

Executive summary

Scope

The Commerce, Industry and Technology Bureau (CITB) commissioned this Spectrum Policy Review by Ovum in partnership with Aegis and Indepen to examine current spectrum policy and management in Hong Kong with a view to:

- providing greater flexibility and transparency in spectrum access
- promoting the timely introduction of new technologies and services in frequency bands that are currently used and in new bands and thereby maximise the economic benefits to the community from use of the spectrum
- strengthening Hong Kong's strategic position by facilitating the introduction of key new wireless services while at the same time ensuring the availability of sufficient spectrum for essential public services.
- continuing to ensure that Hong Kong's regional and international spectrum obligations are fulfilled.

The tasks we were asked to undertake are as follows

1. Analysis of the future shape of radiocommunications
2. Assessment of the future supply and demand for spectrum
3. Assessment of whether spectrum trading should be introduced and, if so, the changes needed to implement such a policy
4. Assessment of the feasibility of introducing spectrum liberalisation in Hong Kong in the next ten years having regard to the proximity of Mainland China
5. Evaluation of requirements for spectrum by essential public services and the suitability of trading and liberalisation and other market mechanisms for these services.

In responding to these requirements the study team has:

- obtained the views of a large number of spectrum users through a programme of interviews
- discussed current use of the spectrum and spectrum management practices with OFTA
- analysed future technology and market developments and their implications for spectrum demand and supply and spectrum policy.
- reviewed international experience in adopting new approaches to spectrum management.
- proposed a number of elements for a revised spectrum strategy
- outlined an implementation plan relating to spectrum release and the introduction of policy and management changes.

Context

We start from the position that it is important to get spectrum planning and management right in order to support wider economic and social goals for Hong Kong. Spectrum is a critical input for future innovation and growth in the communications sector and there is now overwhelming evidence to show that communications, as a part of the ICT sector, is one of the key drivers of productivity and hence long term economic growth.

The nature and pace of future technology and market development is very uncertain and it is this situation that command and control mechanisms cope with least well – because the regulator does not have full information required to make well founded decisions, incorporating issues such as market risk. In addition, an increasing proportion of the spectrum is being allocated to commercial use and so is potentially amenable to market forces.

These issues are affecting all countries with advanced communications markets. A common set of policy instruments for addressing them is emerging in Europe and North America, and to a lesser degree in some countries in Asia. These policy instruments involve greater transparency in decision making and moves from the command and control model to a more market based model of spectrum management.

Spectrum management in Hong Kong is largely based on a command and control approach in which the regulator makes most decisions concerning the allocation and assignment of spectrum. Auctions have started to be used and the regulator has sought to use a “market led” approach in determining technology choices. However, there is scope to extend the use of market based approaches to spectrum management where beneficial.

Findings

As a result of the work undertaken during the review it has been found that there is a need for a more consistent and explicit set of policy goals and principles for making transparent and predictable policy decisions. In addition more information should be provided to industry on spectrum policy intentions and spectrum use so that users can make informed investment decisions.

Currently there are competing demands for spectrum in bands allocated to trunk radio, fixed links, public mobile and broadcasting services. In addition, the impact of future technologies is already being seen with a requirement to provide suitable spectrum for Broadband Wireless Access, HDTV and mobile TV. This requirement conflicts with existing spectrum users.

In the more distant future applications relating to broadband mobility will place greater demands on 500 MHz to 5 GHz. More sophisticated technologies, such as cognitive radio, will require a more flexible spectrum management framework including an appropriate definition of spectrum rights.

Spectrum policy in Hong Kong should involve an increased use of market based approaches, including the application of secondary trading and liberalisation in

selected bands and the application of AIP¹ in congested bands where other market approaches may not be feasible.

The prospect of continuing increases in demand for spectrum from government users for fixed and mobile broadband applications suggests that there will be a need in future for mechanisms to ration demand for spectrum from the public sector. AIP is likely to be a more practical alternative than trading (given the continued requirement to supply government services) but its effectiveness depends on budgetary arrangements for government departments. Administrative review should also be used to improve efficiency of spectrum use in the public sector.

In the case of use of spectrum by broadcasters, efficiency considerations mainly concern the future allocation of the UHF spectrum and here interactions with broadcasting policy need to be taken into account and ultimately a decision based on qualitative factors will be made. Policy trade-offs in this area could be made more transparent by assessing the potential value of services forgone as a result of spectrum use by broadcasting.

Recommendations

Hong Kong's future spectrum strategy should comprise:

- A set of policy objectives and supporting principles
- A spectrum strategy including a spectrum release plan
- A set of specific regulatory tools for managing the spectrum, including administrative and market-based tools

In support of this strategy we make the following recommendations. The Recommendations are numbered by the Chapter in which they appear. An indicative timetable for implementing these recommendations is given in Chapter 7.

Recommendation 4.1: The objectives for spectrum management in Hong Kong should be as follows

- To facilitate the most economically and socially efficient² use of radio spectrum with a view to attaining maximum benefit for the community
- To achieve technically efficient use of radio spectrum to facilitate the introduction of advanced and innovative communications services and strengthen Hong Kong's position as a telecommunications and broadcasting hub
- To fulfil Hong Kong's regional and international obligations relating to the use of spectrum
- To support Hong Kong's strategic position as a world city and the gateway between Mainland China and the world by facilitating the provision of key services in Hong Kong which are deployed or will be deployed, globally or in Mainland China

¹ Administered Incentive Pricing

² By this we mean the promotion of economic and social welfare.

- To ensure that necessary spectrum is reserved for essential public services

Recommendation 4.2: The Government should publish its intention to adopt a market-based approach to spectrum management where there are competing demands unless there are good public policy reasons to do otherwise. Policy priorities that the government wishes the regulator to take into account should be given in policy decisions by the Executive Council.

Recommendation 4.3: In general Hong Kong should adopt international allocations for licence exempt services. If, exceptionally, national allocations for licence exempt use are considered, then the following factors should be taken into account when making such decisions

- The likelihood of the band being congested.
- Options for light licensing regimes (e.g. registration) instead of licence exempt use if congestion is thought likely to occur.
- Users' service quality requirements together with the likelihood of congestion.
- The nature of possible technical restrictions on licence exempt use that could address any future congestion issues.
- Relevant public policy objectives.

Recommendation 4.4: In the longer term, and in association with the introduction of liberalisation and trading, consideration should be given to how best to define incumbent spectrum users' rights in relation to use of the band they occupy by underlay and overlay applications. There is no agreed method for doing this so international developments should be monitored by the regulator.

Recommendation 4.5: In order to achieve an appropriate balance between the allocation of spectrum to government and non-government use, we recommend that

- Government requirements for additional spectrum should be appraised against a set of objective criteria and decisions (including reasons) published subject to any limitations caused by public interest issues
- The possibility of sharing between government and non-government users should be explored in cases where non-government users would like access to spectrum allocated to government use

See also Recommendation 6.1 regarding periodic reviews.

Recommendation 4.6: The regulator should publish a spectrum strategy document. This could include a statement of policy principles, discussion of how the principles will be applied in practice, and a forward look at important spectrum allocation and release decisions. The spectrum release plan should be developed based on this strategy.

Recommendation 4.7: The regulator should publish a spectrum release plan consistent with its spectrum strategy. The spectrum release plan represents the regulator's intentions in respect of spectrum. It is a not legally binding commitment, rather it should change in response to market and technology developments.

The plan should have the following elements

- bands to be released for licensed and licence exempt uses and reasons
- the timing of spectrum release and any dependencies with other events (e.g. refarming, ITU decisions, Mainland China decisions)
- method of release – auction, beauty contest etc.
- an indication of whether spectrum will be tradeable/liberalised or restricted to specific uses and the reasons for this
- an indication of the regulator's initial views on packaging of spectrum
- any restrictions on the allocated use of the spectrum that may arise from policy decisions or international regulation
- a discussion of any matters relevant to the period beyond the plan.

Recommendation 4.8: We recommend that the spectrum release plan covers a period of three years. The plan should be reviewed and consulted on with stakeholders at least every three years.

Recommendation 4.9: The regulator should consider the potential benefits of making a number of fixed bands above 23 GHz, for example, available for a wider range of users to apply for on a first come first served basis at a nominated reserve price. The regulator would publish the available spectrum on its website and if an organisation applies for a particular frequency or block of frequencies then the regulator would ask for any competing bids. The approach would be analogous to that used for land in Hong Kong.

Recommendation 4.10: Refarming decisions should be made by the regulator on the basis of an appraisal of the potential costs and benefits of different refarming options, including a “do nothing” option.

Recommendation 4.11: In order to future proof the spectrum management regime in Hong Kong we recommend that the government considers the creation of generic radio frequency licences separate from service/network licences as a medium term goal. Transitional arrangements that would be feasible under existing legislation should be implemented in the short term.

Recommendation 4.12: There should be an explicit policy on minimum notice periods for frequency variation and/or withdrawal. We recommend the following policy

- For spectrum use associated with long duration service licences (10 years and more), decisions concerning frequency variation or withdrawal should be made at least 3 years before licence expiry. This means consultation on this issue will need to start 4 years in advance of licence expiry.
- Annual licences should be converted to a five year duration and licensees should normally be given at least 2 years notice of frequency variation or withdrawal.

Recommendation 4.13: The regulator should publish the conditions under which frequencies (and in future spectrum licences) might be varied or withdrawn before the end of their term. These conditions should be minimal and should include

- Reasons of public interest
- Compliance with government policy, as articulated in a direction from the Secretary
- Compliance with international and regional obligations or treaties

- Interference to other legitimate uses of spectrum

We have suggested that there would be benefits (in terms of promoting trading) from the regulator publishing the conditions under which frequencies (and in future spectrum licences) might be varied or withdrawn when their term expires. However, we recognise that the government may wish to retain the discretion to reallocate/reassign spectrum on licence expiry. This policy choice is a matter for the Hong Kong government to decide.

Recommendation 4.14: The Government should consider whether the spectrum licensing framework should be extended to users who are currently not licensed, including government users and receive only services, in order to enable formal spectrum rights to be established under a spectrum licence. In respect of government users it might be considered appropriate to establish spectrum rights using administrative means other than licensing.

Recommendation 5.1: Auctions should continue to be the default assignment mechanism in circumstances where there are competing demands for spectrum and should be designed according to the circumstances prevailing at the time. Administrative assignment or beauty contests should only be used if there are good cost or policy reasons for such an approach.

Recommendation 5.2: Principles for the application of AIP (or SUFs) should be published. These should include

- AIP is not applied in bands that are auctioned, except in the case where an auctioned licence is renewed
- AIP is only applied where there are competing uses/users for a band (i.e. where bands are congested)
- AIP should be applied (where practical) to all licensees (primary or secondary) whose spectrum use denies access to other potential users in congested bands where spectrum has not been auctioned.
- AIP should be set to reflect the opportunity cost of the spectrum where this may be calculated using
 - the least cost alternative method and/or
 - relevant current market benchmarks, for example, current auction payments for similar spectrum either in Hong Kong or elsewhere. (Lump sum auction payments would need to be converted to annual fees using a suitable industry discount rate.)

Recommendation 5.3: AIP should be applied to congested UHF PMR bands and fixed link bands, such as those below 16 GHz, so as to promote more efficient spectrum use.

Recommendation 5.4: If AIP is implemented there should be a 3-5 year transition to the new higher level of fees. The level of prices should be reviewed every five years.

Recommendation 5.5: Spectrum trading should be introduced in Hong Kong. Initially, this could be done with respect to spectrum auctioned under the spectrum release plan and then extended to other bands once implementation issues have been addressed. Licensees should be able to transfer, aggregate, subdivide and lease access to their spectrum rights subject of course to meeting any

requirements in their carrier licences. As suggested in Recommendation 4.11, in the longer term service/network and spectrum licences should be separated.

Recommendation 5.6: Additional competition safeguards should be put in place if spectrum trading is introduced. It is recommended that parties to a trade be required to seek advance clearance from the regulator and that the regulator is required to give a decision within a pre-specified time period. This may require a change to existing legislation. The regulator could give guidance on the types of trades for which clearance is likely to be a formality (e.g. where market shares/spectrum holdings do not change materially).

Recommendation 5.7: The release of new spectrum should be packaged on a technology neutral basis in the short term if there are no overriding policy reasons for specifying the technology to be used. The licensee should have the right to change its spectrum use subject to operating within the technical boundaries of their licence. In the longer term we suggest a move to technology and service neutral licences be considered where practical and if there are no overriding policy reasons or international / technical constraints on the service that may be provided.

Recommendation 6.1: There should be periodic reviews of spectrum use by government. Periodic reviews of government spectrum use should

- assess the efficiency of this spectrum use
- assess demands for future use
- make proposals for improving efficiency now and in future
- draw conclusions on future spectrum requirements for government users

The results of such reviews should be published, subject to any public interest concerns, and should be an input to future spectrum strategies and release plans. See also Recommendation 4.5.

Recommendation 6.2: The regulator should continue to reserve spectrum for government users, but this policy should be reviewed once market mechanisms have been applied more extensively to private sector use of spectrum in say 5 years time.

Recommendation 6.3: Assuming government users have sufficient budgetary freedoms to benefit from efficient spectrum use, then AIP should be applied to the use of spectrum by government users in bands where there are potentially competing demands for spectrum – either from government or commercial users. At present this means applying AIP to congested UHF PMR and fixed links bands, for example bands below 16 GHz.

Recommendation 6.4: It would be desirable for broadcasting policy to draw a clear line between services that are intended to achieve public service broadcasting objectives and services that are purely commercial. The latter should access newly released spectrum (e.g. in Band III, L band and UHF spectrum released after switchover) in the same way as other commercial services (e.g. commercial telecom services), just as commercial broadcasting services pay market rates for access to satellite capacity or capacity on wired networks. Policy trade-offs in this area could also be made more transparent by assessing the potential value of services forgone as a result of spectrum use by broadcasting.

Implementation

We consider that most of the above mentioned recommendations can be implemented within the existing law. The detailed implementation of individual recommendations will be subject to the policy objectives, assessment of priorities, and related transition planning, for ensuring that the best political, economic and social welfare outcomes are achieved for Hong Kong.

Out of the twenty five (25) recommendations above, we envisage that the following recommendations *may* need legislative change for full implementation:

- **Recommendations 4.11.** The existing regulatory regime may allow the separation of the terms and conditions governing spectrum use from the service licence. For example S 7(6) allows the regulator to issue 'other licence' to cover the terms and conditions of spectrum use; S 8(1)(b) allows the regulator to manage the terms and conditions of spectrum use through apparatus licensing. Although it is possible that the existing legislation may permit the allocation of frequencies without reference to the provision of any specific service or to specific apparatus (for example, by reference to all services and all apparatus), the avoidance of any doubt may require legislative change to ensure certainty on the matter.
- **Recommendation 4.14.** The extension of the licensing framework may require legislative change for the avoidance of doubt.
- **Recommendation 5.5.** The same point applies here as in the case of Recommendation 4.11, in relation to the separation of service /network and spectrum licensing.
- **Recommendation 5.6.** As already noted, the changes envisaged for the protection of competition in the trading of spectrum may well require amendments to existing legislation.

Suggested areas for early implementation

The following areas can be considered for early implementation under the current regulatory regime. In most cases early implementation will assure policy clarity and predictability from the outset, and also signal a high standard of transparency:

- **Spectrum strategy:** Define and communicate policy principles of a market-based approach for spectrum management. Strategy in respect of licence exempt and government use of spectrum, emerging issues from new technology developments, licensing issues and future allocation policy should be stated.
- **Spectrum release plan:** Communicate future supply of spectrum resources for commercial use (including frequency bands, marketing mechanism adopted, timing of availability, etc.)
- **Register or record of spectrum use:** Communicate status of existing spectrum use

Spectrum trading and liberalisation: Incorporate appropriate terms and conditions in future spectrum assignments (eg auctions) and licence renewals to facilitate spectrum trading and technology neutral licences. Based on the analysis of spectrum demand given in Chapter 2 and the approach to developing a spectrum release plan given in Chapter 4 we have given an example of a spectrum release plan in the following table.

Figure 1: Illustrative Spectrum Release Plan

Frequency band	Method of release	Comment
Year 1		
825 – 851 MHz	Packaged to provide North American pairing in the lower two bands and GSM pairing in the upper two bands.	Partially encumbered until November 2008
870 – 890 MHz		Partially encumbered until November 2008
925 – 935 MHz		
	GSM – divide between existing GSM operators.	
	800 MHz pairing (CDMA2000 by policy decision, otherwise technology neutral) – auction	
1780 – 1785 MHz	Paired – divide between existing PCS operators	
1875 – 1880 MHz		
2300 – 2400 MHz	Packaged on a technology and service neutral basis.	Currently partially encumbered.
2500 – 2690 MHz		Auction
Year 2		
825 – 851 MHz left-over		Consult on market interest.
1785 – 1805 MHz		
1900 – 1905 MHz		
2010 – 2020 MHz		
UHF TV spectrum (678 – 686, 798 – 806 MHz)	Technology neutral ³ ; Either auction or administrative decision	Timing and services linked to successful implementation of single frequency network (SFN) for digital terrestrial television
1466 – 1480 MHz	Technology neutral ³ ; Auction	Timing and demand linked to decisions concerning UHF TV spectrum – consult on market interest.
Band III (216 – 223 MHz)	Technology neutral ³ ; Auction	Timing and demand linked to

³ Service neutrality could also be considered.

		decisions concerning TV spectrum and global developments in digital audio radio – consult on market interest.
Year 3		
9.8 – 10.7 GHz		To be replanned – consult on market interest.
Future Release		
UHF TV spectrum (vacated spectrum after analogue switch-off)	Technology and service neutral; Either auction or administrative decision	Quantity unknown at this stage – policy decisions required to determine whether spectrum is auctioned on a technology and service neutral basis or not.
3.4 – 4.2 GHz 4.4 – 4.99 GHz	Potential refarming required	Review in the light of WRC-07 outcome.