Consultation Paper

Universal Access and Service Projects for 2017

Issued 23 December 2016

Contents

1 Introduction

The *National Information and Communications Technology Act 2009* (the Act) mandates the National Information and Communications Technology Authority (NICTA) to establish a Universal Service Provision Fund to promote and extend ICT services in PNG. The Act also provides for the establishment of a Universal Access and Service Board and Secretariat within NICTA to implement the government's universal access and service policy and administer the Universal Service Fund.

Pursuant to s.108 of the Act, the UAS Board is required to engage NICTA through the Universal Access and Service Secretariat to prepare a Universal Access and Service (UAS) Projects Report. The Report should summarize the UAS Projects under consideration, their respective indicative costs, their proposed ranking (and the reasons) and the proposed aggregate budget.

NICTA is therefore inviting stakeholders, licensed operators and the general public to submit Universal Access Projects for consideration to be implemented in 2017. In this connection NICTA has also prepared the draft proposals aimed at promoting discussion and consideration.

Following consultation, NICTA will finalize the Report for submission to the UAS Board for consideration. The UAS Board will prepare a UAS Project Report 2017 for submission to the Minister for Information and Communications Technology for consideration.

This document has been prepared for the purpose of facilitating industry and wider public discussion on the UAS projects for 2017. The document contains projects NICTA considers as critical for implementation and would ask readers and potential commentators to consider these as very preliminary. They do serve the valuable purpose of focusing comments and discussion.

2 UAS Vision, Mission and Core Values

This section addresses strategic issues and are considered preliminary and will be subject to consultation however they are provided here to guide the readers the basis for the projects proposals for 2017.

The vision should be ICT access for all Papua New Guineans. The mission should be universal access and service for all citizens wherever they are at affordable costs and of the highest quality.

2.1 The Draft Strategic Goals of the UAS

Goal 1 - Facilitate an enabling environment for ICT:

Goal 2 - Promote Universal Access and Universal Service:

Goal 3 - Promote Universal Coverage:

Goal 4 - Facilitate connectivity for development:

2.2 Guiding Principles

The following principles have been formulated to provide focus and guidance in implementation of UAS Programs and projects:

- Co-location/infrastructure Sharing: It shall be obligatory for operators/service providers to share all infrastructure funded by the UAS with other operators/service providers at reasonable prices to ensure the UAS does not fund the creation of local monopolies.
- Social Inclusion: All UASF projects shall be designed and implemented in a manner which ensures equitable access to ICT services by vulnerable groups and disadvantaged interests i.e. the elderly, physically challenged, women and children in the community.
- Geographic Coverage: UAS programs and projects will be developed for provinces, wards, and will provide service to un-served and underserved areas and communities.
- Promote Private Sector Investment: UAS programs and projects will stimulate increased private sector investments in un-served and underserved areas.
- Encourage Competition: UAS programs and projects will encourage competition, as much as possible, between operators and by using transparent and competitive mechanisms to allocate UAS financing and subsidies.
- Promote Consumer Interest: UAS programs and projects will promote consumer interest by facilitating access to affordable, readily available and reliable ICT services.
- Sustainability: the UAS will give priority to programs and projects that are self-sustaining and do not require subsidies on continuous basis.
- Foster Economic and Social Development: UAS programs and projects will stimulate productive use of ICTs for economic, social and cultural development.
- Consultation, Transparency and Accountability: the UAS will develop and periodically update its programs and projects through public consultations with all key public, private and civil society stakeholders.
- Quality of Service: the UAS will enforce compliance with quality of service standards with respect to its projects.

- Technology Neutrality: UAS programs and projects will be guided by the principle of technology neutrality and allow the market place to define the best technology solutions.

NICTA notes that this section addresses strategic issues and are considered preliminary and will be subject to further consultation however, they are provided here to guide the readers on the basis for the projects proposals for 2017.

3 UAS Projects for 2017

NICTA is required under the Act to seek comments, suggestions and or proposals for the industry and general public at large on projects that the Secretariat intends to implement. In this regard, the Secretariat invites the industry and general public to submit proposals for consideration by the Secretariat.

Comments are invited from the industry and general public on the proposed projects in 2017 as outlined in page 14 of this document.

4 Access Gap Analysis

In order to determine what projects may be undertaken, it is important to understand the access gap that exists in the country. The access gap is simply the rift that exists between those that have access to ICT services as compared to those that don't. Closing this access gap is one of the primary objectives of the UAS regime.

In a report by Great Village International Consultants (GVIC)[1], an access can be illustrated using Figure 1. As depicted, the figure shows three main categories: the existing coverage; the efficient market gap; and the access gap or the coverage gap.

An excerpt from the Report explains the three areas as[2]:

- **Existing Coverage**: The inner rectangle illustrates the country's existing population coverage for a given telecommunications network or service. In a market driven only by economic forces, service providers will initially serve the areas with the highest revenue potential and the lowest cost per subscriber (e.g., the most profitable market segments).

[1] Report on Determination of UAS Fund Levy Amount, Great Village International Consultants

[2] Africa's ICT Infrastructure: Building on the Mobile Revolution-Directions in Development Infrastructure, 2011, by Mark D. J. Williams, Rebecca Mayer, and Michael Minges. © 2011 The International Bank for Reconstruction and Development / World Bank. And Mayer, Rebecca, Ken Figueredo, Mike Jensen, Tim Kelly, Richard Green, and Alvaro Federico Barra. 2009. "Connecting the Continent: Costing the Needs for Spending on ICT Infrastructure in Africa." Background Paper 3, Africa Infrastructure Country Diagnostic, World Bank, Washington, DC. And World Bank discussion paper by Navas-Sabater, Dymond, and Juntunen (2002) and further developed in a Regulatel/World Bank study by Stern, Townsend, and Monedero (2006).

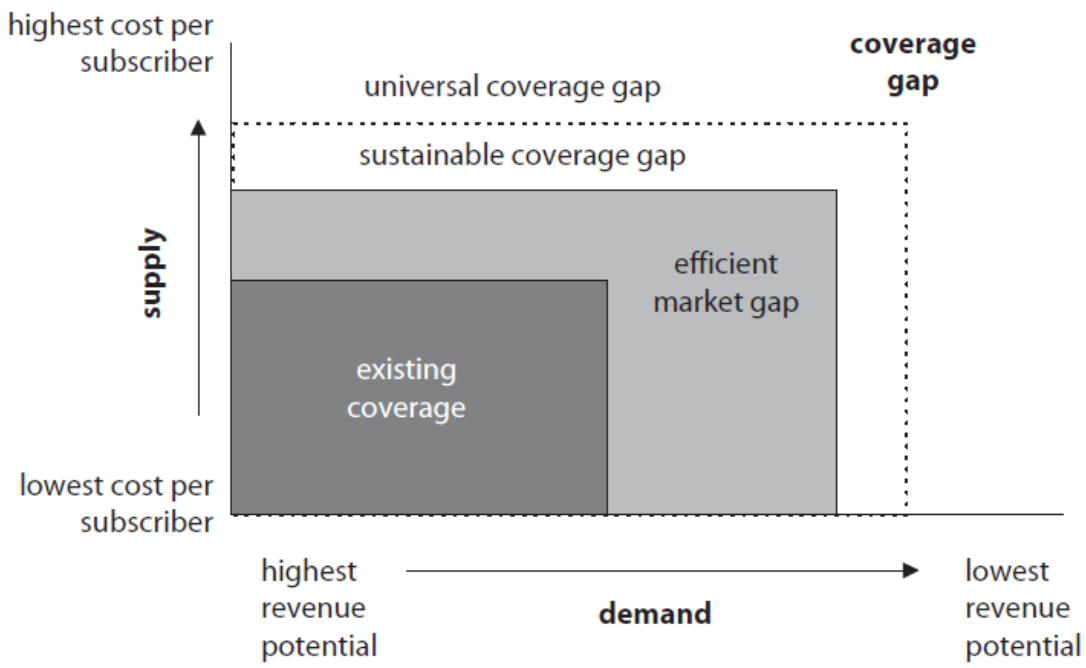

Figure 1 Access Gap Analysis Framework

- **Efficient Market Gap**: Over time, service providers will expand their service toward the efficient market coverage frontier, where commercially profitable service is possible. However, service providers will not offer service beyond this frontier, as it is unprofitable without public intervention. The efficient market gap is the difference between existing coverage and the coverage that would be commercially viable if efficient competition existed. Coverage of the Efficient Market Gap may be delayed due to poor regulation, political risk, lack of competition, lack of financing, or simply the operational inability of operators to rollout service across these areas quickly enough;

- **Coverage Gap**: The areas where constructing and operating a network and offering service would not be commercially feasible. This coverage gap comprises two sub-gaps:

- ***Sustainable Coverage Gap***: areas where sufficient revenue potential exists to cover operating costs and profit, but not initial capital investments for required network infrastructure;

- ***Universal Coverage Gap:*** all remaining areas with insufficient revenue potential to support commercially viable service provision.

The Report highlights that to estimate the status of ICT gaps in PNG, the estimated costs and revenues to provide coverage in specific geographic regions can be calculated (if data is available) to assess whether service can be provided on a commercially profitable basis in each region. The objective of this analysis is to assess whether a geographic region holds enough revenue potential to support minimum network infrastructure required to provide initial coverage (not to calculate the cost of infrastructure required to fully meet all demand). If the region does

have sufficient revenue potential, but no network exists there, the region is included within the efficient market gap (i.e. coverage can be provided on a commercially viable basis in the future). If it does not, then it is included within the coverage gap and the cost of investment required to provide minimum network coverage must be determined.

To calculate the access gaps, at least four factors are often considered:

Market Gap Factor	Factors Used to Estimate…
1. population density	Revenue potential of voice telephony
2. income distribution	services in specific geographic regions
3. terrain	Cost of providing coverage in the area
4. size of the wireless cell site	

5 Market at a Glance

Having demystified the concept of the access gap analysis, it is equally important to understand or at least have a glimpse of the ICT market in PNG.

GVIC's Report highlights that of the current PNG population of about 8 million; approximately 2.5 million residents have access to basic telecommunications services. An additional 2 million subscribers are likely within the anticipated operator commercial rollout out plans that can be expected to be implemented in the next few years. This still leaves about 5.5 million PNG residents, or nearly half the population, who are unlikely to be served by market-based expansion in the foreseeable future. The following provides estimates of subscriber numbers and market growth potential in PNG:

- **Digicel** – approximately 3.7 million subscribers at mid-2016, although its existing network evidently had sufficient capacity to serve 4-million subscribers. They are continuing to expand, with intentions to roll out additional infrastructure and services to currently unserved areas.
- **Bemobile Vodafone** –estimated to have 10% of the mobile market, implying approximately 200,000 subscribers at mid-2016. A rough net growth of 1-million new users beyond current market size is a plausible forecast.

Telikom subscribers of 190,000 – of which 64,000 are fixed line subscribers and 130,000 are fixed wireless CDMA subscribers at mid-2016. Telikom is likely to be a lead player in expanding fixed services, such as broadband and Internet access, beyond Port Moresby. Telikom is now rolling out its 4G LTE network; its CDMA subscribers will be migrated to the 4G network.

The current mobile penetration rate in PNG is approximately 50%, while the mobile broadband penetration rate is less than 3% - mainly in major towns where 3G and lately 4G services are being rolled out. Total PNG International Internet connectivity, according to operator data, is 3100 Mbps, which represents about 0.42 Kbps per population.

Currently available Internet service in the rural areas of PNG is very basic (typically 2G -GPRS / EDGE – low speed mobile internet) for the general public and some dedicated links and VSATs for specific business or institutional use. Broadband access is slowly being made available outside the main urban centres and only available via satellite in rural areas.

Although rural access is limited, this availability still indicates a major improvement from several years ago, when there was virtually no rural internet access. Rapid roll-out of mobile networks has enabled this. Terrestrial microwave Internet transmission costs are much lower than VSAT based service. A small though growing fraction of users (mainly in urban areas) have their own 3G devices (although in rural areas they may be using it in conjunction with a 2G network).[3]

Operators continue to rollout 2G services in rural areas rather than 3G. NICTA has awarded three contracts in 2016 to upgrade 2G services to 3G services in about 120 locations that should provide services to about 500,000 people in rural PNG.

5.1 Network Infrastructure in PNG in 2014[4]

There is a very extensive (and expanding) network of towers (for mobile coverage). As a result, many unserved or underserved localities are within microwave link reach of that network (although for more remote areas, VSAT connection would be required).

The existing microwave transmission backbone and access to international internet capacity (via submarine cable) are potentially bottlenecks in and around Port Moresby. The APNG-2 cable, which has a total capacity of 1.13Gbps, presently carries Internet capacity of between 0.3 Gbps and 0.4 Gbps for international private lines (possibly also mostly IP/Internet traffic) and voice. There appear to be limitations on the existing microwave links across the Owen Stanley ranges to Lae and Madang (which has a current capacity 1.1Gbps). The ongoing NTN project is addressing this issue but will take some time to be realized.

In the short-term the readily available Internet capacity from Madang (2x10 Gbps - of which currently 1.4 Gbps connected to Sydney and 0.5 Gbps to Guam is actually in use) could be used to provide Internet access in the central highlands all the way to the Indonesian border as well as along the Northern coast and New Britain using existing microwave transmission networks. The cost of Internet from Madang is likely to be much lower and less limited than from Port Moresby. A prerequisite for mobile Internet/broadband is a mobile packet core on the northern side of the Owen Stanley range. Digicel has confirmed that it has a mobile packet core in Port Moresby and Lae. Mobile networks which only have a central packet core in Port Moresby will be challenged.

5.2 Initiatives to close the Efficient Market Gap

A number of very important regulatory issues have been addressed by NICTA and these, in combination with the demonstration projects described below, will assist in a relatively high percentage of the population being brought into reach of basic (mobile) Internet access.

5.3 Current PNG UAS Projects to Confirm Costs to Eliminate Access Gaps

NICTA is already undertaking two important UAS demonstration projects, with funding from the World Bank. These projects are summarized below and provide an indication of scale of costs and needs for UAS within PNG. These projects are intended to test approaches and inform future UAS programs.

[3]Extracted and edited from Page15, Rural Communications Project (P107782): Part 2 - Increased Internet Access in Rural Areas: A review of Circumstances, Drivers and Options for NICTA Consideration. April 2014.

[4]Extracted and edited from Pages 14-15, Rural Communications Project (P107782): Part 2 - Increased Internet Access in Rural Areas: A review of Circumstances, Drivers and Options for NICTA Consideration. April 2014.

5.4 Voice Telephony Project

A contract was signed with Digicel on May 16, 2014 to roll-out mobile telephony services in 59 sites across all 4 regions of PNG. The project has been completed benefiting nearly 500,000 people in rural areas. The roll-out combined with existing initiatives by the mobile operators Digicel and BeMobile, boosted total population coverage from about 20 percent in 2009 to around 93% by the end of 2014. The total UAS Fund subsidy cost to support these deployments was USD$7 million with funding from the World Bank.

Figure 2 shows the various locations of the towers around the country.

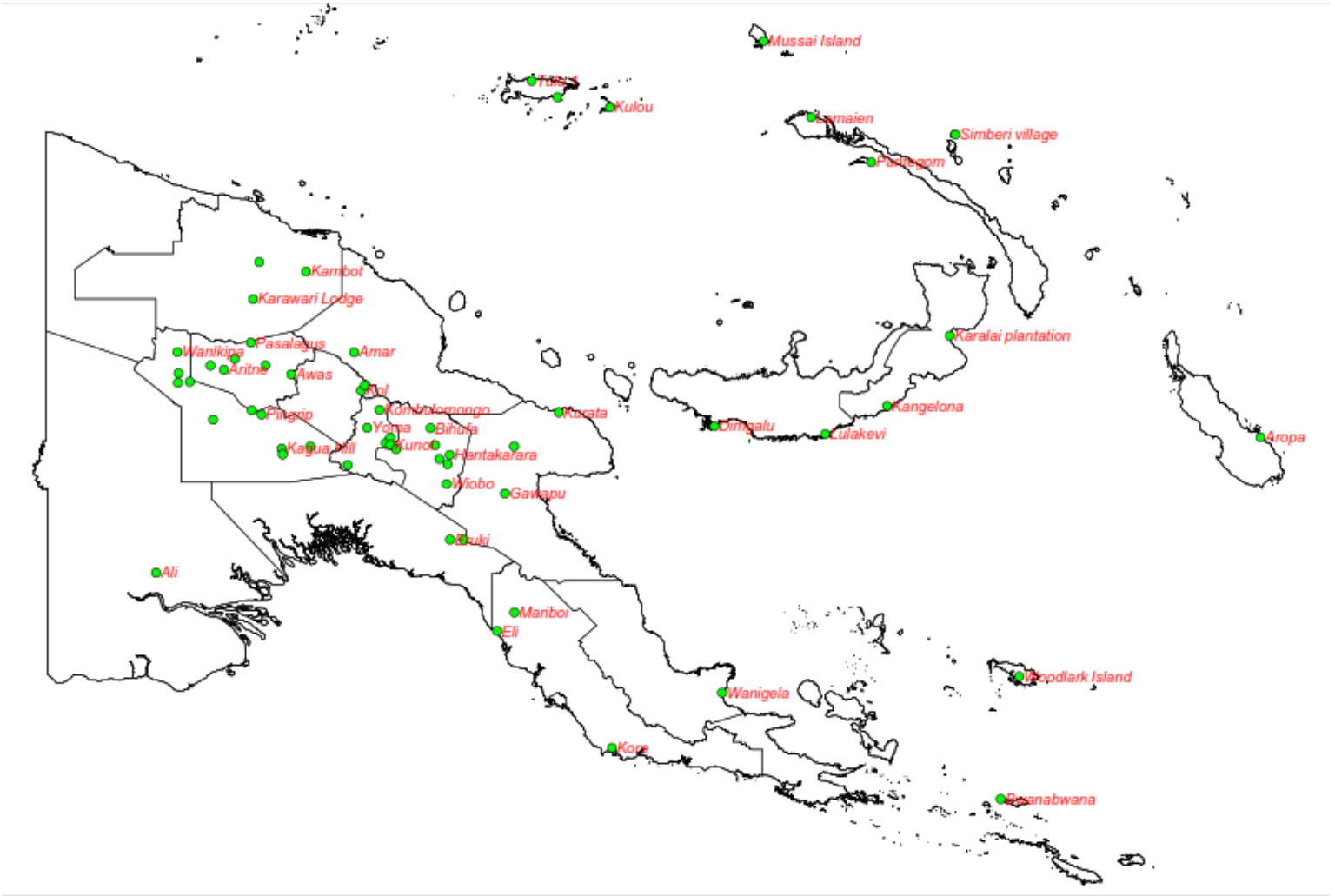

Figure 2 Voice Telephony Project – 59 Towers Source: NICTA

5.5 3G Mobile Internet Projects

NICTA is also implementing two (2) UAS demonstration projects for Internet access, with $5.1 million in funding from the World Bank. The projects provide for 3G Upgrade – Broadband Expansion of Existing Networks. In 2016 Telikom PNG Ltd and Digicel were awarded three contracts to upgrade or build a total of 120 towers to provide 3G services.

This component is implemented in two phases with an initial funding of USD4 million that will provide a one-time capital subsidy to build and/or upgrade existing networks from 2G to 3G/3G+/4G in unserved rural areas to provide significantly increased broadband Internet access and take up across the country. This component is expected to require approximately 80% of the US$5.1 million project budget (about US$4 million). The primary goal is to facilitate service availability to the greatest population and provision to the largest possible number of users. The newer upgradeable sites are not surprisingly located on the edge of the current network and in areas furthest away from population centres, which is advantageous for rolling out 3G service to more remote rural areas. The second upgrade project will be contracted in early 2017.

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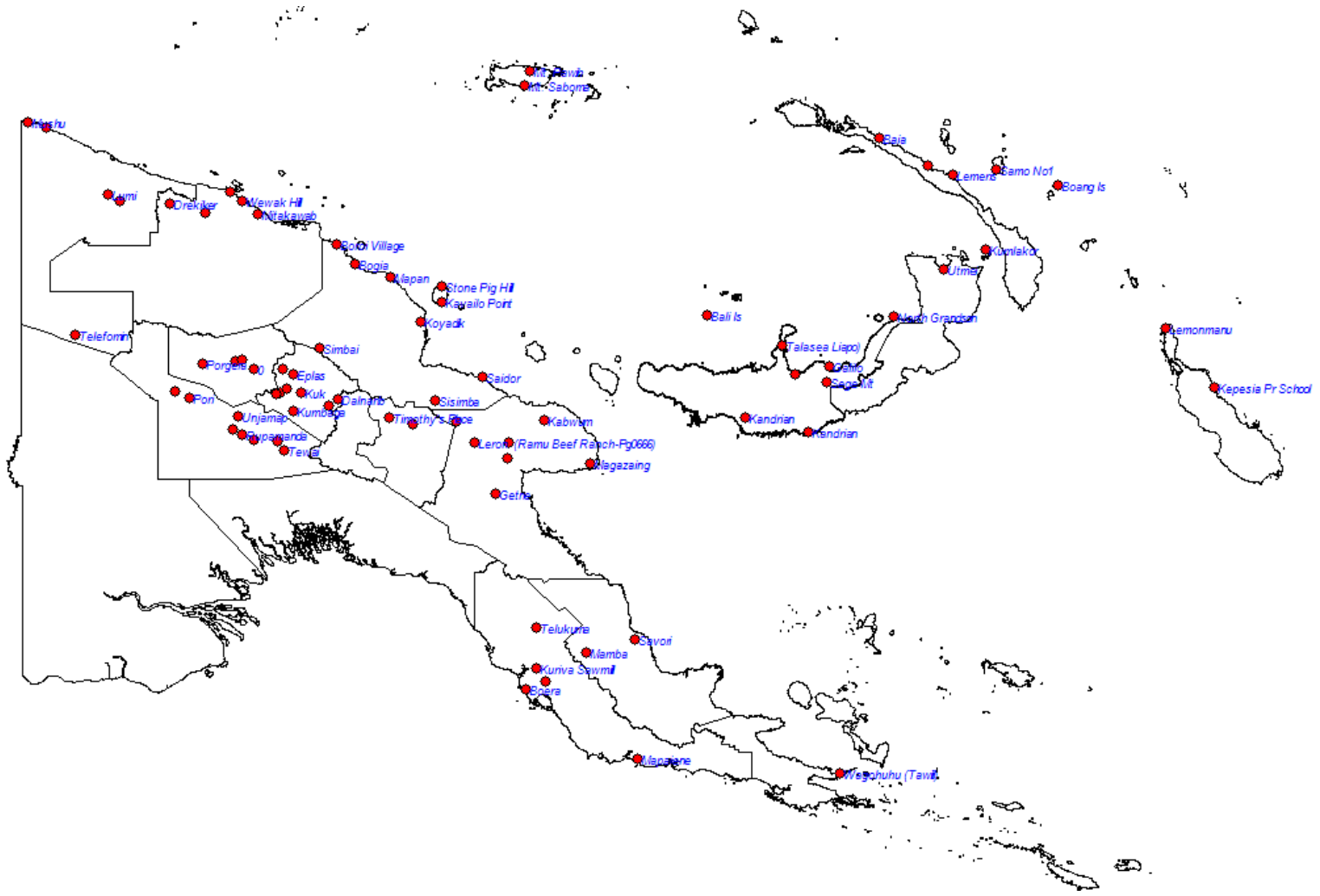

Figure 3 3G Mobile Internet Project – 120 Sites **Source: NICTA**

5.6 Conclusions Regarding Expected UAS Costs in PNG

To meet the UAS needs and eliminate the access gaps identified above in all underserved areas of PNG, for both voice as well as data/Internet services, the total universal access/service subsidy costs are estimated to be in the range of US$150 – $200 million. This estimate takes into account factors including the following factors specific to PNG:

- Limited existing network infrastructure and services in PNG;
- access gaps identified earlier in this report;
- low GNI/Capita (US$1480);
- large and disparate underserved populations in rural areas;
- mountainous territory; and
- high-cost deployment challenges

As detailed above, the scope of investment needed to expand and upgrade ICT access throughout all of Papua New Guinea is substantial. There is very limited telecommunications infrastructure in rural areas, primarily consisting of microwave networks owned by Digicel and Telikom. Although Port Moresby has an existing fiber optic ring, there is virtually no fiber optic backbone network in rural areas. Provision of basic mobile telephone service to underserved remote areas would typically require helicopters to ferry in equipment, fuel, supplies and repair personnel, due to the lack of roads, electricity grid and the extremely mountainous terrain in many locations. The costs for more advanced networks and services, including Broadband access, would be far greater still. Therefore, it is clear that, the costs of universal access programs focused on eliminating existing access gaps across the country will necessarily be very expensive[5].

6 Projects in 2015-2016

6.1 Current PNG UAS Projects to Confirm Costs to Eliminate Access Gaps

NICTA is already undertaking two important UAS demonstration projects, with funding from the World Bank. These projects are summarized below and provide an indication of scale of costs and needs for UA within PNG. These projects are intended to test approaches and inform future UAS programs.

6.2 Voice Telephony Project

The government signed a contract with Digicel on May 16, 2014 to roll-out mobile telephony services in 59 sites across all 4 regions of PNG. The project has benefited nearly 500,000 people in rural areas. Implementation and physical roll-out was completed in early 2015. The roll-out combined with existing initiatives by the mobile operators Digicel and BeMobile, boosted total population coverage from about 20 percent in 2009 to around 93 percent by the end of 2014. The total UAS Fund subsidy cost to support these deployments was about PGK21miilion ($ 7million).

5.2 3G Upgrade

[5]Extracted and edited from Pages 4-5, Rural Communications Project (P107782): Part 2 - Increased Internet Access in Rural Areas: A review of Circumstances, Drivers and Options for NICTA Consideration. April 2014.

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The Minister has also approved projects for 2016. These projects are summarized below.

Table 1 Approved Projects in 2016

Rank	Project	Comments	Indicative Cost
1	Connect the Schools	• Can be sustainable with a one-time capital subsidy; • Technically feasible	K2 million
2	Voice and Mobile Services	• Can be sustainable with a one-time capital subsidy; • Technically feasible	K20 million

7 UAS Projects 2017

Given the above scenario of the market, NICTA proposes the projects set out in this section.

The proposed projects are in line with the National Broadband Policy and supports the Government's development plans including Vision 2050 and the Medium Term Development Strategy.

7.1 Voice and Mobile Data Connectivity

The primary object of the Voice and Mobile Telephony project will be to expand basic voice services and mobile internet access to areas that do not have access to these services.

7.1.1 Impact, Outcome and Benefits

(1) The Project will provide an expansion of affordable telecom services particularly for low income users in rural and remote areas of PNG;

(2) The Project will improve the accessibility and quality of telecom services in PNG, particularly in remote and rural areas;

(3) The increased affordability and improved accessibility will enable inclusive economic growth be facilitating access to markets and information and developing other business relying on telecom service and

(4) Improved network will enable better access to information, including for public service delivery, education, health and security.

The proposed project is in line with the National Broadband Policy and supports the Government's development plans including Vision 2050 and the Medium-Term Development Strategy.

7.1.2 Implementation Schedule

The project was commenced in 2015 and will be continued in 2017 and may be extended until universal access goals are achieved.

It estimated that about K15 million is required for this project.

7.2 Connect the Schools

This project aims to provide internet connectivity and broadband services to all primary, secondary and tertiary institutions throughout the country. In addition to internet access, the project aims to provide each school with a computer laboratory equipped with desktop PCs and printers.

The Department of Education is expected to partner NICTA in this project.

The proposed project is in line with the National Broadband Policy and supports the Government's development plans including Vision 2050 and the Medium-Term Development Strategy

7.2.1 Impact, Outcome and Benefits

(1) The Project will improve the accessibility and quality of telecom services in PNG, particularly to schools in remote and rural areas;

(2) The increased affordability and improved accessibility will enable inclusive economic growth be facilitating access to markets and information and developing other business relying on telecom service; and

(3) Improved network will enable better access to information, including for public service delivery, education, health and security for the school and neighboring communities.

Table 2 UAS Projects in 2017

No.	Project Name	Project Description	Targets	Indicative Costs
1	Accelerated Mobile Phone Expansion –	The project is aimed at encouraging/ subsidising the construction of 3G Base Transceiver Stations	Uncovered areas 30 sites	K10.5 million
2	Accelerated Mobile Phone Expansion – Base Transceiver Station Upgrades	The project is aimed at upgrading base stations from 2G to 3G or 4G	100 sites	K5 million
3	Neutral IXP Transmission Links Project	Neutral IXP Switch to be located at NCTA headquarters with transmission links	POM	K1 million
4	Connect the School Access Project (SAP)	The SAP is aimed at providing public schools with ICT hardware and funding subscriptions for broadband Internet for at least two years	Minimum of 10 primary/secondary schools	K3.5 million

7.2.2 Implementation Schedule

The 2017 Projects will be implemented in 2017

7.2.3 Budgetary Considerations

The industry through industry levies will fund these projects and NICTA Board has set 2% of the annual gross revenues for this purpose pursuant the *Operator Regulations 2010*.

8 Conclusions and Recommendations

The projects proposals for 2017 are based NICTAs projections. The Universal Access Board has yet to determine its final position and will take fully into account the views of the industry stakeholders and the public before doing so. The UAS Board will final its Report and submit to the Minister for Communications and Information Technology for consideration in early 2017.