Mobile Broadband Gap Analysis Guidelines

Prepared for

Communications Regulators' Association of Southern Africa (CRASA)

GSM Association (GSMA)

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1. Introduction

1.1 Background

The Southern African Development Community (SADC) agreed to a Roadmap for Universal Broadband Access Implementation in 2015. The Roadmap seeks a harmonised pursuit for universal broadband access in the region. The Roadmap has the following objectives:

a) Requirement for SADC Member States to establish National Broadband Plans through the use of the SADC Guidelines on the Development of National Broadband Plans;

b) Establish the universal broadband access gaps for SADC Member States and to compare with Connect 2020 targets;

c) Establish a monitoring and evaluation mechanism for universal broadband access;

d) Develop SADC Model Broadband Access Policy Statement and Strategic Plan; and

e) Encourage SADC Member States to include broadband in their Universal Access/Service definition.

1.2 Purpose of the Guidelines

Further to Roadmap objective “b” above, the purpose of these Guidelines is to provide a methodology on how to conduct mobile broadband gap analysis.

As international, regional and national broadband objectives/targets may change (typically every three to five years), the Guidelines are written to be target-agnostic. Refer to the definitions in Section 1.5 for SADC connectivity targets and SADC demand targets. When using the Guidelines, it is important to check whether the current SADC targets or national targets will require any additional analysis from what is set out in this document (see Section 4 (Implementation)).

1.3 Structure of the Guidelines

This Section covers the background and purpose of the Guidelines along with a glossary of abbreviations, acronyms and defined terms.

Section 2 summarises how first-time readers should use the Guidelines.

The methodology itself is described in detail in Section 3 with additional detail in the Appendixes. It consists of six (6) key steps.

Recommendations on how to implement the Guidelines at the SADC and country level are provided in Section 4.

The Appendixes include a description of the input templates and further details on various aspects of the gap analysis.

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1.4 Abbreviations and Acronyms

The following abbreviations and acronyms have been used throughout this document:

A4AI ..... Alliance for Affordable Internet

CapEx ..... Capital Expenses

CRASA..... Communications Regulators' Association of Southern Africa

DCF..... Discounted Cash Flow

DD..... digital dividend (spectrum), not to be confused with the Digital Divide (see Definitions below)

GDP ..... Gross Domestic Product

GNI..... Gross National Income

GSM..... Global System for Mobile

GSMA ..... GSM Association

ICT…… Information and Communications Technologies

IMT..... International Mobile Telecommunications

ITU ..... International Telecommunications Union

kbps ..... kilobits (1,000 bits) per second

LTE ..... Long-Term Evolution

MBB ..... Mobile Broadband

Mbps ..... megabits (1,000,000 bits) per second

MNO..... Mobile Network Operator

NPV..... Net Present Value

NRA ..... National Regulatory Authority

OpEx..... Operating Expenses

PPP..... Purchasing Power Parity

SADC..... Southern African Development Community

UMTS..... Universal Mobile Telecommunications System

USF..... Universal Service Fund

UN..... United Nations

WACC..... Weighted Average Cost of Capital

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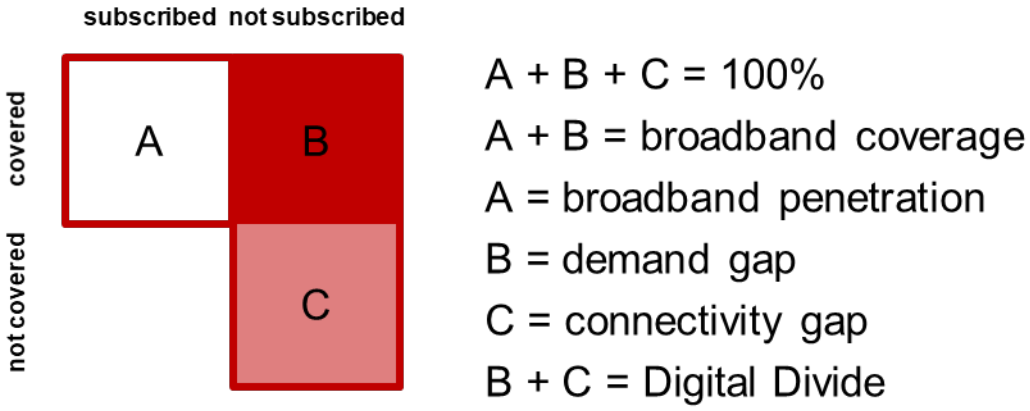
1.5 Definition of Terms

Exhibit 1: Illustration of some defined terms with respect to the population



Terms used in this document are defined as follows:

2G ..... refers only to the GSM standard in this document; data transmission rates are low (typically 200 to 600 kbps) and thus 2G is not classed as mobile broadband

3G ..... refers to the IMT-2000 specification but only the UMTS standard in this document; theoretical download speeds may be up to 42 Mbps and the technical standards provide for even higher rates if the necessary technical features are implemented

4G ..... refers to the IMT Advanced specification but only the LTE standard in this document; theoretical download speeds are higher than 3G (up to 300 Mbps and, depending on the technical features implemented, peak rates over 1Gbps have been achieved)

Addressable market ..... the human population aged six (6) years and older

Broadband coverage..... the population covered by broadband service that exceeds the SADC minimum broadband speed target

Broadband penetration ..... the population that has subscribed to broadband service

Connectivity gap ..... the population not covered by any broadband service

Demand gap ..... the population covered by broadband service but has not yet subscribed

Digital Divide ..... the connectivity gap plus the demand gap

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Investment gap	the investments required to close the connectivity gap and the demand gap; the former investment is calculated as the NPV of the industry net cash flow from extending broadband coverage to achieve the SADC coverage targets; the latter investment is specific to the programme designed to mitigate the affordability drivers
Mobile broadband	a general term that refers to high bandwidth technologies such as 3G and 4G; it is not a telecommunications standard
Population	short name for the addressable market
SADC connectivity targets	the connectivity-related targets agreed by the SADC Information and Communications Technologies (ICT) Ministers from time to time – assumed to be expressed as a % of the population covered by mobile broadband service that meets or exceeds the SADC minimum broadband speed target
SADC demand targets	the demand-related targets agreed by the SADC ICT Ministers from time to time – assumed to be expressed in terms of broadband penetration (% of the population) and affordability (mobile broadband price(s) as a % of the GNI at PPP)
SADC minimum speed target	the minimum broadband download/upload speed (in Mbps) agreed by the SADC ICT Ministers from time to time
Served area	the geographical area that underlies the broadband coverage
Supply gap	alternative term for the connectivity gap
Underserved area	the geographical area with broadband service that does not meet the SADC minimum broadband speed target
Unique subscriber	an individual person who can account for multiple connections (i.e. activated SIM cards with a 2G/3G/4G subscription)
Unique mobile broadband subscriber	an individual person who can account for multiple mobile broadband connections (i.e. activated SIM cards

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	with a 3G/4G subscription); i.e. a subset of the unique subscribers
Unserved area	the geographical area that underlies the connectivity gap

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2. How to Use these Guidelines

This document has been written for the following people:

- The organisation responsible for conducting the gap analysis, usually the National Regulatory Authority (NRA) or Universal Service Fund (USF)[1]:
  - Working-level staff charged with conducting the gap analysis; and
  - Manager(s) responsible for managing the internal process, reviewing the intermediate outputs, soliciting input from industry stakeholders and presenting the Mobile Broadband Gap Analysis Report to the Communications Regulators' Association of Southern Africa (CRASA) membership.
- CRASA Secretariat:
  - Responsible for consolidating the national Mobile Broadband Gap Analysis Reports for the SADC ICT Ministers to review
- Mobile Network Operators (MNOs):
  - Responsible for submission of information to enable the NRA to conduct the gap analysis.

It should also be useful for other stakeholders with an interest in closing the digital divide.

Before proceeding:

- Understand the background: familiarise yourself with the:
  - SADC Rural Broadband Guidelines & Recommendations (April 2018) or subsequent updates;
  - SADC ICT and Broadcasting Infrastructure Sharing Guidelines (February 2016);
  - Your National Broadband Plan; and
  - Any other SADC or national documents that may have an impact on the scope of the gap analysis
- Understand the methodology: read Section 3, the Appendixes and the defined terms in Section 1.5
- Check that all the recommended actions in Section 4 have been implemented.

If you have any questions that your colleagues are unable to answer, please contact the CRASA Secretariat or your peers at the other NRAs.

[1] Throughout the document, the organisation is referred to as the NRA but it may be the USF or another public body in your country.

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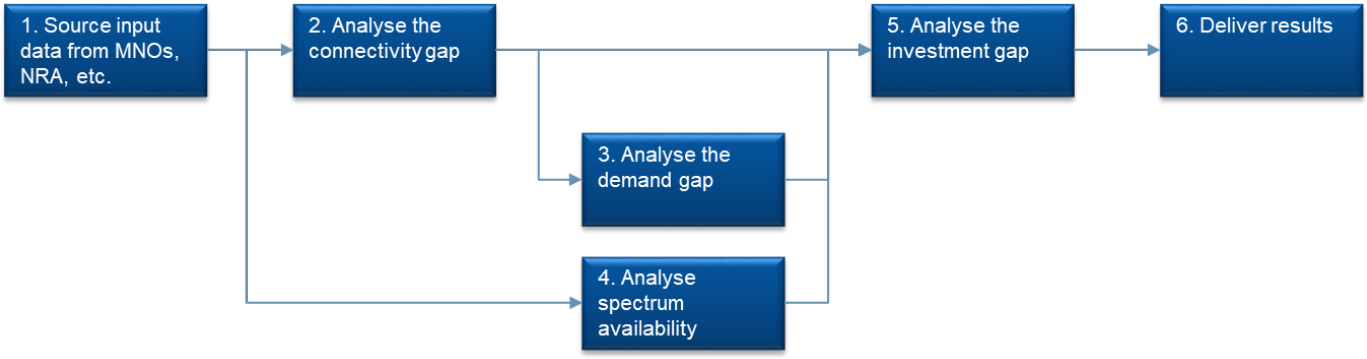
3. Methodology

3.1 Overview

Exhibit 2: Key steps in the process



The process to be conducted by the NRA in each country consists of six (6) key steps as shown in Exhibit 2 above. Each step is described in this Section in terms of its tasks, inputs and outputs. The frequency of the process is discussed in Section 4 (Implementation).

This methodology assumes that mobile networks are the primary broadband service provider in the country. The gap analysis does not consider fixed or satellite network service delivery other than for backhaul.

3.2 Source the Input Data

The first Step is to source all the input data required for the gap analysis. The person responsible for collecting the data should:

- Ensure that their sources understand the overall objectives, process and timing; see also Section 4 (Implementation) regarding the involvement of MNOs in the overall process;
- Keep note of the contact details for future reference; and
- Retain a copy of all correspondence (e-mail, phone calls, etc.).

It is important to validate all input data. The main checks are:

- *Completeness*: if data is unavailable, is there an alternative source or can it be extrapolated or interpolated from other data?
- *Reasonableness*: are there benchmarks with which the data can be compared, in particular from other SADC Members?
- *Consistency*: with data from previous years (back to 2014).

There are two (2) tasks that should be undertaken in parallel as shown in Exhibit 3.

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Exhibit 3: Step 1 – Source the input data

Task No.	Description	Inputs	Outputs
1.1	Source, validate and blend input data from MNOs for mobile broadband subscriber numbers, average prices, network coverage, unit costs, etc. (see Note 1 below)	Template 1 (see Appendix A Exhibit 13)	Template 1 (completed)
1.2	Source and validate other input data such as population, population density, spectrum tables, etc.	Template 2 (see Appendix A Exhibit 14)	Template 2 (completed)

Notes to Exhibit 3:

1) The "blending" of MNO-sourced data is discussed in each of the relevant following Steps/Tasks.

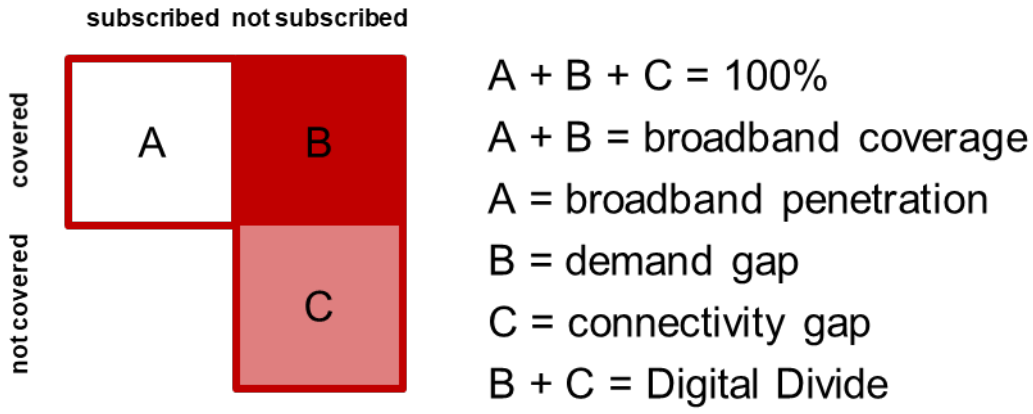
3.3 Analyse the Connectivity Gap

The purpose of analysing the connectivity gap is to quantify the problem and assess how the lack of infrastructure is contributing to the digital divide.

The objectives of Step 2 are (see Exhibit 4 and Exhibit 5):

- Estimate the population, etc.[2] covered by mobile broadband service, i.e., the broadband coverage, and compare with the SADC connectivity targets (as applicable)
- Estimate the populations covered by 2G only and without any coverage; these are intermediate outputs required for inputs to Step 4; add the two together to estimate the population with no mobile broadband coverage, i.e., the connectivity gap.

Exhibit 4: Step 2 is to calculate broadband coverage (A+B) and the connectivity gap (C)



[2] Etc. = any other facilities such as schools, health clinics, public-sector offices included in the SADC connectivity targets.

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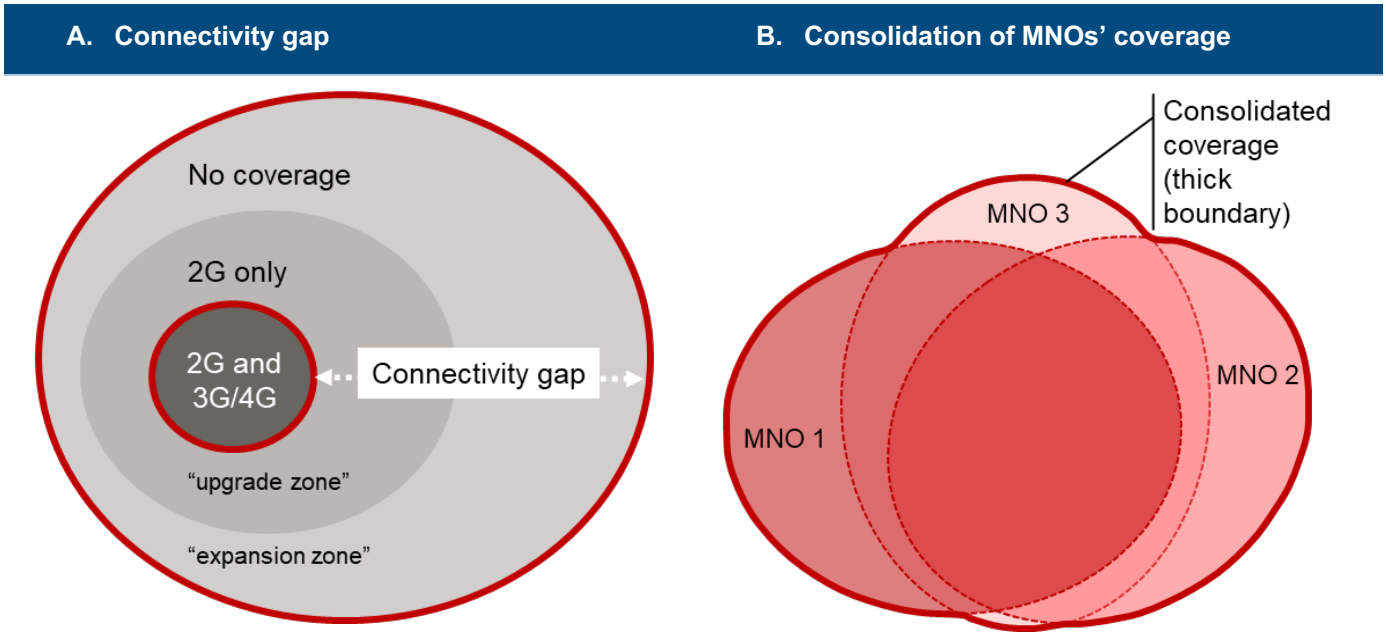
Exhibit 5: Estimating the connectivity gap by consolidating the MNOs' coverage



The connectivity gap consists of two (2) "zones" (see Exhibit 5A):

- An area where there is only 2G coverage, referred to in these Guidelines as the "upgrade zone" because there is existing passive infrastructure, but the active equipment does not provide mobile broadband service; the active equipment may need to be swapped out or upgraded to support mobile broadband (dependent on the existing installed equipment)
- The area where there is no mobile coverage whatsoever is referred to as the "expansion zone" in these Guidelines; new sites will need to be built to provide mobile broadband service.

The broadband coverage should be a consolidated "industry view" derived from overlaying the coverage of all MNOs, i.e., some areas will not be covered by all MNOs as shown in Exhibit 5B.

If one MNO's coverage exceeds all others, the estimated population coverage could be sourced from that MNO alone. In all likelihood this will not be the case and the NRA must estimate the consolidated industry coverage using one of the three methods described in Appendix B.

The NRA should also consider drive-testing to ensure that the predicted coverage is reasonable: either by conducting its own independent survey or reviewing the MNOs' drive test results.

As the population density maps used to estimate the coverage will be for the total population, the coverage estimates will need to be adjusted according to the age distribution to calculate the proportion of the addressable market.

The tasks to analyse the connectivity gap are shown in Exhibit 6.

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Exhibit 6: Step 2 – Analyse the connectivity gap

Task No.	Description	Inputs	Outputs
2.1	Identify the geographical area and estimate the population, etc. (see Note 1 below): • Covered by mobile broadband service • Covered by 2G only • With no coverage	Templates 1 and 2 (completed) from Tasks 1.1 and 1.2	• Population density and coverage maps • Broadband coverage (numbers and %s) • Population, etc. covered by 2G only (numbers and %s) • Population, etc. with no broadband coverage (numbers and %s) • Connectivity gap (numbers and %s)
2.2	Extract the GSMA infrastructure enabler, dimension and indicator scores (see Appendixes A and E)	Template 2 (completed) from Task 1.2	• Infrastructure Index
2.3	Identify if any regulatory changes are required at the national or local level to facilitate site build in the expansion zone		• Action plan to facilitate site roll-out

Notes to Exhibit 6:

1) It may also be necessary to check whether any SADC connectivity targets are covered by fixed broadband access only. The methodology for conducting fixed broadband connectivity analysis is not within the scope of this document – see additional Supplement.

3.4 Analyse the Demand Gap

The purpose of analysing the demand gap is to quantify the problem and develop a programme to mitigate its drivers such as affordability, digital literacy and local content availability.

The objectives of Step 3 are:

- Estimate the demand gap (by subtracting the broadband penetration from the broadband coverage – see Exhibit 7), and compare with the SADC demand targets (as applicable)
- Analyse the factors contributing to the demand gap, compare with the SADC demand targets (as applicable) and develop/update the programme to mitigate them.

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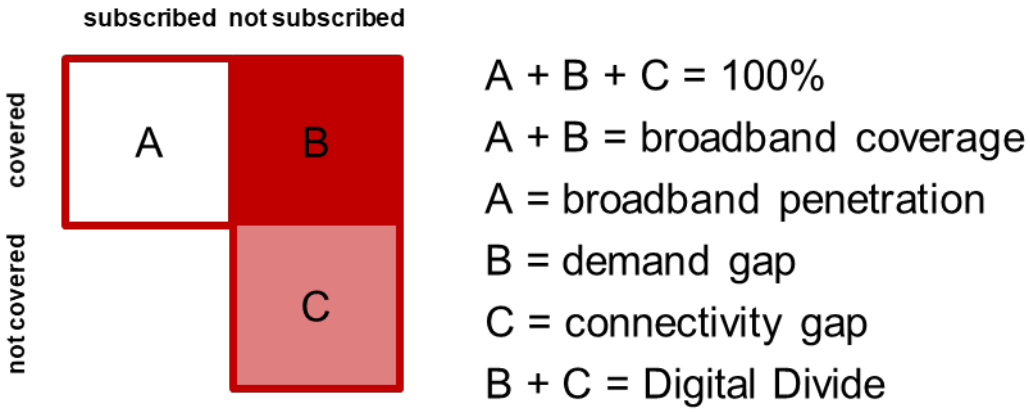
Exhibit 7: Step 3 is to calculate the demand gap (B) and analyse its drivers



There is considerable material available from organisations such as the International Telecommunications Union (ITU), United Nations (UN) Broadband Commission, GSMA, Alliance for Affordable Internet (A4AI), etc. regarding the factors contributing to the demand gap. The NRA needs to undertake a diagnostic project in order to develop the policies and implementation programme to mitigate the demand gap drivers, for example:

- Conduct a diagnostic to assess the profile of non-adopters (consumer and enterprise), mobile broadband price elasticity, availability of local content, etc.
- Develop demand stimulation policies and projects such as (list is not exhaustive):
  - Affordability:
    - Reducing taxation on mobile broadband devices and services; and
    - Subsidising service or devices for targeted consumer groups.
  - Digital literacy:
    - Changes to the formal education system;
    - Training for targeted consumer groups (e.g., unemployed, youth, low income, women, rural, elderly, disabled, etc.);
    - Training, mentoring and consultancy for enterprises;
    - Building community ICT centres; and
    - Creating awareness.
  - Local content:
    - Availability of social media platforms, e-Government services, e-Health services, financial services, etc. in local languages; and
    - Capacity building on content development in order to encourage quality productions and empower content developers on other necessary skills relating to their profession such as copyright issues, contracts, entrepreneurship.
- Plan the implementation programme including project interdependencies, phasing, milestones and expected benefits; this will be a key input to the investment gap analysis in Step 5.

The tasks to analyse the demand gap are shown in Exhibit 8.

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Exhibit 8: Step 3 – Analyse the demand gap

Task No.	Description	Inputs	Outputs
3.1	• Estimate the number of unique mobile broadband subscribers (see Note 1 below) and calculate the mobile broadband penetration as a % of the population (see Note 2 below) • Subtract mobile broadband penetration from the population to calculate the demand gap	• Template 1 (completed) from Task 1.1 • Broadband coverage from Task 2.1	• Broadband penetration (number and %) • Demand gap (number and %)
3.2	Extract affordability metrics for services and installation	Template 2 (completed) from Task 1.2	• Affordability (price as % of GNI per capita at PPP)
3.3	Extract the GSMA affordability, consumer readiness and local content (enabler, dimension and indicator) scores (see Appendixes A and E)	Template 2 (completed) from Task 1.2	• Affordability index • Consumer readiness index • Local content index
3.4	Analyse the demand gap drivers and develop/update programme to mitigate them	• Outputs from Tasks 3.1 to 3.3 • Adoption and pricing forecasts from Task 5.3 (see Note 3 below)	Programme to close the demand gap

Notes to Exhibit 8:

1) "Unique mobile broadband subscriber" throughout this document refers to an individual person that can account for multiple mobile broadband connections (i.e. activated SIM cards with a 3G/4G subscription). See Appendix A for guidance on how to estimate.
2) "Population" throughout this document always refers to the "addressable market" which excludes children up to a certain age; see Section 4 (Implementation) regarding the recommended age.
3) The infrastructure investment gap analysis includes a forecast for adoption and pricing (see Appendix D.2.3). This will be partly due to price competition but will also be dependent on the activities planned under this Task, i.e. there is an interdependency between these two (2) Tasks.

3.5 Analyse Spectrum Availability

The purpose of the spectrum analysis is to identify and remove any spectrum-related barriers that might increase costs or delay the MNOs from closing the connectivity or demand gaps.

The objectives of Step 4 are to:

- Ensure that the spectrum roadmap[3] exists and is up-to-date and that all necessary actions to implement it have been identified and planned; and

[3] The Bibliography contains examples from Australia [3], New Zealand [5], South Africa [4] and the UK [6].

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- Identify when the Digital Dividend (DD) spectrum is likely to be available to MNOs and whether any MNO is disadvantaged in terms of sub-1 GHz spectrum.

The main Task is to prepare or, if it exists, update the spectrum roadmap; this should be done using a public consultation process to ensure that the MNOs and other industry stakeholders are fully involved. The roadmap should:

- Cover at least the next five (5) years;
- Be reviewed on a regular basis (in line with the other Steps in this process – see Section 4 (Implementation));
- Include the status of the existing (interference-free) IMT spectrum assignment per MNO (see Appendix C);
- Take account of the status of harmonised bands for IMT in the African region in accordance with the ITU Radio Regulations;
- Forecast mobile data demand to establish how much spectrum will be needed for what purpose (coverage or capacity), when and by whom, taking account of the existing assignments and licence expiry;
- Consider the equipment and device ecosystems of different frequency bands;
- Allow sufficient time to assign future spectrum taking into account the need for licensing, spectrum clearance, cross-border frequency co-ordination, etc; and
- Include the action plan to allot and assign future IMT spectrum including all enabling activities such as licensing, clearing, etc. and, if required, changes to existing policies, regulations or licences; the latter might necessitate the review of licence durations, licence award/renewal process, spectrum sharing, spectrum trading, etc.

Exhibit 9: Step 4 – Analyse spectrum availability

Task No.	Description	Inputs	Outputs
4.1	Prepare or, if it exists, update the spectrum roadmap	Template 2 (completed) from Task 1.2	Spectrum roadmap (as described above)
4.2	Extract the GSMA spectrum dimension and indicator scores (see Appendixes A and E)	Template 2 (completed) from Task 1.2	Spectrum index

3.6 Analyse the Investment Gap

The objective of Step 5 is to analyse the investment gap based on the coverage gap, demand gap and spectrum analyses and the blended network unit costs from the MNOs.

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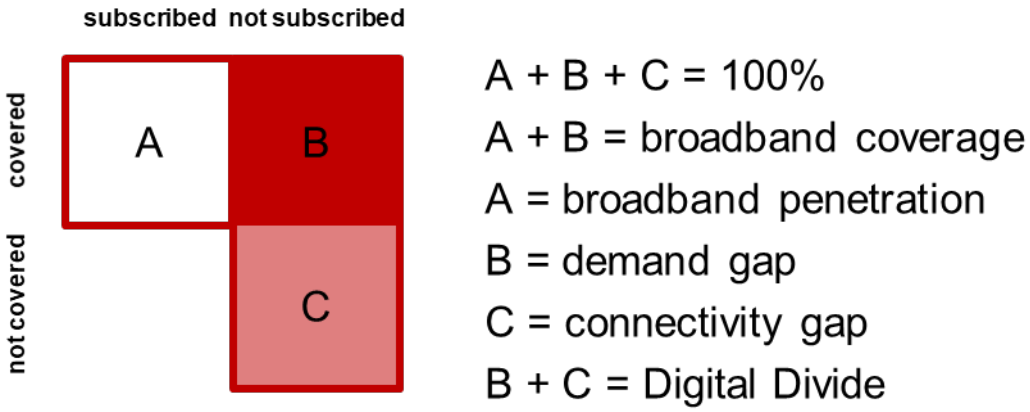
Exhibit 10: Step 5 is to calculate the investment needed to close the demand (B) and connectivity (C) gaps



With input from the MNOs and the appropriate government departments, the analysis should consider the range of options that will enable the MNOs to close the investment gap, for example:

- Different forms of infrastructure sharing[4];
- Availability of the Digital Dividend spectrum (see Task 4.1);
- Funding from the Universal Service Fund (USF) (directly or by waiving contributions);
- Fiscal changes to industry-specific duties or taxes[5]; and
- Regulatory changes to facilitate site roll-out (see Task 2.3).

Having considered the above options, a limited set of scenarios (typically about five) should be defined and analysed using the methodology described in Appendix D.

Note that Appendix D only provides detailed guidance on how to estimate the investment to close the connectivity gap but not on how to estimate the investment required to close the demand gap (due to affordability, digital literacy or local content); the latter depends specifically on the scope of the programme defined in Task 3.4.

Exhibit 11: Step 5 – Analyse the investment gap

Task No.	Description	Inputs	Outputs
5.1	Define the scenarios to be analysed and set the key assumptions (see Appendix D.2.1)		• Scenario definitions • Key assumptions
5.2	Estimate the network infrastructure CapEx and OpEx (see Appendix D.2.2)	• Connectivity gap (numbers and %s) from Task 2.1 • Template 1 (completed) from Task 1.2	Network infrastructure CapEx and OpEx for infrastructure sharing scenarios to close the connectivity gap

[4] Refer to the SADC ICT and Broadcasting Infrastructure Sharing Guidelines (Feb. 2016) [7] for full details on sharing options and the NRA's role.

[5] Headline reductions in industry-specific duties or taxes have been shown to provide a net fiscal benefit to the Government over time due to the increased population coverage and penetration resulting from closing the digital divide.

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Task No.	Description	Inputs	Outputs
		• Spectrum roadmap from Task 4.1	
5.3	Calculate the incremental revenue (see Appendix D.2.3)	• Population covered by 2G only (numbers and %s) from Task 2.1 • Population with no coverage (numbers and %s) from Task 2.1 • Template 1 (completed) from Task 1.1 • Template 2 (completed) from Task 1.2	Incremental revenue from closing the connectivity gap
5.4	Calculate the NPV and sensitivities (see Appendix D.2.4)	Network infrastructure CapEx and OpEx from Task 5.2 Incremental revenue from Task 5.3	NPV and sensitivity analysis for scenarios to close the connectivity gap
5.5	Calculate the impact on the economy and Government of fiscal changes, if applicable – see Appendix D.2.5	• GDP • Fiscal income	• Economic impact on GDP • Fiscal impact
5.6	Calculate the annual investment required to close the demand gap	Programme to close the demand gap from Task 3.4	Annual investment required to close the demand gap

3.7 Deliver Results

The objectives of Step 6 are to collate the results from Steps 2-5 in the Mobile Broadband Gap Analysis Report; review the report internally and with industry stakeholders; and, submit the report to CRASA.

During the internal review process, it is highly recommended that the report is reviewed in a workshop with the MNOs and other industry stakeholders to discuss topics such as policy changes, regulatory changes, USF support, etc. and agree actions that will help close the broadband gap. A summary of the proposed changes and actions should be included in the commentary sections of the report.

Exhibit 12: Step 6 – Deliver results

Task No.	Description	Inputs	Outputs
6.1	Prepare the draft report using the format/template agreed by CRASA (see Section 4 and Appendix E)	Key Indicators from Steps 2-5	Mobile Broadband Gap Analysis Report (draft)
6.2	Review/approve the report internally and with MNOs and other industry stakeholders	Mobile Broadband Gap Analysis Report (draft)	Mobile Broadband Gap Analysis Report (final)
6.3	Submit report to CRASA Secretariat for consolidation and review by the SADC ICT Ministers.	Mobile Broadband Gap Analysis Report (final)	Consolidated report for SADC ICT Ministers

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4. Implementation

At the CRASA meeting of the Universal Access and Service Committee (UASC) on 18-19 Feb. 2019, the following were agreed (Resolution UASC/2/18.19/3):

- The addressable market is the population **aged six (6) years and older;**
- The NPV calculation for the investment gap should be based on a **ten (10) year period;**
- The report format to be used is described in Appendix E**;**
- The annual reporting cycle will be:
  - CRASA Members to submit the Mobile Broadband Gap Analysis Report to CRASA Secretariat by 30th October of each year
  - CRASA UASC to validate the consolidated report by 15th February of each year
  - Submit the consolidated report to CRASA Annual General Meeting (AGM) and SADC ICT Ministers

There are several implementation activities that need to take place in each country before the first report can be produced. The body responsible for undertaking the gap analysis should:

- Identify/brief their manager(s) and staff responsible for undertaking the gap analysis;
- Meet the MNOs to:
  - Gain their support for the gap analysis work;
  - Discuss the process and agree the schedule for how/when they will be involved;
  - Review and finalise the input template (Template 1);
  - Agree the methodology for estimating coverage (Appendix B) and the need/responsibility for drive testing;
  - Discuss the methodology for estimating the number of unique mobile broadband subscribers (Appendix A); and
  - Set up points of contact.
- Establish the baselines and sources for the SADC connectivity targets.

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[7] CRASA and ITU, “SADC ICT and Broadcasting Infrastructure Sharing Guidelines,” Feb 2016. [Online]. Available: http://www.crasa.org/common_up/crasa-setup/13-05-2016_Infrastructure%20Sharing%20Guidelines.pdf. [Accessed Jul 2018].

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Appendix A: Input Templates

This Appendix describes the input templates included in the Microsoft Excel files SADC_MBB_gap_analysis_Template_1_v003.xls and SADC_MBB_gap_analysis_Template_2_v003.xls.

NRAs may already collect some of this data for their own purposes or for submission to the ITU.

All data should be for calendar year-ends starting with 2014 except for network infrastructure unit costs which should be current.

Exhibit 13: Template 1 to be completed by each MNO

Metric	Attribute	Source	Input to Step
Coverage maps (if agreed – see Appendix B)	• 2G • 3G • 4G	MNOs	2.1
Population coverage (%)	• 2G • 3G • 4G	MNOs	2.1
Subscribers (#)	• 2G excluding machine-only • 3G/4G excluding machine-only	MNOs	3.1
Weighted average cost of capital (WACC)		MNOs	5.1
Network unit costs (USD)	• CapEx • OpEx • See template for details	MNOs	5.2
Average price (local currency units and USD)	• Per minute (2G) • Per MB (3G/4G)	MNOs	5.3

Exhibit 14: Template 2 for other sources

Metric	Attribute	Source	Input to Step
Terrain and clutter datasets (if required – see Appendix B)		Commercial suppliers	2.1

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Metric	Attribute	Source	Input to Step
Population (#)	• Total Population – Both Sexes • Medium variant projections	UN	2.1 & 3.1
Addressable market (#)	• Population by Age Groups – Both Sexes • ≥ x years old, where x is the agreed definition (see Section 4) • Medium variant projections	UN	2.1 & 3.1
Population distribution dataset	Density per km	WorldPop	2.1
Infrastructure index	• Enabler scores • Dimension scores • Indicator scores	GSMA Mobile Connectivity Index	2.2
Unique broadband subscribers (see Note 1 below)	Individuals using the Internet (HH7)	ITU ICT-Eye	3.1
Affordability: mobile broadband price as % GNI per capita at PPP	• 500 MB • 1 GB	ITU[6]	3.2
Affordability, consumer readiness and local content indices	• Enabler scores • Dimension scores • Indicator scores	GSMA Mobile Connectivity Index	3.3
Spectrum allocated to national MNOs		NRA: National Table of Frequency Allocations (NTFA)	4.1

[6] From 2017 the ICT Prices report is a separate publication from the Measuring the Information Society Report. The metric can be found in both reports.

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Metric	Attribute	Source	Input to Step
Spectrum availability	• Spectrum dimension and indicator scores	GSMA Mobile Connectivity Index	4.2

Note to Exhibit 14:

1) There are two methods to estimate the number of unique mobile broadband subscribers in Task 3.1:

   - Conduct primary research to collect data on the number of 2G subscriptions and 3G/4G subscriptions per individual (regardless of who pays for them)
   - Until survey data is available, use the ITU indicator (HH7) for % of individuals using the Internet and use an assumption to reduce for those accessing the Internet from fixed broadband only.

   For either method:

   - Check that the estimate is less than the combined total of mobile broadband subscriptions reported by the MNOs using Template 1 (Exhibit 13)
   - Benchmark the estimate with your SADC peers allowing for factors such as GDP (at PPP), fixed broadband penetration, mobile broadband penetration, etc.

Exhibit 15: Template 1 and 2 examples (next four pages)

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SADC Mobile Broadband Gap Analysis | General | Template 1

Company name	xxx
Contact name	xxx
Contact title	xxx
Contact number	xxx
Contact e-mail	xxx
Reporting year	2017
WACC (%)	10.3%

Example

SADC Mobile Broadband Gap Analysis | Demand | Template 1

		2014	2015	2016	2017	2018	2019	2020	Notes
Population									
Total population	Millions	85.2	85.2	85.2					
Population coverage									
2G	%	50.1%	50.1%	50.1					
3G	%	50.1%	50.1%	50.1					
4G	%	50.1%	50.1%	50.1					
Subscribers									
Voice only (2G)	Millions	10.1	10.1	10.1					
Mobile broadband (3G/4G)	Millions	2.1		2.1					
Prices									
Average price (2G)	USD/min								
Average price (3G/4G)	USD/MB								

Example

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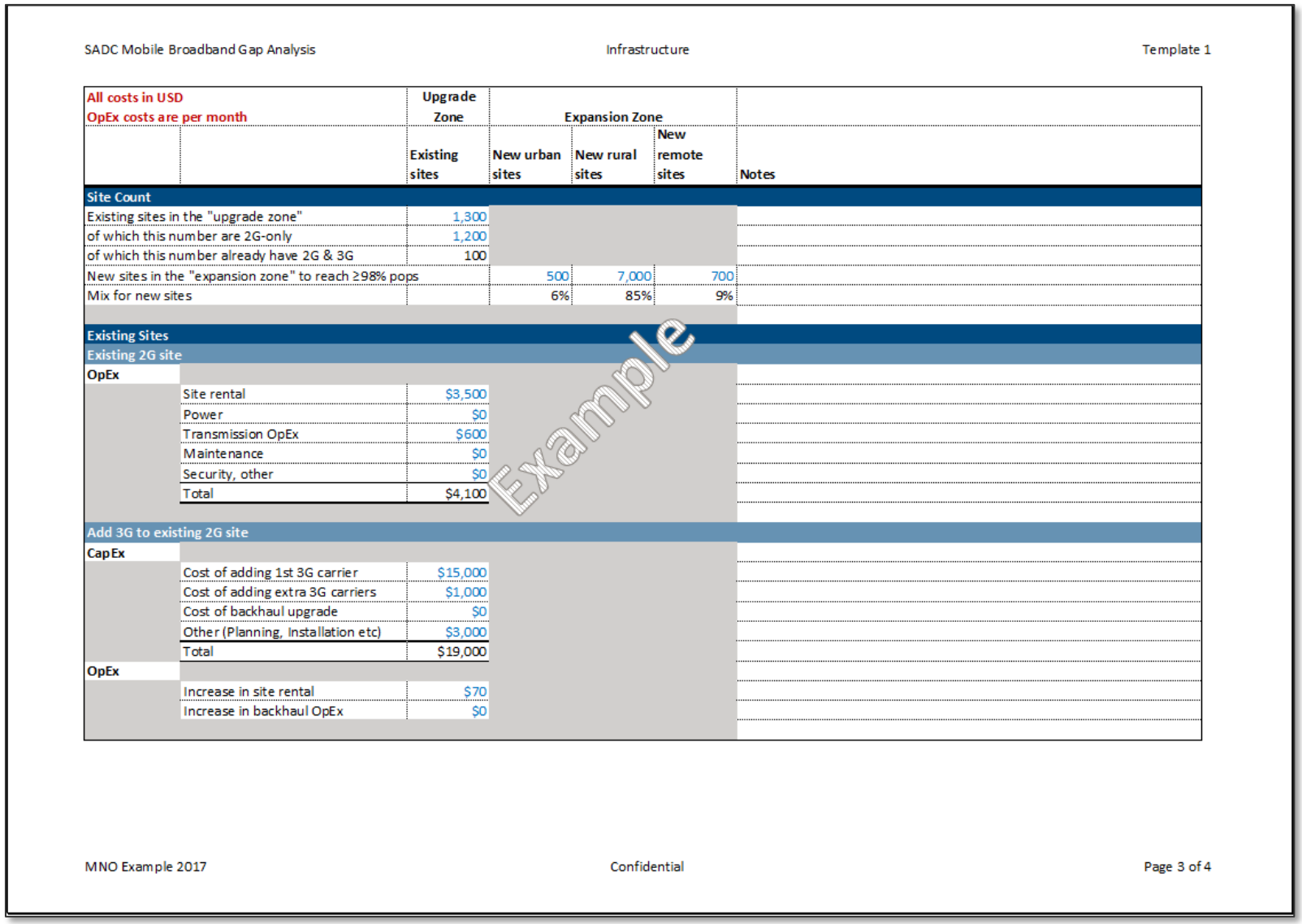

SADC Mobile Broadband Gap Analysis | Infrastructure | Template 1

All costs in USD OpEx costs are per month		Upgrade Zone	Expansion Zone			
		Existing sites	New urban sites	New rural sites	New remote sites	Notes
Site Count						
Existing sites in the "upgrade zone"		1,300				
of which this number are 2G-only		1,200				
of which this number already have 2G & 3G		100				
New sites in the "expansion zone" to reach ≥98% pops			500	7,000	700	
Mix for new sites			6%	85%	9%	
Existing Sites						
Existing 2G site						
OpEx						
	Site rental	$3,500				
	Power	$0				
	Transmission OpEx	$600				
	Maintenance	$0				
	Security, other	$0				
	Total	$4,100				
Add 3G to existing 2G site						
CapEx						
	Cost of adding 1st 3G carrier	$15,000				
	Cost of adding extra 3G carriers	$1,000				
	Cost of backhaul upgrade	$0				
	Other (Planning, Installation etc)	$3,000				
	Total	$19,000				
OpEx						
	Increase in site rental	$70				
	Increase in backhaul OpEx	$0				

Example

MNO Example 2017 | Confidential | Page 3 of 4

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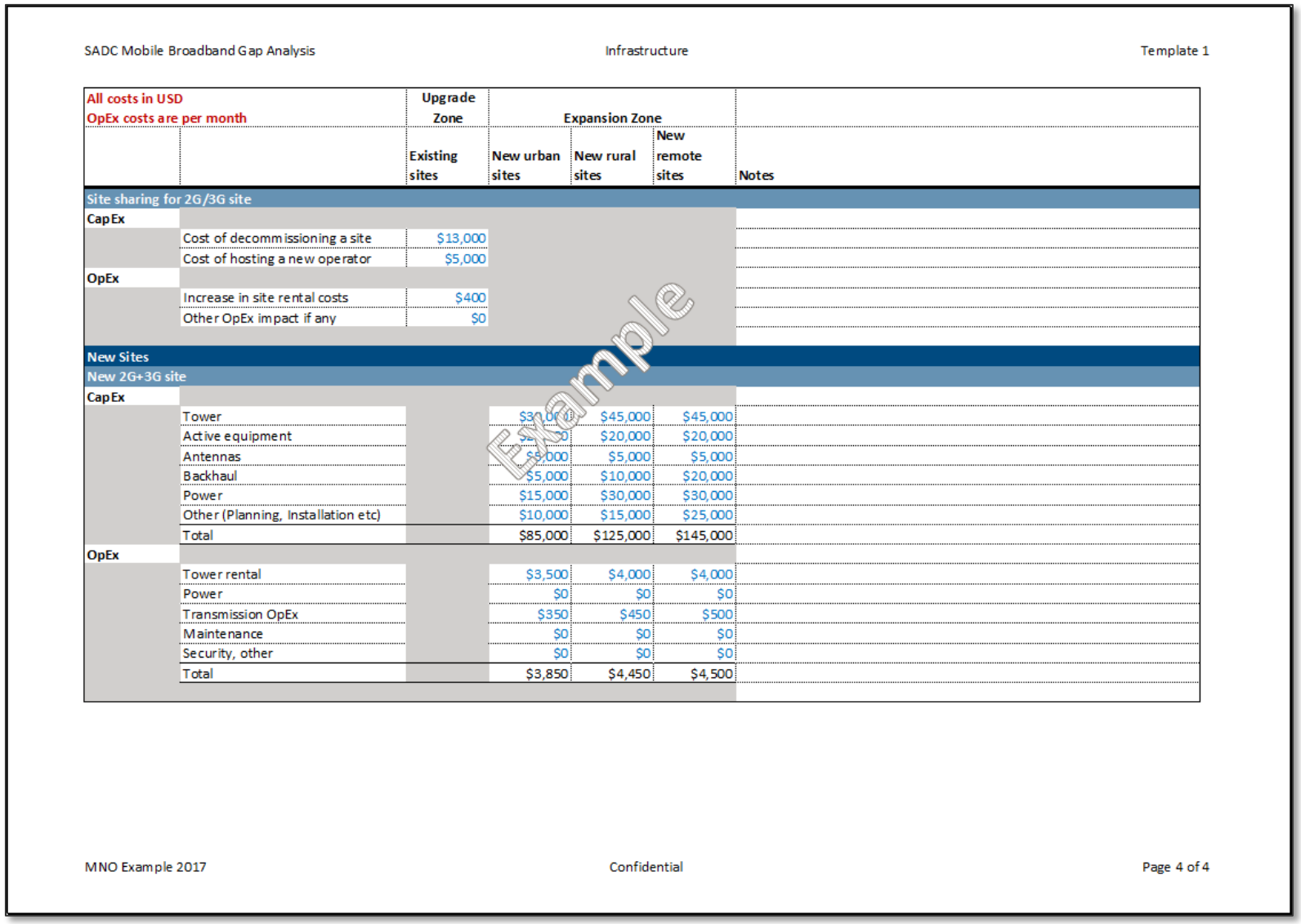

SADC Mobile Broadband Gap Analysis | Infrastructure | Template 1

All costs in USD OpEx costs are per month		Upgrade Zone	Expansion Zone			
		Existing sites	New urban sites	New rural sites	New remote sites	Notes
Site sharing for 2G/3G site						
CapEx						
	Cost of decommissioning a site	$13,000				
	Cost of hosting a new operator	$5,000				
OpEx						
	Increase in site rental costs	$400				
	Other OpEx impact if any	$0				
New Sites						
New 2G+3G site						
CapEx						
	Tower		$30,000	$45,000	$45,000	
	Active equipment		$0	$20,000	$20,000	
	Antennas		$5,000	$5,000	$5,000	
	Backhaul		$5,000	$10,000	$20,000	
	Power		$15,000	$30,000	$30,000	
	Other (Planning, Installation etc)		$10,000	$15,000	$25,000	
	Total		$85,000	$125,000	$145,000	
OpEx						
	Tower rental		$3,500	$4,000	$4,000	
	Power		$0	$0	$0	
	Transmission OpEx		$350	$450	$500	
	Maintenance		$0	$0	$0	
	Security, other		$0	$0	$0	
	Total		$3,850	$4,450	$4,500	

Example

MNO Example 2017 | Confidential | Page 4 of 4

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SADC Mobile Broadband Gap Analysis — UN — Template 2

Metric	Units	2010	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2030	Source
Total Population - Both Sexes	thousands	2,015	2,169	2,209	2,250	2,292	2,333	2,375	2,416	2,456	2,497	2,536	2,576	2,614	2,653	2,690	2,800	World Population Prospects: 2017 Revision
Total Population - Age 15+	thousands	1,350		1,507					1,674					1,852			2,047	World Population Prospects: 2017 Revision
As % of total pop	%	67%		68%					69%					71%			73%	Calculated

Example

SADC Mobile Broadband Gap Analysis — ITU — Template 2

Metric	Units	2014	2015	2016	2017	2018	2019	2020	Source
Mobile broadband price 500 MB (% GNI per capita)	%	5.8%	5.5%	5.1%					ITU Measuring the Information Society Report 2017 Vol. 2 or ICT Prices 2017
Mobile broadband price 1 GB (% GNI per capita)	%	11.6%	11.0%	11.5%					ITU Measuring the Information Society Report 2017 Vol. 2 or ICT Prices 2017

Example

SADC Mobile Broadband Gap Analysis — GSMA Index — Template 2

Metric	2014	2015	2016	2017	2018	2019	2020	Source
Infrastructure enabler score	12.4	15.6	19.8					GSMA Mobile Connectivity Index
Affordability enabler score	18.6	17.5	18.3					GSMA Mobile Connectivity Index
Consumer readiness enabler score	45.1	45.7	46.6					GSMA Mobile Connectivity Index
Local content enabler score	4.2	5.1	5.8					GSMA Mobile Connectivity Index
Spectrum dimension score	14.3	14.3	17.9					GSMA Mobile Connectivity Index

Example

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Appendix B: Consolidated Industry Coverage Estimation

This Appendix describes three methods to estimate the industry geographical and population coverage by consolidating the coverage of the individual MNOs.

All three methods require:

- A Geographical Information System (GIS); common examples include free open source software, such as QGIS, and commercial software, such as Esri's ArcGIS
- Population distribution sourced from WorldPop or similar
- Someone experienced in using a GIS.

The second method also requires a radio planning tool and an experienced radio planning engineer.

B.1 Consolidating Coverage Maps Sourced from the MNOs

The first method is to import coverage maps prepared by each of the MNOs using their own radio planning tools into the GIS. The NRA may then calculate the population coverage based on the consolidated coverage maps of the MNOs.

B.2 Consolidating the MNOs' Site Databases; Sourcing Terrain and Clutter Databases; and Using a Radio Planning Tool

In the second method, the NRA estimates the consolidated coverage using its own radio planning tool and then imports it to the GIS.

Tasks include:

- Merge cell site databases from MNOs
- Source terrain and clutter databases
- Calibrate the radio planning tool and generate the coverage map
- Import the coverage map from the radio planning tool into the GIS and calculate the population coverage.

B.3 Consolidating the MNOs' Site Databases and Assuming Average Cell Site Radii

The third method is to calculate approximate coverage based on average cell site radii. This is quite a rough estimate compared to the first two methods but should yield a reasonable result for the purpose of the gap analysis. If used, the assumptions[7] and average radii should be reviewed with the MNOs.

Suggested cell radii and areas dependent on land type and spectrum are shown in Exhibit 16 and Exhibit 17.

[7] See file "Link Budgets for SADC Broadband Gap Analysis Guidelines.xls".

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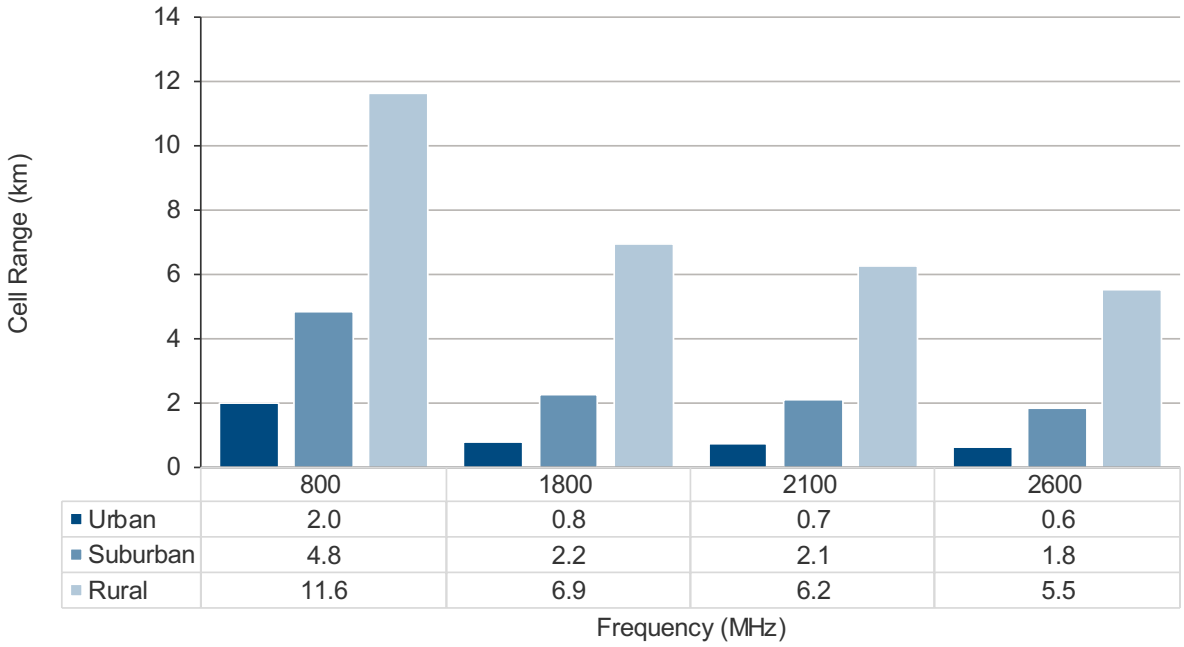
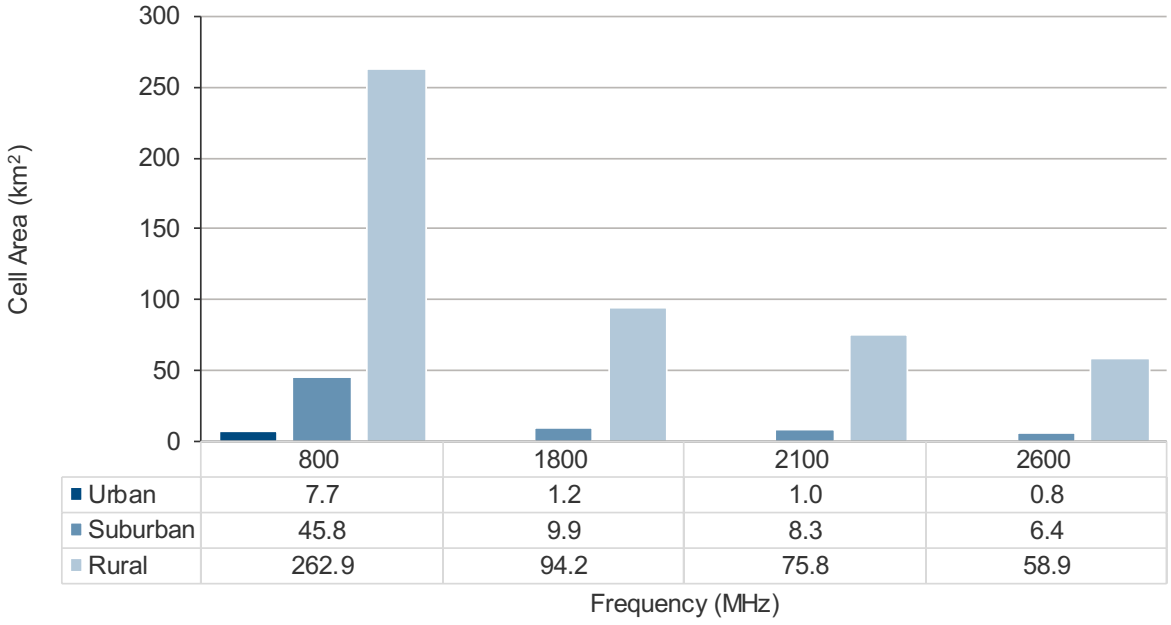
Exhibit 16: Average cell site radii



Source: Coleago

Exhibit 17: Average cell site areas



Source: Coleago

Tasks include:

- Merge cell site databases from MNOs; if necessary, remove overlapping cell sites by calculating the distance from the nearest cell site and, where cell sites are within 25% of the above radii, removing all but one
- Import the merged cell site database into the GIS and calculate the population coverage.

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Appendix C: **Spectrum Analysis Example**

A spectrum analysis example is shown in Exhibit 25 below. The table sets out the spectrum allocated in each band to each MNO and then summarises it according to whether it is DD, other sub-1 GHz or 1-3 GHz. Averages are calculated for the largest MNOs to identify if any MNO is disadvantaged.

Exhibit 18: Spectrum analysis example

SADC Broadband Gap Analysis — Spectrum

MNO	Size	PGSM 900 Uplink	PGSM 900 Downlink	PGSM 900 MHz (Duplex)	PGSM 900	DCS 1800 Uplink	DCS 1800 Downlink	DCS 1800 MHz (Duplex)	DCS 1800	UMTS 2100 Uplink	UMTS 2100 Downlink	UMTS 2100 MHz (Duplex)	UMTS 2100
Africell	Small	890.2-894.2	935.2-939.2	4									
Airtel	Large	902.6-908.6	947.6-953.6	6		1710.2-1722.2	1805.2-18	12		1940-1950	2130-2140	10	
Orange	Large	908.8-914.8	953.8-959.8	6		1761-1773	1856-1	12		1920-1930	2110-2120	10	
SCPT	Small												
Sematel	Small												
Standard	Small												
Tigo	Large	894.2-896.2	939.2-941.2	2		1728-1740	1823-1835	12		1930-1940	2120-2130	10	
Vodacom	Large	896.4-902.4	941.4-957.4	6		1755-1773.85	1850-1856 1868-1880	18		1950-1960	2140-2150	10	
Yozma	Small												
YTT	Small					1710.2-1728 1740-1742.2	1930-1940 1835-1837.2	12		1970-1980	2160-2170	10	
Total				24				66				50	
Total	Large												
Total	Small												
Total													
Average	Large												
Summary													
Legend													

Example

Democratic Republic of Congo — Confidential — Page 2 of 3

SADC Broadband Gap Analysis — Spectrum

MNO	Size	DD MHz	Other sub-1 GHz	1-3 GHz
Africell	Small	0	4	0
Airtel	Large	0	6	22
Orange	Large	0	6	22
SCPT	Small	5	0	0
Sematel	Small	0	5	0
Standard	Small	6	0	0
Tigo	Large	0	6	22
Vodacom	Large	0	6	28
Yozma	Small	0	1	0
YTT	Small	0	0	22
Total		11	34	116
Total	Large	0	24	94
Total	Small	11	10	22
Total		11	34	116
Average	Large	0	6	23.5
Summary		No large MNOs have any DD spectrum. No large MNO is disadvantaged in sub-1 GHz spectrum. One large MNO has an advantage in the 1-3 GHz spectrum.		
Legend		Below average		22.5
		Average		23.5
		Above average		24.5

Example

Democratic Republic of Congo — Confidential — Page 3 of 3

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Appendix D: **Investment Gap Estimation**

D.1 Introduction

D.1.1 What is the Investment Gap?

The investment gap is the investment required to close the connectivity gap and the demand gap. As noted in Section 3.6, the approach described in this Appendix only address the former.

The investment required to close the connectivity gap is calculated as the 10-year NPV of the industry net cash flow from extending broadband coverage to achieve the SADC connectivity targets.

Note that the analysis is conducted at the industry level rather than the MNO level. The latter would be considerably more complicated, not conducive to constructive input from the MNOs and more likely to be challenged. The industry-level analysis is sufficient to assess the size of the problem and determine policy decisions. The MNOs will need to develop their own, more detailed, business plans in private.

D.1.2 What is the Net Present Value (NPV)?

Projects consist of a sequence of cash outflows followed by a sequence of cash inflows. The “time value of money” concept reflects the principle that cash received today is worth more than the same amount of cash received in a year’s time. Thus, this sequence of cash outflows and inflows should not simply be added to find the project value. Instead, discounted cash flow (DCF) analysis is used to calculate the equivalent values at time 0 of each of the future cash flows.

A discount rate is needed to discount the cash flows. It should be the industry weighted average cost of capital (WACC). If the NRA has undertaken other recent cost analyses, then it has probably been through a process to determine a reasonable WACC to use. If not, a WACC should be chosen based on input from the MNOs.

The result of the DCF analysis is called the net present value or NPV. If the NPV is positive, then the project should be worth undertaking.

In the case of the connectivity gap, if the NPV is positive, then the MNOs should be willing to upgrade the 2G-only zone and roll out new 3G/4G sites in the expansion zone without government intervention. If the NPV is negative, then the government will need to act to turn it positive. The two main options are to use the universal service fund (USF) or to make fiscal changes.

D.1.3 Why Net Cash Flow?

Why evaluate the net cash flow and not just calculate the capital expenditure? Like all businesses, MNOs decide whether to roll out a new service (such as mobile broadband) or expand coverage based on the net cash flows over a period, i.e. the NPV described above.

Compared to urban areas, the rural areas that mostly constitute the connectivity gap are typically characterised by:

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- Low income levels that make broadband difficult for many people to afford, which either reduces take-up or requires MNOs to reduce prices; the net result is low revenue per cell site
- Poor infrastructure (such as roads to access the cell sites, electricity to power the network equipment, or fixed network infrastructure for backhaul) increases implementation and operational costs
- Difficult terrain and long distances increase backhaul costs due to the need for multiple microwave hops or satellite
- Low population density increases the capital and operating costs to serve each customer.

The combination of lower revenue and higher capital/operating expenses means that most MNOs reach a point in their network coverage roll-out where the NPV turns negative, i.e. the revenues will never exceed the costs when discounted to a present value. The location of this boundary varies between countries as it depends on the factors described above.

D.2 Step-by-Step Guide to Calculating the Investment Gap

The overall approach to estimating the investment gap consists of:

- Estimating the network costs and incremental revenue for a small number of "scenarios"
- Calculating the difference between each scenario and a "baseline" of no broadband coverage expansion, i.e. "do nothing"
- Calculating the NPV of the net cash flows for each scenario.

There are many revenue and cost elements that do not need to be estimated as they will net to zero or a negligible amount (at the industry level) when the difference between the scenario and the baseline is calculated.

The main tasks (see Exhibit 11 on page 14) are described in the rest of this Section.

D.2.1 Task 5.1: define the scenarios and set the key assumptions

The NRA should work with the MNOs to identify the best options to close the investment gap. Define a small number of scenarios to evaluate these options. There will typically be about five, for example:

1) Mobile broadband rolled out to 80% population coverage, no infrastructure sharing in the expansion area, no USF support, no fiscal changes
2) As Scenario 1 but with passive infrastructure sharing
3) As Scenario 1 or 2 but with active (MORAN) infrastructure sharing
4) As Scenario 3 but with USF support
5) As Scenario 4 but with fiscal changes to industry-specific duties or taxes.

There are many variations on the above, but it is important to keep the number of scenarios small otherwise the Excel model will balloon in complexity and errors are more likely to creep in. For example:

- The infrastructure sharing could be in the expansion area only or also in the upgrade or legacy areas

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- If there are four or more MNOs, they might share one or two RANs
- Instead of MORAN there may be spectrum issues that make MOCN beneficial
- Roaming between the MNOs is another form of infrastructure sharing that might be worth considering for a few years
- Et cetera.

Having defined the scenarios in sufficient detail, clarify the key assumptions for each one. Note that the assumptions are country-specific and should not be harmonised across SADC.

They will typically need to include:

- Spectrum band(s) to be used for mobile broadband in the connectivity gap
- Implementation period and upgrade/build rates:
  - If not already in progress, allow sufficient time for roll-out to commence and to build up to its peak rate
  - Whether the site roll-out will continue at the peak build rate beyond 80% coverage
  - Assume that the same population coverage will be achieved regardless of the number of shared RANs, i.e. only network costs are impacted by sharing
  - Network equipment upgrades in the 2G-only zone may happen in parallel with the site build in the expansion zone and at a faster rate
  - It may not be realistic to achieve 80% coverage by 2020; this does not change the methodology but should be highlighted in the Gap Analysis Report against the SADC connectivity target
- Infrastructure sharing:
  - Number of shared RANs in each zone
  - % changes to unit costs for sharing
- WACC

D.2.2 Task 5.2: estimate the network infrastructure CapEx and OpEx

- Estimate the number of cell sites for the expansion zone
  - Calculate a “best-fit” site concentration curve for the existing number of mobile broadband coverage sites, the existing number of 2G-only coverage sites and the MNO’s forecasts for 99% coverage (see example in Exhibit 19)
  - Read off the number of sites required to reach 80% population coverage from the curve and check how it compares to the MNOs’ forecasts

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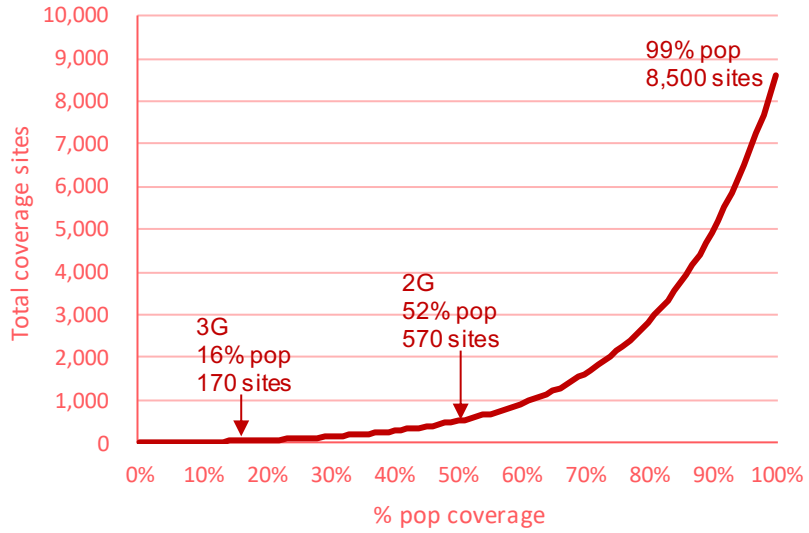
Exhibit 19: Site concentration curve - example



Source: GSMA

- Calculate the site upgrade/build quantities per calendar year
  - Using the implementation assumptions and site numbers
- Blend/validate the network unit costs
  - Blend the network unit costs received from the MNOs using Template 1; on an item by item basis, decide whether to use an average or the high or low figures; in some cases, it may be necessary to solicit input from elsewhere, for example, vendors or other SADC members
  - It is recommended to benchmark all blended unit costs against other SADC members to ensure they are realistic; note that they should not be harmonised because unit costs will vary between countries due to factors such as customs duty, market size, transportation costs, etc.
- Calculate the network CapEx and OpEx per year for each scenario using:
  - Site upgrade/build quantities
  - Blended network unit costs
  - Sharing assumptions
  - USF contribution, if applicable
- There should not be any network CapEx or OpEx for the baseline case.

D.2.3 Task 5.3: calculate the incremental revenue

To calculate the incremental revenue, the recommended approach is to calculate the total 2G (voice-only) revenue and 3G/4G revenue from all unique subscribers (not just the expansion area) as it can be extrapolated more easily from historical data.

- Forecast 2G and 3G/4G adoption rates for each of the three zones
  - In the existing 2G/3G/4G zone adoption should be extrapolated from the historical data
  - In the upgrade and expansion zones the forecast adoption rate will apply to the covered population from when the roll-out starts

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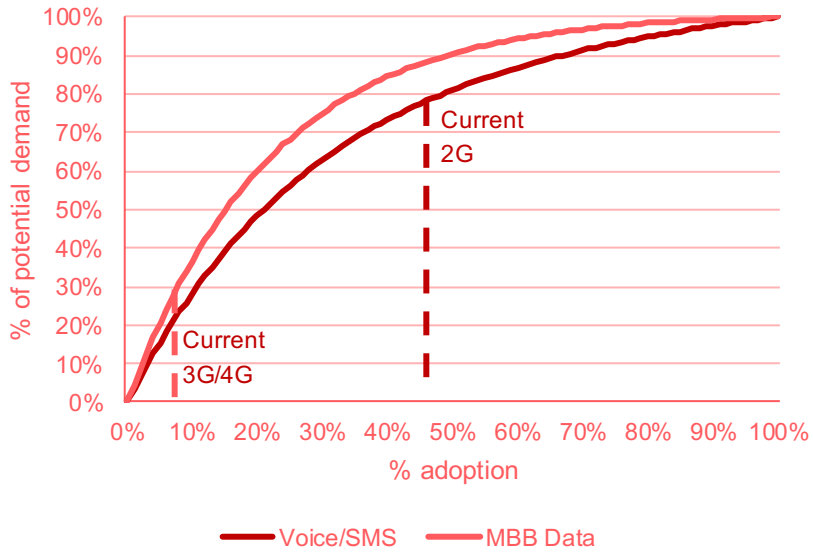
- Forecast the 2G and 3G/4G subscribers for each of the three zones based on:
  - Population coverage forecast
  - Adoption rates
- Prepare demand concentration curves for 2G and 3G/4G (see example in Exhibit 20):
  - Use income distribution (% population versus % income) as a proxy for 2G unless better information is available
  - Assume that 50% adoption equates to 90% demand unless better information is available

Exhibit 20: Demand concentration curve - example



Source: GSMA

- Forecast 2G and 3G/4G traffic based on:
  - Subscriber forecast
  - Demand concentration
- Forecast 2G and 3G/4G average unit prices in local currency and USD (see example in Exhibit 21)

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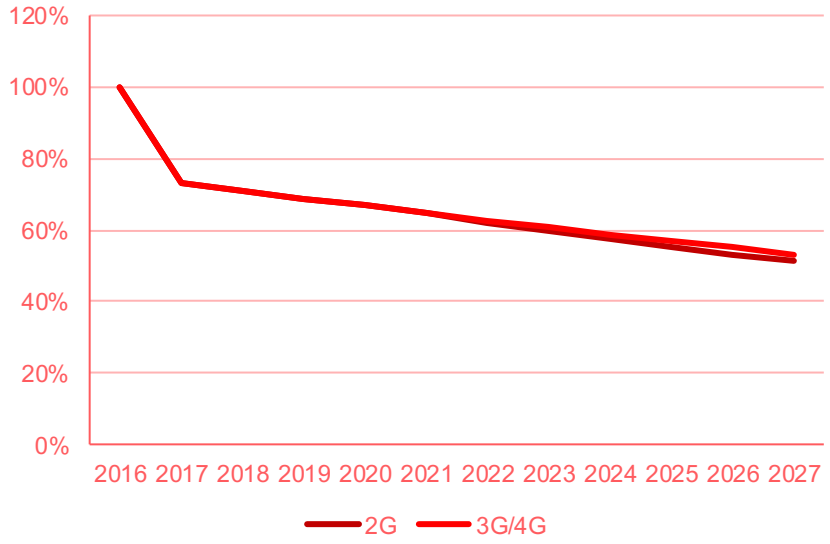
Exhibit 21: Price evolution (USD) - example



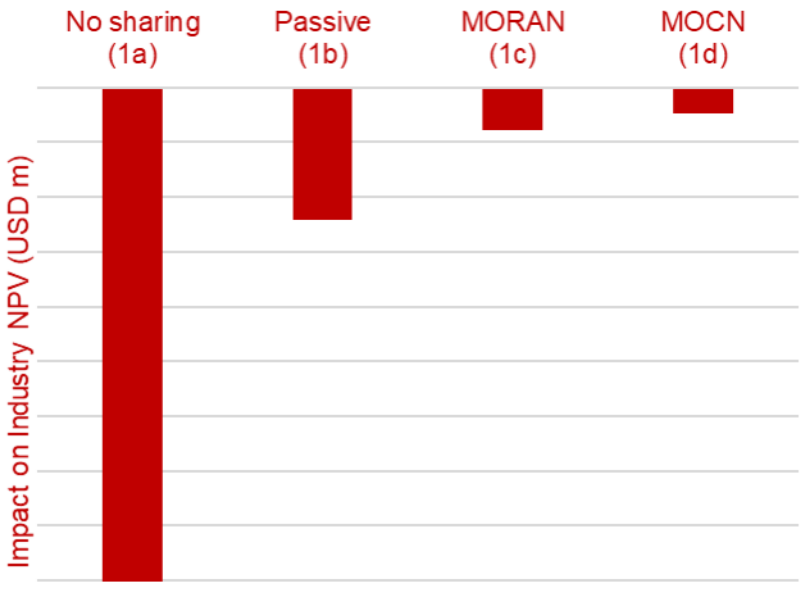
Source: GSMA

- Calculate the 2G and 3G/4G revenues for the baseline case and the scenarios using the:
  - Forecast traffic
  - Forecast unit prices.

D.2.4 Task 5.4: calculate the NPV and sensitivities

- Calculate the NPV for the scenarios (see example in Exhibit 22)
  - Use the incremental revenue and network CapEx/OpEx to calculate the net cash flow per year between the baseline and the scenarios
  - Calculate the NPV from the net cash flows for the period

Exhibit 22: Comparison of scenario NPVs - example



Source: GSMA

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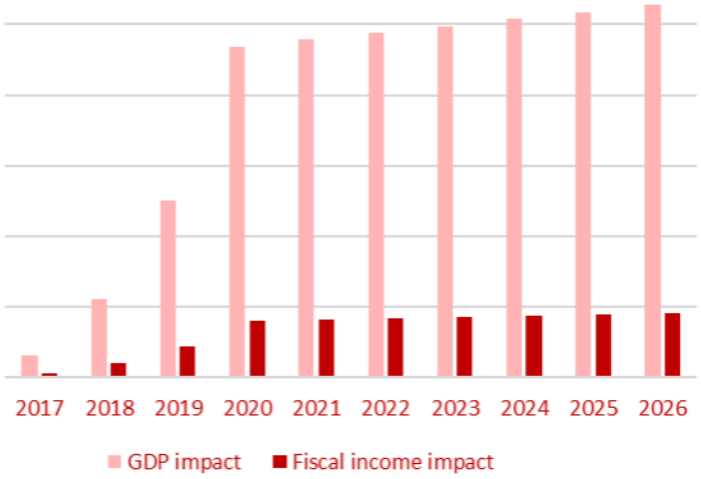
- For each scenario, check the sensitivity of the NPV to changes in key inputs such as:
  - Implementation period (one year faster/slower)
  - Network equipment unit costs (±10%)
  - Adoption rates (±10%)
  - ARPU (±10%)

D.2.5 Task 5.5: calculate the economic and fiscal impact

If fiscal changes are part of a scenario, then the economic and fiscal impact should also be estimated (see Exhibit 23).

Exhibit 23: Economic and fiscal impact - example



Source: GSMA

The economic impact on GDP may be calculated by using a multiplier researched by the World Bank (*Qiang et al.*, 2009) [1] and updated by *Scott* (2012) [2]. The multiplier should be reduced based on the assumption that connecting low-income, rural customers will have a lower impact on GDP than connecting urban customers.

- Forecast the nominal GDP for the same period as the NPV calculation in D.2.4
- Calculate the incremental GDP for the relevant scenario(s) by multiplying the increase in broadband penetration by 0.119 (World Bank figure for Internet adoption for developing countries), adjusted for the relative income levels of the incremental adopters versus the current penetration.

The fiscal impact should be calculated in terms of “direct taxes” received from the MNOs and “indirect taxes” received as a result of the increase in GDP described above.

The direct telecommunications-related taxes may be estimated by:

- Calculating the fiscal income from the baseline case using the current duties and taxes, for example, handset and services sales taxes (value-added tax), SIM or airtime-related taxes, corporation tax, etc.

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- Calculating the fiscal income in the relevant scenario(s) based on the total industry revenues, etc. (not just from the upgrade/expansion areas) and the changed duties/taxes
- Calculating the difference between the scenario(s) and the baseline

The “indirect” tax benefit may be estimated by:

- Calculating the historical ratio of fiscal income to GDP and projecting it to the end of the period
- Calculating the historical ratio of telecommunications-related tax to all fiscal income
- Calculating the incremental indirect tax based on the GDP impact and the above ratios.

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Appendix E: NRA and CRASA Report Examples

This Appendix sets out the recommended format and example for an NRA's Mobile Broadband Gap Analysis Report and the consolidated SADC Mobile Broadband Gap Analysis Report.

There are Microsoft Excel workbook templates for each report, filenames SADC_MBB_Gap_Analysis_NRA_report_v003.xls and SADC_BB_Gap_Analysis_CRASA_report_v003.xls.

The templates are based on the current SADC targets. Results are shown for each year between 2016 and 2025. If the targets are changed, these reports will need to be changed accordingly.

The NRA Mobile Broadband Gap Analysis Report consists of one worksheet structured as described in Exhibit 24 and the example shown in Exhibit 25.

Exhibit 24: NRA Mobile Broadband Gap Analysis Report

	Work-sheet Row	Output from Task #	Comment
Introduction	2-6		
Background	7-11		
Status against SADC targets	12		This section summarises the historical and forecast outcomes against each SADC target.
Population coverage, household coverage, affordability, etc.	13-22	2.1, 3.1 and 3.2	These rows will depend on the SADC targets. In the worksheet the figures are pulled from the relevant rows below.
Commentary	23-27		A brief description about what solution (if any) has been developed with the MNOs to achieve the SADC targets. Brief explanation if any targets will not be achieved and what the options are to improve the forecast.
Connectivity gap	28		This section summarises the output from Step 2.
Broadband coverage	29-30	2.1	
Connectivity gap	31	2.1	100% minus the broadband coverage.
Infrastructure index	32	2.2	
Commentary	33-37		
Demand gap	38		This section summarises the output from Step 3.
Broadband penetration	39	3.1	
Demand gap	40	3.1	Broadband coverage minus the broadband penetration.
Affordability – services	41	3.2	
Affordability – installation	42	3.2	
Affordability index	43	3.3	
Digital skills	44	3.4	
MSMEs unconnected	45	3.4	
Digital financial services	46	3.4	
Gender equality	47	3.4	
Consumer readiness index	48	3.3	
Local content index	49	3.3	
Commentary	50-54		
Spectrum availability	55		This section summarises the output from Step 4.

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	Work-sheet Row	Output from Task #	Comment
Spectrum roadmap	56	4.1	Enter “Yes” or “No” depending on whether it exists and is up-to-date.
DD spectrum per MNO	57	4.1	
Other sub-1 GHz spectrum per MNO	58	4.1	
1-3 GHz spectrum per MNO	59	4.1	
Spectrum indicator score	60	4.2	
Commentary	61-65		
Investment gap	66		This section summarises the output from Step 5.
NPV by scenario	67-76	5.4	
Commentary	77-81		
Legend	82-89		Explains the colour coding used in the report for the “Forecast Year” and GSMA indexes.

Exhibit 25: Example NRA Mobile Broadband Gap Analysis Report (next three pages)

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SADC Mobile Broadband Gap Analysis

	Country: Example Report year: 2018			2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2025 Target	Forecast Year
1	**Introduction**	*Omitted from example*													
2	**Background**	*Omitted from example*													
3	**Status against SADC targets**														
3.1	Broadband coverage - population	%		29.7%	30.3%	31.1%	32.2%	35.0%	42.2%	49.4%	56.6%	63.8%	72.0%	**80%**	2027
3.2	Broadband coverage - households	%		11.2%	13.1%	14.5%	17.2%	18.3%	22.3%	24.4%	26.9%	29.5%	32.0%	**50%**	2028
3.3	Affordability - services	% GNI pc		17.2%	16.4%	15.7%	14.1%	12.3%	10.5%	8.7%	6.9%	5.1%	3.3%	**<2%**	2026
3.4	Affordability - installation	% GNI pc		10.1%	8.2%	6.3%	4.4%	3.3%	2.5%	2.3%	2.1%	1.9%	1.8%	**<2%**	2024
3.5	Funded NBP or incl. in UAS definition			No	No	No	No	No	No	No	No	No	No	**Yes**	2025
3.6	Broadband penetration	%		1.1%	2.6%	4.5%	9.1%	16.7%	23.2%	30.4%	37.5%	44.5%	51.6%	**65%**	2027
3.7	Digital skills	%		N/A	N/A	25.0%	32.0%	39.0%	46.0%	53.0%	60.0%	67.0%	74.0%	**60%**	2023
3.8	MSMEs unconnectedness	%		N/A	N/A	82.0%	71.2%	65.0%	51.2%	42.7%	32.8%	27.0%	25.0%	**41%**	2023
3.9	Digital financial services	%		N/A	N/A	12.0%	14.0%	18.0%	25.0%	28.0%	32.3%	36.6%	40.9%	**40%**	2025
3.10	Gender equality			No	No	No	No	No	No	No	No	Yes	Yes	**Yes**	2024
3.11	Commentary	We expect to achieve the population and household coverage targets by end-2025 by releasing DD spectrum (see Section 4) and providing USF support to the four largest MNOs to construct an active-shared RAN in the rural areas (see Section 5). However, we forecast that the other targets will not be achieved until 2027-2028; we are still working with the MNOs and the national broadband network provider to find options to improve on these forecasts.													
4	**Connectivity gap**														
4.1	Broadband coverage - population	%		29.7%	30.3%	31.1%	32.2%	35.0%	42.2%	49.4%	56.6%	63.8%	72.0%	**80%**	2027
4.2	Broadband coverage - households	%		11.2%	13.1%	14.5%	17.2%	18.3%	22.3%	24.4%	26.9%	29.5%	32.0%	**50%**	2028
4.3	Connectivity gap	%		70.3%	69.7%	68.9%	67.8%	65.0%	57.8%	50.6%	43.4%	36.2%	28.0%		
4.4	Infrastructure index	#		12.4	15.6	19.8									
4.5	Commentary	We have developed a joint plan with the four leading MNOs to build an active-shared RAN in the upgrade/expansion area with some funding support from the USF (see Section 5 below).													

Example

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SADC Mobile Broadband Gap Analysis

	Country: Example Report year: 2018			2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2025 Target	Forecast Year
5	**Demand gap**														
5.1	Broadband penetration	%		1.1%	2.6%	4.5%	9.1%	16.7%	23.2%	30.4%	37.5%	44.5%	51.6%	**65%**	2027
5.2	Demand gap	%		28.6%	27.7%	26.6%	23.1%	18.3%	19.0%	19.0%	19.1%	19.3%	20.4%		
5.3	Affordability - services	% GNI pc		17.2%	16.4%	15.9%	14.1%	12.3%	10.5%	8.7%	6.9%	5.1%	3.3%	**<2%**	2026
5.4	Affordability - installation	% GNI pc		10.1%	8.2%	6.3%	4.4%	3.3%	2.5%	2.3%	2.1%	1.9%	1.8%	**<2%**	2024
5.5	Affordability index	#		18.6	17.5	18.3									
5.6	Digital skills	%		N/A	N/A	25.0%	32.0%	39.0%	46.0%	53.0%	60.0%	67.0%	74.0%	**60%**	2023
5.7	MSMEs unconnectedness	%		N/A	N/A	82.0%	71.2%	65.0%	51.2%	42.7%	32.8%	27.0%	25.0%	**41%**	2023
5.8	Digital financial services	%		N/A	N/A	12.0%	14.0%	18.0%	25.0%	28.0%	32.3%	36.6%	40.9%	**40%**	2025
5.9	Gender equality			No	No	No	No	No	No	No	No	Yes	Yes	**Yes**	2024
5.10	Consumer readiness index	#		45.1	45.7	46.6									
5.11	Local content index	#		4.2	5.1	5.8									
5.12	Commentary	The demand gap increases in 2023-2025 due to the increase in population coverage but slower penetration rate of newly covered areas. We are still working with the MNOs and ISPs to identify options to improve broadband penetration and expect to report progress in this area at our next report.													
6	**Spectrum availability**														
6.1	Spectrum roadmap			N/A	N/A	N/A	N/A	Yes	Yes	Yes	Yes	Yes	Yes		
6.2	DD spectrum per MNO	MHz (x2)		0	0	0	0	8	8	8	8	8	8		
6.3	Other sub-1 GHz spectrum per MNO	MHz (x2)		6	6	6	6	6	6	6	6	6	6		
6.4	1-3 GHz spectrum per MNO	MHz (x2)		24	24	24	24	24	24	24	24	24	24		
6.5	Spectrum indicator score	#		14.3	14.3	17.9									
6.6	Commentary	We have four large and six small MNOs. We do not anticipate any mergers between the large MNOs. No large MNO is disadvantaged in sub-1 GHz spectrum. The DD spectrum is expected to be available to MNOs in 2020. This is a critical enabler to close the connectivity gap.													

Example

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SADC Mobile Broadband Gap Analysis

	Country: Example Report year: 2018			2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2025 Target	Forecast Year
7	Investment gap	NPV (USD m)	NPV (EUR m)												
7.1	No sharing	-4,792.0	-5,271.2												
7.2	Passive sharing	-360.0	-396.0												
7.3	Active (MORAN) sharing	-76.0	-83.6												
7.4	MORAN/roaming	-66.0	-72.6												
7.5	Same as 5.3 + USF support	10.0	11.0												
			0.0												
			0.0												
			0.0												
			0.0												
			0.0												
	Commentary	We developed a number of scenarios with the MNOs. In no sharing (Scenario 1) the investment gap is almost USD 4.8b because beyond 65% population coverage the RAN destroys value. If the four leading MNOs build a single active-shared RAN in the expansion area (Scenario 3), they would be able to push population coverage to 75% before the NPV becomes negative. With a contribution of USD 75m from the USF (Scenario 5), they will be able to exceed 80% coverage. Note that these scenarios assume the use of DD spectrum in the expansion area.													
6	Legend														

Forecast year		GSMA indexes	
4 or more years later	2029	0 to 20	20.0
3 years late	2028	20 to 40	40.0
2 years late	2027	40 to 60	60.0
1 years late	2026	60 to 80	80.0
On or before 2025	2025	80 to 100	100.0

Example

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The consolidated SADC Mobile Broadband Gap Analysis Report includes the individual worksheets from each NRA and a summary worksheet; the latter summarises the actual/forecast outcomes for all countries in a table and two charts for each SADC objective as shown in the example on the next page (Exhibit 26).

Exhibit 26: Example SADC Mobile Broadband Gap Analysis Report (next page)

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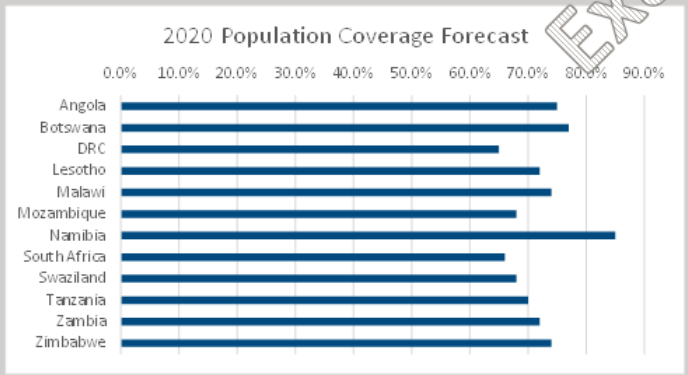
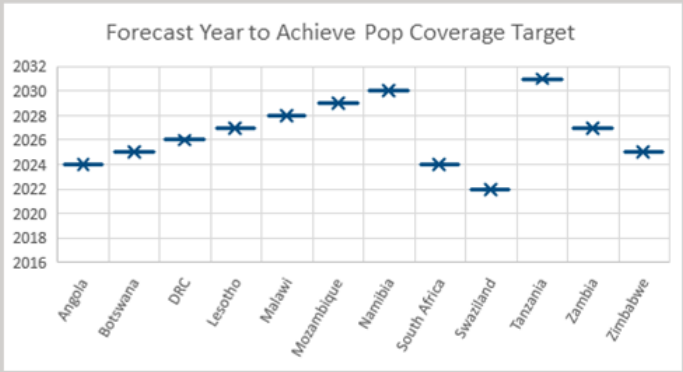
SADC Mobile Broadband Gap Analysis

	Report year: 2018	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2025 Target	Forecast Year
1	**Broadband coverage - population**												
	Angola	5.0%	10.0%	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%	45.0%	75.0%	80%	2024
	Botswana	7.0%	12.0%	17.0%	22.0%	27.0%	32.0%	37.0%	42.0%	47.0%	77.0%	80%	2025
	DRC	9.0%	14.0%	19.0%	24.0%	29.0%	34.0%	39.0%	44.0%	49.0%	65.0%	80%	2026
	Lesotho	11.0%	16.0%	21.0%	26.0%	31.0%	36.0%	41.0%	46.0%	51.0%	72.0%	80%	2027
	Malawi	13.0%	18.0%	23.0%	28.0%	33.0%	38.0%	43.0%	48.0%	53.0%	74.0%	80%	2028
	Mozambique	15.0%	20.0%	25.0%	30.0%	35.0%	40.0%	45.0%	50.0%	55.0%	68.0%	80%	2029
	Namibia	17.0%	22.0%	27.0%	32.0%	37.0%	[illegible]	47.0%	52.0%	57.0%	85.0%	80%	2030
	South Africa	19.0%	24.0%	29.0%	34.0%	39.0%	[illegible]	49.0%	54.0%	59.0%	66.0%	80%	2024
	Swaziland	21.0%	26.0%	31.0%	36.0%	41.0%	[illegible]	51.0%	56.0%	61.0%	68.0%	80%	2022
	Tanzania	23.0%	28.0%	33.0%	38.0%	43.0%	[illegible]	53.0%	58.0%	63.0%	70.0%	80%	2031
	Zambia	25.0%	30.0%	35.0%	40.0%	[illegible]	50.0%	55.0%	60.0%	65.0%	72.0%	80%	2027
	Zimbabwe	27.0%	32.0%	37.0%	42.0%	[illegible]	52.0%	57.0%	62.0%	67.0%	74.0%	80%	2025





Commentary

Example

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