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7th February 2011

Responses to TRAI Consultation Paper on Issues related to Telecommunications Infrastructure policy

ISSUES FOR CONSULTATION

Overview of Telecom Infrastructure

1. Do you agree with the classification of infrastructure elements described in this chapter? Please indicate additions/modifications, if any, particularly where you feel that policy interventions are required.
   As brought out in the consultation paper, the classification of telecom infrastructure has over the years expanded in scope and details depending upon the emergence of telecom technologies and services. Therefore, while we tend to agree with the current classification, but so far as future regulatory / policy support or USO resource allocation is concerned the government needs to look at the justification for each component of the infrastructure separately. Similarly, as regards government permission for sharing of infrastructure is concerned it is time now that the government should permit pure play of market forces provided that the network elements so shared are spectrum agnostic and have not been commissioned with any government support.
   As of now, policy interventions are required in particular:

   a. In issuing licenses to IP-1 category infrastructure providers to facilitate faster permissions from state / local bodies in the tower installations, services connection and right-of-way etc.

   b. In ensuring that infrastructure established / to be established with or without USO support for rural and remote areas coverage is optimally utilized or created so that neither in-efficient networks nor over-capacities are created.
2. What measures can be taken to encourage more ILDOs and ISPs to set up cable landing stations? (No Comment)

Internet Exchange Point (No Comments)

3. Do you perceive the need for effective Internet exchange point(s) in the country to efficiently route domestic IP traffic?
4. If your answer to issue in 6.3 is in affirmative, please comment on the licensing framework of the entities for setting up Internet Exchange Points in India.
5. Will it be desirable to permit those Unified licensees to setup IP exchange points in the country who have no vested interest in routing of the IP traffic?

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Mobile Virtual Network Operator

6. Please give your comments on the changes proposed in Para 3.5 of Section C of Chapter 3. In view of what has been said above the stakeholders may give their opinion on the following modifications to the TRAI's 6th August 2008 recommendations:
   - A Unified licencee who does not possess spectrum may be allowed to work as an MVNO in any service area. The Unified licencee ceases to be an MVNO if he gets his own spectrum.
   - An MVNO should fulfill all the obligations of the Unified Licencee.
   - An MVNO may be allowed to use the spectrum of an MNO and also to set up infrastructure including Radio Access Network (RAN)/Base Station Subsystem, if required.
   - There should not be any limit to the number of MVNOs attached to an MNO. However, an MVNO cannot get attached to more than one MNO in the same service area. Additionally, the MNO should ensure that there is only one MVNO in one revenue district.
   - MVNO should pay spectrum charges as per the slab applicable to the parent MNO.
   - For counting the roll out obligations, the MNO can take into account the roll out done by the MVNOs attached to it.

   While we agree with the revised TRAI proposals for MVNO's in general and the concept of leveraging MVNOs for meeting rural rollout obligations in particular, we **disagree with the approach recommended by TRAI on rural rollout obligations in its recommendations on "Spectrum Management and licensing framework" of May 2010**. We have expressed our view on these recommendations to Secretary, DoT and to Hon'ble Minister of C & IT. We would further like to state our opinion on the approach recommended by TRAI on rural rollout as below:

   1. TRAI Recommendations on rural rollout are not compliant with contractual obligations of service providers under the UAS License:

      Such mandated changes in rollout criteria go **beyond the scope of clause 5 of the UAS License** which states that the Licensor reserves the right to modify the terms and conditions of the license, if it is necessary and expedient to do so:
      - *In the public interest,*
      - *Or in the interest of national security,*
      - *Or for the proper conduct of the telegraph.*

      National security and proper conduct of the telegraph is not relevant to the issue at hand and as articulated below, in our opinion, these recommendations are not in the public interest either.

   2. TRAI recommendations on rural rollout will lead to setting up of duplicate and redundant telecom infrastructure.

- This would impose an onerous cost on the telecom industry as rural demand will not justify the presence of so many service providers.
- These costs will most likely be recovered from the consumers and lead to higher prices being imposed on the rural consumer.

A report[1] (attached with this submission) by Ovum consulting, the renowned Telecom consultant, estimates a cost burden of INR 1,200 billion[2] over 15 years if the proposed rural rollout criteria are implemented. Ovum states:

i. *"….the net effect of the obligations contained in these recommendations is to cause a loss of consumer welfare due to higher prices."*

ii. *"Having multiple operators setting up duplicate infrastructure, in rural areas with limited revenue potential, is very likely to inflate retail prices across the market as a whole, negatively impacting the consumer."*

iii. *"With even most optimistic assumptions on rural mobile penetration the net economic impact on the industry remains negative."*

iv. *"…… the unnecessary duplication on networks in rural areas will lead to a waste of India's capital."*

The additional burden will seriously impact the balance sheets of most operators, particularly, new ones like us.

3. There is an alternative approach to achieve rural rollout in a more optimum way:

Ovum further recommends[3]

i. *".. A **more efficient and economical way for India to increase rural coverage is from using 900MHz spectrum**, due to its superior propagation characteristics compared with 1800MHz spectrum."*

ii. *"Existing operators with 900MHz spectrum should be allowed to retain 900MHz spectrum, as opposed to giving it up as currently proposed by TRAI, and in return would be obligated to rollout services to rural areas in their license region using 900MHz."*

iii. *To ensure adequate competition in rural areas, operators with 900MHz spectrum once they have rolled out to rural areas, should have to offer*

[1] An analysis of the TRAI recommendations on revised rollout obligation. Part 1: Assessing the Economic Impact on Consumers and the Industry. Ovum Consulting, 1st November 2010.
[2] Present Value of Capital Expenditure and Network Operating expenses from 2010-2025
[3] An analysis of the TRAI recommendations on revised rollout obligation. Part 2: A proposal for an alternative approach. Ovum Consulting, 1st November 2010.

MVNO agreements at appropriate rates (potentially government mandated) to other existing operators.

iv. *"The cost to the industry associated with the alternative approach of this paper is in the region of INR 180 billion[4].*

4. Unsustainable financial burden of rural rollout, coupled with possible additional spectrum costs, would drive some operators out of the market, thereby seriously impacting competition in the marketplace

- Hon. Minister of Communications and IT has recently announced contemplating that those operators with only 4.4 MHz of spectrum will need to pay an additional market determined charge for getting the next 1.8 MHz to reach the contracted 6.2 MHz of spectrum.

- **We consider the allocation of up to 6.2 MHz spectrum, without payment of additional charges, a contractual right for ALL operators.**

- Any action contrary to the same would be in violation of the principle of level playing field and non-discrimination vis-à-vis the other operators.

- Coupled with high rural rollout costs, this would lead to some operators being driven off the market, a situation which would not only be in violation of the tenets of the Competition Act of India but would also nullify the competitive progress the sector has made in the last few years. One could see a return to the oligarchic situation that was prevailing in the telecom sector in the early 2000s.

We propose that TRAI strongly consider the arguments in the report by Ovum Consulting.

Ensuring Competitive Safeguards for the MVNO market:

As outlined above, leveraging a combination of MVNOs and coverage-efficient spectrum is an optimum way to achieve rural coverage. But, **for the MVNO model to be effective and sustainable it is important to have a fair, effective and non-discriminatory whole sale market for MVNOs, which is in compliance with the tenets of the Competition Act of India**. Hence, we propose that operators with network in rural areas should be asked to provide **MVNO/Roaming facility with TRAI instituted commercial safeguards on MVNO/roaming wholesale prices** to those new operators who wish to enter these markets.

In fact, TRAI can stipulate ceiling rates for different bulk minute slabs on which niche MVNOs can negotiate with MNOs who have rolled out networks in rural areas. Such a move would help create a wholesale market for airtime, which would be in the best long term interest of consumers

[4] Present Value of Capital Expenditure and Network Operating expenses from 2010-2025

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We also recommend that the topic of cost-efficient and competitive rural coverage by leveraging USO funds, efficient spectrum bands and MVNOs demands a separate consultation exercise in itself and request TRAI to take a deeper look at the issue.

In- Building Solutions

7. What methods would you propose for reduction of the number of towers?
   The new operators having only start up spectrum of 4.4 MHz need to build capacity sites to cater to the traffic requirements which in turn increase the tower requirements especially in dense town areas. The allocation of 6.2 MHz spectrum shall reduce such requirement.

8. In what ways do you think that IBS can be encouraged for better in-building coverage, better QoS and reduction in level of radiated power from Macro cell sites?
   For the large commercial complex / buildings, the requirement of creating infrastructure for supporting IBS (such as fibre ducts for entry of cable etc) should be made part of building by-laws.

9. How can sharing of IBS among service providers be encouraged? Does TRAI need to issue any guidelines in this regard?
   TRAI may propose guidelines in which the exclusivity with any specific service provider in IBS agreement with building owner should be disallowed. The existing contract with such clauses should also be asked to be amended.

Distributed Antennae Systems

10. Do you agree that innovative technologies such as 'Distributed Antenna System' (DAS) can be effectively utilized to reduce number of towers and migrate towards tower-less cities?
    DAS implementation shall require a large no. of permissions viz. ROW from PWD, Municipalities, permission to erect the antenna of street light from Electricity board/ local authorities etc. It can only be termed as an implementable solution if permissions required from various agencies can be routed through a single window (may be on line of present SACFA process).

11. What are the impediments in adoption of new technologies such as DAS and how can these be removed?
    Please refer to answer to point no. 10 above.

Standardization of Tower Design

12. Would you agree that the design of towers can and should be standardised?
13. If yes, how many different types of towers need to be standardised?
14. What are the important specifications that need to be included in these standards?
15. Which is the best Agency to standardise the tower design?

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Any efforts to standardise the design of towers should focus on safety as the foremost objective. Also, innovation in design leads to more efficiencies and improved safety and should be encouraged. Bodies such as SERC and IIT's or any other competent and autonomous bodies can be involved in standardization.

Reducing Visual Impact of Towers

16. What is the likely cost of camouflaging the towers?
17. Can camouflaging be made mandatory? If so, can this be made part of the design standards of the towers?
    Care should be taken that camouflaging of towers does not lead to significant costs being passed on downstream. However, it is important that certain geographical areas of aesthetic and heritage value be given special attention. This can be achieved in co-operation with other civic bodies.

Clearances from Local Authorities

18. Do you consider that the existing framework of different civic authorities to grant permission for telecom towers is adequate and supportive for growth of telecom infrastructure?
19. Is there a need to set-up a single agency for approval and certification of towers? Is there an existing agency that can do this work? If a new agency is proposed, what should be its composition and framework?
20. Is it feasible to have a uniform framework of guidelines including registration charges, time frame, single window clearance etc for granting permission for installation of telecom towers and laying of optical fibre cables? If so, can it be prescribed by the Licensor or the Regulator?
21. What can be an appropriate time frame for grant of permission for erection of towers?
22. How can a level playing field be ensured for telecom service providers vis-à-vis other utility service providers especially in reference to tower erection?
23. Which agency is best suited to inspect the buildings and certify the structural strength of the buildings in case of roof based towers?
    The current framework is not optimal and there is a need for uniformity in policies for Right-of-Way for laying down telecom infrastructure. We propose that a central body should be established, maybe on the lines of present SACFA issuance, for clearance of telecom infrastructure deployment and exempt the local body approval process. A maximum of 30 days is an appropriate time frame for grant of permission for erection of towers.

Infrastructure sharing

24. Should sharing of mobile towers be mandated?
    Yes, the sharing of mobile towers should be mandated as it provides more efficient use of resources and lower overall costs to the industry, society and environment while at the same time enabling a faster rollout of coverage and a competitive market for the customer.

25. Should sharing of active infrastructure, created by themselves or infrastructure providers, be allowed?
The infrastructure providers should be allowed to build and share active infrastructure up to the core network. But sufficient care should be taken that competitive safeguards are employed in wholesale tower/network/bandwidth leasing so as to ensure a level playing field for all downstream operators and competitive services to the end customer. In rural areas, these whole sale providers of passive and active networks could be the recipients of USO support.

Use of USO for rural areas

26. Please comment on the issues raised in paragraph 5.6 of Section A of Chapter 5.
While we agree, with the TRAI recommendations made on "An Approach to Rural Telephony – Suggested Measures for an Accelerated Growth" dated 19th March, 2009 we would like to mention the following points:

1. TRAI's recommendations of May 2010 on rural rollout obligations are not the most efficient way to meet the objectives of rural coverage.

    - These recommendations place an onerous burden on the economy, consumers and the telecom industry as a whole due to creation of duplicate and redundant telecom infrastructure in the rural areas.

2. TRAI's objectives of rural telephony can be better achieved with an incentive based approach.

    - The USO fund framework should be utilized to provide subsidy to those operators who are best placed to make investment in rural areas.

    - USO based schemes should not be limited to either too few operators resulting in aggressive bidding or spread thinly amongst too many operators thus resulting in duplicate infrastructure being installed. An optimum number of operators laying out rural telecom infrastructure would ensure the most efficient utilization of USO resources.

    - In interest of effective competition at consumer end the newer operators should be allowed to access the rural telecom infrastructure which already exists or will be laid out with USO supported schemes in the future. This access can be in the form of **commercially safeguarded MVNO/roaming arrangements**.

3. A mechanism needs to be instituted for optimum use of rural fiber backbone to meet bandwidth requirements:

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- There is a lack of transparency and level playing field in the wholesale market for bandwidth in many areas of the country.

- To enable true competition at the retail end, it is also very important to create a fair wholesale market for dark and lit fibre, wherein any licensee wishing to do so should have equitable access to it. A SPV can be created for this purpose and BSNL's backbone can be unbundled and transferred to this SPV. Private operators could be free to pool their infrastructure with the SPV, or compete if they so desire. The SPV would then play the role of NOFA (National Optical Fibre Agency) as recommended by TRAI and lease fibre/bandwidth to operators at TRAI prescribed rates.

- We have also expressed these views in the Hon'ble MOC's roundtable conference on National Broadband Plan with stakeholders held on January 19, 2011.

IPV6 (No Comments)

4. What measures are required to encourage the deployment and adoption of IPv6 in the country?
5. In your opinion, what should be the timeframe for migration to IPv6 in the country?

IPTV (No Comments)

6. What measures do you suggest to enhance provision of IPTV services by various service providers?
7. Should there be any restriction on ISPs for providing IPTV services?

General

8. Please give your comments on any related matter not covered above.

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An analysis of the TRAI recommendations on revised rollout obligations

Part 1: Assessing the Economic Impact on Consumers and the Industry

1 November 2010

Report version: as date
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1 Executive summary

The TRAI has proposed new recommendations regarding Spectrum Management and Licensing framework. These recommendations include the issue of new licences, re-farming of spectrum from 900MHz to 1800MHz, altered spectrum assignments, revised rollout obligations and enforced levels of competition in all rural areas. This report analyses the economic impact that the proposed TRAI recommendations on revised rollout obligations will have on India, consumers and the telecom industry, if adopted.

The proposed TRAI recommendations on revised rollout obligations negatively impact consumer welfare, India's wider economy and the health of the telecom industry:

- Retail prices for consumers will be higher due to the inefficient rollout on 1800MHz and the cost burdens will be transferred to consumers.
- India's capital will be wasted in unnecessary duplication of networks and will result in less capital for more productive investments in India's economic development
- Higher prices and costs have negative impact on the overall economy as telecom is a basic enabler for commerce and welfare gains
- The solution is not optimal for India and make poor use of scarce spectrum resources.

In this report, the analysis begins by examining the costs associated with deploying the additional base station sites necessary to meet the revised rollout obligations under TRAI's proposed recommendations. We then continue the analysis with an investigation into the revenues that might be expected by deploying these additional base stations. Combining the results of the cost and revenue analysis, we show that the net effect of the proposed revised rollout obligations on India, Indian consumers, and the telecom industry is negative resulting in adverse overall welfare outcomes.

The economic impact of these requirements seem to contradict the fundamental goals of TRAI and harm the very consumers that the regulator should be protecting. This is due to:

- Using the GSM1800MHz band for rural coverage, which increases the costs compared to using the GSM900MHz or CDMA800 band. Through the current recommendations, TRAI is enforcing the inefficient use of scare spectrum resources. This is a non optimal solution for India from both technical and economic viewpoints.
- Furthermore, having multiple operators set up duplicate infrastructures to provide services in rural areas with uncertain and limited revenue potential, will place a significant economic burden on the telecom industry.

The net effect of the TRAI recommendations is very likely to lead to an increase in prices for consumers as operators will need to pass on increased costs to their customers.

While TRAI's rural coverage goals are in line with the Government of India's overall rural development objectives, as stated in the Eleventh Five year Plan[1], we believe TRAI's

[1] "Eleventh Five Year Plan (2007-2012), Volume III, Agriculture, Rural Development, Industry, Services and Physical Infrastructure." Planning Commission, Government of India

current proposed recommendations are not the most economical way to achieve this critical aspect of India's overall rural development.

While regulators have a duty to promote competition, investment and services, and to account for social needs such as coverage and delivery to disadvantaged sections of society, the approach taken by TRAI is not the most efficient.

In addition to the quantitative analysis, this report provides discussion on the relative (in)efficiency of duplicate infrastructure spend in India's rural areas and the general affordability of mobile services to rural consumers. We complete this discussion with an examination of some alternative approaches that might be considered to achieve the rural coverage desired (this is expanded upon in an accompanying report – "Part 2: A Proposal for an alternative approach").

We suggest TRAI reconsider its current set of recommendations. A number of viable alternatives exist that will meet TRAI's rural coverage objectives and, at the same time, significantly increase the efficiency of capital allocation for India. We recommend TRAI undertake a revision of the current recommendations.

The numbers contained in this report are estimates and should not be taken as definitive market numbers but the general conclusions are robust to sizable changes in the inputs. The overall results do not change unless large changes are made to the data and assumptions. Our analysis has ignored some costs such as customer acquisition costs - inclusion of these costs would simply reinforce our general conclusions.

2 Introduction

2.1 Background and scope of work

The Telecom Regulatory Authority of India (TRAI) has proposed new recommendations on Spectrum Management and Licensing Framework (hereafter referred to as the "TRAI recommendations").[2] The requirements are extensive and have a profound impact on India's economy, consumers and the health of the telecom industry. The proposed recommendations include:

- Issue of new licenses.
- Re-farming of spectrum. In India's case this includes the closure of 900MHz spectrum licenses followed by a re-issue of the spectrum.
- Obligations to cover geography and small communities in rural areas.
- Altered spectrum assignments.
- Enforced levels of competition even in rural areas.

This report has been commissioned by Uninor. The purpose of the Ovum study is to examine the economic impact of proposed TRAI recommendations on revised rollout obligations. Specifically, this report:

- Focuses on the broader economic impact and examines the extent to which rural customers are expected to benefit. In particular, we consider: affordability for rural customers; the effect of duplication of infrastructure spending by multiple operators; and various alternative measures that might be adopted in preference to achieve the aims of rural coverage.
- Analyses the various costs associated with mandated rural coverage, investigating predominantly the provision of additional sites, capital expenditure (capex) and operating expenditure (opex).
- Explores the relative costs of building or leasing the infrastructure and examines the extent to which the use of GSM1800 MHz, GSM900MHz or CDMA spectrum influences the cost.
- Estimates the revenues that the industry, as a whole, might expect to receive from services provided in these rural areas, combining current data on ARPUs, population, penetration and forecasting future values of these variables.

We stress that this report focuses exclusively on the economic implications of the TRAI recommendations on revised rollout obligations and does not address the rationale behind these recommendations. The report provides an understanding of the impact of these recommendations on the India's economy, welfare of consumers and the health of the telecom industry.

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[2] "Recommendations on Spectrum Management and Licensing Framework", 11 May 2010. http://www.trai.gov.in/WriteReadData/trai/upload/Recommendations/118/FINALRECOMENDATIONS.pdf

During this analysis there are instances in which we were required to make certain assumptions or estimations, primarily due to lack of data, or the appropriate granularity of this data. In all these instances we endeavoured to provide robust numbers and, where possible, compare these numbers with appropriate benchmarks and existing Ovum data. While we feel it necessary to mention that the numbers contained in this report are estimates and should not be taken as definitive, we believe that the general conclusions are robust as these do not change unless the data and assumptions are in error by very large amounts, which is unlikely to be the case.

2.2 Report structure

This report is structured in six chapters:

- Chapter 1: outlines our approach and highlights the key results from our analysis.
- Chapter 2: details the scope of this report and introduces the issues that are to be investigated.
- Chapter 3: focuses on the costs associated with the TRAI recommendations. We investigate the number of additional sites required to meet the revised rollout obligations, the capital and operating expenditures involved, the impact on cost of the spectrum employed (900MHz or 1800MHz) and the impact on dual technology operators.
- Chapter 4: focuses on the revenues associated with the recommendations. We analyse the demographics of the rural villages to be covered and estimate the mobile penetration levels and the average revenue per user that the industry might expect to achieve. We then estimate a range of the total revenue potential from these rural areas for the industry as a whole.
- Chapter 5: discusses the issues of affordability for rural consumers, duplication of infrastructure spend, and alternative methods through which rural coverage might be achieved.
- Chapter 6: summarises the key findings from the analysis and discusses aspects of the TRAI recommendations on revised rollout obligations that might be revised while still allowing for the key objectives to be achieved.
- Appendix: contains the methodologies for the cost and revenue analyses.

3 Cost implications

3.1 Introduction

In this chapter we present the outputs of the cost analysis. This analysis tool estimated the costs associated with the deployment of the additional base stations that will be required to meet the revised rollout obligations as proposed in the TRAI recommendations. The analysis outputs have allowed us to assess the economic impact the recommendations will have on the Indian economy and telecom industry, in terms of additional costs.

The methodology adopted for this cost analysis is presented in the Appendix. The discussions below are based on the outputs of this analysis.

3.2 Additional sites required and associated costs

The current footprint of coverage in villages with populations of 5,000+ and 2,000 to 5,000 inhabitants varies largely depending on the operator. As expected, the larger operators have greater coverage while the average operator has 37% coverage of villages with over 5,000 inhabitants and 27% coverage of villages between 2,000 and 5,000 inhabitants. This shows that large expansions are needed in order to meet the TRAI requirements: the smaller the operator, the greater the expansion needed.

The actual number of base stations required for the additional coverage depends on the type of coverage (in terms of technology) and the proximity of the villages. Based on our estimates, the total number of additional base stations required to meet the coverage obligations (with all operators using 1800MHz, except where operators already have CDMA800), is around 157,000[3] for all operators combined.

The average cost of the base stations is currently based on typical tower renting costs and ownership of all active elements. Based on this, the average cost of a base station in year 1, including operating costs and if all capital costs are incurred in year 1, is around INR 2 million.

Given our assumptions; the original inputs; and the principle that obligations will be met with only 1800MHz or CDMA800, then the *overall costs* to India's telecom industry to meet proposed TRAI recommendations on revised rollout obligations will be in the region of INR 1,200 billion[4]. The large level of duplicate costs associated with the proposed TRAI recommendations represent a significant waste of India's capital. This capital could be put to a more productive use in India's economic development to benefit the average citizen.

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[3] To calculate the number of sites and associated costs we have assumed that operators will cover 1/3rd of the habitations/villages with population between 2000 and 5000, with their own network, with the balance 2/3rd expected to be serviced through intra-circle roaming as per the recommendations. However, in view of limitations to the reciprocal acceptance of the roaming arrangements between operators, the actual numbers maybe higher – perhaps as many 248,000 base stations

[4] Present Value of Capital Expenditure and Network Operating expenses from 2010-2025

3.3 900MHz versus 1800MHz

Due to the relatively low economic status of the villages and their small sizes, it is reasonable to assume that the sites will be coverage driven rather than traffic driven. If this is the case then the emphasis should be on achieving maximum coverage from a given base station. This indicates that 900MHz, with its superior propagation characteristics, should be preferred to 1800MHz; fewer base stations using 900MHz will be required than base stations using 1800MHz, thereby resulting in lower costs for India.

The TRAI recommendations imply that obligations should be met with 1800MHz. If all coverage was met using 900MHz, the costs would be approximately 34% lower than if all coverage was met with every operator on 1800MHz. This clearly illustrates the spectrum impact.

The analysis is based on the assumption that base stations of 900MHz and 1800MHz are similar in costs. The costs associated with mast, power consumption, operations and antennae will not vary significantly between 900MHz, 1800MHz and CDMA800. The unique equipment costs have only small variations depending on the vendor. Therefore it is reasonable to assume the total cost of one base station is very similar.

3.4 Impact for dual-technology operators

In general, the costs involved with meeting the proposed TRAI obligations should be lower for operators using CDMA800. Assuming identical costs of building the base stations, the costs associated with coverage will be lower because CDMA800 covers a larger area than GSM and therefore fewer base stations will need to be built to meet the requirements. Once again, we are assuming that base stations in the rural areas will be coverage driven rather than traffic driven. This is due to larger cell size, which is also the major cause in the cost differential between 900MHz and 1800MHz.

The total coverage cost of a CDMA800 operator is about 45% lower than that of an 1800MHz operator to cover the same requirement (based on a simple assumption that the operator was either based totally on one spectrum or the other).

4 Revenue implications

4.1 Introduction

In this chapter we examine the potential revenues associated with the TRAI recommendations. The analysis estimated the revenues the industry as whole might expect to receive due to the anticipated additional subscriber base in the rural areas requiring coverage. The output has allowed us to assess the net economic impact the recommendations have on the Indian telecom industry.

The methodology adopted for this revenue analysis is presented in the Appendix. The discussions below are based on the outputs of this analysis.

4.2 Revenue associated with extended coverage

We estimate the revenue potential of all additional villages to be covered as proposed by the TRAI recommendations. This is the estimate of total industry revenue available from customers in these rural villages. Each village will have a limited amount of revenue available for all operators and this will be distributed between operators. From the point of view of the customer, the separate operators' services are likely to be extremely close substitutes and competition is thus likely to be predominantly on price. Revenue estimates are highly uncertain[5], unlike the cost implications of the proposed TRAI recommendations which can be estimated with reasonable certainty.

If we assume a 'best case scenario' of rural mobile penetration rate reaching 65% by 2025, then total revenue potential for the industry, will be around INR 630 billion[6]. If we assume a more realistic rural mobile penetration level for 2025 of 55%, then the total revenue to the industry will be INR 580 billion[7]. This is much less than the costs of INR 1,200 billion, discussed in the previous section. The results from the analysis suggest that the costs associated with all operators meeting the proposed TRAI obligations cannot be recovered through revenue.

The revenues will increase as a whole if the ARPU levels increase or the penetration rates increase. The analysis already assumes an increase in penetration, however there is a limit to their expansion due to the relative wealth and isolation of these villages. It is also important to note that ARPUs tend to fall with increasing penetration rates. We have not modelled this effect but, if we had, it would decrease the overall revenue.

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[5] TRAI report titled "Recommendations on An Approach to Rural Telephony – Suggested Measures for an Accelerated Growth", dated March 19, 2009. This considers challenges related to rural telephony

[6] Present Value of total revenue estimates over the period 2010-2025

[7] Present Value of total revenue estimates over the period 2010-2025

5 Implications for the rural consumer

5.1 Introduction

This chapter uses the outputs from Chapters 3 and 4 as the basis for a discussion on some of the relevant qualitative issues. We discuss the affordability of mobile services by rural customers and the concerns of India duplicating infrastructure spending. Finally, we detail a number of alternative approaches that might be used in order to achieve India's rural coverage objectives.

5.2 Affordability for rural customers

Individuals living in rural villages typically have relatively low incomes and have less disposable income to spend on mobile services compared to their urban counterparts. Consequently, in order to achieve penetration in these rural areas, retail prices need to be set sufficiently low so as to encourage these individuals to take up the services.

As discussed in Chapter 3, the obligation of rural coverage, as laid out in the TRAI recommendations, is associated with significant capital and operating expenditure. Operators will need to recoup these expenses in some manner and as discussed in Chapter 4, given the limited rural industry revenue pool, are likely to pass on the high costs to consumers in the form of higher retail prices. This is likely to mean that not only prices for existing consumers will rise, but it is also likely to result in prices for new rural consumers being higher than might be optimal. This will have an impact on mobile penetration and usage in the rural areas.

In summary, two concerns arise from the high costs of rural coverage: increased prices for the market as a whole and high prices for new customers in rural areas. As any increase in prices, without some associated consumer benefit, results in a reduction of consumer welfare, TRAI should consider how best to serve rural areas while reducing the telecom industry's total capital and operating expenditure, so that the concern of total high industry costs leading to higher consumer prices can be addressed.

5.3 Duplication of infrastructure spend

For the most part (villages with 5000+ inhabitants and one third of villages with 2000-5000 inhabitants), TRAI's proposed recommendations require all operators to meet the coverage obligations using their own networks. This requires large capital outlays for India's telecom industry as each operator will need to install their own base stations, equipment, backhaul networks, etc in all the rural areas to be covered.

The advantage to this approach is that competition is maximised (though there are other methods to achieve the same competition more efficiently for India, described below). The disadvantage, however, is that there will be extensive duplication of infrastructure and wastage of capital which is highly inefficient for India. Furthermore, the sheer cost of the capital outlay required may force some players out of the market, reducing competition and consumer welfare in India over the long term.

If the TRAI recommendations were amended, perhaps in such a way as to require 2 or 3 operators to build their own networks and allow the remaining operators to share this infrastructure, the inefficiencies of duplicate infrastructure spend could be reduced and service competition between operators is retained at a similar level.

5.4 Alternative approaches to rural coverage

In the accompanying Ovum report we propose an alternative approach to rural coverage through the use of 900MHz spectrum. This could be the primary coverage medium for GSM operators, as 900MHz provides the most economic delivery of coverage due to the higher coverage ability of 900 MHz (lower cost per subscriber then 1800MHz as the costs are not traffic driven). GSM operators with only 1800MHz, should be offered a form of Mobile Virtual Network Operator agreement by the 900MHz operators to provide service competition in rural areas. This will ensure lower prices for all Indian customers, ensure India's capital is used most efficiently and India's telecom industry stays healthy (see the accompanying Ovum report for more details).

Another alternative is to employ technologies other than GSM, such as WiMAX and satellite. These technologies are used in many countries in both urban and rural areas, with WiMAX providing good end-user connection where the numbers are reasonably small and satellite offering an excellent backhaul alternative to GSM or fixed cables. Furthermore, broadband using WiMAX or LTE has the flexibility of offering individuals good internet connections as well as voice communication ability via VoIP. Indeed, one good means of providing rural coverage might be to use broadband and VoIP or broadband and picocells to provide connectivity to a telephone booth or communication centre.

A further alternative is an initiative akin to the Village Phone programme, most notably used in Bangladesh and recently adopted in a number of other countries, such as Uganda and Rwanda. This programme allows an individual, usually with some financial assistance, to subscribe to a mobile phone which is then used as an owner-operated payphone. This individual is taught how to use the phone and how to profit from allowing others to use it. A programme such as this is likely to be very successful in the smaller rural villages in India, where individuals are not likely to be able to afford their own subscriptions but can benefit from access to mobile services when required. And while the original programme makes use of GSM technology, the programme could also be implemented using broadband and VoIP, WiMAX or other technologies.

One of the most obvious alternative approaches for achieving rural coverage is to extend the fixed line network so that small villages can become connected via traditional copper or fibre cables. The high population densities observed in most Indian towns and villages suggests that minimal cable might be needed in order to connect a relatively large number of villages. Instead of providing cables to each house, however, a more realistic measure might be to install a number of fixed line telephone booths or communication centres in each village – this would provide the connectivity required for each village and would limit the expense of laying the cable.

In general, there exists a number of viable means through which to achieve rural coverage. The TRAI recommendations focus very heavily on promoting GSM competition while coverage could be achieved through GSM roaming agreements, localised initiatives or the use of alternative technologies. We recommend that the TRAI conduct a careful

evaluation of all these alternatives and consider a cost benefit analysis for each before determining which approach might best serve the stated objectives.

6 Conclusion and Recommendations

This report has investigated the economic implications of the proposed TRAI recommendations on revised rollout obligations as detailed in the May 2010 document entitled “Recommendations on Spectrum Management and Licensing Framework”.

We conclude that the net effect of the obligations contained in these recommendations is to cause a loss of consumer welfare due to higher prices. Having multiple operators setting up duplicate infrastructure, in rural areas with limited revenue potential, is very likely to inflate retail prices across the market as a whole, negatively impacting the consumer.

The results of our cost and revenue analysis clearly demonstrate that the TRAI recommendations impose significant costs, when there is only a limited and uncertain revenue pool available for the industry as a whole in the rural areas. With even most optimistic assumptions on rural mobile penetration the net economic impact on the industry remains negative. This result remains robust to all but the most extreme changes to the base assumptions.

A further issue for TRAI to address is the use of the 1800MHz band compared to the 900MHz for rural coverage. The inferior propagation characteristics of the 1800MHz band mean that more base stations are required when using this band compared to when using the 900MHz band. Consequently, the costs associated with using 1800MHz for rural coverage are higher than using the 900MHz band. The current TRAI recommendations are leading to the inefficient use of scarce spectrum resources, a situation that is not desirable. This use of 1800MHz and the unnecessary duplication on networks in rural areas will lead to a waste of India’s capital. This capital could be used for more productive investments for economic development.

We support the regulators in their duty to promote competition, investment and services, and to account for social needs such as coverage and delivery to disadvantaged sections of society. We believe that the current TRAI recommendations are probably not the most efficient way for India to achieve these objectives. The proposed recommendations by TRAI have potentially negative implications for the economy, consumers and the telecom industry.

The economic impact of these requirements may contradict the fundamental goals of the TRAI and harms the very consumers that the regulator should be protecting. This report has identified a number of viable alternative methods through which rural coverage objectives might be achieved in a more efficient and economical manner. We strongly recommend TRAI reconsider their current proposed recommendations and adopt an alternative approach.

Appendix

Cost analysis methodology

The main factors in the cost analysis are as follows:

1) In order to access the cost of meeting the obligation, we have made a distinction between rural villages with 5,000+ inhabitants and villages with 2,000 to 5,000 inhabitants. As per the census definition, we assumed the maximum population of a "village" to be 20,000. The separation into the two different bands was motivated by the obligations that specify that operators are required to cover the larger band with their own networks whereas operators are able to meet a third of the coverage in the latter band by using their own networks with the remaining two thirds being met with roaming agreements. This has been reflected by only considering one third of costs associated with villages with 2,000 – 5,000 inhabitants.

2) To assess the costs of meeting the obligations, it is necessary to calculate the number of villages which require coverage, for each operator. To do this, we calculated the total number of villages, the number of villages currently covered and the number of villages needed to be covered in order to meet the obligations. We did this separately for the 5000+ and 2000-5000 bands. In order to calculate these figures, we primarily used the individual operator information on coverage found in 'Annexure XV' in the TRAI document 'Spectrum Management and Licensing Framework.' These coverage statistics were adjusted in line with the census data on number of villages.

3) The number of uncovered villages is then adjusted, depending on the proportion of rural areas for which each operator has a licence. This proportion is calculated by a weighted average of the areas with licenses.

4) We then used a factor for the average number of villages that can be covered by a single base station (overlap factor). This estimation was based on the geographical distribution of the villages and the maximum potential coverage of the base station (this depends on spectrum frequency employed). We then calculated the total number of base stations that will be needed to meet the coverage obligations. The distribution of villages was based on the assumption that each village (of 5000+ and 2000-5000) is equally distributed over the total area of India. We then used maximum coverage values to calculate, on average, the number of base stations required to cover a single village. The values used were maximum levels and, in reality, their coverage is unlikely to be as large as this due to geographical elements such as mountains. The value for overlap, therefore, is a maximum and it is likely that, in reality, more base stations are needed and we are likely to be underestimating costs.

5) We assumed that rural base stations are coverage driven and not traffic driven. This is reasonable given the low market penetration and lower usage in low density rural areas. Also, there would be no need for the TRAI obligations if rural cells

were traffic driven as these would be economic areas and no encouragement to cover this sector would be needed.

6) We considered both the capital and operating expenses associated with a base station site. As capital expenditure, we considered the tower, equipment, base station, TRX and backhaul. As operating expenditure we considered maintenance and power as well as any rental costs and site lease that were applicable. The cost of 900MHz, 1800MHz and CDMA800 base stations was assumed to be equal[8].

7) The capital expenses were split into passive elements (the large equipment which is generally shared between operators i.e. tower) and active elements (the smaller equipment which is generally provided separately by each operator i.e. BTS, TRX, Backhaul). The distinction allowed the comparisons between scenarios where operators follow a pure rental model, and scenarios where operators own some of their own infrastructure. The analysis allowed the passive and active elements to be adjusted, depending on the proportion which is shared compared to that which is owned.

8) The base case of spectrum usage is in line with the TRAI recommendations (all coverage must be met with 1800MHz). We also considered the spectrum currently employed and we have also performed the calculation assuming the same proportions are used to meet the coverage obligations. When doing this we took into account the inferior propagation characteristics of the 1800MHz band, in terms of the distance it can cover, and thus the need for an increased number of base stations when using this band compared to the 900MHz.

9) We also considered operators that might have CDMA800 in addition to GSM technology, and the associated impact this might have on overall costs due to the greater distance coverage and therefore the lower number of base stations which are required.

10) The total cost of meeting obligations was calculated by: Cost = (Number of villages x Overlap Factor) x Cost of Average Base Station. The capital costs were distributed over a 3 year period, where 70% of costs are incurred in the first year, 20% in the second year and 10% in the third year. The operational costs were distributed according to the inverse of these values, to reflect the fact that not all base stations will be up and running in the first year. Once the capital is fully invested, the full operational costs will occur every year. It was assumed that the operational costs will rise in line with inflation. The estimates for the inflation rate until 2015 were sourced from Datamonitor and a calculation was made for the years 2016 to 2025 (average of inflation in the preceding three years). Present Value (NPV) was calculated for total costs based on a given weighted average cost of capital (WACC), or discount rate of 15%. The life time of the capital was assumed to be 15 years.

[8] The cost differences, where they exist, are relatively small and therefore will not affect the conclusions.

In most cases we assume lower parameters of cost inputs and therefore it is more likely that costs are underestimated than overestimated. This gives the outputs a robust nature and allows us to be confident in the overall conclusions.

Revenue analysis methodology

The method used in the revenue analysis is as follows:

1) In order to calculate the revenue potential from the increase in subscribers due to extended rural coverage, we first estimated the revenue potential of all villages with 5,000+ and 2,000 to 5,000 inhabitants. This was done using the following calculation[9]: Revenue = Total number of villages x average population of those villages x average penetration rate x average revenue per user (ARPU).

2) The average population of villages was calculated using census data and according to the following calculation: Total population / number of villages. This was done for both the 5,000+ and 2,000 to 5,000 villages.

3) The average penetration rate for rural areas was estimated using the TRAI teledensity statistics. Although the total teledensity statistics included fixed penetration as well as mobile penetration, the coverage of fixed is extremely minimal in rural villages and therefore the total was assumed that this is a good proxy for mobile penetration in rural areas (if anything, this will overestimate the potential revenues).

4) ARPU of rural areas is the final component of the calculation. We collected the total ARPUs (combined urban and rural) for a number of the mobile operators. These ARPUs were then adjusted downwards in order to reflect the lower income of the average rural user. We have assumed that the ARPUs remain constant over time. In reality, ARPUs tend to fall over time as penetration rate increases. In order to provide a robust output, we have assumed that they remain constant which may overestimate revenues.

5) A proportion of revenue must be paid to the regulator for Licence fees. Revenue was adjusted to incorporate these fees as applicable the operator.

In most cases we assume higher parameters of revenue inputs and therefore it is more likely that revenue is overestimated than underestimated. This gives the outputs a robust nature and allows us to be confident in the overall conclusions.

[9] The individual elements of this calculation are discussed below.

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An analysis of the TRAI recommendations on revised rollout obligations

Part 2: A proposal for an alternative approach

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1 Executive summary

This report proposes an alternative approach to the current TRAI recommendations to achieve the Indian government's goal of increased rural coverage and development.

We believe a more efficient and economical way for India to increase rural coverage is from using 900MHz spectrum, due to its superior propagation characteristics compared with 1800MHz spectrum. Existing operators with 900MHz spectrum should be allowed to retain 900MHz spectrum, as opposed to giving it up as currently proposed by TRAI, and in return would be obligated to rollout services to rural areas in their license region using 900MHz. To ensure adequate competition in rural areas, operators with 900MHz spectrum once they have rolled out to rural areas, should have to offer MVNO agreements at appropriate rates (potentially government mandated) to other existing operators.

This approach will ensure India's goal of increased rural coverage, maximize consumer welfare in India through adequate competition, ensure efficient use of capital and enable a healthy telecom industry in India.

From India's wider economic perspective, benefits include:

- Rural coverage, can be achieved in a more cost effective manner as fewer base stations are needed when using 900MHz compared to 1800MHz.
- Saved capital can be invested in more productive infrastructure.
- Overall license fee and revenue related government income stay the same as industry revenues are unchanged - only the distribution of revenues between players are altered.

From a consumer's perspective, benefits include:

- Lower prices, as lower total telecom industry costs will be passed on to them.
- Low prices are ensured through adequate competition amongst operators and MVNOs.
- Reduced risk of service disruption from migration from 900MHz to 1800MHz.
- Better quality coverage on 900MHz.

These mostly impact rural customers but urban customers also benefit as lower costs help to reduce all prices.

Compared to our above suggested approach, the current TRAI recommendations lead to high costs for India and the telecom industry and these higher costs will have to be passed on to the consumers (both existing and new) in the form of higher prices.

We believe the proposed approach in this paper to be a win-win situation for all parties: consumers, the telecom industry and the wider Indian economy.

2 Introduction

This report details an alternative approach that might be adopted by the Telecom Regulatory Authority of India (TRAI). This document was commissioned by Uninor. This proposed approach is as follows:

The obligations for rural coverage should apply only to the GSM operators with 900MHz spectrum. In return for meeting this obligation, these operators should be allowed to retain 900MHz spectrum rather than have this spectrum re-farmed, as currently proposed by TRAI. In order to ensure appropriate levels of competition in rural areas, these operators should have to offer MVNO (or national roaming) access to these rural networks to all other existing GSM operators at government mandated prices.

This proposed approach achieves TRAI's aims of rural coverage and ensures adequate competition in rural areas thus maximizing consumer benefits. At the same time, the approach ensures the telecom industry remains healthy and sustainable. This report presents the proposed approach in further detail, discussing the benefits associated with the approach and considering some of the concerns that may be identified.

In our accompanying report "Part One: Assessing the Economic Impact on Consumers and the Industry" we analysed the economic ramifications of the current TRAI recommendations and highlighted that the balance required between the needs of consumers, government and telecom industry may not be optimised as a result of the current recommendations and could result in economic outcomes that are sub-optimal. We recommend that our proposed approach detailed below in this report be read in conjunction with the other Ovum report.

We have structured the report around the issues central to this approach; the outline is as follows:

- Chapter 1: The Executive Summary highlights the key components of the proposed alternative approach and summarises the benefits.
- Chapter 2: This chapter presents initial insight into the proposed approach and details how the report is structured.
- Chapter 3: This highlights the objective of achieving rural coverage and the decision regarding the appropriate spectrum with which to do so.
- Chapter 4: This focuses on the operators currently operating on 900MHz and examines the benefits of avoiding re-farming of spectrum as well the cost-benefit of providing this rural coverage.
- Chapter 5: This focuses on the competition in rural areas through MVNO (or national roaming). Here we examine the advantages and disadvantages of this approach. We also focus on the importance of the MVNO commercial contract and the details of the agreement.
- Chapter 6: This summarises the features and benefits of our proposed approach.

3 Rural coverage

The alternative approach that we propose – specifically, that operators currently operating on 900MHz retain their spectrum, in exchange for meeting the revised rollout obligations – means that the TRAI's objective in relation to rural coverage is achieved in the most economical and efficient manner for India. Specifically, we propose that the 900MHz GSM operators are obliged to offer mobile services to consumers in all villages that comprise 5000 or more inhabitants. The proposed approach also requires these operators to provide coverage for a third of villages having 2,000 to 5,000 inhabitants, with the remaining two thirds obligation being met with roaming agreements. This leads to typically one or two physical networks for the very small communities. Thus, all rural coverage goals are met in this proposed approach, without duplication of networks and wastage of capital.

A clear advantage of this alternative approach is the way in which rural coverage will be achieved. The inferior propagation characteristics of the 1800MHz band mean that, if this frequency was used to meet revised rollout obligations, 900MHz based operators would need to spend additional capex and opex in order to maintain current coverage levels and quality of service. Also, there could be significant delays and possible interruption of service as existing subscribers are migrated from the 900MHz to the 1800MHz band.

The accompanying Ovum report clearly shows that the costs associated with using the 900MHz band for rural coverage are lower compared to using the 1800MHz band. This is primarily due to fewer base stations being required to cover the same geographic area when 900MHz rather than 1800MHz is used. This lower cost of rural coverage is clearly beneficial for consumers as lower costs should be passed on by the operators to the consumers.

Our proposed alternative approach, therefore, ensures that the TRAI's aims for rural coverage are met completely and that this coverage can be achieved using the preferable 900MHz spectrum rather than the more limited 1800MHz spectrum.

From our analysis, the cost to the industry associated with the alternative approach of this paper is in the region of INR 180[1] billion. This is compared to the cost associated with the TRAI recommendations, which is in the region of INR 1,200 billion[2].

Mandatory MVNO on the networks of operators retaining 900MHz will ensure adequate competitive pressure keeping the physical network operators' prices under control for end customers in all areas. In addition all operators remain free to build additional rural coverage networks – where deemed appropriate on a commercial basis.

As a result, rural consumers will have the benefits of multiple operator supply. Competition effects are maintained. This means they can choose services either from the providers with the physical networks or from others using the MVNO approach (described below). This means consumers effectively have full rural coverage by all players that cover the wider market.

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[1] Present Value of Capital Expenditure and Network Operating expenses from 2010-2025

[2] Present Value of Capital Expenditure and Network Operating expenses from 2010-2025

4 Operators currently with 900MHz retain spectrum

This chapter focuses on the operators currently operating on 900MHz, and how our proposed approach will benefit both them and India in general. We also consider the disadvantages that might arise in connection with this approach.

A key benefit for the GSM operators currently operating on 900MHz is that they are able to retain their 900MHz spectrum and avoid re-farming this spectrum as suggested in the current TRAI recommendations. As mentioned in chapter 3, the ability to retain this 900MHz spectrum and utilise this rather than 1800MHz to meet revised rollout obligations results in significantly lower total costs and reduced interruption of service for the customers of these operators, thus benefitting consumers.

In general, national consumer welfare will be increased by extending coverage to those in smaller rural villages in the most economical manner, and ensuring this coverage is not achieved at the expense of existing and new customers. Further, TRAI's mission specifically states that its key aims include promoting growth in telecommunications and ensuring that consumer interests are protected. These aims imply TRAI should seek improved rural coverage. Operators with 900MHz, being regulated by the TRAI, should willingly comply if they would like to retain the 900MHz spectrum. These operators can achieve this coverage in such a way that minimises the cost to themselves. The fact that this alternative approach avoids the re-farming of spectrum and enables rural coverage to be achieved using the 900MHz band results in lower costs to these operators and the telecom market as a whole and is an improvement on what is currently recommended by TRAI.

In summary, key benefits include:

- The proposed approach will enable the GSM operators currently on 900MHz to provide rural coverage in a more cost effective manner than if the current TRAI recommendations were adopted.
- Consumer welfare through competition and market coverage (national service supply) by all players is assured by options of MVNO/roaming deals.

Further benefits include:

- Incumbents avoid the 900MHz termination and migration expenses.
- Investments in 900MHz are re-used. This provides maximum economic returns on the assets.
- 900MHz service continuity is assured and interim dual-mode provision (needed at switch over) is avoided. Additional costs are avoided.
- Optimal use of scarce spectrum resource (900MHz is fundamentally better for coverage compared to 1800MHz).

Counter concerns do exist. These include:

- The roaming/MVNO deal leads to the incumbent 900MHz players sharing their revenues and diluting market share. This impact is much less of a problem than if the rural zone is shared by say 10 other physical network providers as costs are lower and the incumbent is compensated for by the roaming/MVNO fees.
- Lack of access to 900MHz by other operators. This is compensated for by the reduced cost burden (no need to build in non-economic areas). Also, future business focus will move to broadband where such service delivery is traffic driven (bit/s) and, as a result, the advantages of lower spectrum are diminished as cell sizes have to be smaller anyway to cope with the traffic. Primarily, rural areas have a near term need for basic voice and this is most economic over lower frequencies, like 900MHz. Broadband can be provided over other frequencies.
- MVNO deals are unfair. These are common globally and typically commercially negotiated. A fair deal for both host and MVNO should be possible – the fees and contract allow adjustment in the relative benefits to suit the local situation. MVNOs are clearly a common solution to provide mutual benefits.
- The 900MHz rural providers may still claim to have value-diluting investments forced on them (the additional zones might still not be NPV positive) even though this is compensated for by the other factors (such as avoided migration costs and higher 1800MHz costs) and minimised by the sharing of revenues with fewer players. If there remain any other negative aspects then additional remedies may be considered (including aspects of the MNVO deal or other compensatory actions). In any event, the overall net negative aspects of the approach are much lower than the proposed TRAI recommendations.
- Definition of rural coverage and community sizes. This is not fundamentally any more a problem that with the existing TRAI recommendations and solutions can surely be devised.

5 MVNO (or national roaming) obligations for operators with 900MHz

This chapter focuses on ensuring rural competition and the best prices for rural customers by ensuring operators with 900MHz offer MVNO deals (Mobile Virtual Network Operator) to all operators who do not have 900MHz spectrum. This chapter considers the advantages and disadvantages that operators may experience with this alternative approach and some of the key elements of the approach (specifically, the MVNO or roaming agreements) that need careful design in order to be effective.

One clear advantage for rural customers is that the proposed approach ensures there will be adequate competition in rural areas between physical network operators on 900MHz and MVNOs ensuring the best prices for end customers.

This approach ensures all operators are always able to enter these markets, and competition between operators is promoted (even if only tacit/threatened competition). Importantly, operators with 900MHz will need to remain efficient, so that other operators cannot enter the market and offer consistently lower prices to consumers. Further, the operators with 900MHz will not be able to collude to keep prices artificially high as the threat of entry from other operators should curb any possible market abuse.

Another important consideration is the nature of the MVNO or roaming agreement. How long should operators be able to act as an MVNO in a certain region? What services will the operators with 900MHz supply to the MVNOs? How much control over retail prices will these operators be able to exert on the MVNOs? Will there be re-selling airtime or providing services via national roaming? And further, what regulation would govern the relationship to ensure agreements are enforced and the 900MHz operators do not impose requirements on the MVNOs that are unreasonable and counter to the aim of improved service provision? We believe the government should help set up clear MVNO guidelines including up front costs and on-going tariffs. This agreement between the parties is needed at the outset in order, to ensure the option for all operators to enter the rural markets as MVNOs is effective.

From an operator's point of view, the ability to enter as an MVNO means that they can decide which market segments to target and where value might be added in the form of distribution channels, brand appeal and so on. From the point of view of an operator with 900MHz this tradeoff must be accepted if they want to retain the 900MHz spectrum. These and market sharing issues are normal MVNO issues that are commonly resolved. Most MVNO business issues can be typically resolved by the prices and contract details,.

From a consumer point of view, welfare is likely to rise as MVNOs are likely to bring competition, lower prices, extended services and innovative product offerings. As MVNOs are common in many mobile markets we can reasonable assume win-win deals can be defined.

Our proposed alternative approach ensures competition in rural markets and ensures all operators can still enter rural markets, maximizing consumer welfare in rural areas. We note, that whether or not MVNO entrants do actually enter will depend largely on the number of operators that can realistically serve each of these rural markets as well as on the details of

the agreement reached between the host network and the MVNOs – and this helps to ensure competitive market forces are still drivers for the outcome. At the same time the operators retaining 900MHz will ensure rural coverage is achieved and rural consumers get mobile connectivity.

6 Conclusion and summary of consumer benefits

This report has outlined what we believe to be a win-win alternative approach to achieving the Indian government and TRAI's aim of 100% rural coverage and maximizing consumer welfare. TRAI ensures that all rural villages with 2000 to 5000 and 5000+ inhabitants will receive mobile coverage. At the same time India conserves valuable capital by using the most efficient 900MHz spectrum for rural coverage and this saved capital can be put to more productive use for India's long term growth. In addition the avoided costs should reduce prices for all consumers. At the same time the Indian telecom industry stays healthy. Operators with 900MHz retain the spectrum minimizing disruptions for their millions of customers. In addition, other operators can expand their coverage to rural areas through MVNOs, typically at government mandated prices, ensuring competition and low prices for rural customers.

This proposed approach achieves India's rural coverage objectives underpinning TRAI's proposed recommendations in a capital efficient manner.

We note that details of the roaming/MVNO deal need to be developed as well as the number of 900MHz players in a rural zone.

Even if this proposal is not immediately accepted (and we accept that more analysis is needed) at a minimum it shows that a fuller analysis of other options (compared to the current TRAI recommendations) is surely required to prove whether the current recommendations are really the optimal solution for India. As shown in this paper and the accompanying Ovum report, the proposed TRAI recommendations are potentially not optimum. We believe the approach proposed here is likely to be a significant improvement from a purely economic perspective (we have not considered other issues within this analysis).

Consumer benefits of the proposed approach are summarised as follows:

- Lower prices, as lower costs are passed on to consumers in rural areas.
- Consumers do not have to select a service provider based on whether there is adequate signal coverage in the locality. The MVNO approach allows any other service providers to be selected – increasing competition effects.
- There is no discrimination. Rural customers should obtain the same services and prices as in other regions.
- No risk of service disruption from migration away from 900MHz service provision.