Day 2

Spectrum Pricing

1. Overview of spectrum pricing: Why it matters

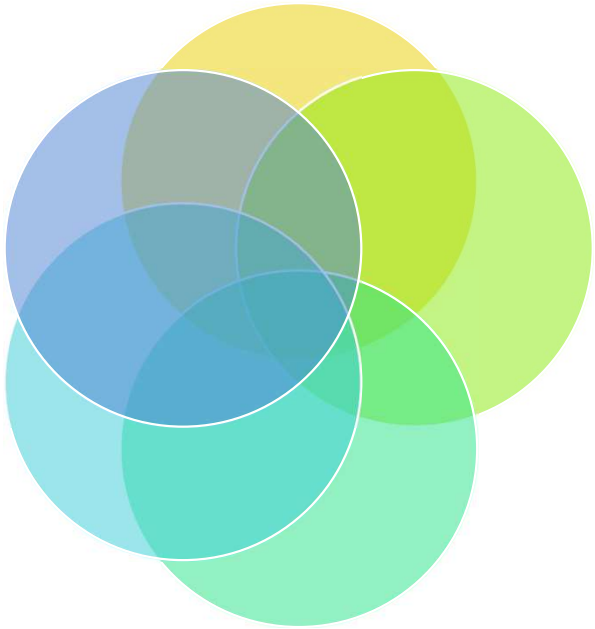
2. Principles and objectives of spectrum pricing

3.Issues and challenges in setting spectrum prices

4. Spectrum fees

Case study

5. Questions



Day 2

Spectrum Assignment

Spectrum Pricing

1. Overview of spectrum pricing: Why it matters

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Overview of spectrum pricing: Why it matters

In an increasingly digital environment, adequate access to spectrum is key to expanding the deployment and coverage of telecommunications networks, and addressing the ever-increasing demand for data services. These networks support a variety of online applications, extending the impact of spectrum management to several sectors of the economy by transforming the way people access resources for health, transportation, education, agriculture, government, and financial services.

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Overview of spectrum pricing: Why it matters

As a scarce resource, spectrum requires proper management from regulators, to ensure equitable access and an interference-free environment among different users and services, as well as to introduce new technologies. The challenges for the government are to achieve a balance among competing requirements and to develop policies that fulfil the intent of those requirements. Spectrum fees charged for various radio services can be a critical part of the spectrum management process.

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Context and : Why it matters

Spectrum prices should promote, and not undermine, the optimal use of spectrum for the benefit of society

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Context and : Why it matters

Spectrum prices should promote, and not undermine, the optimal use of spectrum for the benefit of society

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Context and : Why it matters

- **Data growth and tech evolution make more spectrum vital**
  - Mobile traffic increased 9x in past 5 years in Western Europe
  - LTE-A and 5G are much more spectrum hungry
- **Operators concerned that today's model is unsustainable**
  - Spectrum demand is growing faster than revenues
  - Perception that spectrum prices are rising thus aggravating the issue
  - View that high prices are often due to policy decisions – not the market
- **Some public authorities don't see downside of high prices**
  - View that 'sunk costs' and competition prevent negative consequences

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Spectrum Assignment

Spectrum Pricing

2. . Principles and objectives of spectrum pricing

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Principles and objectives of spectrum pricing

The Objectives should be to:

- improve the telecommunication infrastructure in the country through the efficient and effective use of the radio spectrum;
- administrative fees that support the spectrum management infrastructures
- equitable assessment of administrative fees for all users of the radio spectrum and in a manner that encourages spectrum efficiency by providing appropriate incentive;
- assessment of fees according to the amount of spectrum space used for most services, which should include consideration of the number of transmitters in a network;
- economic principles following the relevant ITU-R Recommendations and Reports ITU-R.

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Principles and objectives of spectrum pricing

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Principles and objectives of spectrum pricing

Spectrum allocated to the highest value use or uses to ensure maximum benefits to society are realized;

- Mechanisms in place to enable and encourage spectrum moving to its highest value use;
- Greater access to spectrum facilitated by least cost and least restrictive spectrum management approaches
- To the extent possible, regulators and spectrum managers need to promote both regulatory certainty and flexibility in how spectrum is used;
- Balance should be achieved between the cost of interference and the benefits obtainable from greater spectrum utilization;
- Fees based on objective factors and all licence holders in a given frequency band should be treated on an equitable basis.

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Principles and objectives of spectrum pricing

- Radio standards equal to, or preferably better than that required in the RR and Fees calculated in a clear way with consultation with stakeholders and published;
- Simple to administer and balanced against efficient spectrum use if fees are set taking account of parameters such as bandwidth, frequency band or coverage;
- Spectrum fees should be reviewed at suitable intervals in order to cater for changes in economic KPIs or advancement in technologies resulting in increase in demand of a particular band;
- Mechanisms should be in place to avoid, detect and where necessary prevent spectrum hoarding which will deter competition
- Establish a balance between financial approach and other key facets - regulatory (competition), social (universal service).

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Principles and objectives of spectrum pricing

Spectrum prices should *promote the efficient use of spectrum.*

As a vital natural resource, the price of spectrum should be sufficient enough to ensure that it is valued and used wisely. Use of the spectrum provides considerable benefit to the economy and the benefit derived from spectrum should be maximized;

The costs associated with managing and regulating radio frequencies (including monitor and control) should be *recovered from those who benefit from spectrum management activities*. User pay should apply to all users of spectrum – both public and private;

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Issues and challenges in setting spectrum prices

Spectrum Pricing

3. Issues and challenges in setting spectrum prices

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Issues and challenges in setting spectrum prices

Setting the appropriate level of fees for spectrum use to support various applications is important. On the one hand, many regulators depend on the fees collected to sustain their annual budgets. However, on the other hand, overly high spectrum fees may discourage or exclude smaller players, new entrants, or individuals from accessing spectrum.

This could especially hinder innovation and competition. Even operators of larger networks, such as mobile network operators, have limitations on the price to pay for spectrum, especially considering the substantial costs to maintain and expand the networks

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Principles and objectives of spectrum pricing

For instance, if spectrum reserve prices are set too high, operators may decide not to participate in assignment procedures for new spectrum. For example, a task force of the Indian Ministry of Finance urged the Department of Telecommunications to reduce its reserve pricing, payment schedule, and interest rates of its 5G auction.

This was in response to fears that the high price, coupled with the financial stress of the telecommunications sector, could result in poor participation, and ultimately delay 5G roll-out in the country.

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Issues and challenges in setting spectrum prices

The primary goal of charging for spectrum is to assign a scarce and valuable resource to those who will use it most efficiently to deliver the maximum benefit to society.

A well-designed auction by a government will assign spectrum at a market-determined price, to the operators that value it most, thus incentivising them to use it efficiently through investment in widespread, high-quality mobile networks.1

However, as governments can obtain substantial revenue from spectrum, some of them prioritize maximizing spectrum revenue over the efficient allocation of spectrum (and the improved mobile services and associated benefits for the economy and society).

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Issues and challenges in setting spectrum prices

Those African countries where the public sector is highly indebted tend to have higher spectrum prices. Given that spectrum prices are unlikely to determine government debt, the more plausible interpretation is that African governments experiencing financial challenges are influencing spectrum fees, in order to maximize public sector revenues. This is also consistent with findings in other developing countries.

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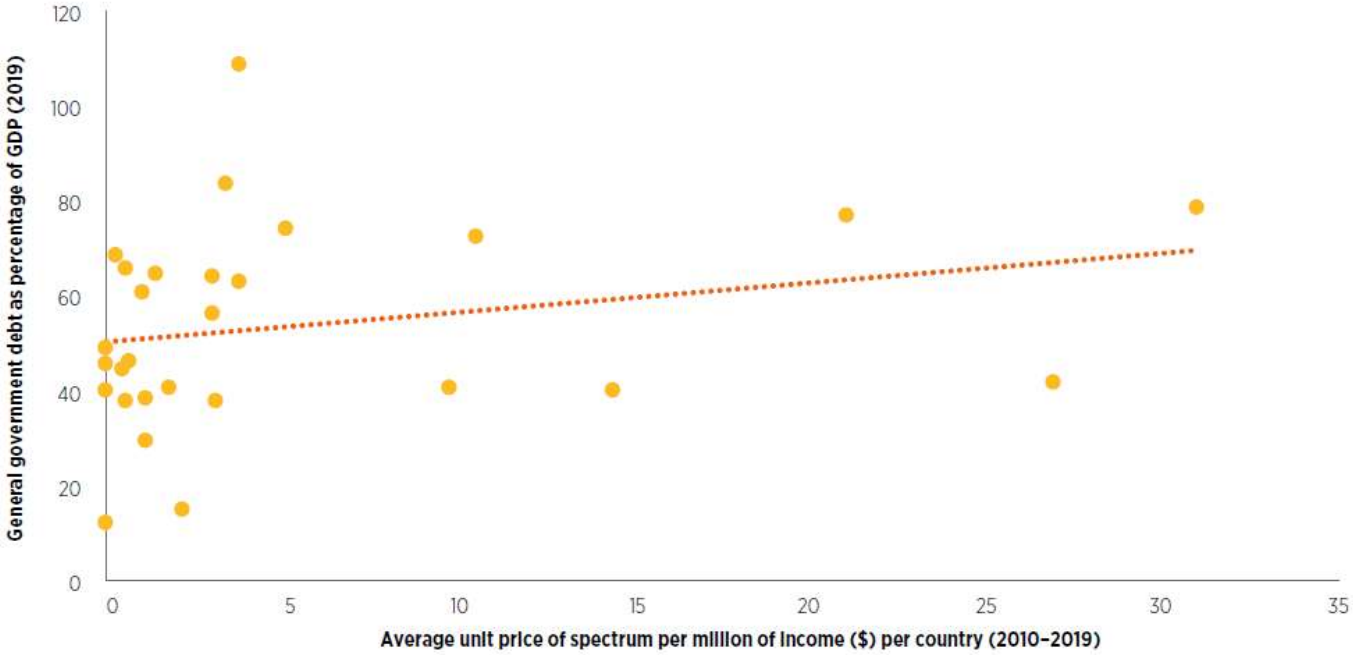
Issues and challenges in setting spectrum prices

More indebted countries license spectrum at higher prices



The price metric considers average spectrum prices in coverage and capacity bands on a per-country basis over the period 2010–2019. It includes countries in Africa where there is at least one assignment with price information available in both coverage and capacity bands, and where there is debt data available.

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Issues and challenges in setting spectrum prices

Spectrum Managers need to review and consider various issues when deciding upon the method, the financial basis and amounts and the timing for payment of fees in respect of a particular spectrum band, type of use or type of user. These issues include:

- Fiscal context;
- The particular relevant principles and objectives for certain types of spectrum fees;
- Funding the regulators' operations;
- The demand and supply for the spectrum;
- Technological change;
- Type and duration of the spectrum authorization and renewal options.

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Spectrum fees

Spectrum Pricing

4. Spectrum fees

Case of Senegal

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Spectrum fees

Senegal applied the spectrum fees and differents prices for mobile industry, independant private network under the Decree .n°2019-1877 du 11 novembre 2019 relating to radio frequencies, the assignement of radio frequencies to obtain license or authorization to exploit and operate radio stations including broadcasting, are subject to the payment of fees and charges

The amounts of these fees and charges are set by Joint Order no. 025982 of November 18, 2019

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Spectrum fees for MNO

Operators granted license pay an annual license management fee (G) of FCFA 50,000,000. around 100 USD KA study fee (E) of 1,000,000 FCFA around 1.5 USD K is charged for all requests for frequencies for public networks.
For fixe terrestrial services the formula below calculted the annual fee to paid by MNO
Annual microwaves fees calculation

R = Pref x LB x CB

Où :

- **R** est la redevance annuelle par liaison en F CFA hors taxe
- **Pref** est le prix de référence en F CFA / MHz,
  avec Pref = 274.386 FCFA
- **LB** est la largeur de bande du canal utilisé par la liaison en MHz
- **CB** est le coefficient de bande, définit comme suit :

Bande de Fréquence (F)	CB
F <=10.7 GHz	1,0
10.7 GHz < F <=19.7 GHz	0,8
F >19.7 GHz	0,6

In order to encourage operators to cover underserved areas, half (1/2) of the frequency usage fees are collected in these localities.
On the basis of pre-defined terms and conditions, the governmental authority sets the list of localities concerned by decree

Day 2

Spectrum fees for MNO

Fees for mobiles services

R = Pref x LB x CB x CU

Où :

- **R** est la redevance annuelle en F CFA hors taxe
- **Pref** est le prix de référence en F CFA / MHz, avec Pref = 20 185 978 FCFA / MHz
- **LB** est la largeur de bande utilisée en MHz
- **CB** est le coefficient de bande qui dépend de la fréquence porteuse, défini comme suit :

Bande de Fréquence (F)	CB
F <=2.3 GHz	1,0
2.3 GHz < F <= 3.8 GHz	0,8
F > 3.8 GHz	0,4

- **CU** est le coefficient d'usage qui dépend de la technologie utilisée (fixe ou mobile), défini comme suit :

Usage	CU
Mobile	1,0
Fixe	0,5

La redevance payable par les fournisseurs d'accès à internet (FAI) est égale au quart (¼) de celle appliquée

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Spectrum fees for MNO

Vsat fees for MNO

Station VSAT		REDEVANCE FREQUENCE (FCFA)
Stations HUB de type VSAT/ Bilatérale	Moins de 2 Mb/s	2.000.000
	2 Mb/s	4.000.000
	8 Mb/s	6.000.000
	34 Mb/s	8.000.000
	70 Mb/s	10.000.000
	140 Mb/s ou plus	12.000.000

Pour les stations en transmission unilatérale, la redevance fréquence est réduite de moitié (1/2).

Pour les stations terminales VSAT dont le HUB ne se trouve pas à l'intérieur du territoire national, les redevances fréquences sont calculées selon le tableau suivant :

Par station de type VSAT	Redevance annuelle par station (FCFA)
Nombre de stations <= 50	20.000
50 < Nombre de stations <= 100	15.000
100 < Nombre de stations <= 500	10.000
500 < Nombre de stations <= 1000	7500
Nombre de stations > 1000	5000

Day 2

Spectrum fees for MNO

Fees for fixe Private Network

Study fees are set at 250,000 FCFA
Management fees set at 1,000,000 FCFA

R = Pref x LB x CB

Où :

- **R** est la redevance annuelle par liaison en F CFA hors taxe
- **Pref** est le prix de référence en F CFA / MHz,
  avec Pref = 68.786 FCFA
- **LB** est la largeur de bande du canal utilisé par la liaison en MHz
- **CB** est le coefficient de bande, définit comme suit :

Bande de Fréquence (F)	CB
F <=10.7 GHz	1,0
10.7 GHz < F <=19.7 GHz	0,8
F >19.7 GHz	0,6

Day 2

Spectrum fees for MNO

Vsat Fees for Private independant Network

La redevance annuelle applicable aux stations HUB de type VSAT à usage privé sont composées des frais de gestion et de la redevance fréquence.

Station VSAT		Frais d'étude (FCFA)	Frais de gestion (FCFA)	Redevance fréquence (FCFA)
Stations HUB de type VSAT/ Bilatérale	Moins de 2 Mb/s	250.000	1.500.000	500.000
	2 Mb/s			1.000.000
	8 Mb/s			1.500.000
	34 Mb/s			2.000.000
	70 Mb/s			2.500.000
	140 Mb/s ou plus			3.000.000

Day 2

Spectrum fees for MNO

Vsat Fees for Private independant Network

The annual fee for VSAT HUB stations for private use is made up of the management fee and the frequency fee. SMS, BLR, PMR and other networks

Réseaux / Stations / Liaisons	Frais d'étude (FCFA)	Frais de gestion (FCFA)	Redevance fréquence (FCFA)
Station terrienne mobile satellite d'un réseau privé indépendant STM	50.000	150.000	
Boucle Locale Radio Large Bande d'un réseau privé indépendant de communication de données à Haut Débit (RLAN, HYPERLAN) BL	250.000	500.000	1000 000 par bande occupée
2RC/3RP/RMU d'un réseau prive indépendant RC /RP/MU	100.000	1.000.000	1.000.000 par canal duplex

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Spectrum fees for MNO

Vsat Fees for Private independant Network

The annual fee for VSAT HUB stations for private use is made up of the management fee and the frequency fee. SMS, BLR, PMR and other networks.

Réseaux / Stations / Liaisons	Frais d'étude (FCFA)	Frais de gestion (FCFA)	Redevance fréquence (FCFA)
Station d'un réseau privé indépendant du service fixe (excepté faisceau hertzien) ou mobile terrestre (en dessous de 1 GHz) **STF / SMT**	50.000	1-10 postes 75.000 10-50 postes 375.000 Plus 50 postes 1.500.000	Bande MF- HF 1.000.000 par fréquence assignée Bande VHF 500.000 par fréquence assignée Bande UHF 300.000 par fréquence assignée Autres Bandes 200.000 par fréquence assignée

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Spectrum fees for MNO

Vsat Fees for Private independant Network

The annual fee for VSAT HUB stations for private use is made up of the management fee and the frequency fee. SMS, BLR, PMR and other networks.

Réseaux / Stations / Liaisons		Frais d'étude (FCFA)	Frais de gestion (FCFA)	Redevance fréquence (FCFA)
Station d'un réseau privé indépendant du service mobile maritime et aéronautique SMM/SMA	Bande MF-HF	50.000	500.000 par station	
	Bande VHF		150.000 par station	
Station de navire SNA	Moins de 150 tonneaux	25.000	150.000 par navire	
	Plus de 150 tonneaux		200.000 par navire	
	Navire de plaisance		50.000 par station	
Station d'aéronef SAE	Privé	25.000	150.000 par station	
	De Transport Public		200.000 par station	

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Spectrum fees for MNO

BROADCAST TV AND RADIO FEES

TYPE DE STATION	FRAIS D'ETUDE DEMANDE (FCFA)	FRAIS DE GESTION AUTORISATION (FCFA)	REDEVANCE FREQUENCE (FCFA)
Radiodiffusion sonore FM commerciale	100.000	250.000	250.000 par fréquence assignée
Radiodiffusion sonore FM associative	25.000	50.000	75.000
Radiodiffusion sonore FM étrangère	125.000	1.500.000	1.500.000 par fréquence assignée
Radiodiffusion télévisuelle terrestre	250.000	2.500.000	5.000.000 par fréquence assignée
Télédistribution / Rediffusion par un opérateur de programmes radio et TV en mode hertzien terrestre, satellite ou filaire (MMDS, CATV, ...)	250.000	1.500.000	1.000.000 par canal assigné

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Spectrum fees

OTHERS SPECTRUM TARRIFS

TYPE D'AGREMENT AGR	FRAIS D'ETUDE (FCFA)	FRAIS D'AGREMENT(FCFA)
Equipements terminaux	50.000	200.000
Equipements et installations radioélectriques	50.000	200.000
Installateurs d'équipements radioélectriques	50.000	100.000
Laboratoires d'essai	500.000	2.500.000

PRESTATIONS	ETABLISSEMENT (FCFA)	RENOUVELLEMENT (FCFA)	DUPLICATA (FCFA)
Examen certificat opérateur radiotéléphoniste	10.000	10.000	10.000
Examen de radioamateur	15.000	10.000	10.000

PRESTATIONS	MONTANT (FCFA)
Cas de brouillage	75.000
Cas de non-conformité des installations	100.000
Contrôle ou visite réseau sur demande exceptionnelle du client	50.000
Visite de navire / Aéronef	50.000 /
Autres prestations Modification de Réseau	50.000

Day 2

Case study spectrum calculation fees

Formation des groupes

Mission:

As spectrum management team you are requested to calculate the following spectrum services based to the formula seen during the workshop :

1. MNO frequency band : 2G, 3G, and 4 G
2. ISP TDD frequency : 3 300 – 3400
3. VSAT Independante network
4. Microwaves links for independent network
5. VSAT Independent Network
6. BL Independent Network

Present the total of amount to be received for the NRA (PPT)

Day 3

Issues and challenges in setting spectrum prices

Key findings: spectrum pricing and trading

- For all types of fees, regulators should aim to set fees in accordance with the level of demand, potential usage, and the time and resources required by the regulator to coordinate, award, and monitor the spectrum usage.
- Regulators should consider demand and availability of spectrum, market conditions, characteristics of the spectrum band, the equipment ecosystem, and proposed usage when estimating spectrum value.
- Benchmarks can provide a useful insight into spectrum's value and can act as a tool for regulators as they set reserve prices and fee schedules.
- Allowing leasing and secondary trading can help to rebalance spectrum valuation, given evolving markets and emerging technologies.
- Regulators should consider balancing price with policy objectives in spectrum proceedings (e.g. give discounts to increase coverage or to encourage network deployment).
- Pricing approaches should be revisited as the market evolves to ensure fees are in line with demand and promote effective spectrum use.

Spectrum scare ressources

Merci de votre attention

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