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Background

The democratic socialist republic of Sri Lanka is an island in the Indian Ocean, south of the Indian subcontinent. While it was considered that Sri Lanka's economy would likely to follow the same trajectory as those of Asian Tigers, on going internal strife had slowed growth. Sri Lanka had one of the most open economies in South Asia. It had low customs duties, investor friendly laws, and recently removed foreign ownership caps on a number of industries (including telecommunications). Key country related indicators are given in Table 1.

Table 1: Key Indicators

Population	20.74 million (2005 est.)
GDP	\$18.4 billion (2003 est.)
GDP real growth*	3.2%
GDP per capita	\$874 (<i>World Bank</i>)
PPP	86.72 billion (2005 est.)
PPP per capita	\$4,300
Literacy	92.3%
Phone lines	1.67 million (2006 Sept.)
Telephone density	7.5 (2006 II nd Quarter)
Mobile phones	4.76 million (2006 Sept.)
Mobile density	21.5 (2006 II nd Quarter)
Public pay phone booth	7,471 (2006 Sept.)
Internet & email subscribers	0.13 million (2006 June)
Employment opportunities in telecommunication sector	12,170 (2006 June)

Source: <http://www.trc.gov.lk/statistics.htm>, March 2007

The economy expanded by an average of 5.2% during the 1990s, reaching 6.0% in 2000, but contracted by 1.4% in 2001, the first negative growth rate since independence. From 2002-2005, the growth rate has averaged 5.8% (USAID Report: Sri Lanka Economic Growth and Conflict Assessment). The government of Sri Lanka had adopted an economic program for 2003-2006, which aimed to reduce poverty through private sector lead growth. As a result of this, the overall growth rate of the country had improved.

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The Department of Census and Statistics had stated a record growth of 7% at constant prices for the first quarter of 2006. The service sub sector of GDP indicated 6.2 % growth rate. The industrial sub sector grew by 6.6 % and the agricultural sub sector of GDP recorded as 11.0% growth rate for the first quarter of 2006 as against that of 2005. The sectoral growth rate contribution to GDP from service sub sector was 48.1 % and the value added contribution from service sector to GDP was 55 % from the first quarter of 2006. (http://www.statistics.gov.lk/Abstract_2006/Pages/indicators.htm)

The largest sectors of the economy i.e. services, under which the telecommunications industry was included, had grown at high rates in recent years; the communications sector was estimated to have grown by about 19% in 2002. Out of a total GDP of \$16.6 billion, revenue from services in 2002 was estimated at \$335 million. Although FDI was in the past concentrated in industry (manufacturing in particular), by 2000 services accounted for 55.6% of total FDI.

(http://www.statistics.gov.lk/Abstract_2006/Pages/indicators.htm, March 2007)

Sri Lanka was among the early countries in Asia to introduce commercial wireless services such as mobile and WLL. It was also relatively early in the adoption of the reform process. The advent of new services (3G), introduction of new technologies (CDMA) and dramatic growth of wireless services, led the regulatory agency to reconsider its process of allocation of spectrum bands. This paper documents the process adopted by TRCSL for realignment of spectrum bands and raises issues regarding the role of the regulatory agencies. This has learning for policy makers and regulators.

Reforms in Telecom

Sri Lanka initially embarked on telecom reforms in 1980 with the bifurcation of posts and telecom service provision by the government under a departmental structure. Subsequently, the Department of Telecommunication was converted in to a public corporation in 1991 through the Telecommunication (Amendment) No. 25 of 1991. Sri Lanka Telecommunication Corporation (SLT) took over the operations of both the inland and overseas telecommunications services from the Sri Lanka Telecommunications department. Under the provisions of the law, SLT was granted a license to operate domestic and international voice traffic. The Office Director General of Telecommunications as a regulatory agency was also created in the same year.

In 1994, the government issued the National Telecommunication Policy (NTP). Its objectives included the provision of telecommunications facility on demand, achievement of universal service in all villages, cost based tariffs, etc. Important goals of NTP are shown in Appendix 1.

Subsequently, the Sri Lanka Telecommunications (Amendment) Act No. 27 of 1996 set up the regulatory agency Telecommunication Regulatory Commission of Sri Lanka (TRCSL) with the objective of bringing in competition. The powers and duties of TRCSL include recommending to the minister the grant of licenses, type approval, and spectrum management. The objectives and responsibilities along with the regulatory functions of TRCSL are shown in Appendix 2. Appendix 3 gives the broad outline of key events in the reform process.

Introduction of Private Operators

The first private mobile operator CellTel Lanka Pvt Ltd (CellTel) entered the Sri Lanka telecom sector in 1989. From the beginning of the reforms in 1980 until 1996-97, the fixed line sector was an integrated, government owned monopoly. With privatization and the adoption of a more proactive approach to competition oriented regulation, there had been a transition from the reliance on government-raised funds to commercial investment.

TRCSL issued local loop licensing for *Wireless in Local Loop* to SunTel Pvt Ltd (SunTel) and Lanka Bell Pvt Ltd (Lanka Bell) in 1996. Dialog Broadband Networks (Pvt.) Ltd. was issued license to operate as the fourth fixed line operator. By the mid-1990s, Sri Lanka also had four cellular operators: CellTel, Mobitel (an SLT subsidiary), Lanka Cellular Services Ltd (Hutchison), and MTN (Dialog Telekom) and four fixed line operators: SLT, SunTel, Lanka Bell, and Dialog Broadband. Appendix 5 gives a brief background of all service operators.

Technology of operation used by all the mobile phone operators varied. All operators were allotted the band which was requested. This practice was continued until 1996. Appendix 4 lists the technologies used by the different service operators. However, the operators wanted to shift to GSM. TRCSL aimed for this transformation to be complete by 2002².

² Samarajiva, R. (2005) "Fixed Line Spike in Sri Lanka", www.lirneasia.net, March 2007

Restructuring of SLT

In 1997, the government divested 35% of its stake in SLT to the Japanese company NTT, which also assumed management control. Two attempts to divest its position further (in 1999 and 2000) were postponed due to poor market conditions and negative investor perception related to SLT's commercial disputes (many of which were interconnection related). In December 2002, the government finally floated 12% of its stake in SLT in an IPO, leaving it with 49.5%, NTT with 35%, and the balance (3.5%) owned by the employees³

To further introduce competition, in 2002, the government announced its intention to institute an open licensing regime for international traffic, a monopoly service for SLT until then. Despite the introduction of competition, interconnection issues, especially those related to interconnecting with SLT, remained unresolved. This prevented the new operators and those who did not have interconnection agreements with SLT from leveraging the available opportunities. However, the positive aspect of competition was that prices of services dropped significantly.

Other Policy Initiatives

In 2001, the government drafted a new National Telecommunications Policy whose main purpose was to update the Telecommunications Act of 1996. It also announced the Communications Convergence Act. The Convergence Act was expected to introduce a comprehensive regulatory overhaul with a view to improving the competitive environment—ending, for instance, the current licensing distinction between the provision of voice and data services.

Another important policy milestone was the passing of the Information and Communication Technology Act in 2003, which created the Information and Communication Technology Agency (ICTA) of Sri Lanka. ICTA was an implementing agency, whose objective was to oversee a broad range of technology-related activities including the implementation of the World Bank supported extensive “e-SriLanka” program. The ICTA was to facilitate auctions for two Regional Telecommunications Network (RTN) licenses to encourage network rollout in underserved regions. These networks were to be auctioned on a least cost subsidy basis and were to be partially subsidized.

Profile of the Telecom Sector

Competition resulted in sharp increases in the number of subscribers, both for fixed and mobile. As was the trend world over, mobile soon took over fixed line. Due to the higher call charges for mobile, fixed lines revenues were higher than those of mobile phone services. The fixed line generated 58% of the total revenue of the industry while the remaining was contributed by the cellular services. Table 2 provides data on the subscribers and revenues. By the end of June 2006 total number of fixed and cellular subscribers was 5.79 million. Of these, 74% were cellular and the remaining were fixed line subscribers. Predominantly, 84% subscribers of cellular were prepaid and the

³ www.slt.lk, March 2007

remaining were post paid. Number of internet users was 1,25,800 during the year 2006 (June), an increase of 9.4% as compared to the year 2005 (1,15,000). Thus far, competition has made the greatest impact on the cellular market. Internet penetration, as in many other developing countries, remained low, at just 105 users per 10,000. Broadband penetration was negligible. This indicated a supply constraint rather than a lack of demand.

In the fixed-line market, SLT maintained a high market share of 85%. Even this figure somewhat understated SLT's dominance as its network was far more dispersed – the private WLL operators were largely confined to the cities and towns – and it continued to own the vast majority of fiber capacity. In addition, as noted above, SLT had until very recently had a monopoly over international traffic, with the result that Sri Lanka's international call rates had historically been kept artificially high.

Table 2: Status of Sri Lanka Telecommunication Segments

Services	2003	2004	2005	2006 (June)
<i>Fixed line (000s)</i>	939	991	1,244	1,510
<i>Cellular (000s)</i>	1393	2,211	3,362	4,284
<i>Internet and email</i>	85,500	93,444	1,15,000	1,25,800
<i>Public pay phone booth</i>	6,440	-	-	7,260
<i>Radio paging</i>	2,851	-	-	-

Source: <http://www.trc.gov.lk/statistics.htm>, 2006, March 2007

Annual investment in telecom equipment representing the value of telecom equipment added during each financial year showed the turnover of 7.61 billion in 2005 as compared to 3.77 billion in 2004. Tele density had increased from 12.2% in 2003 to 29.1% in the year 2006⁴. Appendix 6 highlights the developments and growth in the sector.

There had been a wide regional imbalance in network development. SLT's fiber backbone was present in five out of the nine provinces and its presence in two of those five provinces was very limited. Part of this was due to war in the Northern and Eastern region. The majority of fixed-line subscribers were located in the Western province, a reflection of the fact that the 700km fiber backbone laid by the incumbent in the 1990s was present in only four out of the nine provinces, and only marginally touched another two. The North and the East, in particular, had been hard-hit by the war. The Northern city of Jaffna, for example, with a population of 400,000, had only 2,448 lines in 2001. Rural telecom was underdeveloped. As per the ITU report, rural telecom in Sri Lanka as on 2000, showed penetration level of 4.06%. With only 11% of Sri Lankan villages having telephone service in 2001, and 258,000 citizens (80% of them in rural areas) on waiting lists for phones⁵.

3G Mobile Operators in Sri Lanka

TRC initially offered 3G licenses to existing mobile operators in the 2 GHz band. The licence was offered for a cost of US\$ 5 million each. During mid 2006, TRCSL invited

⁴ www.trcsl.gov.lk, March 2007

⁵ Cohen, N. (2001) "What Works: Grameen Telecom's Village Phones", World Resource Institute Digital Divide.

expression of interests for a fifth mobile operator from recognized local and international organizations with experience in 3G telephony. The license cost was US\$ 4 million and the offer was open until June 30, 2006. Bharti Airtel Ltd, an Indian telecom service operator was selected⁶.

Recognizing the tremendous growth opportunities provided by wireless, there had been various initiatives to review the spectrum policy.

Spectrum Policy

Spectrum in Sri Lanka has generally been bundled with operating licenses and allocated on a first-come first-served basis. Typically, a new operator applied first for a systems license (e.g., in the data or voice categories), and then applied for spectrum allocations to the TRC. Operators did not pay an upfront fee but instead paid an annual fee (generally set according to ITU guidelines) for use of the radio frequency. The one exception to this policy took place in 2003, when a closed auction was held among the four cellular players for additional spectrum in the 1800 MHz range

Drivers for Realignment of Spectrum Bands

As different operators had applied for spectrum at different points in time and were using a variety of technologies, for both WLL and mobile, the spectrum allocation had not been equitable and also had been scattered across different bands, even for the same service. For example, by the end of 2004, Mobitel had 2x10 MHz of spectrum in the 800 MHz band for mobile services. While CellTel had 13 MHz followed by Hutchison and Mobitel with 10.5 and 10 MHz respectively. CellTel and Hutchison had spectrum in the 900 MHz band while Mobitel had it in the 800 MHz band. SunTel and Lanka Bell had the minimum amount of spectrum i.e., 2.5 MHz each. SLT had 2x4 MHz of spectrum in the same band for fixed line services (WLL), but was in the process of limiting to 2.5 MHz as the other two fixed operators.

MTN being the last mobile operator in Sri Lanka could be issued only 5 MHz whereas the other operators had got more spectrum⁷. In 1998, it was issued additional 2.5 MHz in the 900 MHz band. In order to allocate alternative band to Mobitel who had 10 MHz in 800 MHz band as it wanted to shift from DAMPS technology in to GSM and also since Dialog had requested for more spectrum, government worked with the regulatory agency to reform some of the non-optimally used 1800 GSM band. In April 2003, TRCSL auctioned 1800 GSM band through a transparent auction process. But only Dialog Telekom and Mobitel applied. No other operator participated in the bidding process. As a result, only these two operators were awarded 7.5 MHz in the 1800 band⁸. The auction was not very competitive, as there were only two bidders for the four slots. The bidders paid only slightly above the minimum floor price set by the TRC. Dialog was awarded 6.5 MHz and Mobitel got 7.5 MHz.

Operators had used a variety of technologies DECT, PROXIMITY for fixed wireless and AMPS, TACS for mobile services, from which they shifted to GSM over a period of

⁶ Jones, D. (2006) "Sri Lanka: Fifth Mobile License on Offer", www.regulateonline.org March 2007

⁷ Zita, K. and Kapur, A. (2004) "Sri Lanka Brief", USTDA South Asia Communications Infrastructure Conference, April 21-23, New Delhi, India.

⁸ Samarajiva, R. (2005) "Fixed Line Spike in Sri Lanka", www.lirneasia.net, March 2007

time⁹. In early 2000, TRCSL issued 1900 CDMA band outside normal procedure to Lanka Bell (third fixed line operator) but a request by SunTel's (fourth fixed line operator), for additional band were denied.

In 2003, TRCSL allocated 800 CDMA band after a consultative process for two slots of 2.5 MHz of CDMA band to each, SunTel and Lanka Bell whereas SLT already had 2x4 MHz but adjusted to 2x2.5 MHz subsequently. Following further consultations, the government finally completed a key part of the reassignment scheme in 2005.

The realignment process was partly driven by the demand of fixed wireless operators as they felt that CDMA was a low cost solution to fixed wireless access, and this aspect would facilitate rural roll outs. The inequities in spectrum allocation quantum were another driver.

Initially, (prior to the consultation process), in the 800 MHz band, the band allocations were as follows:

- (i) Mobitel (2x10 MHz), earlier for AMPS and then later for Digital AMPS, and
- (ii) SLT which had (2x4 MHz) for fixed wireless.

Initially, (prior to the consultation process), in the 900 MHz band, the band allocations were as follows:

- (i) Initially 2x7.5 MHz bandwidth of spectrum in the 900 MHz GSM band (GSM900) and 2x3 MHz in the 900 MHz EGSM band (EGSM900) was allocated to CellTel for TACS operation and further 2x2.5 MHz was allocated in the GSM900 band for migration from TACS to GSM (Total 13 MHz).
- (ii) 2x7.5 MHz bandwidth of spectrum was allocated to MTN Networks (Pvt.) Limited for GSM operation. 2x10.5 MHz bandwidth of spectrum was allocated to Lanka Cellular Services (Pvt.) Limited (Hutchison) for TACS and later GSM operations.
- (iii) The major bands being used by the operators were the 800-900 MHz and the 1800-1900 MHz. The former was used by GSM mobile operators, and the latter by mobile operators as well as by the WLL operator. SunTel operated a DECT network in the 1880-1890 MHz range. In addition, WLL operators used some frequencies in the 3.5 GHz, 10.5 GHz and 400 MHz bands. Frequencies in the above 3 GHz category were being used by operators for their transmission networks.

Background to the Realignment Process

As per the ITU, the band 806-960 MHz was allocated for fixed, mobile and broadcasting services on primary basis for Region 3 (Sri Lanka is included in Region 3). At the time of

⁹ Samarajiva, R. (2005) "Fixed Line Spike in Sri Lanka", www.lirneasia.net, March 2007

realignment, this band was allocated only for fixed and mobile services in Sri Lanka on shared basis¹⁰. Although the TRCSL was to some extent constrained by existing allocations and defense considerations, it responded to the request of mobile and WLL operators for more spectrum. TRC recognized the problem of scattering and attempted to streamline the allocations and issued a consultation paper in October 2004 that outlined the issues. Simultaneously, it started the process of clearing capacity in the 1800-1900 MHz range. In addition, the TRCSL had recognized that the 1900 MHz band was likely to be needed for future 3G services, and it started the process of clearing space there, too. These were expected to be the major bands available for future wireless applications.

Spectrum Re-alignment Plan: First Consultation Paper¹¹

800 MHz Band for Fixed Wireless Services

The realignment process considered (2x14 MHz) spectrum in 824 – 838 MHz paired with 869 – 883 MHz.

- (a) 2x10 MHz bandwidth (824-834 MHz paired with 869-879 MHz) was reserved for Fixed Wireless Access (FWA) systems using CDMA technology.
- (b) A bandwidth of 2x4 MHz (834-838 MHz paired with 879-883 MHz) was reserved as a guard band.
- (c) The identified (2x10 MHz) spectrum would be allocated to fixed operators on a case-by-case administrative basis in blocks of 2x2.5 MHz for FWA systems.

800 MHz Band and 900 MHz Band for Mobile Services

The realignment process considered (2x32 MHz) spectrum in 883 – 915 MHz paired with 928 – 960 MHz).

- (a) Existing three cellular operators (CellTel, Dialog, and Hutchison) were required to confine their network operations to equal slots of 2x7.5 MHz each.
- (b) 2x7.5 MHz slot was to be allocated to fourth cellular operator (Mobitel) in two stages for GSM expansion.
- (c) A bandwidth of 2x2 MHz (883-885 MHz paired with 928-930 MHz) was reserved as a guard band.

TRCSL came out with a phased time line of implementation for each of the operators. Some key features of this plan was the conditionality of additional spectrum allocation

¹⁰ Telecom Regulatory Commission of Sri Lanka, (2004) “Consultation on Realignment/ Allocation of Spectrum in the 800/ 900”, Sri Lanka

¹¹ Telecom Regulatory Commission of Sri Lanka, (2004) “Consultation on Realignment/ Allocation of Spectrum in the 800/ 900”, Sri Lanka

based on performance measures for SLT and Mobitel in the 800 MHz, following the phased plan as specified. SunTel or Lanka Bell would be granted spectrum in the 800 (826.5-829.5 MHz) on a performance basis. The performance criteria was to be informed at the time of allocation. The summary of proposal is presented in Table 3.

Table 3: Summary of the Proposal (As per the First Consultation Paper)

Bandwidth in MHz

	<i>800 MHz Band</i>					<i>900 MHz Band</i>						
	<i>Released</i>		<i>Allocated</i>			<i>Released</i>			<i>Allocated</i>			
	<i>SLT</i>	<i>Mobitel</i>	<i>SLT</i>	<i>SunTel</i>	<i>Lanka Bell</i>	<i>CellTel</i>	<i>Dialog</i>	<i>Hutchison</i>	<i>CellTel</i>	<i>Dialog</i>	<i>Hutchison</i>	<i>Mobitel</i>
<i>Phase I 4 Q 2004</i>	1.0	2.5	2.5	-	-	-	-	3.0	-	-	-	3.0
<i>Phase II 3 Q 2005</i>	1.0	2.5	-	2.5 ¹	2.5 ¹	3.0	-	-	-	-	-	-
<i>Phase III 1 Q 2006</i>	1.0	2.5	-	2.5 ²	2.5 ²	-	-	-	-	-	-	2.0
<i>Phase IV 2 Q 2006</i>	1.0	2.5	-	-	-	2.5	-	-	-	-	-	2.5
<i>Final (After 2Q 2006)</i>			2.5	2.5	2.5				7.5	7.5	7.5	7.5

Note 1 & 2: Either SunTel or Lanka Bell would obtain 2.5 MHz slot at a time

Review of the First Consultation Paper

Based on the comments of the various operators and other stakeholders, the following were the key issues:

1. There was no allocation for regional telecom networks.
2. Since the allocation of frequencies was first done for the incumbent, it would have given it a head start in deployment of low cost CDMA technologies, further reducing competitiveness of the newly introduced fixed line operators. For example, SLT would get 2x5.5 MHz in the 800 MHz by Q4 of 2004, while the other two fixed line operators would get 2x2.5 MHz by Q2 of 2006.
3. There was no justification for any further allocation to SLT in the 800 MHz band, until equal allocation to other operators could be provided as well.
4. While spectrum allocation was made equitable across mobile services, it was not so for fixed service operators.
5. The realignment process should ensure allocation of minimum bandwidth to WLL operators so that they could start CDMA services
6. The limitation of using fixed wireless handsets, and not the cheaper mobile handsets would not fulfil the objective of low cost wireless services through WLL.
7. The administrative difficulty in managing the boundary between “fixed wireless” and mobile technologies, especially given the Indian experience.
8. All WLL operators should be treated equally so that they all get allocations in the 800 MHz range, especially since the incumbent was allocated bandwidth in this band.
9. Request to allow for “limited mobility”, given the higher costs associated with fixed CDMA equipment.
10. Request for reserving 1900 MHz band for any possible expansion by the WLL operators.
11. WLL fixed operators to be treated equally with mobile operators in spectrum allocation.
12. TRCSL needed to specify the performance indicators.

13. There were operational issues with sequencing of realignment. For example, there was request for additional time so that existing operations could be converted to GSM in 900 MHz, should be considered before release of the 800 MHz band.
14. As many contentious issues such as CPP were yet to be implemented, there was no need to focus on less important issues such as realignment.
15. Realignment of spectrum was tantamount to change in terms of license conditions and operators needed to be compensated by possible allocation of additional other bands.
16. The allocation of spectrum first to SLT which had apparently not complied with earlier mandates of TRCSL could create unhealthy precedents.
17. Realignment should be a part of a larger spectrum management plan with clear objectives and priorities.
18. Too little time had been provided for submission of views.
19. The specific allocation of bands to different bands should have been based on
 - a. a competitive process
 - b. evaluation of operator performance in terms of efficiency of resource utilization
 - c. evaluation of regulatory conformance
 - d. evaluation of costs and benefits for each operator
20. Return to administrative allocation after auction process in 1800 MHz.
21. Non transparent enforcement of evaluation criteria in the past could have implication for the performance criteria specified in the current framework.
22. Lack of published policy with respect to new entrants in the same space.
23. Was there any specific need to realign/reallocate the spectrum, only in the 800/900 MHz band when low cost services could also be provided in the 1800/1900 MHz band?
24. Since infrastructure had been already deployed to provide services across the entire 10.5 MHz by some operators, it was not fair to restrict operations to 7.5 MHz.
25. There was no international precedence for such an exercise.
26. Sudden introduction of performance targets and subsequent allocation of spectrum based on it was not fair.

In response to these comments and issues, TRCSL came out with a second consultation paper. It summarized the outcomes of the first consultation as follows:

Summary of Outcomes of First Consultation Paper as Highlighted by TRCSL

(a) 800 MHz Band

- Opportunity to be made available for all fixed line operators to commence operations in this band simultaneously.
- A minimum band width of 3 MHz to be made available for each operator.
- Reservation of a guard band.
- Reservation for future expansion.
- To permit spectrum for introduction of Regional Telecommunication Network licenses.

(b) 900 MHz Band

- Rebalancing of 900 MHz spectrum should be through an independent study rather than the outcome already been decided.
- Availability of a compensation scheme for compulsory acquisition of spectrum.
- Introduction of the performance criteria should be transparent and in consultation with operators. Adequate provision for intra and inter band guard bands was made.

Detailed band assignments are provided in Appendix 7.

Issues Considered in the Second Consultation Paper (as per TRCSL)

Ensure equal distribution of spectrum amongst the fixed and mobile operators.

Table 4 summarizes the allocation process as per the second consultation paper. As per the process SunTel and Lanka Bell would be issued 0.5 MHz of additional band. SLT would have to vacate all 4 MHz and in return 3 MHz of 800 MHz band would be issued to it. All four mobile phone operators would get 7.5 MHz each in the 900 MHz band. CellTel would have to release 5.5 MHz of 900 MHz band and Mobitel would have to vacate the 800 MHz band. Reallocation process would not make any difference in the allocated band of Dialog Telekom.

Payment of Compensation

Operators made representation to obtain 20 year of extension to their licenses and obtaining spectrum in the 1800 MHz band as compensation. However, TRCSL was of the view that the spectrum in the 1800 MHz should be sold at the base price of the closed bidding process for this band.

Performance Criteria

Services of a consultant had been obtained in this respect.

Regional Network Telecommunications Licenses

TRCSL proposed that spectrum in the 1900 MHz would be made available for this purpose.

After the completion of the reallocation process i.e. by the end of 2006, all the fixed line operators irrespective of the technology in use, would operate in the 800 MHz band.

Table 4: Summary of the Proposal (As per Second Consultation Paper)

	<i>Released</i>		<i>Allocated</i>			<i>Released</i>			<i>Allocated</i>			
	<i>SLT</i>	<i>Mobitel</i>	<i>SLT</i>	<i>SunTel</i>	<i>Lanka Bell</i>	<i>CellTel</i>	<i>Dialog</i>	<i>Hutchison</i>	<i>CellTel</i>	<i>Dialog</i>	<i>Hutchison</i>	<i>Mobitel</i>
<i>Phase I 4 Q 2005</i>	3.0	5.5	2.5	2.5	2.5	-	-	-	-	-	-	3.0
<i>Phase II 3 Q 2005</i>	-	-	-	-	-	3.0	-	-	-	-	-	-
<i>Phase III 1 Q 2006</i>	1.0	4.5	-	-	-	-	-	-	-	-	-	2.0
<i>Phase IV 2 Q 2006</i>	-	-	0.5	0.5	0.5	2.5	-	-	-	-	-	2.5
<i>Final (After 2Q06)</i>			3.0	3.0	3.0				7.5	7.5	7.5	7.5

Other Bands

There was also ongoing discussion about delicensing the 2.4 GHz and 5 GHz bands. These bands were licensed, but with the spread of Wi-Fi (and other unregulated services) around the world, Sri Lanka seemed ready to liberalize allocation procedures somewhat. It was not sure, however, whether the TRCSL would go for a total delicensing. More likely, an initial delicensing of indoor use (with transmit powers kept below 200 mW), with perhaps a somewhat more liberal licensing regime for outdoor services (in particular, the 5 GHz band was under consideration delicensed for rural telecenter use). The TRCSL was also in the process of clearing some bands in the 2.4 GHz range, as frequencies above 2.43 GHz were currently being used by other operators¹².

Analysis

- While initially TRCSL began with a situation where SLT had got more bandwidth due to its legacy situation, subsequent TRCSL actions ensured that it got only as much spectrum as other players. Thus, an open consultation process had reduced the risk of “regulatory capture”.
- While at the outset, it may appear that TRCSL’s quick introduction of wireless services gave a head start to Sri Lanka, the ad-hoc processes for band allocation led to a situation where frequency realignment had to be done very quickly subsequently. This was driven more by operators demand to change from outdated technologies. Although this had long term costs such as costs of shifting to new bands, uncertainty over quantum of spectrum to be allocated and uncertainty involved in adherence to the time table for shifting, it gave the operators an opportunity to have spectrum for newer technologies.
- While TRCSL’s stated objective was to be technology neutral, spectrum realignment led to allocations that were for different bandwidths across fixed (WLL) operators, who got 3 MHz and mobile operators who got 7.5 MHz. The spectrum realignment initiative could have been opportunistically used by TRCSL to create equitable allocation of spectrum. On another dimension, since GSM slots had already been allocated, this process ensured that at least all operators got equal slots of 7.5 MHz.
- The continued imposition of restrictions on cheaper handsets, despite shifting the WLL operators to the more ‘standard’ CDMA band would not allow TRCSL to fulfill its objective of low cost service provision using WLL. The threat of WLL operators wanting to first go through “limited mobility” and later to full fledged mobile services despite the initial limited terms in the license is possibly making TRCSL approach this problem from

¹² Telecom Regulatory Commission of Sri Lanka, (2003) “Consultation on Making 2.4 GHz and 5 GHz Radio Frequency Bands Available for the Use of License Exempt Terminals”, Sri Lanka

a restrictive perspective. The developments in India, where initially, regulatory restrictions led to fixed wireless operators offering “WLL with limited mobility”, and after two years of legal and regulatory wrangles, the CDMA operators were allowed full mobility, show the difficulties in putting regulatory restrictions on new technologies. Subsequent to the entry of CDMA operators, competition in the Indian telecom sector has further intensified, and subscribers have benefited from lower telecom prices and the government from increased service tax.

- The move to realign spectrum had provided an opportunity to review the spectrum availability for new services such as 3G. In the absence of such an exercise, such prospects would have been limited.
- The realignment should have been a part of a bigger initiative of Spectrum Management Policy. The TRCSL should adopt a consistent policy towards treatment of operators who had to shift out of bands in the future. It has not provided any “compensation” so far. The operators also need to recognize that while ad hoc processes may benefit some of them individually in the short term, the advantage is short lived in the long run.

Conclusions

The commercial potential of wireless applications has brought spectrum policies to the forefront of regulatory arena. In the context of rapidly increasing demands on spectrum, regulators have to adopt refarming so as to be able to provide spectrum for new services. A variety of models have been chosen by different countries. This paper documents the approach and process adopted by Telecom Regulatory Commission, Sri Lanka (TRCSL) for refarming of spectrum and draws lessons for policy makers and regulators.

Ad hoc allocation processes could lead to additional burden not only for service providers but also on subscribers and regulators. While the need for realignment was felt most acutely in the mobile technology bands, this opportunity could have been strategically used by TRCSL to review spectrum allocations across all the bands, thus allowing faster deployment of digital services. The open consultation process adopted by TRCSL had reduced the risk of “regulatory capture” and it was able to leverage the refarming initiative to bring equity in quantum of spectrum allocated between incumbent and new operators.

The study highlights that for rapid proliferation of wireless technologies, a forward looking approach is required not only for managing spectrum but also removal of restrictions on handsets, whose price is a critical aspect for penetration in a developing country context.

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Appendix 1: Key Objectives of NTP 1994

- The attainment of an acceptable goal for voice and data communications for both national and international communications
- The elimination of waiting lists for telecom facilities.
- The provision of prompt and effective attention to consumer complaints and improved public relations.
- The progressive increase of local value addition in telecommunications projects, through local manufacture and construction at competitive prices).

Appendix 2: Telecom Regulatory Commission of Sri Lanka

Constitutions	Objectives	Responsibilities	Regulatory Functions
1. The secretary to the ministry of the mister, who shall be the chairman of the commission. 2. The person for the time being holding office as the Director-General. 3. Three members appointed by the minister from among persons who possess any recognized qualifications and have distinguished themselves in the field of law, finance, and management respectively.	1. Ensure the provision of reliable and efficient national and international telecommunication services. 2. Protect and promote the interest of consumers, purchasers, and other users. 3. Maintain and promote effective competition between persons engaged in commercial activities. 4. Promote rapid and sustain development of telecommunication facilities.	1. Fair and sustainable competition among licensed operators. 2. Ensure that telecommunication services are reasonably priced, taking into consideration affordability. 3. Regulation of scarce resources and bottleneck facilities. Promote good governance. 4. Ensure social guidelines followed by all the telecommunication service providers.	1. Processing applications for licenses. 2. Tariff regulations. 3. Monitoring and ensuring compliance with the act and licenses by the licensed operator. 4. Respond to consumer complaints. 5. Ensure proper utilization of the radio frequency spectrum.

Source: www.trc.gov.lk, 2006

Appendix 3: Sri Lanka Telecommunication Sector – Time Line

Year	Particulars
1981	Entry of private paging operators
1985	Entry of private operators in customer premises equipment
1991	Sri Lanka Telecommunications Act, separating the policy and business wings of the Ministry of Post and Telecommunications, and carved out <i>Sri Lanka Telecom</i> (SLT) a separate entity.
1992	Hutchison Telecommunications Lanka(Pvt.) Ltd., Private mobile phone operator entered the telecom sector
1993	Government set up state owned company, Sri Lanka Telecom Services Ltd. (<i>SLTS</i>).
1994	Government committed to set out <i>USO</i> (WTO commitments).
1996	1. <i>Issuing local loop licenses utilizing WLL technology</i> to Sun Tel and Lanka Bell and license to four mobile operators (Cell Tel, Mobitel, Lanka Cellular, and MTN). 2. SLT was converted to a public company, Sri Lanka Telecom Ltd. (<i>SLTL</i>).
1997	1. Government sold 35% of its share holdings in <i>SLTL</i> to Nippon Telegraph and Telephone (<i>NTT</i>) and retained 61.5 % share ownership and <i>SLTL employees</i> were given the balance 3.5%. 2. Formation of Telecom Regulatory Commission of Sri Lanka (<i>TRCSL</i>). 3. Three main decisions by the government: <ul style="list-style-type: none"> • Not to issue any license until 2002 • Monopoly power of SLT for international voice service operations until 2002 • Grant permission for minimum annual tariff increases for domestic services of 25%, 25%, 20%, 15% and 15% by SLT till 2002.
1998	1. MTN (Dialog Telekom) was <i>issued additional 2.5 MHz</i> . 2. <i>Systematic implementation of tariff regulation provision began</i> . TRCSL also introduced a fast-track promotional tariff approval procedure.
2000-2002	Lanka Bell was <i>issued frequencies in the 1900 CDMA band</i> outside normal procedure. <i>Government floated 12% of its stake</i> at an initial public offering (IPO) of <i>SLTL</i> , leaving it with only 49.5%.
2004	1. TRCSL issued first Consultation paper on <i>Realignment/ allocation of spectrum in the 800/900 MHz bands</i> 2. TRCSL issued second Consultation paper on <i>Realignment/ allocation of spectrum in the 800/900 MHz bands</i>
2005	1. TRCSL issued consultation paper on <i>spectrum allocation for third generation (3G) mobile services</i> . 2. <i>Two slots of 2.5 MHz of CDMA 800 frequencies issued</i> to each of the two fixed new entrants (SunTel, Lanka bell)
2006	TRCSL issued consultation paper on <i>issuance of new section 17 system licence to provide outdoor data and internet related services using 5 GHz frequency bands</i> .

Source: TRCSL

Appendix 4: Technologies, Spectrum Bands and Quantum of Spectrum Used by Operators

Operator	Technology Used (Prior to 2002)	Technology in Use (After 2002)	Type of Service	Band MHz	Quantum MHz
<i>Sri Lanka Telecom</i>	Fixed	Fixed	Fixed Line	800	4.0
<i>SunTel</i>	Digital Enhanced Cordless Telephone Network (DECT)	WLL	Fixed Line	1800	2.5
<i>Lanka Bell</i>	Proximity I		Fixed Line	1900	2.5
<i>Dialog Telekom</i>	GSM	GSM	Mobile Phone	900	10.5
<i>Mobitel</i>	TDMA/ GSM	GSM	Mobile Phone	800	10.0
<i>Hutchison</i>	GSM	GSM	Mobile Phone	900	10.5
<i>CellTel</i>	GSM	GSM	Mobile Phone	900	13.0

Note: Prior to 2002 all four mobile operators were using a variety of standards TACS, ETACS, AMPS, and GSM 900.

Appendix 5: Major Service Providers in Sri Lanka (except MTN) (Excepted from the website of the operators)

CellTel Lanka (www.celltel.lk)

CellTel, Sri Lanka's first cellular network, commenced operations in 1989. It was a company owned and operated by Millicom International Cellular S.A. which is a global telecommunications investor with cellular operations in Asia, Latin America and Africa. It had a total of 18 cellular operations and licenses in 17 countries.

CellTel commanded 61% of the market at the end of September 2006, with 2.83 million subscribers.

Dialog Telekom (www.dialog.lk)

MTN Networks Pvt. Ltd., a fully owned subsidiary of the Telekom Malaysia Group operated under the brand name Dialog GSM. It started offering its mobile phone services during the year 1995. Dialog Global was internationally networked by the global presence of its parent company, Telekom Malaysia Bhd.

The company had the highest subscribers (as of December 31st, 2006) with over 3 million subscribers on its network, followed by Mobitel, Celltel Lanka Ltd and Hutchison. Number of subscribers (as of December 31st, 2005) was 2 million, showing an addition of 50% within a year.

During the period 2000 to 2004, the Cumulative Average Growth Rate (CAGR) for revenue was 49.8%. During the same period the gross profit had a CAGR of 60.9%. The CAGR of EBITDA was 61.8% during the period 2000 to 2004 and the CAGR for profit after tax was 66.1%. Profit after tax was Rs. 7.01 million (up by 71% when compared to 2004). Revenue for the same period was of Rs. 18.03 billion, representing growth of 58% above the Rs. 11.40 billion.

Hutchison (www.htil.com)

Hutch was the GSM mobile network of Hutchison Telecom Lanka Limited, which was a fully owned subsidiary of Hutchison Telecommunications International Limited (HTIL).

Hutch covered the western province and all major towns except for the Northern region. Subscriber base of the company had shown an increase from 236,000 to 661,000 during the period of 3Q 2005 to 3Q 2006.

Lanka Bell (www.lankabell.net)

Lanka Bell was the second largest fixed line telecommunications company in the country, with more than 450,000 customers. It was formed in 1997, as the single largest company in Sri Lanka with an investment of over US \$ 150 million designed by the Canadian

telecommunications company Nortel. It introduced the PROXIMITY digital network, a wireless access system to Sri Lanka. It was the first fixed line operator to provide pre-paid services and also to introduce wireless access to the nation. It was the only fixed line operator to offer international SMS. It operated as wireless in loop operator to use VSAT solution. It was the first fixed landline operator to achieve 1,00,000 CDMA connections.

Mobitel (www.mobitel.lk)

Incorporated on February 11, 1993, under a build, operate and transfer agreement between SLT (on behalf of the government of Sri Lanka) and Telstra Australia, formally OTC Australia (Pvt.) Limited, Mobitel was the third operator to enter the mobile telephony market in Sri Lanka.

Telstra, Australia and SLT signed a memorandum of understanding in 1995, under the terms of which Telstra acquired 60% stake in Mobitel whilst SLT retained 40% holding. Operating on this basis and vested with total management control, Telstra Australia continued to drive the organization forward whilst investing in and developing the network.

In November 2002, in keeping with the provisions of the BOT agreement, SLT became the sole owner of Mobitel, when Telstra Australia surrendered its shareholding. Until January 2007, the company had 900,000 subscribers. Mobitel made a loss of Rs. 1.26 billion in 2005. For three months to June 2006 it made Rs.13 million loss, this brought up six months cumulative losses to Rs. 229 million.

Sri Lanka Telecom (SLT) (www.slt.lk)

SLT was the country's first telecommunications company and was the successor to the former government owned Telecommunications Department. It led the telecommunication industry with 87 percent of the fixed landline network. In 1996, SLT was incorporated as a public limited liability company and in 1997 NTT Communications Corporation invested USD 225 million to take a 35 percent stake in SLT. This was subsequently transferred to NTT Communication.

In 2002, SLT came out with Initial Public Offering (IPO) where the government of Sri Lanka, the majority shareholder, divested a 12% stake in the company. Consequent to this IPO, the government owned 49.5% of SLT, NTT Communication Corporation owned 35.2%, and the public owned the balance 15.3%. SLT became the largest listed company in the Colombo Stock Exchange with this IPO. In the same year SLT acquired Mobitel, one of the four mobile operators in the country, in which it previously had a 40% stake.

With its acquisition of Mobitel, the third largest mobile operator, SLT became the only integrated operator in the country to offer fixed landline, data and mobile services. In 2003, Mobitel began a phased transfer of its subscribers from its existing network to a third generation mobile network.

Subscriber base of SLT has increased from 860,922 to 954,060 during the period 2004 to 2005. From 2001 to 2005 SLT's revenue had grown by 50% to Rs. 32 billion. Operating profit for the year 2004 and 2005 is Rs. 3,275 million and 6,087 million respectively. The company had announced the provisional profit of Rs. 886 million in 2006 and a turnover of Rs. 7,073 million, compared to Rs. 4,932 million the year before. During the 9 months ended September 2006, the company reported revenues of Rs. 29.8 billion and net profits of Rs. 3.8 billion giving annualized earning per share of Rs. 2 and 86 cents.

SunTel (www.SunTel.lk)

SunTel was a joint venture company that brought together Swedish telecom operator Telecom AB, Metrocorp (Pvt.) Ltd., Townsend Limited of Hong Kong, the National Development Bank, and the International Finance Corporation (IFC) - a member of the World Bank Group. Company started offering its services through fixed line 1996 with DECT network technology.

SunTel's EBITDA for the year 2001 was Rs. 1.6 billion as compared to Rs. 1.21 billion for the year 2000. Net revenues recorded amounted to Rs. 3.1 billion – up by 17% from the previous year.

Appendix 6: Developments and Growth in the Sector

By June 2006, there were four fixed access telephone and four cellular mobile phone service operators that had been granted the license by the TRCSL. Similar number of licenses for radio paging services and two licenses for trunk mobile radio services had also been approved. There were thirty two external gateways operators in the country. The main factor behind this rapid growth had been liberalization, private ownership, and increased competition. As a consequence, IT companies increasingly gained access to international markets through broadband telecom networks and the use of internet based capabilities.

This growth had been driven by a massive increase in investment. Since the 1991 reforms, over \$1.3 billion had been invested in the telecommunications sector. Spurred by competition, SLT had invested over \$434 million in its network since 1997, and it doubled its subscriber base in just the two years following its privatization. As part of the "Greater Colombo Telecommunications Network Improvement Project," the number of lines in the Greater Colombo region alone increased by 100,000 by the end of 1996. The private sector, too, had made major investments; non-incumbent investments overtook those of the incumbent for the first time in 2002. The government's decision to lift foreign investment caps in the sector had also played a crucial role. One noticeable trend was the decline in recent years: from \$303 million in 1999 to \$103 million in 2001 to just \$87 million in 2002. This trend can in part be explained by the global telecommunications bust, but was also a reflection of worries about Sri Lanka's political situation and regulatory uncertainty.

Appendix 7: Sequencing of Realignment

In the first quarter 2005,

For the 800 MHz band

- SLT was required to vacate the 2x3 MHz in the 835-838 MHz paired with 880-883 MHz) and Mobitel was required to confine its services to 2x4.5 MHz in the 830.5-835 MHz paired with 875.5-880 MHz
- 2x2.5 MHz was to be allocated to each fixed line operator simultaneously.

For the 900 MHz band

- Hutchison required to continue their services in the 2x7.5 MHz
- 2x3 MHz to be allocated to Mobitel

In the third quarter 2005,

- CellTel was required to confine its services to 2x10 MHz

In the first quarter 2006,

- Mobitel was required to vacate 2x4.5 MHz and SLT was required to vacate the 2x1 MHz bandwidth of spectrum in the 800 MHz band
- Mobitel was to be allocated 2x2 MHz in the 900 MHz band

In the second quarter 2006,

- The three fixed line operators, SLT, SunTel and Lanka Bell were required to migrate to 2x3 MHz of spectrum
- 2x2.25 MHz bandwidth was reserved for expansion of services
- A bandwidth of 2x7.5MHz in the 1900 MHz band was reserved for the expansion of FWA services
- CellTel to confine their services to 2x7.5 MHz in the 900 MHz band
- Mobitel would be allocated 2x2.5 MHz in the 900 MHz band

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