CRTV has installed digital production equipment, although the central matrix may still be analogue. Most private broadcasting companies such as STV and Canal 2 already use digital production and post-production facilities.

Production studios/content providers will also need broadband links to transmit programming to the signal distributor. The cost of these will depend on the degree of competition in the telecommunication market. For the signal distributor, the level of competition may have an even bigger impact on the costs of signal distribution which includes the cost of transmission of the signal to the masts from where the signals are broadcast.

There is also a need to cost the digital signal multiplexing equipment that is required to assemble the bouquet of channels, an element that has

16 Interview with former staff member, October 2012

17 MTN Cameroon recently sold all of its masts to IHS. See: Patrick Atuanya, "IHS becomes largest tower company in West Africa" BusinessDay 25 October 2012 <http://www.businessdayonline.com/NG/index.php/markets/fund-manager/46520-ihs-becomes-largest-tower-company-in-west-africa>

no direct counterpart in the current analogue broadcasting system.

Finally, a business model for the signal distributor will need to be developed which takes into account:

- The mechanism for acquiring the broadcasting assets of CRTV and private operators (including the option of selling the masts to a specialised mast operator)
- The cost of installing digital broadcasting equipment and potentially additional power for the masts
- Coverage extension costs (new masts and electronic equipment)
- Backhaul (mast interconnection) leased line costs
- The fee structure (revenue) for the various types of broadcasts: for example, pay/free, SD/HD, large/small broadcaster (many/few channels), etc.
- Spectrum licence fees
- Cost of dual illumination period
- Sources of finance for the DSO.

Broadcast Television Content (Channels and Programming)

The changes needed in the content of TV broadcasting brought on by the DSO are often overlooked in the focus on technological change. However, improved content is actually the most important part of the equation in meeting public needs and is thus the key element in maximising consumer demand for digital TV.

Ensuring that the full potential of the increased number and/or quality of channels that can be made available with digital TV is realised will also have important spinoffs for the economy and in particular areas such as distance education, health care and agricultural information transfer.

The number of free channels available is likely to be a key driver for the success of the switchover. Willingness to pay for set-top boxes or digital TVs is expected to be low if no new channels become available or their perceived relevance is low. As a result, strategies will be needed to ensure sufficient relevant free content is available to attract viewers. For premium content, affordable consumer packages will be needed, which could also include radio channels. In planning support for additional programming, it will be necessary to improve the understanding of consumer demand for different types of content, especially for the public broadcaster.

Considering that free channels are likely to be in the highest demand, advertising revenue issues will affect targets for the number of channels to be broadcast. Each additional channel will partly dilute the

available advertising revenue per channel. Although there could be some additional revenues generated by attracting new advertising to the specific market segment attracted by a particular channel, overall this is not expected to significantly increase the total advertising revenue base, at least in the near-term.

Related to this is the appetite of the public for pay-TV or other value added services that can be provided. Since satellite and cable TV viewers already have an alternative to terrestrial analogue (or digital) broadcasts, their behaviour will depend on the response of the satellite and cable TV operators to the availability and quality of terrestrial digital TV. As these consumers are already paying for satellite and cable TV equipment and services, these viewers represent the high-income group in Cameroon and are thus particularly attractive to advertisers. They are already used to the availability of dozens, if not hundreds, of TV channels and may be unlikely to need digital TV. However, the cost of acquiring the necessary equipment for digital TV is unlikely to be a barrier for this group. On the other hand they are likely to be almost identical to the population segment that would be able and willing to pay for digital TV subscription services. Since satellite and cable services are already well entrenched, the demand for paid digital TV services may be in question, although it is possible that specially designed bouquets of low cost paid content might appeal to some segments of the market. Both Star Times and DSTv's Go service have attracted thousands of users in countries of a similar size to Cameroon (for example, Kenya).

Nevertheless, in the free-to-air market, the number of terrestrial broadcasters could increase significantly with the availability of the lower cost broadcasting platform which substantially reduces the potential barriers to market entry, especially for smaller broadcasters/content providers (no need for capital for broadcast infrastructure, no need to pay spectrum fees). As a result, to support increased diversity of programming options for the public, the licensing regime will need to reflect goals in this area, and take into account that digital TV will not be the only platform for their broadcasts (internet, cable and satellite will also be options).

Provisions also need to be made for the reservation of channels for future broadcasters, and for channels to change from free to pay-TV, or vice versa. This could be included in the design of the contracts that the content providers will hold with the signal distribution/multiplex operator.

Increasing the amount of quality programming produced in Cameroon will also help to fully exploit the greatly increased availability channels and to

meet the needs of the public for relevant media. Incentivising local content production will need to be approached at a number of different levels to be effective. The most important of these are:

- Improving the broadcast environment generally through clear and transparent licensing conditions
- Fiscal incentives for production (such as tax write-offs for companies supporting recognised productions)¹⁸

¹⁸ For example, in Brazil companies can apply a small proportion of their tax returns to individual film and documentary project proposals that are approved by the government. See: Ministério da Cultura Brasil «Programa Nacional de Apoio à Cultura (Pronac)» Accessed 1 March 2013 <http://www.cultura.gov.br/site/ acesso-a-informacao/ programas-e-aco es/ programa-nacional-de-apoio-a-cultura/>

- Minimum local content requirements for channels – especially Free to Air channels
- ‘Must carry’ rules.

Implementation Planning

In order to develop a detailed implementation plan for the DSO it is necessary to integrate the outputs from the above activities and develop a cost-benefit analysis. Such an analysis would inform aspects of the plan such as the viability of planned switch off dates for analog broadcasting, the channel availability targets and potential take up of digital TV by the public. Table 4 provides a potential framework for the cost-benefit analysis. (Table 4)

TABLE 4

Cost Benefit Analysis Framework for DSO

	Benefits		Costs	
	Factor	Evaluation Method	Factor	Evaluation Method
Consumers	a) Better sound and picture quality b) More programmes c) Internet access through digital TV d) Interactive services, video on demand, information services	Willingness and ability to pay, and expected diffusion	Cost of conversion & public awareness campaign costs	Supplier information, dependencies on technology and frequencies used
Broadcasting companies and content producers	a) Early switchover translates to lower cost of migration process b) Possible savings in spectrum fees c) Opportunity to produce and market more content d) Digital infrastructure is cheaper than analogue infrastructure per channel e) Larger pool for advertising	Willingness and ability to pay and expected adoption	Infrastructure investment, human resource development and awareness raising	Analysis of technology choices, business models and implementation strategies
General Economic Impact	a) Reusing the freed-up spectrum b) Opportunity to narrow digital divide c) Improved decision-making, education opportunities, public awareness raising in areas such as health and spin-off economic development benefits d) Increased growth of the advertising sector	Digital dividend depending on current spectrum utilisation and the use of freed-up spectrum as well as opportunity cost savings	Subsidy required for a smooth transition from analogue to digital TV Human resource development for new programmes and information dispersion development	Willingness and ability to pay, expected diffusion, standard cost estimates

TABLE 5

DTV Value Chain Costs and Revenue Sources

DTV Value Chain Element	Cost(s) (Capital and Operational Expenditures)	Revenues
1. TV audience and television viewing equipment	1. Digital reception equipment including set-top boxes, digital TV sets, etc. is a major part of the overall cost of the DSO. May be subsidised by the state for low income households 2. Awareness raising campaigns about the planned change 3. Disposal of analogue TV sets 4. Energy	1. Purchase of equipment (over and above subsidies) 2. Recycling of some TV set components
2. Radio spectrum used to carry the TV signals	Spectrum management and spectrum assignment process	Spectrum Licence Fees (broadcast signal distributor(s) and broadband providers) is a major potential source of funds to support the DSO
3. TV signal transmission/ distribution system	1. New digital broadcasting equipment and installation 2. New and refurbished masts (or mast rental) 3. Multiplexing equipment 4. Backhaul capacity 5. Spectrum licence fees 6. Energy *1&2 are the other major part of the DSO cost (along with viewing equipment)	Signal distribution fees (cost related) Bouquet management fees Sale of masts Grants or loans for DSO costs
4. The broadcast content (channels)/ content producers	1. Recording equipment upgrade to digital 2. Signal distribution fees 3. Broadcast Licence fees	1. Advertising sales 2. Subscription fees 3. Pay-per-view fees

An overall budget for the DSO can then be developed, so that effective fund-raising can take place where needed. Table 5 summarises the costs and revenue sources that would be expected, using the structure of the digital TV value chain described above, with the main costs and revenues highlighted in bold. (Table 5)

Financing the DSO

CAM-DBS estimates the total cost of the switchover to be about CFA 85 billion (USD 168 million). It is expected that about half the cost will be the new signal distribution infrastructure and half will be the cost for changing viewing equipment. This is suggested by the cost estimates made for Cote d'Ivoire, which is a country of similar economic size (USD 25 billion GDP in 2011) and population (20 million), although it is about 50% smaller in land area. As a result, the total cost for Cote d'Ivoire is estimated¹⁹ at CFA 58 billion (USD

115 million), which comprises USD 60 million for infrastructure and USD 50 million for "social costs."

In terms of financing the consumer equipment, some countries such as South Africa have opted to use the universal service funds to support the purchase of set-top boxes, but there may be other more effective uses for these funds which are more in line with the expectations of the telecom operators which are currently their only contributors. Perhaps a less controversial use would be for electricity provision, as is done in Senegal. However if fund contributors were expanded to include licensed broadcasters it may make sense to use the fund for digital TV consumer equipment.

As indicated above, revenues from digital dividend spectrum licensing could be a major contribution to the cost of the DSO. In this respect the telecom operators would be a major source of financing for the DSO, but other private sector entities, perhaps under the umbrella of the Chamber of Commerce, could also be encouraged to provide loan,

¹⁹ <http://www.igici.ci/index.php/mission/internet-en-cote-divoire/133-cote-divoire-108-millions-de-dollars-pour-basculer-vers-le-numerique-audiovisuel.html>

equity or grant finance. Sale of masts could also be an important element, and as the state contribution to a PPP, if an interested private signal distributor can be identified, little additional government funds should be necessary to complete the process.

Recommendations for Business Planning Activities and Related Projects to Support the DSO

TV viewership and viewing equipment

- A survey should be carried out to more accurately estimate the number and geographic distribution of actual and potential TV owners. This could also measure: Their ability/willingness to pay for digital TV equipment and services.
- The impact of satellite and cable TV viewers (including growth patterns and revenue sources (advertising/subscription/VOD) The availability of electricity, and plans for extension of the electricity grid The features desired from reception equipment The channels or content that is or will be in demand, including SD versus HD programming.

Discrete choice contingent valuation surveys are the standard means of assessing willingness and ability to pay which could help provide better estimates of diffusion rates and subsidy requirements for various models. These would estimate the demand for digital TV by ranking, based on a payment ladder, the desirability of:

- Better sound & picture
- More channels
- Interactive information services
- Internet access.

The costs and modalities for the public awareness campaign to be launched at the beginning of the public implementation of the switchover can be finalised once the infrastructure is in place and switched on. This would also likely include developing a public awareness campaign regarding the risks of purchasing an analogue TV when the DSO is imminent. This could include deciding on, and publicising, a date after which import of analogue TVs would be prohibited or be required to carry warning labels.

The standards and retail pricing goals for set top boxes, digital television sets and computer-based digital tuners eligible for subsidy should be finalised as well. This will require surveying what is available in worldwide markets and matching this with the needs of Cameroon's low-income population, while also undertaking a cost-benefit analysis

of reducing retail pricing of a limited range of equipment through three mechanisms:

- Bulk purchasing
- Local assembly
- Import duty and sales tax waivers.

This would include identification of the modalities for implementing these cost cutting strategies (including consideration of options for regional collaboration), such as: fiscal incentives for local assembly, government tender for bulk purchase of set-top boxes, and negotiation with the Ministry of Finance for import duty waivers. While it may be that only one of these methods will be adopted, it is likely that some combination of all three will prove the most cost-effective approach (such as bulk purchasing of components that have had import duties waivers for local assembly).

The range of mechanisms that will be adopted to minimise the cost of DTV viewing equipment should be formalised. This will require completion of the previous activity, along with the TV viewership survey and potential selection of specific equipment that would qualify for a subsidy.

The subsidy amounts for digital viewing equipment that will be made available (total and per person) should be determined, along with the source of funds, selection criteria for equipment that qualifies for subsidy, selection criteria for those who qualify for the subsidy (for example, income level, household size, age or disability), and the disbursement mechanism (for example, the use of vouchers, trade-ins, direct subsidies on specific equipment, etc.).The need for new aerials that some members of the public may need to optimise signal reception should be assessed.

A low-cost solar power system or generator that can provide energy in times of power outage or where there is no grid power should also be identified.

Signal distribution roll-out plans should be coordinated with those for electricity roll-out.

Options for disposal and recycling of analogue TV sets should be identified. This should include taking into consideration the potential benefits of regional co-operation (a centralised multi-country disposal facility) and/or integration with a broader e-waste programme that includes computers, radio and other electronic waste disposal and recycling.

Spectrum

The overall spectrum needs for broadcasting should be determined, taking into account the planned number of SD and HD channels that may need to be made available in the medium to long term.

A decision should be taken on the fund-raising goals and processes for assigning the digital dividend frequencies. This will include designing the assignment mechanism (type of auction, royalty scheme, etc.) and the reserve pricing for each spectrum band.

The priorities and strategies for digital TV frequency co-ordination in the region should be identified, especially with neighbouring countries.

A TV white space pilot should be established to evaluate the potential of the technology for providing broadband access in Cameroon.

Options for the immediate use of the 700–800MHz bands for broadband should be developed in order to assess the revenue generation potential of frequency assignments in this waveband.

Signal distribution mechanisms and infrastructure

A detailed survey and assessment of current mast infrastructure and needs should be carried out to bring coverage to the Cameroon DSO Strategy goal of 85% geographic coverage. This would include the development of alternative coverage level scenarios and their different costs, taking into account the availability of electricity and plans for extension of the electricity grid.

The potential for the sale of broadcasting mast infrastructure in Cameroon to an independent passive infrastructure operating entity should be assessed, building on the experience accumulated in this area by mobile operators. This would also identify any cost-saving opportunities in deploying shared mast infrastructure to form a national network capable of hosting broadcast and broadband services.

If the sale of mast infrastructure is feasible, an assessment of the amount of funds that could be derived from the sale and applied to supporting the DSO could be made. In addition, the regulatory requirements for operation of passive infrastructure and adoption of infrastructure sharing rules should be taken into account.

A provisional budget and tender process for the signal distributor to acquire the necessary (as identified in the first activity) digital broadcasting equipment should be developed, taking into account signal multiplexing equipment and backhaul transmission facilities to transmit the content to the broadcasting masts.

The extent of potential cost savings that could be achieved through removal of import duties and sales taxes on digital transmission equipment should also be identified, and an infrastructure availability and tariff assessment for meeting the

needs of the signal distributor to bring content to the broadcast masts should be carried out. This could include a needs assessment for regulated price for backbone transmission where the market is not competitive. This study should take into account the potential for provision of capacity via current plans for replacing metal infrastructure with fibre in all provincial capitals within two years.

A detailed business plan for the signal distributor based on the costings and alternative scenarios developed in the previous activities should be developed. This will require finalising the business model, valuing the broadcasting assets (masts, power supplies, antennae and electronics) of CRTV and the private broadcasters, and designing the fee structure for the various types of broadcasts (pay/free, SD/HD and large/small broadcaster, limited geographic coverage/nationwide, and 24-hour broadcasting versus limited hours broadcasting).

In addition, coverage extension costs, spectrum licence fees and the cost of finance will also need to be assessed. It will also be necessary to take into account the potential impact on the signal distribution business model caused by broadcasters' use of alternative delivery platforms such as cable, satellite, mobile and internet.

Programming/content

A public survey to help determine the goals for the free-to-air programming that needs to be available at the start of the switchover process should be carried out in order to make the DSO an attractive proposition to the public. This should include identifying the number of free SD and HD channels, the type of content desired as well as the identification of the other value added or enhanced services that will be in demand, such as programme guides and interactive data services. This should then inform the short, medium and long-term goals for the number and type of channels. This will require developing a methodology for determining the desired number of these different channel types, taking into account the availability of and growth of advertising revenues to be split across the free channels and the willingness to pay for subscription channels or video on demand (see viewership survey recommendation above).

The scope of potential pay digital TV services that may be required should be determined, given that this market segment is already well-served by satellite and cable television. This should include an assessment of the potential viability and demand for both subscription and video-on-demand services.

To support the above activities it will be necessary to identify the spending patterns of TV viewers

in Cameroon and the current and potential advertising revenues that are or will be available to support the appropriate number of free channels.

Modalities for streamlining the current TV broadcaster licence process should also be identified, while developing a broadcast licensing regime that can encourage diversity in the sector and the emergence of smaller local broadcasters by limiting their licence fee requirements or other public service commitments while they are still becoming established and building audience.

A strategy for encouraging the development of more local programming should also be developed and adopted, and the provisions required for a channel to be able to change from free to pay TV, or vice versa (including advertising requirements, contractual obligations, etc.) should be identified along with the desired process for reserving channels for future broadcasters.

A programme to raise the awareness of content producers of the technology options, costs, cost savings and business models for content delivery should be developed, focusing on common dilemmas such as SD versus HD, free versus pay, subscription versus video-on-demand, broadcast versus TV over internet.

Costs of digital transmission which include digital recording equipment, leased lines to the signal distributor, signal distribution fees and international transmission costs for sourcing content, should also be publicised along with business implications of the broadcast standard adopted (DVB-T2).

Implementation planning

In order to develop the detailed implementation plan for the DSO, it will be necessary to integrate the outputs from the above activities in a structured cost-benefit analysis which would inform aspects such as the pilot project and signal roll-out goals, the cost and viability of the dual illumination period and planned switch-off dates for analog broadcasting, the channel availability targets, and the potential take up of DTV by the public.

The model should allow comparison of costs and benefits for alternative scenarios in rolling out digital transmission infrastructure. This could then be verified with the implementation of the pilot project to test assumptions and more accurately determine the costs and time required for the complete switchover. Following this, more detailed targets and budgets for signal distribution infrastructure deployment could be developed along with criteria for selection of areas and dates for deployment.

Identification of other human resource costs to support the DSO are needed, mainly to budget for the administration costs for CAM-DTV and Cameroon's technical secretariat. In addition this could also include regulatory capacity building in spectrum assignment and use of new technologies such as TV white spaces, by deploying a pilot.

MODULE 5

Cameroon's DSO Calendar

This section provides an implementation roadmap for the DSO in Cameroon.¹

There are four phases below to the completion of the digital switchover and 46 actions that need to be completed in order to reach the end of the process. Some of these 46 actions are large-scale projects in themselves (the public awareness process) that consist of a much larger number of sub-tasks. These are listed below and a Gantt chart is also provided illustrating the sequence and potential timeframe for each over ten-year timeframe.

Although many of the actions listed below can happen in parallel, there are a number of “dependencies” in this timetable: in other words, something either has to start or be completed before the next step in the timetable can be taken. A failure to meet one of the deadlines that is dependent will lead to delays in implementing the overall schedule. Therefore it is important to have an overall schedule that is accessible to all those involved that shows these dependencies and that they are well understood by those responsible for those parts of the timetable.

Some of the actions described below, like setting up a signal carrier, will be lengthy because they involve negotiations between different parties who need to agree on things that have a fundamental impact on the success of their businesses. Therefore, although they can be scheduled and deadlined, they may actually run over the deadline.

In the African countries that have already publicly launched the DSO process, there has been an

understandable emphasis on the supply side of the process and ensuring that digital transmission coverage is in place across the country. However, the demand side of the process, people buying set-top boxes, is equally important. There is no point in turning off the analogue signal before almost all households with TVs have bought a set-top box or a replacement television set.

The timetables for many of the DSO processes in African countries to the 2015 deadline are reasonable if one only looks at the supply side of the equation. But they do not take into account the need to persuade the country's TV viewers purchase a set-top box or replacement television, which could take much longer.

Co-ordination with regional neighbours is a timely process. However, it is crucially important for two reasons:

- Agreeing to common specifications for set-top boxes so that manufacturers are able to manufacture longer runs potentially makes them cheaper
- Co-ordinating and timetabling the analogue switch-off helps to avoid signal spill-over across borders.

Digital Switchover Task List

Pre-Preparation Before Digital Illumination

Policy and legislation

- (1) Draft outline broadband and converged communications strategy
- (2) Define subsidy strategy
- (3) Finalise import restrictions on analogue televisions
- (4) Finalise local content strategy (dependent on the completion of survey in 1.5 below and channel feasibility study)
- (5) Develop training curriculum with media training institutions
- (6) Establish working group for e-waste
- (7) Create e-waste plan

¹ This calendar provides what we believe is a realistic timetable for the DSO in Cameroon. It stretches over a period of ten years, whereas the ITU deadline for the process is only a little over two years away. The timetable provided lays out the different aspects of the DSO that have to be undertaken and we do not believe that these things can be completed in just over two years. Elsewhere, the DSO process has taken anything between five and fourteen years so whilst it may be possible to improve on a year timetable, it is unlikely to be squeezed into the time before the available deadline.

There has been some debate amongst the stakeholders about the time needed to carry out the DSO and the length of time shown for dual illumination. It is worth noting that the DSO has two aspects: the supply of a transmission infrastructure and the demand from users for set-top boxes to receive the new digital signals. Whilst the supply side of the DSO can be accomplished relatively quickly, it will take longer than twelve months to get users to buy the new set-top boxes.

- (8) Agree DSO dates with neighbouring countries and seek to co-ordinate on minimum specifications
- (9) Create a switchover schedule that includes a pilot, a public awareness campaign, regional roll-out and a switch-off target date

Licensing

- (10) Finalise licence process for broadcasters
- (11) Finalise licence process for signal carrier/s
- (12) Tender and select signal carrier/s (dependent on the completion of the first two items above and the completion of the set-top box specification in 1.3 below)

Regulation

- (13) Carry out spectrum audit, create a spectrum plan and a plan with timings for the reallocation of spectrum
- (14) Wholesale price regulation for fibre network?
- (15) Finalise minimum specifications for digital viewing equipment
- (16) Define and start a TV white spaces pilot

Structures

- (17) Finalise structure and financing needs of signal carrier (dependent on completion of tendering and selection process above)
- (18) Define fora and working groups to oversee the DSO process
- (19) Define co-ordinating body for joint transmission and electricity roll-out
- (20) Restructure CRTV

Public-facing activities

- (21) Survey to help define the free-to-air offer
- (22) Finalise TOR for public awareness campaign (selection, structure and financing of signal carrier needs to be in place)
- (23) Tender and select contractor for campaign
- (24) Define and begin monitoring process
- (25) Start low-cost energy roll-out in selected areas
- (26) Accelerate electricity grid roll-out in co-ordination with broadcast transmission roll-out

Pre-Implementation Phase

- (27) Based on specification finalised in stage one, purchase in bulk or locally assemble set-top boxes
- (28) As part of below, carry out a feasibility study to assess the demand and viability for: pay TV services; video on demand and channels for future demand (needs the completion of the consumer survey before starting)
- (29) Based on decisions in pre-preparation phase, develop a digital channel plan, which shows which channels are allocated to which broadcaster (dependent on consumer survey, feasibility study and local content strategy)
- (30) Begin the spectrum refarming process to provide mobile broadband in the 700-800MHz band (dependent on four contingent deadlines associated with channel allocation to broadcasters)
- (31) Quantify the funds raised from the spectrum refarming process and decide how they will be allocated (dependent on early stage reallocation to allow financial estimates to be drawn up)
- (32) Cost the subsidy programme and source of funds (probably dependent on the receipts from spectrum sales)
- (33) Define the details, costing and schedule of the pilot (dependent on four contingent deadlines for broadcast channel allocation and appointment of signal carrier or carriers)
- (34) Begin human resource development programme for broadcasters and content producers

Implementation Phase

- (35) Finalise the total DSO budget and funding sources based on the work carried out in pre-implementation phase (depends on completion of initial spectrum sales and operation of twelve-month pilot)
- (36) Mobilise the funds for the DSO
- (37) Agree and announce a realistic switch-off date
- (38) Finalise the subsidy fund and operationalise
- (39) Set up and operate Audio-Visual Development Fund

- (40) Winning signal carrier bidder/s agrees geographic roll-out and implements dual illumination and then switch off on an area-by-area basis
- (41) Public awareness campaign launched on an area by area basis (sequence: general awareness; warnings on buying analogue equipment; key area dates for swirchover; old TV disposal options; and availability of subsidies)
- (42) DSO call-centre/support centre for public launched, including mechanism for receiving general complaints about broadcasting

Analogue Switch-off

- (43) Analogue signal switched off completely
- (44) Last households not converted to digital dealt with
- (45) End of set-top-box subsidy programme
- (46) Closedown of public awareness programme and support centre

Digital Switchover Timeline

CAMEROON: DSO TIMELINE																	
Each cell on the chart represents 3 months. / XXXX = Contingent items																	
1. Pre-Preparation Before Digital Illumination																	
1.1 Policy and legislation																	
	Year 1				Year 2				Year 3				Year 4				
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Draft outline broadband and converged communications strategy	■																
Define subsidy strategy	■																
Finalise import restrictions on analogue televisions		■															
Finalise local content strategy (dependent on the completion of survey in 1.5 below and channel feasibility study)						XXXXX XXXXX											
Develop training curriculum with media training institutions	■	■															
Establish working group for e-waste	■																
Create e-waste plan		■	■	■													
Agree DSO dates with neighbouring countries and seek to co-ordinate on minimum specifications		■	■	■													
Create a switchover schedule that includes a pilot, a public awareness campaign, regional roll-out and a switch-off target date			■														
1.2 Licensing																	
	Year 1				Year 2				Year 3				Year 4				Year 5
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Finalise licence process for broadcasters				■	■												
Finalise licence process for signal carrier/s				■	■												
Tender and select signal carrier/s (dependent on the completion of the first two items above and the completion of the set-top box specification in 1.3 below)							XXXX XXXX X	XXXX XXXX X									

1.3 Regulation																			
	Year 1				Year 2				Year 3				Year 4				Year 5		
	Q1	Q2	Q3	Q4	Q1	Q2													
Carry out spectrum audit, create a spectrum plan and a plan with timings for the reallocation of spectrum																			
Wholesale price regulation for fibre network?																			
Finalise minimum specifications for digital viewing equipment																			
Define and start a TV white spaces pilot																			
1.4 Structures																			
	Year 1				Year 2				Year 3				Year 4				Year 5		
	Q1	Q2	Q3	Q4	Q1	Q2													
Finalise structure and financing needs of signal carrier (dependent on completion of tendering and selection process above)									XXXX										
Define fora and working groups to oversee the DSO process																			
Define co-ordinating body for joint transmission and electricity roll-out																			
Restructure CRTV																			
1.5 Public-facing activities																			
	Year 1				Year 2				Year 3				Year 4				Year 5		
	Q1	Q2	Q3	Q4	Q1	Q2													
Survey to help define the free-to-air offer																			
Finalise TOR for public awareness campaign (selection, structure and financing of signal carrier needs to be in place)													XXXX						
Tender and select contractor for campaign																			
Define and begin monitoring process																			
Start low-cost energy roll-out in selected areas																			
Accelerate electricity grid roll-out in co-ordination with broadcast transmission roll-out																			

2. Pre-Implementation Phase

	Year 1				Year 2				Year 3				Year 4				Year 5	
	Q1	Q2	Q3	Q4	Q1	Q2												
Based on specification finalised in stage one, purchase in bulk or locally assemble set-top boxes																		
As part of below, carry out a feasibility study to assess the demand and viability for: pay TV services; video on demand and channels for future demand (needs the completion of the consumer survey before starting)																		
Based on decisions in pre-preparation phase, develop a digital channel plan, which shows which channels are allocated to which broadcaster (dependent on consumer survey, feasibility study and local content strategy)																		
Begin the spectrum refarming process to provide mobile broadband in the 700-800MHz band (dependent on four contingent deadlines associated with channel allocation to broadcasters)																		
Quantify the funds raised from the spectrum refarming process and decide how they will be allocated (dependent on early stage reallocation to allow financial estimates to be drawn up)																		
Cost the subsidy programme and source of funds (probably dependent on the receipts from spectrum sales)																		
Define the details, costing and schedule of the pilot (dependent on four contingent deadlines for broadcast channel allocation and appointment of signal carrier or carriers)																		
Begin human resource development programme for broadcasters and content producers																		

3. Implementation Phase																		
	Year 1				Year 2				Year 3				Year 4				Year 5	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Finalise the total DSO budget and funding sources based on the work carried out in pre-implementation phase (depends on completion of initial spectrum sales and operation of twelve-month pilot)													XXXX					
Mobilise the funds for the DSO															XXXX			
Agree and announce a realistic switch-off date																		
Finalise the subsidy fund and operationalise																	XXXX	
Set up and operate Audio-Visual Development Fund																		
Winning signal carrier bidder/s agrees geographic roll-out and implements dual illumination and then switch off on an area-by-area basis																		
Public awareness campaign launched on an area by area basis (sequence: general awareness; warnings on buying analogue equipment; key area dates for swirchover; old TV disposal options; and availability of subsidies)																		
DSO call-centre/support centre for public launched, including mechanism for receiving general complaints about broadcasting																		
4. Analogue Switch-off																		
	Year 1				Year 2				Year 3				Year 4				Year 5	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Analogue signal switched off completely																		
Last households not converted to digital dealt with																		
End of set-top-box subsidy programme																		
Closedown of public awareness programme and support centre																		

ANNEX 1

Digital Dividend Spectrum Valuation for Business Module

CAMEROON DSO DIGITAL DIVIDEND SPECTRUM REVENUE BENCHMARK ESTIMATOR	
Key Points:	1) Very few developing countries have assigned digital dividend spectrum yet, but some indication of pricing, packaging and allocation information can be drawn from some of the developed countries
	2) Cameroon's digital dividend spectrum plan should ideally be developed as part of an integrated broadband development strategy bringing together different wavebands and access media (wireless, mobile, cable, fixed and satellite) in a single plan
	3) No mobile broadband bandplan has been developed for Africa yet
	4) See subsequent worksheets for benchmarks on spectrum value and allocations/packaging
Conclusion:	Potential revenue from digital dividend spectrum ranges from USD 62.7 million to USD 1.1 billion. The most likely estimate for three operators is USD 94.1 million
Wavebands Potentially Affected by the DSO Digital Dividend Allocation:	
698-790	Mobile Broadband ITU Rec – APT 700MHz Bandplan – 697-702(Guard), 703-748 (45MHz 3GPP Downlink), 749-759 (guard),760- 805 (3GPP Uplink), 803-806 Guard),
790-862	Mobile Broadband ITU Rec – CEPT bandplan – 2 X 30MHz in the 800MHz band
862-960	Current GSM and Potential Future Mobile Broadband (ITU Rec)
174-230	Cameroon Analog Public Broadcaster CRTV (VHF), not valuable for telecommunications
231-469	Mobile Broadband ITU Rec (450-470MHz)
470-862	Cameroon Private Analog TV Stations

CAMEROON POPULATION FORECAST BASED ON 2010 ESTIMATE		
	Population	Population Growth Rate
2010	19,599,000	2.20%
2011	20,030,178	
2012	20,470,842	
2013	20,921,200	
2016	21,381,467	
2017	21,851,859	
2018	22,332,600	
2019	22,823,917	
2020	23,326,043	
2021	23,839,216	
2022	24,363,679	

SOURCE: The World Bank <http://data.worldbank.org/indicator/SP.POP.GROW>

CAMEROON POTENTIAL DIGITAL DIVIDEND (800MHz) SPECTRUM REVENUES FROM THE DSO

(Based on 2013 population estimate and global valuation benchmarks – see Valuation and Allocation Worksheets)

Scenario	Spectrum Price (USD/ MHz/ Capita)	Spectrum Revenue/ MHz	Spectrum Revenue based on 2 Operators (20MHz)	Spectrum Revenue based on 3 Operators (30MHz)	Spectrum Revenue based on 4 Operators (40MHz)	Source
A) Average benchmark digital dividend spectrum price -	0.55	11,415,261	228,305,215	342,457,822	456,610,429	Derived from originally sampled data listed in the Spectrum Valuation Worksheet
B) Minimum benchmark digital dividend spectrum price (BIPE recommendation for 15 year license)	0.15	3,138,180	62,763,601	94,145,402	125,527,203	BIPE Consulting Digital Switchover in Broadcasting, A BIPE Consulting Study for the European Commission (Directorate General Information Society) (Brussels: April 2002) http://www.krrit.gov.pl/Data/Files/_public/Portals/0/radiofonia%20i%20telewizja%20cyfrowa/cyfr_bipe_b.pdf
C) Maximum benchmark digital dividend spectrum price	1.33	27,825,197	556,503,932	834,755,897	1,113,007,863	Italian Spectrum Valuation - see Spectrum Valuation Worksheet

DSO DD SPECTRUM SALE FEES - BENCHMARKING CURRENT PRACTICE

Key Points:	1) Block sizes, frequencies and license terms vary considerably. To assist in comparability, pricing is normally derived as \$/Mhz/Capita of population covered
	2) Aside from the size of the potential market for broadband services, the number of competitors, coverage obligations and license term, the willingness of the operators to pay for additional spectrum and expectations for future allocations in the 1-2GHz bands is partly influenced by the amount of paid already for 3G spectrum.
	3) Spectrum pricing aims to reflect the market value that each operator attributes to the terrestrial resource, but this value will not be revealed by these potential users, who want to pay as little as possible)
	4) Pricing cannot always be compared because different wavebands may be bundled together (for example, 800MHz and 2.6GHz in the UK)
	5) As shown in the chart below, there is no link between country wealth and spectrum fees – some of the lower income countries have fees that are higher than some of the higher income countries
	6) Average fees charged in the countries that have carried out digital dividend spectrum sales to date are about 0.6 USD/MHz/Capita with a range of 0.15–1.33USD/MHz/Capita
	7) The Bipe European Digital Dividend Cost Benefit Analysis points out that more and more spectrum is expected to be liberated, so “a spectrum valuation which we consider prudent. See: BIPE Consulting Digital Switchover in Broadcasting, A BIPE Consulting Study for the European Commission (Directorate General Information Society) (Brussels: April 2002) http://www.krrit.gov.pl/Data/Files/_public/Portals/0/radiofonia%20i%20telewizja%20cyfrowa/cyfr_bipe_b.pdf of 0.01 euro per Mhz per year and per inhabitant covered” (for example, 0.20 USD for a 15-year license term)

DSO DD SPECTRUM SALE FEES - BENCHMARKING CURRENT PRACTICE
Survey of Existing Digital Dividend Spectrum Auctions and Reserve Pricing to Date

Average Fees: 0.56 USD/MHz/Capita. Fee range: 0.15-1.33USD/MHz/Capita. Average License Term: 18 Years

Country	Waveband	Block Size in the DD spectrum (MHz)	Initial Spectrum Fee or Reserve Price*	License Period (Years)	Population	Revenue / Capita/MHz (USD)	GDP/ Capita 2011
Croatia	800 MHz	40	26,000,000	12	4,407,000	0.15	14,180
Denmark	800 MHz	60	132,230,000	22	5,574,000	0.40	59,852
Finland	800 MHz	60	133,500,000	20	5,387,000	0.41	48,823
France	800 MHz	60	3,524,000,000	15	65,400,000	0.90	42,377
Germany	800 MHz	60	4,774,000,000	15	81,800,000	0.97	44,060
Ireland	800 MHz, 900 Mhz, 1.8 GHz	230	642,000,000	18	4,487,000	0.62	48,423
Italy	800 MHz	50	3,950,000,000	18	59,500,000	1.33	36,103
Netherlands	800 MHz	60	280,000,000	17	16,696,000	0.28	50,076
Nigeria	800 MHz	4	3,200,000	5	162,470,000	0.01	
Portugal	800 MHz	60	270,000,000	15	10,637,000	0.42	22,316
Romania	800 MHz	30	280,000,000	15	21,390,000	0.44	8,405
Spain	800 MHz	60	1,730,000,000	19	46,235,000	0.62	31,943
Sweden	800 MHz	60	311,000,000	25	9,453,000	0.55	57,091
Switzerland	800 MHz	60	138,500,000	16	7,907,000	0.29	83,383
UK	800 MHz	30	775,000,000	20	62,641,000	0.41	39,038
USA	700 MHz	65	18,900,000,000	20	311,591,000	0.93	48,112
Average				17		0.55	

*Reserve Price figures: Australia, Finland, Netherlands, Nigeria, UK, Switzerland, Romania

 SOURCE for GDP and population figures: The World Bank <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD> & <http://data.worldbank.org/indicator/SP.POP.TOTL>

Note: PolicyTracker carried out a survey in June 2011 of more than 200 auctions of mobile service licences over the previous decade. It found that, adjusted for inflation, auction prices appeared to be declining throughout the decade, even as spectrum blocks with much better propagation characteristics were opened up for distribution. The newer bands, such as the 700/800 MHz and 2.6 GHz bands appear relative bargains when compared with the initial 3G band (2.1 GHz) that was initially launched in the early 2000s. For example, the average price/MHz/pop for 2.1 GHz spectrum was USD 1.33 since 2000. Even when the “bubble” prices of the initial auctions were removed from the average, the average price/MHz/pop was USD 0.90. By comparison, the average price/MHz/pop for 700 MHz and 800 MHz auctions was USD 0.91, even though these bands are far more economical to employ from an infrastructure perspective. The 2.6 GHz average price/MHz/pop was an order of magnitude lower, at USD 0.07 from 2005 onwards.

 SOURCE: Martin Sims “Study shows new generation of mobile spectrum is better value” Policy Tracker 17 June 2011 <http://policytracker.com/blogs/new-generation-mobile-spectrum-is-better-value>

RELATIONSHIP BETWEEN SPECTRUM REVENUE AND GDP/CAPITA			
Country	Revenue /Capita/MHz (USD)	GDP/Capita 2011 / 10000	GDP/Capita 2011
Croatia	0.15	1.42	14,180
Netherlands	0.28	5.01	50,076
Switzerland	0.29	8.34	83,383
Denmark	0.40	5.99	59,852
Finland	0.41	4.88	48,823
Portugal	0.42	2.23	22,316
Romania	0.44	0.84	8,405
Sweden	0.55	5.71	57,091
UK	0.61	3.90	39,038
Ireland	0.62	4.84	48,423
Spain	0.62	3.19	31,943
France	0.90	4.24	42,377
USA	0.93	4.81	48,112
Germany	0.97	4.41	44,060
Italy	1.33	3.61	36,103
Conclusion: no direct relationship			

DSO SPECTRUM ALLOCATIONS – CURRENT EXPERIENCE

Conclusion: 2 x 30MHz of 800MHz waveband can be split into three equal allocations of 2 x 10MHz each, yielding a stable configuration, although there may be competition for the more favourable allocations where strong interference issues exist.

European Allocation Strategy

Use	Plan
Digital Terrestrial Television	Six DTT multiplexes in each Member State requiring 48 MHz when using National SFN's (8 MHz channels per SFN) and 384 MHz when using MFN's (64 MHz spectrum channels per multiplex).
Mobile Television	One multiplex using either 8 MHz per SFN or approximately 48 MHz for an MFN.
Wireless Broadband	Use of a 72 MHz sub-band within the 470-862 MHz band for wireless broadband services.

SOURCE: Analysys Mason Limited, DotEcon Limited and Hogan & Hartson LLP 'Exploiting the digital dividend' – a European approach (London: Analysys Mason Limited, 2009) <http://www.dotecon.com/assets/images/EUDDReport.pdf>

European Demand Forecasts

Parameter	Demand Forecast 1	Demand Forecast 2	Demand Forecast 3	Demand Forecast 4
Type of Demand	Primarily mobile, urban, low bandwidth	Primarily mobile, ubiquitous, low bandwidth	Mobile and fixed, ubiquitous, high bandwidth	Mobile and fixed, ubiquitous, very high bandwidth
Spectrum per Network	2 X 10MHz	2 X 10MHz	2 X 20MHz	120MHz
Number of Rural Networks	2	4	4	2
Rural Networks using digital dividend spectrum	0	2	3	2
Resulting demand for digital dividend spectrum		40MHz + duplex band spacing	120MHz + duplex band spacing	240MHz

SOURCE: Analysys Mason Limited, DotEcon Limited and Hogan & Hartson LLP 'Exploiting the digital dividend' – a European approach (London: Analysys Mason Limited, 2009) <http://www.dotecon.com/assets/images/EUDDReport.pdf>

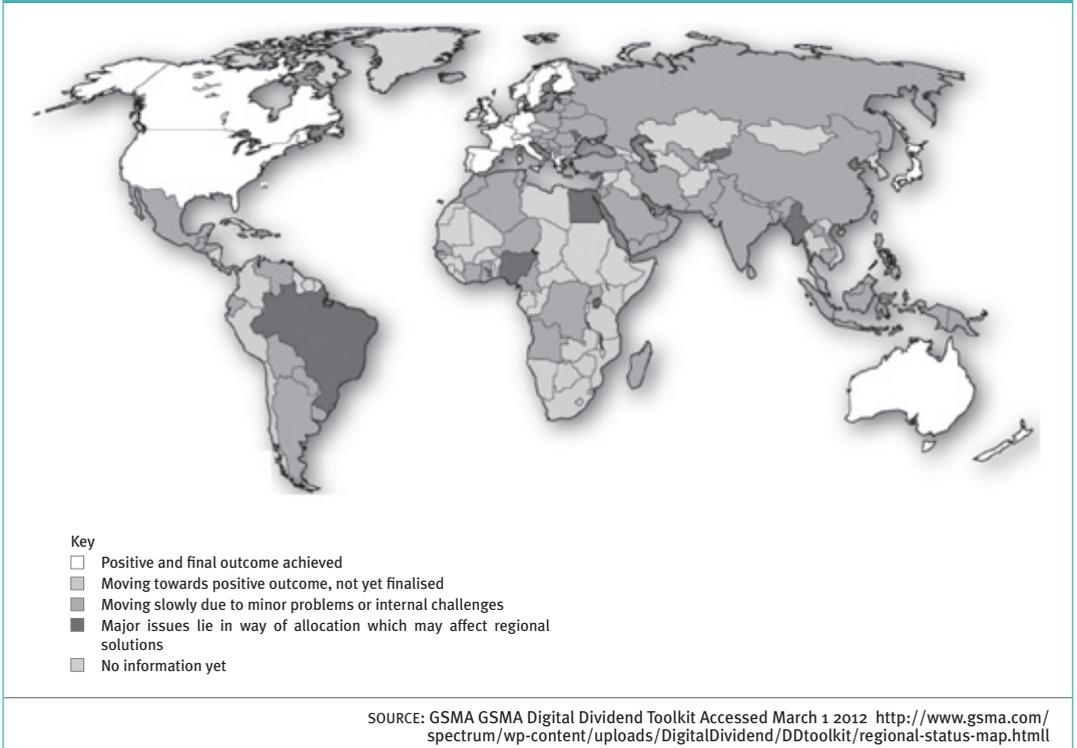
DIGITAL DIVIDEND ALLOCATIONS TO MOBILE BROADBAND SERVICES

Country	Wavebands	Total Blocks Available (MHz)	Packages	Blocks Sold (MHz)
Australia	694 – 820 MHz		TBD	Planned
Finland	790 – 862 MHz		3 2X10MHz	
Germany	790 – 862 MHz		3 2X10MHz	
France	790 – 862 MHz		3 2X10MHz	
Italy	790 – 862 MHz		6 2X5MHz	
Spain	790 – 862 MHz		6 2X5MHz	
Sweden	790 – 862 MHz		6 2X5MHz	
Switzerland	790 – 862 MHz		3 2X10MHz	
UK	790 – 862 MHz (also recently allocated 550-630MHz)	72+80	TBD	Planned
USA	698 – 806 MHz		3 2X6MHz; 1 2X11MHz; 1 2X6MHz	
Croatia	790-862 MHz		3 2X10MHz	
Cam DBS Proposed	694-790 MHz		TBD	N/A

CAMEROON SPECTRUM STATUS

Spectrum Block	Waveband (MHz)	Block Size (MHz)	Current Occupancy	ITU Rec
174-230 (VHF)	174-230	56	CRTV – Public	
470-694 (UHF)	470-550	80	?	
470-694 (UHF)	550-630	80	Private Analog TV	Digital TV
470-694 (UHF)	630-682	52	?	
470-694 (UHF)	682-694	12		Mobile BB
694-794	694-790	96		Mobile BB
790-862	790-791	1		Guard band
790-862	791-801, 832-842	20	CDMA/Camtel (824-880Mhz)	Mobile BB
	801-806, 842-847	10	CDMA/Camtel (824-880Mhz)	Mobile BB
	806-811, 847-852	10	CDMA/Camtel (824-880Mhz)	Mobile BB
	811-821, 852-862	20	CDMA/Camtel (824-880Mhz)	Mobile BB
	821-831	10		Guard band
862-960	862-890	28	?	
	890-960	70	GSM	GSM

REGIONAL STATUS OF USE OF DIGITAL DIVIDEND SPECTRUM



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