PRACTICAL GUIDELINES

SWITCHING TO DIGITAL IN SUB-SAHARAN AFRICA
LESSONS TO BE LEARNED FROM THE DIGITAL TELEVISION SWITCHOVER IN FRANCE

Digital terrestrial television (DTT) permanently replaced analogue broadcasting throughout France on 30 November 2011. DTT enables viewers to access an unprecedented range of programmes.

The TV switchover programme owes its success to several factors: law-makers adopting an appropriate road map, combined with the concerted efforts of public organisations, TV stations and industry.

This transition constitues a major step forward for all countries, not just in terms of technology but also on a social and economic level: the cost of the switchover is considerable, but the spectrum release process does mean that state-owned frequencies can be sold off.

The digital switchover also involves a number of decisions about changes to the regulatory framework as regards the diversity of information and audiovisual works produced and broadcasted, the role of all those involved, and public information.

It is for all of these reasons that this transition is treated as policy in each country: the control of their national audiovisual landscape is at stake.

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France’s public organisations and manufacturers have undeniably gained valuable experience. The diversity of the area covered, which includes mountainous, tropical and equatorial regions, has forced them to tackle a wide variety of problems.

Numerous countries in Latin America, Eastern Europe and the Southern Mediterranean have benefitted from France’s experience, in terms of both regulations and technical issues. The countries now beginning this switchover process will be in a position to draw on feedback and experiences that go far beyond those of France.

This document aims to help them with this and, for those interested, to set up a close cooperation system to enable the DTT switchover to run smoothly.

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WARNING AND METHODOLOGY

PRACTICAL GUIDELINES - SWITCHING TO DIGITAL IN SUB-SAHARAN AFRICA aims to assist African states in the implementation of a smooth transition from analogue to digital broadcasting. Since this involves many stakeholders and has global implications, this transition may seem complex. It is in fact a large-scale project of nationwide import and with huge growth potential.

First and foremost, the switch to all digital is a political choice. While its scope is international, the switch to digital is above all the result of national strategy. It involves technical choices, in that technology underpins everything else. A secure regulatory and legal framework is required in order to adapt it to requirements and to achieve full digital potential. In financial terms, this transition to digital generates costs yet also holds the promise of potentially greater income. Methods to finance this transition must factor in this balance of cost and income. Looking beyond technical, legal and financial issues, the switchover also has cultural implications, in particular regarding the choice of channels to be broadcast and new services made possible with interactivity. Lastly, for this transition to work properly, inhabitants need to have taken it fully on board.

This guide has been produced bearing all these aspects in mind. It is not exhaustive but sets out the main points to be examined. It puts forth possible solutions based on French and European experience as well as that of French cooperation worldwide.

It cannot replace a detailed national document but can be used as a basis for planning. Each country is free to do with it what they wish, whether they draw inspiration from it, use all or part of it, according to their needs, situation and state of progress.

It can serve as a basis, or in addition, to the national document on “switchover strategy from analogue to digital broadcasting” that each nation needs to draw up in order to implement the ITU (Union Internationale des Telecommunications) and ATU (African Telecommunications Union) recommendations, and the GE06 Agreement of 16 June 2006, and thus contribute to putting an end to analogue using UHF (470-862 MHz) by 17 June 2015, and VHF (174-230 MHz) by 17 June 2020.

It can provide assistance for the National Transition Committee in charge of steering the operation which will need to rise to the regulatory, political, technological and economic challenges to implement this transition. Covering the main issues, this practical guide can enhance brainstorming or pave the way for all stakeholders, including the government, regulatory bodies, service providers, civil society and the commercial sector, and the regional and international organisations working in broadcasting to benefit from clear vision and enhanced insight into the issues and aims involved.

Looking beyond this practical guide, French cooperation can provide operational support to the competent authorities as required: assistance with technical, regulatory, financial and industrial matters, training, content etc.

We do hope this guide will prove useful.

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POLITICAL ISSUES
1. MAJOR STRATEGIC OPTIONS

- **choices regarding television**
- **choices regarding telecommunications**
- **choices regarding urban planning**
- **choices regarding public finances**
- **choices regarding the sense of community and the bridging of the digital divide**
- **choices regarding culture**
- **choices regarding public services**

The switchover from analogue to digital is a global movement impacting all technologies in the information society. It has been achieved in telecommunications, music, photography and pictures; it is under way in television, while radio is lagging behind.

The fantastic boom in mobile telephones and Internet stems from this switch to digital which allows for individual mobility in a connected world. Countries with the least landline development are skipping a generation to concentrate on mobile telephones and Internet instead. As a result, the terrestrial spectrum is highly sought after, rare and costly, all the more because all the new services are to use the same frequency bands, especially UHF.

The switch to digital TV has freed some highly valuable frequencies, known as “golden frequencies”, that are of use to all, for digital TV as well as telecommunications, economic development, urban planning, the sense of community, public services etc., as well as being a boon to public finances given the TV licences paid in return for the privilege of using them.

This switchover can take various forms for which governments need to make political and strategic choices as to the developments they wish to foster. This is coordinated internationally by the ITU and regionally, by the ATU in Africa.

While it is part of a global movement, the transition to digital is above all a matter of national sovereignty.

National governments involved in these changes must define the scope of the switch to digital, indicating the priorities each give to the various sectors involved in the switchover. Once these sectors have been defined, guidelines need to be drawn up with the relevant ministers, for example for:

- **Public finances**: opting to favour the short or long term. A short term approach would involve high income generated from licences to use the frequencies, while a long term approach would involve lower costs for major projects for infrastructure such as broadband coverage (high points for both audiovisual and telecommunication, 4G or fibre optic links within the country).

- **Urban planning**: first choosing the areas to receive digital TV. The last areas are by far the most costly and terrestrial solutions are not necessarily ideal for far-flung areas. A second choice involves the opening up of rural areas, linking them to economic areas using fibre optics, or high speed terrestrial, to carry television as well as mobile telephones.

- **Public services**: the choice revolves around whether or not to reserve a frequency for public services (public healthcare, state education, electronic administration, police, road maintenance, customs etc.) and whether to harness the switchover to set up a common service on these lines.

- **The sense of community and the bridging of the digital divide**: here it is a matter of choosing whether to help certain users in areas without coverage to acquire a receiver and use TV for digital development services using interactive services (going prices for farm produce, healthcare, education etc.).

- **Television**: the choice involves for example whether the switchover will take place gradually, one area at a time, or all at once. This change may be an opportunity to overhaul the TV industry.

- **Economic development**: the government needs to choose whether or not to involve national and international players in telecommunications, audiovisual and finance in the investments needed to see the switch to digital through.

- **Culture**: strategic choices need to be made as to whether to produce national content, in the official language and/or in dialect/s, involving the relevant players.

Other considerations may be taken into account according to the prevailing local issues, with all due respect to national sovereignty.

The main course must be charted by each government when embarking on the project, then honed in light of studies produced by technical, regulatory and financial experts.
2. COLLABORATION AND POLITICAL SALES PITCH

2.1 Collaboration among players
As a number of players are involved, the switch to digital TV requires the organisation of collaboration and the drafting of an appropriate sales pitch.

Collaboration must lead to decisions at state level. Some players will have conflicting interests, so it might be useful to refer to the solutions coordinated at regional level within the African Union or tried and tested abroad in countries having achieved the transition.

2.2 Sales pitch
The switch to digital broadcasting is a major challenge in political and economic terms and for society. Fewer frequencies may be used to broadcast more TV programmes using less energy. This opens up a host of possibilities: expanding the offer, introducing High Definition (HD) and a wide range of services featuring interactive elements, developing local production and improving picture and sound quality. It also offers the possibility of introducing new telecommunications services.

The transition to all digital is a source of wealth creation and can accelerate economic development with the development of telecommunications and the arrival of high-speed Internet.

2.3 Communication and Support
The “Communication Issues” section features an in-depth examination of this aspect crucial to a smooth transition.

3. OVERHAULING THE TV INDUSTRY

3.1 Organisation
The development of the TV industry is a major political and cultural issue.

The transition to all digital is conducive to the emergence of new audiovisual services. This prompts debate on their existence alongside other, existing, analogue or digital channels, especially in countries that already have local or national DTT packages developed by commercial firms. These packages have mostly been developed and licensed without factoring in the arrival of DTT.

Licensed services may simply be left to broadcast alongside each other yet in most cases, a review of frequencies may help to free up some spectrum as neatly as possible.

Looking at the technological side, most existing DTT packages are broadcast using DVB-T/H, others using a digital standard (often DVB) or an analogue standard on MMDS networks, either in the UHF broadcasting band, or in Fixed Service Frequency Bands or the mobile service above 1 GHz.

The transition to all digital offers an opportunity to rethink the entire setup of these services: management and allocation of frequencies, a common standard to standardise and add to the equipment, organisation and numbering of services (national / regional services, free / pay-TV channels).

A certain number of questions need to be asked:

→ What decisions need to be taken in terms of equipment compatibility if a different DTT standard is chosen in the country?
→ Is it wise to let two different standards exist alongside each other or must operators be forced to switch over to compatible decoders?
→ Must the state introduce broadcasting obligations (must-carry) for these operators? If so, for which channels? All free DTT channels? Only public or national channels?

3.2 Monitoring of broadcasting - Integrating commercial operators and channels
The switch to digital TV is an opportunity, as in Europe, to separate broadcasting from publishing within state-owned audiovisual firms in order for each to concentrate their resources and focus fully on their own remit. Content publishers and broadcasting operators can become separate entities in many countries, applying different policies and operating within different frameworks. While this principle seems to have been widely accepted, the question of monitoring still needs to be considered.

The existing state broadcasting infrastructure can serve as a basis for the building of a new digital network. This in turn can also integrate the existing network infrastructure of commercial operators when appropriate.

How much room and importance must be given to the commercial sector and commercial operators? Must they be involved in financing the network to be developed? How much room should they be given regarding governance in this society? Who will own the network once it has been built and is up and running?

The political response to these questions and the funding methods chosen will depend on the nature and mode of governance of these new entities.

3.3 Enlarging the audiovisual offer
The transition to all digital heralds an enlargement of the audiovisual offer and the arrival of new commercial players or the reinforcement of existing operators.

Licences are granted according to political choice:

→ General-interest or special-interest channels?
→ Educational or religious channels, others?
→ International, national or regional channels, or national channels with regional switchovers?
→ What share is to be granted to national and sub-regional content, and French-language channels?
→ Which languages or dialects?
→ How much local production should be required? The transition to digital can open up a proper national market, and even a sub-regional market, for content production, provided this aim is shored up by strong political encouragement.

These new channels ought to offer added value to TV viewers over and above what is already available.

Against this backdrop, the creation of HD channels or the take-up of international HD channels on DTT can drive public interest for this change.
Points of strategic importance

While it is part of a global movement, the transition to digital is above all a matter of national sovereignty.

A setup needs to be chosen.

Should partial or total simulcast be authorised and encouraged for existing analogue channels?

4. SYNERGY BETWEEN THE AUDIOVISUAL AND TELECOMMUNICATIONS SECTORS

Regarding digital technology, media convergence is not devoid of meaning since it covers the convergence of content, channels, receivers etc. This process leads to the opening up and blurring of lines between businesses which used to be totally separate. This is especially true of the audiovisual and telecommunications industries.

The upheavals inherent in this convergence are shaking up the economic models of players in these industries, who must move quickly to adapt to this new consumption behaviour and work in synergy. In countries where these two industries are well established, convergence does not come spontaneously. Close collaboration between audiovisual and telecom players is nevertheless a crucial element in the smooth transition to digital.

All synergies need to be examined, in particular the choice of a common standard and the integration of a return channel in reception equipment. Regulations can also require the integration of a DTT tuner in all Internet devices marketed nationwide.

The transition to all digital necessarily implies the concurrent development of the audiovisual and telecommunications industries (3G / 4G licences / high-speed Internet / LTE etc.).

5. IN AFRICA: SUB-REGIONAL COORDINATION AND COLLABORATION

The Final Acts of the International Telecommunication Union’s Regional Radiocommunication Conference (CRR-06) of 16 June 2006, known as “GE06”, set deadlines for states to achieve the transition to digital: analogue broadcasting using UHF bands (470-862 MHz) is to be fully phased out by 17 June 2015 and VHF bands (174-230 MHz) by 17 June 2020. Countries in Sub-Saharan Africa face the same obligations and issues. Early adopter experience can enhance that of others; discussion and regular communication among countries in this sub-region can save time and foster the sharing of best practices.

The choice of a common standard and possibly the same shared satellite to uplink programmes for the whole sub-region would also be beneficial.

Identical standards and technology would enable the globalisation of the equipment market. Once the standard and required technical features have been defined, the setting up of a joint certification laboratory for this equipment could also be envisaged at sub-regional level. Likewise, similar satellite broadcasting could impact bandwidth cost. Against a tough economic backdrop, resource optimisation can lead to significant economies of scale.

Sub-regional coordination could also be extended to audiovisual content. A sub-regional policy to exchange programmes could facilitate the emergence and development of a flourishing content industry.

Sharing a satellite, or satellite capacity, would offer interested states a solution to save on broadcasting programmes by others national channels in the sub-region on their own territory.

It is in the interest of countries in Sub-Saharan Africa to cooperate at sub-regional level. This would furthermore be a stepping-stone to leveraging international support. Section 25 lists some possible avenues for cooperation.
TECHNICAL ISSUES
A. FUNDAMENTAL ELEMENTS

6. INITIAL DIAGNOSIS OF THE SITUATION FOR EACH COUNTRY

Before embarking on the switch from analogue terrestrial television to digital, the state must first draw up a complete list of existing infrastructure: existing analogue facilities, whether up and running or undergoing maintenance, in VHF and UHF. This must cover both state-owned and commercial networks. The same may then be conducted for digital networks.

6.1 TV equipment
Thorough knowledge of viewer equipment is useful, in particular receptor characteristics, with a special focus on their capacity to connect a decoder and their geographical distribution. It can help to assess the scale of the transition and estimate the cost. It can also help the government assess its equipment policy and any benefits or measures to be taken to assist inhabitants. It is necessary to define coverage priorities. It can also act as a guideline to define the technical conditions for digital adapters and receivers.

To prevent large-scale imports of unsuitable equipment, the government must quickly define its TV standard, publish the regulations governing the approval process and designate certification laboratories.

In Africa, statistics are patchy. Apparently, fewer than 30% of households own a TV. Television remains a broadly urban phenomenon. Over 70% of households in built-up areas have at least one set and 80% of these are CRT monitors or second-hand sets.

6.2 Definition of network architecture for Digital Terrestrial Television
Network architecture for TV broadcasting is geared around two levels: that of the main stations serving the major population centres, and that of the secondary network backing up the main transmitters, reaching those living outside these coverage areas. These power relays are linked up to the main station and take up its programmes, sometimes with the possibility of regional switchovers. This secondary network of transmitters are also known as “gap-fillers” since they fill the gaps in coverage, mostly broadcasting to small areas within the geographical area covered by the main transmitter but where reception is poor or nil, generally due to relief. Should a main transmitter stall, all secondary transmitters depending on it stall too. Each network can thus be broken down into “patches”.

Points of strategic importance
- Define the categories of existing TV equipment according to whether a decoder can be fitted: whether there is a SCART connector; whether a more complex decoder is necessary (such as those used for cable networks).
- Immediately set up regulations governing the technical characteristics of TV receivers.
- Regulate imports.
6.3 Existing network architectures

The architecture that has already been implemented in a country depends on many factors including implementation of the television and its topography. Flat countries can be covered with just a few powerful transmitters, while mountainous terrain will need powerful transmitters and additional transmitters to fill the gaps. Whatever the country’s topography, regional or local swichovers can be implemented on a main transmitter and on a power relay.

The architecture of existing analogue terrestrial network/s should give rise to a succinct diagnosis. For each analogue programme broadcast (in order to distinguish, for example, between state and commercial programmes), the diagnosis should focus on the following:

- Configuration of networks in table form, number of transmitters / power rating
- Distinction between the main network (number of transmitters) / Relay network (number of power relays): a more appropriate type may be used if necessary.
- For multiple networks, a brief analysis of the co-location rate for existing networks.
- UHF / VHF frequencies used (succinct list): this point will be addressed in the frequencies analysis, however it is important for a firm grasp of network types.
- Surface coverage and population coverage: coverage maps, regional / district coverage and any other breakdown, urban / rural ratios and any other type of relevant coverage.

This diagnosis is the starting point when considering the development of terrestrial means; it must be shared widely by all players.

6.4 Diagnosis of analogue broadcasting sites

Given that the broadcasting network is one of the most important economic components in digital terrestrial broadcasting, its cost must be calculated with the greatest possible accuracy. Much analogue infrastructure can also be used for DTT, including towers, premises, transmitting antennas, feeders, dishes, UHF/VHF receiving antennas (satellite feed) and energy facilities (transformers and gensets). Radio frequency multiplexers mostly cannot be used for DTT (due to filtering and power peak issues).

Some recent equipment still in use (solid-state transmitters) can even be modified at a low cost to avoid purchasing new transmitters (this is only useful for powerful appliances, over 1 kW for DTT, and if the solid-state technology is recent, less than 10 years old).

It is important to have as an accurate a diagnosis as possible of the state of all sites and, at least, a good recap of the state of the main sites. Depending on how many there are, the network relay sites can be sampled according to relevant criteria (assumed age, challenging environment etc.). The diagnosis of broadcasting sites should include the following elements.

- Engineering design (hard copy or in electronic form) for each transmitting site:
  - the floor plans for the buildings,
  - the outdoor implementation of dishes, gensets and cooling units,
  - the plans for towers with accurate positioning of all antennas (TV, radio, microwave and others) and feeders,
  - the descriptions of transmitting and receiving antennas,
  - the descriptions of energy facilities,
  - the diagrams of active equipment: transmitters, electronics cabinets and their location (dimensions, equipment for switching, controlling and remote management),
  - the descriptions of all equipment used, with their characteristics, and any other relevant items.

- Diagnosis at the transmitting site:
  - checking compliance of facilities against the engineering designs,
  - state of different elements of infrastructure and equipment, especially the state of the tower, antennas, dishes, feeders and energy facilities,
  - measures of analogue signals at various points of the channel to check their operating point,
  - tests of monitoring, supervision and operation resources.

Comprehensive information will then help to accurately estimate the scale of work to be conducted, and thus its cost.

Points of strategic importance

- Description of existing analogue terrestrial broadcasting networks.
- Clear and succinct vision of coverage data for all programmes (state/commercial) to shape the DTT TV industry.

Points of strategic importance

- Monitoring of the actual towers, buildings and overhead facilities.
- Assessment of the possibility of re-using existing facilities.
6.5 Current operational setup and maintenance of analogue terrestrial broadcasting networks

Looking beyond the existing infrastructure and equipment, with a view to a possible new setup, a diagnosis of the current setup (or at least a description) must be produced to deploy, operate and maintain the networks. This diagnosis is necessary when technical duties are included in those of the public organisation in charge of all functions, from the content production through to broadcasting.

The aim of this diagnosis is to identify the various technical functions which can be spread to varying degrees within the organisation to describe their function and dimension, how they interact, and then identify the first avenues for development which may be necessary to set up the DTT.

The diagnosis must especially include the following:

- organisation of engineering: sizing, competences, means, for the design (feasibility studies) as for deployment (facilities),
- organisation of operations: existence of an operations centre (functions, organisation and resources),
- organisation of maintenance: sizing (regional distribution), competences, technical and human means,
- possible organisation of measurement teams (excluding maintenance): capacity of transmitter validation measurements.

All these means and resources can be integrated in the implementation of the DTT networks, especially with a view to operations.

6.6 Existence of a DTT or MMDS networks

It is also possible to design a new configuration, better suited to the distribution of populations, closer to that of cellular networks for mobile telephones, which has the advantage of streamlining the network infrastructure. This strategy could require aerials to be reoriented, which in turn would require a specific campaign to inform the public, and the building of new sites (civil engineering etc.).

Existing DTT or MMDS networks must be taken into consideration, especially:

- the standards chosen by the operator
- their penetration rate
- the geographical areas involved
- the network infrastructure used, how to integrate these offers into the “official” DTT offer
- the possibility of using existing transmitters and thus streamlining the network
- whether these transmitters can be “provided” by the commercial operator like the analogue transmitters of state channels in a public-private partnership

NB: if several emitting networks exist alongside each other, the transmitters for one geographical area should be grouped in a close geographical area, to avoid antenna reorientation or the installation of double antennas as far as possible.

Points of strategic importance

- Existence of active technical functions within the public broadcasting system.
- Capacity of existing technical functions to participate in the implementation of DTT.
- Existing DTT networks must be factored into the implementation strategy.
- This must not be used as a reference but play a part in the future digital industry.
7. FREQUENCIES

7.1 Frequency plan GE06
The ITU website can be used to check each nation’s rights in terms of assignment (for a given station) and allotment (for a given area) using a certain number of tools developed by the Radiocommunication Bureau. The text of the GE06 agreement and the procedures to arrange for plan entry or to modify the plan are also set out on the website.

The authorities can thus determine the country’s frequency plan for digital TV, as well as any necessary changes, taking into account choices regarding the digital dividend and the number of multiplexes to be broadcast.

The document can be downloaded on the ITU website or:

The authorities determine the country’s frequency plan, in a document that assigns frequency bands to the various services, including digital TV.

7.2 Determining the frequency band used for digital television
The GE06 plan grants each nation VHF and UHF rights. The choice of band to introduce digital TV can depend on:

→ the existing analogue network, mainly deployed in band III in African nations,
→ whether the country intends to have a period of simultaneous broadcasting,
→ availability of frequencies (entry to GE06 and choice of digital dividend) factoring in possible modifications envisaged at ATU workshops.

For the time being, analogue networks are mainly broadcast using the VHF band, with some facilities transmitting on UHF frequencies. The latter is mainly used to broadcast digital TV in those countries where it is authorised, however the digital VHF option must be carefully examined (using the same high points, no antenna reorientation needed, cost of building a lower network etc.).

7.3 Frequency planning
Frequencies for digital terrestrial TV will be planned in compliance with ITU decisions. Should the participating nations so wish, it will plan ahead for the creation of a second dividend in the 694 to 790 MHz band (first dividend: 790 - 860 MHz) with the WRC-15 specifying the technical conditions for implementation. Special attention shall be paid to frequencies used on borders.

These plans will also indicate frequency bands allocated to other broadcasting services (radio and television) and mobile services in addition to television. This does not mean that all identified frequencies will be allocated straight away.

Regarding audiovisual broadcasting, future developments ought to be planned for, such as the number of TV channels, HD or 3D, requiring the reservation of frequencies.

In Africa, the implementation of coordinated frequency plans can be conducted via the ATU. With a view to the impending WRC-15 decision, the ITU and the ATU are organising workshops to revise plans for the 470-694 MHz band. The meetings in Nairobi from 29 November to 1 December 2011, in Bamako from 12 to 15 March 2012 and in Kampala from 16 to 20 April 2012, served to define the aims of new plans and produce the initial iterations for the building of a new plan.

7.4 International frequency coordination
Frequency coordination at borders is of the utmost importance to avoid interference and perturbations. It is necessary:

→ when the implementation of plan entry is subject to an agreement with another country,
→ when the government wishes to modify its rights (adding or modifying an assignment or allotment),
→ to check that there are no difficulties in the digital dividend bands.

7.5 Frequency modifications at national level
Modifying allocations at national level, for the digital dividend for example, can entail the definition of a new frequency plan and thus a change of frequency for some services or stations. These modifications need to be planned and they involve technical costs for work carried out on transmitters for broadcasting operators, in addition to the cost of communicating to the general public. Each change of frequency requires viewers to search for channels and memorise them. Failing this, they can no longer tune into their programmes. They thus need to be informed and provided with explanations to implement these changes. While this may be simple at first glance, difficulties with this have been encountered in other countries.

National legislation must allow for government modification of frequency assignment for authorised radio facilities.

Point of strategic interest
The national frequency plan is a strategic document applicable in the long term, it must give players visibility.
8. MULTIPLEXING PROGRAMMES

Unlike analogue TV broadcasting, where there is only one TV programme per radio frequency, digital broadcasting can combine several programmes for broadcasting on a single radio frequency on one 8MHz band (6 or 7 MHz in some countries in Asia or the Americas). The entire set of programmes is referred to as a DTT multiplex.

To make the best possible use of frequencies, planners shall make sure of sharing multiplexes among various programmes and will set out regulations accordingly. The regulation of multiplexes can be entrusted to the independent authority in charge of dispensing licences to publishers, which will dictate regulations and decisions to multiplex operators and publishers. Given the technical competences in some countries, the broadcasting network operator could double up as the multiplex operator.

The impact of multiplexing on broadcasting policy is addressed in section 14.

9. BROADCASTING STANDARDS

Several standards have been recognised by the ITU and are now available on the market.

According to the ITU-R BT.1306-6 (12/2011) recommendation, *Error-correction, data framing, modulation and emission methods for digital terrestrial television broadcasting*, there are four systems.

A single carrier system - system A (ATSC) - and 3 multi-carrier systems based on OFDM modulation - system B (DVB-T), system C (ISDB-T) and system D (DTMB - Chinese standard):

→ The ATSC standard was initially developed for US broadcasters by the Advanced Television System Committee (ATSC), and was also selected by other countries, in particular Canada, Mexico, Korea and Honduras.

→ The DVB-T standard (Digital Video Broadcasting - Terrestrial) comes from the DVB Project produced by the EBU (European Broadcasting Union), ETSI (European Telecommunications Standards Institute) and CENELEC (European Committee for Electrotechnical Standardization). It has been selected as a standard by member countries of the CEPT (Conference of European Post and Telecommunications) and as a benchmark standard for planning at the World Radiocommunication Conference in 2006. This standard, and later variants of the same, have been adopted by many countries in the three ITU regions.

→ The ISDB-T (Integrated Services Digital Broadcasting - Terrestrial) standard produced by the ARIB (Association of Radio Industries and Businesses) has become the Japanese standard. The SBTVD-T (Sistema Brasileiro de Televisão Digital - Terrestrial) version is the DTT system used in Brazil. SBTVD-T (ISDB-Tb) is based on ISDB-T. This version was also chosen by many Latin American governments.

→ The DTMB (Digital Terrestrial Multimedia Broadcasting) standard was adopted by the People’s Republic of China.

The ITU-R BT.1306 recommendation supplies the references of all standards applicable to each system.
9.1 The DVB family
The DVB-T and DVB-T2 standards are the terrestrial broadcasting standards used by the first and second generations respectively, relative to the broadcasting of the signal for TV programmes between the transmitter and the receiver.

The DVB-T / MPEG 2 standard was chosen by first countries to implement a switch to digital (including France and the UK). Those starting after 2006 chose the DVB-T / MPEG4 standard (for example Portugal) which optimises bit rate and facilitates the introduction of HD. The last implementers are now opting for version DVB-T2 with the compression standard MPEG-2 (for example Ukraine).

DVB technology has been tried and tested, there are many equipment suppliers, there are returns on investment outlay, and equipment is available at cheaper prices. By early 2012, the DVB standards family had been adopted by 140 countries.

In most countries having opted for the DVB-T / MPEG 2 standard, DVB-T MPEG2 equipment is used alongside DVB-T / MPEG 4 equipment. MPEG 4 equipment can read MPEG 2 but not vice versa. This backward compatibility ensures a smooth transition from one technology to another.

Once the standard has been selected, it has to be enforced via national legislation, thus enabling publishers, infrastructure and multiplex operators, and providers to market the equipment and launch network deployment.

The choice of standard affects technical characteristics and type of channel (SD or HD).

For Region 1 (Africa, Europe and the Middle East, governments taking part in the RRC 06 all agreed to use the DVB-T standard as a benchmark for planning.

9.2 DVB-T or T2?
Nowadays, the authorities having to make a choice tend to opt for the DVB-T2 / MPEG4 standard.

The choice is as much economic as technical. DVB-T2 equipment is more recent and thus more expensive, even if their sale price is bound to come down, as for DVB-T / MPEG 4. While the economic aspect for households is less important, planners ought to opt for DVB-T2 given its possibilities regarding frequency optimisation, in particular for greater broadcasting capacity with a stronger signal.

Several European countries having opted for DTT, as well as Panama, chose DVB-T / MPEG 4 to receive High Definition programmes without having to change their equipment.

The latest development in the DVB-T2 standard allows for greater planning flexibility while improving spectrum occupancy.

Other countries, including Russia, Finland, Ghana and Kenya, chose DVB-T2, even though the decoders are currently more expensive than those used for DVB-T.

NB: The DVB-T2 characteristics repeat those of DVB-T. For countries choosing DVB-T2, the GE06 plan can be reused without any significant adaptation, even if geographical coverage modifications are possible when upgrading from T to T2, according to the variants chosen.

9.3 Number of DVB multiplex channels
With compression standard MPEG-2, with reception using fixed antenna and 64 QAM modulation, a DVB-T multiplex can broadcast 6 SD channels.

With compression standard MPEG 4, a DVB-T multiplex can broadcast 3 HD channels or 10 SD channels.

With compression standard MPEG 4, a DVB-T2 multiplex can broadcast 4 to 5 HD channels or 15 SD channels.

Coding developments (HEVC) will enable a 50% increase in multiplex DVB-T2 capacity, in a few years’ time (the first equipment is due in 2013 - 2014).
10. NETWORK ARCHITECTURE

As explained in section 6, network architecture for TV broadcasting is geared around two levels: main and secondary stations. Each network can thus be broken down into “patches” comprising a main transmitter and power relays linked to it.

Analogue television sites can be used with the addition of digital equipment. This can help with initialisation, since antennas are already oriented towards these transmitters. Towers and energy facilities can also be used. The creation of new transmitters must also be envisaged.

→ 10.1 Network sites

When creating a digital broadcasting service, planners can put forward several options to be selected in light of the candidates applying to develop the digital broadcasting service. Broadcasting network architecture will be set up according to coverage obligations as governed by legislation and the specifications for authorised operators.

→ An initial option would involve the re-use of infrastructure at existing high points, possibly rounded off by additional sites. Reusing existing sites for broadcasting means that the initialisation of receiving antennas can be leveraged.

→ The second option involves defining the service area, i.e. the reception area, with fixed conditions, letting candidates suggest sites, either those rented from operators of up-and-running infrastructure or new sites.

In many African countries, existing broadcasting infrastructure is state property and the government will seek to optimise it by authorising broadcasting by public service operators and opening this infrastructure up to newcomers.

→ 10.2 Receiving modes

There are three receiving modes when broadcasting with DVB-T: portable, mobile and fixed reception.

The further the receiving antenna is from the transmitter, the weaker the service: indoor antenna, outdoor mobility, rooftop antennas, and rooftop antennas with amplification. The further the receiving antenna is, the greater the need for optimised antenna alignment.

→ Fixed reception: reception using a rooftop antenna; it is also possible to boost reception (also known as outdoor reception) by installing an amplifier on the headend.

→ Portable reception: TV reception using a portable or indoor antenna located around 1.5 m from the ground.

→ Indoor reception: a special case involving an indoor antenna.

→ Mobile reception: TV reception on the move (in a vehicle for example).

NB: The number of programmes per multiplex also depends on the reception aims. Mobile and indoor reception generally implies fewer programmes on the multiplex.

In Africa, the most commonly used receiving mode is portable reception, so this is probably the best choice.

NB: Bearing in mind the distance and geographical location of signal reception, analogue TV can suffer from interference such as blurred pictures and “snow”. With digital broadcasting, the TV viewer either has a picture or nothing. Quality does not diminish over distance from the transmitter or in less than peak receiving conditions. Network architecture must bear this in mind.
10.3 Network architecture for broadcasting digital TV

To analyze the drawing up of a national plan, planners must take into account:

- the size of the service area: national, regional or local,
- the need for local switchovers,
- the bit rate needed, according to the number of programmes,
- the availability of sites with the antenna height (effective height), orientation and the effective radiated powers necessary,
- VHF and UHF frequencies,
- the receiving mode (fixed, portable or mobile) and intended coverage (entailing a certain strength or signal to noise ratio).

Next, the system variants envisaged need to be examined. The elements are set out in the DVB-T and DVB-T2 standards. For DVB-T2, planners can use the European Broadcasting Union’s guide on the http://tech.ebu.ch/publications website.

Then they will choose the technical characteristics provided in the standard, especially the modulation settings such as constellation size (16 QAM, 64 QAM or 256 QAM), with the appropriate bit rate and strength (signal to noise ratio C/N) according to target bit rate / strength trade-off.

The next step is to examine the structure envisaged for their network according to frequency availability and MFN or SFN configuration. This process is iterative, so several scenarios will need to be examined before a solution may be reached. Planning software can be of use here. Planners will also examine upgradability over time according to how dense the network is and multiplex development. Flexibility is important when using SFN.

Finally, they will feed their option into all the distribution channels for digital video signals to check that no further adjustments are necessary.

10.4 Taking the broadcasting network into account

There is another type of architecture in which all transmission sites receive the signal uplinked by satellite, microwave and fibre optics or cable. Whatever the settings, estimated bit rate to subscribers will be calculated by factoring in the complete delivery chain. Uplink capacity can restrict this bit rate and thus the number of programmes, or quality.

Preparing a network thus requires input from all players along the complete digital TV delivery chain.

10.5 Refurbishing sites

Site refurbishment falls within the remit of the technical broadcasting operator. Aside from building maintenance operations, the technical broadcasting operator must take into account the setup of the antenna systems for the arrival of digital TV. Generally, they will rely on the skills of specialised engineering firms and their antenna vendor.

Furthermore, planners will if necessary take into account the number of existing Digital Terrestrial Television networks (see section 6.3). They will especially focus on:

- harnessing existing multiplex capacity to streamline the planning,
- planning all transmitters and multiplexes, possibly in a public-private partnership.

Points of strategic importance

- Exact description and full audit of existing facilities, including an accurate description of frequency assignment.
- Confirmation of aims in terms of service areas.
- Coordination of all potential players in the delivery chain.
- Choice of criteria and settings for the network/s, liaising with all players.
- Costing the setup of multiplex coverage and the entire operation.
- Economic analysis of options examined to reach the best possible decision.
- Coverage with indoor reception antenna of the most densely populated areas.
- Network design must take into account the shadow effects (high-rise buildings), which can require low-power power relays (gap-fillers).
When choosing modulation settings for the standard used, other technical characteristics need to be determined such as the size of the guard interval (1/32 or 1/8), code performance or FEC (2/3 or 3/4) etc., so that viewers do not have to make too many adjustments and to make sure there are no incompatibility issues with existing equipment.

SFN or MFN?

There are two planning types with digital terrestrial television:

- MFM (Multi Frequency Network) in which network transmitters use different frequencies,
- SFN (Single Frequency Network) in which network transmitters use the same frequency; here, transmitters need to be synchronised very accurately to avoid interference.

Regional or local switchovers entail more complex infrastructure, often leading to higher design and operating costs. Switchover is facilitated by MFN.

The choice of planning type (SFN or MFN) impacts the number of frequencies used in fine (and thus dividend size) as well as on the fragility and complexity of broadcasting equipment necessary and adjustments to avoid interference. To put it in a nutshell, SFN does use less terrestrial spectrum, but it is trickier to install and maintain. This is all the more the case with peculiar topographical conditions and climate. MFN facilitates local and regional switchovers.

### Points of strategic importance

- Small countries should opt for SFN.
- Larger countries would be better off with MFN to avoid subsequent modifications (as in Spain which switched from SFN to MFN).
- The same geographical or cultural area ought to be covered by the same frequencies.
13. GEARING UP FOR ANALOGUE SWITCH-OFF

13.1 Technical switch-off strategy
The digital terrestrial network can either be deployed one patch or geographical area at a time or one transmitter at a time (along with the power relays working with it) according to technical and political choices as well as the financial resources allocated to this operation.

Once a significant proportion of households have acquired the necessary digital equipment, analogue broadcasting can be switched off, however it is often better to do so in stages in order to correct any errors and benefit from experience. Sequencing the switch-off plan may depend on technical criteria, the number of inhabitants involved and political criteria.

Point of strategic interest
Analogue switch off should not occur until the network infrastructure has been developed properly and is up and running and the vast majority of homes are adequately equipped for digital reception.

13.2 Training
The switch to digital necessarily entails training for local engineers and technicians on frequency planning and building equipment. Technical teams then need to be trained to install and maintain them.

This training must take into account the fragility of digital broadcasting and reception. Analogue signals can continue, even when deteriorated, for whatever reason (broadcasting and reception issues). However, the reception of a digital signal either works properly or not at all.

In Africa, interference with waves in tropical habitats can extend over huge distances, especially along the coast. Training must take this into account.

13.3 Setup of a legal, regulatory and technical framework (operators, licences, receiver certification and standards etc.)
Legal experts (see the legal section) will take the technical aspects into account, for example:
→ standards,
→ receiver certification,
→ whether there are broadcasting operators or not,
→ allocation of licences,
→ etc.
B. BROADCASTING

--- Separating the broadcasting and publishing lines of business
--- Management methods and monitoring management firms (PPP, State-owned etc.)
--- Financing infrastructure
--- Ownership of infrastructure
--- Creating and managing one or several multiplexes

14. MULTIPLEXES

The DVB standard allows for the creation of multiplexes, i.e. the broadcasting of several programmes on the same frequency, without this being an obligation. Most countries have chosen to leverage this possibility of optimising the spectrum and making the most of the digital dividend.

The creation of one or several multiplexes (for example state-owned/commercial, SD/HD) means the costs of broadcasting can be shared between the various channels on the multiplex. The cost of multiplex broadcasting remains the same however many programmes are broadcast. Multiplex programmes are broadcast by the broadcasting corporation which owns the infrastructure (see section 15).

Multiplexing not only makes the most of the digital dividend and cost-sharing, it also introduces an extra component in the broadcasting value-chain. Multiplex operators are responsible for the composition of the multiplex to be broadcast by the broadcasting company. This aspect of the multiplex operator’s duties can be separated or shared with the broadcasting company.

In Africa, once the decision to create a multiplex has been taken, it needs to be taken up by:
→ existing state channels,
→ national commercial channels,
→ international or regional channels (such as ARTE in France and Germany): these can improve the free audiovisual offer and harness multiplex capacity to the full, thus reducing broadcasting costs for each channel and offering HD services (case of TV5 in 2014/2015).

NB: the cost of broadcasting a multiplex is identical, whether operating at 50% or 100% capacity.

15. BROADCASTING COMPANY

The creation of the broadcasting company is a critical step in the transition process.

Many countries envisage taking the opportunity of the transition to digital to entirely overhaul state broadcasting and separate broadcasting and publishing at state channels. They are in fact two very different lines of business and separating into two entities means they can develop separately. The commercial sector has to decide whether to use a state broadcasting company or another (since several may compete against each other).

The setup of a single broadcasting company facilitates public-private partnership and optimises the investment necessary for the transition to digital TV. It must work independently to channels of content to ensure the neutral handling of clients.

A mixed system can be envisaged: state channels can have a multiplex that they use while switching over from analogue to digital, and the commercial channels have their own network. This is the case in Columbia where there are two broadcasting networks, one state-owned and the other commercial. The main problem with this setup is the doubling of investment and costs, which can be an important obstacle to the development of digital TV and to fight the digital divide (see section 15.3).

Furthermore, having several broadcasting networks introduces another degree of complexity to household reception. It can involve differences in coverage and generate new technical constraints. In some cases, when different transmitter sites handled by companies are far from each other, private individuals must reorient their antenna, or even install a second one to be able to receive all channels.

Point of strategic interest

Governments must ensure pluralism of content as well as the broadcasting of public services. In this respect, TV5Monde, a French-language operator and main multilateral channel to invest in African programmes, hope to benefit from a special status in order to feature on the multiplex at a preferential rate.
15.1 Setup of a broadcasting company
Several scenarios are possible, according to what already exists in the country. The simplest solution is to create a new company, either fully state-owned or open to investors. Existing analogue infrastructure can be included as part of the state’s capital, with ensuing compensation for the state-owned TV company and special attention to the transfer and staff training. In the event of private investors, the extent of state control needs to be considered. It is preferable for the company to be regulated (and its competitors in the event of several broadcasting companies) by an independent authority.

Even if the company is fully controlled by the state, it may be privatized later once the transition is complete, enabling the state to monetize investments, especially if these have been financed by the digital dividend.

Lastly, the level of financing required and infrastructure ownership depend on political choices, with mixed solutions being a possibility.

Point of strategic interest
The creation of the broadcasting company is a critical step in the transition to digital.
In Africa, this step has already been taken in some countries including Gabon, Kenya, Ghana and Mauritania.

15.2 The broadcasting company’s markets
A broadcasting company is primarily a company owning broadcasting sites, known as “high points”. As such, it can extend its market beyond audiovisual to all potential clients for high points, especially telecommunications. Telecommunications operators need high points to deploy LTE Internet for roaming.

15.3 In Africa: use the DTT network to deploy mobile Internet (LTE) and help bridge the digital divide
In Africa, and generally speaking in rural areas, Internet will first be deployed with wireless connections, even for desktops. The main difference between a DTT network and a telecommunications network for mobile users is cell size: the largest possible for television (50/80 km), smaller for mobiles according to user density as well as terminal range (a few kilometres). However, to ensure maximum ROI, operators have used “boosters” in rural areas to link terminals to antennas located several dozen kilometres away. In this case, the high point network deployed for television can be used for Internet (4G, LTE) in rural areas thus combatting the digital divide, as at the CAP (community access program) sites for example, which can be deployed alongside that of the DTT network.

In built-up areas, the high point network must be enhanced by telecommunications operators.

15.4 Strategic partnership for the broadcasting company
Given the huge differences between analogue and digital, it is recommended that the broadcasting company forges a strategic partnership with an operator already boasting experience in this field and to work as part of a regional network to share best practices.

In Africa: below, we will suppose that investment outlays will mostly be financed by the digital dividend, which implies that the broadcasting company does not pass these write-downs to the audiovisual companies, at least not before a certain time; later on, provisions will have to be made to update the networks. This strategy ensures a swifter transition.
C. PLANNING THE NETWORK

Reminder: section 7 specifically addressed frequency planning.

16. NETWORK

The network can be planned based on previous work and the frequency plan, drawing up its design, patch of transmitter coverage and transmitter characteristics. Specialised software can facilitate this planning, in particular by simulating propagation to identify potential and actual interference.

16.1 Transmitter network

Planning the network depends on coverage aims and available funds! Digital TV can be rolled out in several stages. Full coverage of the territory is not necessarily possible. A limited number of transmitters can be rounded off with Direct-to-Home satellite reception; terrestrial/satellite coverage is to be examined in each country. Direct-to-Home satellite reception provides remote populations with the possibility of receiving DTT channels, for the price of a dish and a suitable decoder, which is more expensive than installing an aerial and a DTT adapter.

In this case, these populations should have access to a satellite offer without a subscription to receive the free DTT channels. According to the terrestrial/satellite coverage chosen, the state can legislate to ensure the creation of an offer without subscription, as is the case in France, to ensure equal treatment for all households, for those already covered with DTT and those which are not.

In Africa, unlike Europe where the coverage of territory was a political issue from the outset, the number of digital transmitters necessary to cover the needs of the population will no doubt be limited according to local economies and only gradually covering the entire territory.

16.2 Uplink network

The transmitters must receive the TV signals and be synchronised. This broadcasting network can be terrestrial (microwave or optic) or use a satellite but mostly, both are used. Many countries choose to set up a solution known as a “feeder link” facilitating the synchronisation of sites (indispensable for an SFN).

Feeder link and direct reception functions involve renting out satellite capacity from a specialised operator.

While the aims are different (normally, a feeder link is only used to feed the signal to transmitters, while a Direct-to-Home satellite ensures that homes can receive the signal using a classic dish), the feeder link can actually be used in some cases for Direct-to-Home reception. This was the case in France for the satellite AB3 which used to broadcast analogue channels.

16.3 Headends

This is the equipment which receives the signals to be broadcast, puts the multiplex together and sends it to the transmitters via the uplink network. This equipment must be sized as from the design stage to house all the channels.

16.4 Training

As mentioned in section 13.2, training is key to a successful transition. The innovative and technical aspects of digital broadcasting are such that technical staff involved in the transition will need specific training. More general training can also be planned for staff selling receivers, those installing antenna and, generally speaking, agents working in the public services who may have to deal with questions from the public during the transition.

Points of strategic importance

→ Publishing a planning document for broadcasting patches and sticking to the schedule ensures the necessary visibility for a smooth transition with all the stakeholders involved.
→ Planning must cover the entire territory, the steps being defined according to available funds.
→ A private satellite infrastructure is only feasible at regional level.
→ The planning document can include terms of reference for a call for tender with a view to building the network.
TRANSMISSION THROUGHOUT THE MEDIA CHAIN
D. OPERATIONAL IMPLEMENTATION

17. ORGANISATION

Building the technical infrastructure hinges on the studies and decisions taken previously as seen above. In light of the conditions economic and political and recommendations from the National Transition Committee (NTC), the public authorities plan the network, the multiplex structure (if this solution is chosen), the technical characteristics of the transmission and broadcasting network, the training policy and support for the transition. These specific tasks will be conducted by a special technical commission.

The next step prior to operational implementation is the creation of the broadcasting company as defined by the NTC.

18. CALLS FOR TENDERS

→ Calls for tenders
→ Deadlines and building methodology
→ Training technical maintenance teams

The broadcasting company must next build the infrastructure relying, if possible, on the analogue network based on the results of its audit.

The procedure for the call for tender to source equipment follows classic lines. The call for tender and examination of the tenders take place in compliance with the specifications of any donors.

This call for tender can include a technical assistance batch for the duration of the work, a training batch and a batch covering assistance with maintenance (supervision of the network in particular), including training for operatives. These batches can be awarded independently of the equipment batches.

At each stage of the building phase, the public authorities must check the work, making sure that it is compliant with the plans and the compulsory technical characteristics. Independent expert support for public authorities can be allocated along with the equipment batch.

19. BUILDING THE NETWORKS

Building the networks, or at least the broadcasting and headend networks, is the responsibility of the broadcasting company (the uplink network may be rented). The NTC and the competent authorities must ensure strict compliance with specifications and plan testing prior to implementation.

The coverage area and the technical characteristics must especially be checked and monitored throughout the work.

20. EVALUATION OF COSTS AND ALLOCATION OF FUNDING

An evaluation of building and operating costs is indispensable to steer the implementation of the business plan and the allocation of funding. It will be adjusted according to the results of the call for tender, which may prompt the Transition committee to modify network plans.

As a matter of principle, network costs (from the headend to the transmitters) are to be borne by the broadcasting company, which is supposed to pass these costs on to the sale price of broadcasting to television companies. This cost will include maintenance and operating costs on top of this.

NB: network maintenance costs must be calculated carefully. They are very often underestimated.

21. GOVERNANCE AND MONITORING

Once the network has been deployed, an in-the-field monitoring phase must be included along with the reception phase, to check coverage and service quality.

The type of governance is fundamental to ensure monitoring quality. This can be handled jointly by the Authority in charge of planning (High Authority of Audiovisual Regulation, High Authority of Telecom Regulation etc.), in collaboration with a National Frequency Agency in charge of checking any problems encountered in situ and applying appropriate measures.

The authority in charge of planning must monitor and check the aims for national and local coverage, ensure that transmitters are properly adjusted and handle technical coordination.

If necessary, the National Frequency Agency can apply measures for tricky points and inform the High Regulation Authority and the broadcasting company so that they can take all necessary action.

Good coordination between these regulation authorities is essential to keep the network operating smoothly.
LEGAL AND REGULATORY ISSUES

Source: this section has mostly been inspired by the “legal kit” drafted by the OIF (Organisation International de la Francophonie).
A. STUDIES

22. INITIAL DIAGNOSIS OF EXISTING EQUIPMENT IN EACH NATION

22.1 Identification of players

It is useful to list switchover stakeholders (publishers, commercial operators, technical operators, distributors, elected representatives and local or regional authorities, telecom operators etc.) to check the pertinence of relevant existing legislation at each level.

The new legal framework applicable to digital terrestrial broadcasting of television services will mostly depend on local institutions and TV industry: the importance of the public sector, existence of regulatory bodies governing the audiovisual industry and telecoms, administrations managing frequencies, the Ministry of Communication, international authorities such as the ITU and ATU and the degree of complexity of players and sectors to be regulated.

22.2 Regulatory bodies

The transition to all digital is an opportunity for the country to set up an independent regulatory body governing audiovisual communication services. The public authorities must examine the pertinence of setting up a single regulatory body for telecommunication and audiovisual, or two separate bodies, and coordination at regional or sub-regional level.

Countries already having switched to all digital or where the switchover is under way, have adopted a wide range of regulatory aspects. In some countries, a single regulatory body is in charge of all resources like, for example the UK, Germany and Luxembourg and, to a lesser extent, Switzerland. In other countries, there is one a regulatory body for audiovisual and one for electronic communications, and sometimes an agency in charge of managing or monitoring of the radio spectrum (this was the case in France in mid-2012 with the CSA, ARCEP and ANFR, although this is likely to change in 2013), which requires extra coordination at national level.

Given media convergence as well as the emergence of new services, a single set of regulations covering the entire digital economy and a single regulatory body would ensure more consistency in implementation.

However, the existence of two separate bodies can also work, possibly as a regulatory body comprising two separate colleges. The traditional “audiovisual and telecom” distinction would be replaced with the “container-content” distinction. The aims of cultural policy (where one exists) bundled in with the regulation of content work in favour of the conservation of a specific regulatory body for this line of business.

However, conflicts regarding competence may arise between these various bodies.

The new legal framework will also depend on how television and radio is distributed in each nation: the respective shares of broadband, fibre, cable, satellite and terrestrial, bearing in mind that terrestrial TV reception will be certainly be predominant.

23. ADAPTING A REGULATORY AND LEGAL FRAMEWORK

This section lists the points to be explored and covered. Each nation will then determine which points take precedence and how they are to be handled, according to their needs and situation.

Technical aspect

23.1 Allocation of frequencies

Further to international coordination by the ITU, it was decided that it was up to the government of each state to allocate frequencies. The governments must define the frequencies or frequency bands assigned and share them between the various state administrations, telecoms and audiovisual. This decision may be postponed until after consultation of regulatory bodies. The allocation of audiovisual frequencies absolutely ought to be handled by one and the same entity.

Frequencies for DTT can be allocated as part of a “national table of frequency sharing” which can factor in the next stages of development such as increases in the digital dividend or bands reserved for new services (see section 7.3).

23.2 Technical specifications

The choice of compression standard and broadcasting technology is made by the government after consulting the regulatory body or a specialised entity. Sub-regional coordination is highly recommended for the purposes of economies of scale.

Managing the spectrum

23.3 Priority for public service

State channels are supposed to reach all homes. Legislation can enforce this, by specifying that all state channels are to be received via DTT, including for the operators of commercial packages, along with the right of priority or pre-emption for future services. This obligation can be extended to foreign channels of interest to the public (for the region for example, or for French-language channels).

23.4 Must-carry rights for analogue channels

The transition to all digital and the arrival of new competitors can be compensated by must-carry rights for commercial analogue channels. Should they so wish, these channels have the right to continue broadcasting in digital without encountering state opposition, and without it being an obligation either (unlike for state channels).
23.5 Authorisation procedures
Authorisation procedures can work to several rules:

- The “first come, first served rule” when candidates are few, resources allocated on request once compliance of the service and infrastructure with current legislation has been checked;
- Call for applications: as with analogue, selection based on criteria defined by the legislative body; DTT specifics: grouping of candidates on a multiplex, services to encourage the development of DTT etc;
- Auctions: rule whereby the candidate making the highest offer is selected. They have the right to the use terrestrial resources in consideration of the payment of a TV licence.

The last two aspects can easily be combined.

23.6 Allocation of the resource which can be free or paid for
The DTT resource belongs to the public domain of the state, it cannot, as a matter of principle, be transferred to a channel. It can be allocated free of charge, with the aim of fostering freedom of communication and the freedom of access for all to the various modes of communication, or offset with obligations involving contributions to production.

It can also be paid for. In this setup, payment is made in consideration of the right to use radiofrequencies used and services in connection with this usage, especially, but not exclusively, for pay-TV channel services. Income generated by this tax can be allocated to special usage. Traditionally, the frequencies used for free audiovisual are free of charge. Some countries are exploring this further to the sale by commercial operators of free channels enjoying high added value, without the state reaping any benefits from such sales.

23.7 Authorisation of multiplexes
Multiplex operators are the technical distributors of services authorised on the frequency it manages. If the multiplex is only or mainly catering to state television, the national broadcasting corporation can operate it. If this is not the case, the services authorised on the same multiplex by the regulatory body must designate it jointly. Mostly it is a separate company. Failing agreement between the publishers on the same multiplex, legislation can provide for a new call for applications.

The broadcasting operator can be a multiplex operator provided it works independently to the TV channels.

Managing channels

23.8 Numbering
During a call for applications, channels are authorised by the regulatory body, i.e. they are numbered for TV viewers, without the services plan being organised. This is handled by the public authorities. The numbering of authorised channels can be decided on, either according to a principle of fairness among publishers, using a lottery for new entrants, or retaining analogue numbering for previously existing channels.

This only involves free channels since the pay-TV channels are put forward by a commercial distributor. The commercial distributor decides on the scheduling of services within its offer. According to this hypothesis, the regulatory body only intervenes in the event of disagreements between the publisher and the distributor. The commercial distributor may be required by law to comply with the numbering of free services in its offer.

23.9 Obligations regarding the promotion of local production
Since it is authorised on the universal network accessible all homes nationwide, the DTT service must fulfill obligations relative to the promotion of local production from the continent or country in question.

Two types of obligations can be imposed: broadcasting quotas or obligatory investments in production. Investment may be made in proportion to turnover.

In this case it is necessary to define what the legislative body means by audiovisual and cinematographic works. These promotional obligations for local production can distinguish between two levels: strictly national works and those from the sub-region.

To foster the emergence and development of a local market for content production, these obligations regarding local or sub-regional promotion can also be agreed at sub-regional level.

23.10 Protecting children and ethics in programmes
The rules governing ethics in programmes can be the same as for analogue channels: respect for the dignity of human beings, preservation of public order, the fight against discrimination, programme honesty, respect for human rights etc.

The switch to digital is an opportunity to force publishers broadcasting X-rated content to set up an alphanumeric coding system to block programmes to prevent minors from viewing this content.

23.11 Regime of related data
Two types of interactive services can be developed via the terrestrial network:

- data related to a channel programme: this data uses the terrestrial resource allocated to the channel publisher, they do not require a specific authorisation procedure; they merely need to be stipulated in the agreement.
- interactive services independent of a channel: these use a specific terrestrial resource and can involve a call for applications; they require specific licences; a special case is that of public services to reduce the digital divide which can benefit from priority access to the resource.

23.12 A scheme to prevent concentration
The multiplication of the number of TV channels available can generate abuse given the dominant position of some audiovisual firms. A preventive measure could involve regulations setting forth a maximum number of DTT licences per audiovisual firm, whether held directly or indirectly, or set up a framework relative to the audience of channels owned by the same firm, if the authorised DTT services reach a substantial portion of the population.
--- 23.13 Distributors of DTT pay-TV channels
For commercial distributors not using any terrestrial resources, a prior procedure to make a declaration to the regulatory body is still necessary.

Distributors must be able to take up authorised DTT channels in fair, non-discriminatory and open conditions.

Publishers and service distributors may submit claims to the regulatory body regarding disputes relative to the distribution of their channel, including those involving technical and financial conditions.

--- 23.14 Conditional access systems
In countries wishing to authorise pay-TV channels accessible via an aerial, commercial distributors must set up a “conditional access system” so that only subscribers receive the encoded signal.

Holders of rights to industrial property for conditional access systems must grant licences to the manufacturers of equipment for the general public in fair, reasonable and non-discriminatory conditions.

--- 23.15 Obligations pertaining to coverage of territory
Two options are possible according to type of territory, economic situation and policy:

→ If terrestrial broadcasting is a national priority with DTT considered to be a universal service which must reach all inhabitants, and if the territory is suitable, the state can oblige publishers to broadcast their services to X% of inhabitants, as established by the regulatory body and according to its schedule; coverage aims are set for the entire nation as well as by local authorities, with steady, fair progression.

→ If terrestrial broadcasting is too expensive, it can involve only densely populated areas, with other areas being covered by satellite. Channels with a national licence must cover specific geographical areas (the capital, local seats of government, large built-up areas, all cities served by transmitters) and be available without subscription.

--- 23.16 Setup of a satellite offer for areas without coverage
Free DTT channels must be available to all. In areas where aerial reception is not available or is not possible, the satellite network must take over. This type of additional coverage can be made compulsory, in particular if the territory is not fully covered. It is necessary to plan for an offer, subject neither to renting a reception terminal, nor taking out a subscription.

--- 23.17 Must-carry rules on other networks
The state can require free DTT channels, either run by the state or of general interest, to be received by all. This could be the case for TV5Monde especially (see section 14). Publishers cannot object to the carrying of their services on other networks. The state can also require operators to carry the free channels and retain their terrestrial numbering.

--- 23.18 Deployment of DTT compatible receivers
For a country to develop a Digital Terrestrial Television offer, receivers adapted to the new technical standard need to be available for viewers to get equipped. The country must thus impose obligations on manufacturers, distributors and vendors. These obligations must be introduced when the chosen technical standard is announced so that people don’t invest massively in obsolete or incompatible equipment (for example, the importing or sale of equipment not compatible with the technical DTT standard chosen by the country should be prohibited as from a certain date). These obligations can be introduced gradually according to the date, type or size of equipment. Legislation can also incite distributors to provide better information to consumers (explanations, marking with a logo etc.).

--- 23.19 Recycling
The transition to all digital accelerates the renewal of TV sets across the nation. This is especially true of households equipped with SECAM sets without a SCART socket. Reception sets contain dangerous substances which can be recycled. Collecting and recycling these old sets can be governed by legislation (with local authorities or distributors being obliged to collect old sets, or being encouraged to do so by way of tax breaks etc.).

--- 23.20 Switchover plan
The DTT can only really develop once the public authorities have clearly announced an official switch off date for analogue TV.

→ The final switch off date for analogue TV is specified in the national switchover plan, adopted by the government after consulting the regulatory body and stakeholders. For example, “The broadcasting of terrestrial analogue television services shall be switched off no later than 17 June 2015”.

→ The switchover plan defines how analogue is to be switched off in favour of digital. In the case of a gradual switchover, it specifies the schedule and areas involved. It may include prior experimentation. It can specify a deadline between the announcement of the switchover in a geographical area and actual switching off of analogue broadcasting, as well as the duration of simulcast (dual analogue/digital broadcasting). It can also define the measures to provide support for the public. The switchover plan takes switchover plans of border countries into account to coordinate frequencies at the border.
23.21 Informing the public
For a fully successful switchover, the public and viewers must be informed and given support. The legal framework can include national and regional information campaigns, or compulsory information at sales outlets.

23.22 Financial assistance with the purchasing of equipment
To help households switch over to all digital, legislation can plan for financial assistance with the purchasing of equipment to ensure ongoing reception of free DTT channels, as the new universal television service. This assistance can be allocated individually to homes or benefit the industry directly via subsidies, tax breaks or exemptions (see section 42).

The Future

23.23 Assignment of the digital dividend
The legal framework can also define the future assignment of UHF between the audiovisual and telecom lines of business. This assignment is conducted according to political arbitrage as part of international or sub-regional standardisation.

23.24 Deployment of High Definition
High Definition (HD) television is one possible form of DTT services. The applicable legal framework is thus similar to the one set forth above. The legislative body can however add specific criteria, for example fostering the uptake of services already authorised in SD or requiring HD publishers to broadcast a certain percentage of programmes exclusively shot in High Definition.

23.25 Personal Mobile Television (PMT)
Even if this is not yet on the cards, some frequencies ought to be reserved for it in the frequency plan.

23.26 Digital Terrestrial Radio (DTR)
There are two types of DTR: those broadcast in the country and those broadcast from abroad. Foreign radios, numbered OC, OM and OL, for which the DRM standard is the most promising, can only be regulated internationally, at least with respect to interference risks.

For radios broadcasting within the country, specific legislation must be introduced to launch DTR. Firstly, the standard (DRM, HD, DAB or T-DBM) must be defined, factoring in market trends to lower the price of equipment and AM/FM compatibility. This legislation can be similar to that introduced for DTT: must-carry clauses for analogue radios switching to digital, right of priority for state radios, call for applications with additional selection criteria specific for digital (consistent propositions formulated by the candidates to be grouped in a multiplex, related data etc.) and coverage obligations. If the resource assigned to DTR is not rare, if FM is not particularly congested for example, this process can be alleviated.

23.27 Audiovisual media services on demand
With the digital terrestrial network, services on demand such as video on demand and catch-up TV can be deployed. This is a specific feature of the transition to all digital. These services are becoming the main competitors of TV channels, so they need a legal framework. It can be similar to that applicable to linear services.

Advertising market

23.28 Legal framework for advertising
The provisions governing advertising (ethics, prohibition of surreptitious advertising, product placement, time restrictions and advertising breaks, protection of children, prohibited sectors etc.) must be introduced or can be revised when new digital channels are launched. The clear definition of a legal framework can foster the development of a flourishing advertising market.

Archiving

23.29 Digitizing the archives
Conserving collections, to communicate them and hand them down to future generations, is a major cultural issue. Even recent audiovisual archives are suffering from the swift development of technology. Archivists must deal with highly diverse media carriers and technical formats, the deterioration of these media carriers and the swift obsolescence of reading equipment.

Digitizing means that content can be preserved, and possibly restored. It involves a certain number of steps involving both logistics and technical issues, all the more complex given the sheer quantity, diversity and heritage value of documents to be digitised. A certain number of procedures and technical choices need to be made, for the identification of archives to be digitised as a priority, encoding, storage and the restitution of documents, to ensure the content’s ongoing value and integrity.

International protocols govern the cataloguing and sharing of data and encoding formats, to ensure the standardised formatting of information and the interoperability of databases. These protocols must be complied with. Choices will be recorded in documents contributing to the drafting of specifications needed to procure and monitor of markets.

Digitizing to conserve archives, and facilitating consultation of these, access modes and levels of access to sources must also be defined. A search engine needs to be chosen, files need to be processed for online publication and viewing, and ergonomic graphic interfaces need to be designed for users.

Archives are not only of interest in terms of heritage, they also have market value. Digitising projects must thus take into account legal issues in connection with using the documents.

Several African countries have already embarked on digitising archives, with support from partners such as International Council of French-Speaking Broadcasting Corporations (CIREF), the Organisation internationale de la francophonie (OIF) and the French audiovisual institute (INA).

The setup of regional clusters is conducive to the digitizing of archives (see 28.3).

More information is available on the INA website: http://www.institut-national-audiovisual.fr/
23.30 Rules governing rights

Digitizing works must be carried out in compliance with rights held by those with rights on the archives resulting from applicable legislation in each nation. In some cases, the rules governing rights may need to be revised or adapted to take the dematerialization of carriers into account.

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The framework used in France is available on demand, also on www.legifrance.gouv.fr:

→ Schedule for the switch to all digital television.
→ National plan to reuse frequencies freed up by switching off analogue broadcasting (22 December 2008).
→ Ruling dated 23 July 2009 approving the revision of the national plan to switch off analogue broadcasting and switch to digital.
→ Act No. 2007-309 dated 5 March 2007 governing the modernisation of audiovisual broadcasting and television of the future.
→ Decree No. 2009-1670 dated 28 December 2009 governing assistance for viewers with a view to ongoing reception of non-scrambled analogue terrestrial television services.
→ Act No. 2009-1572 dated 17 December 2009 governing the bridging of the digital divide.
→ Promulgation of Act No. 2009-1572 dated 17 December 2009 governing the bridging of the digital divide.
→ Decree No. 2010-546 dated 26 May 2010 governing the implementation of technical assistance for certain households to ensure ongoing reception of non-scrambled television services.

Point of strategic interest

Legal safeguards are decisive in attracting international and national investors.
B. ORGANISATION

24. SETUP OF A NATIONAL COORDINATION BODY

The transition to all digital involves various players, for both planning and steering as well as for implementation and viewer information.

The switch to all digital television ought to be overseen by the Prime Minister or President. The Ministry of Information and Culture and the Ministry of Telecommunications can shoulder joint responsibility for guidelines and the coordination of operators.

To ensure a smooth transition to digital, states must set up an adequate organisation and entrust a specific body or bodies with ensuring its success. This or these entity/ies will be set up specifically for the transition to digital. Its remit will be clearly set out, clearly limited in time and with a specific budget.

24.1 National Transition Committee (NTC)

The National Transition Committee is in charge of charting the main course for the project. It comprises representatives of the various administrations (Ministries of Communication and Telecommunications, the Economy and Finance), regulatory bodies (audiovisual and telecommunications) and other stakeholders (state and commercial channels). It should come directly under the highest ranking state authorities. Colleges of experts must meet to discuss major cultural, technical, legal, budgetary and financial themes. The Committee drafts a strategic road map and puts its recommendations to the Government. It will only meet for a limited time.

24.2 Operations Steering Committee (OSC)

Once the strategic roadmap has been drafted and duly approved by the competent authorities, the project is then managed by an Operations Steering Committee.

This Committee is rarely the continuation of the National Transition Committee since its remit is strictly operational. It is a legal entity with the aim of implementing the measures necessary to switch off analogue broadcasting and over to all digital, in compliance with the guidelines drawn up by the NTC and approved by the Prime Minister, the President, or the Minister in charge of the operation. It is financially independent. It is responsible for seeing all operations through.

It is placed under Government responsibility because it is responsible for a national political project. It involves or works in close collaboration with all switchover stakeholders and especially with the regulatory body or the entity in charge of frequency planning.

The OSC is the national coordinator of the entire process. According to the typology and size of the country, it can be represented at regional level to ensure its presence throughout the region or area switching over to digital. In this case, the remit of this regional delegation is to ensure that local authorities, players and viewers are given the fullest possible information, taking local specifics of a technical, social, cultural, religious and linguistic nature into account. These regional delegations ensure the project is taken fully on board by making sure everybody understands the issues and is in full agreement.

24.3 Audiovisual and Telecom regulatory bodies

Depending on each country, audiovisual frequency planning can be entrusted to the regulatory body governing Audiovisual or that governing Telecommunications.

The authority in charge of planning must determine the switchover dates (in the case of a gradual switchover) and define the technical specifications. It works in close collaboration with the Operations Steering Committee to agree to the drafting of the national switch off plan and ensure consistent development of the network.

24.4 Other bodies

A smooth transition to all digital is largely dependent on good stakeholder coordination. All means to discuss issues must be encouraged. The OSC must organise specific meetings with professional distributors, antenna installers, local authorities and consumer associations. It can also elect to organise these discussions more formally via ad hoc commissions or an Advisory Committee.

Legislation can also plan for the creation of regional transition commissions and for them to meet, as was the case in France. The purpose of these regional meetings is to ensure that all local, political, institutional and technical players are informed and involved. They can especially help to identify potential sources of risk ahead of time.

On demand:

Incorporation agreement for the Public Interest Group France Télé Numérique (Operations Steering Committee in France).

Decree No. 2010-670 dated 18 June 2010 governing the members of Commission overseeing the transition to digital TV.
25. COORDINATION IN THE SUB-REGIONS

In many aspects, inter-country cooperation can be beneficial. The role of the ITU and ATU is to be emphasised. These two bodies are behind many such initiatives.

Leaving nations to control their respective national TV industries and governance of the switchover, sub-regional cooperation can help towards the standardisation of technological choices, practices and even texts, facilitate the meeting of the 2015 deadline and furthermore, help to cut the cost of producing equipment. A coordinated sale of the digital dividend could especially ensure it is leveraged to the full.

The setup of shared resources can also be envisaged. This kind of regional approach not only facilitates the transition and cuts costs, it can also make it easier to harness projects funded by international donors. This section presents some of the projects that can be developed at regional level (i.e. by a set of similar countries) which can be put forward to international organisations, or share funding. French cooperation is available to provide support and foster the emergence of projects such as those listed below.

25.1 Common certification centre
For countries having defined the same standard and technical characteristics, an equipment certification centre (to certify receivers, decoders, antennas etc.) can be set up to deliver a logo certifying the quality of equipment to reassure consumers, all the while ensuring equipment traceability.

25.2 Expertise and technical support centre
This is a centre bringing together top level experts to answer questions from regional players. This kind of centre can refer to an engineering school or a polytechnic for training and participation in R&D projects (for example when there are agreements with business excellence clusters in Europe) to maintain and develop skills.

25.3 Centre for digitising audiovisual archives
The development of digital TV paves the way to an enhancement of available content, for new general-interest channels, or special-interest or regional channels. Digitizing audiovisual archives means this heritage can be leveraged, making thousands of hours’ worth of content available.

For example: the EU FRAME project could be furthered in Africa: see www.ina-sup.com/en/about-ina-sup/frame-future-restoration-audiovisual-memory-europe

25.4 Centre for content production and digital services
The production of digital content underpins the development of digital TV as well as other carriers such as mobiles. Interactive services available with digital TV can supply tools for digital development for the public and for professionals. Such a centre would pave the way to TV channels and telecommunications operators achieving better synergy and the development of products suitable for the global market.

25.5 Content bank and cloud computing
The sharing of audiovisual content among regional channels can enhance the audiovisual offer of national channels, as is the case for state televisions in northern Europe which achieve this by harnessing cloud computing. These techniques are mature and easy to implement.

25.6 Manufacturing decoders
The availability of decoders at the lowest possible cost is a one of the challenges in the development of digital TV. Setting up a plant could cut costs significantly. A siting study would only be justified at regional level.

An example of effective cooperation in Europe: There is a technical body to coordinate the various European countries, the CEPT. The European Commission issues compulsory directives to be integrated into all national legislations and to the deadlines, based on the results of the CEPT’s work. Audiovisual is thus governed by several directives. The “Telecom Package II” comprising operating rules governing the industry and providing a framework for the technological developments in markets and usage, was published in late November 2009. This package required the implementation of spectrum standardisation to facilitate the transition from analogue television to digital. The Citizens’ Rights Directive, for data protection, privacy and consumer protection, and the Better Regulation Directive, pertaining to licences and the regulatory framework, were promulgated as a result. These directives were transposed to all national legislations by end May 2011 at the latest. Furthermore, the BEREC (Body of European Regulators for Electronic Communications) was up and running by late 2010. This body comprises the 27 European regulatory bodies in charge of advising and coordinating, with a right to veto for all major decisions.

In Africa, there are several regional organisations interested in this project, under the aegis of which this cooperation could be organised, such as the ATU (African Telecommunications Union) or the WAEMU (West African Economic and Monetary Union). This approach can involve member countries of WAEMU or ECOWAS (the Economic Community of West African States). The regional regulatory body, WATRA (the West African Telecommunication Regulators Association), can also play a role.

Border countries can also coordinate independently and bilaterally.
COMMUNICATION AND SUPPORT ISSUES
The switch to digital terrestrial TV is a major change for the general public. It has great impact on society and culture, modifying consumer habits with regard to television and the media, and financial impact, given the ensuing adaptation of equipment.

Keeping control of such an environment requires large-scale assistance and support, using tools and targeted communication campaigns, as well as a system of financial assistance or subsidies, facilitating the acquisition of adequate equipment.

26. TOOLS AND COMMUNICATION CAMPAIGNS

26.1 General remarks
The transition to digital must be considered as a major national cause, requiring efforts from all stakeholders: the state, local authorities, commercial operators, inhabitants etc. All players, such as political leaders, local authorities, the general public, professionals and organisations must be convinced of the necessity of the switchover, understand the point of it and related issues, in order to better take on board the constraints, and work together for optimum effectiveness.

Communication is thus a key factor for a successful transition. What are the underlying principles? It has to include everybody, nobody must be left by the roadside. Complex, technical, and exclusively political concepts need to be explained. It is a public service goal and it aims to provide a public service, and needs to preserve total neutrality in technological and commercial terms. It must stand out from commercial messages.

26.2 Targeted audiences
It has to target various audiences and adapt to each of these. Five audiences have been distinguished:

Elected representatives and other local leaders
Their acceptance of project is crucial since they must then relay information to the inhabitants. Technical constraints must be vulgarised, political choices must be clearly set out. The transition to digital must not turn into a political issue, since this could hamper and even halt the process.

Professionals (antenna installers, vendors, manufacturers etc.)
These specialists in the sector are informed ahead of time of the measures taken or to be taken in order to plan for the switchover and set up the distribution circuits and source equipment accordingly.

The managers of collective housing (administrations, hotels, property managers etc.)
These are mainly in large built-up areas. Collective reception facilities will all need to be checked and in some cases, upgraded to meet standards. The managers of collective housing must have a clear idea of what the transition involves, what is expected of them and the deadlines to be met.

The media
The media can be a great help in putting messages across. The Operations Steering Committee must make sure of the media being their main allies and consider them as partners.

26.3 National and/or regional campaigns
A project that is national in scope needs a correspondingly large communication campaign. However, according to the size of the country, social make-up, topography, phasing chosen for the transition to all digital (all at once or region by region) and strong cultural specifics, the communication campaign can also be rolled out locally. The regional campaigns back up the national messages, adapting them to regional specifics.

In the case of a gradual switchover to digital, the transition process can be launched officially with a national campaign to announce the start, with messages gradually introduced region by region. If the transition to digital is to take time, it would be tricky to only have one national wave of information. It is on the contrary advisable to communicate on a regular basis to keep the pressure on and inform inhabitants of the smooth progress of the transition. This puts out a positive message (the project is moving ahead) and naturally speeds the switch to digital up.

26.4 Stratégie de communication grand public
Strategy of communication to the general public.

Stage 1: raising awareness to kindle desire
Firstly, awareness of the project must be raised. Major media players, television of course - since it’s all about television! -, as well as all the other media with a firmer footing than television, must be called on (radio, posters etc.).

To encourage identification, the campaign needs a logo and signature. Some countries have gone further, creating a cute mascot to symbolise the transition and foster appropriation. For example: a robot in the UK; in France, two small TVs decked out in the colours of the French flag, one blue and one red; a character with a TV head and a body in traditional dress in Ghana etc.

The campaign must convey positive messages (an asset for the countries, modernity etc.) but above all highlight immediate user benefits (more channels, new services, development of Internet etc.). The messages must also be reassuring (ease of access etc.).
Whatever the carriers chosen, the initial phase in this campaign is often mainly via advertising. It can be rounded off with an intense press relations campaign. The various media or carriers will take this on board all the better if the project is presented as a major national cause.

→ Stage 2: educate people about the transition

After an initial communication phase of a general nature to project a positive vision of the project, it will be necessary to explore the details and educate the public about the switchover. In phase 2, the aim is to incite households receiving analogue television to acquire the new equipment. The communication campaign must answer simple, practical questions: Who is involved? How do you acquire the equipment? What receiving modes are there? Where do you find the equipment and how do you install it? etc. Digital technology may seem daunting and inaccessible to some, and as a great opportunity to others who cash in on the naiveté of the former!

The main point of this communication phase is to make the information accessible, in content (simplifying a topic that seems complex), form (explaining clearly, reassuring, standing out from other advertisers) and the choice of broadcasting channels (reaching out to all concerned, including the most remote).

It is preferable to set up multi-channel system based on actions and additional tools.

→ 26.5 Planning actions

The existence of these various tools does not entail scaling-up the budget. On the contrary. Their complementarity can help achieve considerable savings, provided they are properly orchestrated over time and actions do truly complement each other. Planning these various tools is essential to keep within budget.

This is how it was rolled out in France:

NB: The barometers refer to regular studies to monitor the transition process
26.6 Tools

Scrolling messages

A keyer to insert scrolling messages can be installed at the foot of main transmitters in the analogue delivery chain, to display scrolling messages during the TV programmes broadcast by this transmitter. Technically simple to achieve, this process reaches out to all inhabitants receiving analogue television from this transmitter. When inserted on the main transmitters, the messages are also displayed on the power relays which reproduce the signal of the main transmitters.

This is an inexpensive means of providing information (investment outlay and the cost of installing the equipment at the foot of the transmitters only), and all the more when the switchover is to take place gradually, region by region, allowing for the rotation of keyers. This system is however limited graphically since only text can be used. To be hard-hitting, messages must be short. This is a simple means of communication to put across a single message (for example a reminder of the switch-off date for analogue broadcasting). It cannot be used to explain the switchover process.

This system was successful in France. It was especially effective since its purpose was two-fold, as a targeted communication channel and a diagnosis tool (“If you can see this scrolling message, you are using an analogue terrestrial receiver. You must upgrade your equipment by date - the switchover date”).

Advertising (TV and radio spots, announcements in the press, posters etc.)

Advertising must favour the mass media and especially radio, to reach out to those who don’t yet have TV sets, to encourage them to obtain one.

To make sure of people understanding, the classic communication rule must be adhered to, i.e. a single piece of information in each message. If several messages are necessary, they need to be created separately using different designs to facilitate understanding. Simple designs are recommended, with plenty of visual impact so that everybody can understand them.

In terms of pace, experience in other countries shows that it is not necessary to communicate to the general public very early on but it is important to adopt a steady pace of communication to maintain awareness and harness what people learned during previous waves.

Advertising alone is not sufficient. It is not only costly but must be rounded off with other communication tools such as the press relations and editorial content to lend credibility to the government’s message and enhance the general public’s knowledge.

Press relations

It is important to consider existing media as partners crucial to the success of the project, meaning that a trusting relationship based on openness needs to be built up. It is necessary to explain the issues involved in the transition to digital, what it will bring the country, the development possibilities it can throw up - including for their own agendas - and keep them informed regularly.

To maintain the attention of journalists, a good orchestration is necessary over time. For example meetings to raise their awareness, press conferences or individual meetings to explain what will happen, organisation of reports in the field, communiqués, regular updating etc.

Experience shows that information sought out are practical in tone, or homely. The media buzz must be focused on the project and how it works. To avoid controversy, it is important to ensure that it does not become a political issue or focus on specific people.

Editorial content

Short educational programmes can be developed to explain what the switch to digital represents, the stakes and practical details. They will be then be made available to the national and local media free of charge. Given the sheer wealth of topics and its positioning, the theme of the switch to digital is ideal for this type of communication. To be taken up, these educational programmes must be short and entertaining. This is not advertorial content but actual editorial content. As with press relations, it is advisable to give these additional programmes a “consumer”, “practical” and close-to-home tone. Well designed, they can be presented as a digital soap opera and will be considered as free content by carriers.

They can be put together by a communications agency on behalf of Operations Steering Committee, delivered ready for broadcasting to the channels and radios or presented in a generic manner, so that the various media can deck it out in their own colours. It is also possible to make hard-copy versions (as comic strips for example), for insertion in the press or as a special publication.

This scheme can work perfectly in media with flexible programming. For a low cost (limited to production costs and management), it can represent hours of broadcasting and have a communication impact far beyond the required financial investments. The messages put across benefit from greater credibility than that generally achieved by advertising messages.

Brochures, guides and leaflets

Even in the civilisations where oral communication dominates, the publishing of written documents is recommended. When printed, they can contribute to a shared knowledge base, and when passed from hand to hand, contribute to the propagation of correct, quality information. It may take the form of full brochures or mere leaflets. It can be necessary in some cases to translate these official documents into local languages. To cut out translation and illiteracy issues and to facilitate understanding in general, they can feature diagrams and illustrations.

They can be distributed in schools (as was the case in the UK) or made available in public venues (town halls).
**Call centre**

A specific call number can be set up to answer calls from the general public. This number must be easy to remember and regular reminders must be published in all communication tools. Training for telemarketers is of the utmost importance. As the ambassadors of the switchover and the “voice” of project, their knowledge and command of the project must be supervised and strictly monitored.

According to the number of calls expected, increasingly more powerful tools can be developed to handle and process these, from simple scripts recapping key information through to the tools for customised answers according to where the person is calling from. In most cases, the architecture can be kept simple.

To be fully effective, the service must be provided in the local dialects or languages. Lastly, the number chosen ought not to be overtaxed to ensure swifter implementation. The fear of having to pay a high price for the call can in fact discourage many from calling.

**Website**

The creation of a specific website on the transition to digital may be useful. According to Internet outreach in the country, this service may only be available to those who need it the least, such as young people and city dwellers familiar with new technologies. The existence of such a web site can however be of great added value for professionals and local authorities to find the information they need.

**In-the-field team**

Access to most information supposes either a proactive, determined approach by users (using the call centre, taking and keeping a leaflet), or already being in contact with the outside world and technology (having a television, listening to the radio etc.). Setting up an in-the-field team is more a matter of outreach, since it involves going out to meet people, especially the most remote, and those who have the most difficulties with technology. The aim is to forge as many personal contacts as possible to explain face-to-face how to receive digital TV, showing and reassuring, as well as taking local specifics into account.

The in-the-field team requires a network of staff having received special training on the transition to digital, even, in some cases, with tools to give demonstrations. These team members act as ambassadors of the project. They must be easily identifiable for example wearing a uniform or bearing a distinguishing mark in campaign colours.

To be effective without being too costly, this team needs to cover the territory and the main population basins. In the most remote, more sparsely populated areas, they can go to villages and towns on market days or other days when people get together.

This in-the-field team can be itinerant (giving demonstrations on market day, announcing public meetings etc.) or fixed. In this case, these ambassadors act as “local contacts” for the switchover. The local inhabitants know them and they can hold information sessions.

It is also possible to round off this network of contacts and guides to the switchover with a network of volunteers who are trained to act as contacts and information relays. For example, France Télé Numérique offered rural taxi drivers in Mayotte a training course on the switch to digital for their département so that they could inform their clients. Many volunteers came forward.

Beyond an interest in communication, this human presence in the field can be a remarkable source of feedback on the general public’s perception and grasp of the transition to digital. The managers of these teams must set up a system to collect and report reliable information (gathering, collating, recapping etc.).

### 27. CAMPAIGNS FOR PROFESSIONALS

#### 27.1 Communication with professional manufacturers, vendors and antenna installers

Manufacturers must be informed as soon as possible of the technical choices and standard chosen, as well as any legal obligations.

Professional antenna installers and vendors are to play a crucial role in the switch to digital. They must have the necessary technical information to work effectively with their clients, whether they are private individuals or local authorities. Furthermore, it is important to avoid the spin-off effect the switchover can generate with the sale of unnecessary articles and interventions.

Several types of actions can be implemented:

- regular sharing of information with the vendors, installers and manufacturers (holding information meetings, providing brochures and documentation, ad hoc technical communications etc.); distributors and installers can in return provide feedback (knowledge and grasp of the switchover, equipment, difficulties encountered etc.), data which is all the more important given that reliable studies are rare and the barometers for monitoring purposes are too costly to set up;
- have them agree to a charter to protect consumers which can be drafted in collaboration with bodies representing vendors; in return for strong commitment (entry level and quality products, transparent information, competitive prices etc.), it is possible to promote the stores having signed the charter by providing them with special signage.
27.2 Communication with managers of collective housing

Managers of collective housing rarely have technical specialists to hand. They thus need simple information explaining what is expected of them and what may happen if the buildings they manage are not checked and adapted to digital reception, i.e. complete loss of TV reception.

The cost of tasks involved in the headend but above all cabling, in particular if the building has not been refurbished recently, can soon add up. It is thus necessary to plan long enough in advance.

Experience has shown that it can be difficult to get such players motivated, since they do not necessarily grasp what is at stake or the implications the switchover can have on their business. In this case, it is necessary to organise meetings at the Ministries involved, which is all the easier when the players are concentrated in the large built-up areas. It is often necessary to repeat information systematically.

28. COMMUNICATION FOR ELECTED REPRESENTATIVES AND REPRESENTATIVES OF LOCAL AUTHORITIES

The Operations Steering Committee must ensure that elected representatives and local authorities have taken the project on board.

Whenever possible, the national project must be rolled out locally to ensure a close-to-home approach. Catering for local issues in advance means risky situations can be dealt with early on, especially avoiding all sorts of political controversies or scandals in the media.

To ensure the enthusiasm of local authorities, ongoing relations and a close-to-home approach is needed. It is necessary to inform the elected representatives and local authorities in advance of any action in their region. Several tools can be set up: face-to-face meetings, visits, delegations etc. or the sending of systematic and comprehensive files containing all the useful data on the switchover in their region (technical information on the deployment of the network, planned communication etc.).

It is advisable to get them actually involved in the project, providing regular updates on progress as well as of the points for which there is room for improvement in the operations. As the partners of the national project, they can be incited to also become players. Their involvement can lead, for example, to the organisation of public meetings or the involvement of managers of solidarity organisations, in direct contact with fragile members of the public.

A team similar to that of the Transition Commissions, such as that set up in France and described in section 27-4, can be another setup solution.

This cooperation can be facilitated if the Operations Steering Committee has an official local representative.

MPs and the central political powers must likewise be given regular updates on how operations are moving forward.

29. FINANCIAL AID

One of the main difficulties inherent in the transition to digital is the cost of these new technologies for households. The probable choice of DVBT2 - MPEG 4 adds another level of complexity to the situation. Adaptors for this new standard are much more expensive than those used for tried and tested technology (approximately double the price). Luckily, prices are expected to drop.

However, this cost may still seem high for most households. Several solutions can be envisaged:

→ direct financial assistance for households in the form of a refund; this solution can, in most cases, be difficult to implement (what form should these refunds take when the households don’t have a bank account, tricky management of cash etc.);

→ direct financial assistance for households in the form of vouchers to be cashed in with distributors corresponding to a proportion of the cost of equipment. The distributors can then cash the vouchers in from the state; this solution requires the setup of a stringent management system (clear definition of allocation criteria, management of the distribution of vouchers, management of refunds to stores); it does however give a reliable indication of the rate at which modest homes acquire the equipment and, when the sale is declared, it can also contribute to an increase in VAT revenue;

→ direct financial assistance for households in the form of credits. This also requires a stringent management system;

→ direct financial assistance for professionals, in the form of tax breaks on some types of equipment for a limited time; this solution is without doubt easier to implement but it is general rather than targeted.
BUSINESS PLAN ISSUES
A. ECONOMIC MODELLING

This section lists the major sources of income and costs, identifying the significant parameters for calculation, and the associated variables.

30. PRIOR MARKET ASSESSMENT

To evaluate the business plan for its switch to digital, each state needs the following data.

30.1 National parameters of the existing setup

Demographical data and geographical distribution:

- Surface area of the territory (in sq.m), to assess coverage difficulties
- Number of inhabitants and the number of households (or average number of inhabitants per household if the number of households is not known) to assess the number of homes to reach out to
- Population density: distribution of urban population (%) vs. density of rural inhabitants (number of inhabitants per sq.km) To assess the difficulties in reaching out to a high percentage of the population. The more sparsely populated areas are, the more the terrestrial coverage will cost.

For example in France: 600 transmitters sufficed to cover 85% of the population in mainland France. Another 1,000 more were needed to reach 97%.

- Number of large built-up areas and the number of secondary urban centres.

The idea is to distinguish between the large built-up areas which can easily be covered by one huge transmitter with possibly some power relays when needed, and average ones where only one lower-capacity power relay is necessary.

Data on equipment:

- Number of TV sets (or the number of inhabitants/TV set when this figure is not available) and their technical characteristics (whether they have SCART sockets etc.). To assess the cost of adapting the TV sets installed.

The current analogue terrestrial TV industry and network serving it:

- Number of national state-run and commercial channels
- Number of regional state-run and commercial channels
- Regional switchovers, multi-lingual broadcasting
- The quality of the current network: the number of public analogue transmitters with the breakdown of those not working and those requiring partial repairs
- The same for commercial analogue transmitters (number, % of those not working, % requiring partial repairs)

The data to be collected is listed in sections 6-2 and 6-3. This data is important to assess the number of sites to be adapted and the number of local sites to be reused.

The funding method for state radio and television

And in particular the ratio between TV licences, state subsidies and advertising.

How the TV licence works (when it exists)

State channels and radios can draw all or most of their resources from a TV licence, hence the importance and control of this resource in the budgetary balance for these media.

When the TV licence does exist, it is necessary to calmly assess its level, the revenue it is based on, the means used to collect it, collection costs and the difference between the amount that would logically be collected and that actually collected, lastly the sharing of funds between television and radio.

The pay-TV channel offer

How many people subscribe to pay-TV networks, cable networks, terrestrial networks including MMDS, satellite offers (pay-TV channels as well as possibly, packages available without subscription), their penetration rate, the cost of a monthly subscription, the type of offer available and their content.

This data can help not only to better position the DTT offer but also to assess the pertinence of offering pay-TV channels on DTT, and for these, to assess their general economic situation. If there are informal pay-TV networks, they must be estimated.

The conditions for broadcasting licences, granted (terrestrial, cable, satellite) and their duration. The duration of the concession granted, its status (pay-TV or free), imposed obligations and publisher compliance with these obligations, will be key elements in the negotiations to be held between the state or the regulatory body and the existing channels.

This analysis is necessary when the state has planned to streamline the national TV industry by incorporating channels or existing commercial packages into the future DTT offer.

30.2 The knowledge and monitoring of the nation’s economic data

On top of demographic data and the data on equipment, it is important to know about the nation’s economic situation to assess its development potential. This data is important to determine potential revenue for future channels as well as the funding methods possible for the transition to all digital.

Data to be monitored includes (without being limited to).

The GDP/inhabitant and how it is shaping up

This data provides the economic index of the country and potential development can be determined by how it is changing.

The median income of households

This data must be rounded off with the evaluation of household income from the grey economy. The resulting amount helps to assess the capacity of households to purchase their equipment or sign up for pay-TV channels.
31. ANALYSIS OF THE TELECOM SECTOR

31.1 Telecommunications are a catalyst for economic development and a key player in promoting the digital dividend

Special attention must be paid to the telecoms sector because telecom operators are in a position to make the best offers when putting the digital dividend on the market. The spectrum in itself is of no value. Its value is a result of its rarity (relative according to country) and its many potential uses. The growing number of mobile telephones in Africa has surpassed the operators’ most optimistic forecasts. With more than 620 million mobile connections, Africa has outstripped Latin America and now ranks second worldwide, after Asia, in the number of connections. In the past ten years, the number of mobile connections in Africa grew at an annual average rate of 30% and is expected to reach 735 million by end 2012.

Mobiles have extended coverage by opening up areas without landlines, becoming highly popular. Competition has brought prices down and increased the penetration rate with the offer of more affordable services. Prepaid subscriptions with telephone services currently dominate the market (96%) but the use of data services is constantly rising. Even among poorer populations, the appearance and content of telephones are not mundane, they have become individual identity markers. It is highly probable that the development of mobile telecommunications and Internet, in particular in Africa, is only just taking off.

In Africa: the mobile industry now contributes around US$56 billion to the region’s economy, accounting for 3.5% of total GDP. It is estimated that the mobile ecosystem employs - either directly or indirectly - over 5 million people. The Observatory estimates, however, that significant potential remains untapped: 36% of Africans – in the 25 largest African mobile phone markets – still have no access to mobile phone services. Projections indicate that if a mobile phone penetration rate of 100% was reached, the aggregate GDP for the region could rise by US$35 billion, i.e. an increase of 2% (sources: GSMA - Africa Mobile Observatory).
Direct contribution of mobile telephone operators to GDP in 25 African countries (in 2010)

<table>
<thead>
<tr>
<th>Country</th>
<th>Revenue of mobile operators as % of GDP</th>
<th>Potential increase in GDP if 100% penetration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senegal</td>
<td>6.00%</td>
<td>2.40%</td>
</tr>
<tr>
<td>Ivory Coast</td>
<td>5.70%</td>
<td>0.80%</td>
</tr>
<tr>
<td>Kenya</td>
<td>4.20%</td>
<td>0.80%</td>
</tr>
<tr>
<td>Mali</td>
<td>4.20%</td>
<td>3.30%</td>
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<tr>
<td>DRC.</td>
<td>4.10%</td>
<td>7.50%</td>
</tr>
<tr>
<td>Ghana</td>
<td>3.80%</td>
<td>2.40%</td>
</tr>
<tr>
<td>Bénin*</td>
<td>3.80%</td>
<td>1.60%</td>
</tr>
<tr>
<td>Tanzania</td>
<td>3.70%</td>
<td>5.00%</td>
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<tr>
<td>Zambia</td>
<td>3.70%</td>
<td>5.00%</td>
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<tr>
<td>Nigeria</td>
<td>3.70%</td>
<td>3.30%</td>
</tr>
<tr>
<td>Morocco</td>
<td>3.50%</td>
<td>NA</td>
</tr>
<tr>
<td>South Africa</td>
<td>3.50%</td>
<td>NA</td>
</tr>
<tr>
<td>Cameroon</td>
<td>3.40%</td>
<td>5.00%</td>
</tr>
<tr>
<td>Libya*</td>
<td>2.90%</td>
<td>NA</td>
</tr>
<tr>
<td>Tunisia</td>
<td>2.90%</td>
<td>NA</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>2.70%</td>
<td>5.80%</td>
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<tr>
<td>Uganda</td>
<td>2.70%</td>
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<td>Angola</td>
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<td>Egypt</td>
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<td>Mozambique</td>
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<tr>
<td>Madagascar</td>
<td>2.10%</td>
<td>6.70%</td>
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<tr>
<td>Algeria</td>
<td>1.90%</td>
<td>0.80%</td>
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<tr>
<td>Ethiopia</td>
<td>0.70%</td>
<td>7.50%</td>
</tr>
<tr>
<td>Sudan</td>
<td>0.70%</td>
<td>4.10%</td>
</tr>
</tbody>
</table>

*Extrapolated revenue
NA (not applicable) designates the countries where the penetration rate exceeds 100% and where it is not possible to calculate a potential increase against the GDP

The mobile telephone industry in the emerging countries and developing countries is a catalyst for economic development in many sectors and has especially fostered the emergence of an industry in mobile services that’s one of its kind (promotion of agriculture, civil status, wiring funds and banking operations, education, healthcare etc.).

Great needs for frequencies

Internet on mobiles and the deployment of broadband networks (3G and 4G) represent a new growth opportunity for all established operators, which can put forward new services, from the basic high-speed Internet mobile access through to premium services and even content. To perpetuate this growth, the mobile telephone industry thus requires more frequencies in bands appropriate for the development of mobile services with a high bit rate.

The allocation of the digital dividend to mobile telephone services can help this industry step up its efforts to provide information in all the regions, improving the capillarisation of wired Internet connections.

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31.2 Issues holding progress back

While creating the digital dividend is a key element in the future of the telecommunications industry, mobile Internet throws up several challenges for operators.

The ongoing drop in ARPU (Average Revenue Per Unit)

Right when they need to invest in a new network - hence an opportunity, even the necessity, of sharing the network and high points among various telecom and audiovisual operators - operators have to deal with the fact that ARPU is falling.

It has halved since 2005 in Africa. This trend is turning however, with the increase in data consumption. The growth in turnover for mobile operators catering to the general public is mostly due to the growth in penetration rate (and for the highest achievers, the growth of their relative market share). Behind these figures, situations can differ widely from one country to another, even within a country, from one operator to another.

New usage

In order to develop, the market requires encouragement with the creation and development of new usage adapted to each sub-regional market. This new usage consumes a lot of energy. Recharging batteries is another issue in countries where access to electricity is expensive and sometimes difficult.
The economic model and the cost of terminals
Increasing use of large mobile bands – the dividend’s main attraction - requires stations on which to browse on Internet (PCs with 3G, tablets, Smartphones etc.) which, when sold without a subscription, are still very expensive. In Europe, the cost of buying a terminal is mostly bundled in with the cost and duration of the subscription. This economic model is in contradiction with the current consumption mode in many countries, relying on a system of prepaid cards and low cost handsets. The operators will have to invent a new economic model, or even agree with equipment manufacturers on a system to transfer value.

→ 31.3 Telecoms data to monitor and know about
Despite these issues, making full use of the dividend will mostly depend on the drive of telecom operators in the country. It is thus important to know the main data relating to the industry (non-exhaustive list):

→ The penetration rate for mobile telephones in the country
This rate is a good indicator of potential development. Low rates can mean greater development potential but can also point to greater economic difficulties. Gross rates must be considered relative to their evolution over time and in particular over the most recent quarters.

→ Market players/operators and their respective market shares
For an idea of the potential purchasers of freed-up frequencies and whether there is room for a newcomer on the national market.

→ ARPU for mobile telephones
This data must be known overall for the country as a whole, and if possible by operator.

Point of strategic interest
This data changes over time. In the absence of an observatory to collect the necessary information and share it among all stakeholders, one ought to be set up. This would further facilitate the Operations Steering Committee’s remit.

32. PROJECT VARIABLES TO BE DEFINED PRIOR TO IMPLEMENTATION

Costs inherent in the transition to digital vary from one country to another and according to the political aims decided by the authorities. These variables must be determined in advance.

→ 32.1 Fundamental variables

Expected digital terrestrial TV industry:
→ Number of national state-owned / commercial channels
→ Number of local state-owned / commercial channels
→ SD / HD specification for each
→ Number of channels using local switchovers
→ Free / pay-TV channels

NB :
→ The expected digital channels will take into account the channels in DTT packages and/or existing MMDS and networks used (location, characteristics etc.)
→ To broadcast a pay-DTT package, an encrypting system needs to be integrated into the signal.

Choice of standard and other technical characteristics:
The broadcasting standard chosen (DVB-T/ MPEG 4 or DVB-T2 / MPEG 4) directly impacts the number of programmes carried on the same frequency, thus on the number of multiplexes to be created, and on the price of equipment for viewers.

Apart from the choice of definition (channels in SD or in HD), the number of programmes available with multiplex also hinges on others factors such as Forward Error Correction (FEC) data to protect the signal, the existence of related services and an update channel for decoders (highly recommended), not forgetting reception issues (Outdoor, Portable, Indoor and Mobile). The combination of these choices will ultimately define the channel’s useful throughput.

According to the aims and reception conditions which can prove tricky, we can estimate a useful bit rate per channel of 24 Mbits in DVB-T and 32 Mbits in DVB-T2.

The price of DVBT2 – MPEG 4 adaptors is still high. These prices will drop provided manufacturers have a potential market that is continent-wide and rather than nationwide. Inter-state coordination is crucial for this point.

Point of strategic interest
Knowledge of the existing and expected TV industries at the time of the transition will be useful to determine the number of necessary multiplexes, in light of the technology chosen and aims regarding reception.
Coverage aims
There are two coverage rates focussing on population and territory. Defining these two figures, which are different and complementary, is crucial to evaluate the cost of building the network.

Target territory coverage is the percentage of territory that the government wants covered by the digital terrestrial network. This aim will vary greatly from one country to another, according to its surface area, topography and of course financial means. NB: the last pockets of territory covered are by far the most costly. The most complex regions (mountains for example) require a great number of transmitters. Each transmitter covers a given surface according to its power and allocated broadcasting size. The addition of all these surfaces gives the total coverage.

Target population coverage is more or less easy to achieve, according to the population spread and in particular the number of major urban centres. In cities, a single high-power transmitter mostly suffices to cover a great number of homes. To curb the digital divide, as well as take into account the ensuing heavy financial stakes, the legislative and regulatory bodies can set nationwide target population coverage and other regional targets, as was the case in France.

Points of strategic importance

Coverage aims determine the configurations for transmitter networks (high-power transmitters covering a large surface, lower-power transmitters).

These aims need to be defined to determine the cost of building the network.

They are defined according to the territorial planning policy (aiming to open up rural regions etc.).

32.2 Other variables
Sharing commercial and state networks
Actual sharing proportions need to be realistic, according to where equipment is set up and how well various setups complement each other. Arrangements must be made well in advance with the site owners.

Target reception (indoor, mobile, portable and outdoor)
The number of programmes on a multiplex varies according to the chosen service quality. Indoor, mobile and portable reception all require greater power given the defects and difficulties in antenna reception, which inevitably leads to a compromise in strength/ useful bit rate.

The choice of network (exclusively terrestrial or combination of terrestrial and satellite)
Networks associating terrestrial broadcasting and DTH (Direct To Home) satellite broadcasting involve satellite costs. Mixed networks (terrestrial and DTH for sparse, remote populations) reduce initial investment outlays in the network but increase viewer equipment costs. Digital decoders for satellites are more costly than the DTT adaptors, however this choice can have significant financial impact for the state, when a policy to partially subsidise this equipment has been adopted.

The frequency band used and whether to simulcast
As a matter of principle, VHF networks require fewer transmitters and at equal power, a VHF antenna boasts greater coverage than a UHF antenna. This can bring the network cost down. However this needs to be examined in light of local conditions. Digital broadcasting on VHF can make simulcast impossible. This is nevertheless the safest solution for the state since it ensures a smooth transition. Simulcast is expensive for TV channels. They need to broadcast everything in both analogue and digital, which is obviously reflected in their operation statement.

The level of security needed
The level of security required for the signal can have a major impact on the budget: redundant equipment, ensuring a reliable electricity supply. Engineers and technicians want it to be reliable and this is perfectly understandable. This need must be assessed in view of risks as well as the extra costs generated.

33. THE COST OF THE TRANSITION TO DIGITAL
There are several types of cost. They include the points listed below.

33.1 Management and operating costs
Transition committee
Operating costs can be absorbed by the participating entities or on the contrary integrated in the cost of the transition. In the latter case, it is necessary to take into account and assess expenses related to staff, premises, travel, studies etc.

Operations Steering Committee
Running costs for the Operations Steering Committee are included in transition costs. They take into account expenses related to staff, premises, travel, studies etc. They must be proportional to the duration of the transition process, and include funds for Committee operations to continue for some months once the analogue signal has been switched off for good. Past experiences of countries switching over to digital have shown that there are still issues up to six or nine months after the switching off of analogue transmitters. To keep costs to a minimum, the Steering Committee can be downsized towards the end of the process.
Team size can vary from one country to another. Some countries will wish to outsource services as much as possible and diversify their service providers, resulting in a small but highly qualified operational team to coordinate the players, or on the contrary, conduct a certain number of tasks in-house. Whatever the policy chosen, Steering Committees are geared around a few main points: marketing / communication; technical issues; operations (regional implementation, liaising with other players); functional matters (finances, legal and administrative matters etc.).

Regional representation offices
The government may consider that it is necessary to have local representation offices during regional switchover. This incurs costs (payroll for the representative and team workers, offices, travelling expenses etc.) but for a short time, generally only a few months. NB: In the absence of local representation offices, it is wise to factor higher travelling expenses into the Operations Steering Committee’s budget.

Training players
The switch to digital is a revolution in usage and working habits for a great number of players who must acquaint themselves with these new technologies. Managers working for publishers, government offices, professionals in the sector and broadcasting companies must all plan staff training. Experience of countries having recently switched to DTT shows that training is often needed over a period of several months.

Studies and technical assistance
These assignments can be included in the expert assignments described above or included as a specific batch of equipment markets to be placed.

Creating or contributing to the funding of an observatory
An observatory to monitor economic developments, data on equipment, and people’s grasp and opinion of news of the switchover would be a great tool to monitor the transition and steering process. If an economic observatory does already exist, it may simply need rounding off with some additional monitoring data. If there is no such thing, the observatory needs to be set up: this supposes a greater investment outlay. The cost should not be allocated solely to the transition process. The observatory could perfectly well monitor other similar economic sectors, such as telecom.

33.3 Technical costs

Cost of modifying the spectrum
The transition to digital can require partial modification of the spectrum. If this is the case, these modifications generate costs: costs of studies (calculations and new plans); technical costs (work to be conducted on the transmitters); costs related to communication and supporting inhabitants. Several players may bear these costs: the state, local authorities, the state television service, publishers of analogue television services and new DTT publishers.

For example in France, the government decreed that the cost of modifying the frequencies would be spread among all publishers of services with a DTT authorisation.

Cost of building or adapting the network (capital expenditure network CAPEX)
Deployment of the network infrastructure is one of the main investment needs and can cost up to several million euros. This will depend on the options taken by the state, as explained in sections 32-1 and 32-2. The costs of building or adapting the network are investments (CAPEX) that only yield returns several years later (generally 15 years for heavy infrastructure, 5 to 10 for lighter equipment).

Network maintenance costs (capital expenditure network maintenance CAPEX)
Too often neglected, network maintenance costs must be budgeted for by the broadcasting companies in their business plans, and the publishers of services, since maintenance costs are included in services to be invoiced in turn to the clients of broadcasting companies.

The investments necessary to network maintenance can cost up to 6 to 8% of the initial investment. These percentages are given as averages over time, since investments for maintenance are obviously not linear. Some years they can be very low. When the network is first launched, they can represent 15% of the investment initial, the next year it might be down to 2%.

It is however vital to include CAPEX for maintenance in the business plan and switchover costs.
Operating expenses - network OPEX
The costs of operating the network (network OPEX) have to be added to maintenance CAPEX. These costs cover network management, minor maintenance and equipment, the purchasing and renewal of licences, electricity, payroll etc. Analogue network OPEX were not necessarily identified, in that broadcasting and publishing were closely connected. The “network OPEX” budget line was in some cases practically non-existent. It needs to be integrated: network OPEX represents an annual average of around 30% of the initial investment.

Cost of monitoring the spectrum
The installation of a new DTT network can require the setup of teams, at a Frequency Agency if there is one, specialising in monitoring the spectrum, if this service did not previously exist. The spectrum is to be monitored once the building of the network has started. The team intervenes in the event of dysfunctioning and disputes.

33.4 Communication costs
The success of the transition to digital can be measured via viewer satisfaction and whether the transition occurs without any significant hitches. The quality of communication to the various players, from the general public to professionals and local elected representatives, is a key element for success. This can never be repeated enough: the main issue in the transition to digital is not technical, it is societal. Communication is therefore a major issue.

To calculate the communication budget, some recommend applying an average cost per inhabitant or household. This approach is simplistic and can engender huge errors of appreciation. The cost of creating a campaign will be the same, whether it is for 3 million inhabitants or 30 million.

To calculate communication costs, a “bottom-up” approach is preferable, i.e., assessing the cost of each tool suggested and adding the costs of the tool mix chosen. Costs to be assessed and taken into account include the points listed below.

Agency fees
These fees can be calculated as a flat rate or per month. The amount will depend on the agency’s reputation and exactly what it is asked to do. When signing the contract it is crucial to check what is covered and what is not (Monitoring exclusively? Creation? PR? Media consulting? etc.).

It is possible to work with a single Agency capable of handling all lines of business or on the contrary work with several agencies specialising in each line of business.

Working with a single agency, or just a few, helps optimise communication tools and simplify coordination. The team on the Operations Steering Committee can be smaller. On the other hand, the choice and quality of the Agency selected is of the utmost importance. This is the organisation which was chosen in France. The UK opted for different agencies for different lines of business or on the contrary work with several agencies specialising in each line of business. This approach involved more complex coordination however other countries have followed suit.

Evaluation of a budget line for creation and technical advertising expenses
This can be calculated based on average costs, even if in advertising, the notion of average costs doesn’t mean much. Prices depend in fact on the choice of director, actors, screenplay complexity and handling (graphics, shooting locations, use of 3D etc.).

However this approach can result in a realistic total cost, which can be considered to be the ceiling cost. Some key points:

→ Average cost of creation and shooting of a TV spot X number of spots
→ Average cost of creation and recording of a radio spot X number of spots
→ Average cost of creation and shooting of a press announcement or poster X number of creations; Average cost of other creations imagined X number wanted

Advertising space purchasing budget
The campaign has been designed but it won’t have any impact unless it is broadcast. The advertising space purchasing budget will depend on the number, and quality, of carriers and media selected. It is however possible to slash this budget by requesting free space on some carriers, in particular TV and Radio, the future of which hinges directly on a successful transition to digital.

Negotiations are crucial and must be conducted with state and commercial media well in advance. Choice of carrier can also depend on the negotiation rate obtained.

In addition to free slots, it is however necessary to assess the average budget of various types of inserts: average price of a wave on TV, radio or billboards for a set duration (15 days for example), the average budget of a full page in the press etc. multiplied by the number of waves or inserts planned.

The evaluation of these costs taken individually will no doubt be wrong but the sum of these amounts should give an idea of an estimated advertising space purchasing budget.

Press relations
Press relations can be integrated or outsourced. Aside from any fees if the services are outsourced, technical expenses related to publication (brochures, files etc.) and expenses in connection with organising events (shows, conferences, visits to transmitters etc.) can be planned.

Assessment of the “PR technical expenses” budget is similar in principle to that used to assess the technical expenses for advertising creation (evaluation of an average budget for events, multiplied by the number of times these events are repeated).

Editorial content
This mainly involves production costs of TV programmes, radio or other carriers. Their design can be handled directly by the local media (especially state media) which will bear the costs of broadcasting it, otherwise it can be funded by the Operations Steering Committee. In this case, they will be produced by the communication agency, an independent producer or the production department of the state radio or channel. In the event of commercial competitors, the programmes produced must be neutral, i.e. they must not bear the “state radio and TV programme” logo. The commercial media could then quite rightly refuse to broadcast it. The broadcasting of these educational programmes explaining the transition to all digital does not require the purchasing of space. Their content is informative rather than advertising.

The cost of producing these programmes varies according to their duration and how it is depicted and staged. Before launching production, it is preferable to ensure that they will be broadcast.
Publishing
Publishing costs include the costs related to creating and writing brochures and documents (targeting the general public, professionals or elected representatives) as well as printing costs. Printing costs are always difficult to assess, since they are not proportional to the volumes printed and depend on the machinery, paper and formats used. Low print-runs are always more expensive per unit given the make-ready costs. To avoid too great error margins during assessment, it can be useful to refer to the costs of recent prints, ordered by Ministries or other bodies, for documents with a similar number of pages or run size.

Call centres
The costs of a call centre are usually broken down into three main categories: setup (creating the technical infrastructure to meet needs, drafting scripts, integrating these scripts into the tool), training the call centre agents and handling the calls.

A light technical infrastructure is sufficient for generic answers. If the answers are to be given according to location, the technical infrastructure to be set up will be more complex and costly. It implies the indexing of databases to be created. The investment outlay is not necessarily justified.

Training periods for call centre agents are crucial. As ambassadors for the switchover to viewers, they set the tone and project a positive or negative image of the transition. The duration of the training session depends on how complex the script is.

The cost of handling calls generally depends on the duration of the call. For information, the average duration of calls in France was four minutes. Forecasting the number of is tricky. Experience shows that the rate of calls fluctuates from one country to another, and from one region to another.

For example, 9.8% of homes in Polynesia contacted the call centre, in less than a year, between the arrival of DTT and analogue switch-off. This percentage dropped to 7.6% in New Caledonia, 3.5% in Guadeloupe and Martinique, 2.8% in La Réunion and 0.5% in Mayotte. The percentage of homes in mainland France having used the call centre varied from 4.7% in Alsace to 9.7% on the French Riviera.

If a low number of calls can be expected, these calls can be handled within the Operations Steering Committee.

In addition to the results of an observatory and a fortiiori, when this observatory does not exist, these calls can be analysed, listened to and monitored for an indication of market trends: difficulties encountered, approval, rate at which people are acquiring equipment. These calls can be used to collate feedback, indispensable to monitor the process.

Website
The creation of a website involves investments in design, development and hosting. The level of investments will factor in the Internet penetration rate among target populations.

It is preferable to use open technologies, which cost less and enable easy updating. Hosting costs vary according to the necessary bit rate. Simple interfaces will be preferred to limit loading times and take bit rate and access issues into account.

In-the-field team
The in-the-field team involves recruiting and training in-the-field teams to visit the territory. The cost depends on the scale. In France, the in-the-field team accounted for nearly 25% of overall communication costs.

The in-the-field team mainly involved a human presence. It is not surprising that the first budget item is the payroll, hiring and training costs.

The second item is equipment provided for these digital ambassadors (for example trucks, uniforms in campaign colours, brochures, exhibition equipment, goodies etc.)

The third item is travelling expenses since the teams visited the entire territory.

The in-the-field teams involve a great number of persons and events. It is wise to outsource this service and plan for management fees to pay for the services rendered.

To cut recruitment and staff costs, there is also the possibility of relying on a network of volunteers, who must be trained. The availability of this “labour force” cannot be guaranteed since they are not paid, but their contribution can be decisive. For example, 43,000 volunteers were trained in France. For a minimal cost, their action doubled the number of events in the field.

Scrolling messages
The use of scrolling messages involves the purchase of keyers to be installed at the foot of analogue transmitters. The number of keyers required depends on the number of transmitters. If the switch-off is to take place gradually, one patch at a time, the keyers can be moved from one patch to another. Furthermore, a keyer placed on a main transmitter can transmit the message to the power relays hooked up to this main transmitter.

These two factors can cut the cost of the necessary investment.

33.5 Support costs
The most underprivileged populations may have difficulties paying for their adaptor (decoder), the cost of which will depend on the standard chosen and method of distribution. States can decide to set up a fund or a benefit system to subsidise decoders and adaptors.

The amount allocated to this fund can significantly impact the cost of the transition.

When subsidies are targeted (for example, distribution of vouchers to homes meeting certain criteria) there are fewer individual benefits but management costs can prove complex and costly. Non targeted subsidies (for example, VAT breaks or reductions for the duration of the transition on entry-level adaptors) are more general in scope. They involve higher volumes but fewer management costs.

To assess support costs, it is possible to take a value corresponding to the reduction in VAT or the value of the voucher plus related management costs, and multiply it by the number of households involved.

The state can weight its subsidy policy with variations in value and/or the number of households involved.
33.6 Others costs inherent in the switch to digital

- Adapting production equipment (studios, equipment etc.) for state televisions and radios, to be financed at least partially by the state
- Simulcasting costs
- Additional production costs

34. FUNDING THE DIGITAL ACTION PLAN (DAP): POSSIBLE REVENUE

34.1 The transfer of audiovisual licences to channels
The terrestrial resource falls within the public domain of each state.

This public resource can be used free of charge to foster freedom of communication and the freedom of access for all to the various modes of communication. This freedom can be offset with obligations for the channel involving contributions to production. This is the case in France.

The state can otherwise elect to allow the use of the public resource subject to the payment of a TV licence, as for example in Belgium, Canada and Switzerland. In these countries, licenses are paid on an annual basis. In Switzerland, for example, the annual TV licence fee must not exceed 1% of gross advertising and sponsorship income. The Swiss Federal Council sets the amount for the TV licence as well as a franchise.

Moreover, requiring the payment of a TV licence for the use of the radio spectrum does not rule out the possibility for the state of imposing obligations in terms of investments in production (for example in Belgium).

Point of strategic interest
Revenue from the sale of licences could contribute to the cost of the transition to digital. Annual levying of these licences would ensure regular, lasting and stable income.

34.2 The introduction of a TV licence or the overhauling of collection methods
In Europe, TV licence fees to finance state-owned audiovisual firms vary greatly from one country to another (€129 in France, €215 in Germany, €220 in Switzerland for a TV set or €346 for a TV set and a radio, €180 in the UK). The TV licence is the only source of revenue for some public firms, others draw income from both TV licences and advertising revenue. The TV licence and its continuity are stabilising factors which encourage the development of media. TV licences do not exist in all countries. In this case it might be useful to envisage its introduction. When they do exist, the amount can be revised, the scope extended and collection method reviewed, with a view to optimising and continuing revenue.

34.3 Taxes on imports of potential TV receivers
A specific tax on imports of all TV receivers can be envisaged to finance the building of the network.

34.4 Taxes on the turnover of telecommunications operators
Some countries levy taxes on the turnover of telecom operators, as an annual fee to use the spectrum and management costs. Other countries levy specific additional taxes to finance the audiovisual sector. These funds can represent considerable sums, part of which could contribute to financing the transition to all digital.

34.5 Value added tax
The launch of DTT automatically spurs the purchasing of TV sets, thus increasing VAT revenue for the state, all the more if the difference in price between a simple adaptor and a new TV set is low. In France the VAT generated by the renewal of TV sets prompted by the transition to all digital covered all state expenditure over a 3-year period.

34.6 Leveraging high points
High points can be used to set up and broadcast new services: telecom services (3G and 4G), transmission of data from other ministries, e-economy services etc. Broadcasting companies can find other sources of revenue than audiovisual players.

34.7 Leveraging the dividend
Funds obtained by leveraging the digital dividend can contribute to financing the switchover.
B. THE DIGITAL DIVIDEND

35. CREATING THE DIGITAL DIVIDEND

The publication of a new frequency plan, including frequency modifications made possible with the switch-off of analogue TV and the development of digital, allows for the allocation of unused frequency bands, especially in 800 Mhz. This is the digital dividend.

The right to use these frequencies, for a given period, can be sold by the public authorities. This enables the monetisation of the digital dividend. Some these frequencies can be reserved by the state for its own needs or public services (emergencies etc.).

In Africa there will be a double digital dividend, first on 800 Mhz (790-862 Mhz) then as from 2015 – 2016 on 700 Mhz (698-780 Mhz).

An example of the digital dividend in Europe (source: ITU)

Suggested digital dividend for ITU Region 3 (source: APT)
## Digital dividend in some countries (source: ITU)

<table>
<thead>
<tr>
<th>Country</th>
<th>National situation</th>
</tr>
</thead>
</table>
| Australia | → Analogue TV switch-off in 2013  
           → 694 – 820 MHz allocated to mobile broadband services  
           → Auction of licenses in 2012 |
| Finland | → Analogue TV switch-off in 2007  
          → 790 – 862 MHz allocated to mobile broadband services  
          → Agreement with Russia on protection of Aeronautical Radionavigation services from mobile services in the band 790 – 862 MHz in December 2010  
          → Re-allocation of PMSE services to 700 MHz band |
| France | → Analogue TV switch-off finalized on 30 November 2011 in Metropolitan France and overseas territories  
          → 790 – 862 MHz allocated to mobile broadband services  
          → Migration of broadcasting and military from 790 – 862 MHz  
          → Auction of licenses in December 2011 |
| Germany | → Analogue TV switch-off in 2008  
          → 790 – 862 MHz allocated to mobile broadband services  
          → Migration of broadcasting from 790 – 862 MHz  
          → Auction of licenses in December 2010 |
| India | → Analogue TV switch-off in 2015  
          → 698 - 806 MHz allocated to mobile broadband services |
| Japan | → Analogue TV switch-off in 2011  
          → 710 – 780 MHz allocated to mobile broadband services |
| Korea | → Analogue TV switch-off in 2012  
          → 698 - 806 MHz allocated to mobile broadband services  
          → Frequency plan for 698 – 806 MHz to be developed |
| Spain | → Analogue TV switch-off in 2010  
          → 790 – 862 MHz allocated to mobile broadband services  
          → Migration of broadcasting from 790 – 862 MHz  
          → Auction of licenses in July 2011 |
| Sweden | → Analogue TV switch-off in 2007  
          → 790 – 862 MHz allocated to mobile broadband services  
          → Migration of broadcasting from 790 – 862 MHz  
          → Auction of licenses in February 2011 |
| UK | → Analogue TV switch-off in 2012  
          → 790 – 862 MHz allocated to mobile broadband services  
          → Migration of broadcasting from 790 – 862 MHz  
          → Auction of licenses planned in 2012 |
| USA | → Analogue TV switch-off in 2009  
          → 698 - 806 MHz allocated to mobile broadband services, mobile TV and public safety services  
          → Auction of licenses in 2008 and before |
36. POTENTIAL DIGITAL DIVIDEND CLIENTS

Only commercial services can justify the purchasing of the right to use these frequencies. The ones mentioned most often: the setup of 3G and 4G mobile networks, one or several new telecommunications operators, specific mobile Internet networks, new mobility services (like ITS, Intelligent Transport Service or “Internet of Things”).

A pay-TV operator might be interested, but it would have trouble bidding over telecom operators, which explains why the terrestrial pay-TV channels must be handled separately as part of the digital TV offer.

37. LEVERAGING FREQUENCIES IN THE DIGITAL DIVIDEND

The economic theory underpinning this evaluation, as studied in various countries having put the digital dividend up for sale, is that of social welfare as consumer surplus plus producer surplus and positive market externalities induced by mobile services.

→ The first part is in connection with the surplus of the franchised operator’s profits, compared to the previous situation. This is what can be monetised in the system to allocate the digital dividend.

→ The second is the value the consumer gains when using these new services between their cost and what the consumer is prepared to pay for the services. This cannot be monetised directly in the allocation process, but is indirectly by the VAT it generates (for the state) and the operator’s turnover (which justifies the risk taken at the time of allocation).

→ The third corresponds to the overall profits derived from the use of mobile services: a more effective economy (a drop in transaction costs) and the creation of new jobs.

The theoretical studies show that the three parts grow in value: from the state’s viewpoint, the sale of frequencies is but the smallest macro-economic part of profits in the process.

38. MONETISING THE DIGITAL DIVIDEND FOR THE STATE

39. DETERMINING THE RESERVE PRICE

Prior assessment methods (a cost per Mhz for 10 to 15 years) have generally underestimated the final price reached during the auction. These are conducted by the operators which have their own vision of the market and factor developments in.

There are two useful methods to determine the reserve price:
1. Based on the results of auctions in European countries corrected for the difference in population of the relevant countries, purchasing power parity, the size of the informal economy, technological and social trends etc.
2. Based on the results of auctions in European countries corrected for the difference in population of the relevant countries, ARPU (average revenue per user) and technological and social trends. ARPU in France 2011: €24.1; ARPU in Africa 2011: €4 to 8 depending on the country (for example Chad 2011: USD 4.96, according to a Clarity survey). NB: ARPU drops as new layers of the population acquire equipment. When over 50% of the population own the equipment, ARPU stabilises at an estimated €4 minimum. Its future growth depends on data use (15% of ARPU in South Africa). Each nation must adapt this data to its own case.

In Africa:
1. The informal economy has been evaluated at 60% of the GDP. This economy relies heavily on mobile telephones, it is thus the main client in the economy. Given the payment of VAT and communications taxes, mobile telephones can be considered as a means of partially re-integrating this informal economy in the fiscal circuit. The system based on purchasing power parity must thus be corrected by a minimum factor of 1/0.6 i.e. 1.67.

2. In countries where mobile phone ownership is equal to or above 50% (average rate in Africa), the ARPU method seems the most reliable since ARPU includes the grey economy.
40. THE FREQUENCY ALLOCATION PROCESS

Based on the experience of countries having applied this process, competitive bidding appears to be the most effective system (rather than something in the form of a beauty competition). It can reassure the sponsor as to the transparent nature of the process, and can be held along the following lines:

- Public consultation of authorities on the digital dividend: who is interested, which frequency band, what they want to do with it etc.
- Report on the consultation and definition of frequency bands up for auction: by batch, guardband, duplex or not, complementarity with 2.6GHz, whether or not mobile virtual network operators (MVNOs) are to be included, coverage deadline etc. At this stage it may be wise not to put the entire dividend up for auction, but to organise rarity, thus obliging franchised operators to optimise their networks, and compete in a second process some years later, with a reserve price being that of the MHz sold in the initial allocation.
- Auction: using a public Internet system for a series of rounds so that bidders can maximise their offers.
- Allocation, payment: The payment can be made annually (rather than all at once), in this case it can be wise to index-link it partly to the franchised operator’s actual turnover (variable).

41. METHODS TO EVALUATE THE DIGITAL DIVIDEND

Evaluating the digital dividend is risky and difficult.

The expected value of the digital dividend can depend on the following factors:

- **The duration of the franchise granted**
  A long duration means security for investments and operators’ business, however it can obliterate the creation of future resources in connection with the emergence of new services and technologies.

- **The type of dividend or frequency band put up for sale**
  The so-called “golden frequencies” are obviously more expensive than the others with lower penetration and involve higher network deployment costs.

- **The number of MHz granted**
  Or bandwidth granted.

- **The size of the population**
  Frequency value is linked to the potential of the market it caters to.

- **Mobile penetration rate**
  Mobile penetration rate is a good indicator for potential development. A low penetration rate portends a high a development potential. On the contrary, a strong penetration rate is indicative of a more mature market with development potential on a par with data consumption and renewal of TV sets.

42. USE OF THE DIGITAL DIVIDEND FOR THE TRANSITION PLAN

Legislation can require part of the dividend, or all of the first digital dividend, to be allocated to financing the transition to digital, thus mostly to investments financed either by the state, or by international donors. This percentage can be allocated for a period of 10 years, which – especially in the case of a 15-year licence – can allow for the acceleration or slowing down of the deployment programme according to the annual flows.

- **Average ARPU**
  ARPU is tending to drop. The new services are expected to help boost it again.

- **The nation’s development potential (dynamic factor)**
  The development potential of a country as seen by the operator can boost their hopes for sales and turnover growth, thus on its faculty to outbid to obtain an operating licence. This “dynamic factor” can for example hinge on the nation’s growth rate extrapolated from the duration of the licence.

- **The country risk rate**
  The country risk rate can be drawn from the rates used by international financing bodies (World Bank, COFACE etc.). Risk evaluation by the investor can limit the funds it is likely to commit.
Points of strategic importance

→ A transparent process secured by legislation will maximise results.
→ Licence duration can be set at up to 10 or 15 years.
→ Auctions can be held in several dozen rounds, and must be governed by confidentiality and non-entente clauses.
→ Ongoing innovation in mobile usage in Africa is a key factor for success for the amounts reached in auctions.
→ It can be wise to include a clause index-linking the payment to operator turnover and an annual payment for the dividend.
→ Only auction the bandwidth necessary and especially do not allocate the second digital dividend before 2016-2017.

43. OUTCOME

The study of previous transitions and forecasts for countries currently undergoing the process show that revenue can easily cover the costs, above all if the ensuing effects are taken into account. However international donors, like private banks, can help finance the transition and fill the gap between short-term investment outlays, and returns on investment expected in the long term.

Leveraging the digital dividend can be the tipping point for donor go-ahead, for countries wishing to call on them.
### Examples of digital dividend allocation (source: ITU)

<table>
<thead>
<tr>
<th>Digital Dividend spectrum allocations</th>
<th>USA</th>
<th>Germany</th>
<th>Sweden</th>
<th>Spain</th>
<th>France</th>
<th>Italy</th>
<th>Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency bands considered in the same process</td>
<td>700 MHz (698–787 MHz)</td>
<td>800 MHz, 1.8 GHz, 1.9/2.1 GHz &amp; 2.6 GHz</td>
<td>800 MHz</td>
<td>800 MHz, 900 MHz &amp; 2.6 GHz</td>
<td>800 MHz</td>
<td>800 MHz, 1.8 GHz, 2.0 GHz &amp; 2.6 GHz</td>
<td>800, 900 MHz 1.8 GHz, 2.1 &amp; 2.6 GHz (FDD &amp; TDD)</td>
</tr>
<tr>
<td>Date of licensing decision</td>
<td>1/24/2003-2/3/2012</td>
<td>04/03/2011</td>
<td>17/01/2012</td>
<td>18/05/2011</td>
<td>May 2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>License duration</td>
<td>10 years</td>
<td>15 years</td>
<td>25 years</td>
<td>Until 31 December 2030</td>
<td>20 years</td>
<td>17 years</td>
<td>12-16 years. Until 31.12.2028</td>
</tr>
<tr>
<td>Type of licensing process</td>
<td>Auction</td>
<td>Auction</td>
<td>Auction</td>
<td>Auction</td>
<td>Auction + weighted commitments</td>
<td>Auction</td>
<td>Auction</td>
</tr>
<tr>
<td>Packaging of DD band</td>
<td>Three 2x6 MHz, one 2x11 MHz, and two unpaired 6 MHz blocks = 70 MHz</td>
<td>6x(2x5) MHz = 60 MHz</td>
<td>6x(2x5) MHz = 60 MHz</td>
<td>3 blocs of 2x10 MHz = 60 MHz</td>
<td>6 blocks of 2x5 MHz</td>
<td>Each of the 3 bidders (Orange, Sunrise, Swisscom) won a package of 2 x 10 MHz.</td>
<td></td>
</tr>
<tr>
<td>Amount raised for DD band</td>
<td>$19.1 G (Sum of net bids in auctions 44, 49, 60, 73, and 92)</td>
<td>2054 MSEK (€220 M)</td>
<td>3 operators got two blocks of 2x5 MHz each. For each block of 2x5 MHz: €170 M €221.9 M €230.0 M €226.3 M €228.5 M €228.5 M</td>
<td>3 operators got one block each: €683 M €891 M €1065 M Total €2.639 G</td>
<td>3 operators got 2 blocks each: €978 M €992 M €992 M Total €2.96 G</td>
<td>N/A (During the auction, bidders could bid on different packages consisting of frequency blocks in different bands. Therefore the prices are per package)</td>
<td></td>
</tr>
<tr>
<td>Amount raised/ MHz/population</td>
<td>$0.98</td>
<td>€0.39</td>
<td>€0.48</td>
<td>€0.70</td>
<td>€0.82</td>
<td>N/A</td>
<td></td>
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   34.3 Taxes on imports of potential TV receivers
   34.4 Taxes on the turnover of telecommunications operators
   34.5 Value added tax
   34.6 Leveraging high points
   34.7 Leveraging the dividend
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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADETEF</td>
<td>French international technical assistance agency of the Ministries for the Economy, Budget and Sustainable Development - France</td>
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<tr>
<td>AFD</td>
<td>French Development Agency - France</td>
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<tr>
<td>ANFR</td>
<td>French Frequency Agency - France</td>
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<tr>
<td>ARCEP</td>
<td>French Regulatory Authority for Electronic and Mail Communications - France</td>
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<tr>
<td>ASO</td>
<td>Analogue Switch Off</td>
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<td>ATSC</td>
<td>Advanced Television Systems Committee - US Standard</td>
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<td>AV</td>
<td>Audiovisual</td>
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<td>AVC</td>
<td>Advanced Video Coding</td>
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<td>ADB</td>
<td>African Development Bank</td>
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<tr>
<td>ANFR</td>
<td>French Frequency Agency - France</td>
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<tr>
<td>CDM</td>
<td>Master Control Room</td>
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<td>CDMA</td>
<td>Code Division Multiple Access</td>
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<td>CFI</td>
<td>Canal France International</td>
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<tr>
<td>CSA</td>
<td>French audiovisual regulatory body - France</td>
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<tr>
<td>WRC 12</td>
<td>World Radiocommunications Conference 2012</td>
</tr>
<tr>
<td>dBi</td>
<td>Measurement of the gain using an isotropic antenna</td>
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<td>DRM</td>
<td>Digital Radio Mondiale (digital radio standard)</td>
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<td>DSO</td>
<td>Digital Switch Over</td>
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<td>DVB-C</td>
<td>Digital Video Broadcasting - Cable</td>
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<td>DVB-S</td>
<td>Digital Video Broadcasting - Satellite</td>
</tr>
<tr>
<td>DVB-T</td>
<td>Digital Video Broadcasting - Terrestrial</td>
</tr>
<tr>
<td>FEC</td>
<td>Forward Error Correction</td>
</tr>
<tr>
<td>FEI</td>
<td>France Expertise International</td>
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<tr>
<td>MW</td>
<td>microwave</td>
</tr>
<tr>
<td>FO</td>
<td>fibre optics</td>
</tr>
<tr>
<td>FM</td>
<td>Frequency Modulation</td>
</tr>
<tr>
<td>GEO6</td>
<td>2006 Geneva Agreement</td>
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<tr>
<td>GHz</td>
<td>Gigahertz</td>
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<td>Gov</td>
<td>Government</td>
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<tr>
<td>HD</td>
<td>High Definition</td>
</tr>
<tr>
<td>HEVC</td>
<td>High Efficiency Video Coding or H.265</td>
</tr>
<tr>
<td>HDI</td>
<td>Human Development Index</td>
</tr>
<tr>
<td>ISDBT / SBTVD</td>
<td>Integrated Services Digital Broadcasting - Japanese / Brazilian Standard</td>
</tr>
<tr>
<td>kW</td>
<td>Kilowatt</td>
</tr>
<tr>
<td>Mbit/s</td>
<td>Megabits per second</td>
</tr>
<tr>
<td>MFN</td>
<td>Multiple Frequency Network</td>
</tr>
<tr>
<td>MHz</td>
<td>Megahertz</td>
</tr>
<tr>
<td>MMDS</td>
<td>Multichannel Multipoint Distribution Service</td>
</tr>
<tr>
<td>MPEG</td>
<td>Moving Picture Experts Group</td>
</tr>
<tr>
<td>NTSC</td>
<td>National Television System Committee</td>
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<tr>
<td>PAL</td>
<td>Phase Alternating Line</td>
</tr>
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<td>ATU</td>
<td>African Telecommunications Union</td>
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<tr>
<td>DAP</td>
<td>Digital Action Plan</td>
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<tr>
<td>DTR</td>
<td>Digital Terrestrial Radio</td>
</tr>
<tr>
<td>DTT</td>
<td>Digital Terrestrial Television</td>
</tr>
<tr>
<td>TIC</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>ITU</td>
<td>International Telecommunication Union</td>
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<tr>
<td>LTE</td>
<td>Long Term Evolution</td>
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<tr>
<td>NTC</td>
<td>National Transition Committee</td>
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<tr>
<td>OSC</td>
<td>Operations Steering Committee</td>
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<tr>
<td>OFDM</td>
<td>orthogonal frequency division multiplexing</td>
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<td>SFN</td>
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<td>Wi-Max</td>
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<tr>
<td>dBi</td>
<td>Measurement of the gain using an isotropic antenna</td>
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<td>Digital Radio Mondiale (digital radio standard)</td>
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<td>DSO</td>
<td>Digital Switch Over</td>
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<td>DVB-C</td>
<td>Digital Video Broadcasting - Cable</td>
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<td>Digital Video Broadcasting - Terrestrial</td>
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<td>HEVC</td>
<td>High Efficiency Video Coding or H.265</td>
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<td>ISDBT / SBTVD</td>
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<td>Mbit/s</td>
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<td>MMDS</td>
<td>Multichannel Multipoint Distribution Service</td>
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<td>Moving Picture Experts Group</td>
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CFI, THE FRENCH OPERATOR IN MEDIA COOPERATION

As a subsidiary of France Télévisions funded by the French Ministry for Foreign Affairs, CFI has acted for the past 24 years as the French operator in media development aid for 150 partners in Africa, the Arab World, the Balkans, Caucasus and Asia. Its method: harnessing the expert knowledge and savoir-faire of French media professionals to help modernise the media in these countries, via consulting and training initiatives, audits and research.

As it constitutes an opportunity to give the audiovisual landscape a complete overhaul, switching over to digital TV in Africa is an issue of considerable importance. By means of advisory and coaching missions dealing with both technical and strategic concepts, CFI is providing support for African public authorities to help them tackle and organise this transition effectively.

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ADETEF is the international technical assistance consultant agency and operator for the ministries in charge of Economy and Finance, Industry, Sustainable Development and State Reform. It provides national governments and public authorities with cutting-edge technical expertise from French officials and public sector experts.

ADETEF is a public interest group (GIP) set up by the French government, the French Development Agency, the Caisse des dépôts et consignations, the Institut Mines-Télécom and the Mines ParisTech group.

ADETEF works on public policies in the field of public finance, economic and financial regulation, economic development, digital economy, energy and sustainable development, statistics, public procurement and communication, and human resources development.

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French public authorities having participated in the various document drafting stages and likely to participate in technical assistance initiatives:

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Jean-Bernard Gramunt – DGCIS