



# **Spectrum Pricing and Related Issues**

**- A Presentation at**

**“The GSM Spectrum Seminar”**

**04 December'2003 @ New Delhi**

**T V Ramachandran  
Director General, COAI**

# Spectrum – The Life Blood of Mobile Telecommunications



1. Spectrum Bandwidth determines service cost and and Quality of Service.
2. Demand for Spectrum for Mobility increasing enormously due to
  - steep fall in tariffs leading to more usage/subscriber and
  - aggressive spread of service
  - ever increasing QoS requirements.
3. Spectrum demand can exceed supply in particular geographical areas, particular frequency bands and for particular services depending on liberalisation extent and technology development.
4. Indian market most price sensitive; hence adequate spectrum essential to drive costs down and maintain viable tariffs.

**Spectrum therefore a key factor for accelerating India's march to higher teledensities and GDP Growth**

# ITU's Recommendations on Spectrum Management



**“management of scarce resources (e.g. frequencies, numbers and orbital positions) is an important permanent element of the national regulatory framework.**

**Allocation and use of scarce resources must be**

- objective**
- timely**
- transparent**
- non-discriminatory**

**To have a mutual understanding, a common economic definition should be elaborated for scarce resources.” -- ITU**



# Spectrum for GSM Cellular

- Industry most grateful for Government support in the critical area of Spectrum for arranging :-
  1. Focussed examination of GSM spectrum for cellular by Special DoT Spectrum Committee resulting in
  2. Provision of Policy/Roadmap for 2x15 MHz per Operator linked to subscriber numbers and,
  3. Championing release of more Spectrum from Defence.

**Much has been achieved; more actions with exponential benefits possible**



# Spectrum for GSM Cellular

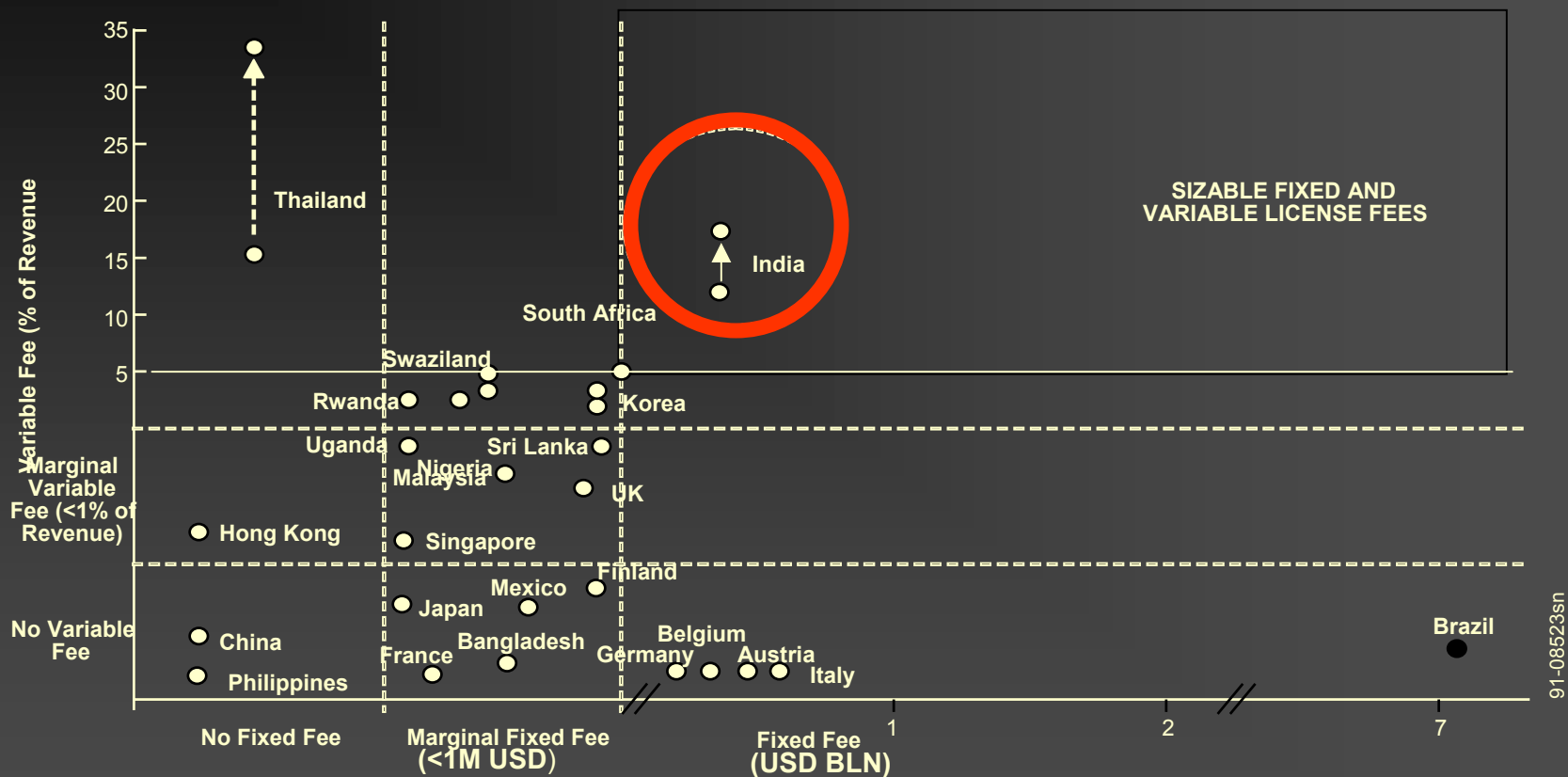
- GSM 900 was mandated standard from '94 to end '99.
- Important to note that once frequency band (900 MHz) is stipulated, then available commercial technologies get automatically determined.
- Over Rs 12,000 crores for country wide world class GSM 900 infrastructure by the time technology neutrality announced end '99.

# Mobile Entry Fee includes Spectrum Cost

**“For the existing service providers who use spectrum for providing telecom services, entry fee paid includes spectrum charges....”**

**TRAI, Consultation Paper No.5/2003 Dated 15<sup>th</sup> November’2003**

# India vis-à-vis International Practice - License Fees of Mobile Operators



91-08523sn

**Indian GSM Operators have paid amongst highest license fees in the world, for right to use spectrum and offer mobile services**

# China - spectrum availability & Charges

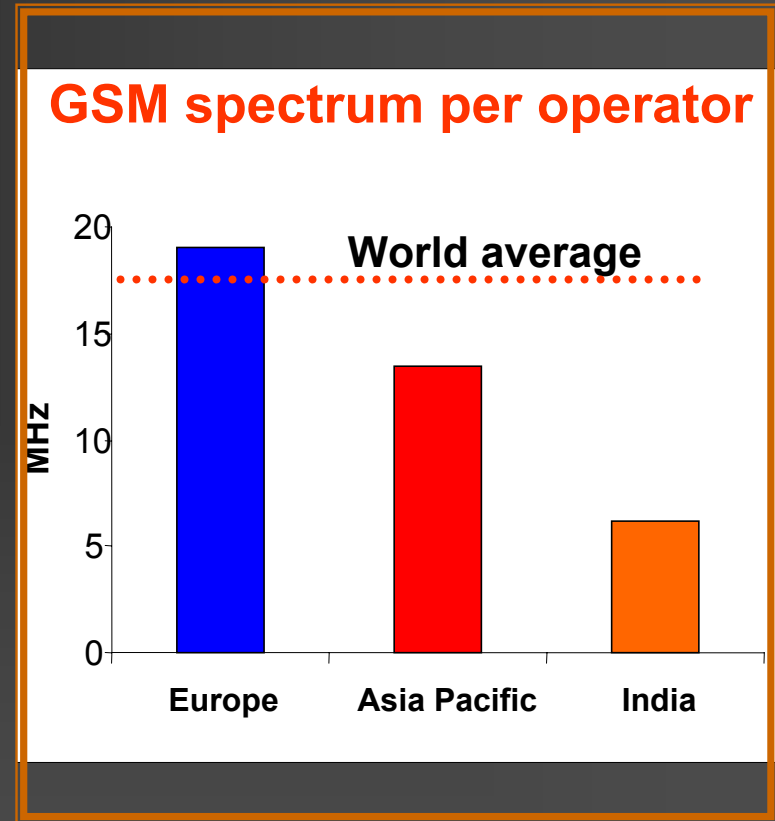
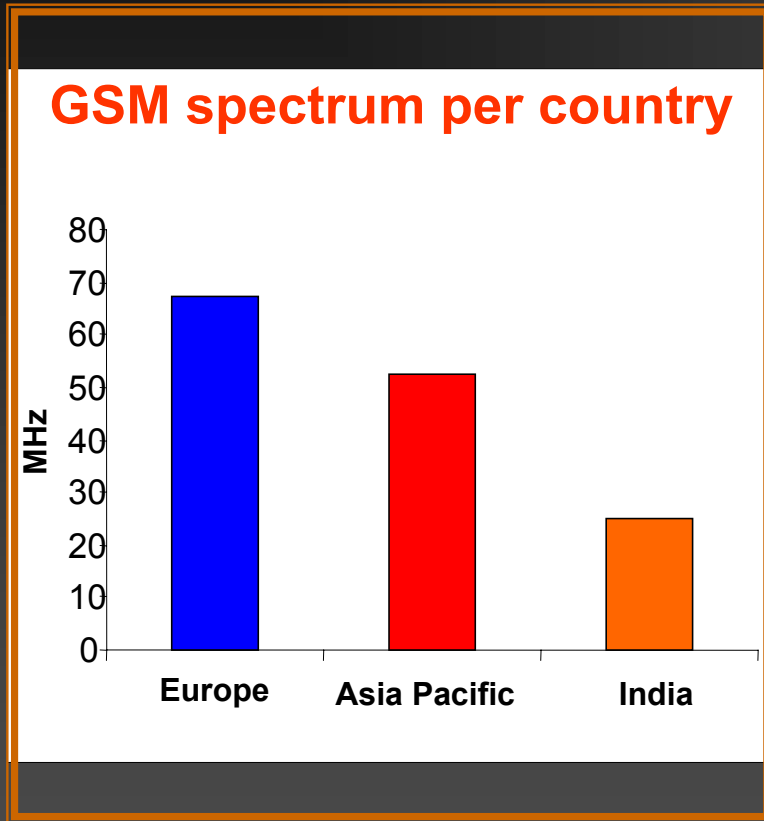
- ◆ China Mobile has perpetual right to 2x29 MHz of spectrum
- ◆ Both China mobile and China Unicom obtained the spectrum at no charge **i.e. no entry fee.**
- ◆ Spectrum Usage charges for China Mobile are 15 MN Rmb for operating revenues of 64 BN Rmb – i.e. 0.02% of revenues
- ◆ Indian Operators are charged between 100 – 200 times more than their Chinese counterpart for the right to use one third of the same resource

**Spectrum availability has direct exponential impact on capital expenditure in a country like India where capital funds are scarce. Also the perpetual usage permits an operator proper network planning at the outset to the graded spectrum approval in India, which leads to roll out on the assumption that additional spectrum may not be available and has very significant capital expenditure and operating expense implications**



# International Practices - Spectrum Allocation

# International Practices – Spectrum Allocation



NB: Spectrum allocated in paired bands – actual allocations are 2x allocations illustrated

**India far below world average i.e. 2x17.1 MHz**

# Spectrum Allocation - International Better Practices



Country	No. of GSM Operators	**Total Frequency	Av. GSM frequency per Operator
United Kingdom	4	2 x 105 MHz	2 x 26.3 MHz
Switzerland	3	2 x 79.6 MHz	2 x 26.5 MHz
Sweden	3	2 x 75.0 MHz	2 x 25.0 MHz
France	3	2 x 74.4 MHz	2 x 24.8 MHz
Belgium	3	2 x 81.0 MHz	2 x 27.0 MHz
China	2	2 X 45.0 MHz	2 x 22.5 MHz
Italy	4	2 X 71.6 MHz	2 x 17.9 MHz
Thailand	3	2 x 57.1 MHz	2 x 19.0 MHz
Estonia	3	2 x 51.6 MHz	2 x 17.2 MHz
Denmark	4	2 x 109.6 MHz	2 x 27.4 MHz
Germany	4	2 X 80.0 MHz	2 x 20.0 MHz
Hungary	3	2 x 68.6 MHz	2 x 22.9 MHz
Ireland	3	2 x 62.4 MHz	2 x 20.8 MHz
Netherlands	5	2 x 105.8 MHz	2 x 21.2 MHz
Spain	3	2 x 64.2 MHz	2 x 21.4 MHz
Malaysia	5	2 x 90.0 MHz	2 x 18.0 MHz

\*\* Includes frequencies in 900 MHz, 1800 MHz & E-GSM Bands

**Average of World Better Practice = 2x22.19 MHz Per Operator**

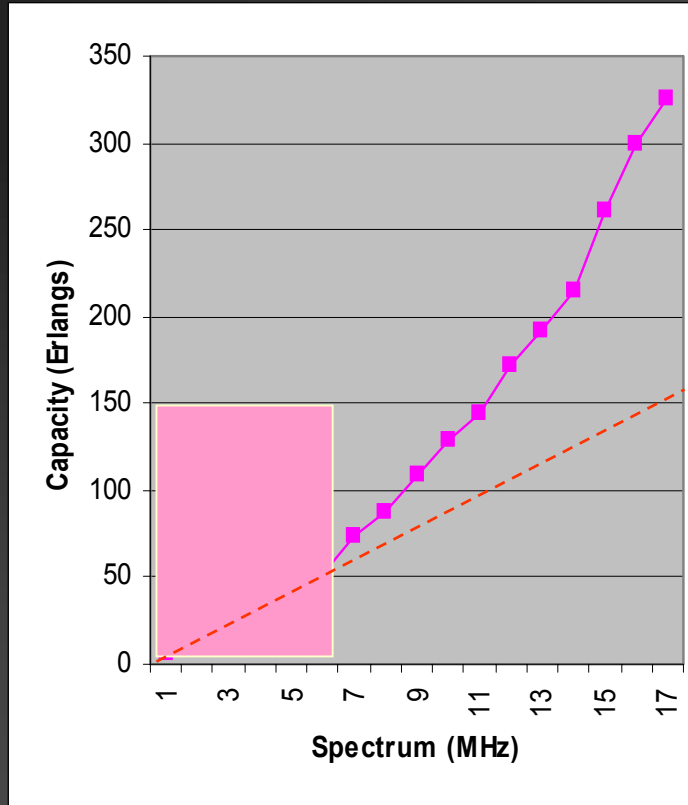


# GSM Trunking Efficiency

Spectrum	Site Config.	Offered Erlang
6.2 MHz	4/3/3	48
8.0 MHz	5/5/4	81
10.0 MHz	7/7/6	122

**Between 6 and 10 MHz, 61% increase in spectrum results more than 155% increase in capacity**

# GSM Trunking Efficiency



**Approx. seven fold capacity increase for 1.75% times spectrum,- 6.2 MHz to 17.1 MHz**

# Spectrum Utilization Efficiency



- Key parameter for spectrum requirements, as per international practice, normally based on
  - Spectrum utilization efficiency measured in erlangs in busy hour per MHz per Sq. Km.
  - Grade of service, measured using % of blocked calls etc.
- Mobile networks are thus designed to achieve required grade of service in busy hour in the maximum subscriber concentration area (hot spot), as per international practices.
- The parameter of subscribers/MHz per service area does not take into account key aspects such as
  - (1) Geographical coverage area (eg. China is a Unitary Service Area that is 3 times size of India)
  - (2) Subscriber concentrations / density
  - (3) Subscriber socio-economic profile,- purchasing power, age profile, literacy, life style etc.
  - (4) Traffic profile and
  - (5) Grade of service

**Thus, Subscribers/MHz not considered appropriate for judging spectrum efficiency ,- it could lead to  
- greatly misleading inferences**

# Subscribers/MHz

Country	Spectrum	Sub as on Aug'03 (million)	Sub./MHz (million)
Malaysia	90 MHz	10.1	0.11
Thailand	57 MHz	21.0	0.37
United Kingdom	105 MHz	50.84	0.48
Australia	30 MHz	14.4	0.48
Indonesia	25 MHz	14.4	0.58
<b>India</b>	<b>25 MHz</b>	<b>17.5</b>	<b>0.70</b>
Germany	80 MHz	59.8	0.75
Philippines	25 MHz	18.7	0.75
Italy	71.6 MHz	54.5	0.76

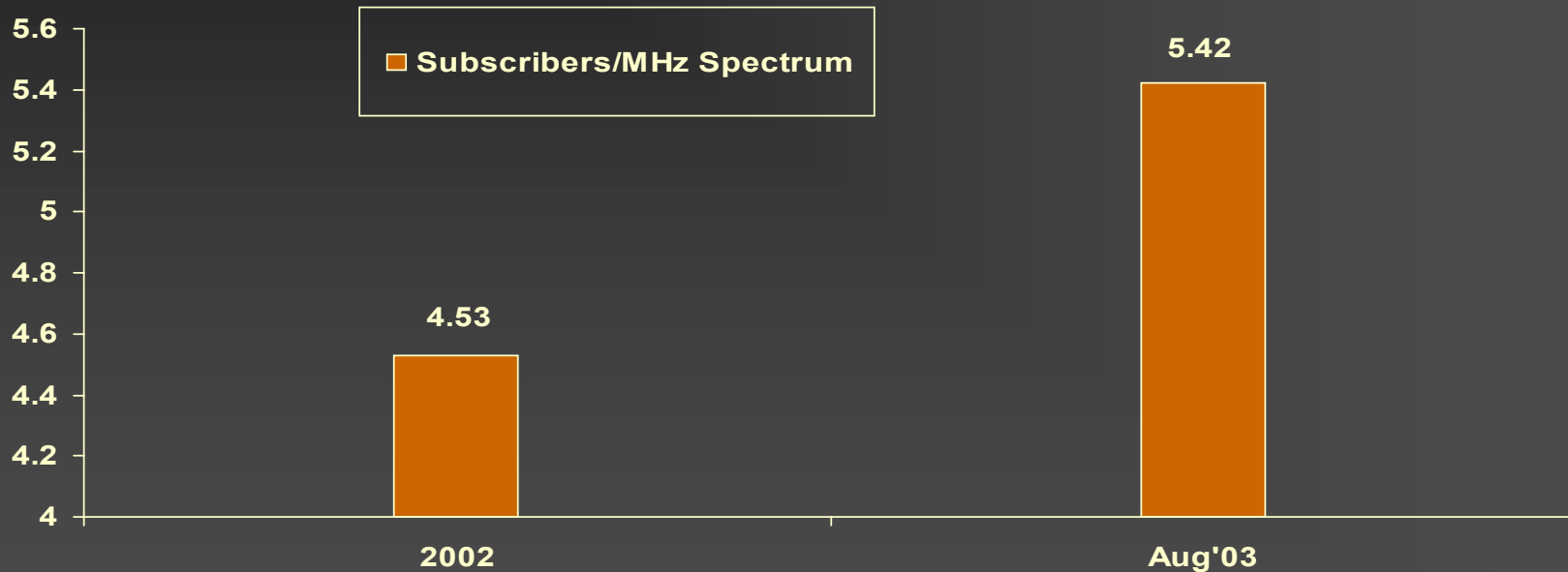
**Seven fold variation in above countries' Subscribers/MHz does not imply a related variation in spectrum efficiency!**

**eg. Malaysia, Thailand, UK, Australia cannot be termed to be inefficient**



# China – Subscribers /MHz

Year	Subscriber (million)	Total Spectrum (MHz)	Subscribers/MHz (million)
Dec'02	204	45	4.53
Aug'03	244	45	5.42



**20% increase in Subscribers/MHz in China in last one year due to teledensity increase and cannot be attributed to spectrum efficiency increases**

# Spectrum Usage Charges

## Possible Options :-

- Fees set at zero and radio users not charged at all.
- 2. Fees that do not reflect the cost of regulating the spectrum.
- 3. Fees that reflect the direct cost and / or the indirect cost of spectrum management.
- 4. Fees set at variable rate based on a service and also set of predefined area.

**For ensuring accelerated teledensity increase through lowest possible tariffs, vital for India to have spectrum pricing for a few years at least, on cost basis.**

# Spectrum Usage Charges - Indian Situation



## Present Scenario

- Unduly high at 2-4% of AGR, during FY'03, industry paid nearly Rs 300 crores of WPC fees,- amounting to over 4% of revenues
- Higher charges also result in increased cost of Service

## Our Suggestion

- Spectrum Usage charges be set to only cover the costs of administration and regulation
- Cost of administration & regulation (i.e. WPC costs) likely to be well below 0.5%
- Government may cap usage charges to cover WPC costs and other indirect costs of spectrum regulation

# Spectrum Allocation and Pricing - The Way Forward



1. Confirm entitlement of 2x20 MHz per GSM operator.
2. Provide Roadmap for actual assignment after coordinating with present users.
  - Roadmap already available from DoT Spectrum Committee for 15 MHz / operator linked to subscribers.
  - Prioritise top 20 towns / cities for allotment to (to first address network capacity constraints in metros & big cities witnessing large subscriber growth)
3. Cap Spectrum usage charges to just cover costs of administration & regulation of Radio Spectrum.



**Thank You!**