Case Studies of Spectrum Management in Developing Countries:

Sierra Leone & Zimbabwe

Dr. Arturas Medeisis
Vilnius Gediminas Technical University, Lithuania

1

Presentation Outline

- Introduction: why case studies?
- Spectrum Management in Sierra Leone
- Spectrum Management in Zimbabwe
- Identified common problems
- Directions for addressing those problems

2

Why Case Studies?

- Case studies provide a structured way of looking at events or systems, collecting data, analysing information, and reporting the results
- The outcome is a sharpened understanding of how a system works and why it has developed in the way it has
- Also, the study can identify what might become important to look at more extensively in future research and what might be appropriate examples to be considered for application in other situations or environments

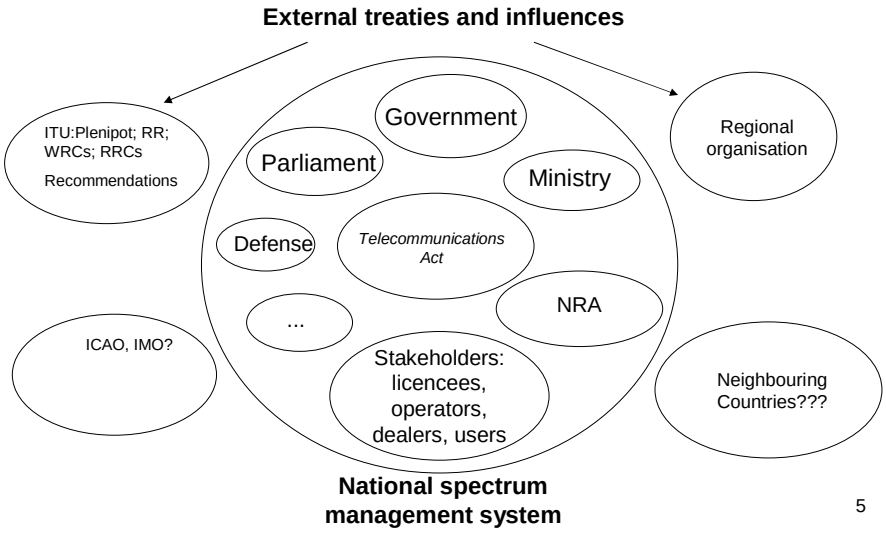
3

Areas considered

1) Country Background
2) National telecoms market
3) Legal Framework for Spectrum Management (**SM**)
4) Institutional structure for SM in a country
5) Spectrum Allocation: current situation and future trends
6) Frequency Assignment & Apparatus Licensing processes
7) Spectrum Pricing, Financing of SM Organisation
8) Spectrum Quality Control, Interference Management & Enforcement
9) Equipment Standardization and Type Approval matters
10) International/Cross-border Spectrum Planning
11) Stakeholder Participation in the SM Process
12) Research Collaboration with Institutions of Higher Education

4

National SM Environment



5

Case Study I

Sierra Leone

6

Sierra Leone: Background

- Area 71 740 km^2, two neighbours: Guinea, Liberia
- Population 6.3 Million
- Legacies of civil war
- Now firmly on the road of peaceful development
- Agriculture: 42% of GDP
- GDP: ca. 700 USD p.c.

7

Sierra Leone's Market

- PSTN 24000 lines (less than 0.5%), no DSL
- Many ISPs (VSAT backbone): est. 10 000 Internet users, only some 3000 on subscriptions
- Broadcasting – mostly FM radio (27 Tx in Freetown), TV only in capital
- GSM penetration 1.3 million active SIM cards (ca. 20%)
- 4 active GSM networks, some more expected soon (GSM-1800, CDMA-800)

8

Legal Framework for SM

State legislation: -Acts	***Telecommunications Act (2006)***
Secondary legislation: -Government Decrees -Ministerial Decrees -Resolutions and orders of SM organisation	None approved, drafts in the process of preparation
Spectrum Policies and Strategies	None published
New and developing initiatives	Re-distributing spectrum in 900 MHz to accommodate new operators??? Possible licensing of WiMAX/3G – no public information. Nothing else known by operators!

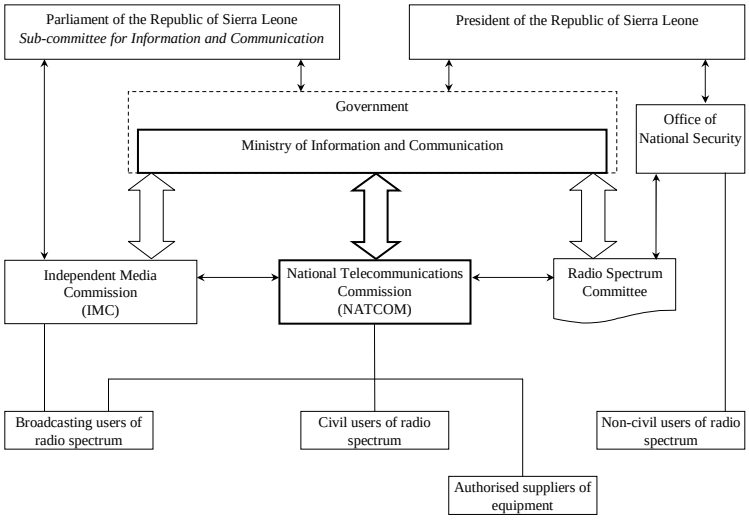
9

Telecommunications Act (2006)

- The Act specifies:
  - Setting up and duties of NATCOM
  - Duties of the Ministry of Information and Communication
    - Incl. establishing Radio Spectrum Committee
  - Rights and obligations of public network operators
  - Spectrum management assigned to NATCOM
  - Inter-institutional coordination and setting of strategic SM directions through Spectrum Committee under the Ministry

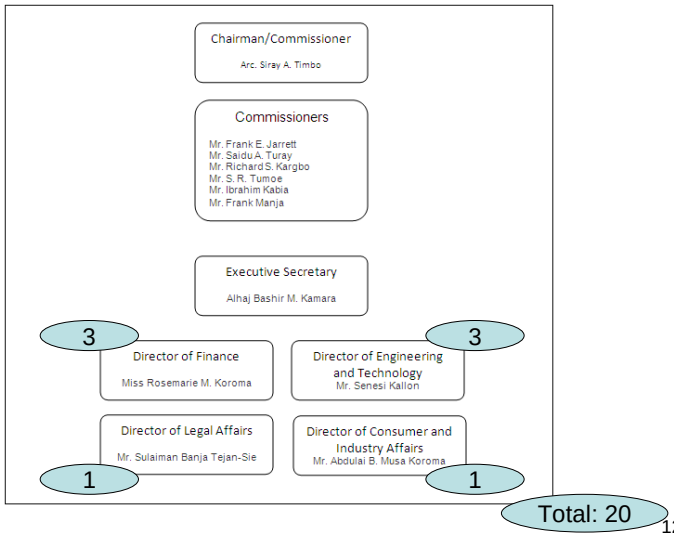
10

Institutional structure for SM



11

SM Organisation: NATCOM



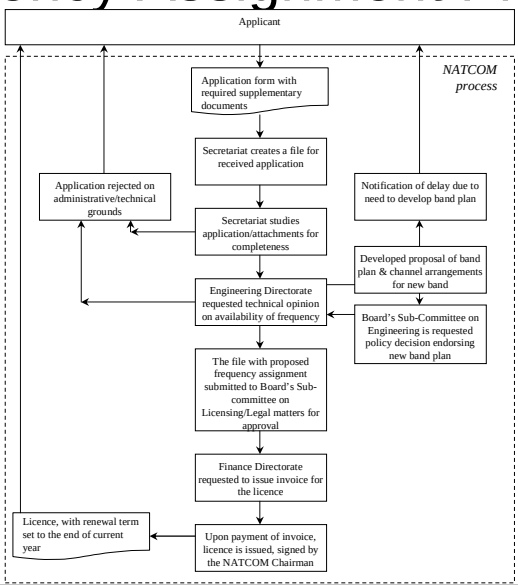
12

Spectrum Allocation

- National Frequency Allocation Table in draft from, not approved nor publicised
- No formal sharing/dividing spectrum between civil users and ”uniformed forces”
- Major uses:
  - Public Cellular (mixture of technologies from various regions)
  - FM radio broadcasting
  - VHF/UHF Private Mobile Radio
  - VSAT

13

Frequency Assignment Process



14

Spectrum fees

- Spectrum fees are generic, i.e. linked to network/licence:
  - application fee – one off for application processing
  - annual licence fees - per licence (only in case of PMR number of handheld terminals is taken into account)
  - annual spectrum usage fees - per block of given size issued for network (some formula only for fixed microwave links)
- NATCOM financed from collected fees, surplus channelled into state coffers

15

Spectrum Quality Control

- Currently no dedicated staff to deal with spectrum monitoring, hence no activities taking place
- Only very basic equipment available at NATCOM, some of the available equipment not (fully) functional

16

Enforcement

- Currently: no dedicated staff at NATCOM
- Only very occasional inspection tours (provincial tours)
- GSM operators report that interference issues happen
- There is no prior culture of respecting spectrum usage rules among the market players, so it may be expected that a large extent of illegal use happens
- No prior culture of respecting trading & standardisation rules by equipment dealers

17

Type Approval

- Currently: no staff, no activities
- No effective control of imported equipment:
  - what types of equipment are brought onto market
  - what number of radio transmitting equipment is brought
- No control of dealerships:
  - no control over whether dealers are selling radio equipment only to legal users (i.e. licence holders)

18

Cross-Border Planning

- Currently: no cross-border planning, no cross-border cooperation with neighbouring countries, no notification to ITU BR
- Thus – no legal protection of stations in case of interference or legal dispute, e.g. over cellular coverage across the border
- The cross-border interference not yet reported, but this might be due to a simple fact that so far there was no extensive radiocommunications use on either side of borders; this will gradually change, raising the danger of interference

19

Stakeholder participation in SM

- Up to now only occasional direct (letters, meetings) consultation with stakeholders: operators, market players
- No formal rules: each time the question of whether to consult with industry and how is taken on *ad hoc* basis by the NATCOM Board or one of its sub-committees
- Operators express concerns over not knowing the national regulatory strategies, such as suddenly proposed re-distribution of 900 MHz GSM frequencies
- Operators sometimes receive conflicting signals from NATCOM and Ministry/government, which adds to their feeling of regulatory uncertainty

20

Case Study II

Zimbabwe

21

Zimbabwe: Background

- Area 390,580 km^2
- Four neighbours: Botswana, Mozambique, South Africa, and Zambia
- Population near 14 Million
- Harare about 2.8 Million
- Surviving very difficult economic period

Zimbabwe's Market

- PSTN 350,000 lines (penetration of around 3%)
- Six licensed ISPs (typically VSAT backbone): Internet penetration estimated at around 11%
- Broadcasting – only one broadcaster: state corporation ZBC (1 TV + 4 radio programmes)
- GSM penetration est. 1.7 million (ca. 12%)
- 3 active cellular networks, no plans for new operators
- BWA (WiMAX) networks expected soon

23

Legal Framework for SM

State legislation: -Acts	***Postal and Telecommunications Act (2000)***
Secondary legislation: -Government Decrees -Ministerial Decrees -Resolutions and orders of SM organisation	•Statutory Instrument 11A (2001): specifies the licensing, registration and certification procedures; •Statutory Instrument 14 (2008): determines the fees schedule, including the formula for calculating radio spectrum fees; •Statutory Instrument 162 (2008): describes the penalties for licence breaches; •Statutory Instrument 165 (2008): amendment of SI#14 on fees.
Spectrum Policies and Strategies	None published

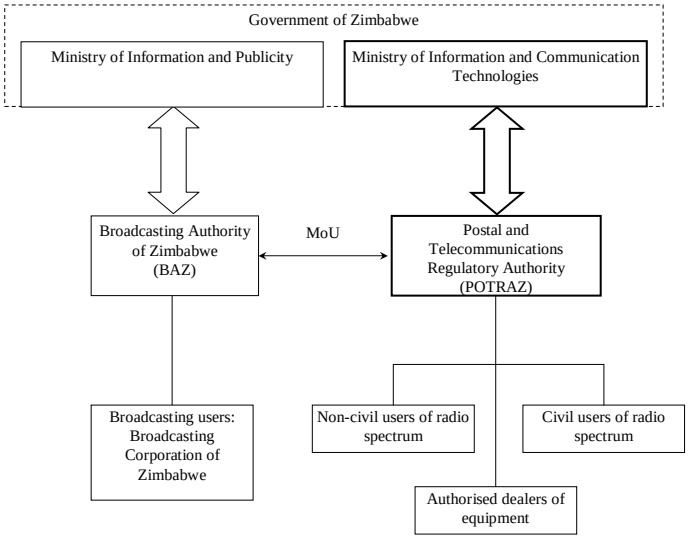
24

Postal and Telecommunications Act (2000)

- Besides the establishment of POTRAZ, the Act describes:
  - composition and functioning of the Board;
  - right of the Minister to give policy directions to the POTRAZ Board;
  - provisions for funding of POTRAZ through licensing fees;
  - sets out the types of licences and licensing procedures;
  - setting up and functioning of the Universal Service Fund;
  - other provisions related to regulation of telecommunications networks (interconnection, type approval matters and so on);
  - regulation of postal services, and
  - miscellaneous provisions (offences, etc)
  - i.e. NOT much about SM!

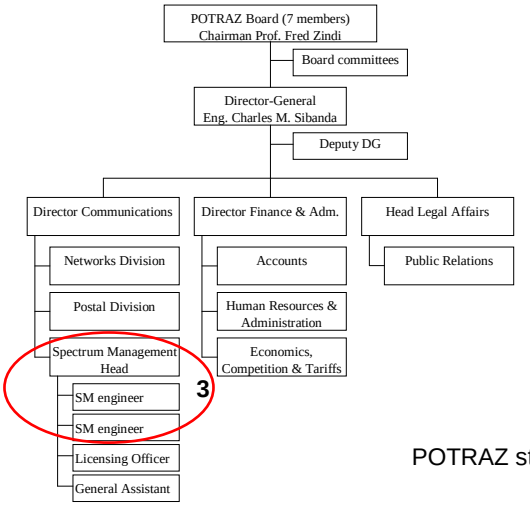
25

Institutional structure for SM



26

SM Organisation: POTRAZ



POTRAZ staff total: 32

27

Spectrum Allocation

- There is no approved National Frequency Allocation Table
- Formal agreement with Broadcasting Authority on designation of broadcasting spectrum
- No formal sharing/dividing spectrum between civil users and ”uniformed forces”
- Major uses:
  - Public Cellular (GSM)
  - HF/VHF Private Mobile Radio
  - VSAT
  - Microwave links

28

Frequency Assignment Process

- Frequencies assigned as part of issuing network licences
- Licences are issued with duration of 1 year, licences renewed subject to payment of annual licence fees
- No automation

29

Spectrum fees

- Spectrum fees calculated using formula:

$$SpecFee = \frac{RFbandwidth}{SpecUnitBW} \times k_{REUSE} \times k_{SERVICE} \times k_{SHARING} \times k_{SATSERVICE} \times SpecUnitFee$$

- POTRAZ financed from collected fees, surplus assigned to Universal Service Fund
- Due to hyperinflation over several last years, budgetary planning was impossible, all savings in USF have vanished

30

Spectrum Quality Control

- Currently no dedicated staff to deal with spectrum monitoring, hence activities are random and very occasional
- Former extensive monitoring base built by monopoly PTT was abandoned for a while during liberalisation and is now not functional
- Currently only basic equipment functional, more handheld equipment purchased
- Purchase of more equipment to resuscitate activities of fixed monitoring station and at least one mobile monitoring vehicle is on the agenda of POTRAZ

31

Enforcement

- Currently: no dedicated staff
- Only very occasional inspection tours (provincial tours)
- The previous inspection tours report a significant extent of illegal use

32

Type Approval

- Type Approval system is formally in place
- However no dedicated staff is assigned at POTRAZ, type approval activities carried out by SM engineers on *ad hoc* basis
- Only partial control of equipment import, permissions granted for entire batches of any type approved equipment
- No equipment marking, no effective control of equipment dealers

33

Cross-Border Planning

- Currently: very occasional cross-border coordination with neighboring countries, no notification to ITU BR
- Abundance of issues reported by cellular operators regarding interference or ”illegal coverage” in border areas

34

Stakeholder participation in SM

- Up to now only occasional direct (by letters, meetings) consultation with stakeholders: operators, market players
- Some formal rules exist in SI11A for the case of awarding new licences, however these are too generous therefore could not be followed by the letter
- No formal consultation rules for other cases, such as consultation on policy developmens, each time the question of whether to consult with industry and how is taken on ad hoc basis
- So far POTRAZ had no its own Web site

35

Identified common problems

- inefficient or outright missing secondary legislation
- insufficient staffing of SM functions
- lack of proper enforcement
- insufficient publicity in developing major spectrum management policies
- lack of process automation
- no contacts with Universities

36

I. Secondary legislation

- Comprehensive set of secondary legislation is very important for smooth and transparent functioning of SM:
  - National Table of Frequency Allocations
  - Delineation of roles of involved SM parties
  - Rules for licensing and frequency assignment
  - SM strategy documents
  - Financial, enforcement regulations, etc.

37

Building legislative base

- Needs to be assigned a clear priority
- Either dedicate own staff to that task og outsource it, given its ”one-off” nature
- No need to ”re-invent the wheel”, a lot of relevant information could be found in ITU materials, regional organisations and by reviewing similar legal instruments of national regulators in other countries

38

II. Appropriate SM staffing

- The number of SM staff should be appropriate for the number of carried duties
- Even more important is that organisational units/dedicated staff exist to address specific SM functions:
  - planning, coordination
  - licensing, frequency assignment
  - radio monitoring
  - enforcement
  - type approval

39

III. Role of enforcement

- It is inconceivable that the regulator can achieve any of its objectives without proper enforcement:
  - who would follow the regulations if not faced with the prospect of prosecution for non-compliance?
- Therefore permanent and highly visible enforcement activity should be an essential element of any SM organisation

40

Building enforcement

- Start from one inspection team, give it a schedule of at least one inspection visit a day
- Based on initial experience, increase the number of teams, re-enforce them with suitable equipment
- Build regional offices, with the main tasks of radio monitoring and enforcement

41

IV. Publicity issues

- Transparency of SM operations is important prerequisite of a stable and flourishing wireless market, where players can make well-informed decisions and are confident of the future
- Publicity can be easily achieved by some organisational adjustments:
  - creating formal rules for public consultations
  - having an informative website, constantly update it
  - establishing regular venues for exchange of information with industry, such as annual seminars or consultative bodies

42

V. Automation of SM processes

- Important for increasing efficiency of SM organisation
- Enables expert spectrum management decisions by providing access to:
  - administrative tools
  - spectrum planning and engineering tools
  - related databases: licensing, frequency planning, assignment, monitoring
- Essential functionality provided by BDT's SMS4DC software tool

43

VI. Bringing in the universities

- Cooperation with universities is often overlooked though it is one of the simplest methods to achieve two aims:
  - develop in-house/in-country know-how
  - groom the future staff for administration
- Such cooperation could be often started at no charge, by simple feeding of research projects and offering internship to advanced students
- In more advanced cases, universities could be used as bases for building R&D facilities for the administration

44

Example of University Network

- Set up by Malaysian regulator (SKMM)
- Example of SM projects initiated in 2007:

No.	Research subjects	Universities	Collaborative partners
1	Impact on the society	Universiti Teknlogi Malaysia (UTM)	University of Sydney, International Islamic Universiti Malaysia (IIUM), University of Kuala Lumpur
		Universiti Kebangsaan Malaysia (UKM)	Universiti Utara Malaysia (UUM)
2	Radiation hazard	Universiti Tenaga Malaysia (Uniten)	UTM
3	Spectrum cost vs network cost	Universiti of Nottingham in Malaysia	First Principle Sdn Bhd
4	Cognitive radio	UTM	Uniten, IIUM
5	Frequency adaptive HF systems	UTM	Universiti Malaysia Pahang, Malaysian Red Crescent Society, RF Communication (a private company)
6	Frequency use above 25 GHz	Universiti Putra Malaysia	UTM, Universiti Sains Malaysia, IIUM Malaysia, CRC (Canada)
		Multimedia Universiti (MMU)	Malaysian University of Science and Technology
7	Spectrum needs for IMT-Advanced	UTM	UKM, Maxis (a mobile operator)
8	Coexistence in extended C-band	MMU	MIMOS Bhd (a government research institution)
9	Synergizing 2G, 3G and WiMax	Universiti Malaya	DiGi (a mobile operator)

45

Conclusions

- The administrations in developing countries often underestimate importance and complexity of SM
- Careful design and constant improvement of SM organisations and their functioning is required if SM was to achieve its objectives
- Advices may be found in ITU Handbook on National Spectrum Management

46

Thank you!

Dr. Arturas Medeisis
E-mail: am@rslab.lt