with

submitted to

Botswana Communications Regulatory Authority

Regulatory Impact Assessment on National Roaming in Botswana

Revised Interim Report

6 May 2013

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Executive Summary

The implementation of National Roaming (NR) internationally has generally been to support a new entrant in the market by providing them with access to a national network. Once the new entrant has built their network so that it meets some pre-defined population coverage (usually included in the licence conditions), NR is often ruled out. The reason for ruling it out, based on EU experience, is that NR could deter network investment in areas outside of high traffic urban locations. Botswana's experience has been very similar, with NR cancelled in 2000 because the Authority believed it was negatively impacting network rollout.

Certainly, events subsequent to the cancellation of NR in Botswana have supported this decision, with two mobile operators having over 95% population coverage and a third having about 75% population coverage.

Recently, however, there are concerns that areas with only one operator do not allow citizens to make calls unless they are subscribers to that network. NR is seen as a potential solution to this problem, allowing visiting subscribers to make and receive calls, as long as they have network coverage. The purpose of this report is to conduct a Regulatory Impact Assessment (RIA) in order to determine what regulations have the greatest likelihood of achieving the BOCRA's policy objectives.

Based on the output of the RIA, the finding of this report is that mandating national roaming (NR) would come at a significant competitive cost, with beMobile, the weakest market player, likely to lose subscribers and the market trend towards increasing dominance by Mascom and Orange.

The review of the mobile market, including current mobile coverage, termination rates and retail tariffs emphasised the factors that would impact upon the implementation of NR:

- Infrastructure sharing, which is the prime alternative to national roaming in rural areas, is used extensively amongst operators already and particularly in Nteletsa areas;
- There is also potential for substantial further growth in infrastructure sharing in Nteletsa localities, reducing the number of people in these areas that don't have access to at least two operators, to only approximately 47,000 people within the next two to three years.
- Botswana's termination regime is markedly more expensive, on average, than other countries, and this tends to have a harmful effect on the smallest operator and weaken competition in general;
- The analysis of retail prices shows that Botswana is one of the most expensive countries in Africa. The comparison did not include promotions and discounts though it should be noted that "hidden" promotions and discounts weaken competition and have also tended to drive multiple SIM usage.

In addition to these factors, the demand survey highlighted three features of subscribers in Botswana:

- 69% of visitors to Nteletsa areas already have more than one SIM[1];

[1] See Section 4

- 37% of subscribers stated that they would take advantage of NR even if it was offered at a premium price[2];
- Subscribers with multiple SIMs are more price sensitive than subscribers with only one SIM[3].

A series of predictive scenarios were constructed that examined the impact of NR on consumers (villagers and visitors to Nteletsa areas), operators and the long-term impact on competition on the sector. Sensitivity analysis was modelled in three ways:

- Retail pricing sensitivity analysis was built into each scenario, with prices set at 0% (the same as current rates in Nteletsa areas); 15% premium to local rates (to account for the overhead administrative costs or NR plus a modest profit margin) and a 30% premium.
- Demand sensitivity analysis was modelled, with demand for NR declining as prices increased.
- Cost sensitivity analysis was also modelled, based on a range of roaming overhead costs and roaming host markups and modelled for each call type that could occur in a NR environment.

Impact of NR on Consumers

For *residents* of Nteletsa areas, the introduction of NR would create the potential opportunity to switch to the largest operator and reduce the overall cost of calls – since the majority of calls will be on-net for the largest operator and off-net for the smallest operator. For *visitors*, NR was determined to have a positive impact (net benefit) if prices are regulated to equal current local call rates and still a modest positive benefit to cost ratio if prices were set by commercial agreement to 15% above local call rates. If prices were increased by 30%, however, the benefit to cost ratio for consumers is negative. The break-even between positive and negative net benefit is at approximately 23% premium pricing.

Impact of NR on operators

The model assessing the impact of NR on operators incorporated demand and supply side sensitivity analysis. In all scenarios, the model predicted that the overall revenues from Nteletsa areas would increase by between 35% and 66%. In addition, the model assessed the impact on the smallest operator in Botswana, beMobile. If prices are equal to existing local call rates, beMobile – as the host roaming operator in Nteletsa areas 1, 2 and 3 – would see revenues increase by 50%. If prices are increased by 15%, beMobile revenues could increase by 19%. If prices are set to a 30% premium over current local call rates, beMobile revenues would reduce by 1%.

Impact of NR on competitive structure of the market

The final assessment was the impact of NR on the competitive structure of the telecommunications sector in Botswana. The assessment took into consideration the following factors:

- Botswana's relatively high termination prices;
- The fact that Mascom and Orange *currently* offer cheaper prices than beMobile;
- A significant number of beMobile subscribers (nearly a quarter of their total subscribers) come from Nteletsa areas; and

[2] See Section 4

[3] Ramachander, S. 2010. The Price Sensitivity of Mobile Use among Low Income Households in Six Countries of Asia. Available at http://lirneasia.net/wp-content/uploads/2010/03/RAMACHANDER-TBOP3_07.pdf

- That beMobile is the smallest operator with a market share of 13%.

The finding was that if NR is mandated, unless the balance of tariff regimes change significantly, there is a clear incentive for consumers to move away from beMobile towards either of the larger operators, most likely Mascom, in order to take advantage of both cheaper prices and coverage. In other words, mandating NR takes away beMobile's competitive advantage and encourages subscribers to migrate away.

Therefore, in terms of achieving any-to-any connectivity, mandating NR would come at a significant competitive cost, with beMobile likely to lose subscribers and the market being increasingly dominated by Mascom and Orange.

Recommendations

It is recommended that the BOCRA should do the following with respect to NR in Nteletsa areas:

- Do not mandate NR but allow NR to take place on commercial terms – i.e., operators are free to negotiate NR for the Nteletsa areas only, if they find a compelling economic justification. The role of BOCRA is to communicate that there are no regulatory obstacles.

In contrast to this light-handed approach to NR, the consultant also suggests that competition could be strengthened in the sector by exploring higher impact alternative regulatory strategies, namely:

- Further reduction in termination rates;
- Encouraging a more transparent retail pricing regime; and
- Supporting increased passive infrastructure sharing.

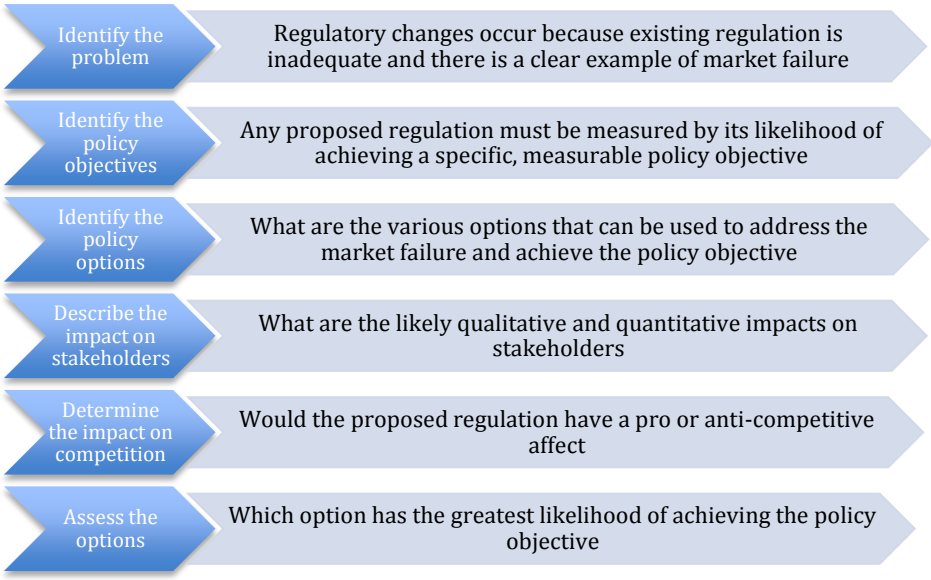
These alternative regulatory strategies promise to have a positive impact upon all subscribers compared to the minimal impact that NR would have on only 2.3% of the population of Botswana and those who visit the areas.

1 Introduction

The purpose of this report is to assess whether NR is a viable and effective regulatory intervention on the part of the Botswana Communications Authority (BOCRA). It is crucial that this report clearly identify the objective of NR for the BOCRA and the Government of Botswana (GoB). What, precisely, does the BOCRA and the GoB wish to achieve if NR were implemented?

The mechanism to assess the feasibility of NR is a Regulatory Impact Assessment (RIA). RIAs are relatively new tools in Southern Africa, with governments recently starting to formally adopt them into the policy making process[4]. For example, no countries in Southern Africa have legislated a requirement to conduct a RIA prior to making regulations.

A RIA is an extension of the broader trend of evidence based policy-making and is a tool used to collate, compare and evaluate data according to a set process. RIAs follow a specific format as indicated below:



1.1 Overview of National Roaming

NR became a feasible regulatory intervention during the 1980's and 1990's as the traditional position that telecommunications was a natural monopoly collapsed, especially with the success of mobile telephony. NR has since been used primarily as a support for new entrants to enter the market so that they can compete against the incumbent while they build their networks.

As noted above, most countries discontinued NR once new entrants reached a pre-defined measure of national coverage. NR as a support for new entrants gained new life in the early 2000's as 3G licenses were issued and the new 3G licensees were allowed to

[4] Truen, S. 2011. Regulatory Impact Assessment in SADC: Improving Regional Regulatory Outcomes.

roam on incumbent 2G networks while they built their 3G networks. As before, NR either will be or has been discontinued once 3G networks had reached predefined coverage milestones. In growth markets, NR still has a role to play as a tool to support the new entrant – in mature markets the benefits of NR are declining.

In 2003, NR acquired a different focus when it was one of the tools used by the French regulatory authority (ARCEP) as part of its universal access and service strategy. The Authority defined a series of geographical areas that had coverage only by a single operator and compelled that operator to offer NR. In 2011, the program ended and a 2012 review found that 98.75% of the country was covered by at least three operators. The French experience is useful because it looked at NR as one instance of network sharing, ranging from Radio Active Network sharing (RAN sharing) to passive infrastructure sharing to national roaming. The following section provides a definition of NR and its position along the continuum of network sharing options.

1.1.1 Definition of NR

The definition of NR generally shares a common formulation. Below are a selected number of definitions of NR from a range of countries and organisations:

- Australia: The ability for a customer of one domestic network (the home network) to access service from another domestic network (the host network) using the same handset[5].
- Saudi Arabia: National Roaming means one Facilities Based Providers' Subscribers may be hosted using the facilities and/or services of a second Facilities Based Providers' mobile telecommunications network where these Subscribers are out of range of their own mobile telecommunications network coverage[6].
- Nepal: The ability for a cellular customer to automatically make and receive voice calls, send and receive data, or access other services, including home data services, when travelling outside the geographical coverage area of the home network, by means of using a visited network[7].
- 'Home roaming' (or 'national' roaming) refers to an agreement among operators within an individual nation or state to provide services in geographical areas where one, or other, operator has no coverage[8].

The Australian definition is the clearest and simplest definition and does not in any way conflict with the other definitions and so it is the one adopted in this report.

There are several associated concepts that need to be included for understanding all aspects of this study:

- Outgoing vs. incoming roamed calls:
  - An outgoing roamed call is a call made by a subscriber when roaming on a visited network (also termed mobile originated roamed call)
  - An incoming roamed call is a call received by a subscriber when roaming on a visited network (also termed mobile terminated roamed call).
- Seamless vs. non-seamless roaming:

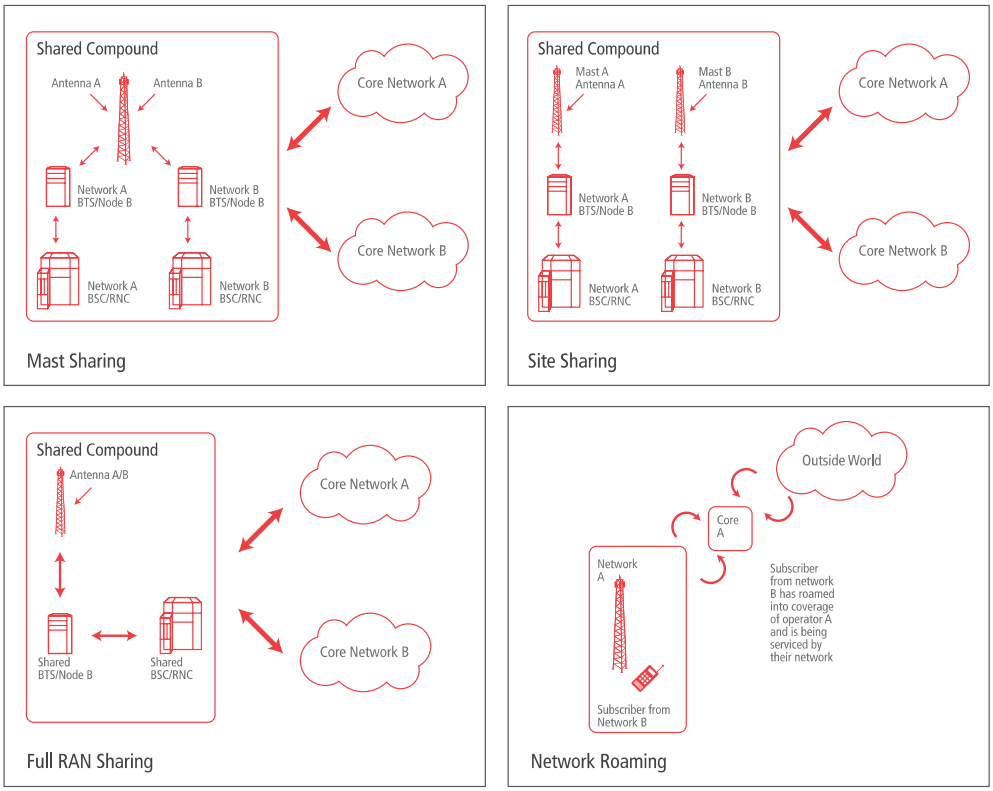
[5] Australian Competition & Consumer Commission, 2004, p. 11
[6] Communications & Information Technology Commission, Saudi Arabia, 2006, p.3
[7] Nepal Telecommunications Authority, 2011, p.iii
[8] Analysys Mason, Regulatory Impact Assessment Study on SADC Home & Away Roaming, 2010, p.9

- Seamless roaming is much more complex to implement than non-seamless since it involves hand-over from home to visited network (and the reverse) without dropping a call.
- Under current roaming arrangements in most countries with NR, when a subscriber is on a call and moves outside the home network to the visited network, the call drops out and must be re-initiated on the visited network. This is known as 'non-seamless' roaming.
- Intelecon is not aware of any country that currently mandates seamless communications hand-off particularly using prepaid mobile telephony.

- Different types of inter-operator sharing – the GSMA[9] distinguishes between four main types of sharing:
  - Site and mast sharing (passive sharing);
  - RAN sharing;
  - National roaming; and
  - Core network sharing.

For the purposes of this report, the focus is on the first three types of sharing: passive, active and national roaming. Each type of sharing is illustrated in the graphic below:

Figure 1-1: Type of Network Sharing



Source: GSMA, Mobile Infrastructure Sharing, p.5

The primary focus of this report is NR (the fourth diagram in the illustration above), but active and passive sharing are also considered as alternatives to NR. That is, would active or passive infrastructure sharing have a smaller, equivalent or larger impact on the LTIE than NR.

[9] GSMA, Mobile Infrastructure Sharing, p. 21.

1.2 Objective of the Study

The objective of this study, as defined in the ToR, is to assess whether NR will be viable, technically, commercially or otherwise taking into account the following:

- The viability of roaming in Underserved Areas (USA); and
- Alternatives that are available for facilitating universal access to ICT in USA such as infrastructure sharing, low cost infrastructure and spectrum allocations.

The output is a comprehensive Regulatory Impact Assessment (RIA) that shows the costs and benefits of national roaming.

1.3 Structure of this Report

The structure of this report is as follows:

- Section 2 is a review of international best practice and provides a series of case studies that are relevant to Botswana, culminating in a summary of value and impacts based on international experience.
- Section 3 is an analysis of the mobile market in Botswana with an examination of coverage, termination rates and retail tariffs.
- Section 4 is a review of the field survey conducted by Intelecon's team that included questionnaires administered to both residents and visitors of Nteletsa II localities.
- Section 5 considers alternatives to NR and includes a review of infrastructure sharing, low cost infrastructure and pro-rural spectrum allocation.
- Section 6 lays out the formal Regulatory Impact Assessment, following the generally accepted RIA methodology, bringing together analyses of the options, the benefits to consumers and operators, the impact of NR on competition, and an overall assessment of the options.
- Section 7 provides a series of Conclusions and Recommendations that are derived from the Sections 2 to 6.

2 International Best Practice

NR has been an instrument of policy in multiple countries around the globe for over two decades. It came to prominence in the late 1980's and early 1990's with the crumbling of the traditional view that telecommunications supply was a natural monopoly and the need to facilitate market entry, reduce concentration and to increase competition[10]. As such, it has been used by the vast majority of countries, and particularly in the EU, in support of new entrants. NR as an instrument of Universal Access and Service (UAS) policy is a relatively new phenomenon and the poster child for its UAS use has been France. In addition, NR has been an instrument of policy for large, geographically diverse countries that initially had few (or none at all) national mobile operators (i.e. operators that covered the entire country). The most common examples here are India, Australia and the USA. Finally, NR has been used to support emergency communications. That is, to ensure that emergency calls (such as to 911 or 112 numbers) can be connected wherever there is coverage.

2.1 Objective of NR in other countries

The objectives of NR are summarised in the table below:

Figure 2-1: Benefit of NR

	Rationale for National Roaming	Intended benefit	Country
1	Support new entrant	Increased competition resulting in lower prices, increased 3G/4G/LTE coverage and greater service options, lower investment costs, extra source of revenue for incumbents	Turkey, France, New Zealand, EU
2	National coverage in geographically large country	NR would allow consumers to use the same number throughout the country; Greater competition (i.e. less monopoly power)	India, Australia, USA
3	Under served areas	Lower switch-over cost for consumers (i.e. remove duplicate SIMs); Lower environmental impact (fewer base stations)	France, UAE, Bhutan, Australia
4	Emergency communications	Coverage, traceability of emergency calls in all areas of a country	Australia, USA, UK

[10] Sutherland, 2011.

2.2 Outcome of NR in other countries

NR has been a highly successful tool for regulators wishing to facilitate market entry. As such, the outcomes in the EU are well documented and easily accessible. Since Botswana has a different objective than what is common to most of the EU, we have selected three countries that have outcomes particularly relevant to Botswana: Australia, France and India. Extensive case studies of these countries (and a few others) are provided in Section 2.4.

Figure 2-2: Outcome in other countries

	Country	Outcome
1	Australia	National roaming allowed based on commercial negotiation between operators (i.e. no regulatory requirement to provide NR); and Regulatory Authority to monitor prices and terms and conditions of NR to ensure that commercial agreements remain fair; Outcome was that multiple NR agreements were signed between operators (based on commercial agreement).
2	France	NR required as part of the Programme Zones Blanches (White Zone Program); By 2012, 98.75% of the population of France was covered by at least three operators, 1.03% by two operators, 0.2% by one operator and 0.02% of the population remain uncovered (a white zone).
3	India	NR offered on a commercial basis between operators; National roaming is an important revenue source for Indian operators, representing 8.57% of total sector revenues; and 2012 Consultation paper on pricing suggests that the regulator is considering regulatory intervention to reduce prices.

2.3 NR specifically for universal access

France and Bhutan are the primary examples where the government is either actively considering or has implemented NR for UAS policy objectives. Australia has been included as an example because it did consider regulating NR for UAS policy objectives (specifically the achievement of any-to-any connectivity) in 2004. However, Australia decided not to mandate NR, but rather to allow NR to be implemented based on commercial negotiation.

Bhutan is currently undergoing a consultation process on whether to regulate NR to achieve universal service goals. The Bhutan Infocomm and Media Authority is considering the following options:

- No regulatory intervention, that is, leave it to market forces; and
- Alternative options to achieve seamless movement of a subscriber to an area where its network does not exist.

The outcome of the consultation process is scheduled for the latter half of 2013.

ARCEP, the French telecommunications regulatory authority, required NR as part of its Programme Zones Blanches (White Zone Program). The primary objective of the program

was to ensure that subscribers had a choice of operators throughout the country. As part of the initiative, the Authority subsidised network rollout, encouraged infrastructure sharing, changed network coverage licence obligations and included NR. The program was discontinued in 2011 after ensuring that 98.75% of the population had access to at least three operators and only 0.2% remained with one operator.

2.4 Specific country examples relevant to Botswana

2.4.1 Australia

The Australian Competition and Consumer Commission (ACCC) conducted an enquiry in 2004 to establish whether national roaming would benefit the long term interests of the end-user (LTIE). Australia has both CDMA and GSM networks rolled out across the country and some operators do not have national coverage. It also has similar population densities to Botswana in many areas and challenging geography.

In determining if national roaming was in the LTIE, the ACCC wanted to know if national roaming would achieve the following objectives:

- Promote competition;
- Achieve any-to-any connectivity; and
- Encourage the economically efficient use of, and the economically efficient investment in, the infrastructure by which telecommunications services are supplied (ACCC, 2004, p.4).

While the primary focus of the ACCC was national roaming as a national service (i.e. not limited to any geographic area), it did consider specifically the objective of any-to-any connectivity in rural areas. Any-to-any connectivity means that every end-user is able to "communicate, by means of that service or a similar service, with every other end-user even where they are connected to different telecommunications networks" (ACCC, 2004, p.7).

In the view of the ACCC, national roaming was required in order to achieve the three objectives of promoting competition, achieving any-to-any connectivity and the efficient use and investment in infrastructure. However, national roaming could be achieved through commercial negotiation between operators and did not require regulatory intervention.

There were several factors supporting this conclusion:

- An existing history of commercially negotiating national roaming agreements between operators;
- There is an incentive for all operators to provide roaming services if one operator is prepared to offer roaming services (if one operator knows that roaming will be offered by another operator, then there will be a race to offer roaming because the revenue from roaming can offset the loss of profits from increased competition);
- Indications that national roaming was being offered at reasonable prices;
- In areas that have sufficient traffic volume, carriers preferred to use substitutes to national roaming such as infrastructure sharing; and
- Spectrum such as 800 MHz was already allocated to operators allowing 3G services to closely mimic 2G and 2.5G services and therefore offer more competition (potentially also in rural areas).

Though the ACCC didn't support regulatory intervention, it did find that there were areas of concern in the CDMA market that meant that it must continue to monitor developments and ensure that the terms and conditions for commercial negotiation of national roaming continue to be reasonable.

Relevance to Botswana

In terms of its relevance to Botswana, Australia has three important lessons:

- Focus on the long term interests of end-users and the impact of any regulatory intervention on their interests;
- An existing history of commercially negotiated national roaming agreements between operators; and
- Pro-rural frequency assignments were considered important, albeit this relates primarily to 3G and broadband.

Like Australia, Botswana has a history of commercially negotiated national roaming agreements. While the national roaming agreements were cancelled, there is also a history in Botswana of commercially negotiated infrastructure sharing. In an environment of successfully negotiated commercial agreements between operators, the impact of regulatory intervention on the functioning of the free market must be carefully considered.

2.4.2 Bhutan

Along with Australia and France, Bhutan is one of the few countries in the world that has considered NR for UAS purposes. The market context in Bhutan is that the Universal Service Fund (USF) connected 572 villages to mobile services based on a combination of private and public funding. Public funds were awarded on an open bidding basis[11].

Bhutan is considering NR for rural areas that have just one operator (the equivalent of grey zones in France). This exclusivity affects both villagers and visitors:

- Villagers: Access to only one operator, therefore less choice and potentially higher prices (i.e. less competition);
- Visitors: For those visiting these villages if the visitors are not subscribers of the network provider operating in that area, then they need to buy a second SIM card to access the network.

The potential benefits, as identified by the USF are:

- NR would provide extra source of revenue for operators;
- Ease of market entry for any new operators coming into the market;
- Provide a better choice of service to consumers;
- Lower switch-over cost for consumers (i.e. remove duplicate SIMs); and
- Lower environmental impact (fewer base stations).

The Bhutan Infocomm and Media Authority is in the consultation phase regarding NR. One of the targeted outcomes of the consultation is to determine whether the Authority should intervene in the market in the form of NR regulations or leave NR to commercial negotiations between operators. An outcome of the consultation phase is expected in the latter part of 2013.

[11] Bhutan Infocomm and Media Authority, 2012, p. 3.

Relevance to Botswana

All the potential benefits of NR identified by the Bhutan USF could be pertinent to Botswana:

- NR as an additional source of revenue: unlike other countries that have considered NR for UAS, the new entrant, beMobile, has better rural coverage than any other operator (usually the dominant operator, in this case Mascom, would have the better rural coverage). At the outset, it has been considered that NR could possibly provide beMobile with additional revenue, in certain instances. However, beMobile stated in its submission to the Consultant, that several areas that it covers are at capacity and the additional revenue might not cover the costs of expanding capacity.
- Ease of market entry: Botswana has three operators and small population of just over 2 million. It is unlikely that new entrants would be sustainable in this environment.
- Better choice for consumers: This would be an important benefit for consumers in Botswana.
- Lower switch-over costs: In Botswana, the costs of a SIM are negligible. Rather, it is the *inconvenience* of having to carry multiple SIMs and of multiple phone numbers, though this seems to be commonplace in Botswana for various reasons.

2.4.3 France

France has implemented national roaming as part of a universal service program. In 2003, the Electronic Communications and Postal Regulatory Authority (ARCEP) launched the white zone programme (Programme Zones Blanches). The aim of the program was to bring mobile telephony coverage to the 3,000 towns of France where none of the three operators were present. This programme was to encourage each operator to cover 99% of the population. In 2006, this figure was included as an obligation in the operators' licences. The program consisted of two phases:

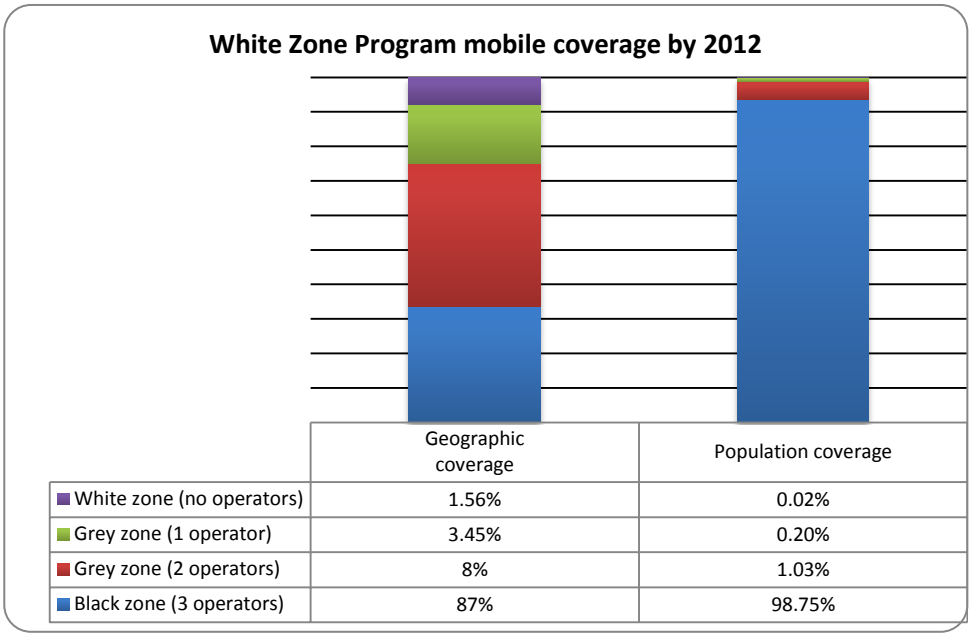
- Phase I funded in part by government (local and national); and
- Phase II funded entirely by the operators (as a result of the issuing of new licenses in 2006).

As shown in Figure 2-1, by 2012, 98.75% of the population of France was covered by at least three operators, 1.03% by two operators, 0.2% by one operator and 0.02% of the population remain uncovered (a white zone).

ARCEP utilized several methods to increase mobile coverage so successfully:

- Operators were allowed to roam into areas that were "grey" zones, i.e., where less than three operators were present;
- Infrastructure sharing was encouraged and regulations passed to support it; and
- License conditions required operators to build infrastructure in white and grey areas.

Figure 2-3: White Zone program



	Geographic coverage	Population coverage
White zone (no operators)	1.56%	0.02%
Grey zone (1 operator)	3.45%	0.20%
Grey zone (2 operators)	8%	1.03%
Black zone (3 operators)	87%	98.75%

Source: ARCEP, 2012

While national roaming was one of the strategies utilized by ARCEP, it is not clear that this was the direct cause of the dramatic increase in population coverage in France. Extensive research by Intelecon has been unable to establish the ***direct*** results of national roaming as it relates to universal service. Rather, the obligations contained in the licence conditions of the mobile operators along with the infrastructure sharing regulations are more likely to have had a direct impact on the increase in population coverage.

Relevance to Botswana

France has several close similarities to Botswana:

- Use of a combination of private and public funds to increase population coverage;
- Support for infrastructure sharing amongst operators in order to lower the cost of extending access to mobile signal; and
- Use of national roaming to achieve universal access and service goals.

France is different from Botswana in a few important areas:

- Licence conditions specifically required operators to extend access to a list of specific localities in France, based on an analysis by ARCEP. This list was subsequently updated in 2009 to ensure that some municipalities that had been missed in 2006 were included.
- Pro-rural frequency assignments – e.g. 700/800/900MHz. Operators were able to provide access in rural areas using a wider range of spectrum.
- Publicly available and detailed coverage maps that were monitored and evaluated by ARCEP to ensure their accuracy. Consumers are able to see the coverage situation interactively on the ARCEP website (see http://www.arcep.fr/index.php?id=11557).

The primary outcome of the analysis of France is that the successful white zone program is unlikely to be the direct outcome of NR, but rather the combination of different

regulatory tools, mainly pro-rural frequency assignments and enabling infrastructure sharing regulations.

2.4.4 India

India implemented national roaming in 1995. However, the relevance of national roaming in India to Botswana is questionable because of the unusual context of the Indian market. India was divided into a series of 23 circles, mostly along state boundaries. Licenses were given on a circle-by-circle basis. Each circle was categorized as Metro A, B or C depending on the revenue potential when the circles were created in 1995. Between 2005 and 2007 there was a period of consolidation between operators and now there are 13 operators nationwide. Many of the 13 operators now have licenses for all 23 circles.

In terms of national roaming, the Indian market has a unique feature: If a customer is registered in one circle (their home zone) and travels to another circle, they would have to pay a roaming rate in order to make or receive calls in the visited circle, even if with the same operator. This call rate has historically been at a premium to a local call charge in the home zone or circle. National roaming, therefore, is an important revenue source for Indian operators, representing 8.57% of total sector revenues.

In 2012, TRAI proposed zero NR charges for all operators in order to increase telecom usage, inter-state trade and the mobility of people between states. This would meet the objective of the National Telecom Policy of 2012 of "working towards One Nation - Free Roaming"[12]. The initial consultation document was released in December 2012. A review of responses to the consultation document was released in February 2013. It is expected that new regulations regarding tariffs will be released in the second half of 2013.

Relevance to Botswana

As implied above, the relevance is very limited or non-existent. A simple example illustrates the difference between India and Botswana: Vodafone India has a license for each of the 23 circles. If national roaming did not exist, a Vodafone subscriber in Circle 1 would have to carry a SIM card for each of the 23 circles, which is clearly unworkable. National roaming is a key feature of the market in India and is not related to universal access and service goals and is not directly comparable to the current situation in Botswana.

2.5 Summary of value and impacts

The select review of international experience provides several useful examples to Botswana:

- In France, a combination of several regulatory tools was used to achieve competitive (i.e., more than 2 operators) universal service for 98.75% of the population; and
- In Australia, the ACCC considered the history of successfully concluding commercial agreements between operators was an important signal that regulatory intervention to mandate NR was not required.

The review also highlighted factors that were unique or unusual to Botswana and how these factors may percolate through to an analysis of the feasibility of NR:

[12] National Telecom Policy of 2012, p.6

- Unlike other countries that have considered NR for UAS, beMobile has better rural coverage than any other operator;
- Botswana is becoming a mature market and has three operators and a small population of just over 2 million and it is unlikely that new entrants would be sustainable;
- In Botswana, the costs of a SIM are negligible but there is significant sensitivity amongst consumers to price and any outcome that does not reduce prices nationally or at least allows users to continue to "shop" for prices dynamically would not have an impact on the number of SIMs in operation.

Consultation question – Chapter 2
2-1 Are there any other countries or models that we have not considered that have particular relevance to Botswana and specifically the concept of NR to achieve Universal Access and Service?

3 Mobile Market in Botswana

There are three telecommunications operators in Botswana:

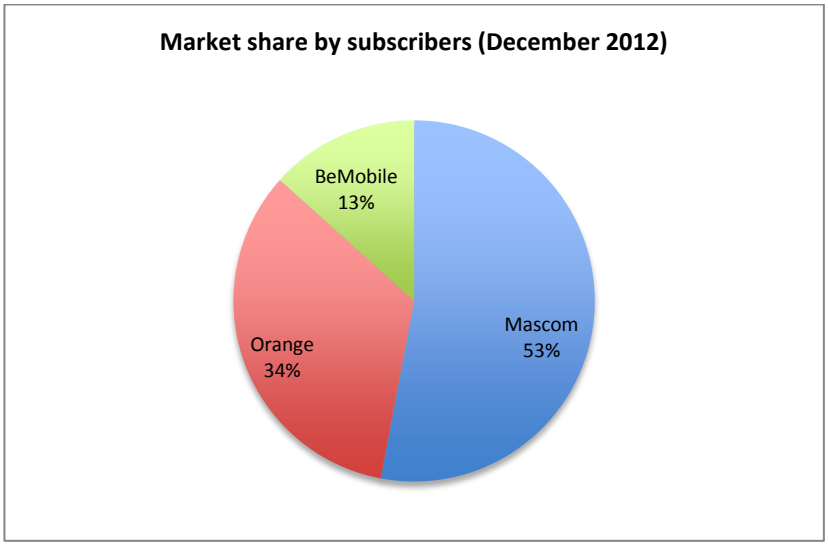
- Botswana Telecommunications Corporation Limited – mobile and fixed services;
- Mascom – mobile licence; and
- Orange – mobile licence.

BeMobile, BTC's mobile subsidiary, entered the market in 2008, a full 10 years after Mascom and Orange were licensed. 98% of the market is prepaid.

3.1 Market shares and ARPU

BeMobile as the late entrant to the mobile market is struggling to gain and maintain market share, even though it has broad national *geographic* coverage. At the end of 2012, beMobile had a market share of 13.3%.

Figure 3-1: Market Share



Source: BOCRA data & Operator responses

Average Revenue per User (ARPU) is roughly the same across all three operators. BeMobile has a slightly higher ARPU at BWP 69 per month.

Figure 3-2: ARPU

	Mascom	Orange	beMobile
National ARPU	BWP 66	BWP65	BWP69

Source: operator responses

Unfortunately, none of the operators track rural ARPU or were able to provide this to the Consultant, but only a blended national rate. However, the demand survey showed signs that rural ARPUs in Botswana could be higher than the national average. There could be several reasons for this, as follows:

a) The Nteletsa village populations are not necessarily poorer than marginal urban residents but are generally living in remoter areas and may tend to travel more, use of their phones may have more economic value (e.g., in saving travel), thus they could be heavier users. There is a common tendency internationally for rural users in similar situations to be relatively high spenders;

b) Users who are limited to one operator have no option to select an operator with tariffs and promotions more suited to their calling pattern and therefore, as a result, will end up spending more than users who have more choice;

c) Since the survey was small and indicative, rather than statistically representative, and was drawn together around (though not limited to) the village officials and teacher, the average expenditure of the respondents could be somewhat higher than that of the average citizen.

The consultant believes that although the survey results may be biased as explained in c) above, the indication of higher spending in the Nteletsa areas is a plausible conclusion. If indeed village ARPUs are above the national average, having a higher proportion of remote rural users may work in BeMobile's favour and explain why the operator's reported ARPU is slightly above that of the other operators. However, to ensure the impact analysis results are not skewed by an over-estimate, a sensitivity check is performed to ensure that conclusions are robust.

3.2 Coverage

Ideally, a comparison between mobile operator 2G and 3G coverage would have been done using Geographic Information System (GIS) software. This would have enabled the Consultant to demonstrate an up-to-date estimation of population coverage and the degree of overlap between operators. Unfortunately, only Orange (which has the lowest coverage) was able to provide BTS coordinates, though not coverage shape files, and so this task could not be completed. Nevertheless, the Consultant estimates that overall population coverage is substantially higher than 95% because Mascom and beMobile will not have perfectly identical coverage areas. It is likely that a very small percentage, probably less than 3% - all in relatively remote communities with populations well less than 250 - will not be covered by any operator today.

Figure 3-3: Population Coverage

	Mascom	Orange	beMobile
Population coverage	95%	75%	95%

Source: Operator responses

Of the three operators, Orange has the smallest network coverage at 75% and has the smallest rural coverage, partially because it has not participated in the Nteletsa initiatives. The superficial inference that can be drawn is that Orange is likely to be the biggest beneficiary of NR because it has the smallest population coverage and very little penetration into the Nteletsa areas and into rural areas generally.

3.3 Termination Rates

Botswana has committed to a termination rate glide path from 0.453 Pula in 2011 to 0.295 Pula in 2014. Mobile termination rates are currently set at 0.348 Pula.

Figure 3-4: Termination Rates

	2011	2012	2013	2014
Fixed termination rate	0.174	0.183	0.191	0.201
Mobile termination rate	0.453	0.401	0.348	0.295
Source: BOCRA				

Though termination rates are on a glide path, it is impossible to assess whether these rates are high or low without comparing to other countries. In Africa, the most aggressive termination rate declines have been in Kenya, Tanzania and Ghana. The reduction in termination rates in Kenya has had a follow-on effect on pricing, with prices rapidly decreasing[13]. In Table 3-4 below, termination rates are compared for several African countries. Although a full benchmark study would need to consider the cost factors that might determine or contribute to differences between countries, the figures in Table 3-3 are indicative of likely space for future movement which could exist in Botswana.

Figure 3-5: Termination rate comparison

Country	Mobile Termination rate				
	Regulation Currency		US $ FX*	US cents	USD
Kenya	1.44	KES	0.01151	1.66	0.0165744
Tanzania	34.92	Shilling	0.0006	2.1	0.020952
Ghana	0.045	New Cedi	0.51259	2.31	0.02306655
Nigeria	4.9	NGA	0.00624	3.06	0.030576
Namibia	0.3	NAD	0.10625	3.19	0.031875
Botswana	0.35	Pula	0.11921	4.17	0.0417235
South Africa	0.4	ZAR	0.10726	4.29	0.042904
Cameroon	25.00	XAF	0.00197	4.93	0.04925
Mozambique	2.5	MZN	0.03295	8.24	0.082375

Source: Research ICT Africa

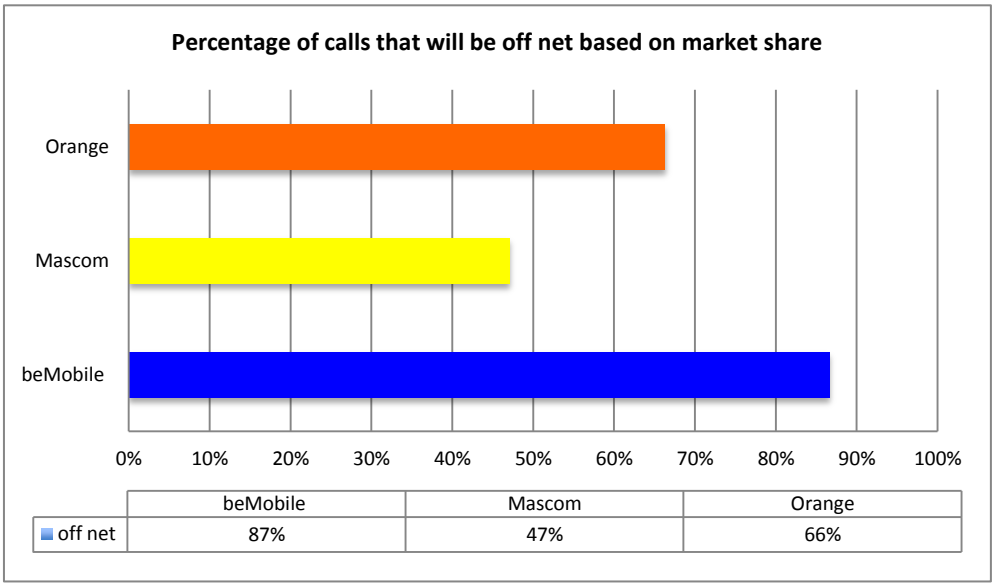
Kenya is recognised as being a leader in reducing termination rates towards cost. Research has confirmed the view that termination rates that are close to cost have a beneficial effect on pricing for consumers, with increased competition amongst operators. The average termination rate for the sampled countries is USD 0.038 compared to Botswana's rate of USD 0.0417. Mozambique distorts the picture slightly by having a substantially higher termination rate at 0.0824. If Mozambique is excluded, the average termination rate amongst the sample countries is USD 0.032. On either formulation, Botswana's termination regime is more expensive, on average, than other countries and 151% more expensive than Kenya, i.e., 2.5 times the price of Kenya.

High termination rates have a harmful affect on smaller operators because the majority of calls from a smaller operator are likely to terminate on the larger networks. BeMobile, as the smallest operator in Botswana, would have approximately 87% of its calls

[13] See, for example: http://uk.mobile.reuters.com/article/industrialsSector/idUKL5E8G21D620120502 & http://www.nation.co.ke/business/news/Airtel-unveils-new-calling-rates/-/1006/1643120/-/ls8yh4z/-/index.html

terminate on either Orange or Mascom's network[14]. Furthermore, dominant operators tend to use on-net / off-net prices to discourage customer churn.

Figure 3-6: Off-net calls



In contrast, 47% of Mascom's calls are terminated off-net. Because it dominates the market with over 53% market share, Mascom is able to offer on-net discounts and promotions and still maintain a high level of profitability that would be difficult for smaller operators to compete against. Because of its small market share, the options for beMobile to do the same profitably are limited.

3.4 Retail Tariffs

BeMobile offers a simple tariff structure for consumers: all calls (to mobile and fixed) cost 1.32 Pula per minute with no off-net / on-net difference. Orange offers the more traditional peak and off-peak calling rates, while Mascom has followed African trends in offering an off-off peak rate that is lower than the off-peak rate.

Figure 3-7: Prepaid tariffs

Prepaid Tariffs	On-Net			Off-Net		
	Peak	Off-Peak	Off-Off Peak	Peak	Off-Peak	Off-Off Peak
BeMobile	1.32	1.32	1.32	1.32	1.32	1.32
Mascom Flexi Call	1.35	0.85	0.45	1.7	0.85	0.65
Mascom Flexi Executive	1.25	0.85	0.45	1.5	0.85	0.65
Orange	1.35	0.875	0.875	1.65	0.875	0.875

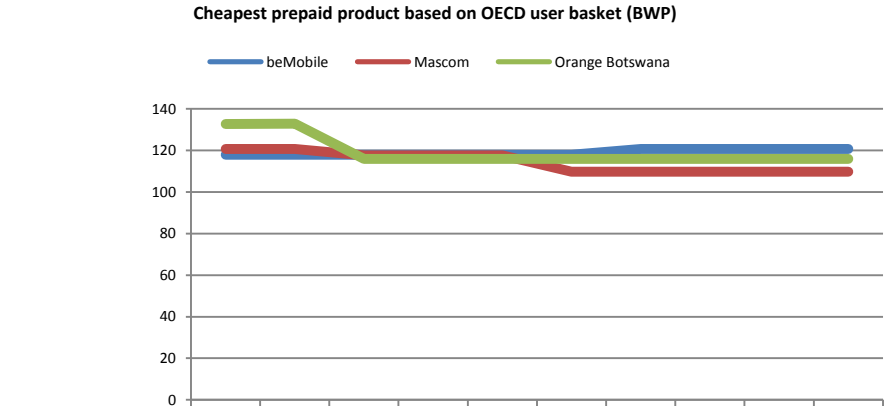
Source: Operator websites

Comparing on-net and off-net tariffs per minute does not offer real life insight to consumers – no consumers use the phone for just one minute. Rather, consumers use a

[14] The percentage of calls that will be off-net is calculated from the market share of each operator. If an operator has a market share of 18%, then 82% of calls are likely to be off-net.

basket of services, ranging from SMS' to on-net peak calls, off-net off peak calls etc. The most common basket methodology is from the OECD. Using the 40 minute user basket defined by the OECD[15], each operator's prices can be compared, mimicking the usage of an actual consumer. In the graph below, beMobile is today 10% more expensive than Mascom, even though its off-net peak rate is the lowest compared to Mascom and Orange. The explanation for this is that beMobile does not offer off peak and off-off peak rates, like Mascom and Orange.

Figure 3-8: Cheapest prepaid product



	Q4 2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011	Q1 2012	Q2 2012	Q3 2012	Q4 2012	Q1 2013
beMobile	117.94	117.94	117.94	117.94	117.94	117.94	120.68	120.68	120.68	120.68
Mascom	120.75	120.75	117.67	117.67	117.67	109.79	109.79	109.79	109.79	109.79
Orange Botswana	132.72	132.82	116.01	116.01	116.01	116.01	116.01	116.01	116.01	116.01

Source: Research ICT Africa, 2013.

The above analysis does not take into account promotional discounts and offers that are endemic in Botswana, with weekly promotions or specials discounts offered. None of these promotions or discounts are published on operator websites and most are based on demand and supply – i.e. if traffic in a particular area is low, promotions and discounts can be offered in that area. Despite seeming to be overwhelmingly positive, "hidden" retail price discounts have the negative affect of preventing consumers from explicitly comparing offerings between operators, leading to increased noise in the market and fewer educated or informed consumers. Nevertheless they appear to contribute to users' propensity for maintaining several SIMs.

Like termination rates, an analysis of retail prices is not that useful unless benchmarked against other countries in the region. The table below shows that Botswana is one of the more expensive countries in Africa, with only Zambia, Cameroon and Malawi having higher prices (again, for a 40 minute basket as defined by the OECD). Of the sample group of 22, 18 countries have lower prices than Botswana.

As in the termination rate comparison, although cost factors determine or contribute to differences between countries, the figures in Table 3-6 are most likely indicative of higher than normal tariffs in Botswana.

[15] OECD, 2010. Available at http://www.oecd.org/sti/broadband/48242089.pdf

Figure 3-9: Tariff comparison (US$)

Countries	Q4 2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011	Q1 2012	Q2 2012	Q3 2012	Q4 2012	Q1 2013
Kenya	3.2	3.2	2.9	2.9	3.2	3.2	3.2	3.2	1.7	2.6
Ghana	4.7	4.2	4.2	4.2	3.9	3.9	3.9	3.9	3.9	3.9
Egypt	5.0	5.0	5.0	5.0	5.0	4.7	4.7	4.7	4.0	4.0
Mauritius	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Ethiopia	3.9	3.9	3.8	3.9	3.9	3.9	3.9	4.3	4.3	4.3
Tanzania	5.8	4.6	4.6	4.6	5.8	5.8	5.8	5.8	5.8	5.0
Nigeria	9.6	9.6	9.6	9.6	5.8	5.8	5.8	5.8	5.8	5.8
Sierra Leone	-	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Uganda	3.9	3.9	3.9	3.9	3.9	3.9	6.3	6.3	6.3	6.3
Rwanda	5.8	5.8	5.8	2.4	8.0	8.0	8.0	8.0	8.5	6.4
Namibia	12.8	12.8	12.8	12.8	12.2	12.2	12.2	12.2	12.2	12.2
Liberia	13.3	13.3	13.3	13.3	13.3	12.4	13.3	13.3	13.3	12.4
Benin	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
South Africa	16.6	16.6	16.6	14.7	14.7	14.7	12.9	12.9	12.9	12.6
Cote d'Ivoire	17.8	15.6	15.6	15.6	17.4	17.4	17.4	17.4	14.7	12.8
Senegal	14.9	14.9	14.9	14.9	15.3	16.2	15.8	15.8	12.8	12.8
Mozambique	19.5	19.5	17.5	17.5	19.5	16.1	14.0	14.0	14.0	14.0
Burkina Faso	15.0	15.0	14.8	14.8	14.7	14.7	14.7	14.7	14.7	14.7
Botswana	15.8	15.8	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5
Malawi	10.3	13.9	13.9	16.7	16.3	15.5	15.5	16.9	16.9	16.9
Cameroon	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Zambia	16.8	16.8	16.8	16.8	9.9	9.9	9.9	9.9	6.1	18.6

Source: Research ICT Africa, 2013

If the comparison is limited to countries in Southern Africa, Botswana performs poorly. South Africa, for example, is commonly acknowledged to have high prices, yet on a 40 minute basket it has cheaper prices than Botswana. Again, only Zambia is more expensive.

Figure 3-10: Southern African comparison

Countries	Q4 2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011	Q1 2012	Q2 2012	Q3 2012	Q4 2012	Q1 2013
Namibia	12.8	12.8	12.8	12.8	12.2	12.2	12.2	12.2	12.2	12.2
South Africa	16.6	16.6	16.6	14.7	14.7	14.7	12.9	12.9	12.9	12.6
Mozambique	19.5	19.5	17.5	17.5	19.5	16.1	14.0	14.0	14.0	14.0
Botswana	15.8	15.8	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5
Zambia	16.8	16.8	16.8	16.8	9.9	9.9	9.9	9.9	6.1	18.6

Source: Research ICT Africa, 2013

3.5 Issues related to NR

The purpose of the review of market share, termination rates and retail pricing is to assess the impact that national roaming might play on retail prices, especially in Nteletsa areas. However, as the previous analysis makes clear, although Botswana has three operators with quite broad coverage, it has a relatively concentrated market, dominated

by one operator, with relatively high termination rates leading to relatively high retail prices. Promotional discounts have a significant impact on pricing (Intelecon estimates that a 40 minute basket of calls for Orange would reduce from 116 Pula to around 88 Pula) but these discounts are not transparent and consumers are unable to compare products and these discount regimes would benefit the larger operators at the expense of the smallest operator[16].

NR would only be available in Nteletsa areas and only in those areas with one operator. Further, operators are not allowed to apply asymmetric retail pricing between geographic regions. That is, operators cannot charge a higher price in a rural area than in an urban area. Therefore, NR would have a negligible impact on pricing, while pricing can have a significant impact on the use and benefits of NR, as discussed later. Other issues, such as further lowering termination rates and simple remedies such as increased retail pricing transparency would have a more significant impact on overall pricing across Botswana. This means that the main benefits of NR for customers who are resident or travelling in rural Botswana are to facilitate the convenience of any-to-any connectivity without having to switch SIM cards. As discussed in Section 5, the "benefit" of customers receiving additional choice in these areas will also impact the operators in quite different ways.

Consultation question – Chapter 3
3-1 Do you agree that other regulatory strategies, such as lowering termination rates, would have a greater impact on pricing in Botswana than mandating NR?

[16] Promotional discounts favour on-net calling. In an environment with high termination rates and large market share discrepancies, consumers will choose the largest operator, leading to a less competitive sector. It is possible that this is already occurring with beMobile's market share declining from 18% to 14% from the third to the fourth quarter of 2012.

4 Individual and group demand surveys

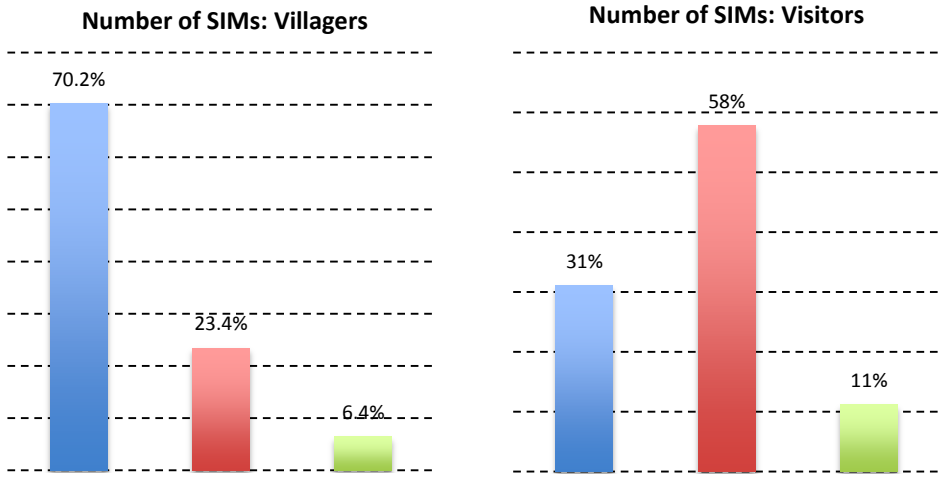
A demand survey was conducted in 9 different locations across Botswana. Each of the 9 locations was a Nteletsa locality *served by only one operator* and these surveys were carried out as group surveys with a minimum of 10 participants, in each of the three separate Nteletsa service areas. A total of 94 face-to-face interviews and an additional 45 individual telephonic interviews with visitors to these 9 Nteletsa areas were conducted. These were known contacts nominated by the villagers.

4.1 Key points emerging from the field survey

4.1.1 Multiple SIM cards

One of the essential concerns of the ToR is the prevalence of multiple SIM cards in Botswana. In a previous study[17] for the BOCRA, it was demonstrated that 55% of the respondents had more than one SIM card (i.e., two or three SIMs). The study calculated that there are 1.69 SIMs for every subscriber. In summary, multiple SIMs are widespread. The demand survey under this study established that 29.8% of villagers have more than one SIM. This is substantially less than the national estimate of 55%. The explanation is, however, simple: the survey was conducted in Nteletsa areas where there was only one operator and so having multiple SIMs would only relate to times of travel away from home. In fact, the figure of 29.8% is high and is an indication of how prevalent multiple SIM ownership is.

Figure 4-1: Number of SIMs

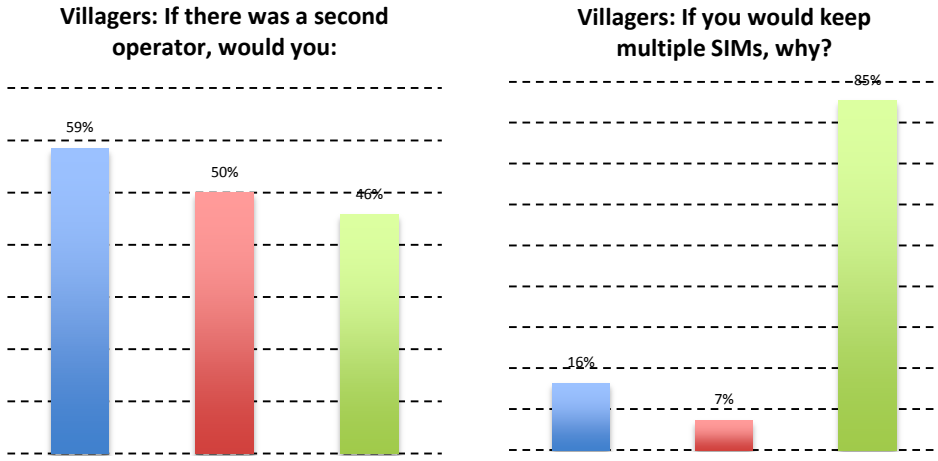


Amongst visitors to Nteletsa areas, however, multiple SIM card ownership is far more extensive, with 69% of visitors (i.e., above the national average of 55%) having more than one SIM. Again, this is understandable since the majority of these persons, who are most likely to have another operator as their main service provider, have *needed* to purchase an additional SIM in order to make calls in Nteletsa areas.

[17] BOCRA, 2012, Operator and Customer Perception Survey. The study showed that 45.1% of respondents had one SIM card, 40.0% had 2 SIMs and 14.9% had three SIMs. Thus 54.9% had more than one SIM.

Villagers were asked what they would do if there was a second operator providing competitive service in their village and 59% stated that they would hold multiple SIMs, compared to 50% who said that they would change to the new operator and 46% who said they would remain with their existing operator. Of those that would keep multiple SIMs (i.e. 59% of villagers), 85% stated that they would do so to get better network coverage and only 16% would keep multiple SIMs in order to get promotional discounts.

Figure 4-2: Multiple SIMs



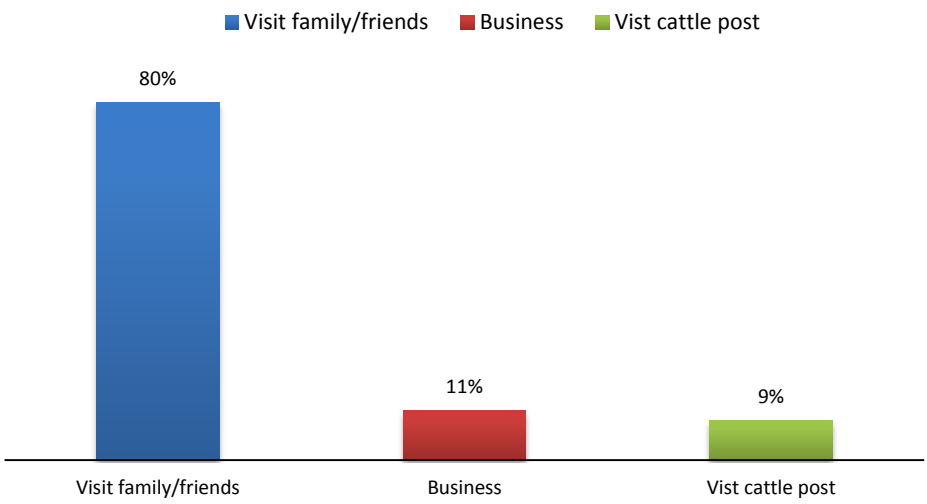
Villagers were asked what they would do, if there was roaming but if they were unable to take advantage of special promotions and discounts while roaming. (Some operators have indicated that they would not pass on special discounts or promotions to subscribers while roaming, while others have stated that it depended upon the pricing regime). 52% of respondents would keep multiple SIMs. The data indicates, therefore, that at least 50% of users would keep multiple SIMs either to take advantage of special promotions or for other reasons such as to ensure that they can get good network coverage elsewhere in the country. *In short, multiple SIM card ownership would continue at current levels even if NR were introduced.*

4.1.2 Travel into Nteletsa Areas

A critical factor in determining potential use of NR in Nteletsa areas is the number of visitors. In the telephonic interviews, the 45 individuals were asked their reasons for travelling into the Nteletsa area. 80% stated that their purpose was to visit family or friends and the average number of times they visited was 1.8 per month. Only 11% had business in Nteletsa areas and just 9% owned a cattle post, substantially fewer than anecdotal evidence had suggested would be the case.

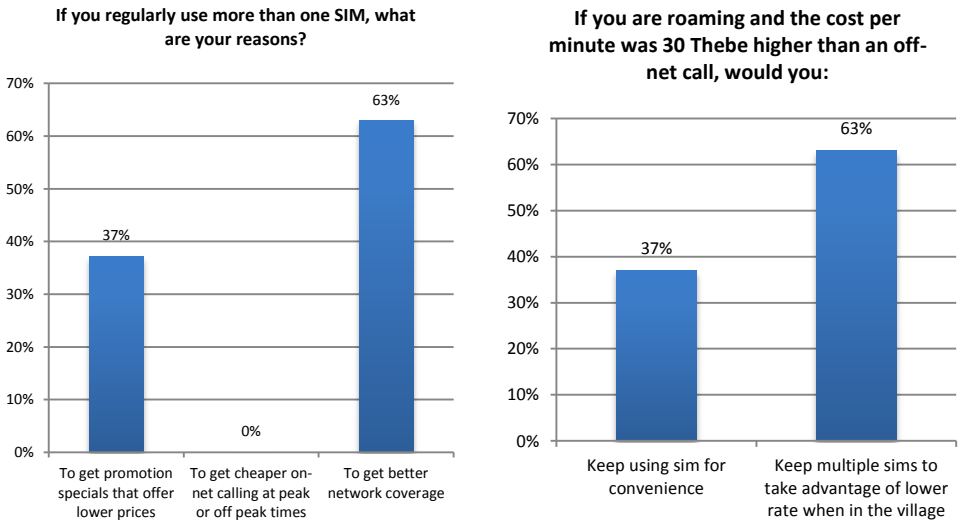
In addition to the individual surveys of villagers and visitors, villagers were brought together into mini-discussion groups of between 9 and 10 people per locality. The purpose of the mini-discussion groups was to gain insight into some of the individual answers, but also to get as accurate an estimate of the numbers of visitors coming into Nteletsa areas. The mini-discussion groups estimated that visitors would make up around 23% of its total population.

Figure 4-3: Reason for travelling into Village



Amongst visitors to the Nteletsa areas, 63% use multiple SIMs to get better network coverage and 37% to get promotional pricing specials. Because NR is likely to be a premium service and therefore have rates that are priced higher than local calls, visitors were also asked if they would continue to keep multiple SIMs to take advantage of lower prices when visiting the village or if they would roam on their primary SIM regardless of price. In answer to this separate question, 63% stated that they would keep and use multiple SIMs, while 37% stated they would keep using their primary SIM for convenience. This suggests that if premium prices were charged, maximum adoption of NR would be 37% amongst visitors to Nteletsa areas but that most people (63%) are price sensitive and would only consider roaming if it cost them no more or close to their regular tariffs.

Figure 4-4: Roaming



4.1.3 Villager and visitor expenditure

Expenditure on mobile by the villagers interviewed was an average of 55 Pula per week or 220 per month. To remove the impact of outliers, the median spend per villager has been used to indicate actual expenditure, which is 40 Pula per week or 160 Pula per month.

In contrast, expenditure on mobile by *visitor*s was an average of 72 Pula per week or 288 Pula per month. Again, to remove the impact of outliers, the median spend per visitor has been calculated, which is 30 Pula per week or 120 Pula per month.

Both sets of interviewees reported spending considerably more than the average nationally blended ARPU reported by the operators. As explained in Section 3.1, the average spend reported per villager, will be due to a combination of the following factors:

- The survey was not statistically representative and so figures could be skewed; specifically, the group of ten people selected for interview in each village purposely included several relatively senior individuals (e.g., village headman, school teacher, members of the village development council as well as randomly selected villagers). The average income and calling patterns might therefore have been above the village mean;
- Villagers in the Nteletsa area, who might otherwise be "average" citizens but are located in more remote localities, typically have more needs for travel and communication. It has been noticed on other surveys elsewhere in Africa that villagers in this situation tend to spend more than the average or marginal urban citizen (who dominates the nationally blended ARPU calculation); and
- Villagers in the Nteletsa areas surveyed having a choice of only one operator and reported that they may have to spend more than if they had a choice of operators which could offer lower priced alternatives to better suit their individual calling patterns.

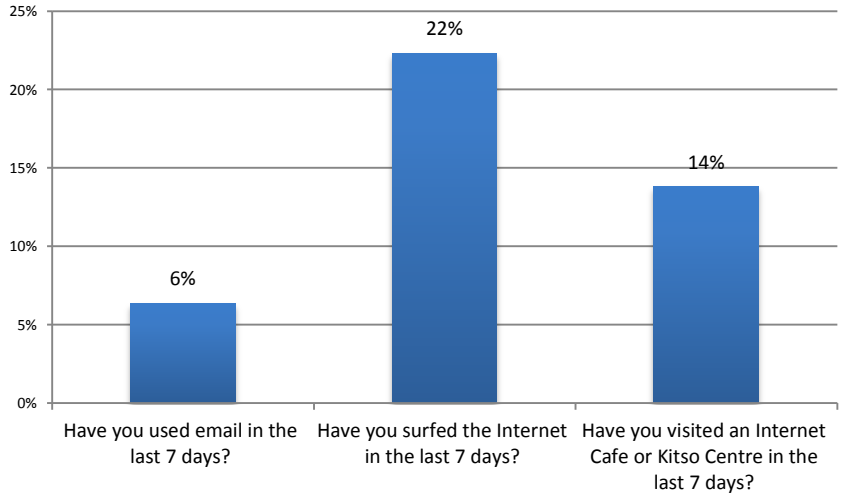
In summary, whereas the survey was not designed to be statistically representative and is probably somewhat skewed towards a higher estimate, it could nevertheless be indicative that the village mean expenditure in Nteletsa localities is above the nationally blended ARPU.

As with the average spend amongst villagers, the monthly expenditure amongst visitors is considerably higher than the national ARPU. A reason for this is that visitors are more likely to have higher than average incomes (i.e., they can afford to travel for weekends to see family or for business).

4.2 Data usage

As expected, data usage amongst villagers was low. 11% of villagers have a smartphone, so the majority of usage is likely to be on feature phones or via internet café (Kitsong centre), work or school. As illustrated in Figure 4-5, the survey showed that 6% of villagers had sent email in the last 7 days and 22% of villagers had surfed the web over the previous week. 14% of villagers had visited an Internet café or Kitsong centre. This number could potentially be higher, but several of the Kitsong centres were not operational at the time of the survey.

Figure 4-5: Data usage amongst villagers



Amongst visitors, smartphone usage was also low with 11% of visitors having a smartphone. Demand for data roaming over the period of visitors' stay in the Nteletsa villages was reported as very low – less than 4% had used the Internet while travelling and none had sent or received email. Of course, their smartphone penetration and inclination to collect and send emails while travelling is expected to rapidly increase over coming years. Operators reported that data usage represents between 3% and 6% of revenues and is growing between 34% and 100% annually.

Whereas the brief survey undertaken could not necessarily capture the *future* demand for data roaming, Section 7.3 addresses the potential implications for data roaming in the Nteletsa context.

Consultation questions – Chapter 4
4-1 The demand survey found that the ARPU of both villagers and visitors to Nteletsa areas was higher than the national average. Do you have any data to suggest that this is incorrect?
4-2 The demand survey found that data usage amongst villagers was especially low. Do you have any information that suggests that data usage is higher?

5 Alternatives to National Roaming

In this section, the potential impact of NR is interpreted against the main options considered in the study, namely:

- Infrastructure sharing
- The application of low-cost base station technologies to increase competitive roll-out by the operators, and
- Pro-rural spectrum allocation.

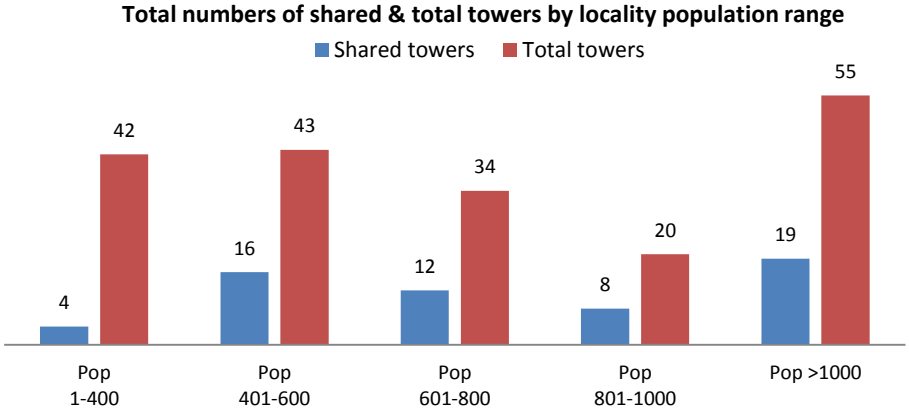
5.1 Infrastructure Sharing

Competitive expansion of operators into one another's territory of course reduces the need for NR is Nteletsa areas, whether through infrastructure sharing or the overlap of coverage through operators' owned infrastructure. As noted in Section 3.2, the consultant was not able to compare GIS based signal coverage maps. Thus infrastructure sharing is taken as the main proxy for competitive overlap of operator service. The sharing of passive infrastructure (towers) – as encouraged by the Guidelines for Sharing of Passive Communications Infrastructure – is already underway on a widespread basis through commercial arrangements between the operators. The Guidelines came into force on the 1st of April 2012 and have served to formalise the process that had been functioning for some time between the major operators.

For example, BTC has leased space on 53% of its towers (316 of its 600 total) and is leasing a further 84 towers from either Orange or Mascom (representing 14% of its installed tower base). The level of infrastructure sharing is also high for the other operators. Mascom, for example, leases 155 towers, while it has 230 of its own towers, of which 60 (26%) are leased to other operators. Orange, on the other hand, leases more towers (188) than it owns (174), while leasing space on 26 (15%) of its own towers.

In Nteletsa II areas, based on BeMobile and Orange reporting, a minimum of 59 towers (30%) of the infrastructure operated by BTC and Mascom, covering an estimated 34% of the total Nteletsa II population served, has already been leased to a competing operator. Figure 5-1 summarises the towers in the Ntelesa II areas that have already been leased to a second operator, categorised by population of the villages covered.

Figure 5-1: Tower sharing



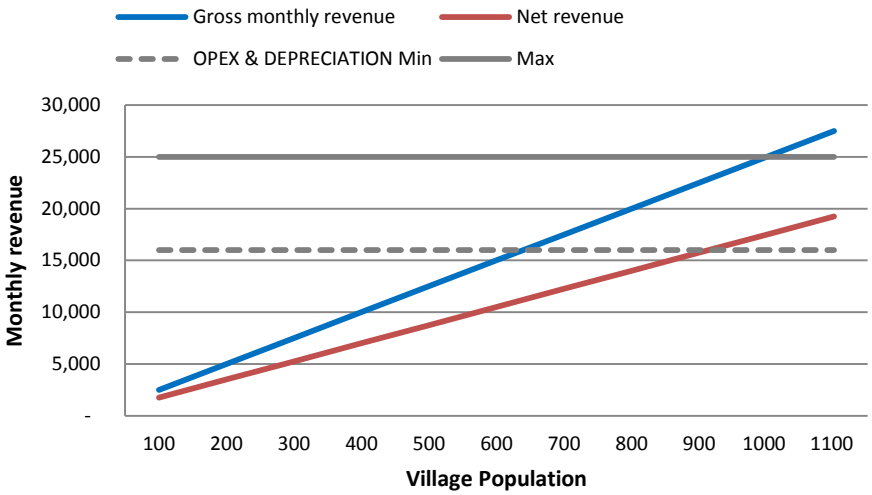
Source: Operator consultations

Figure 5-1 indicates that the need for NR in Nteletsa II areas is continuously reducing as operators extend their coverage through infrastructure sharing. More important, the population distribution indicates that, provided further requests for sharing can be physically accommodated (i.e., tower and site technical feasibility), there are significant remaining opportunities for second and/or third operator market expansion through infrastructure sharing.

Economic rationale for the infrastructure sharing assumptions

The average village population of the towers shared to date is 934, though more than half are well below this, indicating various reasons for their commercial selection. Depending on operators' OPEX, Capital Depreciation and Administrative/ Marketing costs, Figure 5-2 indicates that the break-even village population for market entry by means of infrastructure sharing is projected to be in the range 500-1,000.

Figure 5-2: Infrastructure sharing Break-even



The assumptions, which are consistent with operator decisions interpreted to date, are as follows:

- Village customer ARPU of 66 Pula per month (national average, which the demand survey indicated could be conservative for the Nteletsa areas);
- Market capture by new entrant at 50%;
- OPEX (tower lease, Operation & Maintenance) 16,000-20,000 Pula per month (the lease rate will presumably vary with tower sharing under different conditions such as on-grid and off-grid, etc.); and
- CAPEX recovery of 240,000 Pula for single BTS and antenna over 5 years.

Assuming the larger population centres offer the more feasible opportunities, the predicted minimum growth of infrastructure sharing over the near future (2 years assumed) can be conservatively projected approximately as shown in Table 5-1.

Table 5-1: Projected infrastructure sharing

Projected future infrastructure sharing							
Size category (pop'n)	Villages	Tower Shared today	Remaining villages	% shared to date	2-3 Year Projected Percentage	New towers shared	Approx. population covered
1-400	42	4	38	9.5%	15%	2	1,422
401-600	43	16	27	37.2%	40%	1	8,626
601-800	34	12	22	35.3%	50%	5	11,892
801-1,000	20	8	12	40.0%	70%	6	12,467
> 1,000	55	19	36	34.5%	90%	31	82,568
Total	**194**	**59**	**135**	**30.4%**		**45**	**116,974**

Source: Intelecon analysis

The table illustrates that the heavier growth will be in the higher population categories. Using the reasonable assumptions shown, a minimum of 45 additional towers are projected to be shared. This will bring the population in villages where towers are shared to almost 117,000, which is 71% of the Nteletsa II population. A total of approximately 47,000 people in the Nteletsa II areas (predominantly in villages with populations below 600) would remain served by only one operator over the two to three year prediction period to end 2016, i.e., only 2.3% of Botswana's population.

It can be noted that many smaller villages already have two operators. In some cases, this will be due to factors other than pure population revenue projections (e.g., administrative centres, border posts, proximity to larger centres and importance for other reasons). In cases where larger centres that are theoretically feasible are not covered, or will not be easily covered even in the future, it is assumed that tower sharing has not been possible for technical reasons, or the cost of repeaters reduces attractiveness, or operators have yet to assess the potential due to imperfect mapping or other internal factors. For this reason it is assumed that 10% of the largest villages may still have only a single operator even 2 years from now. However, on balance, future expansion will be based on economic merit and will favour the larger villages.

A sensitivity analysis on customer ARPU (e.g., reduction to 50 Pula) would increase the minimum theoretical population breakeven from 500 to 700 persons. However, this would impact the projection in Table 5-1 very little, since operators have already demonstrated an interest in sharing towers for much small population centres and, in any case, only a marginal increase in the proportion of towers to be shared at this population range has been projected.

In conclusion, infrastructure sharing has already had a positive impact on offering choice to residents and visitors in Nteletsa areas and this is projected to increase over the next two years (i.e., to 2015/2016) and beyond, covering the majority of the population in these areas in the coming years.

5.2 Low Cost Infrastructure

In locations where infrastructure sharing is not feasible for technical or other reasons, the CAPEX and OPEX costs for a second operator to enter the remaining Nteletsa areas with a completely new second infrastructure would *at least* double if conventional BTS

technology is used[18] This would raise the breakeven population for a second operator well beyond that of almost all Nteletsa villages. Since the infrastructure was subsidised in the first instance, there would be little chance of a second operator entering the market.

However, a small number of technology suppliers offer BTS solutions which can theoretically greatly reduce the passive infrastructure costs, using low antenna masts instead of towers, lower powered transmitters supplied by solar generators and little or no equipment housing. The low-cost solutions utilize IP relayed BTS equipment or VSAT trunked solutions and some systems have been showcased in a number of African countries, including Ghana, Niger, Kenya and Uganda.

The cost of the low-cost technology solutions is not generally competitive with infrastructure sharing and is therefore limited only to the locations remaining beyond the feasibility border discussed in the previous section and Table 5-1. In addition, the operator consultations indicated that the operators in Botswana generally prefer to implement solutions based on innovations offered by their main technology suppliers, as well as solar hybrid power installations if possible, in order to reduce their CAPEX and OPEX costs. In general, the addition of new vendors is considered to bring hidden O&M costs, service quality compromises and operating risks which the operators are hesitant to accept, especially in order to enter a rural market already occupied by an operator under universal access subsidies.

For these reasons, there is little chance that these solutions will become a factor in the Botswana market as an alternative to NR, especially in the smallest and remotest localities under study.

5.3 Pro-rural spectrum allocation

Lower frequency can substantially increase the coverage range of BTS's. However, the 900 MHz allocations available to all of the existing operators for 2G GSM services are already optimal for rural areas. Thus the concept of pro-rural allocations applies primarily to the re-farming of 900 MHz frequencies for 3G broadband, or the consideration of the 700/800 MHz "Digital Dividend" bands for allocation to 4G / LTE services.

The GSM Association has highlighted an emerging consensus amongst regulators and mobile operators that the so-called "Digital Dividend" spectrum is important for delivering affordable access to broadband, especially in rural areas. Due to increased coverage radius, it is approximately 70 per cent cheaper to provide mobile broadband coverage at frequencies around 700/800MHz than to use the 3G frequencies at 2100MHz or above (i.e., only one-third of the towers are needed). This means that networks can be rolled out quickly and cost-effectively, bringing cheaper advanced broadband services to consumers. These effects are multiplied when countries work together to ensure they implement the digital dividend in a harmonised way regionally, or globally if possible. In countries where harmonised spectrum is not made available in a timely way, the uptake of broadband could be significantly lower, as well as slower.

In ITU Region 1, in May 2010, the European Commission adopted a decision establishing harmonised technical rules for Member States on the allocation of the 790–862MHz band (The CEPT Band Plan). The spectrum is *already being used to connect rural homes to*

[18] In conventional GSM infrastructures, the cost of tower, building, power generation, land and site fencing (i.e., civil and passive infrastructure) represents typically 70% or more of total, whereas the cost of a single BTS and antenna is only 30% or less. This is largely transferred to an OPEX charge, calculated assuming at least two operators are using the same facility, if the passive infrastructure is shared.

the internet using LTE technology across the continent, ahead of the 2015 deadline for implementation. To accelerate the process, the Radio Spectrum Policy Programme (RSPP) adopted by the European Commission requested EU Member States to release the Digital Dividend spectrum for mobile by 1 January 2013. The market for network equipment and devices in the 790–862 MHz band is rapidly growing, with parts of the Middle East following the European plan for the Digital Dividend in Region 1 and African markets also seeing the opportunity to leverage these economies of scale. Mozambique, for example, has just published notification of a frequency auction for the 790–862MHz band for LTE.

Since this study did not find a significant demand for data roaming services yet in the Nteletsa areas and found no support for data roaming amongst operators at this stage, this matter is a subject for future study rather than a topic for the current project, but is addressed in Section 7.3.

Consultation questions – Chapter 5
5-1 The analysis of infrastructure sharing found that operators have already had a positive impact on the achievement of any-to-any connectivity and that this is projected to increase. Do you have data to suggest that infrastructure sharing is not going to increase as much as projected over the coming two to three years?

6 Regulatory Impact Assessment

6.1 Step 1: Identify the Issue or Problem

The problem identified by the BOCRA in the Terms of Reference was that:

"[T]he underserved areas, which are mainly rural, are covered by a single mobile network and therefore as users move from one area to the other, they are forced to carry multiple SIM cards from various operators"[19].

The Australian Competition and Communications Commission, in its examination of national roaming, termed this requirement any-to-any connectivity:

"[E]ach end-user of a service that involves communication between end-users is able to communicate, by means of that service or a similar service, with every other end-user even where they are connected to different telecommunications networks"[20].

Any-to-any connectivity means that there is no need for multiple SIMs in order to make a call (or send an SMS) to another user, regardless of which network either user is on. The problem in Botswana is that in Nteletsa areas where there is only one operator, a visitor to the Nteletsa area that is not on the same network cannot make a call or send an SMS to another user.

The negative impacts of this problem are:

- Inconvenience of having to carry multiple SIMs in order to make a call;
- Missing calls on the original number because contacts are unaware of the new number;
- Splitting airtime between multiple SIMs; and
- For residents, no alternative choice of service provider beyond the single operator providing service.

6.2 Step 2: Describe the Objective

The simple objective is to ensure that a subscriber in an Nteletsa area is able to make and receive calls as long as the area is covered by mobile signal. This concept is captured in the phrase "any-to-any connectivity". The mechanism under consideration to achieve this is NR.

There are four objectives that are NOT captured in the concept of any-to-any connectivity:

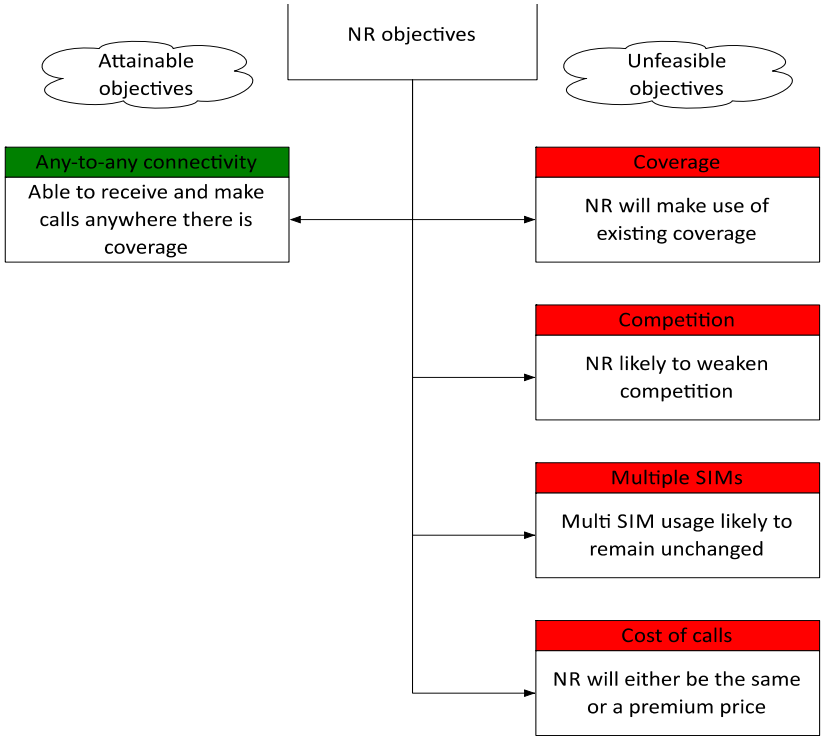
- Increased coverage – the implementation of NR and the achievement of any-to-any connectivity would not increase coverage in Botswana but instead make use of existing coverage.
- Reduced cost of calls – if NR were implemented the likelihood, at least in the short to medium term, is that it would be a premium retail service. At this stage, there are only two countries in the world that are considering making NR calls the same price as local calls: India and Russia. Both of these countries are at the consultation phase. Both countries have a long history of NR and have significantly different environments to Botswana.

[19] BOCRA Terms of Reference, p. 15.
[20] ACCC, 2004, p. 7

- Increased competition – the implementation of NR will not increase the levels of competition nationally by any significant extent because it will be applied only in Nteletsa areas where there is a single operator. However, Section 6.5 shows that customers would increase their available choices. The total population that would be affected today is a maximum of 109,244 individuals or 5.4% of the population, based on the infrastructure sharing data received.
    - In addition, we predict that current levels of infrastructure sharing will continue to expand, offering more direct competitive choice. Intelecon has calculated in Section 5.1 that only 47,000 people may remain covered by only one operator in the next 2-3 years (2015/2016).
- Reduction in multiple SIMs – multiple SIM ownership is prevalent in Botswana, with more than 50% of subscribers carrying multiple SIMs. One of the main reasons to carry another SIM is to take advantage of discounts and special promotions that operators offer on a weekly basis. If NR were implemented, it would affect a maximum of 109,244 people currently, but only 47,000 in the future and, as a result, have a negligible impact upon multiple SIM card ownership. Furthermore, NR would have no impact upon general retail prices and so multiple SIM ownership would continue even in Nteletsa areas where NR is offered.

Figure 6-1 below summarises the various objectives according to whether they are attainable or likely to be unfeasible.

Figure 6-1: Feasibility of objectives



As a result, NR and its objective of any-to-any connectivity could be viewed as a potential universal service obligation that might be placed upon existing licensees and specifically the mobile operators, except for the potential negative impacts on operator competition under some scenarios.

6.3 Step 3: Identify and Describe the Regulatory Options

6.3.1 Option A: Do Nothing

From the standpoint of the Authority, one of the options is to leave the market as it currently stands, with no regulatory intervention. This option does not exclude the option of encouraging operators to introduce NR on a commercial basis and this is an option explained later on.

6.3.2 Option B: Promote Other Solutions through Regulation

The main regulatory option that could achieve any-to-any connectivity in the long-term is infrastructure sharing. The BOCRA has issued infrastructure sharing guidelines, but infrastructure sharing on a commercial basis is already well established. Mascom leases 155 towers, Orange 188 towers and beMobile 84 towers.

The continued expansion of infrastructure sharing will mean that a greater proportion of Nteletsa areas will soon have more than one operator. In section 6, we forecast that in the near future (e.g., 2 years) approximately 47,000 people in Nteleta areas would still be served by only one operator, representing 2.3% of Botswana's population.

6.3.3 Option C: Require National Roaming

The reason to mandate NR would be to achieve any-to-any connectivity, as discussed in section 3.5. Therefore, NR would be implemented as a licence obligation, as per section 12.8 of the PTO licences:

The BOCRA reserves the right, after consulting the Licensee and other Stakeholders to issue guidelines in relation to Interconnection and access. The BOCRA further reserves the right, after consulting the Licensee and other Stakeholders and in a case where the Licensee operates a Mobile Cellular System at the Licence Date, to direct the Licensee to provide National Roaming at the request of any other licensed Public Telecommunications Operator which does not operate a Mobile Cellular System at the Licence Date in such areas and for such periods as the BOCRA may stipulate[21].

6.3.4 Option D: Encourage commercial negotiation

Botswana is unusual in that beMobile, the smallest mobile operator, has the largest rural coverage and nearly identical national coverage to the dominator operator, Mascom, even though beMobile's market share is the lowest by a wide margin. Botswana has a history of successful commercial negotiation between operators in sharing infrastructure and all operators share significant portions of their networks. National roaming was also available up until 2000, so the technical and cost aspects are likely to be minor. All operators use GSM. It is possible that there are some Nteletsa areas that are attractive to national roaming and these could be the subject of commercial negotiation. Assuming that there is sufficient capacity and that prices would also be subject to commercial negotiation, operators may decide that it is mutually beneficial to offer NR. The BOCRA can encourage this by ensuring that there are no regulatory obstacles (i.e. NR would not require any regulatory approval) to commercial negotiation.

[21] BOCRA Terms of Reference, p. 18.

6.4 Step 4: Determine the Impacts on all Stakeholders

There are three groups of stakeholders: consumers, operators and the regulator. Consumers that benefit from national roaming are mainly visitors to Nteletsa areas who would prefer to continue using their SIM card, assuming that they are not already subscribers to the network serving the Nteletsa area. For operators, the impact of NR depends on whether they are a host network in the Nteletsa area or would be roaming on the host network. For the regulator, NR might achieve certain policy objectives – in this report, BOCRA's policy objective is assumed to be any-to-any connectivity. In the section below, the impact of NR is quantitatively assessed for first consumers and then operators.

6.4.1 Consumers

Benefits of NR

If NR were to be implemented, it would be required in Nteletsa areas only. There could be benefit to villagers, in terms of opportunity to change operator and realize pricing benefits if NR were implemented on the basis of regulated pricing, while visitors would also benefit from convenience and the choice of a service provider based on pricing advantage.

The benefits of roaming are:

- SIM card – no need to purchase additional SIM card;
- Requirement to change numbers – no need to change numbers;
- Make and receive calls & SMS – ability to make and receive calls and SMS' on the user's primary / original number;
- Lost calls – no lost calls due to being out of coverage area; and
- Data – benefit to send and receive emails or to browse the Internet

For the four benefits related to voice, the cost to consumers is estimated on a monthly basis, discounting once-off costs such as a new SIM card, which is negligible and already widely incurred. Besides owning an additional SIM, the only substitute to roaming is call forwarding and this is used as a proxy to value the benefit of roaming[22].

Table 6-1: Benefits to consumers

No.	Benefits to consumers (travellers)	Value (Pula)	Comment
1	New SIM card	0	Once-off cost
2	Requirement to change numbers	0	Incorporated in cost of call forwarding below
3	Make and receive calls & SMS	6.0	Cost of call forwarding
4	Lost calls	0	Included above in cost of call forwarding
	Total benefit (Pula per month)	6.0	

Table 6-2 provides the calculations for cost of call forwarding indicated above, assuming the expenditure ARPU estimated from the field survey. The model assumes that users would make approximately 20 calls per month from an Nteletsa area where the home

[22] The benefits of using data services were not assessed as data activity identified amongst roamers in the field survey was less than 4% of respondents. A separate survey would need to be made to project data service demand and specific benefits into the future.

network does not have any coverage. (The average monthly expenditure by visitors in an Nteletsa area is estimated at 24 Pula[23]. The average per-minute price of a call in Botswana is 1.29 Pula, thus 19 calls were estimated, which has been rounded up to 20 call per month for clarity).

Table 6-2: Call forwarding calculation

Cost	Value
Call forwarding charge	0.30
Number of minutes (per month)	20
Total	6.0

This means that the maximum benefit of NR is 6.0 Pula per month assuming a basket of 20 calls per roaming subscriber, at the estimated ARPU[24].

Costs of NR

The costs of NR are based on three different scenarios:

1. Scenario 1: equal price to existing local rates (based on an assumption that BOCRA would mandate that costs must be absorbed by the operators or charge wholesale roaming tariffs based on a retail minus scheme);
2. Scenario 2: 15% premium to local rates (based on a basic estimate of roaming overhead costs (primarily call accounting procedures, with no CAPEX required);
3. Scenario 3: 30% premium to local rates (based on an assumption that the host network operator would charge a premium over cost).

In each scenario, the cost of NR is based on the difference between the local tariff and the NR tariff. For example, in a beMobile area, the difference would be between the cost of beMobile call at 1.32 Pula per minute and a NR call.

Table 6-3: Cost of NR

	Scenario 1 - No premium	Scenario 2 - 15% premium	Scenario 3 - 30% premium
Number of calls	20	20	20
Premium	0%	15%	30%
Difference between standard and premium tariff	0	0.198	0.396
Cost of NR	0	3.96	7.92

In Table 6-3, the consumer's cost of NR is zero when call rates are equal to local calls, 3.96 Pula per month per roaming subscribers when call rates are at a 15% premium (which was estimated to cover roaming overhead costs and profit) and 7.92 Pula per month when rates are set at a 30% premium.

Results

Table 6-4 summarizes the consumer's maximum net benefits and benefit/cost ratios for the three scenarios. As expected, the largest net benefit to consumers is realized where the premium paid for roaming is the lowest.

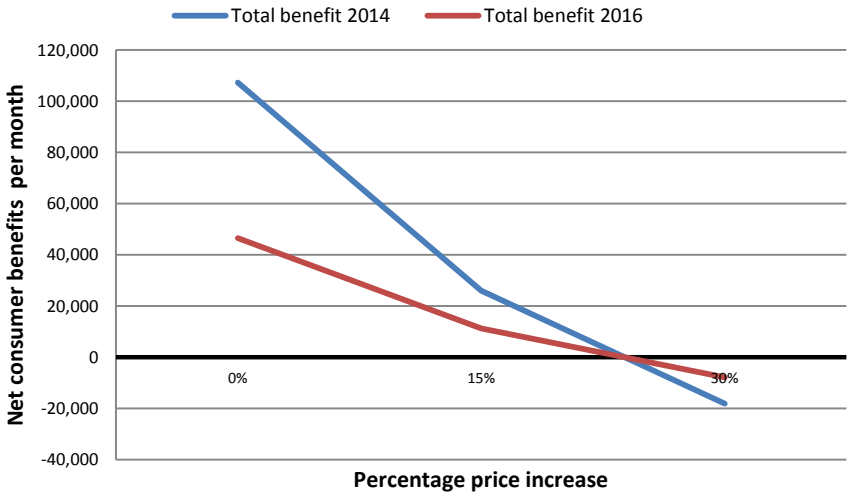
[23] The visitor spend is based on the above-average ARPU indicated by the demand survey. If the spend is lower, then the benefits reduce. The analysis is thus on the optimistic side and is therefore subjected to sensitivity analysis later.
[24] See above note.

Table 6-4: Benefit to cost ratio

	Scenario 1 - No premium	Scenario 2 - 15% premium	Scenario 3 - 30% premium
Benefit	6.0	6.0	6.0
Cost	0	3.96	7.92
Net benefit	6.0	2.04	-1.92
Benefit to cost ratio	n/a	1.52	(0.76)
Max. *visitor* population impacted (2014)	25,536		
Total monthly net benefit (2014)	101,888	22,216	-17,234
Max. *visitor* population impacted (2016)	11,081		
Total monthly net benefit (2016)	44,214	9,641	-7,479

In summary, visitors benefit under a NR price regime that is either equal to existing local call rates or at a 15% premium. If NR rates are set at a 30% premium to local call rates, then the net benefit to consumers is negative 1.92, i.e., at a 30% premium, consumers will pay out more than the benefit they realize from the convenience of having roaming. Figure 6-2 illustrates the benefit stream for current beneficiaries (2013/2014) as well as the lower benefit stream for the lower number of beneficiaries expected to remain in 2015/2016.

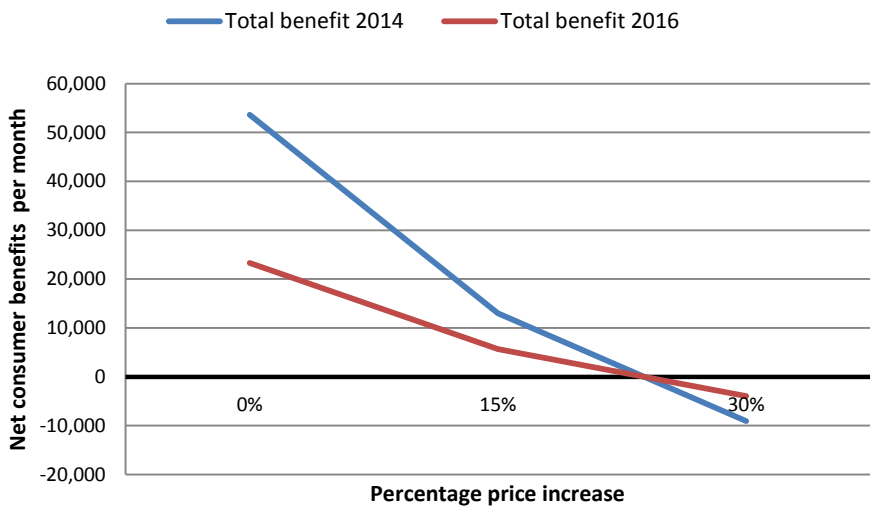
Figure 6-2: Monthly consumer net benefits (using survey ARPU)



It will be noted that the "break-even" point for consumers, *below* which benefits are received, is around 23% premium above normal pricing.

Figure 6-3 shows the dramatic reduction in the total benefits if the lower nationally blended ARPU is used for the visitor population. In this case, the benefit break-even point is still at the 23% premium over regular tariffs, though benefits are halved.

Figure 6-3: Monthly consumer net benefits (using national ARPU)



6.4.2 Operators

The second stakeholder that NR would have an impact upon is the mobile operators. In order to assess the impact of NR on mobile operators, the consultant built a model integrating supply and demand factors.

Supply side – cost elements

Roaming calls can be described by type of call. These are as follows:

1. A caller from network A (*home network*) goes to network B (*roaming network*) and makes a call to a subscriber of network B;
2. A caller from network A goes to network B and makes a call back to a network A subscriber;
3. A caller from network A goes to network B and receives a call from network A; and
4. A caller from network A goes to network B and receives a call from network B.

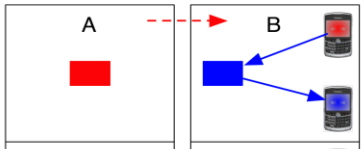
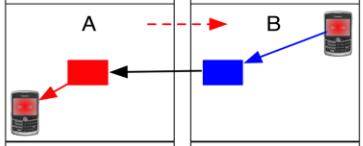
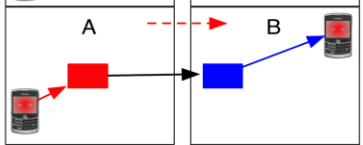
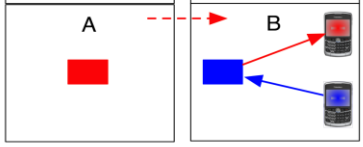
In each case the cost structure of the call is approximately the same:

Mobile origination + national transit + mobile termination + roaming overhead[25]

The model illustrated in Figure 6-4 has been used to break the cost of a roaming call into its constituent parts and estimate the cost per component.

[25] Roaming overhead costs are related to caller registration, call details and accounting, though little or no additional Capex is required to facilitate these functions

Figure 6-4: Call types

Call Type	Cost Elements	Illustration
Call inside a visited network Caller from network A goes to network B and makes call to subscriber of network B	Mobile origination in network B + National Transit + Mobile termination cost + Roaming overhead	
Call from a visited network to home network A visitor from network A goes to network B and makes call back to home network subscriber	Mobile origination in network B + National Transit + Mobile termination cost + Roaming overhead	
Receiving a call in visited network A visitor from network A goes to network B and receives a call from its network	Mobile termination in network B + National Transit cost + Mobile termination cost + Roaming overhead	
Receiving a call inside a visited network A visitor goes from network A to network B and receives a call from network B	Mobile termination in network B + National Transit + Mobile termination cost + Roaming overhead	

A relatively simple model of costs is assumed as per the Table 6.5 below (note that a sensitivity analysis is done further on in this section – the simple model just outlines the structure of costs to the operator and assumes approximate equality between operators):

Table 6-5: Cost structure of a NR call

Cost component	B (Host prices)	A (Roamer operator receipts where appropriate)
Call origination	0.30	0.30
National transit	0.72[26]	0.12[27]
Call termination	0.30	0.30
Normal tariff	1.32	n/a
Roaming overhead cost factor	(Add)	(Add)
Roaming host mark-up of overheads	(Add)	n/a

The typical cost of a call is BP 1.32 per minute, which is the same as a call in a beMobile Nteletsa area. Call termination cost is assumed at the regulated "glide path" rate for 2014 and is kept by the host operator or paid to the roamer's operator when terminating a call from the roamer (depending on call type in Figure 6-4). Call origination is assumed at the same cost since network usage is similar, and is also kept by the host or paid to the roamer's operator when a call is received from the home network, as the case may be.

In addition, every roaming call has a roaming overhead cost factor – i.e. the cost of providing roaming, which is mostly for exchange of registration records, call details and accounting. The roaming operator also has the option of marking up the overhead cost. For example, if the cost of roaming per call is 8 or 10 Thebe as assumed in the model, each operator would incur this cost since both have administrative overheads to handle roaming. In addition the host operator may charge a markup on the cost, assumed to

[26] Wholesale charge from host to roamer operator is assumed at around BP 0.60 (i.e., 83% of retail price)
[27] Roamer operator's share of national transit is assumed at BP 0.12

range from 0% to 200%. This could reflect additional costs for the hosting operator, or purely a significant mark-up to reflect market objectives, which is common on commercial roaming agreements internationally.

Based on this simple model, three different scenarios are assumed, namely:

1. **Scenario 1** – prices are equal to existing local call rates. For simplicity, we have assumed a local call rate of 1.32 – the beMobile standard tariff. Of course, any local call rate may be assumed, such as that of Orange or Mascom peak or non-peak rates, though the BeMobile rate is less complex and pertains to 73% of the Nteletsa areas.
2. **Scenario 2** – prices are 15% higher than the call rate in Scenario 1, due to roaming overhead cost factors (ROCF) and also the markup on the ROCF).
3. **Scenario 3** – prices are 30% higher than the call rate in Scenario 1, assuming a higher ROCF and markup.

These scenarios are summarised in Table 6-6 and can be varied, though the consultant believes them to reflect typical costs in reality and sensitivity checks were run.

Table 6-6: Cost structure by scenario

Scenario	1	2	3
Roaming O/H cost factor	0	0.08	0.10
Host roaming O/H Mark-up	0%	50%	200%
Total price change	**0%**	**15%**	**30%**

In these scenarios, the ROCF thus increases from 0 to 0.1 Pula and the markup changes from 0% to 200%. Of course, this impacts on the retail price to consumers, leading to a total price change of between 0% and 30%. To complete the analysis, the impact of the price change on consumer behaviour needs to be modeled.

Demand side – price sensitivity

The different scenarios mean that roamers will be faced with mobile tariffs that are either the equivalent of local call rates (Scenario 1), or assumed to be 15% higher than a local call rate (Scenario 2) or 30% higher than a local call rate (Scenario 3). Dependent upon the tariffs associated with each scenario, consumers will make more or less roaming calls.

To model the price sensitivity of consumers, we have divided potential roamers into three categories:

1. Visitors that are relatively price insensitive and would make a roaming call regardless of price;
2. Visitors that might make a roaming call depending on price (i.e., they are price sensitive – if the price is too high a portion of these would not make any calls);
3. Visitors that would continue with beMobile (i.e. continue to have either multiple SIMs or are already beMobile subscribers).

In the demand survey, 37% of visitors stated that they would roam even if faced with a 30% price increase. This figure has been taken as an indication of the percentage of price insensitive consumers. That a minimum of 37% of visitors to Nteletsa areas would roam regardless of price is considered to be the minimum roaming usage. The question is by how much this minimum would increase based on the attraction of lower prices.

Scenario 1 represents the model with the highest potential demand for roaming calls because prices are the equivalent of local rates. We have therefore assumed a relatively high take-up of roaming in Scenario 1. Although the field survey showed that 47% of *current* visitors to Nteletsa areas do not make any calls because they have not purchased a beMobile SIM, we have assumed that a significant portion of these would make calls if roaming rates were the same as a local call. Therefore in Scenario 1, it is assumed that 70% of visitors would actually roam and only 18% (out of the 53% who have already purchased host network SIMs) would continue using them. The consultant believes this to be a particularly prevalent threat in the case of the BeMobile areas because of the otherwise low market share (13%) BeMobile possesses.

In Scenario 2, because the price has increased by 15% above local call rates, only 50% of visitors are assumed to roam and the number of people opting to continue to use a beMobile SIM increases to 28% because it is now cheaper to use a beMobile SIM than to roam.

In Scenario 3, only 37% of visitors would roam – these are the price insensitive consumers that value the convenience of keeping their SIM above the cost of calls. The number of beMobile subscribers is the highest under this scenario because the cost difference between roaming and a local call is the greatest. These results are summarised in Table 6-7 below:

Table 6-7: Demand side assumptions

Consumer category	Scenario 1 Same Price	Scenario 2 15% price incr.	Scenario 3 30% price incr.
% Visitors that would make a roaming call	70%	50%	37%
% Visitors that don't make calls that might roam	35.0%	25.0%	18.5%
% Visitors that continue to use beMobile	18.0%	28.0%	34.5%

Results

The demand and supply side impact of roaming were then modelled as shown in Table 6-8. The three different scenarios were integrated across the four different call types to establish the impact on the sector as a whole in terms of revenue and also the share of revenues between the various operators.

Table 6-8: Results of sensitivity analysis

Scenario		Call type 1	Call type 2	Call type 3	Call type 4
		Making a call inside a visited network	Making a call from a visited network to the home network	Receiving a call in the visited network	Receiving a call from within the visited network
Scenario 1 (0% price increase)	Roaming O/H cost factor	0			
	Host roaming O/H Mark-up	0%			
	Total price change	0%			
Scenario 2 (15%	Roaming O/H cost factor	0.08			

price increase)	Host roaming O/H Mark-up	50%
	Total price change	15%
Scenario 3 (30% price increase)	Roaming O/H cost factor	0.10
	Host roaming O/H Mark-up	200%
	Total price change	30%

The results of the model were compared with a baseline scenario where roaming is not offered – in other words, the situation in Nteletsa areas today. In the baseline scenario (Table 6-9), the survey indicated that 53% of visitors make calls using the host network's SIM, representing 13,534 subscribers and that they spend 24 Pula while in Nteletsa areas for a total revenue of 324,818 Pula per month, from which BeMobile is estimated to retain revenues of 276,391.

Table 6-9: Baseline scenario revenues

Baseline scenario	Results
Number of visitors that make calls using multiple SIMs	13,534
Current revenue (assuming no roaming)	324,818
Host network net revenues (assuming BeMobile)	276,391

The three roaming scenarios were compared with this baseline scenario to establish the increase in overall sector revenues and also the split of revenues between operators. As in all the examples, for simplicity, roaming in a beMobile area was assumed. The results are shown in Table 6-10 below:

Table 6-10: Impact on sector and operator revenues by scenario

Output summary	Demand assumption	Market revenues	BeMobile revenues
Scenario 1 (0% increase)	70%	66%	+50%
Scenario 2 (15% increase)	50%	47%	+19%
Scenario 3 (30% increase)	37%	35%	-1%

In **Scenario 1** with a 0% price increase and assuming 70% of visitors would roam, overall market revenues would increase by 66%. Since demand would increase substantially, i.e. more people will make calls because roaming is offered, beMobile's revenues would also increase by 50% in its areas because of additional traffic, using the cost model's expected revenue split. Similar results are observable for +/- 10% demand assumptions, with the change in total market more or less reflecting the revised assumptions, while the BeMobile revenues would also change at approximately half of the difference.

In **Scenario 2** with a 15% price increase and assuming that 50% of visitors would roam, overall market revenues increase by 47% but beMobile revenues are only 19% above the baseline scenario because prices are 15% higher and more people would switch to their beMobile SIM to take advantage of lower prices rather than decide to roam. If the

number of roamers increased to 60% in this price scenario, the market increase would be 57% and BeMobile's revenues would increase by modest 33%.

In **Scenario 3** with a 30% price increase and assuming only 37% of visitors would roam (i.e., those indicating they are price insensitive), overall market revenues increase by 35% but beMobile revenues decline by 1%. beMobile's revenues decline in Scenario 3 because price insensitive consumers would continue to roam even though prices are 30% higher than local call rates and would not be making calls using a beMobile SIM card as they would have been in the baseline scenario. The results are heavily dependent on demand; for example, if the number of roamers at this price increased to 50%, the market would increase by 47% and BeMobile's revenues would increase by 17%, whereas if the demand was only 25%, then the market would increase by 24% and BeMobile's revenues would decline by 17%. (Similarly scaled changes are observable for all scenarios, but the balance of outcomes between them remains.)

In summary, the impact on operators is highly sensitive to the demand for roaming at various price points. In the short term at least, the overall market would increase significantly at the lower prices and the host network operator would gain revenues though, as explained elsewhere, BeMobile in particular could be at risk of losing significant market share at the same time. On the other hand, the increased revenue benefits would evaporate at higher roaming prices while BeMobile in particular would likely be more successful at defending its market share by charging premium wholesale prices for roaming.

6.4.3 Regulator

The final stakeholder to be considered is the BOCRA. The mandate of the BOCRA is to promote the development and provision of efficient telecommunications services. Each of the four options must be assessed in terms of the impact they would have on the efficient provision of telecommunications services. These are summarized in Table 6-11.

Table 6-11: Option Summary

Stakeholders		Option A: Do Nothing	Option B: Promote other solutions	Option C: Require NR	Option D: Commercial Negotiation
Nteletsa Villagers & Visitors	Benefit	None	Increased competition, gradual increase in areas with two or more operators	Any-to-any connectivity	Gradual any-to-any connectivity
	Cost	Inconvenience, multiple SIMs, no any-to-any connectivity	None	Premium pricing unless enforced at current price or cost	Potentially premium pricing
Operators	Benefit	No implementation costs for NR	Access to new technology or frequencies *(not considered of relevance or value in the 2G context)*	Better service to subscribers; small increase in revenues (*to some operators*)	Better service to subscribers; small increase in revenues, reduction in regulatory oversight
	Cost	Some	None	Cost of	Cost of

		consumer frustration in Nteletsa areas		implementation; potentially higher infrastructure costs to handle increased traffic *(both negligible)*	implementation; potentially higher infrastructure costs to handle increased traffic
Regulator	Benefit	Resources can be allocated to projects with a bigger impact	Increased competition; focus on regulations with a bigger impact	Policy success	Policy success
	Cost	Frustration from a small number of consumers	Existing cost (i.e. resources already focused on these options)	Time developing policy, preparing regulations/guidelines	Oversight / monitoring of commercial negotiations

6.5 Step 5: Determine the Effect on Competition

The preceding steps provided a quantitative analysis of the impact of NR on consumers and operators in Botswana. The outcome of the quantitative analysis found that if NR is offered the market would increase in size and that at prices that are below 15-23% premium over normal tariffs, consumers would benefit. The impact on individual operators was variable. For Mascom and Orange, the introduction of NR was positive, with increased revenues. For beMobile, the impact of NR depended upon the tariffs offered. Assuming a retail-minus wholesale tariff (i.e., where calls are the same price as current local call rates), beMobile revenues would increase. Assuming a 15% tariff increase, beMobile's revenues would increase by around 19%. Assuming a 30% tariff increase, beMobile's revenues would decline.

However, the quantitative analysis does not take into account the long-term effects on the competitive structure of the market as a whole. Assuming that tariff differentials between operators remain the same – i.e., that Mascom offers a cheaper on-net peak rate compared to beMobile – the competitive advantages that beMobile currently enjoys by offering national coverage will be steadily eroded and subscribers will migrate towards either Mascom or Orange. In fact, given the significant coverage differences between Mascom and Orange, the assumption is that subscribers will be more likely to move to Mascom over Orange.

The analysis of the long-term competitive impact of NR is by necessity qualitative. There are simply too many variables to provide a definitive (and quantified) answer. Rather, this chapter looks at the probable long-term impact, derived from the quantitative analysis. To arrive at the probable impact on the long-term competitive structure of the Botswana telecommunications market, the Chapter starts by analysing the likely behaviour of consumers to the introduction of NR and then the impact of this behaviour on the operators.

6.5.1 Long term impact on consumers

The analysis of the impact on consumers is done in the context of beMobile's, Orange and Mascom's status in the market, specifically:

- beMobile is the smallest operator with 13% market share, Mascom is the largest operator with 53% market share and in an environment of high termination rates beMobile will struggle to compete against larger operators on price;
- Orange has approximately 75% national coverage and is not significantly present in Nteletsa areas. beMobile and Mascom are the primary operators in Nteletsa areas.
- beMobile and Mascom have roughly equal national *coverage*, but beMobile has larger coverage in Nteletsa areas, which is an unusual feature internationally where the newest entrant typically has the smallest coverage.
- The beMobile subscriber base has increased by 89,430 since January 2012 and a large portion of this is likely from Nteletsa areas.

As explained earlier, if prices are set by commercial agreement, NR would most likely be a premium service. For villagers, if NR is a premium service then there is no benefit because current local call rates are cheaper. Alternatively, if prices are regulated to be equal to existing local call rates, then villagers are likely to trend towards purchasing a Mascom SIM because:

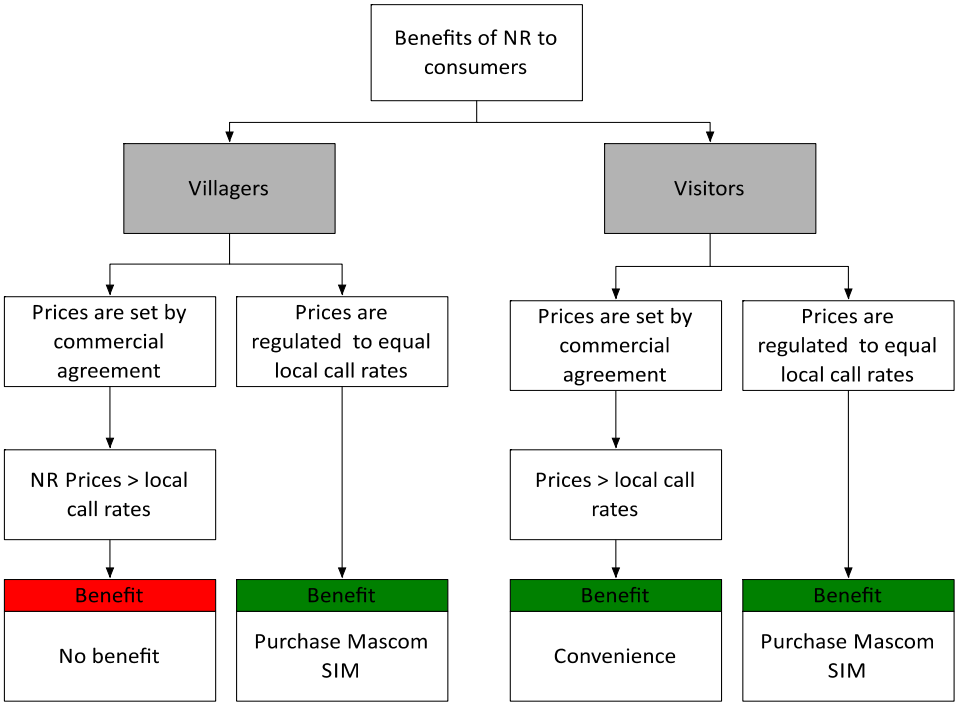
- Prices in Nteletsa areas would be the same between Mascom and beMobile and therefore the Nteletsa area coverage advantage of beMobile disappears; and
- The majority of calls are likely to be off-net because beMobile has 13% of the market. Off-net calls are substantially more expensive than on-net calls. Even though beMobile has a standard rate of 1.32 for both on-net and off-net, this is 36% more expensive than a Mascom on-net call.

For villagers, if NR is set at prices greater than existing local rates, it has no benefit. If prices are set to equal local rates, then there is an incentive for villagers to migrate to Mascom to take advantage of cheaper on-net calls.

For visitors to Nteletsa areas, the outcome of NR in Nteletsa areas is positive under both price regimes. If prices are set by commercial agreement, NR prices in the roaming areas will be higher than local call rates in order for the host operator to avoid losing its subscribers to other operators. However, 37% of visitors in the demand survey stated that they would continue to use their primary SIM even though the price would be higher than having a local SIM. The benefit for these visitors is the convenience of not having to have multiple SIMs and being accessible on the same number without having to bother with call forwarding to avoid lost calls.

The options available to villagers and visitors are illustrated in Figure 6-5 below.

Figure 6-5: Benefits for consumers



Source: Intelecon

If prices are regulated to equal local call rates, then there is a financial benefit for visitors as calculated in Section 6.4. As well, they have the benefit of increased choice to use a Mascom SIM only (i.e., get rid of the beMobile and Orange SIMs) because Mascom prices are guaranteed to be equal to beMobile in the roaming area and Mascom subscribers can also take advantage of Mascom's lower on-net prices. (At today's tariffs, Mascom prices are 36% cheaper than beMobile).

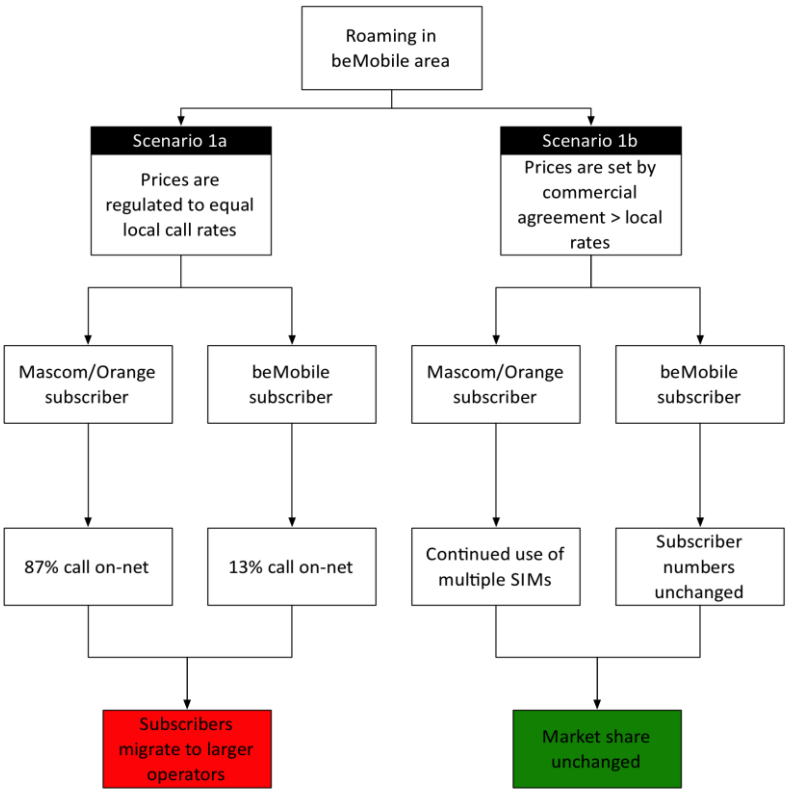
6.5.2 Long term competitive impact on the market

There are two operators that could offer NR: Mascom in Nteletsa Area 4 and beMobile in Ntelestsa Areas 1, 2 and 3. The impact of providing NR in a beMobile area is Scenario 1. The impact of providing NR in a Mascom area is Scenario 2.

Scenario 1

Figure 6-6 below lays out the logical flow of offering NR in a beMobile area and the long-term impact this would have on beMobile subscriber numbers:

Figure 6-6: Roaming in beMobile area



There are two options in terms of pricing: prices are regulated to equal local call rates or prices are set by commercial agreement.

Scenario 1a:

In this scenario the assumption is that prices are regulated according to prevailing local call rates in that area. beMobile no longer has a competitive advantage over Mascom for the following reasons:

- Coverage is the same as Mascom (i.e. Mascom has access via NR to all beMobile coverage areas);
- Prices are cheaper on Mascom compared to beMobile – 87% of calls will be made to Mascom or Orange subscribers, therefore paying high off-net calling rates.

As a result, beMobile subscribers will migrate towards Mascom[28] barring changes taking place in comparative tariff regimes. Existing Mascom subscribers will remain with Mascom. The same applies if Orange is substituted for Mascom. The net result is a reduction in competition as beMobile loses subscribers to Mascom/Orange. The migration could, in fact, have an even more dramatic impact on beMobile since the vast majority of new subscribers to the beMobile network come from Nteletsa areas, as established earlier on in this report.

[28] The movement of subscribers away from beMobile to Mascom would be accentuated if Mascom allowed roaming customers to take advantage of price promotions and discounts. Mascom has indicated that this is a possibility depending upon the pricing regimes in place.

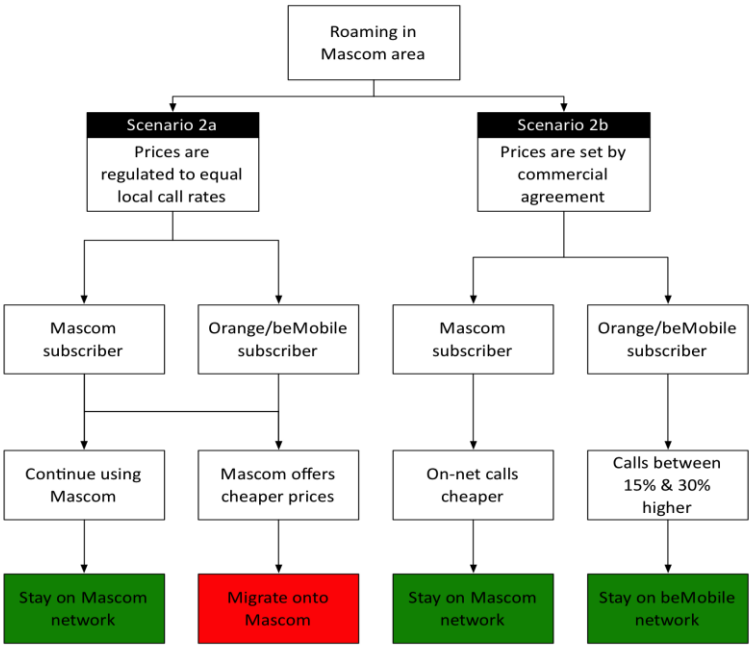
Scenario 1b:

In this scenario, prices are set by commercial agreement and will likely be set either 15% or 30% higher than current call rates. NR is therefore a premium service and subscribers are prepared to pay a premium for the convenience of keeping their SIM. Because prices are so much higher than existing local call rates, consumers will keep multiple SIMs or stay on their existing networks. There is likely to be no impact on operator market shares and the competitive structure of the market remains the same.

Scenario 2

Figure 6-7 below lays the impact of offering NR in a Mascom area and the long-term impact this would have on Mascom subscriber numbers:

Figure 6-7: Roaming in Mascom area



There are two options in terms of pricing: prices are regulated to equal local call rates or prices are set by commercial agreement.

Scenario 2a

In scenario 2a, we assume that prices are regulated according to prevailing call rates in that area – the same as scenario 1a. The difference between scenario 1a and 2a is that 2a is in a Mascom area and the Orange/beMobile subscriber is roaming. In this scenario, the outcome is the same as Scenario 1a: Mascom offers substantially cheaper on-net prices based on its 53% market share. For beMobile subscribers, significantly cheaper calls and identical coverage on Mascom means that they will migrate away from beMobile and towards Mascom.

Scenario 2b

In scenario 2b, we assume that prices are set by commercial agreement and will range from between 15% and 30% more expensive than existing local rates. Faced with higher rates, Mascom subscribers will either keep multiple SIMs or not make any calls when in Nteletsa areas. beMobile subscribers will stay on the beMobile network in order to keep the lower prices. Market share between operators is likely to remain unchanged.

6.5.3 Outcome

In scenario 1b and 2b, market share between operators will remain roughly unchanged. beMobile is able to protect its competitive advantage – coverage in Nteletsa areas – by providing NR at higher prices than current local call rates. In Scenario 1a and 2a, the lower prices offered by the larger networks (by virtue of their larger market shares and the differential between on-net and off-net prices) as well as identical coverage offered between the operators, will attract subscribers onto the larger networks and away from beMobile.

6.6 Step 6: Assess the Options

The purpose of this section is to assess the probability of the proposed regulation of NR achieving the policy objective of any-to-any connectivity. In order to arrive at an informed assessment, the following analyses have been completed:

- Assessment of the likely impact of alternative regulatory options such as infrastructure sharing;
- Assessment of the potential quantitative benefits of NR for consumers and operators; and
- Assessment of the potential impact of NR on the long-term competitive structure of the telecommunications sector in Botswana.

6.6.1 Alternative regulatory options

The analysis of both competitive coverage overlap and alternative regulatory options focused mainly on infrastructure sharing and found that operators were already sharing significant numbers of towers. In fact, the model predicts that the population in villages where towers are shared will be almost 117,000 within the next two to three years, which is 71% of the Nteletsa II population. A total of approximately 47,000 people in the Nteletsa II areas (predominantly in villages with populations below 600) could remain served by only one operator over the 2-3 year prediction period, i.e., only 2.3% of Botswana's population.

Therefore, in terms of achieving any-to-any connectivity, existing regulations on infrastructure sharing show significant progress.

6.6.2 Quantitative benefits of NR

The quantitative benefits of NR were modelled for consumers and operators. For each group, three different pricing scenarios were created: 0% increase, 15% increase and a 30% increase in price. For consumers, the model predicted that the "break-even" point for consumers, below which benefits are received, is around a 23% premium to local call rates.

For operators, the model predicted that revenues from Nteletsa areas would increase by between 35% and 66%, depending on the tariffs. beMobile revenues would range from between 50% - assuming no price increase – to a loss of -1% if there was a 30% price increase.

Therefore, in terms of achieving any-to-any connectivity, mandating NR would generally increase revenues from Nteletsa areas, which would be one evidence of success.

6.6.3 Impact of NR on competition

The final assessment was the impact of NR on the competitive structure of the telecommunications sector in Botswana. The assessment took into consideration the following factors:

- Botswana's relatively high termination prices;
- The fact that Mascom and Orange currently offer cheaper prices than beMobile;
- A significant number of beMobile subscribers (nearly a quarter of their total subscribers) come from Nteletsa areas; and
- That beMobile is the smallest operator with a market share of 13%.

The finding was that if NR is mandated, there is a clear incentive, unless the balance of tariff regimes change significantly, for consumers to move away from beMobile towards either of the larger operators, most likely Mascom, in order to take advantage of both cheaper prices and coverage. In other words, mandating NR takes away beMobile's competitive advantage and encourages subscribers to migrate away.

Therefore, in terms of achieving any-to-any connectivity, mandating NR would come at a significant competitive cost, with beMobile likely to lose subscribers and the market increasingly dominated by Mascom and Orange.

6.6.4 Summary

While the quantitative analysis of NR finds that revenues in the Nteletsa areas would increase due to NR, this is only the case in the short term. As subscribers realise that they can take advantage of beMobile's coverage, via NR, but at a much cheaper rate by subscribing to Mascom's network, many are likely to migrate away from beMobile. The long-term effects on competition by mandating NR are thus overwhelmingly negative.

Nevertheless, there is a scenario according to which beMobile can defend its market share but at the same time ensure that NR is available to consumers that are prepared to pay for the convenience. In this scenario, NR is not mandated and pricing is not regulated. Operators are free to negotiate NR if they find a compelling economic justification. The role of the BOCRA is to communicate that there are no regulatory obstacles standing in the way of commercial negotiations between operators.

Consultation questions – Chapter 6
6-1 The report has stated that the policy objective of NR is any-to-any connectivity. Do you agree? If not, what do you believe the objective of NR in Botswana should be?
6-2 The report has stated that NR would not achieve lower retail tariffs nor reduce the prevalence of SIMs in Botswana. Do you agree? If not, why?
6-3 Four regulatory options have been identified: a) Do nothing; b) Promote other solutions through regulation; c) Require NR; and d) Encourage commercial negotiation. Do you agree that these are the options available to BOCRA? Do you believe that there are other regulatory options that should be considered?
6-4 In terms of benefits to consumers, the report has found that there is a net benefit as long as prices are not increased by more than 23%. Do you agree with the assumptions made to derive this conclusion?

6-5 The report has assumed that consumers are relatively price sensitive and that, if NR is implemented and prices are kept at their current level, demand for roaming in Nteletsa areas will be from 70% of visitors and that demand will be lower at premium prices. Do you agree with this premise?

6-6 All operators in Botswana currently offer international prepaid roaming to select countries. The report has assumed that the technical requirement of CAMEL technology in order to implement NR already exists and that the CAPEX to activate it for NR is relatively insignificant. Consequently, the primary costs of NR are OPEX related and not CAPEX.

a) Can you confirm that all operators have CAMEL and that the costs of NR are primarily OPEX related?

b) Can you indicate if you agree with the approximate overhead cost assumption at approximately 8 or 10 Thebe per call?

c) Do you have any other comment about cost and the wholesale tariff assumption made related to possible commercial NR agreements for the Nteletsa areas?

6-7 Do you have any comments regarding the consultant's analysis of the potential impact on competition, in particular the likely behaviour of customers under various pricing options?

7 Conclusions and Recommendations

7.1 Conclusions

The purpose of this report is to assess whether NR is a viable and effective regulatory intervention on the part of the Botswana Communications Authority (BOCRA). To answer this question, it has been necessary to clearly identify the problem that NR would address: The problem is simply that there are Nteletsa areas where a subscriber cannot make a call unless they are prepared to change SIMs.

Three potential policy objectives of the BOCRA were considered: increased competition in the Nteletsa areas, efficient and effective investment in infrastructure and any-to-any connectivity. We concluded that the policy objective that the BOCRA and the GoB wish to achieve is any-to-any connectivity without the need for multiple SIMs.

The review of the mobile market, including current mobile coverage, termination rates and retail tariffs, however, emphasised the factors that would impact upon the implementation of NR:

- Infrastructure sharing is used extensively amongst operators already and particularly in Nteletsa areas;
- There is also still potential for substantial growth in infrastructure sharing in Nteletsa localities, reducing the number of people in these areas that don't have access to at least two operators, eventually projected to approximately 47,000 people. By association this also reduces the number of visitors into areas with only one operator, who would need to make use of roaming.
- Less than 3% of the population – all resident in very small and remote localities - is not covered by any operator today;
- Botswana's termination regime is substantially more expensive, on average, than other countries; high termination rates have a harmful affect on smaller operators and weaken competition in general; and
- The analysis of retail prices shows that Botswana is one of the most expensive countries in Africa based on publicised tariffs (the comparison did not include promotions and discounts though it should be noted that "hidden" promotions and discounts weaken competition).

7.2 NR for voice and related services

In addition to the above factors, the demand survey singled out three features of subscribers in Botswana:

- 69% of visitors to Nteletsa areas have more than one SIM[29];
- 63% of visitors to Nteletsa areas stated that they would use multiple SIMs to take advantage of cheaper prices if NR were to be offered at a premium price[30];
- Subscribers with multiple SIMs are more price sensitive than subscribers with only one SIM[31].

[29] See Section 4
[30] See Section 4
[31] Ramachander, S. 2010. The Price Sensitivity of Mobile Use among Low Income Households in Six Countries of Asia. Available at http://lirneasia.net/wp-content/uploads/2010/03/RAMACHANDER-TBOP3_07.pdf

The quantitative benefits of NR were modelled for consumers and operators. For each group, three different pricing scenarios were created: 0% increase, 15% increase and a 30% increase in price. For consumers, the model predicted that the "break-even" point for consumers, below which benefits are received, is around a 23% premium to local call rates.

For operators, the model predicted that revenues from Nteletsa areas would increase by between 35% and 66%, depending on the tariffs. beMobile revenues would range from between 50% - assuming no price increase – to a loss of -1% if there was a 30% price increase.

When assessing the impact of NR on the long-term competitive structure of the sector, the finding was that if NR is mandated, there is a clear incentive for consumers to move away from beMobile towards either of the larger operators, most likely Mascom, in order to take advantage of both cheaper prices and coverage, unless beMobile could defend its market share through aggressive price reductions. This would not be easy as the weakest player. In other words, mandating NR takes away beMobile's competitive advantage and encourages subscribers to migrate away.

Therefore, in terms of achieving any-to-any connectivity, mandating NR would come at a significant competitive cost, with beMobile likely to lose subscribers and the market increasingly dominated by Mascom and Orange.

7.3 NR for data services

Mandating NR for data services has also been considered. Jurisdictions that have mandated 3G national roaming in particular have done so on the basis of smaller operators gaining access to dominant operators' data networks. For example, in the USA, smaller, regional operators are now able to access national operators' data networks[32].

The consultant was unable to find a jurisdiction where NR was mandated in the reverse direction, that is, a country where larger operators have poor data networks and are allowed to access smaller operators' data networks in order to increase competition or to facilitate universal access. In the Botswana context, and in Nteletsa areas in particularly, data roaming would need to commence with 2G only since almost all Ntelesa area are equipped with only 2G base stations and offer EDGE data transmission at best. No jurisdiction has ever tried to mandate that operators must expand their data transmission assets to facilitate roaming. While today there is insufficient demand to require upgrading and migration to 3G in Nteletsa areas, such demand as might occur could be an additional financial burden for the operator. In any case, on balance, the greater demand for data services in Nteletsa areas is most likely to occur in areas that economically justify tower sharing. Facilitating the demand for roaming that does occur through mandatory regulation could also increase subscribers' tendancy to switch to one of the more dominant operators that offer more 3G services country-wide in any case.

As with NR for 2G voice services, mandating NR for data –including 3G - would achieve the policy objective of any-to-any connectivity, though it is likely to increase customers' incentive for switching to the dominant operator(s) which already have better data coverage and thus increase the pressure on long-term competition in the Botswana telecom market. It is therefore not recommended at this time, though a wider study on

[32] As of April 2011 the FCC mandated National Roaming in the USA.

data roaming in general could be justified if future policy envisages the entry of new data-only services providers into the market.

If data roaming is allowed on a voluntary basis, as seems to be the best solution for voice service roaming, operators would be free to negotiate terms that are mutually acceptable, though the consultant has observed little or no interested by the operators and is therefore recommending that data services not be included as a component of any roaming objectives at the current time.

7.4 Recommendations

In light of our finding that NR would achieve any-to-any connectivity at the expense of competition and efficient infrastructure investment, but that it could be beneficial in certain select areas provided it is done on commercial terms, we recommend that BOCRA do the following:

1. NR is not mandated and pricing is not regulated. Operators are free to negotiate NR for the Nteletsa areas only, if they find a compelling economic justification. The role of BOCRA is to communicate that there are no regulatory obstacles standing in the way of commercial negotiations between operators;
2. Monitor the terms and conditions of NR commercial agreements that arise to ensure that these agreements are made in good faith; and
3. Provide clear dispute resolution procedures to ensure their speedy resolution.

In addition to these steps, Intelecon recommends several regulatory options that should be considered in the short term. These are:

1. A faster reduction in termination rates based on an updated benchmark analysis of termination rates in Africa and specifically East Africa;
2. Increased retail pricing transparency from operators, particularly dominant operators; and
3. An investigation into current pricing regimes (specifically weekly promotions and discounts) and their impact on competition.

In particular, termination rate reductions (also highlighted by the Consultant hired to do a RIA on Mobile Number Portability) would have a significant impact on the affordability of communications throughout Botswana and would not be limited to Nteletsa localities only.

Consultation questions – Chapter 7
7-1 Do you agree with the report's conclusion that the benefits to consumers of mandated NR at zero price increase must be weighed against a potentially negative impact on competition?
7-2 Do you agree with the report's recommendation that NR should not be mandated and that pricing should not be regulated, but that operators should be free to negotiate NR for the Nteletsa areas only, if they find a compelling economic justification? Give reasons for your opinion.
7-3 Do you agree with the recommended "light-handed" role of BOCRA in guidance, monitoring and dispute resolution?
7-4 What is your opinion on the additional regulatory measures recommended beyond NR, related to a) Faster reduction in termination rates; b) Increased retail pricing transparency from operators; and c) Current pricing regimes (specifically weekly promotions and discounts).
7-5 What is your opinion on the report's conclusions related to data roaming in Nteletsa areas?

Annex A: Data status table

Data	Objective for use	Status	Impact
Comprehensive Description or Report providing exact detailed data on all Nteletsa villages, by area, precise number and location of BTS sites and repeaters	Accurate summary of site and tower names for matching with operator site lists and tower sharing calculations	Nteletsa II Update Report January 2013 does not provide accurate district / area classifications for the 197 villages Ntelesa II Detailed GSM Project Information, showing villages, BTS and repeaters, only provides for Area 1	Final listing of villages, BTS and sites not possible. Reduces accuracy of the tower sharing and projection analysis
General operational and cost data requested from each operator through questionnaire	Market analysis, comparison of operator strategies, preferences and costs	Completed questionnaires received from all operators. Some minor details regarding OPEX remain to be clarified following Interim Report	Responses sufficient for main analysis. Final details may increase accuracy of some analysis assumptions
GIS Shape coverage maps files from each operator	Creation of an accurate coverage map to identify population coverage and Nteletsa sites	Received BTS locations from Orange but not coverage. Other operators provided PDF maps which cannot be used for detailed coverage analysis	Limits the accuracy of population coverage estimates, but does not affect the final conclusions of the study
List of Nteletsa tower names where each operator has either requested to lease space or has leased to another operator	Accurate calculation of towers and village populations remaining with only one service provider	Provided by BTC and Orange; not provided by Mascom	Accuracy of the tower sharing status and projections reduced

Note: Since the consultant did not receive GIS coverage maps, there has been no estimate of which Nteletsa areas have more than 1 operator providing usable signal through normal competitive overlap, other than by means of infrastructure sharing.

Annex B: Tower sharing by Nteletsa Village[33]

No.	VILLAGE	DISTRICT	Area	2001 Pop	2011 Pop	Tower sharing - BTC	Tower sharing - Orange	Tower sharing - Mascom
1	Khwai Camp	North West	1	395	395			
2	Nxaunxau	North West	1	330	400			
3	Ghani	North West	1	480	480			
4	Mababe	North West	1	157	230			
5	Xaxa	North West	1	280	492			
6	Sankuyo	North West	1	372	410			
7	Eretsha	North West	1	616	720			
8	Matsaudi	North West	1	446	345			
9	Kudumane	North West	1	252	252			
10	Sekondomboro	North West	1	655	629			
11	Chukumuchu	North West	1	270	161			
12	Samochema	North West	1	847	1156	Yes		
13	Tsodilo Hills	North West	1	172	204			
14	Xaudum	North West	1	252	252			
15	Mochaba	North West	1	151	151			
16	Xininkwe	North West	1	29	29			
17	Xakao	North West	1	1049	1,565			
18	Mogotlho	North West	1	6	6			
19	Kauxwhi	North West	1	859	2,040			
20	Beetsha	North West	1	760	941			
21	Gudingwa	North West	1	732	725			
22	Habu	North West	1	304	533			
23	Ngarange	North West	1	948	988	Yes		
24	Botlhatlogo	North West	1	467	555	Yes		
25	Etsha 1	North West	1	614	965			
26	Semboyo	North West	1	246	412			
27	Bodibeng	North West	1	472	778	Yes		
28	Kareng	North West	1	599	1259	Yes		Yes
29	Ikoga	North West	1	699	673			
30	Tubu	North West	1	392	483			
31	Ghwihaba	North West	1	252	252			
32	Shorobe	North West	1	955	1031			
33	Mokgalo	North West	1	361	175			
34	Makakung	North West	1	84	119			
35	Gonitsuga	North West	1	506	0			
36	Nxharaga	North West	1	317	346			
37	Qangwa	North West	1	337	710			
38	Phuduhudu	North West	1	377	564			
39	Kacgae	North West	1	282	634			
40	Nxharage	North West	1	317	346			
41	Qabo	North West	1	401	762			
42	Bere	North West	1	385	559			

[33]. Note: The consultant has not received a list of Nteletsa localities according to area. We have inferred which villages are in which areas based on the Department of Telecommunications & Postal Services Nteletsa II Project Progress Report Update, January 2013, but there are inconsistencies in this report. E.g., According to Appendix 2 of the document, one of the major districts is North West District. On pages 3 and 4, there is no North West District mentioned.

43	East Hanahai	North West	1	405	532			
44	Chobokwane	North West	1	484	771			
45	West Hanahai	North West	1	560	702	Yes		
46	New Xanagas	North West	1	540	777	Yes		
47	New Xade	North West	1	930	1269			
48	Ncojane	North West	1	1439	1,958	Yes		Yes
49	Kule	North West	1	1339	807	Yes		
50	Makunda	North West	1	331	685			
51	Groote Laagte	North West	1	483	849			
52	Metsimantsho Farm	North West	1	152	346			
53	Kavimba	North West	1	519	549	Yes		
54	Satau	North West	1	730	605	Yes		
55	Parakarungu	North West	1	806	899	Yes		
56	Mabele	North West	1	696	773	Yes		
57	Ngoma Border Post	North West	1	20	53	Yes		
58	Lesoma	North West	1	410	613			
59	Kachikau	North West	1	881	1,356	Yes		Yes
60	Rappels Pan	Kgalagadi	2	278	283			
61	Khwawa	Kgalagadi	2	517	817	Yes		
62	Bogogobo	Kgalagadi	2	341	360			
63	Phuduhudu	Kgalagadi	2	332	482			
64	Bokspits	Kgalagadi	2	499	507	Yes		
65	Gachibana	Kgalagadi	2	501	746	Yes		
66	Ncaang	Kgalagadi	2	175	228			
67	Maralaleng	Kgalagadi	2	487	586	Yes		
68	Maleshe	Kgalagadi	2	389	462	Yes		
69	Bray	Kgalagadi	2	899	1,041	Yes		
70	Khuis	Kgalagadi	2	755	897			
71	Kolonkwane	Kgalagadi	2	591	599	Yes		
72	Inalegolo	Kgalagadi	2	489	533	Yes		
73	Middlepits	Kgalagadi	2	657	1,121	Yes		Yes
74	McCarthy's Rust	Kgalagadi	2	123	217			
75	Hunhukwe	Kgalagadi	2	431	753	Yes		
76	Monong	Kgalagadi	2	172	267			
77	Zutswa	Kgalagadi	2	469	469	Yes		
78	Lokgwabe	Kgalagadi	2	1304	1,417	Yes		
79	Tshane	Kgalagadi	2	858	1,020	Yes		Yes
80	Lehututu	Kgalagadi	2	1719	1,956	Yes		
81	Make	Kgalagadi	2	366	398	Yes		
82	Maubelo	Kgalagadi	2	453	514	Yes		
83	Ukwi	Kgalagadi	2	453	459			
84	Drieertjies	Kgalagadi	2	252	9			
85	Vaalhoek	Kgalagadi	2	346	355			
86	Struizendam	Kgalagadi	2	313	519			
87	Kutuku	Southern	2	221	166			
88	Mahotshwane	Southern	2	487	861	Yes		
89	Kanaku	Southern	2	149	188			
90	Molete	Southern	2	320	331			
91	Tlhankane	Southern	2	503	722	Yes		
92	Betesankwe	Southern	2	299	389			
93	Matasalalo	Southern	2	187	50			

94	Khonkhwa	Southern	2	473	475	Yes		
95	Itholoke	Southern	2	283	497			
96	Mmathubudukwane	Kgatleng	2	2049	2,203			
97	Modipane	Kgatleng	2	2423	3284		Yes	Yes
98	Ramonaka	Kgatleng	2	518	573			
99	Matebeleng	Kgatleng	2	1180	2,196			
100	Dikgonnye	Kgatleng	2	216	431	Yes		
101	Dikwididi	Kgatleng	2	203	225	Yes		
102	Kgomodiatshaba	Kgatleng	2	330	418	Yes		
103	Mabalane	Kgatleng	2	814	847		Yes	Yes
104	Khurutshe	Kgatleng	2	35	130			
105	Leshibitse	Kgatleng	2	407	545			
106	Ramotlabaki	Kgatleng	2	200	370			
107	Oliphants Drift	Kgatleng	2	758	925			
108	Malotwane	Kgatleng	2	354	608	Yes		
109	Sikwane	Kgatleng	2	1585	1466			
110	Malolwane	Kgatleng	2	2369	2,406		Yes	
111	Dikgatlhong	Kweneng	2	241	241	Yes		
112	Monwane	Kweneng	2	375	513	Yes		
113	Sorilatholo	Kweneng	2	472	897	Yes		
114	Metsibotlhoko	Kweneng	2	355	403	Yes		
115	Serinane	Kweneng	2	450	787	Yes		
116	Mmokolodi	Kweneng	2	674	434			
117	Kweneng	Kweneng	2	415	570			
118	Kaudwane	Kweneng	2	551	1,084	Yes		
119	Khekhenya+Chepetese	Kweneng	2	339	501			
120	Loologane	Kweneng	2	448	448	Yes		
121	Kgope	Kweneng	2	507	507	Yes		
122	Mogonono	Kweneng	2	201	349			
123	Lepashe	CENTRAL	3	347	544			
124	Thalamabele	CENTRAL	3	80	13			
125	Kedia	CENTRAL	3	793	1,237	Yes		
126	Sepako	CENTRAL	3	627	682			
127	Changate	CENTRAL	3	938	1169			
128	Tshokatshaa	CENTRAL	3	458	634			
129	Matsitama	CENTRAL	3	1030	1309			
130	Makuta	CENTRAL	3	1295	1014			
131	Mmeya	CENTRAL	3	556	752			
132	Dimajwe	CENTRAL	3	1017	1423			
133	Kutamogoree	CENTRAL	3	763	1035			
134	Dagwi	CENTRAL	3	1512	454			
135	Jamataka	CENTRAL	3	580	650			
136	Maposa	CENTRAL	3	205	413			
137	Mokubilo	CENTRAL	3	1129	1907			
138	Mokoboxane	CENTRAL	3	1290	1594			
139	Mmanxotae	CENTRAL	3	442	643	Yes		
140	Senete	CENTRAL	3	2523	2440			
141	Matobo	CENTRAL	3	1314	1136			
142	Semitwe	CENTRAL	3	537	724			
143	Mafongo Lands	CENTRAL	3	764	1151			
144	Zoroga	CENTRAL	3	948	1358			

145	Mmadikola	CENTRAL	3	828	830	Yes		
146	Moreomaoto	CENTRAL	3	526	518			
147	Malatswai	CENTRAL	3	872	1482			
148	Toromoja	CENTRAL	3	649	710			
149	Mmatshumo	CENTRAL	3	865	1122	Yes		
150	Goshwe	CENTRAL	3	1156	1574			
151	Mabesekwa	CENTRAL	3	886	1528			
152	Mosu	CENTRAL	3	1100	1,792	Yes		
153	Natale	CENTRAL	3	1117	1288			
154	Nswazwi	CENTRAL	3	1741	2185			
155	Xere	CENTRAL	3	236	343			
156	Khwee	CENTRAL	3	477	1196			
157	Mmaphashalala	CENTRAL	3	1027	1,044	Yes		Yes
158	Majwanaadipitse	CENTRAL	4	425	638			
159	Dovedale	CENTRAL	4	706	832			
160	Mokgolopite	CENTRAL	4	252	0			
161	Robelela	CENTRAL	4	471	829			
162	Mookane	CENTRAL	4	2297	2983			
163	Moralane	CENTRAL	4	446	866			
164	Tshimoyapula	CENTRAL	4	1467	1626			
165	Matlhako	CENTRAL	4	679	752			
166	Kudumatse	CENTRAL	4	1339	2030			
167	Gamabuo	CENTRAL	4	605	744			
168	Parrs Halt	CENTRAL	4	18	16			
169	Itsokwane	CENTRAL	4	151	138			
170	Mogome	CENTRAL	4	371	540			
171	Lose	CENTRAL	4	11	19			
172	Mabolwe	CENTRAL	4	735	701			
173	Moreomabele	CENTRAL	4	478	602			
174	Mokoswane	CENTRAL	4	362	556			
175	Makwate	CENTRAL	4	1591	1,611		Yes	Yes
176	Mokgware	CENTRAL	4	335	334			
177	Foley	CENTRAL	4	442	534			
178	Tewane	CENTRAL	4	126	459			
179	Otse	CENTRAL	4	973	1787			
180	Motshegaletau	CENTRAL	4	1194	958			
181	Shashe/Semotswane	CENTRAL	4	2077	3136			
182	Mosolotshane	CENTRAL	4	1796	2017			
183	Kodibeleng	CENTRAL	4	1206	1298			
184	Ikongwe	CENTRAL	4	471	533			
185	Lepokole	CENTRAL	4	505	955			
186	Damochojena	CENTRAL	4	760	993			
187	Poloka	CENTRAL	4	563	743			
188	Thabala	CENTRAL	4	2284	2429			
189	Mmutlana	CENTRAL	4	841	854			
190	Sehunou	CENTRAL	4	252	1049			
191	Mogorosi	CENTRAL	4	2033	2,716	Yes		
192	Moiyabana	CENTRAL	4	2619	3571			
193	Bonwapitse	CENTRAL	4	544	635	Yes		Yes
194	Tshokwe	CENTRAL	4	897	1070			
195	Gojwane	CENTRAL	4	1041	1411			

196	Kalamare	CENTRAL	4	2241	2,196		Yes	Yes
197	Loomboko	CENTRAL	4		0			
	TOTAL POP			**130,942**	**164,381**	**54**	**5**	**11**
						27.4%	**2.5%**	**5.6%**