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Policy Notes

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Reviewing the Philippines' spectrum management policy

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The issue

There was doubt whether the country's telecommunications market would be ready to absorb 3G technology because of the high cost of infrastructure development, expensive 3G handsets, and the popularity (and affordability) of the 2G platform which has made text messaging the cheapest means of communication for the masses.

However, user demands for faster data transmission and more sophisticated multimedia services that include voice, video, and fax transmission and reception that are impossible in the current 2G platform seem to have made the deployment of 3G technology inevitable. Third generation technology allows wireless applications that will enable roaming capabilities, broad bandwidth, and high-speed communications of as much as 2 megabits per second. Under the 3G platform, the convergence of existing cellular standards such as global system for mobile communications (GSM), code division multiple access (CDMA), and time division multiple access (TDMA) into a single uniform global system that includes terrestrial and satellite components in its functioning is very likely.

The advent of 3G technology and the recent issuance by the National Telecommunications Commission (NTC) of 3G licenses to three telecommunications companies through an administrative procedure have brought into light the crucial importance of revisiting the spectrum management policy. Some legislators have questioned the appropriateness of the administrative allocation method used by NTC in awarding those licenses. The suggestion was

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to consider other allocation methods such as market-based mechanism like an auction.

Undoubtedly, 3G technology challenges the regulator to have a more efficient allocation and assignment of radio spectrum. As pointed out by Hatfield (1993), radio-based systems are crucial in extending telecommunications and information services in the economy and an administrative process used to manage a critical and scarce resource—the radio spectrum—raises certain policy issues. Administrative processes lack the flexibility to deal with forces affecting frequency management, namely, rapid technical and marketplace changes, the resulting pressure for faster decisionmaking, and the increased economic importance of radio-based services, which in turn have led countries to investigate, experiment with, and implement alternative ways of managing the spectrum resource.[1]

Spectrum management is traditionally viewed as a system of radio frequency allocation, allotment, and assignment. In this system, the entire range of the useful spectrum is divided into blocks or bands of frequencies called allocations. These frequency allocations determine the type of use allowed within the block or band of frequencies. For example, separate allocations are made for broadcasting, land mobile radio, point-to-point microwave, and amateur radio services. Broadly, allotment refers to the subdivision of bands already allocated to a particular service for specific user and/or provider groups within that service. Within an allocation for the land mobile radio service, for example, allotments might be made for public cellular mobile telephone, specialized mobile radio ("closed user group"), and public safety services. An assignment, on the other hand, is a grant of authority—a license—for a specific party to operate a radio transmitter on a specific channel at a particular location under a specific set of conditions (Hatfield 1993).

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This brief *Policy Notes* first presents the policy and institutional framework for spectrum management and then, discusses alternative approaches to spectrum management and their policy implications.[2]

Policy and institutional framework for spectrum management

Legal basis

Republic Act 7925 (An Act to Promote and Govern the Development of Philippine Telecommunications and the Delivery of Public Telecommunications Services) states two basic principles for spectrum allocation and assignment, namely: (a) allocation should be given to the best-qualified applicant, and (b) when demand for specific frequencies exceed availability, an open tender bidding process shall be used. The applicants are evaluated on the basis of a predetermined set of criteria such as possession of a legislative franchise, track record, existing infrastructure, financial stability, and the absence of outstanding financial obligations to the NTC. The law requires a periodic review of spectrum allocation and as-

[1] Dale Hatfield. 1993. Spectrum issues for the 1990s: new challenges for spectrum management. Conference on National Spectrum Management Policies and Strategies for the 1990s and Beyond. Centre for International Research on Communication and Information Technologies, South Melbourne, Australia, November 23.

[2] I will discuss the regulation of the spectrum in another *Policy Notes* because of space limitations.

signment and the imposition of "reasonable spectrum user fees" (section 15, RA 7925). The NTC monitors the use of spectrum allocations and reserves the right to recall and reallocate unused channels.

The Implementing Rules and Regulations of RA 7925 provide the following guidelines on spectrum management:

- The radio spectrum allocation and assignment shall be subject to review in the interest of public service and in order to keep pace with the development in wireless technology with the end in view of insuring wider access to the limited radio spectrum and the use of cost effective technology.
- The Commission shall create a Radio Frequency Consultative Committee from various stakeholders from the telecommunications industry and the Department of Transportation and Communication and the NTC, which shall recommend to the Commission guidelines covering the following concerns:
  - the procedure on how to undertake the review and allocation of the radio spectrum taking into consideration the need to provide universal access to basic telephone service.
  - the transfer of all authorized and existing users in the band allocated to other bands of radio frequencies.
  - how the cost of the transfer of the authorized and existing users to other frequency bands shall be shared by the new assignees.
  - the manner of calculating the cost of the transfer.
  - the procedure on how to calculate the reasonable spectrum users fees and the amount to be paid for the use of the spectrum.
  - the determination of situations where the demand for a particular radio frequency band exceeds availability and the manner by which spectrum shall be bid out in case the demand for a specific band of radio frequencies exceeds availability.

A mobile phone with 3G technology features.

The recent bidding process for 3G allocation illustrates the process undertaken by NTC in awarding the licenses. Based on the criteria contained in Memorandum Circular 07-08-2005, four out of nine applicants were determined to be capable of providing 3G services. However, one of the four was disqualified because of an outstanding indebtedness to NTC.

Spectrum licensing and transfer of rights

The NTC awards licenses based on the specific service requested. It maintains a "technology-neutral" position with regard to licensing, meaning, the company can use any chosen technology. A license is valid for three years and can be renewed for continued use. The renewal process is less rigorous than the initial assignment process. Spectrum rights may be transferred to other parties but this requires NTC approval. The transferee must be able to meet NTC's assignment criteria. As deemed necessary, the NTC reserves the right to reallocate existing spectrum assignments but a public hearing is required prior to reallocation. New assignees (entrants) should reach an agreement with legacy licensees or "tenants" on the channel with compensation at the expense of the new entrant. The agreement may involve carrying the tenant on the assignee's network,

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a buy-out of the current tenant or compensation for infrastructure investments made by the tenant.

It is noted that the negotiations are left to the private parties concerned but disputes may be raised with the NTC for appropriate action. The NTC has adopted a hands-off policy unless the affected parties cannot settle their disagreement among themselves.

Spectrum fees

NTC indicated that spectrum fees have been an important source of revenue for the government, contributing about P500 million to the national coffers in 2005. Under the telecommunications law, "spectrum user fees shall be applied uniformly and without discrimination to all users under the same classification or category. Services which cater to emergency situations as may be determined by government, national disasters, public safety, and national security shall be exempt from the payment of spectrum user fees." A committee appointed by the NTC makes recommendations on the fee schedule. Before approving the final schedule of spectrum user fees, the NTC conducts public hearings.

According to the NTC, there are three criteria which are considered when determining fees: 1) "sale-ability" of the frequency, 2) bandwidth requirements, and 3) geographic considerations—fees are decreased for service delivery in rural areas to attract companies to underserved markets.

In the recent allocation for 3G-radio bandwidth, spectrum fees were tied to the number of subscribers. A base price of $1.2M (for 10 MHz) was established to accommodate up to four million users. An additional spectrum user fee of $26,000 will be assessed for each additional group of 100,000 users over the four million-user threshold. In 2000, the NTC tried to improve spectrum assignment efficiency by imposing fees according to bandwidth requirements. Fees were previously levied according to the number of mobile stations maintained by the licensee. Telecom firms have the option to use and pay for a wider bandwidth in order to reduce the need to build and install new stations. If the bandwidth were thin, telecoms firms would have to invest in more stations to widen coverage for a particular service.

Toward an efficient spectrum allocation and assignment

Spectrum scarcity drives the need for efficient spectrum allocation and assignment. Spectrum is used in broadcast radio and television, microwave telecommunications system, satellites, dispatches, and wireless communication systems, among others. Although the spectrum is an inexhaustible resource that anyone with appropriate technologies and equipments could use, scarcity in spectrum arises because of the possibility of interference, i.e., not everyone can transmit and use the same spectrum bands all at the same time and different signals may interfere with each other causing the failure of receivers to differentiate and translate the sound into intelligible information.

The National Telecommunications and Information Administration (NTIA) of the United States explains the problem of scarcity as fol-

lows: "Electromagnetic waves propagate outward in all directions. A transmitter generally seeks to communicate with a particular receiver; the transmitting antenna directs the majority of the signal toward that receiver and the receiving antenna is most sensitive to signals coming from the direction of the transmitter. However, an antenna radiates signals at lower levels and can receive signals from all directions. An interfering signal will be amplified and detected just like the desired signal once it enters the receiver. If the interfering signal is sufficiently large, it can prevent the desired signal from being properly demodulated and understood." The NTIA points out that the use of the radio spectrum is regulated, access is controlled, and rules for its use enforced because of the possibilities of interference among uncoordinated uses. Thus, some form of coordination of operating frequencies and transmitting powers is necessary and this motivates the search for appropriate allocation and regulation of the spectrum.

Two ways of allocating spectrum

There are two general ways of allocating spectrum: administrative allocation and market-based allocation.

Under *administrative allocation*,[3] the government grants licenses to firms that best show financial and technical capacity to provide the required capitalization and infrastructure that would, theoretically, optimize usage of the awarded spectrum bands. These license holders operate under rules and regulations set by the government, which includes assigning spectrum blocks according to specific criteria and determining which services would be permitted to operate at a particular frequency. A general procedure for this system begins when a firm wishing to utilize spectrum for a specific purpose within a particular frequency in a particular location applies for a license that covers only that purpose, frequency, and location. However, this system has produced inefficiencies and underutilization of spectrum bandwidths, not to mention limiting the flexibility in service provision and impeding technological developments. This has also been criticized as a process that could be politically influenced.[4] The inefficiency and inflexibility of the system has resulted to unused spectrum units that are merely warehoused by license holders.

A more efficient mode of allocating scarce resources is through market forces. An administrative procedure for allocating and assigning a scarce resource such as spectrum is inefficient. The literature indicates that establishing a market for spectrum, in which owners could buy, sell, subdivide, and aggregate spectrum parcels would lead to a much more efficient allocation of this scarce resource.[5] Scarcity makes the spectrum an economic good that is best allocated by market mechanisms. Benkler suggests defining property rights in spectrum units and allowing market transactions to allocate spectrum to its highest valued uses as defined by the willingness of spectrum users to pay for the spectrum units.[6]

A *market-based allocation and assignment of spectrum* would primarily rely on market pricing to allocate and assign spectrum units to those who value them the most. It will also allow for flexibility of use that can accommodate changes in technological preferences. The main elements of an ideal market regime, as

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[3] Sometimes referred to as administrative fiat or beauty contests.

[4] Faulhaber and Faber (2002) cited the U.S. case of radio licenses obtained by Lyndon Johnson while he was still a congressman. The authors contend that these controversial licenses became the foundation of his personal fortune.

[5] Faulhaber, Gerald R. and David Farber. 2002. Spectrum management: property rights, markets and the commons [online]. Available from the World Wide Web: (http://bpp.wharton.upenn.edu/Acrobat/Faulhaber _AEW_paper_6_19_02.pdf).

[6] Benkler, Yochai. 1997. Overcoming agoraphobia: building the commons of the digitally networked environment. *11 Harvard Journal of Law and Technology* 287 (Winter).

reflected in recent literature and outlined by Kwerel and Williams, are: (a) flexibility of use wherein no restrictions on spectrum use and users beyond those necessary to limit interference, prevent anti-competitive concentration, and comply with international agreements are imposed; (b) exhaustive assignment of spectrum rights, i.e., no spectrum should be reserved; and (c) exclusive licenses to internalize transaction costs, which do not preclude the use of intensive engineering techniques that permit economically efficient sharing of spectrum by multiple users.

All these will provide correct incentives for license holders to maximize the value of their spectrum; to replace current boundary limits to output limits defined in terms of power limits and not by technical restrictions regarding power and place of emission and direction and time of emission; and special provisions for low-power devices such as cordless telephones, automatic garage doors, etc.[7] These elements of the market regime make the 'owners' of the spectrum particularly open to technical innovations and sensitive to changes in consumer preferences which would contribute to higher consumer welfare and more profits to owners of the spectrum.

Models under market-based allocation method

Under the market-based allocation method, two schools of thought have emerged – (a) the property system, and (b) the spectrum commons. While both property system and the spectrum commons are market-based alternatives to the administrative allocation system, their difference lies in that the property system is a market in infrastructure rights while the spectrum commons is a market in equipments. Property systems will invest more at the core of the network and have cheaper end user equipment while spectrum commons will have exactly the opposite capital investment structure. The end user equipment market is the primary market driving innovation and efficiency in the spectrum commons model.

The most important transaction costs associated with the commons model are the network management overhead that devices need to use in order to coordinate their communications. Primary administrative costs for the property system are the definition and judicial enforcement of the property rights. On the other hand, the most important transaction costs associated with spectrum commons are those entailed by the need to negotiate clearance of permissions to transmit in a specified bandwidth. In spectrum commons, the primary administrative costs are the standards setting processes and the enforcement of equipment compliance with them.[8]

There is substantial agreement among the advocates of a property-based system that auction is the best mechanism for spectrum to be priced according to how potential users value them. The primary advantage of an auction is its ability to assign the spectrum to those best able to use it. This is accomplished by competition among license applicants. Those companies giving the highest value for the spectrum are willing to bid higher than the others and hence, tend to win the licenses.

A second important advantage of auctions is that the competition is not wasteful and leads to auction revenues. The U.S. Treasury realized over US$40 billion in revenues in 1994-2001 from 33 spectrum auctions. The early auctions in Europe for 3G mobile wireless licenses raised nearly $100 billion in revenues.

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[7] Kwerel, Evan and John Williams. 2002. A proposal for a rapid transition to market allocation of spectrum. Working Paper 38. Federal Communications Commission, Washington, D.C.

[8] Benkler, Yochai. 2002. Some economics of wireless communications. *Harvard Journal of Law and Technology* 16, No. 1 (Fall).

Finally, an auction is a transparent means of assigning licenses as all parties can see who won the auction and why.[9]

Engineers tend to favor the spectrum commons where they believe future innovations and technological breakthroughs can be possible. Benkler (2002) likens the commons model to the "open road" or the "open architecture" of the internet, which describes a network that treats some resources as open to all equipment to use, leaving it to the equipment manufacturers—cars or computers, respectively, in those open networks—to optimize the functionality they provide using that resource.

The spectrum commons model is likely to have higher capacity for any given level of investment in equipment and to grow capacity more rapidly than property-based systems because the free availability of bandwidth and the higher computational intensity of end user equipment will allow spectrum commons systems to use and improve processing and cooperation gain in pace with the price/power growth in processing. On the other hand, property-based systems will be limited by the lower computational complexity of end user devices, the relative stickiness of proprietary bandwidth, and the likely higher signal-to-noise ratio required by receivers.

It seems that these two systems are not incompatible. Faulhaber and Farber (2002) believe that the spectrum commons model can exist within a property regime, particularly in a property regime with an easement for noninterfering uses. It is noted that there still seems to be a lack of sufficient empirical evidence to show which of the two systems is the most efficient spectrum allocation system. Faulhaber and Farber suggest that the most prudent course would be to start the transition away from the administration allocation system by setting up sufficiently robust experiments with both market-based approaches. This way, something can be learned from the experiences and at the same time, the approach will not preempt future policymaking.

Relevance for the Philippines

Unlike other Asian countries such as Hongkong and Singapore that have shifted to a market-based mechanism through auctions, the Philippines still uses an administrative allocation and assignment approach or a `beauty contest' system in allocating spectrum rights. This was used in the recent award of 3G licenses. The Philippines is not alone though in using this method since some countries like Malaysia and Thailand and European countries such as Spain and Denmark also use it. However, it will be important for the NTC to examine very thoroughly the merits and demerits of alternative allocation/assignment methods in order to determine which is most suitable for the Philippines given the policy and institutional environment and the state of the information and telecommunications market.

A shift to a market-based system is not easy. It would involve a redefinition and restructuring of rights across a wide range of spectrum. Experiences of regulatory bodies in other countries such as that of the Federal Communications Commission (FCC) in the United States with regard to making the transition from administrative to market-oriented allocation show the complexity of the shift. The shift to a market-based mechanism requires transparency of the process, a highly liquid spectrum market (such that large portions of spectrum are technically and legally substitutable and no single entity can affect the prices), participation by all players, and simultaneity of the

[9] Cramton, Peter. 2001. Spectrum auctions. In *Handbook of telecommunications economics* edited by Martin Cave, Sumit Majumdar, and Ingo Vogelsang. Amsterdam: Elsevier Science B.V.

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process (such that all highly complementary and substitutable spectrum should be available to the market at the same time).[10]

Policy implications

If the government looks to the ICT industry as one of the main drivers of economic growth, it has to start on the difficult task of reviewing its spectrum management policy to arrive at a better allocation and assignment of spectrum rights.

There are both competing uses and users of scarce radio spectrum. Reexamining the country's spectrum management policy will involve, among others, a review of the allocation and assignment of current radio spectrum bands, a determination of the optimal allocation and assignment method, and a reallocation of the spectrum to its most efficient allocation and assignment, to the extent that is practicable and possible. The underlying objective of the review is public interest.

A corollary is the review of licensing policies as well as the structure of fees charged to spectrum users in view of the huge revenue potential. In mid-2005, NTC called for the reallocation of several identified bands and the recall of idle frequencies from radio and television stations. Some incumbents, not surprisingly, questioned this decision, claiming disruption in their provision of services as well as creating risks for sunk investments in the telecommunications sector. They also cited the financial and technical inability of potential new entrants to roll out 3G services as a reason for maintaining the status quo.

The regulator has to review its licensing policies and the structure of fees charged in light of the current developments in the information and telecommunications market.

[10] Kwerel, Evan and John Williams. 2002. A proposal for a rapid transition to market allocation of spectrum. Working Paper 38, Federal Communications Commission, Washington, D.C.

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