

# Learning From Best Practice Spectrum Management in Botswana

The Botswana Communications Regulatory Authority conducted a review of its spectrum management strategy to align with international best practice. The Authority was advised by Coleago and in this paper, Project Director Graham Friend, highlights the learning for other regulators in developing markets

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## Introduction

*Coleago advised BOCRA on the development of its spectrum management strategy*

In 2019, the Botswana Communications Regulatory Authority (BOCRA) adopted a set of recommendations designed to modernise its spectrum management strategy and align it with international best practice. Coleago worked alongside BOCRA to develop recommendations which took account of the relatively small size of the Botswana market (population of 2.3 million) and that BOCRA does not have the same level of resources as regulators in larger markets. Coleago focused on developing pragmatic and practical recommendations that encompassed the following areas of spectrum management:

- new spectrum assignment;
- spectrum pricing;
- licence conditions to promote rural coverage;
- secondary markets and spectrum trading;
- approaches to sharing;
- licence renewal; and
- licence duration.
- In this paper we describe the recommendations which represent international best practice in spectrum management, with a focus on spectrum assignment and pricing.

## Focus on policy objectives

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The starting point for the project was to understand BOCRA's statutory duties and the aims of the Government's National Broadband Strategy. BOCRA's statutory duties are:

- protecting and promoting the interests of consumers;
- facilitating and encouraging private sector investment and innovation;
- ensuring that technology is aligned with recognised standards so that Botswana can benefit from economies of scale in equipment manufacture and inter-operability;
- promoting efficiency and economic growth in the sector and ensure rational use of radio spectrum;
- ensuring the availability of ICT services to low income groups, rural areas or otherwise disadvantaged groups of consumers; and
- promoting and facilitating the convergence of technologies.

The principle aims of the National Broadband Strategy are to establish a coordinated approach to ensure that reliable high-speed networks are universally accessible throughout the country; and ensure equitable and affordable access to broadband infrastructure and services by all people over time. Throughout the project we ensured that the recommendations were aligned with meeting these policy goals.



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## New spectrum assignment

To determine the appropriate approach for assigning new spectrum, BOCRA will first assess whether the demand for the spectrum exceeds supply. A formal and transparent assessment approach will be adopted similar to the approach used in Norway. Any request for new spectrum will trigger the opportunity for other stakeholders to express an interest in the spectrum. If all the demands for new spectrum can be met from the available supply, then there is no excess demand, and the spectrum is assigned using an administered approach. Where there is excess demand, then BOCRA will seek to use some form of auction, provided an appropriate auction design can be developed.

There was considerable debate during the project as to whether auctions were appropriate for a market as small as Botswana. We examined whether there were examples of small markets successfully using auctions. The Exhibit below lists a number of countries which have similar populations and / or GDP per Capita levels to Botswana that have auctioned spectrum. We concluded that the nature and size of the mobile market in Botswana was unlikely to be a barrier to the successful use of auctions. However, we recommended that BOCRA adopted simple and straightforward auction designs – the recent 700 MHz auction in Tanzania provided a good example of a simple but effective process which could be replicated in other African markets.

Exhibit 1: Auctions in countries of similar size and national income to Botswana<sup>1</sup>

Country	GDP/capita, US\$ PPP rates	Population	Spectrum auctioned
<b>Botswana</b>	<b>17,354</b>	<b>2,291,661</b>	<b>n/a</b>
			1800 MHz: 2015
Albania	12,021	2,873,457	2100 MHz: 2016
Costa Rica	17,044	4,905,769	1800, 2100 MHz: 2017
			800 MHz: 2015
Georgia	10,699	3,717,100	2100 MHz: 2017
Macedonia, FYR	15,231	2,083,160	800, 1800 MHz: 2013
Moldova	5,698	3,549,750	2600 MHz: 2012
Montenegro	18,765	622,471	900, 1800 MHz: 2016

Source: Coleago

In assigning new spectrum, we recommended that BOCRA adopted licence conditions which were aligned with its policy goals. Spectrum and technology neutral coverage obligations should be used to further the attainment of the National Broadband Strategy. Long licence terms (a minimum of 15 years) and a strong presumption of renewal in favour of incumbents should also be adopted to promote investment and innovation.

## Spectrum pricing principles and best practice

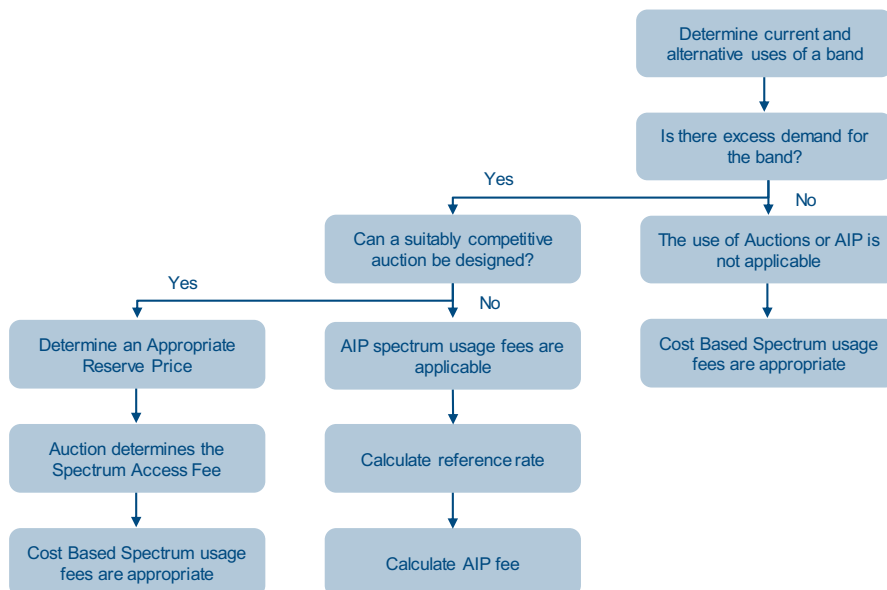
*Spectrum pricing is one of the most important decisions facing a regulator*

Spectrum pricing is one of the most important decisions facing a regulator. BOCRA has now adopted an approach which reflects the best practice developed by Ofcom, the telecoms regulator of the United Kingdom. The approach makes the distinction between spectrum access fees and ongoing, annual spectrum usage fees. Access fees are the charges to gain initial access to the spectrum; often determined by auction. Ongoing, annual spectrum usage fees may be related to either BOCRA's costs of spectrum management (where there is no excess demand) or the market value of

<sup>1</sup> Population and GDP per capita data is for 2017, source World Bank

spectrum (where demand exceeds supply) based on Administered Incentive Pricing (AIP).

Exhibit 2: Best practice approach to spectrum pricing



Source: Coleago / Ofcom

The key elements of BOCRA's approach are:

- spectrum which is not congested or does not face excess demand should be subject to spectrum usage fees based on an allocation of BOCRA's own spectrum management costs;
- where excess demand or congestion exists and where appropriate, market-based mechanisms should be used to assign spectrum and to determine the spectrum access fee, subject to on-going cost-based spectrum usage fees;
- spectrum trading should be facilitated to provide ongoing market-based incentives for spectrum to move to its most economic use; and
- where spectrum is congested or faces excess demand, but a suitable market-based mechanism cannot be utilised (for example the spectrum is already assigned), then spectrum should be priced based on some form of Administered Incentive Pricing (AIP).

### Implementing spectrum pricing best practice in Botswana

*The main challenge was pricing spectrum which had already been assigned*

The main implementation challenge for BOCRA related to the pricing of spectrum for frequencies which had already been assigned for which there was presumed excess demand and yet, current prices did not reflect the market value of the spectrum. Examples included VHF frequencies as well as IMT bands such as 900 MHz, 1800 MHz and 2100 MHz.

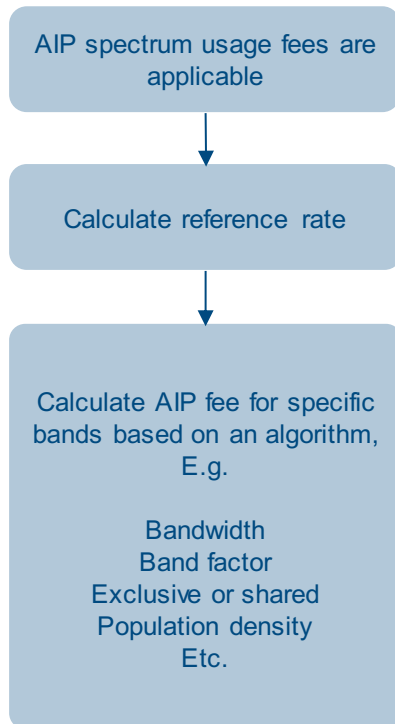
Spectrum prices were last reviewed in 2008 and during that review there had been no attempt to relate spectrum prices to market value for spectrum with excess demand. Spectrum prices were therefore extremely low, and revenues generated from spectrum were insufficient to meet BOCRA's costs of operation. The vast majority of BOCRA's revenues came from a share of revenue.

*Charging for spectrum based on a share of revenue creates significant concerns*

Charging for spectrum based on a share of revenue created significant concerns. The first was that BOCRA would experience volatility in its own income and may not be able to meet its operational expenditure if the industry suffers a significant reduction in revenue. The second was that a revenue share penalises efficient users of spectrum

(i.e. those generating the highest revenue) by charging them more than inefficient users and so does not promote the efficient use of spectrum. The third, was that a revenue share adversely impacts the business case for increased coverage, investment in new services, etc as it reduces the incremental benefits arising from any new investment. Coleago's recommendation was to shift away from revenue shares towards spectrum-based pricing using some form of AIP. BOCRA implemented AIP for VHF frequencies and IMT bands. The implementation approach is shown below.

Exhibit 3: Implementing AIP



Source: Coleago

The typical process for implementing AIP involves first establishing a reference rate. The reference rate represents the market value or opportunity cost of the spectrum band. As it is not practical to estimate a reference rate for every specific frequency and each individual assignment, an algorithm is used to adjust the reference rate to reflect the characteristics of different frequencies and individual assignments. The more closely the reference rate reflects the characteristics of the specific frequency and assignment, the better AIP will mimic the outcome of a market-based approach to spectrum pricing. The best practice principles of implementing AIP are:

- regulators should select reference rates which are based on spectrum bands which are as similar as possible to the frequencies subject to the AIP algorithm;
- formulate an algorithm which is as simple as possible, and which best relates the reference rate to the spectrum subject to AIP (for example, avoid including multiple factors that seek to achieve the same objective);
- avoid algorithms that create significant variations in price between similar frequencies;
- set prices conservatively; and
- subject prices to periodic review.

*The process of developing AIP is simple in theory but presents significant practical challenges*

The process of developing AIP is simple in theory but presents significant practical challenges, especially in a small market like Botswana. The greatest challenge is developing appropriate reference rates as these must reflect the opportunity cost or market value of the spectrum.

*Many of the approaches adopted in other African markets do not reflect the market value of spectrum*

Many regulators in Africa adopt administered pricing regimes that resemble or claim to achieve the same outcomes as an AIP approach. However, they often are not explicit about the way in which the reference rates are established. Coleago suspects that many of the administered pricing regimes adopted in Africa do not accurately reflect the market value of spectrum. Where regulators are explicit about their approach to estimating reference rates, they commonly adopt one of two approaches – spectrum auction value benchmarking and cost modelling.

The main challenge for a regulator like Botswana is that cost-modelling is complex, time-consuming and costly to perform and so this approach only tends to be adopted by large and well-resourced regulators such as the UK's Ofcom. However, the results of the cost modelling performed by Ofcom (subject to appropriate adjustments) can be used to inform pricing decisions in other markets – this was the approach adopted by BOCRA for the pricing of VHF frequencies.

*Spectrum auction benchmarks should be used with great care*

In the case of the IMT bands, the results of spectrum auctions from other markets were used to estimate the market value of spectrum in Botswana. There are very significant risks associated with the use of benchmarks and so we recommended a very conservative approach to setting prices to avoid creating any inefficient distortions in the use of spectrum. The market value estimates were then converted into an equivalent, annual spectrum usage fee.

The proposed new spectrum prices represented a significant re-balancing of fees away from revenue, towards spectrum. In order to ensure that the operators had sufficient time in which to respond to the changes, it was agreed that the changes were implemented over an extended period of time.

*The implementation of the new pricing regime will be phased in over five years*

The introduction of the new spectrum pricing regime will be introduced over five years. During the first two years the new pricing regime will have been announced but will not be in effect. In the third year, the fees will increase, where appropriate, to 35% of their new levels, in the fourth year to 70% of their new levels and 100% at the start of the 5<sup>th</sup> year; and all prices will be subject to inflationary increases based on the change in the Consumer Price Index from two years ago. The new pricing regime will encourage the efficient use of spectrum, promote investment and reduce uncertainty in BOCRA's own revenues.

### Other elements of best practice spectrum management

Other recommendations included:

- introducing network sharing;
- incorporating coverage obligations into licence awards;
- consulting on spectrum trading;

### How Coleago can help

In supporting BOCRA, Coleago relied heavily on our years of experience of working closely with operators to understand how spectrum policies impacted their business decisions. Our experience has allowed BOCRA to implement a pragmatic and practical spectrum management strategy which will support the attainment of its policy goals. Graham Friend, M.A., M.Phil., (Cantal), ACA, is an economist and the Managing Director and Founder of Coleago Consulting. If you would like to discuss any of the issues raised in this paper, then please contact Graham.

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