Community broadcasting in an all-digital environment: A preliminary assessment of options and challenges

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Introduction

Community broadcasting, owned and managed by civil society organizations and operated for community benefit, is a growing part of the global communications landscape present in over 110 countries and counting in the region of 10,000 stations worldwide. Community radio has been a significant part of the European broadcasting landscape since the early 1980s and is present today in most western European countries and a growing number of central and eastern European countries. Community television is less widespread but is also increasing in numbers as the costs of production and transmission come down and as policy reforms enable establishment. Community broadcasting has gained an important foothold on the major analogue distribution platforms for local broadcasting – FM and AM radio, and UHF television, as well as having a presence on cable platforms in some countries.

The emergence of digital broadcasting systems presents an opportunity for community broadcasting - the transition to digital broadcasting systems is expected to lead to greater spectrum efficiency and a reduction in the need for regulation of the radio spectrum. But it also presents a threat because some current and planned approaches to spectrum management, such as spectrum auctions, tend to disadvantage civil society organizations. Furthermore, some technical options in the digital environment lead to new forms of gatekeeping - digital platform operators - that may not provide assurance of affordable access. In addition, digital broadcasting is currently characterized not by convergence, but rather by a fragmentation of the landscape into a multiplicity of competing technical standards. This has created a highly unpredictable environment for broadcasting development.

The increasingly urgent digital challenge facing the community broadcasting sector is to plan for a future technical environment in which current analogue platforms for radio and television will be obsolete. It is urgent firstly because commitments to "switch off" analogue use of the radio spectrum are becoming embedded in public policy at country level and in international agreements, including within the International Telecommunications Union (ITU). Secondly because there is no established digital platform for community broadcasting, radio or television, that provides adequate flexibility, affordability or market penetration to provide an assured migration route. The "push" to digital, driven mainly by the manufacturers of new digital consumer reception equipment and by governments eager to release a radio spectrum "digital dividend" creates a danger that community broadcasting, having established a foothold in the analogue environment could be marginalized in a digital future. This assessment of the challenge ahead examines new approaches to spectrum planning and management, it describes competing digital systems for television and radio and it provides some initial conclusions with respect to spectrum policies and digital system requirements for community broadcasting.

Spectrum policy

Traditionally the radio frequency spectrum has been allocated by States for a designated purpose, such as television broadcasting or private mobile radio, through a licensing system that allows use of a specified part of the spectrum for an agreed duration and within defined technical parameters. The basis for this "administrative" approach has been that spectrum is scarce and that use of the same part of spectrum in the same location by different users can cause interference between the services. The need for fair access and the avoidance of interference have provided the justification for a system in which

spectrum usage licences are administered through a central regulatory agency.

Licence awards under the administrative approach are generally provided either on a first-come-first-served basis or, in the case where competition exceeds the available spectrum, through some form of selection process or "beauty contest". Spectrum pricing in this approach is usually based on the costs of administration although there has been a trend towards market pricing as governments have recognized the revenue generating potential of spectrum licensing. The system has worked reasonably well where States respect the right to freedom of expression, where they recognise the benefits of a plurality of service providers, where spectrum demand has not been high, and in a planning framework that matches designated spectrum with particular transmission technologies. There is no doubt, however, that most governments have been slow to encourage civil society use of the radio spectrum, such as for community broadcasting, and claims of "spectrum scarcity" have often masked more political motives.

The administrative approach has been brought into question by several new factors including the increasing economic value of the radio frequency spectrum that is highlighted by the growth of mobile telephony, the "digital dividend" of greater spectrum capacity being freed up by new and more efficient digital transmission systems, and a proliferation of new and rapidly evolving technologies that require spectrum access including "spread spectrum" technologies that enable more than one service to operate in the same frequency band without the interference degradation that characterizes analogue use.

There are two distinctly different alternatives to the traditional administrative approach and which reflect different interests. One can be described as the "market-based" approach and the other as the "open spectrum" approach[1]. If the administrative approach is considered to maintain public control in the last instance, the market-based approach is a private ownership model in which market competition replaces the need for regulatory planning. The open spectrum approach is a more radical libertarian model that promises greater freedom of access and privileges particular technologies that assist this.

Under the market-based approach it is argued the creation of a commercial market in spectrum development will produce greater efficiency in spectrum use and thus yield greater economic and other benefits from the available spectrum. This approach has three main components. First, the disposal of spectrum access rights to private service providers on a long term basis through market pricing mechanisms such as auctions. Second, the removal of technical and content restrictions on the privatised spectrum such that access rights are both "technology neutral" – any technically suitable transmission standard can be used – and "service neutral" – with no restriction on the content carried. Third, the permission of "secondary trading" allowing spectrum access rights to be bought and sold like real estate.

In contrast to the market-based approach, the open spectrum approach calls not for privatization of spectrum access rights but for the opening up of radio spectrum to public use without a requirement for the licensing of individual operators. This approach has some parallels with other debates on "global commons" in the Internet environment. It offers two possible mechanisms to replace traditional spectrum licensing. The first is a regulated approach to "licence exemption" in which users of open spectrum have certain obligations - for example to use particular technologies, not to exceed defined power outputs – that are contained in a "class licence" that applies to the whole of the designated open spectrum. The second is to rely on local communal management of the spectrum rather than external regulation, with spectrum users themselves establishing arrangements to coordinate their spectrum use. In practice both of these mechanisms have played a part in the introduction of local WiFi networks, where the open spectrum approach has been most extensively demonstrated especially in the 2.4GHz

[1] There are a variety of terms currently in use but a broad consensus on the three approaches. The European Union uses the terms "traditional administrative", "market-based" and "unlicensed". In the US the FCC has used "command and control model", "exclusive use model" and "commons model".

and 5.8GHz bands. Most countries permit licence exempt use of these bands and this has demonstrably contributed to the growth in mobile Internet connectivity and to connectivity generally in areas with a low level of wired telecommunications infrastructure. Other open spectrum may become available but this is dependent on international negotiations and is not practicable in one country alone.

The three approaches to spectrum management are distinctly different from one another from both a technical and political perspective but they can co-exist within an overall regulatory framework. European Union proposals for spectrum management reform have called for strengthening the use of class licensing whenever possible and, otherwise the introduction of measures to encourage service and technological neutrality in the provision of spectrum usage rights while recognizing that "the administrative model will remain important especially where, on balance, legal certainty and interference management issues are priorities and where public interest objectives are at stake".[2]

The US Federal Communications Commission's Spectrum Policy Task Force Report similarly states: "no single regulatory model can or should be applied to all spectrum"[3]. It proposes that the "exclusive use model" (private ownership) should be applied primarily in bands with high scarcity and low transaction costs and the commons model should be applied primarily in bands with low scarcity and high transaction costs while the traditional administrative approach should be used where it is necessary to accomplish important public interest objectives or treaty obligations. In particular, and subject to longer term review, it states: "Broadcast spectrum should remain subject to the current regulatory model, which is based on statutory public interest objectives"[4].

In summary, while there are strong proponents for each of the new approaches, there is also a broad consensus that spectrum management will be characterised by a mixed approach with no single model appropriate to all communications sectors. Where there are well established and affordable new broadcast transmission standards, as we will see below is the case for digital television, their planned adoption in particular wavebands and the administrative assignment of frequencies may continue to be the most reliable means to meet the public interest in new services and to assure sufficient digital spectrum for the future development of community broadcasting. Broadcasting, because of its social and political importance, might reasoinably be expected to continue, at least in the medium term, to be largely managed through the administrative model. This can no longer, however, be assumed.

Market-based assignment of frequencies is gaining ground as an approach to spectrum management, and this approach is likely, in the future, to include spectrum with potential for broadcast use. Where economic returns and consumer demand justify investment and lead to roll out of new services this may quickly produce new broadcast platforms and services. There will, however, be legitimate public interest concerns that allowing private operators the flexibility to determine which technologies to adopt on the basis of their assessment of the market is a risky strategy vulnerable to speculative acquisition, spectrum hoarding and stifling of competition rather than leading to the faster roll out of potential new services. At best this approach is unproven as a means of achieving public interest objectives. More specifically the privatisation of spectrum, while it may encourage investment in infrastructure, can also tend to encourage rent seeking behaviour that could lead to the exclusion of community and public service usage unless there are specific arrangements for spectrum to be set aside for such purposes or "must carry" rules applied to the private communications platform operators.

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2 European Commission (2006) Communication on the Review of the EU Regulatory Framework for electronic communications networks and services COM(2006)334 final, accessed 17 October 2006 at http://europa.eu.int/information_society/policy/ecomm/doc/info_centre/public_consult/review/com334_en.pdf

3 Spectrum Policy Task Force (2002) Report, ET Docket No 02-135, Federal Communications Commission, accessed 17 October at http://www.fcc.gov/sptf/

4 Ibid.

The open spectrum model, although it has been mainly applied in the wireless Internet environment, may also have relevance to community broadcasting. A portion of spectrum set aside as broadcast "commons" could remove current regulatory burdens and provide a straightforward means for low cost community radio and television services to gain access to a broadcasting platform which would then be self regulatory within defined parameters, for example, having a fixed transmitter power ceiling.

The debate between advocates of privatisation of the function of spectrum allocation, continued public administration of the spectrum and alternative, more libertarian models, is often somewhat ideological in nature. At the same time there is a general, more objective desire to reduce regulatory burdens and to allow flexibility for technical improvements to be brought rapidly into play in the face of a proliferation of competing transmission standards. How, in such circumstances are public interest objectives best achieved and an appropriate balance maintained between public service, community and commercial use? In the following sections we compare the new digital broadcasting technology standards for television and radio and we review their implications for regulation in the public interest.

Digital television – changing channels

Since the mid 1990s there has been rapid growth in digital transmission platforms for television. Digital transmission systems provide substantial improvements in spectrum and channel efficiency since many more services can be accommodated in the same spectrum or channel or, alternatively, capacity can be freed up for other uses. The rapid growth in digital television has been led initially by the conversion of satellite and cable broadcasting from analogue to digital transmission leading to many more channels becoming available to homes served by satellite or cable. From a regulatory perspective this has been a relatively seamless transition since most satellite and cable operators already carried a number of different services. Digitalisation has enabled them to increase the number of services carried. At the same time digital transmission allows for additional functionality such as electronic programme guides and this does create new concerns for regulation in the public interest, in particular to ensure due prominence is given to all programme services rather than preferential treatment to certain services.

The growth of digital satellite and cable services has brought pressure on terrestrial (over the air) television services to also convert to digital platforms in order to be able to compete with the range of services available on digital satellite and cable television and also to be able to provide ancilliary services such as programme related information. At the same time, with the growth of mobile telephony, there has been pressure from mobile telecommunications operators for some of the analogue spectrum currently used by terrestrial television services to be freed up for mobile telephony and other non-broadcast uses. International planning for analogue terrestrial television has required a substantial allocation of spectrum in parts of the radio frequency bands that are now considered very attractive for other uses. In the US, for example, the frequency range for UHF analogue television is from 470 MHz to 810 MHz, some 17 times that allocated for FM radio in spectrum, and ideally suited for mobile telephony and wireless broadband. The development of digital terrestrial television promises to reduce the spectrum requirements for the same number of channels by a factor of five or six. The opportunity for more television channels and/or the release of a "digital dividend" for other uses has been a key driver in the push to "switchover" from analogue to digital television distribution. Governments have been receptive to these demands particularly in view of the high prices mobile telecommunications operators are prepared to pay to gain long term use of prime spectrum allocations.

Satellite and cable television, both analogue and digital, has required a licensing approach that recognizes a difference between the network operator who controls and operates the transmission system and the programme service providers which are carried by the network operator. Regulation in the public interest requires that the network operator provide access on the basis of fair and non-

discriminatory terms and that services of particular public interest, such as public service broadcasters are guaranteed access to the platform ("must carry" rules). Similar arrangements may be needed for digital terrestrial television because digital transmission platforms are generally capable of carrying more than one programme service unlike analogue where one channel carries one programme service

International planning for digital terrestrial television has taken as its starting assumption that it is not feasible to identify a large new area of spectrum for digital television services to commence while continuing to retain the spectrum required for analogue television. Instead it has been concluded that digital services should commence within the existing bands and eventually replace the analogue services after a "switch-off" date[5]. This process of replacing analogue with introducing digital terrestrial television presents a number of regulatory challenges with significant public interest implications:

- There is a need to select the digital transmission standard to be adopted in the face of competing approaches – a common standard brings spectrum efficiency benefits and can assists in promoting consumer uptake
- There is a need to ensure that digital terrestrial television will provide universal coverage or at least equivalent coverage to that currently available on analogue, so that no viewer loses out
- There is a need to actively promoting the uptake of digital television receivers and at the same time to ensure those who can not afford to switch over from analogue to digital are assisted to do so
- There is a need to ensure existing programme providers on analogue are guaranteed a migration route to digital at an affordable cost, either through must carry rules or by becoming a digital platform operator
- There is a need to introduce regulatory procedures to distinguish between the separate roles of digital platform multiplex operator and digital programme service provider

The challenge for governments and regulators has been made more complicated by the fact that there is not a single agreed global standard for digital terrestrial television. Instead there are competing technologies with relative advantages and disadvantages and among which the most important are known by their abbreviations as DVB, ATSC, ISDB and DMB T/H. The most widely adopted of these is DVB[6], the European open standard which has been accepted for exclusive use as the replacement technology for analogue television in Europe, Africa and the Middle East and has also been adopted by Australia, New Zealand, India and several South East Asian countries. ATSC[7] is a US proprietary format which has also been adopted in Canada, Mexico and the Republic of Korea. Japan has developed the ISDB[8] standard which has also been adopted by Brazil. China has approved DMB T/H[9] as a digital television standard for mobile (handheld) receivers as well as fixed reception.

Despite the proliferation of standards most countries have made firm, although not necessarily irreversible, policy decisions to adopt one of the four standards described above for the first generation of digital terrestrial television. Many countries have already adopted a switch off date and have moved into planning how to deploy the "digital dividend" of spectrum to be freed up after analogue switch off. For countries of Europe, Africa and the Middle East the commitment to DVB is now embedded in international agreement in the framework of the International Telecommunications Union[10]. While other standards may gain a foothold in new spectrum released from digital switchover, it is generally agreed in Europe that DVB is the primary replacement technology for terrestrial analogue television, at least for the major public servic and commercial television broadcasters.

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5 ITU (1993) International Telecommunications Union Radio Recommendations - Digital Terrestrial Television Broadcasting in the VHF/UHF Bands (BT.798.1), approved July 1994

6 Digital Video Broadcasting Project, see http://www.dvb.org

7 Advanced Television Systems Committee, see http://www.atsc.org

8 Integrated Services Digital Broadcasting, see http://www.dibeg.org

9 Decision GB 20600-2006 of the Standardisation Administration of China, 18 August 2006

10 Decision of the Regional Radiocommunications Conference 2006 covering ITU Region 1 (Europe, Africa and the Middle East) http://www.itu.int/ITU-R/conferences/rrc/rrc-06/index.asp

For community television broadcasters in Europe, however, the future is by no means yet secured.

First, many of the existing community broadcasters operate on cable systems where channel availability or "must carry" rules have enabled them to gain a foothold. Without "must carry" requirements on the new digital cable systems, community television services on cable face a precarious future despite the increased channel availability. This is because cable operators achieve significant economies of scale by centralised (country level or large region) digital multiplexing of the programme services which inherently tends to favour the carriage of national or large area services rather than local services.

Second, the DVB terrestrial broadcasting system is currently based on each digital television multiplex occupying 8MHz of spectrum, enough to carry six to eight digital television programme services but this is costly and inefficient if only one or two services are to be carried. The digital terrestrial television multiplex operators can achieve significant economies if scale by operating wide area coverage using a "single frequency network" carrying a "bouquet" of six to eight channels. Dropping one of these channels to add in a local service requires costly additional multiplexing and "breaks" the single frequency network such that this part of the signal can't be re-used in neighbouring areas.

The solution could lie in the setting aside part of the broadcasting spectrum for a "cut-down" digital terrestrial television standard occupying 1.5 – 2.0MHz of spectrum, where each local or community television service occupies just enough spectrum for one or two programme services and where the spectrum allocated for local and community services is planned on a cellular basis that would enable at least one operator in each locality. The problem is that no such standard is yet fully established and there is no guarantee that it would be compatible with the current generation of digital consumer sets. As the digital broadcast standards becoming increasingly software-based it may be possible in future for a software upgrade to enable the reception but this is a long way from being a reliable solution. The most promising developments are in the field of mobile multimedia where lower bandwidth multimedia broadcasting standards are under active development and could be appropriate to community media.

Digital sound broadcasting

The digitalization of television has resulted in a proliferation of competing broadcast standards rather than convergence towards a single digital platform. Compared to radio, however, the choice of standards is relatively limited and the selection can be made by country administrations on relatively clear grounds of public and economic cost/benefit. In the case of sound broadcasting, where digital transmission systems have now been tested and developed over a much longer period, the picture has become more, rather than less confusing. First generation digital sound broadcasting is being overtaken by better and more efficient technologies. Countries, firms and consumers that have made an early investment in digital systems are faced with the need to replace increasingly obsolete first generation digital technology. An even greater proliferation of standards is emerging.

The digitalization of radio, just as with television, promises improvement in the technical quality of the service, more efficient use of the spectrum and additional functionality. In contrast to television, however, the adoption of digital platforms by consumers has been slow, even in countries where radio services are widely available on digital platforms. The main reasons appear to be that improvements in the quality of service are not sufficient to persuade listeners to move to digital, the costs of digital receiver equipment are much higher than their analogue equivalent and the digital platforms do not offer a greatly increased choice in the range and diversity of services available to the listener.

Regulators in the sound broadcasting environment are faced, on the one hand, with a relatively slow

adoption of the digital platforms and, on the other hand, with the competing demands of different possible digital transmissions systems all of which need access to radio spectrum if they are to become established. At the same time technical improvements, particular in audio coding technologies, require the digital standards themselves to be sufficiently flexible to be able to evolve over time without the need for expensive consumer equipment to be replaced. The technologies developed, or under development, for digital sound broadcasting fall into six main groups. Three of these have been specifically developed for terrestrial sound broadcasting and are known as DAB, IBOC and DRM. In addition, the digital television technologies DVB and ISDB are being developed to carry sound broadcasting services. None of these systems have yet been widely adopted. Finally there is a group of distinct and non-compatible technologies developed for satellite digital radio (SDR).

DAB is the first generation of digital sound broadcasting, developed by a European consortium[11] in the late 1980s and in some countries, notably the UK, a focus of substantial infrastructure investment and public promotion of the "new" technology. The DAB standard provides only marginal audio quality improvement, its deployment requires new spectrum and for local (as opposed to national) radio services it does not provide significant spectrum efficiency improvements over analogue systems. Improved audio coding technologies underpin an updated version, known as DAB+. In addition a derivative platform that can carry both radio and television has been developed by the Republic of Korea, and is known as DMB[12]. Unfortunately the first generation of DAB receivers are unable to receive DAB+ or DMB and are not software upgradeable so will eventually need to be replaced.

Additional serious concerns with DAB, from a community radio perspective, are similar to those described above for DVB in relation to community television. The DAB platform operates as a "multiplex" in which a single transmission system carries up to ten programme services. The DAB system thus introduces a powerful new gate-keeping role for the DAB multiplex operator while the high transmission infrastructure costs mean that a stand alone service would be unviable, thus excluding many rural, small-scale and community radio services[13]. In practice DAB viability requires for regional, national or large urban area coverage that can sustain this number of programme services. Where DAB has been established, the multiplex operator gains a dominant position in the supply chain which can lead to increased media concentration unless there are measures to ensure fair and affordable access to the DAB platform or guarantees of carriage for services of particular public interest.

IBOC is a general method rather than a specific technical standard. It stands for "In Band On Channel" and it has been the approach of choice for adoption of digital transmission by sound broadcasters in the US. IBOC systems provide a digital signal on the back of an analogue radio channel. The broadcaster is then able to offer both analogue and digital transmission. IBOC is essentially an incremental approach to digitalization with minimal impact on existing regulatory systems or on the range of services available. There are two IBOC systems in operation in the US which are known as HDRadio[14] and FMeXtra[15]. Brazil, Philippines, Thailand and France have also licensed HD Radio broadcast trials. The IBOC method would be more suited to community radio but no European country has made a policy level commitment to enabling IBOC development and the main US standards are proprietary systems with high charges to be paid to the consortia which own and develop these systems.

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11 Developed by the Eureka 147 Project, see http://www.worlddab.org

12 Digital Multimedia Broadcasting, see http://eng.t-dmb.org

13 As early as 1992, a Council of Europe study drew attention to the difficulties the DAB system presents for small area and community broadcasters, see: Gronow, Lannegren and Maren (1992) New technical development in the sound broadcasting sector and their impact on mass media policy, CDMM (92)18, Strasbourg: Council of Europe

14 Developed by the Ibiquity Consortium, see http://www.ibiquity.com

15 Developed by Digital Radio Express, see http://www.dreinc.com

DRM[16] stands for Digital Radio Mondiale, which is the name of both an international consortium and the digital transmission standard which it has developed. DRM was developed first for operation in the AM bands (up to 30MHz) and particularly for digital transmission by international broadcasters such as Deutsche Welle. Unlike the US-developed IBOC systems, DRM is a largely opoen standard. It offers stand alone digital transmission at relatively low cost and is increasingly considered a viable replacement for existing AM radio services. Compared to AM transmission it offers much better sound quality and is more spectrum efficient. An extended version of DRM, known as DRM+ is under development for bands above 30MHz including the existing FM broadcast bands and which could provide a more flexible and affordable digital transmission solution than DAB for small-scale, rural and community radio services. The regulation of DRM services would adopt a similar approach to analogue radio services. This may become the most suitable digital replacement for FM radio, but the DRM+ standard has not yet been finaised and no country has yet made a policy commitment to this solution.

Both the European DVB and the Japanese ISDB systems, discussed in the previous section and designed for digital television transmission are also being developed for digital sound broadcasting. A compact version of the DVB system, known as DVB-H, for portable (handheld) devices is of particular relevance to sound broadcasting and could become quickly available if mobile phone manufacturers embed DVB-H chipsets in next generation mobile phones. Similarly a variant of the Japanese ISDB system, known as ISDB-Tsb, is being developed in Japan for terrestrial sound broadcasting services.

Satellite Digital Radio (SDR) groups together distinct and non-compatible systems for digital sound broadcasting by satellite. At the international level the leading system is that developed by Worldspace and receivable in Africa, the Middle East, Asia and Latin America and under development in Europe. It is in direct competition for use of the same spectrum as terrestrial and satellite distribution by DAB. In the US, XM Radio and Sirius Radio have achieved a substantial subscription base for proprietary SDR services. The DMB, DVB and ISDB systems all have adaptations that provide for satellite delivery.

In summary, the proliferation of digital sound broadcasting standards creates a complex set of regulatory challenges with respect to spectrum planning and the roll out of new services and for which there is yet no guaranteed solution for migration to digital of community radio. With more than ten different standards available, each of which requires a different receiver, and no single standard having achieved widespread acceptance, digital sound broadcasting is a long way from a state of convergence and interoperability. In the face of this situation several administrations are undertaking fundamental review[17] of the digital options for sound broadcasting and of their traditional regulatory assumptions.

Of the standards that are available or emergent, the most promising solution for a stand alone community radio service would currently appear to be DRM+, although more work is needed to develop the standard, to test its operation in the VHF spectrum and to establish policy frameworks for its future development and the migration from and eventual closure of analogue AM and FM services.

On the other hand, new systems being developed for mobile multimedia applications, especially DMB, IP-DAB (data delivery on DAB), and DVB-H may provide, for community media providers that offer both radio and television, a means to carry both types of services on the same platform.

Conclusions for public interest regulation

[16] Digital Radio Mondial, see http://www.drm.org

[17] In France, for example, see: Republic of France (2006) "Consultation publique sur les norms de la radio numérique", available at http://www.ddm.gouv.fr/IMG/pdf/consultationradionumvf.pdf

It is clear from this review that the term "convergence", widely used as shorthand for significant technological and regulatory change in the communications field, is rather inadequate for understanding the complex policy challenges particularly in the context of medium term developments in digital broadcasting systems. Spectrum planning and management is a highly contested space for policy development in which there are complex and distinct technical aspects to take into consideration and competing interests and policy goals at stake. Rather than convergence what is emerging is increasingly fragmented, characterised by competing technologies, distinct policy and regulatory choices, new forms of gatekeeping and pressure on content providers to invest in a multiplicity of distribution platforms.

Probably the most challenging current policy debate, and one which impacts directly on efforts to plan a digital future for community broadcasting, is that concerning spectrum management and the public interest. From the perspective of community media development, the market-based approach to spectrum policy presents particular dangers since it could in effect lead to the privatisation of large parts of the future radio spectrum and thus any future decisions over which content services have access to such spectrum and which do not. Unless there are clear long term guarantees of affordable access for community broadcasters this could foreclose many of the possible digital broadcasting solutions.

At the same time it must be acknowledged that there are serious weaknesses in the administrative system of spectrum allocation as it has been applied to broadcasting. All too often governments have treated such powers of spectrum allocation as a means to stifle and limit plurality and diversity in the media. This danger has led to the growth and development of a body of international norms and standards which set out how broadcasting can best be regulated in the public interest by independent but publicly accountable bodies that operate for this purpose and that work to assure a range and diversity of broadcasting services including public service, community and commercial broadcasters.

If there is a general conclusion to be drawn for community broadcasting in an all-digital environment it is that radio spectrum will continue to need to to be set aside for civil society and community use and current decisions on future spectrum allocation need to avoid the foreclosure of the possible solutions that could best meet the needs of community radio and telkevision. At the same time work must be accelerated at the policy, regulatory, socio-economic and technical levels to research and establish viable solutions suitable for the migration of community broadcasting into a digital environment in such a way that this sector can continue to develop and deliver community benefit and social gain.

One over-riding observation that arises from this discussion of new trends in spectrum management and digital broadcasting systems is that decisions on technical policies for media development are rarely exposed to adequate public scrutiny and consultation despite the widely acknowledged social, cultural and political of the broadcasting environment. More needs to be done by governments, communications regulators and international bodies responsible for technical standards and coordination arrangements to ensure that the impact of technical choices and regulatory approaches on the public interest is adequately assessed and subject to public consultation before policy decisions are taken.