ITU/BDT Regional Seminar on the Economic and Financial aspects of Telecommunications/ICT

The Brazilian experience on spectrum pricing modeling: The 3G and 4G license

Abraão Balbino e Silva

Competition Manager - Anatel, Brasil

México D.F.

Agenda

- **Motivation**
- **Auctions Theory: A Brief Overview**
- **Institutional Aspects of the Regulation of Telecommunications in Brazil**
- **Spectrum Pricing Models:**
  - Demand, Incomes, Expenses (OPEX), Investments (CAPEX), Weighted Average Cost of Capital (WACC) and other important variables.
- **Public Policies and the Valuation of Spectrum**
  - Goals besides the increase in state revenue;
  - Merger of public policy objectives in the Business Plan: The auction of spectrum to deploy 3G technologies (2007) and 4G (2012).

Motivation

Motivation

The electromagnetic spectrum

Scarce

The crescent demand for spectrum for new wireless services consolidation as evidenced by, among others, mobile communication systems, networks of digital terrestrial television broadcasting or the various systems of broadband wireless access

A resource with the ability to influence a country's competitiveness

Therefore, there is no doubt about the importance of proper assessment of the opportunity cost of their idleness.

Actions Theory

The main types of auctions:

- ***English Auctions:***

  The price is increased successively until only one buyer remains, which is what wins the right to the final price.

- ***Descending or Dutch auction:***

  Previous reverse mechanism, ie, in this case the auctioneer begins with a high price that decreases on until a buyer agrees.

- ***First sealed bid auctions:***

  The bids are submitted simultaneously to the auctioneer in sealed envelopes. Winning participants who made the best bid, provided that the reserve price has been reached

- ***Closed auction on second-price (or Vickrey auction):***

  Tenders are also presented with a sealed envelope. Still, the price to pay is not relevant to the offer of the winner, but the second highest bid submitted

Auctions Theory

- Revenue Equivalence Theorem.;
- These four basic types of auctions support many variants, for example, may include a minimum price (**reserve price**).
- Anatel traditionally uses a combination of English auction with sealed bid auction first. We also adopts a reserve price and other mechanisms such as the division of RF blocks, the order of bidding for blocks.

This method complicates the collusive activities among buyers, since that allows a cartel member obtains a positive expected utility if he loses the group discipline (doing, so that these agreements are less stable)

Institutional Aspects

Institutional Aspects

Classification of the services:

1. ***Public regime***
   - Services of general interest, whose existence, universality and continuity of the State undertakes to insure.
   - Anatel defines obligations of universality and continuity, fees and adjustments.
   - Concession or permission.
2. ***Private regime***
   - Services restricted interest and collective based on the constitutional principles of economic activity (freedom).
   - The prices of the services are free.
   - Authorization.

The State does not have the same tools in the public system has to promote the expansion of these services

Institutional Aspects

ANATEL

REGULATION	❖ Legal system of the pillars of the regulatory model
AUDICT	❖ Verification and compliance guidance adequate provision of services
ARBITRATION	❖ Driving transparent resolution of conflicts.
LICENSING	❖ Delegation of power grantor
CERTIFICATION OF PRODUCTS	❖ Mechanisms for certification and approval of products
SPECTRUM MANAGEMENT	❖ Management of Scarce Resources

Spectrum Pricing

CONTROL COURT (TCU): A atividade de outorga de direito de uso de radiofrequência deve ser amparada por "*(...) critério metodológico compatível com a avaliação dos negócios empresariais, promovendo estudos fundamentados de viabilidade econômica do empreendimento, considerando inclusive a projeção de lucros e as taxas de risco, de atratividade e de retorno do negócio, a fim de estabelecer o preço mínimo de venda*"

Anatel performed a complex pricing study that is revealed in the form of a Business Plan

Spectrum Pricing

Discounted Cash Flow (DCF): Determines the current value of discounting future cash flows at a rate that reflects the cost of capital contributed.

i. assessment of the investment is based on cash flows from operating

ii. the risk is incorporated in the economic evaluation of the investment, subject to investor preferences regarding conflicts of risk-return

iii. decision identifies the current value of the asset based on the appropriate discount rate to compensate the owners of capital

$$NPV = \frac{DCF_1}{(1+k)^1} + \frac{DCF_2}{(1+k)^2} + \frac{DCF_3}{(1+k)^3} + \ldots + \frac{DCF_n}{(1+k)^n}$$

Operational Cash Flow

Net Present Value

WACC

In general:

$$(p/f) = 1 / (1+r)^n$$

$$f = \{[(R - G - De)*(1 - i)] + De\} - I$$

R: Incomes; G: OPEX; De: Depreciation;
i: Taxes; I: CAPEX; r: WACC
n: Number of periods; p: Net present value

- Demand;
- Incomes;
- OPEX;
- CAPEX
- WACC.

$$WACC = \frac{E}{E+D} K_E + \frac{D}{E+D}(1 - T)K_D$$

$$K_d = r_f^{GL} + \text{Credit Risk Premium} + RS + DI_{Br-US}$$

$$E(R_i) = R_f + \beta*(E[R_M] - R_f)$$

$$\beta_i = \frac{\text{cov}(r_i, r_m)}{\sigma_{r_m}^2}$$

The Brazilian Experience

The Brazilian Experience

Traditional Model of Ascending Auction ::

- Government intends increase the collection, with high spectrum prices and expectations of good will;
- All money raised goes to the Treasury;
- Companies that acquire spectrum is free to provide the services according to their competitive strategies.
- **Problem**: Social welfare often not achieved, because it turns out that many areas are not covered.

Traditional Model of Beauty Contest

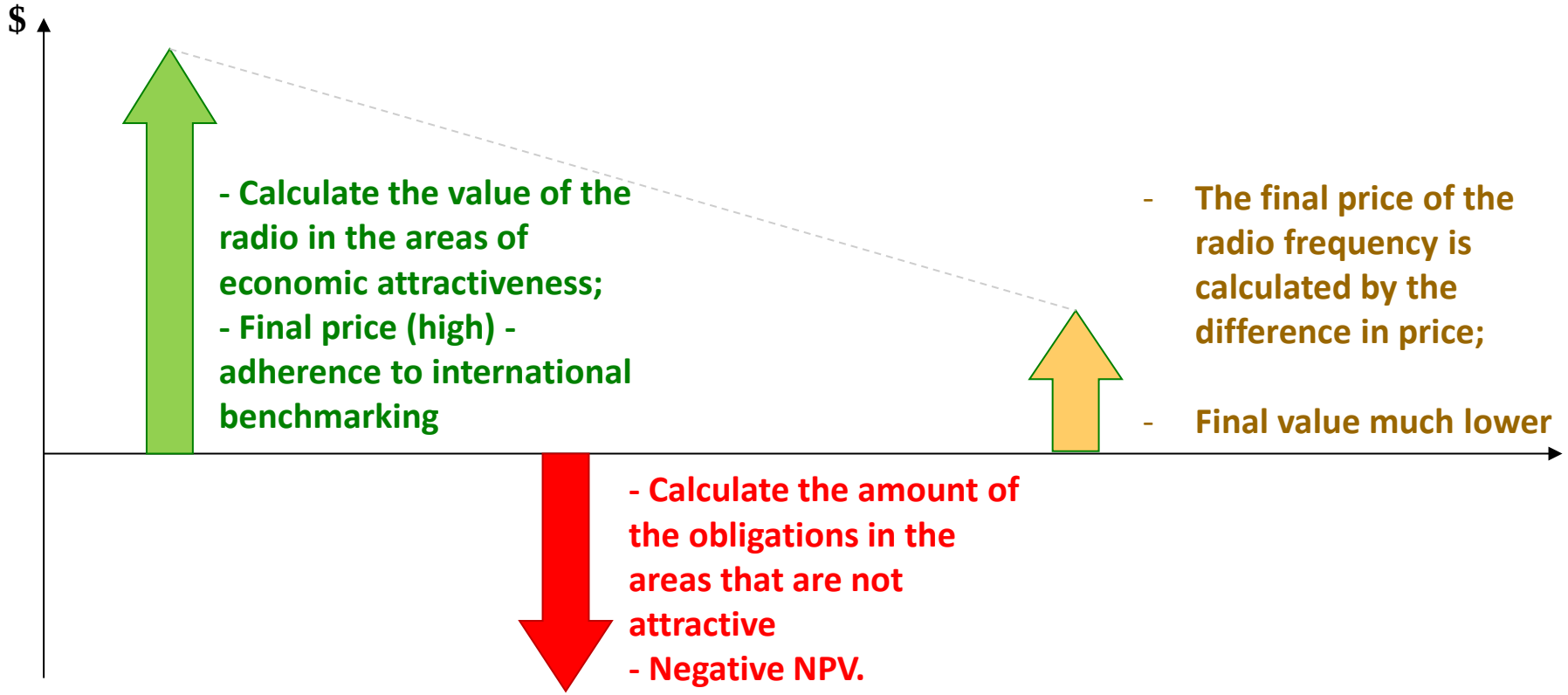
- Tenderers must submit its proposal on the type of bond that is willing to comply.
- Win the company with the largest number of bonds at a specified price.
- Government waives the collection to increase social welfare.
- **Problem**: This model is difficult to implement due to implementation difficulties and risks of judicial resources.

The Brazilian Experience

Brazilian Alternative:

- Model that seeks to add the strengths of traditional models;
- **The operation takes as an ascending auction model:** simple to perform, the highest bid wins;
- Coverage obligations and investments in infrastructure are prerequisites for a winner, ensuring that welfare policies are met;
- In the other hand, there is a significant reduction in the final price of spectrum licenses, as this price includes execution of coverage obligations and investments in infrastructure.
- As the auction model is simple, the risks of the legal and operational problems in the auction are simple.

The Brazilian Experience



Benefits:

- All investments are private, and the government audicts the execution.
- The information asymmetry is corrected by the auction.

Public Policy and spectrum valuation

- **Besides revenue collection aspects are other issues important to the public interest is maximized in the auction of rights to use radio frequency.**

In particular, to achieve two main objectives

- **COMPETITION**
- **COVERAGE**

- **COMPETITION** → **Spectrum Caps**

- **COVERAGE** → **Imposing coverage obligations in order to ensure that the service is also offered in areas of lower economic attractiveness.**

The auction of licenses: the case of 3G

Context in 2007:

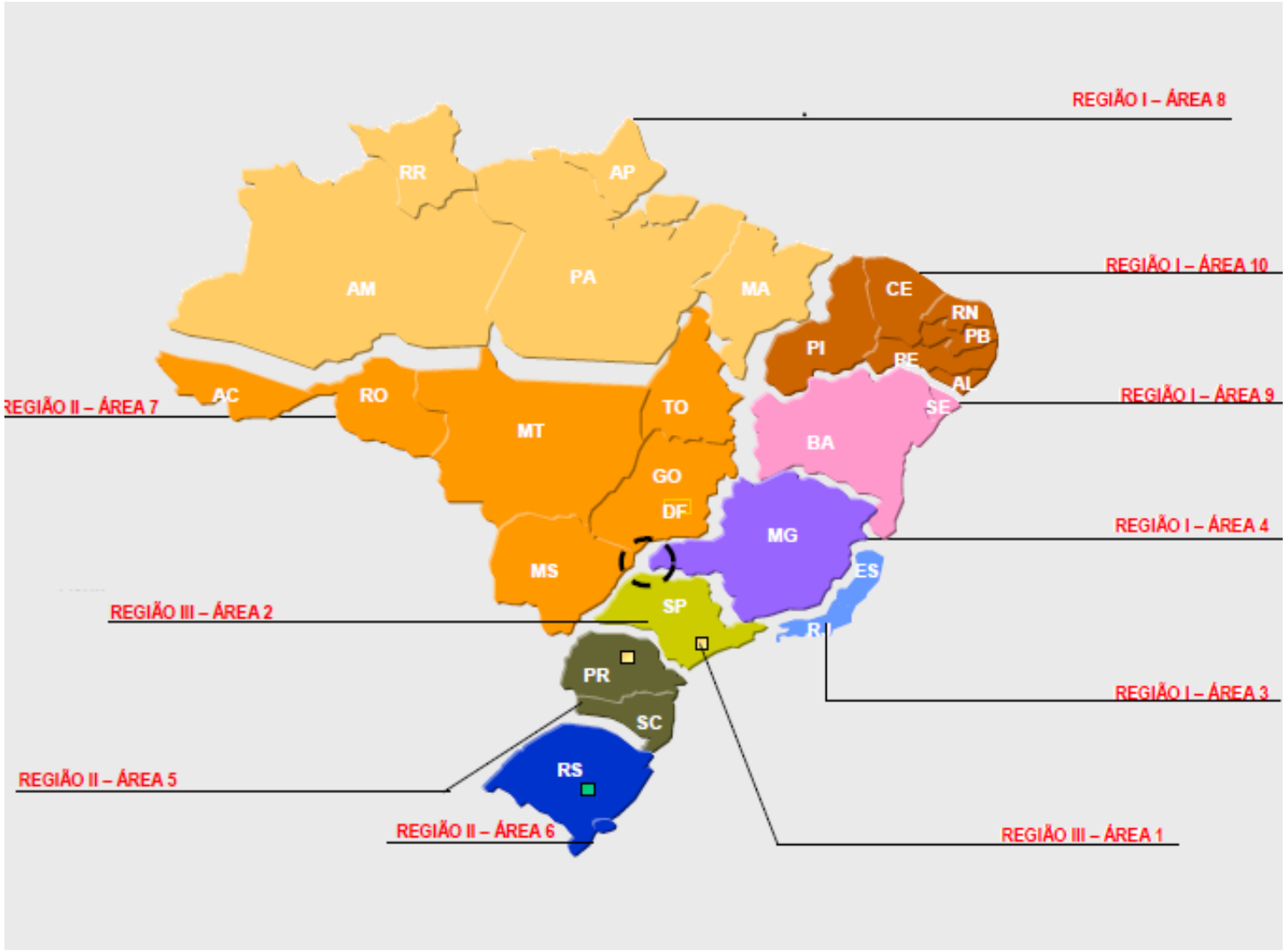
- Of the 5,564 Brazilian municipalities, municipalities lacked 1836 mobile infrastructure. Most of these municipalities have less than 30,000 population and are located in the north and northeast of the country, economically poorer regions;

- The lack of infrastructure to provide mobile broadband services, even in large cities;

- 1.900/2.100 MHz band was available.

The auction of licenses: the case of 3G

Edital de Licitação nº 002/2007/SPV



The auction of licenses: the case of 3G

Edital de Licitação nº 002/2007/SPV

The geographical dimension of the relevant market is divided into three segments:

- **Cities with population of more than 100,000 inhabitants;**
- **Cities with populations between 30,000 and 100,000;**
- **Cities with population of less than 30,000.**

- ***3 Great Business Plan;***
- ***For every 10 business plan cash flows in accordance with the division of states defined macroeconomic terms.***

The auction of licenses: the case of 3G

Edital de Licitação nº 002/2007/SPV

COVERAGE OBLIGATIONS	DEADLINES
Cover all the munincipalities without any mobile technology	2 years
Cover all municipalities with populations above 100,000 inhabitants with 3G	5 years
Cover 50% of the municipalities with populations between 30,000 and 100,000 inhabitants with 3G	5 years
Cover 15% the municipalities with population below 30,000 inhabitants (no overlapping)	8 years

Results

	> 100	[30, 100]	<30	<30 sem SMP	TOTAL
TOTAL 15 + 15	1.625.192.070	-303.591.252	29.151.940	-419.419.609	931.333.150
TOTAL GERAL	4.875.576.210	-910.773.756	87.455.820	-1.258.258.826	2.793.999.449

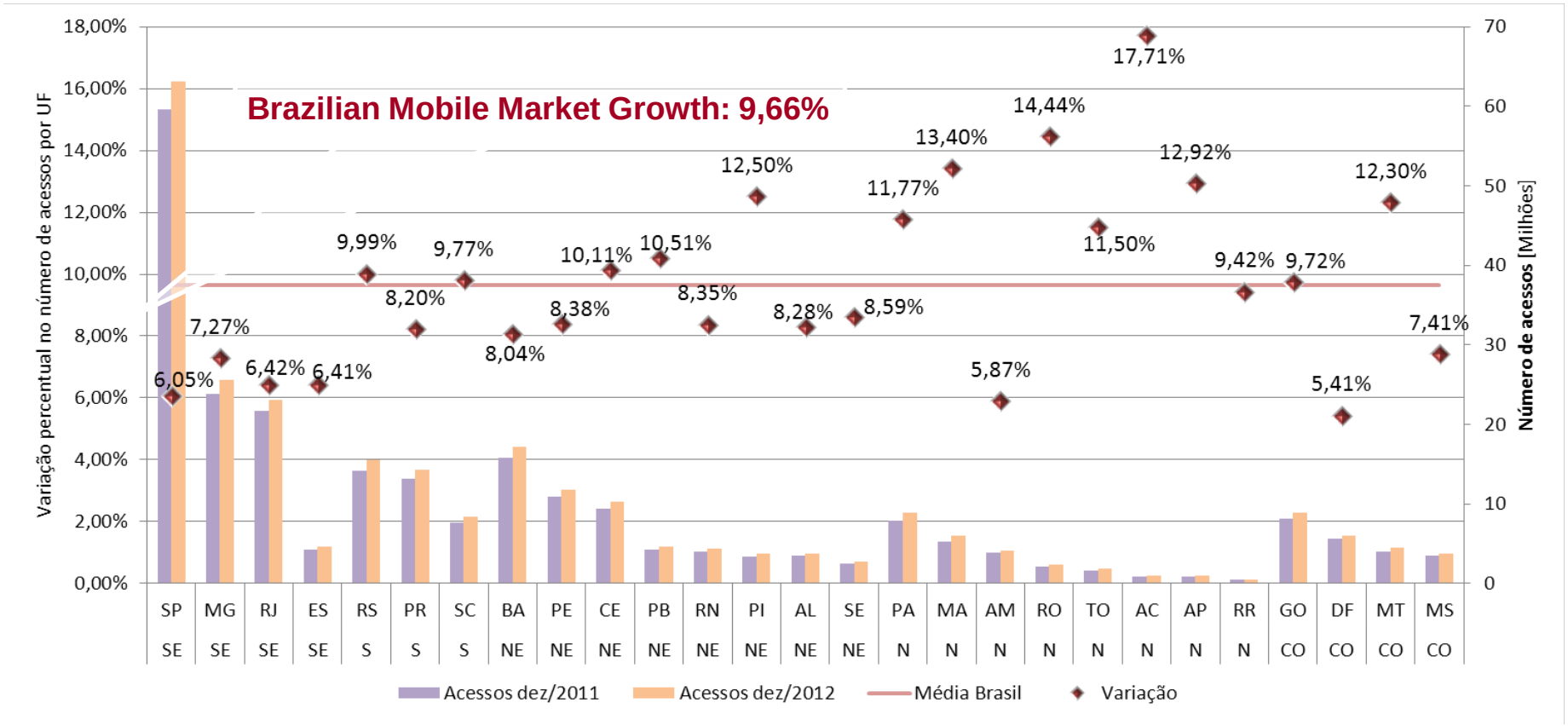
TOTAL DA LICITAÇÃO	2.793.999.448,52
POPULAÇÃO DO BRASIL	189.178.159,00
TOTAL PER CAPITA (US$) - COM SUBSÍDIO	7,42
TOTAL PER CAPITA (US$) - SEM SUBSÍDIO	12,95

TOTAL GERAL	2.793.999.448,52
SUBSIDIO	(2.081.576.761,51)
S/ Subsídio	4.875.576.210,03

The results after 5 years:

- *100% of Brazilian municipalities already have mobile;*
- *BTS number grew from 35,000 in 2007 to 60,000 in 2012, an increase of 71%;*
- *Number of mobile terminals*
  - *12/2007: 106.6 million;*
  - *12/2012: 261.8 million;*
- *MOU (Minutes of Use)*
  - *12/2007: 82 minutes / month;*
  - *12/2012: 120 minutes / month.*

Results


Brazilian Mobile Market Growth: 9,66%
Variação percentual no número de acessos por UF
Número de acessos [Milhões]
18,00%
16,00%
14,00%
12,00%
10,00%
8,00%
6,00%
4,00%
2,00%
0,00%
70
60
50
40
30
20
10
0
6,05%
7,27%
6,42%
6,41%
9,99%
8,20%
9,77%
8,04%
8,38%
10,11%
10,51%
8,35%
12,50%
8,28%
11,77%
8,59%
13,40%
5,87%
14,44%
17,71%
11,50%
12,92%
9,42%
9,72%
5,41%
12,30%
7,41%
SP SE
MG SE
RJ SE
ES SE
RS S
PR S
SC S
BA NE
PE NE
CE NE
PB NE
RN NE
PI NE
AL NE
SE NE
PA N
MA N
AM N
RO N
TO N
AC N
AP N
RR N
GO CO
DF CO
MT CO
MS CO
Acessos dez/2011
Acessos dez/2012
Média Brasil
Variação

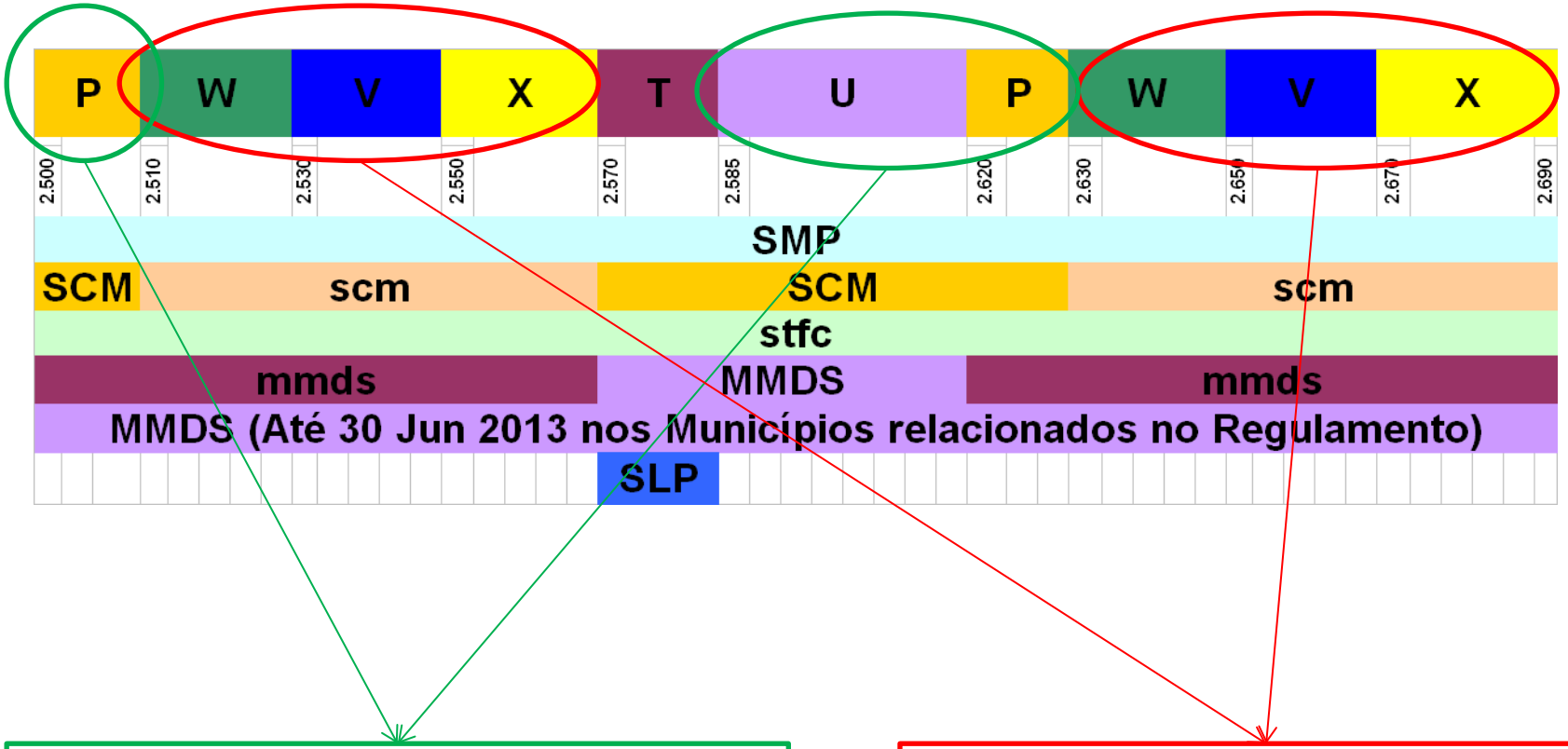
The auction of licenses: the case of 4G

Context:

- The lack of telecommunications infrastructure in rural areas of the country;
- Perspectives from major international events to be held in Brazil in the coming years;
- The complementarity of the two bands of 450 MHz and 2.5 GHz
- We try to overcome the problem of lack of economic attractiveness of the rural area by the prospect of profits in the business city

The auction of licenses: the case of 4G

2,5 GHz MAP



Topics subsidies being regionalized;

Not affiliated with the operation of 450 MHz;

Currently not available in areas where there MMDS providers

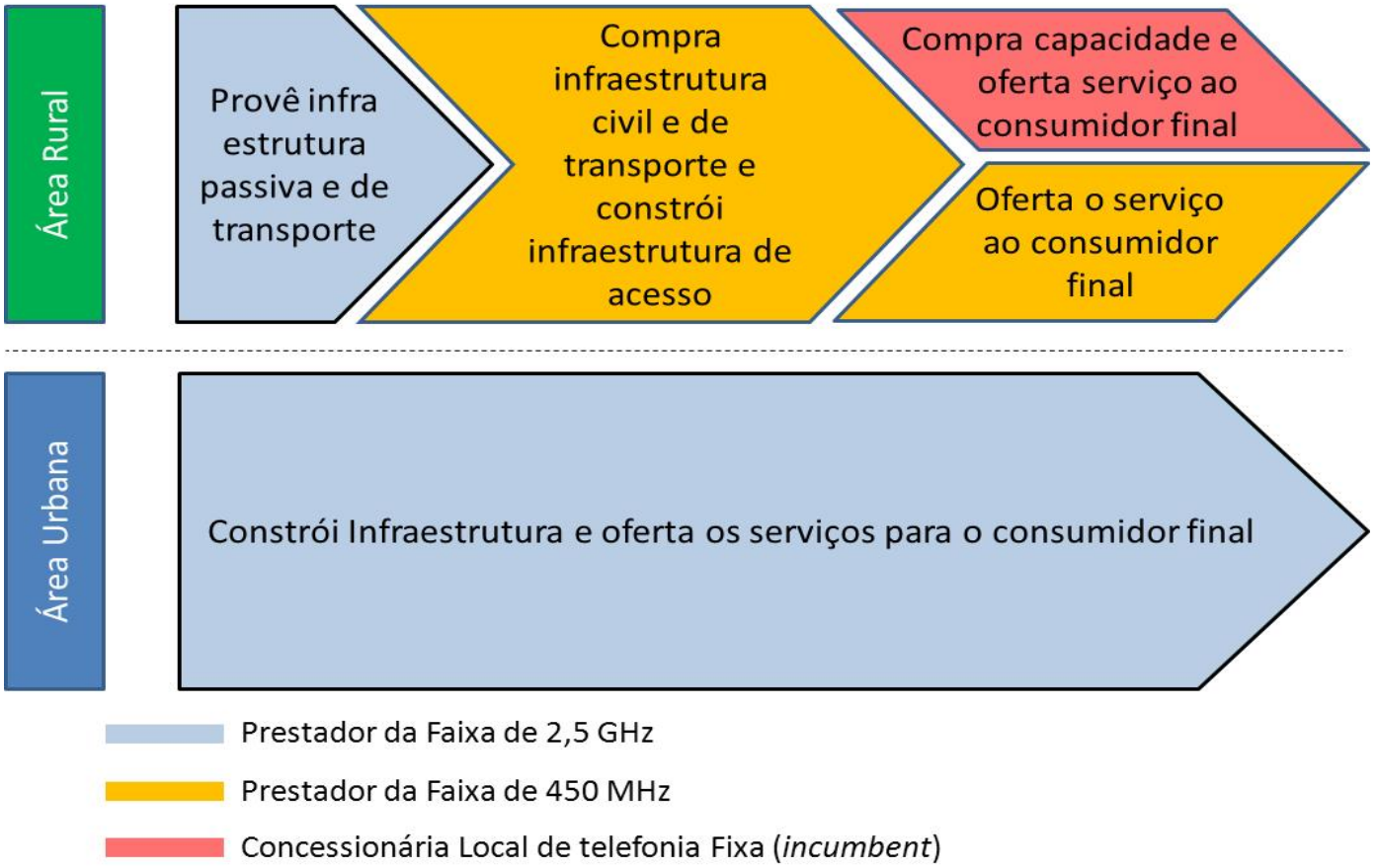
Tracks 20 + 20 MHz FDD

Increased interest

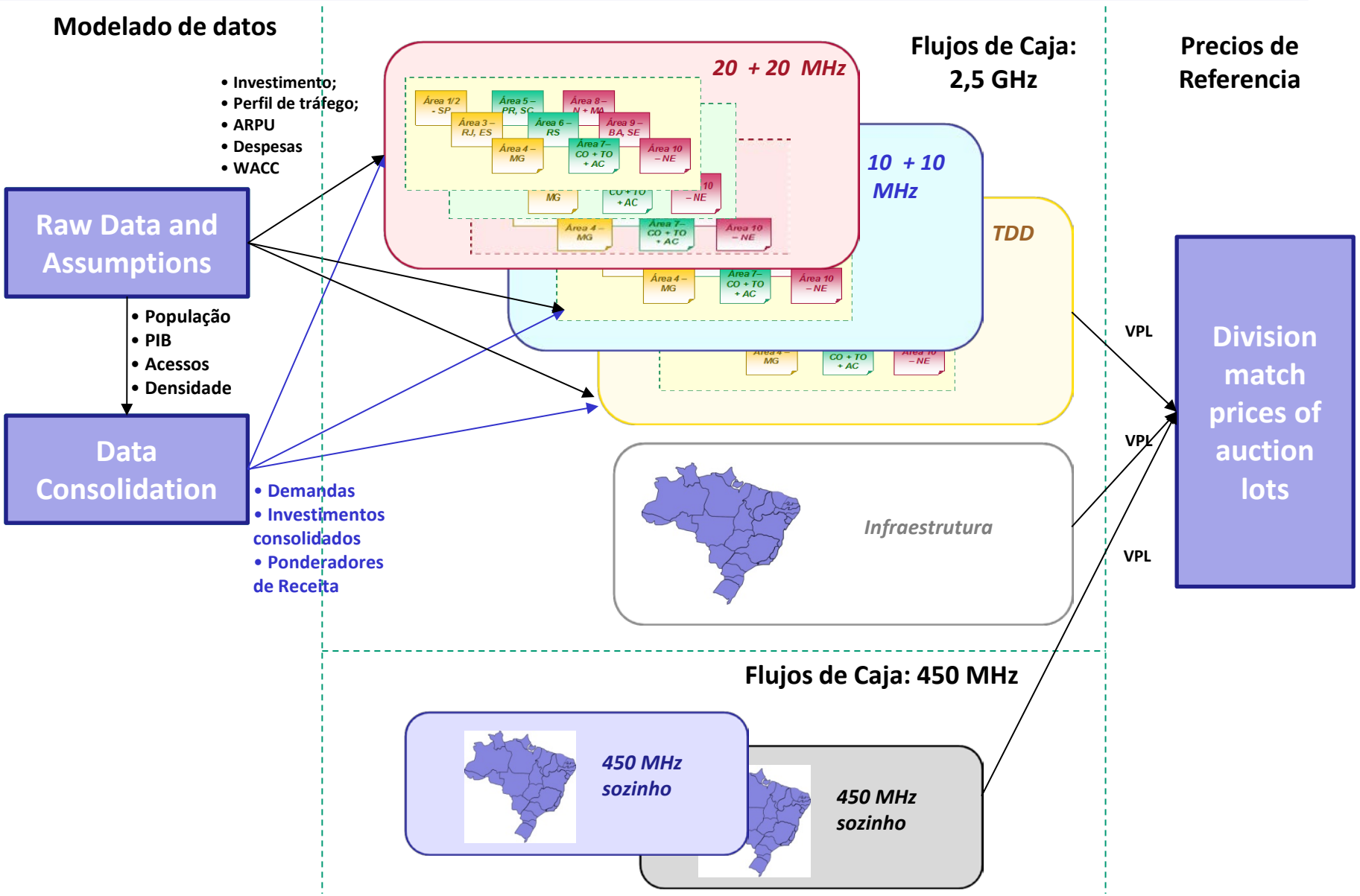
Tracks that are linked to the operation of the 450

The auction of licenses: the case of 4G

Cadeia de Valor Prevista no Edital de 4G.



The auction of licenses: the case of 4G



The auction of licenses: the case of 4G

abr/13	• TODAS as sedes da **Copa das Confederações 2013**
dez/13	• TODAS as SEDES e SUBSEDES da **Copa do Mundo** 2014
mai/14	• TODAS as Capitais e municípios com mais de **500 mil hab.**
dez/15	• TODOS os municípios com mais de **200 mil hab**.
dez/16	• TODOS os municípios com mais de **100 mil hab**.
dez /17	• TODOS os municípios **entre 30 e 100 mil hab.**

The auction of licenses: the case of 4G

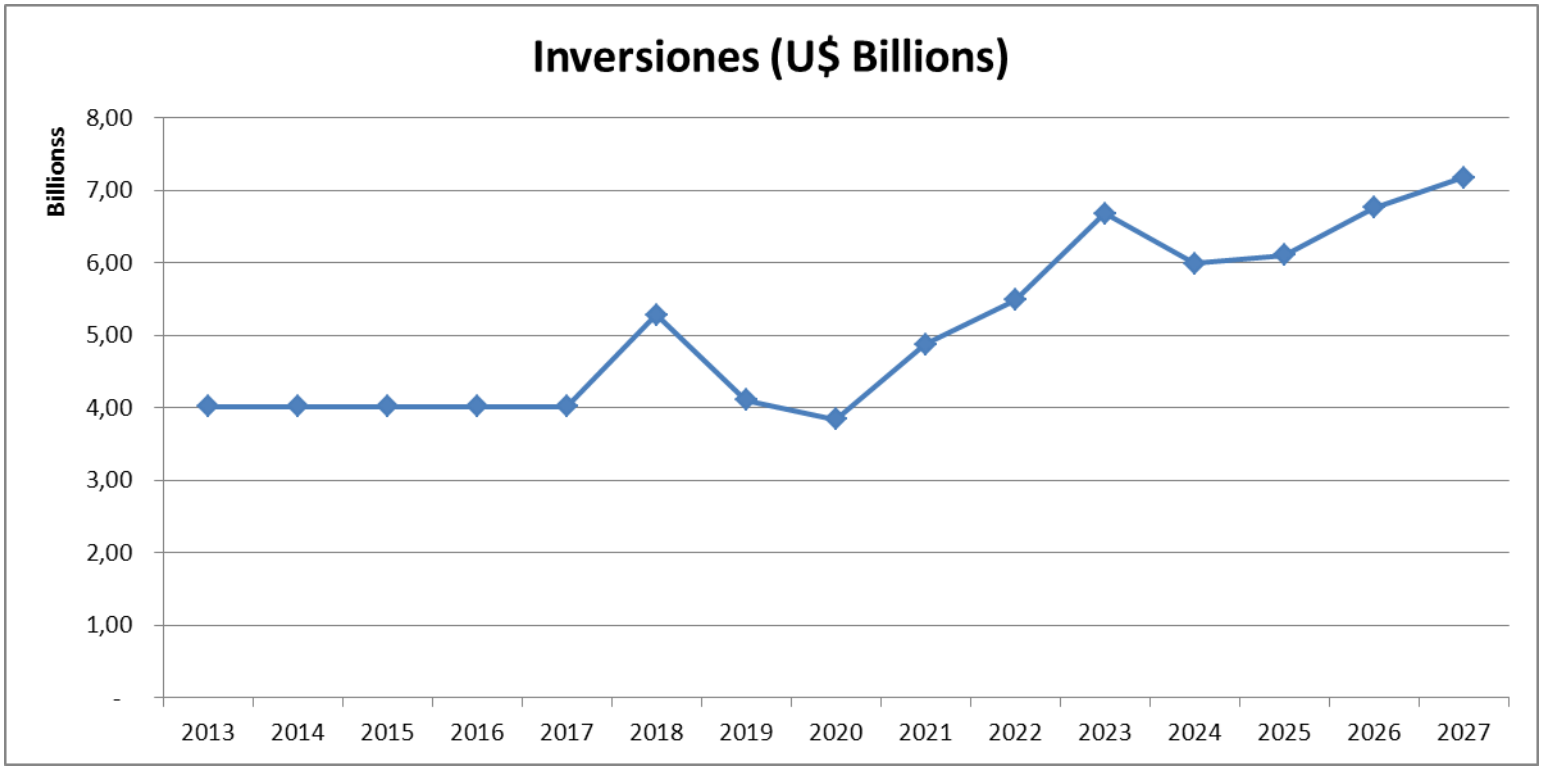
450 MHz	7 + 7 MHz	
Voz e dados no varejo (*)	30% dos municípios até 30/6/2014	Download de 256 Kbps Upload de 128 Kbps Franquia mensal de 250 MB
	60% dos municípios até 31/12/2014	
	100% dos municípios até 31/12/2015	
	100% dos municípios até 31/12/2017 (***)	Download de 1Mbps Upload de 256 Kbps Franquia mensal de 500 MB
Conexões de dados em escolas públicas rurais (*)	30% dos municípios até 30/6/2014	Download de 256 Kbps Upload de 128 Kbps Sem franquia mensal
	60% dos municípios até 31/12/2014	
	100% dos municípios até 31/12/2015	
	100% dos municípios até 31/12/2017 (***)	Download de 1Mbps Upload de 256 Kbps Sem franquia mensal
Capacidade de rede para as concessionárias (**)	30% dos municípios até 30/6/2014	-
	60% dos municípios até 31/12/2014	-
	100% dos municípios até 31/12/2015	-

The auction of licenses: the case of 4G

Objeto	Lotes	Preço mínimo (U$)
Tipo A	**450 MHz**	-
Tipo B	**450 MHz + W**	315.095.500,00
	450 MHz + X	315.095.500,00
	450 MHz + (V1 ou V2)	157.548.000,00
Tipo C	**W**	301.394.500,00
	X	301.394.500,00
	V1 ou V2	150.697.500,00
Tipo D	**TDD (U+T)**	477.231.116,12
	P	527.578.454,19

The final price was around U.S. $ 0.04 / MHz per pop, much lower than the other auctions of 2.5GHz band

The auction of licenses: the case of 4G



Planned investments of the auction: $ 75 billion for the next 15 years

Next Projects

➢ Auction of 700 MHz - Digital Dividend - Primary Objectives

- Anticipation of digital TV;
- Expanding the capabilities of core and backhaul, the obligations of transport networks;
- Improved quality of service;
- Coverage of major Brazilian roads.

Conclusions

The spectrum valuation in Brazil has been supported by robust pricing methodologies use rights RF developed to optimize the use of this asset to maximize its economic value, considering the options available in terms of services, applications technology.

The Brazilian experience in the valuation of spectrum has allowed the implementation of public policy objectives, in particular, the expansion of coverage and investment in infrastructure.

The imposition of obligations by reducing the prices of frequencies allows the creation of a simple mechanism to implement these goals.

¡Muchas Gracias!

Abraão Balbino e Silva
Gerente de Competición - Anatel, Brasil
asilva@anatel.gov.br