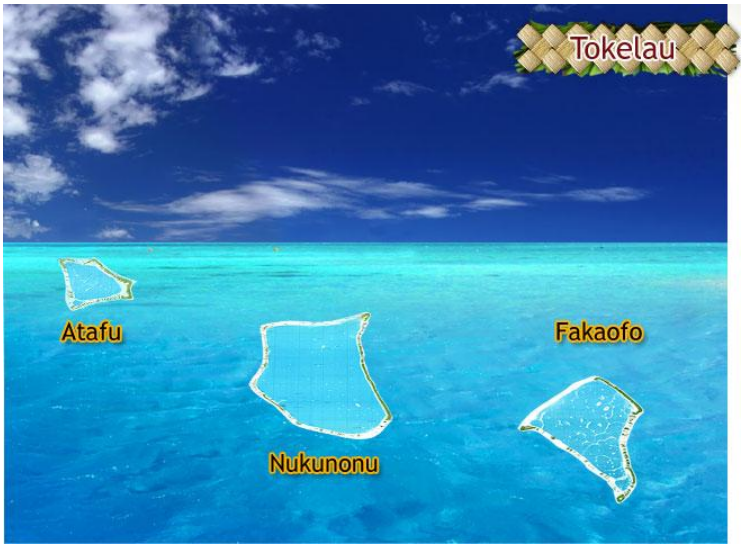
Telecommunications in Tokelau



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A. Introduction

1. At the request of the Government of Tokelau, John Haydon, Consultant in Telecommunications Regulation, under the supervision of Ms Natasha Beschorner, (World Bank Senior ICT Policy SpecialistTransport & ICT Global Practice) visited Tokelau over the period 3-7 June 2014. Purpose of the visit was to review the telecommunications circumstances in Tokelau and consider issues for improvement of telecommunications services delivery. In particular the request of the CEO of Teletok to the World Bank (Senior Country Officer, Pacific Islands Country Unit East Asia and Pacific Department) was for:

…areportorseriesof(preferablyaction-based)reportsaddressingthevariousissues,includingbutnotlimitedto:ownership,governanceandoperatingmodels,technologyoptions,investmentrequirements,fundingstrategies,andtrainingandsupportneeds

Work under this program has comprised meetings and discussions with the responsible Minister, the Taupelega of each of the islands of Tokelau, the current acting and recent past CEO of Teletok, Island Administrations of each Island and consumer representatives, plus consultations with New Zealand Government officials. A number of documents were provided and others accessed through the Internet to supplement information gathered in discussions.

Stakeholder Objectives

2. Government aspirations are expressed in the Tokelau National Development Plan and the Village Development Plans for each of Fakaofo (2011-2015), Atafu (Action Plan 2013 – 2014**)** and Nukunonu (Work Plan 2011-2015). These plans are not as services specific as the commentary from the community meetings. A review of these plans in terms of their relevance to and drivers for ICT infrastructure and institutional developmentis at Annex A.

3. Discussions with Island representative groups highlighted that the communities wanted:

- Reinstatement of Sky TV service;
- Much improved Internet access at lowest rates;
- Mobile telephony at lowest rates; and
- A radio broadcast service (AM broadcast was highlighted)

4. There are two bodies of work to address the needs and circumstances of Tokelau:

- Institutional development to provide for future sector oversight and review (regulation).
- Network development to enable the provision of services—requiring investment in infrastructure;

World Bank

5. Subject to discussion between the World Bank and the Government of New Zealand on an appropriate engagement framework, the World Bank could potentially support Tokelau in the form of additional technical/advisory support on specific topics. While decisions about the path forward are for the Government, a suggested set of activitiesis at Annex F.

B. Meetings

6. OverthethreeworkingdaysinTokelauandinApiameetingsanddiscussionswereheld withthefollowingpersons.

Name	MeetingLocation	Position
Faipule Kuresa Nasau	Apia	UluoTokelau
Hon.MosePelasio	FakaofoIsland	TelecommunicationMinister
MsHinaPuka-Tuia	Fakaofo	CoordinatoroftheOfficeoftheTaupulegaFakaofo
MrSefoVulu	Atafu	DirectoroftheOfficeoftheTaupulegaAtafu
MrTinoVitale	Nukunono	GeneralManageroftheOfficeoftheTaupulegaNukunonu
MrAsofaFereti	Apia	DirectorofTransportandSupportServices
AssemblyoftheTaupalegaFakaofo	FakaofoIsland	
AssemblyoftheTaupalegaAtafu	AtafuIsland	
AssemblyoftheTaupalegaNukunono	NukunonoIsland	
MrJovilisiSuveinakama	Apia	TokelauApiaLiaisonOffice(TALO)

C. Documentation

7. DuringandfollowingthevisittoTokelau,the following material was reviewed.

- LegislationandRegulations:
  TokelauTelecommunicationsCorporationAct1996(Amended2007)
  NumberPlanasregisteredwiththeITU
- Informationaboutthe currentTeletok TelecommunicationsNetwork.
- PreliminaryTeletokFinancialReports2012 -2013

Sincethevisitelectroniccopiesofthefollowinghavebeenacquiredandperused.

- 2011TokelauCensusofPopulationandDwellings
- Telephones and law-making for Tokelau (Tony H Angelo, *Professor of Law, University of Victoria, Wellington*
- ReportofAdministratorofTokelau2006-2010
- VillageDevelopmentPlansforeachofFakaofo(2011-2015),Atafu(ActionPlan2013–2014**)**andNukunonu(WorkPlan2011-2015)
- TokelauInfrastructureStrategyandInvestmentPlan(independentreportforPRIF2012)
- Tokelau National Development Plan 2010-2015

D. Summary

Sector Governance and Institutional Development

8. Telecommunications services for Tokelau are provided by Teletok, currently the sole telecommunications/ICT service provider, under the Tokelau TelecommunicationsCorporationAct 1996 (Amended 2007). Under this Act the Corporation functions set out at s8 combine business perspective - (…*efficiency and economy*…), a CSO -(...*satisfying … reasonable demands for … services*…); social needs (*measures for the safety of life*and*promotion of research and development*). However ss9 & 15 constrain the Corporation (…*shall not borrow funds or acquire securities*… & …*total revenue of the Corporation is sufficient to meet its total outgoings*...). The last prescription about covering costs is not clear if this is annual reckoning or otherwise.

9. The Government will need to clarify if it wants Teletok, to operate as a social service (with necessary ongoing subsidy), a defined community break-even/ non-profit enterprise or as a business servicing paying customers (sustainable and self-funding and market focussed).This is the logic for having some kind of independent review of operations from a financial and technology perspective. Under any of these scenarios, revision and further strengthening of Teletok's management and governance structures will be essential.

10. One aspect of governance is how Teletok is to be accountable. The current legislation provides that the Board, comprising the Council of ongoing Government, is charged with ensuring the goals of Teletok are the goals of the Government as expressed through the TNSP and Island Strategic Plans. However the goals expressed in these Plans are not readily converted into Teletok business behaviour which could have at least three possible business formats (see preceding paragraph) and Board members – as politicians - may seek to focus Teletok operations in terms of individual political needs rather than market objectives.

11. For this reason the report suggests a few possible regulation options, the most significant being a review and performance monitoring body – either a new entity or an adaptation of the existing PMU. The existing Performance Monitoring Unit located in Apia (PMU) is not the only possibility but is suggested because it exists and is understood to be required to review performance and progress of work in relation to Island Councils- a role similar to reviewing Teletok progress and performance. Incremental expansion of the PMU to address Teletok oversight would be less expensive than creating a new entity and would enable use of skills that may already exist in the PMU in lieu of duplicating them in any new review entity. Its function would be to provide outside pressure to review the business for efficiency of operation and technology directions that could have been taken but may not have been. It is a surrogate for competition as much as an audit/ testing body.The Regulator typically represents the interests of service users/consumers. In this regard it differs from the Board, the function of which is to steer the business for the benefit of shareholders.

12. Separately additional 'tweaks' to the legislation (non-exclusivity of service provision, consumer right to make own arrangements) increase pressure on Teletok that might otherwise have come from competition. This permits new entrant operators to offer selected services - where a business case is apparent - or alternatively permits consumers to be a competitor to Teletok in providing services to themselves.

Network Development

13. Network development to meet community declared wishes (see next section) can be:

- Investment in three separate network modules (Sky TV, telecommunications, and radio broadcast) which would ensure that no single failure would result in loss of all services; or
- Investment in a single next-general platform that would enable delivery of TV, telecoms and broadcasting (which would need to be 4G and require that more than 65% of the population is able to afford a 4G device); or
- a combination of the above. For example, SKY TV and telecommunications services delivered via a 4G network and a radio broadcast service separately established as a means of ensuring two paths of information flows during a disaster for reliability of information delivery. Alternatively, the SKY TV service may be separately delivered (as it is a high bandwidth service) and Internet radio and telecommunications combined in a 3G or 4G network

14. An important issue related to any network development is the appropriate reliability and robustness for service continuity. Higher infrastructure and service integration can reduce costs and simplify some aspects of user access to services delivered, but at the increased risk of a single failure resulting in loss of more than one service. The remoteness of Tokelau adds to the need to consider this possible loss of multiple services especially at times of high need (e.g. disaster coordination).

15. Regardless of approach to national network services delivery, international and inter-island connectivity is critical to continuity of services and arrangements need to be resolved.

Sector Financial Capacity

16. However the overarching consideration in any sustainable telecommunications path forward for Tokelau is the financial capacity of the industry to sustain services. This is dependent on the aggregate available disposable income of citizens and institutions in the countrytogether with preparedness to spend on telecommunications services and the sources of external revenue that are possible. A 2014 estimation of Tokelau GNI is NZ$23 million (derived from the General Fono Budget Papers (2014) and the reports of the Administrator (years 2006 through 2010). Teletok draft financial reports for 2013 provide data on external revenues and an indication of the surety of continuity of these external revenues. No hard data was available.

17. These set the medium term notional upper boundary of the industry (Teletok) capacity for sustainable expenditure at about US$1.3 million (~NZ$ 1.6 - 1.7 million). This is the basis for consideration of workable options in telecommunications development. Disposition of this prospective revenue is a matter for business operations and is tied to all other costs and financial provisions of Teletok.

18. The analyses below assume that initial capital outlays to establish services will - in the main - likely require external financing while the ongoing sustainability of the infrastructure and services will be met from Teletok operational revenues and budget.

19. Choice of technology for services provision is very relevant in this consideration and there are now and in the near future options for significantly improved services within the financial capacities of Tokelau.

Current Telecom Infrastructure Condition

20. **Fixed lines.** Between 70 and 80% of households as indicated in the Household Income and Expenditure Survey of 2011 (HIES 2011)and all Government bodies have telephone service, providing fixed phone access to about 75% of the populationReplacement of the PABX used for fixed call services is now complete and noting that its replacement was based on integration with existing modern equipment, provides a basis for, or at least a component of, services development into the future.Fixed telephony services are based on automatic free calling within each Island but charged, operator assisted calling applies between islands and internationally.

21. In- ground telephone cable (copper) seems sound, is underutilised and could be further exploited. Expected cable life from 2014, 20+ years.In premises cabling is not assessed but is usually a weakness in developing states and for services expansion based on use of the telecommunications access network (high speed ADSL based services) may need refurbishment on a case by case basis.

International Satellite Links

22. Existing main satellite dish antennas are being replaced with slightly larger units to accommodate the introduction of new Telecom New Zealand International services. This is fortuitous as the existing units are showing deterioration and a refurbishment / replacement program would be required. The replacement program is understood to be linked to the TNZI program to provide for establishing direct island to island communications (in lieu of the need to connect from island to NZ and then back to the other island – such 'two hop' format make conversation difficult, uses double satellite capacity and limits data communications).

23. The quantum of current international connectivity (satellite) is of inadequate capacity and is restricting services provision. Aditionally backup arrangements though SpeedCast (which were installed to address a past instance of complete loss of connection)are reported to be underperforming in terms of throughput and reliability.

Internet and Data

24. The existing core MSAN equipment (*multi-service access node)*is modern, adequate and has been expanded as part of the fixed phone service refurbishment - recently completed. MSAN equipment is a core system that integrates and interconnects connects different subscriber services (phone, ADSL, Video on demand, internet radio) to the core network components that provide these various services. The existing MSANs have capability and capacity for expansion for new services and should be retained. They have a prospective further life of about 5-7 years.Other telecommunications plant on the island is relatively minor capital value and is mostly fully depreciated

25. Fixed broadband services (ADSL): The HIES 2011 indicates that about 20% of homes have fixed broadband serviceand about 55% of homes have a computer. This, noting Wi-Fi spillover beyond the service location, is understood to provide direct access to broadband to some 30 plus percent of population.

26. Mobile services. There are no mobile phone services in Tokelau at present. The wish to have such a service was very strongly expressed at all meetings with the Taupulega on each island. The issue then is what kind of network from the available technologies.

TV and Radio

27. The country has recently lost access to SKYTV and replacement of the previous individual satellite services with suitable individual satellite services is not practical (the replacement dish is too big and cannot be roof mounted). A practical solution is a central large antenna and onward transmission of the received signalvia a community coaxial cable or delivered via fixed or mobile broadband (ADSL/ 4G). Delivery by ADSL (video on demand home service) /3G (video on the move but small number of simultaneous users) is likely more workable. Any approach will require central receiver system. Life of such equipment will be about seven years.

28. Atafu once had an FM radio service and the communities were keen for such a service. A practical solution could be either an FM transmitter on each island linked to a central broadcast studio by satellite, or Internet radio via the mobile phone network. A separate FM system could be considered if over dependence on the telecoms network were seen as a risk to information provision during an emergency. Both systems could use the same towers if two systems were required. A broadcast studio for assembly of broadcast material would be required for either approach. Conveniently most 3G mobile phones already incorporate an FM radio which could provide independence in the event of electricity loss. Life of each such electronic system would be about seven years.

Options for Development

International Connectivity

29. The near even spread of population across the islands of Tokelau warrants similar connectivity for each island. Microwave linking of the islands (to a central hub station) is impractical as distances are too great. Options include:

- expansion of TNZI service which could be set up in 0.3 years and have a life determined by the service satellite and contract duration - say 5-7 years.
- O3B service which could be set up in 1 year) and provide service for the life of the satellites (20 years) subject to contract life 5-7 years.
- Kacific satellite service (ready for service currently cited as 2017 but has not yet established a customer base);service for the life of the satellites (20 years) subject to contract life 5-7 years; or
- Hawaiki cable (ready for service currently cited as 2016 but not yet a confirmed project)and providing service for the life of the cable 20+ years.
- Some combination e.g. continued use of the existing TNZI service pending availability of one of the other options.

30. O3B and Kacific are offered at minimum entry capacity greater that prospective needs of Tokelau. If the capacity to be contracted can be renegotiated, one of these could provide economic and efficient international connectivity. The Hawaiki cable can be dimensioned in line with needs but has very high initial cost.

31. The satellite back up links supplied by SpeedCast should be addressed to ensurethrough-put and reliability are in accordance with contracted quality and also as their intention is as an emergency backup when other forms have failed.

32. A cache (storage on a local server for the most commonly accessed websites) for international Internet services could be installed to improve apparent performance. Such equipment would significantly improve the user experience at relatively low cost. One would need to be installed on each island.

Fixed Telephony

33. Prepaid services should be established together with automatic dialling for all calls. Prepayment permits simplification of billing systems, reduced billing costs and

surety of customer payments. Auto dialling permits closure of operator assistance for calling although a help desk may still be appropriate.

Internet

34. ADSL in conjunction with the MSAN equipment could be a sound platform for continued ADSL services. The MSAN could also be used to deliver Internet via the mobile network and this could include either or both of radio or television. A data cache could improve the apparent performance of the Internet service, especially when delivering internationally sourced video material.

Mobile Telephony

35. As noted Tokelau presently does not have a mobile telecommunications service but mobile telephony is very much desired by the community. The choice is between 3G and 4G networks as 2G networks are now obsolete and have limited and declining vendor support. Most countries are now in the process of retiring their 2G networks and re-farming the spectrum (with some exceptions related to contracted security services). In choosing between 3G and 4G networks the issues centre on the affordability of user handsets, capacity and price of international connectivity, licence fee s for network components and prospective network life. There is little difference in cost of network build especially for an initial construction where the majority (75%) of cost is non telecom plant (tower, power, premises) which is common to both.

36. International connectivity is an issue as 4G networks are designed to offer services that will demand high capacity (social networking, You Tube, gaming and video). If that capacity cannot be provided to users at affordable prices and users cannot be encouraged to take up such services, the benefits of a 4G network are unlikely to be realised.

37. Licence fees for network services and components is a feature of many 3G and all 4G network equipment vendors. The prices charged are entirely market driven as they are largely software that has been developed and hence incremental cost of supply is very low (e.g. the cost of the media on which it is supplied). Such charges are usually an annual licence fee and subject to negotiation some components may be provided at very low price at the time of initial network plant purchase but will mostly be much more expensive afterwards.

38. In terms of network life, it necessary to note that this will be determined by factors outside Teletok control –manufacturer support, availability of spares and service extension components. In the case of Tokelau, manufacturer support is probably less important as there are ‘after-market’ component suppliers and technical support capable of supply in adequate quantities. After- market components and support also will be less expensive than manufacturer supplied equivalents.

39. In terms of services considerations,4G is more recent (i.e. has longer likely support life), is designed for data delivery (operators are likely to encourage data based services) which could be local (e.g. SKY TV) and international. 4G handsets are 8-12 times more expensive than 3G equivalents which could be adequate subject to international connectivity costs. The mobile core network components would connect through the MSAN equipment to access satellite connectivity, for calls between fixed and mobile networks and for various Internet based services that might be delivered by the mobile network. The towers would have a life of about 20 years and the 3G network equipment about seven years. Fortuitously, many 3G handsets incorporate both Satellite Navigation (for SOLAS) and an FM radio.

40. If a mobile network is to be established in Tokelau, the following would need to be addressed.

- Recovery of one or more digits from the +690 number ranges for the mobile services.
- Establishment of spectrum management and access for use by the network.

41. A Mobile Network either 4G or of a kind that would provide for future easy migration to 4G could be established in less than one year. The mobile network could be based on prepaid billing, automatic national and international calling and incorporate Internet access. When Banking regulation provides, the network could provide mobile banking and easy funds transfer from expatriates to families in Tokelau.

SKY TV

42. Service could be reinstated on the basis of a large central antenna for each island with reticulation by a new coaxial cable network, ADSL based Video on Demand or a 4G mobile network when installed.

Radio Broadcast Service

43. A FM radio transmitter could be established on each island with a central control and studio and content management system. Content could be distributed to each island via satellite link either in real time (e.g. at times of high interest) or distributed at times of low satellite traffic for automatic transmission at a future time (e.g. light entertainment). Satellite capacity for FM broadcast would be similar to that required for about two telephone calls.

Indicative Costs -Network Developments

The diverse components of this analysis require diverse sources of information and pricing data. In all cases the price data should be considered indicative and comparative as for all the products analysed, the price will be determined by a market process – negotiation and vendor perceived challenges of getting product to Tokelau,through its bureaucracies and the extent of vendor support to establish the product.

Sources generally relate to ex-vendor pricing so an allowance is required for additional costs unique to Tokelau.

Mobile Network Establishment Price

44. While in this document indicative prices for networks are based on recent regional experiences (Kiribati, PNG), the actual price for a buyer will be more determined by the negotiation skills and purchasing power of the buyer. Network equipment vendors' prices are largely determined by licence fees for attributes and capacities sought and whether these are part of the initial purchase (when features and licences may be offered at zero or low price) or as later additions (when prices will be disadvantageous). These licence charges will generally be annual recurring charges. The customer would be advantaged by use of a knowledgeable and skilled customer advocate.

International Connectivity

45. Hawaiki Cable, O3B and Kacific satellite costs are derived from the offers to Teletok and the Government of Tokelau by the relevant provider. In the case of Hawaiki Cable the data varies across three separate offers made to Tokelau and some interpolation has been required.

46. Costs for extension of the NZI service are derived from current payments by Telketok to TNZI from the Teletok financial data of the 2013 financial report.

SKY TV

47. Data from SKY TV and other satellite broadcast providers has been used to estimate costs of a larger (3.6 metre) satellite receiving station with relevant electronics. Costs for cabling relate to estimated labour rates of Tokelau and author experience in outside cable plant to estimate time for completing work. An assumption has been included that the existing cable has bee laid in ducts large enough for inclusion of an additional TV distribution cable.

48. Cost for distributing the SKY TV signal via a 4G network derive from actual quoted prices for a similar (but reduced number of channels) service provided in Nuie, with adjustment for the increased number of channels of the SKY TV service.

Broadcast Service

49. The United States Department of Commerce,National Telecommunications and Information Administration (NTIA), Office of Telecommunications and Information Applicationsprovides planning budget data for various types of broadcast installation. Separately, data from the 'Broadcasting for Remote Aboriginal Communities(BRAC)' in Australia has provided indicative costs for establishing remote area broadcast services. Both of these have been applied in estimating costs for simple broadcast services based on satellite links for three islands in Tokelau with a coordinating central studio. The costing from NTIA is based on choosing equipment which will have a life of ten years, the BRAC project is based on less robust equipment and shorter life.

50. Broadcasting costs estimates for this report are an interpolation between these two sources.

Indicative Costs - NetworkDevelopments

Requirement	**Possible Solutions (assuming availability of external grant funding - i.e. no capital repayment**	**Est Capital Cost (US$ M)**	**Est. Operating Cost (US$M p.a.)**
International Connectivity	Hawaiki, (20 Mbps,2-3 yrs, 25 Yrs)*-if deployed O3B, (50-150, 1yr, 7 Yrs)*-if beam deployed Kacific (60-120 Mbps, 2-3 yrs, 7 Yrs)*-if launched TNZI (30 Mbps, 0.3 Yr, 7 Yrs)* (new equip in place) *** Service (capacity, time to establish,service life)**	5-15.0 1.5 0.4 0.1	0.5- 0.8 0.6-1.2 0.3-0.6 0.5
Fixed phone services	Remediation completed. ($0.11M, 7Yrs life) Local cablein good condition and of good capacity Household cabling unclear, mayneed refurbishment for advanced ADSL services	NIL	
Prepaid platform	None existing, New system&scope to be developed	0.05-0.15	
ADSL	MSAN equipment in good condition and good future capacity. Expansion of capacity appropriate	0.02	
Mobile Phone services	Mob Network+Towers (0.4 Yr, 7/ 20 Yrs life) (3G phones have Sat Nav (SOLAS), FM radio)	1.00	0.15
SKYTV	Central antenna/island, (0.3 Yr start, 7 yrs life) Cable distribution (1Yr start, 7/20 Yr life) or ADSL or 3G/4G distribution (0.3Yr start, 7/20 Yr life)	0.30 0.16 0.08	
Radio Broadcast system	Central broadcast studi (0.3 Yr start, 7 yrs life) (required for any provision of local content) Local news gathering ADSL/ 3G I'net radio (0.3 Yr start, 7 yrs life) or	0.30 0.06 0.05	0.04 0.02

	FM Transmitter per island (0.3 Yr start, 7 yrs life)	0.20	0.02
Equipment Rooms	Equipment rooms include equipment not in use, aged batteries and poor layout. Removal and Refurbishment required	0.15	

Indicative Costs - Non Network / Institutional Developments

Issue	**Options and Considerations(based on donor funding - i.e. no capital repayment in operating costs)**	**Est Cost (US$ M)**
New legislation	No extant legislation. Develop suitable non restrictive telecom legislation	0.25
Monopoly Regulator	Establish legal underpinning for monopoly regulation, develop regulator under suitable TA for staff and skills development, specialist tools and regulatory instruments(Spectrum, Consumer protection/ awareness, Community Service)	0.45
Teletok Reformation	Revisit of founding legislation, governance, business structure and business methodologies	0.30
New Services	Studies re M-Paisa (mobile money, Education/ Health)	0.10
Administrative Review	Numbering (+690), and ccTLD (.tk) clarification & options external revenues significant for Teletok development and sustenance.	0.20

E. TheCountry

Geography

51. TokelauisaPolynesianislandnationlocatedinthePacificOcean,some500Kmsnorthof Samoa and is a territory of New Zealand.Thecountryismadeupofthreesmallcoralatolls.Thenorthern-mostatoll,Atafu,lies92kilometresnorth-westofthecentralatollNukunonu.Thethirdatoll,Fakaofo,is64kilometressouth-eastofNukunonu.

52. Tokelauhasstronghistoric tieswithSamoaandmostTokelauansunderstandSamoanasSamoanlanguagebibleswerethesourceofChristianinstructionuntilrecentyears.AccesstoTokelauisonlybyshipfromApiawhichalsoistheonlyre-supplymeansforthecountry.Sailingsareapproximatelyweeklyandtheroundtripisfourtosixdaysdependingonobjectivesofthesailingandweather.TheTokelauPublicServiceofficeisbasedinApia.

53. ExceptforFakaofo(whichhastwovillages-FenuafalaandFaleondifferentisletsabout2.3Kmapart),thepopulationofeachatollisconcentratedinasinglevillageon islets on westernside of each atoll,closetoasmallnaturalpassintothecentrallagoon.Thisallowscanoesandsmallerboatstotransportpassengersandcargofromlargershipsdockedinthedeeperopensea.Tokelauhasnoportfacilitiescapableofshipaccess.Populationoftheislandsisapproximatelyequalatbetween350and450persons(Fakaofobeingthehighestpopulation.

54. Thelowfertilityofthecoral-sand‘soil’meansthatonlyafewfoodcropscanbesupportedintheTokelauenvironment(coconut,breadfruit,pandanus,giantswamptaro,taamu,andbanana).NotablyAtafuhassignificanttreegrowthofCanavaandPukawhichhavetraditionallybeenusedforcanoebuilding.

55. Followingtworeferendumsforchangein2006and2007,Tokelauremainsaterritoryof NewZealand.AtthetimeofNewZealand’s2006CensusofPopulationandDwellings,over6,800peopleidentifyingwiththeTokelauanethnicgroupwerelivinginNewZealand.Thedejureusuallyresidentpopulationof Tokelauin2011was1,411.

56. InformationabouttheIslandsofTokelauisintheTablebelow.

Atoll/Island	Main village	Landarea(km²)	Tot.area(km²)	Pop. (2011census)	Min.No. ofislets	No.of villages	Location
Atafu	Atafu	2.5	15	482	25	1	8°33′6″S172°30′3″W
Nukunonu	Nukunonu	5.5	109	490	30	1	9°10′6″S171°48′35″W
Fakaofo	Fale	3	17	397	16	2	9°21′55″S171°12′54″W
Tokelau		11	141	1411	124	4	

Government

57. On 1 August 1996 the Tokelau Amendment Act 1996 of the New Zealand Parliament came into force.Under this Act a Tokelau national body (the General Fono) isgiven the power to make laws for the good governance of Tokelau. This was the

devolution of government powers from the New Zealand central government to the authorities in Tokelau.

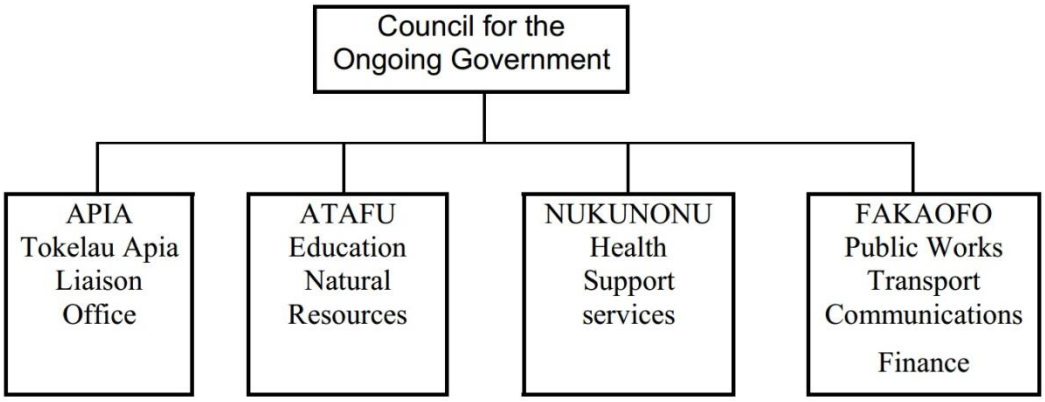
58. Accordingly the General Fono has a power "to make rules for thepeace, order, and good government of Tokelau". A remaining control on the exercise of this Tokelau law-making power, is that of the Administratorof Tokelau may disallow any rule within a period of 30 days of notification ofthe exercise of the rule-making power.

59. ThelawmakingbodiesforTokelaucomprisetheGeneralFono,whichmeetsthreetimes peryear;andforeachofthevillages,theVillageCouncil(the*Taupalega*).Thereisnocapitalcity ormainislandforTokelau,andtheroleofChiefMinister(*Ulu*)oftheGovernmentrotatesamong thethreeFaipule(VillageCouncilChief)eachyear.ThetermofofficeofFaipuleisthreeyears,a ndeachchairstheCouncilofOngoingGovernmentforoneyear.

60. DuringthatyearthemeetingsoftheGeneralFonoarehostedbytheislandoftheFaipule whoistheChiefMinisterforthatyear.TheGeneralFonoalsohasachairpersonwhoisproposedb ythehostislandfortheyearduringwhichtheGeneralFonositsinthatisland.Thechairpersonisn otamemberoftheGeneralFonoandhasneitheradeliberativenorcastingvote.

61. TheCouncilofOngoingGovernment(COG)providesdecisionmakinginbetweenme etingsoftheGeneralFono.TheCOGisalsotheBoardofTeletokandmeetsinthatcapacityfourti mesperyear.

Figure 1 – Organisation of the Tokelau Government as distributed by island



Economy

62. ThephysicalcharacteristicsofTokelau'satollsallowlimitedscopeforeconomicdevel opmentandthefewnaturalresourcesaresufficientonlytomeetlocalneeds.Foodcropsconsisto fcoconuts,pulaka,breadfruit,taamu,papaya,ediblepadanusfruitandbananas.Livestockcons istsofpigs,andpoultry.Thereisverylimitedprivateenterprisewithmostbusinessoperationsbe inggovernmentorcommunityrun.InthepastSOEshavebeenestablishedinafewareasincludin gtransport/shipping,fisheries,communitystoresandtelecommunications.OftheSOEsthatha vebeenestablishedoverpastyears,Teletokistheremainingenterprisein Tokelau.

63. TheTokelauNationalDevelopmentPlanincludesencouragementofprivateenterpris eincludingthatoperatedbywomen.Itciteskeyobjectivesinthisregardas:

- *Toprovideanenablingenvironmentandinfrastructurewhichwillpromotetheestablis hmentandsustainabilityofsmallenterprisedevelopment;*

- *ToenhanceandpromoteTokelau'sprivatesectorthroughsmallenterprisedevelopmentandentrepreneurialskillstraining.Tofacilitateongoingbusinessplanningandfinancialmanagementtrainingforall CBOs.*

64. Nationalincomereliesheavilyonaidfrom NewZealand.Forthe2012/13financialyear,NewZealand'sofficialdevelopmentassistancetoTokelauwas$20.3million,andeconomicsupportamountingtoaround75%percentofTokelau'srecurrentbudget.AnInternationalTrustFundwasestablishedin2004toprovideTokelauwithanindependentsourceofrevenueandnowstandsat$70million.

65. TheGeneralFonoDecisionsofFeb2014budgetreviewindicatesNZMFATbudgetsupportofNZ$11.7millionwithlocalrevenue(EEZfisherieslicences,variousgovernmentduties,communityservicelevy,boatfares&freight,Teletok,andothers)ofNZ$7.7million.Otherexternalfundsamountto NZ$1.36millionforanannualbudgettotalofjustunderNZ$21million.GrossNationalIncomeforTokelauamountstoaboutNZ$23million.

66. Tokelauhasbeenincreasingitsownrevenueearningcapacityinareassuchasfisheriesli censing,handicrafts,tourismandstampsandcoins.Improvedtelecommunicationsservicesareakeyingredienttothatfuture.

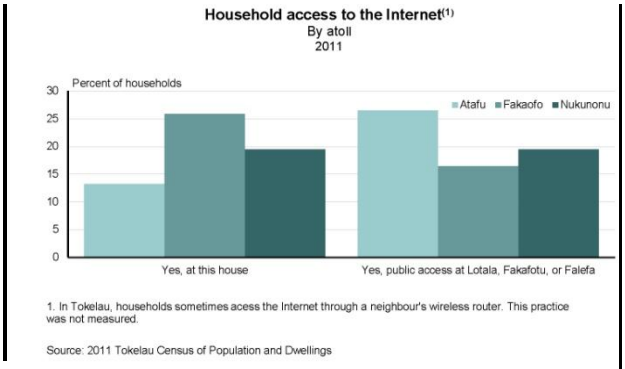
67. Teletokbeganderivingadditionalrevenuefromtheuseofitsnationalnumbercode(+690)forinternationalpremium-ratetelephonenumbersunderthemanagementofZeatelinNewZealand (a broker providing little used numbers from developing countries for 'premium rate services') andfromthecommercialisationofits".tk"Internetdomainname,whichismanagedby'Dottk',a Netherlandsbasedenterprise (a broker of Internet domains).The".tk"domainnameinitiallygeneratedsubstantialroyaltiesforTeletokhowevertherehavebeennofundspassedtoTeletokinrelationto'.tk'sincemid-2013. The 2012-13 financial year draft reports show these arrangements provided NZ$585,000, which is about half of the total revenue for Teletok.

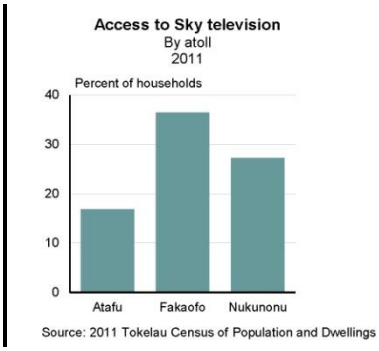
Community

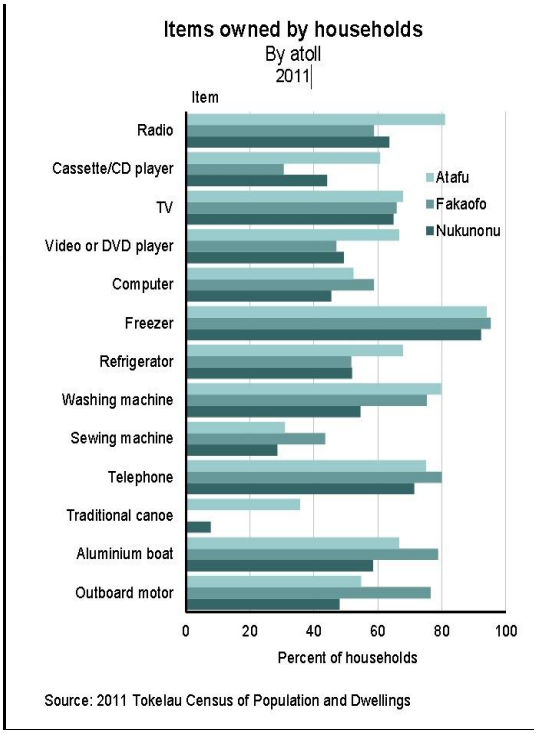
68. Eachatollhasa co-operativestorerunbythevillagemanagementcommittee.Thepublicserviceadministrationworkscloselywiththesecommittees.

69. Eachatollhasoneschool-Matauala(Atafu),Matiti(Nukunonu)andTialeniu(Fakaofo)providingforpre-schoolersthroughYear10.Somestudentsareawardedscholarshipstoattendschools inSamoaand,ifsuccessful,enrolintertiaryinstitutionsinSamoa,FijiandNewZealand.Privatelyfundedstudentsalsoattendschools inSamoa,NewZealandandAustralia.TheUniversityoftheSouthPacific(USP)hasanoutpostoneachatollthatislinkedbysatellitetoUSP(Fiji).Thepotentialofthisfacilitytoprovidetertiaryeducationandtraining forTokelauhasyettobefullyexplored.

70. AllhousesinTokelauhavemainselectricityconnection.Asignificantnumberofhouseholdshaveaccesstothe Internet(via ADSL2+ which is often distributed in the house via Wi-Fi) andSkyTV.Additionally the 2011 census of population and dwellings notes that some persons access the internet via a neighbour's ADSL based Wi-Fi service. Thefollowingtabulationsfromthe2011censusofpopulationanddwellingsindicatetheextentofavailabilities.







FinanceSector

71. Intheabsenceofbankingfacilitiesontheatolls,theGovernment(MinistryofFinance)operatesapassbooksavingsschemeforthecitizensofTokelau.Interestispaidtodepositorsat3.5%perannum.TheschemeisregulatedbytheTokelauBankingRules2004whichprovideforthe TokelauSavingsBank(Passbooksavingsscheme)andtheTokelauDevelopmentBank.TheTokelauDevelopmentBankisnotyetoperational.

72. WiththeintroductionoftheTokelauBankingRules2004,thefundsofthesavingsschemearenolongeravailableforGovernmentcashflowpurposes.Thetotalsavingsaccountbalanceincludesfundsinaccountsheldby Teletok,whichisawhollyownedGovernmentCorporation.Thatamountisincludedintheitem"BankAccounts"inthestatementoffinancialposition.Asthesavingsschemeisoperatedbythe TokelauSavingsBank,aseparateorganisationfromthatoftheGovernment,theseamountshavenotbeeneliminatedwhenpreparingthesefinancialstatements.

73. ThereareninternationalmerchantservicessuchasCreditCardsorAutomaticTeller Machines on
Tokelau.WithoutatraditionalcreditcardservicE,(Visa,MasterCardetc.)citizensofTokelau and tourists
aresignificantlylimitedincommercialopportunitybothasavendorandacustomer.Inatelecommunicationscontext,thosewhowouldwishtouseSkypeorothersimilarservicecanonlyusethatserviceforSkypetoSkypecontactsunlesstheyseparatelyhaveacreditcardaccount(e.g.inSamoaorNewZealand)asanySkypetofixedormobileservicerequiresacreditcardtopurchaseSkypecredit (orequivalentservice)foruse.It is pragmatic to note that thecountrywouldbewellservedbye-bankingservicesiftelecommunicationsandfinancialsectorarrangementscanbeestablished.

F. Community Meetings

74. In the course of the visit, the three Taupulega expressed the following themes which align generally with the TNSP.

- Internet Reliability (which seems to be related to quality of electricity supply, discussed separately);
- Loss of Sky TV - the only available broadcast service and opportunity to connect with outside world developments and the national passion for rugby;
- Cost of services (a tabulation of service prices is attached);
- Telecommunications based education and telemedicine in all forms;
- Disaster Management and Safety of Life at Sea (SOLAS);
- Mobile services (there are presently none in Tokelau but about 20% of the population has a mobile phone that is used overseas for telecommunications and in Tokelau as a camera, entertainment, diary, GPS service etc.);
- Improved international connection as an enabler (high awareness of submarine optical fibre and its benefits overseas);

75. Notably Teletok is by law not permitted to borrow for any purpose including network development. Tokelau has not sought externaltelecommunications investment but has trusted to the government monopoly. Had it done so the question would be whether a monopolistic private sector supplier of services will be more efficient and effective than a government monopoly especially in relation to the less economic circumstances of Tokelau.

G. TelecommunicationsandICTin Tokelau

Sector Overview

Ministry

76. ICTfallswithintheMinistryofCommunications,whichbecauseoftherelationshipand functionsofTeletok,doesnothavepolicyoroperationalstaffbutithasasupportsecretariat.The appointmentasMinisterforCommunicationsisanautomaticassignmentofportfoliotothePul enukuofFakaofo.Broadcasting is a separate matter that falls within the portfolio of the Ulu of Tokelau.

Network History

77. Prior to 1997, all communication between islands and to international destinations was via HF radio links that required a manual switchboard for management of the connection.

78. In the 1996, a program for the modernisation of telecommunications commenced with the passage of the Telecommunications Tokelau Corporation Act (TTCA) by the then recently empowered General Fono. In concert with this legislation (which does not encompass broadcasting), Tokelau undertook a NZ$4 million project to establish its telecommunications systems and network including international satellite services. Earlyin 1996 the project installation team for a telephone system for Tokelauarrived on the atolls, and began the construction and installation worknecessary for the reticulation of telephone services on the atolls and theconnection of each atoll's telephone system with that of the other two atollsand with countries world-wide via satellite. Most of that installation remains in place today.

Competition

79. The situation of Tokelau is unique. As a very small nation it is most unlikely that competition could succeed due to market size and geography. The prospective national telecommunications revenue is already small and if there were more than a

single operator that prospective revenue would be shared among operators. Costs of servicing the country at present limit the viability of Teletok and reduction of revenues per operator would not permit multiple viable businesses.

80. Connectivity between the Islands and to the outside world underpins the ability to offer meaningful services in country. This aspect is the subject of considerable internal and external discussion. A submarine cable to serve only one island is impractical given the near equal population of each and the distributed nature of the Government of Tokelau. A satellite solution (the current format via TNZI, O3B or Kacific would provide coverage to all islands. A review of international connectivity options is in this report. The World bank has also commissioned Polyconseil (a French consultancy with specialisation in this area) to review options for international connectivity for Tokelau. That work is not yet to hand. Howver for Tokelau, all three island can be reasonably taken as "outer islands" in a program of connectivity to and services for outer islands.

Stakeholders' Goals

81. The General Fono objectives for telecommunications are understood (from the Tokelau National Strategic Plan (TNSP) to be the lowest possible prices for the widest array of services subject to self-sustainability of Teletok.

82. Discussions with Island representatives highlighted that communities wanted:

- Reinstatement of Sky TV service;
- Much improved Internet access at lowest rates;
- Mobile telephony at lowest rates; and
- A radio broadcast service (FM broadcast was highlighted)

Scale and Capacity of the Sector

83. The overarching consideration in any sustainable telecommunications path forward for Tokelau is the capacity of Teletok to pay. This is dependent on the aggregate available disposable income of citizens and institutions in the country and the sources of external revenue that are possible. As the report notes, the 2014 General Fono Budget papers allowed an estimation of Tokelau GNI at NZ$23 million (this is an estimate as no hard data was available).

84. Benchmarks of national telecommunications spending as a proportion of GNI for different GNI per capita are available from the International Telecommunications Union -a part of the United Nations - 'Measuring the Information Society' which it produces annually, the most recent (2012) addressing the year 2011. This analysis shows that at high GNI per capita, the telecommunications services spending is of the order of 2%, rising to around 8% for countries with very low GNI per capita.

85. Noting the situation for Tokelau, 5% of GNI may be considered an upper likely boundary. Thus Tokelau's prospective available telecommunications industry revenue is about NZ$1.1 million plus external revenues. The external revenues are precarious and prudence would require that the contribution of this component be estimated conservatively. In 2013 the contribution of these components to the industry in 2012-13 year was about NZ$ 0.53 million (Teletok draft accounts). If half of this is considered reliable and sustainable, the industry (Teletok) available national revenues are potentially about NZ$1.4 million or about US$1.1 million.

86. In 2012-13 Teletok national revenues were about NZ$585,000 (~US$470,000). On this basis there is scope for possibly doubling of national revenues, which with the

external revenues (conservative) could result in gross medium term Teletok revenues of about US$1.3 million (~NZ$ 1.6 - 1.7 million).

87. This sets the notional upper boundary of Teletok capacity for sustainable expenditure. Disposition of this prospective revenue is a matter for business operations and is tied to all other costs and financial provisions of Teletok.

TelecommunicationsRegimeandLegislation

Telecommunications Legislation

88. There is no Telecommunications Act for Tokelau. The regime is defined by:

The Tokelau Telecommunications Corporation Act 1996 (TTC Act) which establishes the Teletok and sets objectives. Its functions are set out as follows at s8.

(1)Itshallbethefunctionanddutyoftheˆ Corporation—

(i)tobethesoleprovider,operatorandmaintaineroftelecommunicationservicesintheinterestsofthepeopleofTokelau;

(ii)topromotethedevelopmentoftelecommunicationinaccordancewith,asfaraspracticable,recognisedinternationalstandardspracticeandpublicdemand;

(iii)tofurthertheadvancementoftechnologyrelatingtotelecommunication.

89. In 2007 the Teletok Act was amended to change the Board structure from .

(i)theMinistertowhomresponsibilityforTelecommunicationshasbeenassignedasChairperson;

(ii)onerepresentativefromeachvillage(notbeingtheFaipule)designatedbytheTaupulegaandendorsedbytheGeneralFono;

(iii)TioniVulu;

(iv)theGeneralManager.

(Tioni Vulu is a personal appointment. He has since died)

To

TheCouncilfortheOngoingGovernmentistheBoardfortheCorporation.

90. The TTC Act is the mandate for Teletok to operate as a telecommunications provider. There is no separate licence document for Teletok. Under this Act the Corporation functions set out at s8 combine business perspective - (…*efficiency and economy*…), a CSO -(...*satisfying … reasonable demands for … services*…); social needs (*measures for the safety of life*and*promotion of research and development*). However ss9 & 15 constrain the Corporation (…*shall not borrow funds or acquire securities*… & …*total revenue of the Corporation is sufficient to meet its total outgoings*...). The last prescription about covering costs is not clear if this is annual reckoning or otherwise.

91. The Government will need to clarify if it wants Teletok, to operate as a social service (with necessary ongoing subsidy), a defined community break-even/ non-profit enterprise or as a business servicing paying customers (sustainable and self-funding and market focussed).This is the logic for having some kind of independent review of operations from a financial and technology perspective. Under any of these scenarios, revision and further strengthening of Teletok's management and governance structures will be essential.

92. Separately, TTC Act specification of the constitution of the Board of Teletok is unusual. Community representation on the Board of an SOE is usual but such Boards

would also include members with a business background (preferably in the industry), technology and possibly legal skills. In telecommunications and ICT generally, Board access to such skills is very important. These are not an automatic component when the Board comprises only community elected representatives.

93. The legislation presently provides that Teletok is the sole provider of services. While a new full services new entrant is unlikely the legislation should not preclude alternatives to Teletok - as an incentive to perform and providing options for the future. Such an arrangement in the legislation would need to ensure equality of opportunity (i.e. control of 'cherry picking').

94. Subject to 'cherry picking' additional 'tweaks' to the legislation (non-exclusivity of service provision, consumer right to make own arrangements) etc. would increase pressure on Teletok that might otherwise have come from competition. Permission for a new entrant operator to offer selected services - where a business case is apparent - or alternatively permits for consumers to be a competitor to Teletok in providing services to themselves are clearly possible and in the situation of Tokelau, advantageous.

95. As a bulk supplier of services, Teletok should always have better buying power and technical capability be able to offer any service at a better price than a single citizen / organisation could arrange. The removal of exclusivity adds a competition overlay in that if customers see Teletok offerings as deficient, they can exercise a choice to provide their own services. This encourages Teletok to ensure its services meet market needs at prices such as to retain business (i.e. are competitive to customer provided alternatives).

96. Another approach is to explicitly provide for different management approach. Ifaprivateorpartlyprivatemonopolywereconsidered,theprimary legislationwouldneedtoberevisedanddeveloped. Additionally the terms of the new monopoly would need to be closely negotiated.

97. Options for inclusion of external engagement into Teletok might include:

- Management contract. An external experienced CEO or other senior manager be brought into the business to assist skills development in business, operation, vendor negotiation and customer care. Such an arrangement would enable access to experience and skills that may not be available in Teletok.
- Partial sale if a suitable investor is available. This would provide access to new capital as well as management and operations expertise. It may also bring access to international connectivity under a larger purchase umbrella at reduced rates. This would however dilute Government control / ownership of Teletok
- Formation of an alliance with a larger partner which could bring skills, access to better supply arrangements for products and services that are inputs to Teletok products and services. This arrangement would not dilute Government control as owner.
- Some other arrangement.

Regulatory Environment

98. There is no regulator of telecommunications in Tokelau, nor does the Teletok Act or any other rule provide for regulation or oversight of the Teletok monopoly. Giventheverylimitedopportunityforcompetitivesupplyoftelecommunicationsservices inTokelau,a monopoly regulator as a surrogate for competition isprobably the

mostworkable alternative to provide for consumer protection and ensure the accountability of Teletok to its ultimate constituency – the public.

99. Amonopolyregulationdevelopmentprogramwouldbenovelinaworldgenerallypredisposedtocompetition.Needswouldbedifferentfrommainstreamregulatoryorthodoxy.Theprogramwouldneedtobeboththeoretical(presumingazerobase)andastheregulatorcommencesoperationsundernew/ordevelopedlegislation,practicaladviceandmentoringonissuesastheypresent.Thetopicareaswouldneedtoaddressalltheaspectsofthenewlegislationandincludecomparisonswithotherregimes.

100. The current legislation provides that the Board, comprising the Council of ongoing Government, is charged with ensuring the goals of Teletok are the goals of the Government as expressed through the TNSP and Island Strategic Plans. However the goals expressed in these Plans are not readily converted into Teletok business behaviour which could have at least three possible business formats (see preceding paragraph) and Board members – as politicians - may seek to focus Teletok operations in terms of individual political needs rather than market objectives.

Teletok Performance Review

101. A few possible regulation options are possible, the most significant being a review and performance monitoring body – either a new entity or an adaptation of the existing Performance Monitoring Unit (PMU) which the Government operates under the COG. However the PMU is based in Apia and so is remote from the operation of entities that might be supervised by this body. The PMU role to date has focussed on the review of achievement of Island Administrations against their published development and improvement plans, effectively an oversight agency, to Island and National Administrations in Tokelau.

102. It is presently not, but could be applied to the role of being, an effective surrogate for competition in the Telecommunications sector. Competition would otherwise be the primary driver of efficiencies and increased variety and quality of services. To do this the PMU could be strengthened to be effective in this role to the benefit of the people of Tokelau. Key roles for such a strengthened unit would be reviewing performance of Teletok (perhaps in conjunction with CEO remunerations), consumer tariffs and consumer service monitoring and management, consumer protection.

103. The existing PMU is not the only possibility but is suggested because it exists and is understood to be required to review performance and progress of work in relation to Island Councils- a role similar to reviewing Teletok progress and performance. Incremental expansion of the PMU to address Teletok oversight would be less expensive than creating a new entity and would enable use of skills that may already exist in the PMU in lieu of duplicating them in any new review entity. Its function would be to provide outside pressure to review the business for efficiency of operation and technology directions that could have been taken but may not have been. It is a surrogate for competition as much as an audit/ testing body.The Regulator typically represents the interests of service users/consumers. In this regard it differs from the Board, the function of which is to steer the business for the benefit of shareholders.

104. Incorporation of an M&E framework into the telecommunications regime would not be difficult as there are suitable models that could provide a basis or even be duplicated. One such regime is operating in Fiji. In March of 2014, the Government of Tokelau sought applications for a consultant to strengthen the capabilities and effectiveness of the PMU.

105. One other aspect raised at two of the public meetings related to the transparency of Teletok operations. Annual accounts of Teletok are presented to the General Fono and the Administrator but seem not to be otherwise available to the public. Good practice would warrant that annual reports – which are presented to the Board within three months of the end of the financial year – be made available for public review soon afterwards.

106. Radio spectrum management is not part of the TTCA. The only relevant Tokelau legislation is the Tokelau Post Office Regulations 1991/13. At one stage the New Zealand Post Office Act 1959 extended to Tokelau with the consequence that the use of the radio spectrum was regulated by the NZ legislation. The current New Zealand legislation on these matters has not been extended to Tokelau (The Telecommunications Act 1987 and the Radiocommunications Act 1989). In a technical sense therefore it is not Tokelau law. In the international context however. those laws are relevant because the New Zealand authorities are responsible internationally for the use of the radio spectrum in the state of New Zealand of which Tokelau is an integral part.

H. Telecommunications Tokelau Corporation (Teletok)

Establishment and Charter

107. Teletok was established as a SOE by the first law – Telecommunication Tokelau Corporation Rule 1996 (TTCR1996) – passed by the General Fono under its newly delegated powers to make laws. The Rule authorised Teletok to take over all telecommunication[1] functions, assets, and liabilities of the Tokelau Administration. The business of Teletok officially started 1 July 1997.

108. The 2007 amendment to the Rule changed the composition of the Teletok Board to be the COG, which is the current arrangement.

109. The functions of Teletok,2007 amendment to the Rule and current Board structure as prescribed by the Rule are discussed above under the *Telecommunications Legislation* heading. Under the decentralisation arrangements of Government Departments Teletok's head office been erected on Fenuafala, Fakaofo, with two satellite offices set up on Nukunonu and Atafu.

110. Teletok is an SOE and governed by a Board that is the Council of Ongoing Government. This arrangement ties Teletok to Government perspectives rather than commercial imperatives. Also theTeletok Board structure does not formally include financial, market or technological perspectives. The absence of such perspectives further limits the commercial focus of the SOE. If the Government would wish that Teletok become customer and market focussed toward ensuring self-sustainability, the Teletok Board arrangement and composition should be revisited and revised.

[1] Telecommunications means transmission, emission or reception through the sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems whether or not such signs, signals, writing, images, sounds or intelligence have been subjected to rearrangement, computation, or processes by any means in the course of their transmission, emission or reception.

Management and Organisation

111. The day to day operation of the Corporation is managed from Head Office, headed by a General Manager with direct responsibility for the day to day running of Teletok, including personnel and asset management, financial management, policy advice, foreign relations, level 2 technical support,). The General Manager is supported by a Deputy General Manager who oversees the Billing, Fraud Assessment and Revenue Assurance, Local Finances, HR and Administration.

112. The satellite offices on Nukunonu and Atafu are managed by Field Managers who are responsible for the day to day management of the Satellite Earth Stations, personnel, and senior technical controllers and level 1 and 2 technical support.

113. All the 3 offices are supported by technical staff in the area of telephones, IT, and direct to home sky TV services, as well as administrative personnel to look after the revenue receipting, banking, accounts payable, operator and directory service, CDR and DAS management.

114. Total staff positions are 14 with one position (finance) unfilled. During the visit little information was available about the organisation design/ staff skills /job descriptions etc of Teletok. Accordingly there is little opportunity for analysis and review of the staffing levels, skills available or staff efficiency. However it is difficult to see a customer service function at less than two or three persons per island and then a central management, engineering, financial and business administration function at less than say five persons. At a total staff of thirteen it seems to be quite efficiently staffed.

115. A finance management service is provided by the Ministry of Finance which prepares Teletok financial reports from data supplied by Teletok. In recent times the Ministry of Telecommunications (and hence Teletok) has had four Ministers since October 2012. While these changes could have been detrimental Teletok was able to maintain its program of network upgrades and service delivery. The current Minister is Hon Mose Pelasio (Pulenuku of Fakaofo).

116. The past (and first) CEO of Telelok had served from inception until June 2014 and has served very well. Policy has been largely irrelevant as operational issues prevail and such policy as has been applied has happened at the behest of the CEO. The one feature of the rules that,in retrospect,has helped is the bar on borrowing (Teletok Act s9 (2)) but there is no indication that the past CEO would have done otherwise. The zero debt of Teletok has been and is a key strength (compared with the financial circumstances of other PIS).

Financial Performance

117. For the year to 30 June 2013 unaudited draft financial statements indicate net profit is $346,345 which includes internationally sourced revenues from making available part of the number space for International premium services and external management of the '.tk' cc TLD which amount to NZ$ 535,000. The continuity of these external sources is a concern noting that the '.tk' related revenues have ceased. The loss of this revenue is under investigation as described separately under the heading Spectrum Numbering and Internet below (Page 22).

118. A snapshot of Teletok financial status is below. The available data relates to 2012-13, the most recent completed period. Data for earlier periods was not available. Financial results for the period indicate a sound business but one that is dependent on uncertain foreign sourced funds. It would seem that Teletok is unlikely to be profitable and would not cover costs without the foreign funds of the current arrangements.

Year	Profit (loss) NZ$000	Gross Revenue NZ$000	Staff	Comment
2012-13	346	1120	14	Of the Gross Revenue, NZ$585,000 appears to be sourced from the domestic market (includes inbound call settlements). The balance NZ$535,000 appears to be foreign sourced (+690 & .tk)

119. Costs of staff, consultancies and Board (14%), satellite capacity(22%) and depreciation (17%) amount to more than half of gross income. Noting that gross income is inflated by the foreign sourced revenue(NZ$535,000), absent this income, Teletok would not cover these costs.

120. Teletok's draft Balance Sheet for 2013 shows it to have a positive equity value of NZ$1.615 million (despite carrying past losses of NZ$957,000). As the TTC Act prohibits borrowing for Teletok operations, the only liabilities that Teletok carries are current creditors (NZ$194,000). It also carries a provision for bad or doubtful debt of NZ$228,000 (which amount would be avoided completely by use of prepaid billing).

121. Total Teletok fixed assets and network plant has an historical acquisition cost of about NZ$4.0 million and a depreciated value of about AU$0.89 million. Total capital injections to the company since inception amount to NZ$3,467,000 which includes grants. However shareholder value is positive although diminished from the total capital applied to the corporation by the Tokelau Government and donors (NZ$3.467 million).

Services Delivery

122. Teletok provides:

- International telecommunications services via satellite and connected to the Global network via Telecom New Zealand International (TNZI).
- fixed line telephony services to about 80% of households and Island and national administrations. Intra island telephony is free and all inter island and international calls are operator assisted.
- ADSL Internet services to about 20% of households
- A resale of SKY Television to about 25% of residences (although at present this service is not operational due to SKY Pacific having relocated the service to a satellite that is outside of easy access from Tokelau - see separate discussion.)
- ICT equipment supply and repair services

123. There are no local radio or television services and no mobile telecommunications services.

Current Telecommunications Network

124. A pictorial description of the Teletok network is at Annex B. A tabulation of current prices of telecommunications services is at Annex C.

125. The departing General Manager and the acting GM, described the core facilities of the Islands as identical on each island with variations only reflecting the differences of customer configurations and delivery of services. The current network was constructed in 1996 and commenced service in 1997. There have been more recent additions (MSANs for ADSL services, backup satellite system) with the most recent being about 2008.

Fixed Network

126. On each island thereare60-80fixedtelephoneservices whichare now providedbya recently installed soft switch. (total value of this replacement is about $110,000).

127. Between20and30ADSL2+ servicesareoperationaloneachisland(currentcapacityofMSANequipments in the island communications room thatprovidestheserviceis72perisland although expansion is straight forward). Most of the ADSL services are understood to be reticulated around the customer premises by Wi-Fi (which is reported to provide fortuitous access to more than the customer). TheMSANcapabilityandcapacitycanbeexpandedbyinstallationofadditionalcards(e.g.forvoice,videoorotherservices). About 6 VDSL services are recorded but VDSL equipment was not apparent at the time of the visit. The network was designed to provide for public access WiFi hotspots but these have not been implemented. All services are post-paid but migration to prepaid would provide efficiencies for Teletok and elimination of bad debt.

128. MSAN[2] equipment are installed on each atoll for ADSL2+ internet using existing telephone lines to government and village offices and also to private homes. Being presently only used for ADSL services- are underutilised, adequate and will be slightly expanded as part of the PABX change out. The existing MSANs have capability and capacity for expansion for new services.

129. BothphoneandADSLservicesaredeliveredviaawellmaintainedcoppernetworkthat providesaccesstoallresidencesandofficesoneachisland.Coppercapacityisabout30%utilised. Accordingly there is capacity for considerable expansion of utilisation.

130. The copper access network extends a maximum of about 1Km from the Teletok equipment building (which is approximately central to each village and houses the MDF and cable terminations). The exception to this is on Fakaofo where the equipment building is at Fale and is separately connected to Fanuafala by a submarine (copper) cable about 2.5Km long.

131. The equipment installations of each island are identical comprising

- Main and back up satellite systems;
- Solar array, batteries and management systems for power (independent of the local grid);
- Multi-serviceaccessnode(**MSAN**) (for ADSL2+ at present but capable of voice,videoanddataservicestousers);
- Main voice switch (Nortel, obsolete and being replaced with soft switch system);
- Call metering and billing system; and
- A switchboard for connecting customers to other island or international locations and customer enquiry / support is in the Teletok administrative centre of each island (near but separate from the equipment room).

132. Equipment buildings are identical transportable structures about 5M square. The equipment room is air-conditioned but retains half of a passive cooling system that was installed when the network was commissioned. Removal of this residual of the system would recover 3-4 square metres of floor space per building.

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[2] *multiservice access node*- connects different subscriber services (phone, ADSL, Video on demand, internet radio) to the various core network components that provide these various services.

133. Complete modernisation of the fixed network facility (beyond the recent replacement of the obsolete PABX equipments - $110,000) could reasonably include the following (with indicative costs):

- Conversion of billing to prepaid (30,000-50,000);
- Elimination of the switchboard for inter island and international calling (reducing staff workload) ($10,000);
- Expansion of the existing MSAN equipment for new services (Mobile telecoms, Video on Demand, Internet radio, emergency warning by SMS) ($20,000);
- Introduction of a M-PAISA like service platform (mobile money).

134. There is a compelling case for simplification of the network (e.g.by abandonment of the wire line PSTN and migration to mobile network only) as a measure to drive down costs. However this would need to be considered in relation to best arrangements to address customer needs. Should this path be chosen retirement of the fixed network could be staged.

135. A public prepaid Internet service (WiFi)would be an advantage for citizens not ready for a mobile based service.

InternationalConnectivity

136. The Telecom NZ iDirect platform is the main system for telephony and internet, with a total of 6Mbps/ 2Mbps forvoice and internet services on the same satellite link. This satellite installation is being upgraded by TNZI and which, when completed will provide for enhanced services and operation of the overall telecommunication network – when such enhancements can be implemented.Replacement of the satellite dish antennas is understood to be part of this program however there was little data available on this at the time of the visit.

137. What is understood is that the satellite dish antennas on each island are being replaced as part of an upgrade to the satellite service. The current arrangement requires that a call from one island to another is routed from the origin island to the satellite and then to New Zealand satellite control centre and then return via the satellite again to the destination island. This incurs two satellite 'hops' for the signal path with double delay in speech between the caller and called party as well as requiring twice the satellite bandwidth for the call. Prospectiveworking arrangement (when implemented) willpermit the call to be connected directly from the calling island to the destination island on a single hop. This reduces satellite delay and also saves on satellite bandwidth capacity (effectively halving the cost to Teletok to provide the call).

138. The satellite equipment inside the equipment building has recently been upgraded to provide for this enhancedcapacity for long term needs.Each atoll has its own Satellite Earth Station and PABX for surety of service. In addition to the internet access via the iDirect platform, Teletok operates a satellite link, also for each island via PacTel (now SpeedCast) for redundancy (commissioned in April 2008).

139. The PacTel link provides an alternative satellite link for internet service, during major breakdowns ofthe main system, and combine to add more bandwidth when the main system is working. The additional capacity for internet access is 1M x 500KB – giving Tokelau a total capacity of 2M x 1M of internet access when both systems are combined. This arrangement is depicted in the network diagram at Annex B.

140. Teletok provides all services to Island Administrations (apart from the Government office functions in Apia). There are satellite services independent of Teletok (USP outreach on each island, and some private Pactel services). All other ICTinfrastructureandoperations, including SKY TV, iscontrolledby Teletok.

Current Arrangements

141. MainInternationalsatellitebandwidthis8Mbpssupportedby4.5Metredishantennasa teachsite(2Mbpstoeachofthethreeislandsandanaggregateof2Mbpsfromthethreeislands).T hedishantennasareintheprocessofbeingreplacedwithslightlylargeronesforimprovedperfor mance,whichisconvenientastheexistingunitsareshowingcorrosiondeterioration.The international linkisaserviceprovidedbyTNZIandterminatesatWarkworthinNewZealand.Core equipment has been recently upgraded to enable immediate access to expanded capacity (subject to price arrangements).

142. Abackupservicewasestablishedafterafailureofthemainlinkwhichsaw Tokelauwith outcommunicationsforaperiodofweeks.Thebackupserviceprovidesanaggregateshared1M bpstotheislandswith256kbpsfromFakaofoand96kbpsfromAtafuandNukunonosupportedb ya1.2Metredishantennaateachsite.ThebackupserviceisprovidedbyPacTel(nowSpeedCast)andterminatesinHawaii.Whenbothservicesareoperatingtheircapacitiesaggregateforimpr ovedperformance,howeverreportsduringthevisitwerethatthebackupservicehasnotfunction edsuccessfully.

143. Draftfinancialstatementsfor2012-13indicateaboutUS$1530/Mbps/monthforTNZIcapacity,whichisatthelowendofmarketrat es(forthissmalltotalbandwidth).ThepaymentsforthebackupcapacityindicateaboutUS$368 0/Mbps/monthforSpeedCastcapacity.TotalinternationalconnectivitypaymentsbyTeletoka mounttoUS$214,000peryearwhichrepresentsabout22%ofTeletokgrossincome.

Connectivity Development

144. At each Taupulega meeting on this mission there was interest in and discussion about a submarine cable connection via Hawaiki cable, the route for which is indicated to pass between Nukunono and Fakaofo islands. Hawaiki (along with O3B and Kacific) has made an offer to provide a connection to Tokelau. Depth of discussion of options is necessarily limited by the detail available- the Hawaiki cable offer was in fact three offers, each at different pricing for the same product, the O3B and Kacific offers provided for the transmission component but made no mention of termination prices for the remote end of the services offered). With these boundaries a review of these options is below.

145. ThecircumstancesofTokelauconstrain options, viz:

- threeislandsapproximatelysimilarpopulationwhichisdeclining andprospectivelowvolumeoftraffic(goodperformancetodaywouldrequirelessthan20 Mbps,longtermneedslessthan30 -40Mbps).
- TheprospectivefuturerevenueofTeletokfromallservicesmaybeestimatedintothelongte rmasabout5%ofGNI indicating prospective local telecommunications revenues may be about NZ$ 1 million. GrossTeletok revenuesin2012-13wereUS$0.98million(NZ$1.12million) of which about half came from sale of services while the balance came from international royalties which are showing to be at risk (revenues from Dot tk).

146. Current and prospective data bandwidth needs of Tokelau should also be considered.

147. Requirement of bandwidth is dependent on what is to be done with it and if efficiency measures such as a local storage for video content (You Tube, social networking, games) are implemented. As a rough benchmark Fiji has international bandwidth of6.5Kbps per population in June 2014 (TAF website). The ITU in its ‘Measuring the Information Society 2012 cites Fiji in 2011 as having 8kbps

international bandwidth per Internet user and 29% of households with Internet connection. On this basis if Tokelau were to have Internet performance similar to Fiji it would require less than 10 Mbps of international connectivity. However fluctuations of demand are more pronounced in smaller markets so a greater bandwidth (say double) would result in 'Fiji like' Internet performance. Of course greater bandwidth would yield 'better than Fiji' performance.

148. Noting the 2012 HIES for Tokelau indicates that about 22% of houses have an Internet connection (about 50% have a computer), the Internet demand prospects for Tokelau are commensurate with Fiji. Noting the impact of fluctuations on the smaller population, an estimate of current bandwidth for similar performance asfiji is about twice the current bandwidth. Into the medium term, the estimated prospective demand is 50-70% more (30-40 Mbps).

149. The customer perception of Internet performance can be enhanced by means of local storage of frequently accessed material (Facebook, You Tube or other video). This is termed Caching and is simply a dynamic storage so that material is down loaded once and distributed from the Cache multiple times rather than call from the international source each time. By this mechanism, the perceived performance is 50-100% greater than the international bandwidth.

International Connectivity Options

150. The following is a review of the international connection options considering these circumstances and the available data about the vendor offerings.

Hawaiki Submarine Cable connection to one island is offered at US$5-10 million (different prices attach to the three different offers) and annual charges of US$480,000 plus US$ 62,400 (total US$542,000pa) for 20 Mbps capacity. Finance charges on the initial capita (US$5-10 million) would amount to US$400,000 to 800,000 per year. Comparison annualised cost for a 20 Mbps entry level system is of the order of US$0.95- 1.45 million per year. A submarine cable connection would have a long useful life of more than 25 Years and expansion of capacity is straight forward. On the assumption that this project proceeds, 'ready for service' date is currently cited as mid 2016.

The Kacific Satellite is a new generation of geosynchronous ‘high throughput satellites’ that has been in service in Europe, North America and elsewhere for some years. Because the satellite, launch and operating costs are spread across the very high total capacity of the satellite, the cost per unit capacity is much lower than traditional satellites. One of its seventy or so antenna beams is able to cover all of Tokelau although amore beams are proposed to provide for communications for the ship that is the supply line between Apia and Tokelau. The Kacific offer is based on Teletok contracting for a minimum capacity of 60 Mbps growing to 120Mbps at about US$400/Mbps/month. The hub terminal equipment and costs are similar to existing satellite systems at an estimated US$50,000 -100,000 each although it appears that the Kacific operating arrangements could, for Tokelau, avoid this cost. Further information is required. This would provide service to all three islands for a capital outlay of US$300,000 (if this is required) and initial operating cost (for 60Mbps) of US$ 300,000 per year rising to US$0.6 million per year for the fully contracted amount (120Mbps). On the assumption that this project proceeds, 'ready for service' date is currently cited as early 2017.

O3B is also a ‘high throughput satellite’ but of a new lower altitude orbit (non-geosynchronous). It is a solution for Tokelau and has the advantage of being immediately (or nearly immediately) available. One of the twelve O3B satellite beams

is able to cover all three islands. The offer requires Teletok to contract for 50Mbps initially (at about US$1000/Mbps/Month) and then increasing bandwidth to 150Mbps (at about US$700/Mbps/Month). As this would require O3B satellite (tracking) facilities - two tracking antennas on each island, capital costs (equipment, setup and ancillaries) would be about (US$1.2 - 1.5 million). Comparisonannualisedcostforentrylevelsystem(whichismorethaniseverlikelytoberequired)isoftheorderofUS$0.6 millionperyear rising to .1.2 million.

TNZI (current service) could provide adequate capacity (say 20 Mbps- 15/5 Mbps) via the existing geostationary satellite (via the existing TNZI facility) for around US$370,000 per year. With the inclusion of the upgrades to the system that are already in train, expansion of capacity, while the most expensive per Mbps/month rate, is straight forward. If one of the other options were to be considered, expanded capacity of the existing system would provide a suitable stop-gap.

151. This analysis addresses annual operating costs only. Choice of a suitable system for Tokelau would necessarily need to consider timing of availability, technology risk, operation and maintenance practicalities (staff skills, special tools), network reliability and redundancy arrangements etc. The preparedness of donors to fund the initial capital outlay is also relevant. These are outside of the scope of this report.

152. Sustainability conclusions are tied to the medium term prospective Teletok revenues (above -US$1.3 Million) - of which a maximum of say half (US$0.65 million p.a.) could be applied to international connectivity) subject to technical, time and other considerations.

153. Considering the characteristics and boundaries of available data in relation to these possible paths, the following conclusions are reasonable.

- An optical fibre solution (US$0.95-1.45 million p.a.) is out of financial reach.
- The O3B solution is available now (with a lead time of up to a year) and has better (i.e. lower) latency -a technical issue for multi hop voice communications (which can be managed with modern systems) or for interactive video (especially gaming). Contract arrangements under the O3B offer show expenses of initially US$ 0.6 million p.a. rising to US$1.2 million p.a. and hence borderline or out of financial reach.
- The Kacific project is not yet confirmed (satellite launch is to be early 2017) so has attendant risk unless Tokelau is in a position to wait (relying on the TNZI service in the interim). Contract arrangements under the Kacific offer show expenses of initially US$ 0.3 million p.a. increasing to US$0.6 million p.a. and viable if the ultimate contracted capacity can be reduced (ideally contained to the initial contracted capacity).
- The existing TNZI arrangement provides far less capacity at much higher (x2 for O3B and x5 for Kacific) per unit price. If current TNZI capacity were doubled, expenses would be within the notional available funds for international connectivity and services and services quality would be much improved (but still with room for further improvement).

Sky TV

154. SKY Pacific is a Fiji based pay TV service owned by Fiji Television Limited. The service delivers 16 TV channels via direct-to-home (DTH) satellite on C-band to subscribers in Fiji and across the South Pacific including Tokelau and Tuvalu. Teletok

has been a reseller of SKY TV services since SKY TV was established. SKY TV has provided the only whole country TV service to Tokelau and about 30% of homes have the service although a larger faction have access to SKY TV – especially in relation to sport (rugby). Until June 2013 SKY TV operated via the Intelsat 18 Satellite (ISS18) which is located above the equator at 180 degrees of longitude. The coverage pattern that provided the service to Tokelau is shown at figure 1 of Annex E. Under this arrangement, Tokelau had good service using 1.2metre satellite receiver dish antennas mounted on the roofs of homes.

155. In June of 2013, SKY TV changed their arrangement and began providing the service via ISS19 (at 166degrees of longitude) instead of the ISS18. The resulting coverage pattern in the region of Tokelau is shown in Figure 2 of Annex E. It shows that Tokelau is now outside of easy coverage and hence no longer has access to SKY TV service on the basis of the small antennas that were used.

156. At all of the meetings with Taupulega, the loss of the SKY TV and its restoration were topics of considerable discussion.

157. SKY TV have offered to provide larger (1.5 metre diameter) antennas for the residents of Tokelau however tests and analyses by Teletok have shown that an antenna of at least 2.4 Metres diameter is required to access the now considerably weaker signal. An antenna of this size is not a usual residential system component and supply is challenging. Additionally, this sized antenna cannot be mounted on the residence roof (as the previous installation was) and would require a concrete pad adjacent to each residence that has the service and a robust installation to withstand tropical storms. These factors mean that restoration of access to the service will cost NZ$2000- 3000 per residence and change the visual amenity of the village considerably.

158. Alternatives are to install a single central large antenna (3.6 metre) adjacent to the telecommunications building and then:

- install and use a coaxial cable service to deliver the television service to residences
- use ADSL to deliver the Television service to residences as a Video–on–Demand (VOD) service;
- install a 3G/ 4G mobile network and use it to deliver the television service to residences using a Video–on–Demand (VOD) service; or

159. Indicative review of these options is below. All costs are in US$.

Installation of a coaxial cable service (assumed underground as current telecoms and electricity is underground). Each Island would require:

- A new central 3.6 metre satellite antenna and receiver installation for each island ($300,000 total)
- about 5Km of cable ($25,000) per island,
- conduit fittings, ($20,000 per island),
- fittings for connection to the cable, ($30 per connection- say $1000 per island),
- in house termination unit ($30 per connection- say $1000 per island),
- installation of street cabling (five persons 6-8 weeks say $12,000 per island),
- residence installation(one person, one day say $40 per residence /$2000 per island.

160. Each customer would be responsible for a separate account for their SKY TV service (which could be co-ordinated /aggregated through Teletok. Total capital would be of the order of $100,000 per island, a total of about $300,000 and a new cable distribution and connection network at about $157,000. There would be additional operating maintenance costs equivalent to about one staff member for Teletok.

ADSL and VOD based delivery. Existing central ADSL equipment (the MSAN) and street cabling is adequate for this purpose. Additional items per island would comprise:

- A new central 3.6 metre satellite antenna and receiver installation ($100,000 per island)
- Central VOD equipment and management system for about 60 subscribers (installed in Teletok equipment buildings) - $15,000.
- Installation of central equipment - $5,000

161. Teletok could be responsible for any negotiations with SKY TV about its redistribution of SKY TV services. Its subscription /operating costs would be recovered from subscribers to Teletok in lieu of SKY TV. Each subscriber would require an Internet to TV receiver box at about $200 each (provided by Teletok as part of the subscription. Consequent total indicative capital cost for this path is $55,000 per island, a total of $160,000.

3G /4G Mobile Network Distribution. If a 3G network is to be installed, the additional costs would be the same as for the ADSL based VOD system, viz.

- A new central 3.6 metre satellite antenna and receiver installation ($25,000)
- Central VOD equipment and management system for about 60 subscribers (installed in Teletok equipment buildings) - $15,000.
- Installation of central equipment - $5,000

162. Teletok could be responsible for any negotiations with SKY TV about its redistribution of SKY TV services. Its subscription /operating costs would be recovered from subscribers to Teletok in lieu of SKY TV. Each subscriber would require a Wireless Internet to TV receiver box at about $200 each (provided by Teletok as part of the subscription. Consequent total indicative capital cost for this path is $55,000 per island, a total of $160,000

Radio Broadcast Service

163. As noted above, Atofa had a local FM radio broadcast service but this service no longer operates. At the meetings with Taupulega, there was considerable interest in having a broadcast service for broadcasting discussions of the General Fono, disaster messages and entertainment. The arrangement suggested was to have an AM radio service located on Nukunono and designed to provide coverage to the other islands.

164. Establishment of a central (and centrally located) AM radio service for Tokelau, while intuitively attractive, may not be the most appropriate solution. Very few people presently own AM receivers (certainly in comparison to FM receivers or mobile phones –which often incorporate FM receivers). Separately, an AM Transmitter that is capable of covering the area of Tokelau would be demanding of electrical power –10-20 Kilowatts.

165. When considering an AM radio solution, it is useful to review the arrangements of similar environments. Key considerations are that AM radio broadcast over sea provides considerably better coverage than over land. For this reason, a useful comparison is the US state of Hawaii, the AM stations of which seek to cover an area of the globe commensurate with (but a bit larger than) Tokelau.

166. In the case of Hawaii the AM radio stations transmit power is between 5 and 10 Kilowatts, the lower end of which would be the minimum requirement for Tokelau. For this level of transmit power, the electrical input power would need to be about double - i.e. 10 to 20 Kilowatts. This needs to be considered in the context of the available

electrical power of Tokelau - noting that total supply capability was designed around a consumption average of 75KWH per house per month. An AM radio station of (say) 10 KW radiated power would consume a month of an average household power provision in about five hours. The monthly power consumption would depend on the number of hours of operation per month.

167. Separately the Hawaii broadcast stations along with all AM radio stations use very high antennas. For operation in the AM band an antenna would need to be a minimum of 75 metres tall. The guy wires for such an antenna would need to be anchored over an area of between 100 and 150 metres diameter. This may be a challenge on Nukunono.

168. On this basis it is useful to consider alternatives to traditional AM broadcast that could address the need in a more efficient and effective way. In any such review of alternatives, the preparation of the material the need for a studio and broadcast material assembly remains. The focus of any analysis is an alternative delivery to the audience by a means that is energy efficient and of reduced impact on the visual environment.

169. The objective is the provision of a service that

- Permits citizens to be able to engage with discussion of the General Fono and with Village Taupulega;
- Be able to be advised of weather and other emergencies;
- Be able to follow developments in the outer world community; and
- Be entertained or appraised with messages of their choosing.

170. Teletok has addressed the issue in part in that it engaged an NZ company (Kordia) to assess tower needs for both a local broadcast service and mobile telecommunications. The survey tabled at the Council meeting on Nukunonu recommended a new 30 meter tower for Nukunonu and Fakaofo, and remedial work on the exiting tower on Atafu to produce towers that would be suitable for broadcast and mobile telecommunications.

171. A possible arrangement might be the establishment of a local FM service on each atoll that used satellite links to the other islands for transport of General Fono meetings or other material assembled in a central broadcast studio. Material that is not time sensitive could be transmitted by the satellite at time of low traffic to contain costs and stored for transmission locally at a suitable time.

172. Alternatively, if a mobile telecommunications service is to be deployed, the objectives of the service could be achieved with a modern 3G/ 4G telecommunications network. A 3G system would be more economically viable as the handset cost of 3G handsets is presently NZ$80-120 for a useable unit and around NZ$240 for one that incorporates a GPS, IP TV, FM receiver and comfortably useable Internet capabilities. A 4G handset costs NZ$500-600 for equivalent functionality.

173. Indicative costs for these alternative paths might be as follows.

- FM transmitter (with antenna and cables) and broadcast storage at each site $65,000 per site;
- Remote management and control systems for each transmitter ($20,000);
- Central broadcast studio for assembly of program material and system management $300,000;
- Tower cost ($80,000/ site), could be shared with a mobile telecommunications system (assuming that mobile telecommunications service is to be deployed.

174. The system would require one technical person at each site for gathering or recording of Council / General Fono Meetings and maintenance of the local system. The central Broadcast studio depending on chosen complexity and hours of transmission, could require three suitably skilled persons (total six persons at $60,000 p.a.)). Satellite capacity would comprise say 64Kbps per site of capacity at times of direct transmission (estimate is $100 per month, $1200 p.a.). Total capital costs for this approach would then be $345,000 plus $65,000 p.a.

175. If the broadcast service were integrated with the mobile network or additionally included with the existing ADSL network for redundancy, e.g. as internet radio, any subscriber with a suitable mobile phone or computer or suitable low cost ($50) interface device would have access to the broadcast service. The additional cost of the internet radio over a standard mobile telecommunications system would be

- Remote management and control systems for each mobile base station($20,000);
- Central broadcast studio for assembly of program material and system management $300,000;

176. The system would require one part time suitably skilled person at each site for gathering or recording of Council / General Fono Meetings and connection to the Broadcast studio. The central Broadcast studio depending on chosen complexity and hours of transmission, could require three suitably skilled persons (total 4 persons equivalent at $40,000 p.a.)). Satellite capacity would comprise say 64Kbps per site of capacity at times of direct transmission (estimate is $100 per month, $1200 p.a.). Total capital costs for this approach would then be $45,000 plus $42,000 p.a.

MobileServices

177. Thereisnomobileserviceavailableonanyislandbutsuchaserviceremainspartofthe planned Teletokworkprogram.Teletokhasdeferredtheserviceduetofundingconstraints.

178. Ateachmeetingdiscussionindicatedconsiderablepentupandunsatisfieddemandbot hforlowercostinternetaccessandmobiletelecommunicationswiththeattendantfeaturesofsu chaservice(M-Paisa/mobilemoneyinparticular).AsnotedabovetheabsenceofacreditcardserviceinTokelau limitsSkype(orequivalentservice)usetoSkypetoSkypeconnectionsastheSkype-outservicerequiresprepaymentviaCreditCard.AnM-PAISAservicescouldbeasurrogateforcreditcardservices.

179. There is already extensive work on this in the Pacific through the financial inclusion program. Critical success factors include an affordable and widely-used mobile network which would need to be established as a pre-cursor to being able to offer such a service. However the main enabler is financial sector/banking regulation that permits the telecommunications operators to provide this kind of services, subject to appropriate regulation.

180. Boththesafetyoflifeatseaandradiobroadcastservicecouldbeaddressedinconjunctio nwithestablishingamobiletelecommunicationsservice.Eachwillrequireatowerforeachisla nd(astudycommissionedbyTeletokhasestimatedworkstoprovidesuitabletowersatNZ$240, 000.

181. A modern mobile network (3G or 4G) is suitable for integration of services such as Internet radio, Video on Demand (for SKY TV) emergency message communications and Safety of Life at Sea. Establishing a 3G mobile network (with option for future migration to 4G) would be technically straight forward and would lend itself to easy co-existence with a local FM broadcast service if that were preferred as a

means of ensuring redundant emergency communications to the community. Conveniently, most 3G handsets also include an FM radio and many include GPS.

182. Installation of a complete 3G network (for the sake of containing handset costs as discussed below) would consist of the following features.

- One base station on each island with coverage to all population centres;
- Distributed control to ensure no single point of failure;
- Internet Protocol (IP) based backhaul (satellite) shared across services at each island;
- Inclusion of services such as Internet radio, SMS emergency warning, VoD (subject to continuity of service considerations) and prepaid billing;
- Beacon light at the top of each tower (for safety at night);
- Mobile coverage to 10 Kms out to sea for Safety of Life at Sea; and
- Ready connection to the fixed network with automatic dialling to any national and international number

183. Such a solution would cost about $0.7 Million assuming the towers are separately established or less than 0.95 million including necessary tower works. A 4G solution would cost more but being data focussed would provide data based services (VoD, Internet, permanent virtual circuits) more efficiently. 4G handsets are much more expensive than 3G handsets ($300-400 each compared to $50-90 each) and this could limit take up of the service and consequent reduce benefits that might attach to such expanded services in Toklau.

184. If a 4G network were preferred over a 3G network, network component costs are not greatly differentgreat - especially where the majority(75%) of costs for a new network will be tower, electrical power and equipment housings. If a 4G network were installed from the beginning there is the prospect of a longer installed life for the equipment. However the primary consideration would be likelihood of take up of services as a 4G network requires 4G handsets for every subscriber – a 4G handset can operate on a 3G network but a 2G or 3G handset cannot operate on a 4G network. The key decision consideration would be the cost of user equipment. Current reasonable capability low cost/entry level 3G handsets are priced at US$50-90 in many East Asia markets today. A similar functionality low-cost/entry-level 4G handset is priced at US$300-400. A medium market unit is perhaps double that price. It becomes a business judgement as to the capacity of customers to purchase their handset (how many customers Teletok is likely to get) that determines which network to install.

185. Telecommunications plant has a decreasing life and future changeover is to be expected. All operators need to plan to scale up and the investment/upgrade path is now from 3G to 4G. A twenty year life is no longer the pattern with life being determined by factors outside operator control. A 3G network today would have a residual life governed by cessation of manufacture of spares by vendors and availability from other sources. On this basis 3G systems would have a life of ten or more years. However the kind of 3G network plant that could be installed could be software upgradeable to 4G network at some suitable point in the future – e.g. when handset prices fall to the point that say 70% of Tokelau population could purchase one..

186. It is on this basis that it may be prudent to install 3G equipment at this time, but with a view to migration to 4G at a time that Teletok judges appropriate subject to maintaining its customer base (and hence revenues).

187. The cost estimates provided relate to works in other remote island countries e.g. Kiribati. Prices do vary significantly - mostly driven by negotiating strength of the buyer and circumstances for delivery of plant and related assembly/ construction (e.g.

towers). These may be cross-checked with Pacific service providers, e.g. through the Pacific Islands Telecommunications Asociation

188. Introduction of mobile telecommunications would require revision of the current number plan and may require recovery of at least one number digit from the current arrangement with Zeatel. Additionally, radio spectrum would need to be assigned which would require the development of a spectrum management regime for Tokelau.

Indicative Costs -Network Developments

The diverse components of this analysis require diverse sources of information and pricing data. In all cases the price data should be considered indicative and comparative as for all the products analysed, the price will be determined by a market process – negotiation and vendor perceived challenges of getting product to Tokelau, through its bureaucracies and the extent of vendor support to establish the product.

Sources generally relate to ex-vendor pricing so an allowance is required for additional costs unique to Tokelau.

Mobile Network Establishment Price

189. While in this document indicative prices for networks are based on recent regional experiences (Kiribati, PNG), the actual price for a buyer will be more determined by the negotiation skills and purchasing power of the buyer. Network equipment vendors' prices are largely determined by licence fees for attributes and capacities sought and whether these are part of the initial purchase (when features and licences may be offered at zero or low price) or as later additions (when prices will be disadvantageous). These licence charges will generally be annual recurring charges. The customer would be advantaged by use of a knowledgeable and skilled customer advocate.

International Connectivity

190. Hawaiki Cable, O3B and Kacific satellite costs are derived from the offers to Teletok and the Government of Tokelau by the relevant provider. In the case of Hawaiki Cable the data varies across three separate offers made to Tokelau and some interpolation has been required.

191. Costs for extension of the TNZI service are derived from current payments by Telketok to TNZI from the Teletok financial data of the 2013 financial report.

SKY TV

192. Data from SKY TV and other satellite broadcast providers has been used to estimate costs of a larger (3.6 metre) satellite receiving station with relevant electronics. Costs for cabling relate to estimated labour rates of Tokelau and author experience in outside cable plant to estimate time for completing work. An assumption has been included that the existing cable has bee laid in ducts large enough for inclusion of an additional TV distribution cable.

193. Cost for distributing the SKY TV signal via a 4G network derive from actual quoted prices for a similar (but reduced number of channels) service provided in Nuie, with adjustment for the increased number of channels of the SKY TV service.

Broadcast Service

194. The United States Department of Commerce,National Telecommunications and Information Administration (NTIA), Office of Telecommunications and Information Applications provides planning budget data for various types of broadcast installation.

Separately, data from the 'Broadcasting for Remote Aboriginal Communities (BRAC)' in Australia has provided indicative costs for establishing remote area broadcast services. Both of these have been applied in estimating costs for simple broadcast services based on satellite links for three islands in Tokelau with a coordinating central studio. The costing from NTIA is based on choosing equipment which will have a life of ten years, the BRAC project is based on less robust equipment and shorter life.

195. Broadcasting costs estimates for this report are an interpolation between these two sources.

I. Numbering,InternetandSpectrum.

Numbering

196. Tokelau(CountryCode+690)presentlyhasafourdigitplanforfixedservices(leaddigits2,3,4 - a separate digit for each island).Digit 1xx is reserved for 'Dial It' services. Digits5-9arenotinusein Tokelau and are madeavailablefor international premium services via an arrangement with internationalpremiumserviceprovidersthroughZeatelLtd.,aNewZealandmanagerofsuchresources.Revenuefromthisarrangementareconsolidatedwithother Teletokrevenuesandusedforcapitalworksforexpandingservice(TeletokpastGM).Draftaccountsof2012-13indicatethearrangementprovidesaboutNZ$228,000in thatyear.

Internet

197. A similar arrangement to the international use of numbers above was also established in relation to the '.tk' cc TLD. In 2006, TheInternetAssignedNumbersAuthority(IANA), agreed to the re-delegation of the'.tk'ccTLD from the caretaker VixieNZLtd to Teletok. ThelistedtechnicalcontactisJoostZuurbierofTaloha,Inc.Taloha,Inc.isthecompanycurrentlyhandlingthetechnicaldutiesofadministeringthe '.tk' top-leveldomain. The '.tk' domain has been passed to DotTK, theregistrationdivisionofTaloha,Inc.,whichisajointventureofaprivateorganization,BVDotTK,withTeletok.BVDotTK,whichisdoingbusinessasDotTKregistry,hasbeenappointedbytheTokelauGovernmentastheexclusiveentityforregistrations under the '.tk' TLD.Theyareknownfortheirinnovative 'OpenccTLD',whereinalimited-use '.tk' domainisprovidedfreeofcharge.Theyalsoselldomainsandacceptdonations.

198. The.tk ccTLD, has 16.7millionactiveregistrationsaccordingtothelatestCENTRDomainWirereport. This compares with'.de' and '.uk' at 15.4 and 10.5 million respectively. With such a high number of largely uncontrolled registrations, malicious registrations are an issue.

199. AtthetimeofenteringintothisarrangementtheremittancesfromDotTKweresubstantialandincludedanupfrontpaymentofUS$210,000.Howeverrevenueshavedwindledandnonereceivedsincemid2013 (the draft 2012-2013 P&L statement of Teletok indicates annual receipts of 308,000 in that year). Teletok is working with a New Zealand domain registry to investigate to loss of the revenue stream and to ensure '.tk' cc TLD is not lost. It is separately investigating what action is possible to terminate the arrangement with DotTK and to recover control of the '.tk TLD. The loss of this single income stream will have a large impact on Teletok finances as this stream in 2012-13 was about the same as Teletok net profit and equal to about 55% of income from national subscribers.

Spectrum

200. Althoughnotexplicitlyprovided for,Teletok,initsresponsibilityforallaspectsoftelecommunicationsisthede facto managerofspectruminTokelau (despite the legal technicality discussed above).Howeverthereisnoradiospectrummanagementregimenorasystematicrecordofallocationstousers.Thereisarenomicrowavelinksinuse inTokelaubuttherearesatelliteservices,HFandVHFradioandportradiocommunicationstovessels,handheldradiosandWi-Fiservices.

201. Broadcastandrelatedspectrumusescould alsofallundertheTelecommunicationTokelauCorporationRules(again despite the legal technicality discussed above)andhencetheresponsibilityofTeletok.Therearenobroadcastradioservicesin Tokelau althoughone did exits on Atafu and thereisacommunitydesireforsuchaservice(evidencedatmeetings)andprovisionofbroadcastservicesinincludedintheTokelauNationalandVillageDevelopmentPlans.

QualityofServices

202. InmeetingswithTaupulega,membersdidraiseissuesaboutqualityofInternet services.Specific complaints were that it was unreliable and slow. PricesforInternetserviceswerealso raisedateachvenue.AsnotedaboveInternetresponsesareslowanddifficulttouseinanyresearchcontext.Thisalsoindicatesinadequatecapacityin theInternationalconnection. An anecdotal observation about continuity of the Internet services at the customer premises was that problems were being experienced with ADSL modem dropping out of connection due to problems with the island's AC 240 Volt supply. The main supply was claimed to fluctuate significantly but the cause was not identified and the extent to which it happens and causes remain unclear.

J. GovernmentObjectivesforTelecommunications

203. CommentaryfromintervieweesoftheGovernmentofTokelauwasquiteconsistentin wantingreliableandaffordabletelecommunicationsservices.TheTokelauNationalStrategicPlan(TNSP)citestelecommunicationsascurrentlynotmeetingneedsandwarrantingdevelopment. Opportunities for development of the kind in other larger economies are dependent on external assistance.

204. The TNSPnotesthatTokelauansareregularlyexposedtoSamoaandNewZealandwithover80%ofallTokelauansover15yearshavingspentmorethan6monthsabroad(TokelauNationalStatisticsOffice).

205. TheTNSPnotesthemainissueswhichneedtobeaddressedare:

- Servicesreliability-telephoneorinternet(orboth)arecitedasnotworkinginoneormoreoftheatolls;
- Limitedservices-onlybasicservicesavailablethroughthetelephonelines;
- Governance-especiallyinrelationtowishesofislandcommunitiesandmergerofITunderTeletok;
- CostofService-chargesfortelephonecallstotheconsumerareexpensive.

206. TheGovernmentofTokelau,throughitsTNSPcitestelecommunicationsasakeycomponentinitsfutureespeciallyinrelationtoeconomicdevelopment(throughaccesstoinformationandfinancialsystems),healthandtelemedicine,distanceeducationandtraining,tourismdevelopment,safetyoflifeatseaanddisastermanagementandnationalefficiency.

KeyObjectives

207. TheTNSPnotesthefollowingasneedingtobeaddressed.

- Toestablishanefficient,reliableandaffordabletelecommunicationssystemwhichcompl ieswithinternationalstandardsandhasthecapacitytomeetpresentandfutureneedsofpriv ateconsumersandthepublicservice;
- Toprovideservicessuchasvideoconferencing,telemedicine,distanceandflexibleeducat ioninsupportofnationalservicessuchasHealthandEducation;)
- TostrengthenHRcapacitytomeetallrequirementsfornewsystem,serviceprovisionsand successionplanning;
- ToprovideITsupportservices;
- Toprovideforemergencytelecommunicationswhenthenationalsystemhasanoutageori nsupportofSearchandRescue.

208. The TNSP and issues related to telecommunications are discussed at Annex A.

Annex A – Government Goals

Tokelau National Strategic Plan

1. The TNSP 2010-2015 builds from the 2007 Economic Support Arrangement between New Zealand and Tokelau. It cites four policy outcome areas for attention in that period. These are reviewed in terms of the contribution of ICT to these goals.

Policy Outcome Area 1: Good Governance

Goal 1: *Improved governance, public sector and financial management, and application of the rule of law.*

2. The current TTC Act is in need of development. Components for inclusion to support this Policy Outcome are:

- Review of the current Telecommunications Tokelau Act to assess modernisation and closer alignment with the TNSP and with the capabilities of modern telecommunications technology options. This includes the provision for forms of service provision that would be a surrogate for competition or a form of competition within the market realities of Tokelau (citizen self-provision of sevices)
- Revise arrangements concerning the Board of Teletok so that suitable relevant skills – in particular business skills -are part of the governance arrangement.
- Incorporating into the regime and legislation a monopoly regulation arrangement for supervision of Teletok operations and delivery of services that would be a surrogate for competition. This may be best addressed by increasing the role of the PMU or revising the PMU so that it can effectively investigate Teletok performance and provide realistic advice toward improved commercial efficiency and better address the market needs.
- Revise the current TTC Act to end the exclusivity of Teletok particularly in relation to permitting new entrant niche providers who could provide new services, stimulate Teletok in its operations, and provide opportunities for new enterprise (including for women).

3. Linked to these themes and to infrastructure development below is the need to-

- Revisit the National Number plan for services.
- Consider a spectrum management regime as new services will inevitably require this resource.
- Revisit the arrangements for the management of telephone numbers and the '.tk' cc TLD to ensure that national needs are not sacrificed to the international user community, that any international access to Tokelau's numbering and '.tk' resources produce a suitable return to Tokelau.
- Incorporation into the legislation a contribution scheme (e.g. a Community Obligation) for services to each school, development of educational material and new services such as M-Paisa and telemedicine.
- Consider development of subordinate instruments relevant to the needs of Tokelau in relation to telecommunications and telecommunications related development.

Policy Outcome Area 2: Infrastructure Development

Goal 2: *Improved standard of living through adequate, reliable and efficient infrastructure*.

4. The development and redevelopment of telecommunications infrastructure is a major component of the community needs expressed in the meetings program. In all

considerations it is necessary to note the domestic revenue of Teletok has an upper bound of about NZ$1.1 million per year and the international revenue which is not certain in the long term may add an additional NZ$0.5 - 0.6 million per year.

5. **International connectivity** is in need of attention. Potential paths addressed above are

- expansion of the current arrangement with TNZI (which is immediately possible subject to costs (current capacity could be doubled for an additional NZ$0.185 million p.a.),
- take an O3B service (about 1 year to establish) available at a capital cost of US$1.2 - 1.5 million and ongoing cost of US$0.72 -.0.96 million per year
- Take a Kacific satellite service (subject to that project proceeding in about 2017) at a capital cost of US$0.3 million and operating cost of US$0.3 million per year for an entry level capacity that would be more than prospectively needed; or
- Establish a connection to the Hawaiki cable (subject to that project proceeding in about 2016) at a capital cost of US$5-10 million (or more for a connection to each island) and operating costs of total US$ 0.54 million per year for a suitable capacity which can be easily expanded.

6. **Fixed Network Services** have in the main been addressed by the recent upgrade to a soft switch to replace the existing PABX and ancillary equipment. No further expenditure is necessary.

7. **Fixed Internet (ADSL2+) services** are in place and suited for service into the medium term at least. The core that is providing the ADSL2+ service (the MSAN) is presently underutilised and can be readily expanded to address a range of identified needs. Maintenance and expanded use of the existing ADSL 2+ network would make it also a means to readily deliver services such as Internet to each school, telemedicine to each clinic, as well as a public, prepaid Wi-Fi access service for those who might otherwise be left behind in this services revolution. Facilities in schools / clinics could be part of a 'Universal Service' like scheme noted in Policy Outcome 1 above.

8. **Mobile Telecommunications** is a clear gap in the services portfolio of Tokelau. Establishment of a 3G network (preferred over 4G because 3G handsets cost to end users is about $50 compared to $400-700 for 4G units) would cost less than $0.7 Million assuming the towers are separately established or less than 0.95 million including necessary tower works.

9. A 3G (or 4G) mobile network has the capacity to deliver additional services (mobile Internet, Internet radio- in lieu of FM, Safety of Life at Sea - within 10-15 KMs of the base station) and because many 3G handsets incorporate features such Global Positioning, users are advantaged with Safety of Life at Sea over virtually unlimited distances.

10. **Mobile Money (M-PAISA or equivalent)** service would add considerably to the ability of Tokelau to attract tourism business and enable Tokelauans to gain from the benefices of expatriates in Samoa, New Zealand or elsewhere. Establishing such a service need to be explored in conjunction with a bank and within the financial management regime of the Government of Tokelau.

11. **Educational Internet** made available at schools would assist the education and development of young Tokelauans. Arrangements for schools would ordinarily include a cache of material certified as suitable for student access. Such an arrangement could be established under a Community Service Obligation that may be incorporated into legislation as a levy on all users or some other scheme. Establishment costs would be

low ($20-30,000 per school) plus operating costs commensurate with a reasonable ADSL service.

12. **SKY TV Restoration** can be addressed most efficiently (least cost) by a centralised system by installing on each island a central large (3.6 Metre) antenna, expanding the currently in place MSAN equipment and installing new Video on Demand server equipment so that the existing ADSL facility can be used to distribute SKY TV material. Total cost of this approach is about $0.46 million.

13. **Broadcast services** which were once in place were identified as a current need. The broadcast function could be addressed most efficiently in conjunction with the proposed mobile network (Internet radio over the handset) and as Internet radio delivered via the existing ADSL network. The key cost component in this approach (whether dual mobile / ADSL or single via either) is the costs of a broadcast studio to assemble material for broadcast. Total cost of a central studio with staff at each Village council and in the Broadcast studio (assuming building space can be provided within an island administration building) is about $0.20 million and about NZ$42,000 per year. There is a cost to subscribers of about $100 per subscriber (an Internet radio) and the subscription fee that would be set by Teletok.

14. An alternative that would provide redundancy in that it is not dependent on the mobile phone network could be a small FM transmitter on each island, linked by satellite to a central broadcast studio. Listeners would require an FM radio for access (noting that most 3G phones incorporate an FM radio).

Policy Outcome Area 3: Human Development

Goal 3: Improved health and education outcomes and social-wellbeing of our communities

15. The availability of ICT services is widely recognised as an enabling service for economic and society development. Encouraging the take up of ICT by providing services recognisable as commensurate with those of Samoa and New Zealand will encourage enterprise. The advent of USP into each island of Tokelau brings the opportunity for education and skill development in areas of business and commerce as well as other streams.

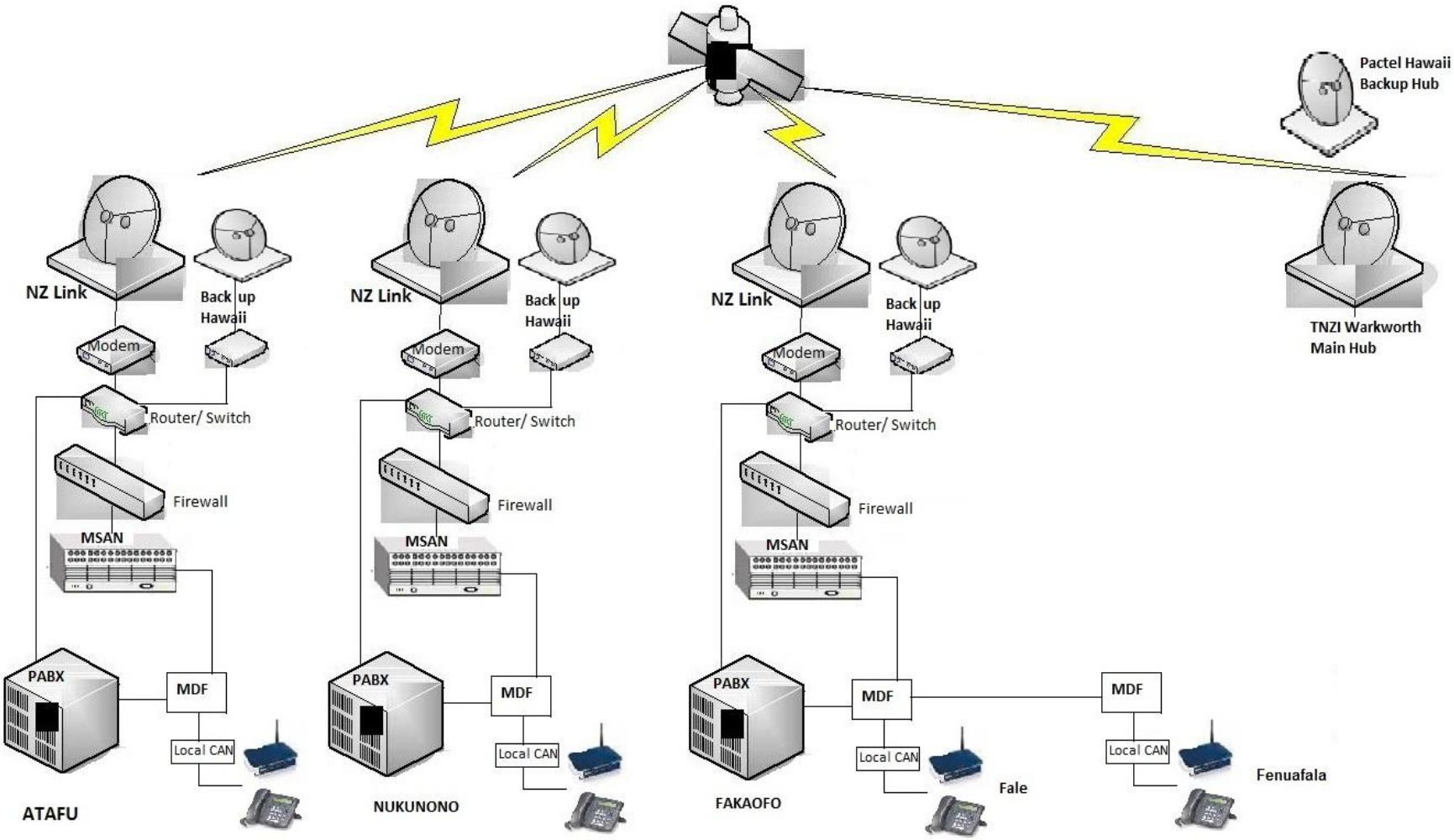
16. With the complementary component of removing the exclusivity of Teletok, it is reasonable to anticipate that citizens will identify niche service opportunities and with encouragement seek to exploit them. Such opportunities will extend to both men and women, who with an appreciation of technology, business operation and a market opportunity will prospectively add to the economy of Tokelau.

Policy Outcome Area 4: Sustainability

Goal 4: Improved economic, cultural, environmental and spiritual sustainability

17. The suggested suite of services and arrangements for their exploitation are all based on least energy impact, alignment with the TNDP and competencies available now or in the near future. The introduction of expanded ICT services in Tokelau offers promise for both a better future and service delivery within the bounds of resources available now and into the future in Tokealu.

AnnexB-theTeletokNetwork



TOKELAU TELECOMUNICATIONS NETWORK FOR THE THREE ISLANDS

AnnexC-PricesofTelecommunicationsServicesinTokelau(2013)

NationalandInternationalcallingRatesfromTokelau

RATES FROM TOKELAU EFFECTIVE MARCH 1 2014

Country	***1min***	***6 sec***	***12 sec***	***18 sec***	***24 sec***	***30 sec***	***36 sec***	***42 sec***	***48 sec***	***54 sec***	***60 sec***
Tokelau	$0.40	$0.04	$0.08	$0.12	$0.16	$0.20	$0.24	$0.28	$0.32	$0.36	$0.40
Tokelau, Off-Peak	**$0.20**	**$0.02**	**$0.04**	**$0.06**	**$0.08**	**$0.10**	**$0.12**	**$0.14**	**$0.16**	**$0.18**	**$0.20**
Australia	$0.90	$0.09	$0.18	$0.27	$0.36	$0.45	$0.54	$0.63	$0.72	$0.81	$0.90
mobile	$0.95	$0.10	$0.19	$0.29	$0.38	$0.48	$0.57	$0.67	$0.76	$0.86	$0.95
New Zealand	**$0.80**	**$0.08**	**$0.16**	**$0.24**	**$0.32**	**$0.40**	**$0.48**	**$0.56**	**$0.64**	**$0.72**	**$0.80**
mobile	**$0.85**	**$0.09**	**$0.17**	**$0.26**	**$0.34**	**$0.43**	**$0.51**	**$0.60**	**$0.68**	**$0.77**	**$0.85**
Samoa	$0.90	$0.09	$0.18	$0.27	$0.36	$0.45	$0.54	$0.63	$0.72	$0.81	$0.90
mobile(bluesky)	$0.90	$0.09	$0.18	$0.27	$0.36	$0.45	$0.54	$0.63	$0.72	$0.81	$0.90
mobile(digicel)	$1.10	$0.11	$0.22	$0.33	$0.44	$0.55	$0.66	$0.77	$0.88	$0.99	$1.10
Fiji	**$1.00**	**$0.10**	**$0.20**	**$0.30**	**$0.40**	**$0.50**	**$0.60**	**$0.70**	**$0.80**	**$0.90**	**$1.00**
mobile	**$1.00**	**$0.10**	**$0.20**	**$0.30**	**$0.40**	**$0.50**	**$0.60**	**$0.70**	**$0.80**	**$0.90**	**$1.00**
ROW	$1.95	$0.20	$0.39	$0.59	$0.78	$0.98	$1.17	$1.37	$1.56	$1.76	$1.95
	1min	***6 sec***	***12 sec***	***18 sec***	***24 sec***	***30 sec***	***36 sec***	***42 sec***	***48 sec***	***54 sec***	***60 sec***

InternetPrepaidandPrepaidChargeUpsRates (NZ$)

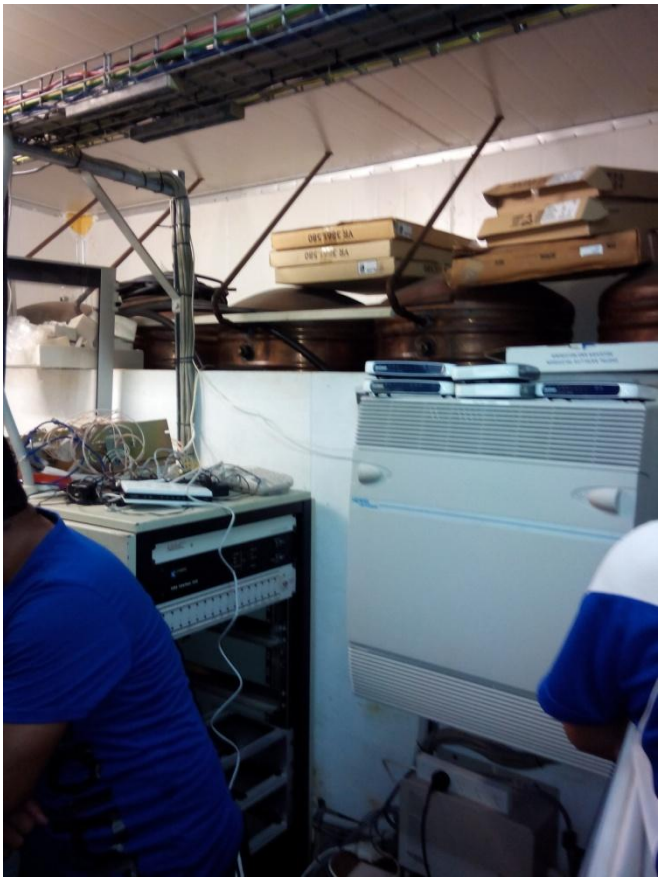
$5 80MB
$10 167MB
$20 346MB
$30 540MB
$40 750MB
$50 978.26MB
$60 1227MB(or1.227GB)
$70 1500MB(or1.5GB)
$80 1800MB(or1.8GB)
$90 2132MB(or2.132GB)
$100 2500MB(or2.5GB)

Thecostsarebasedon$6per100MBbutcascadesothemoreyoupaythelessper100MBischarge(e.g.$100for2500MBor2.5GBequatesto$4per100MB)

AnnexD–TeletokEquipment

SatelliteAntennas,SolarandEquipmentRoom

MSAN(ADSL)andPABX



PABXandPassiveCool ingTanks

AnnexE– Sky TV Coverage

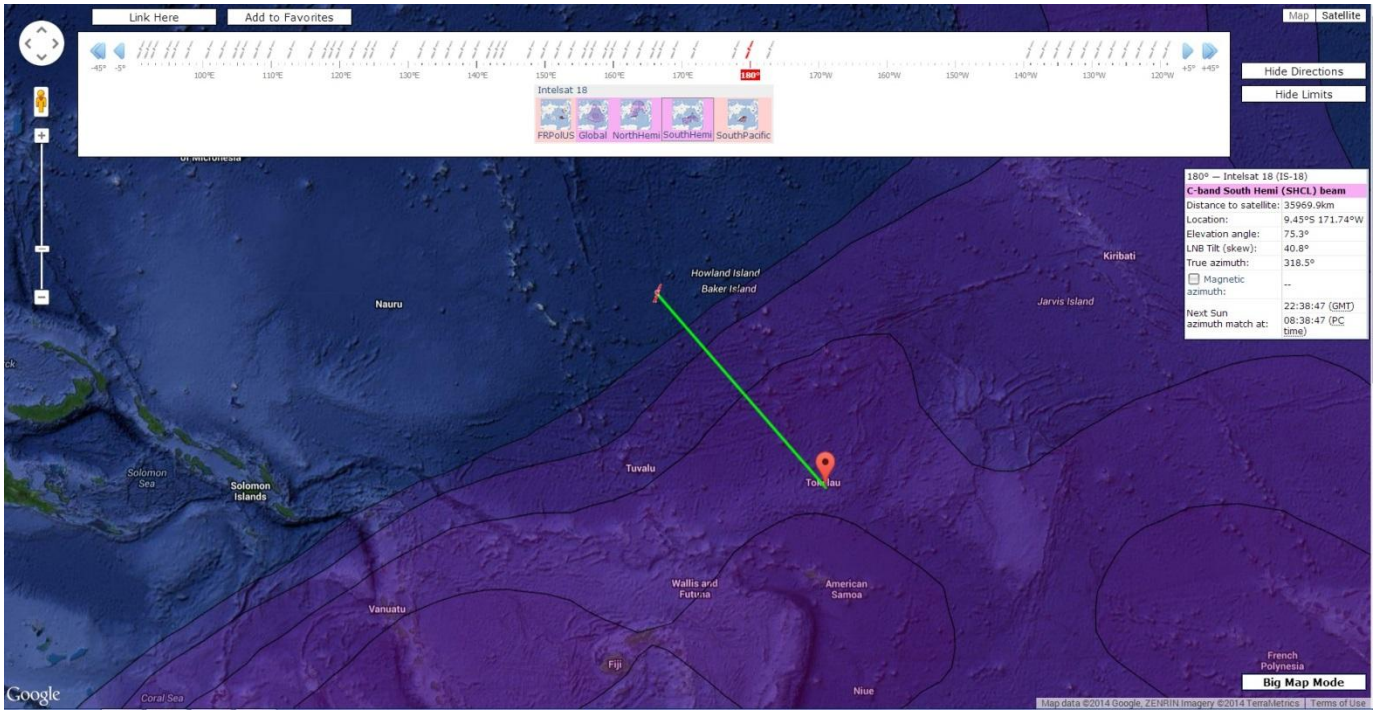


Figure 1 Previous coverage of SKY TV from ISS18 (Purple is good coverage, Blue is poor coverage)

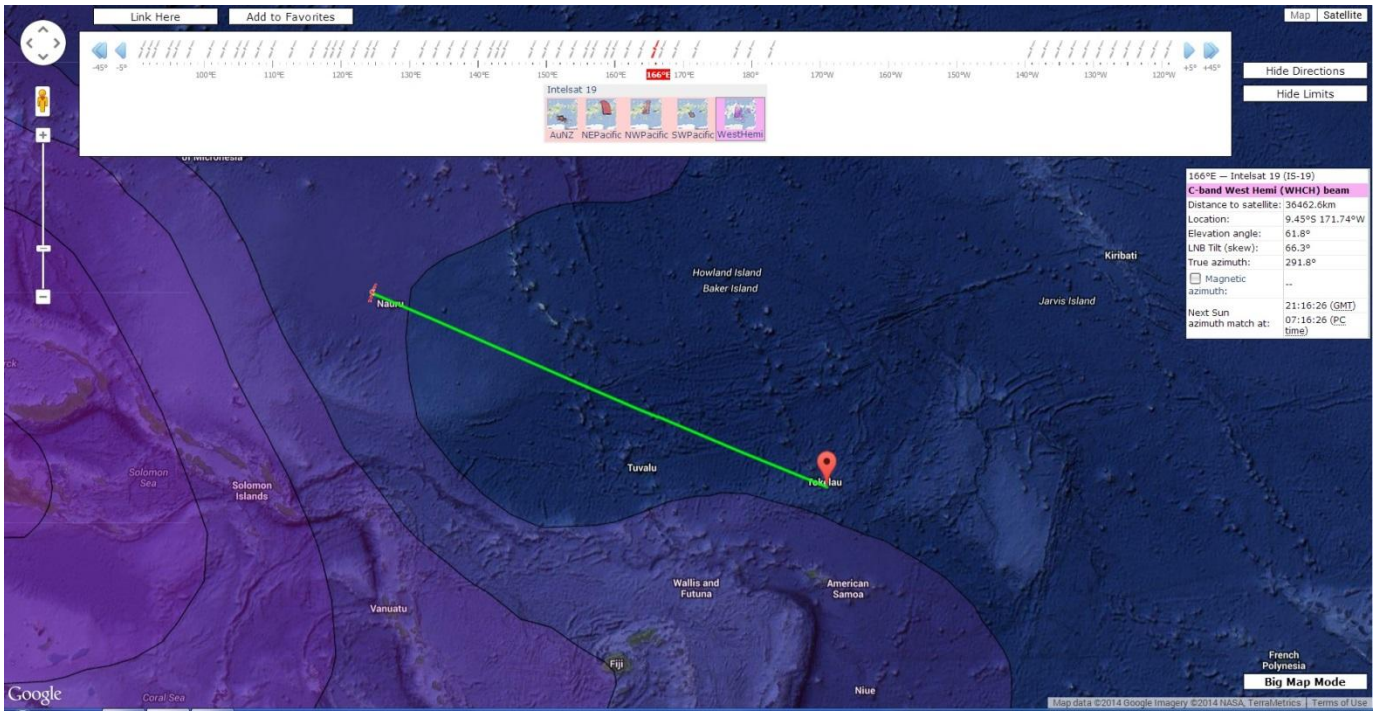


Figure 2 Current coverage of SKY TV from ISS19 (Purple is good coverage, Blue is poor coverage)

Annex F –Going Forward

Network Development

1. Develop sound market data on genuinely prospective revenues that will be available to Teletok over the medium term. This data will be key to decisions about network and services development. **Indicative cost US$30,000- 50,000**

2. Build a 3G network installation as soon as practicable. The 3G network will require a single 30 Metre tower at each island and incorporate a beacon light at the top (assisting night fishermen). System to be able to connect calls locally without any reference to a remote site, be able to seamlessly share capacity between voice and Internet and be structured with the satellite system so that all calls (or the vast majority of call cases) are single hop satellite connection. Link this to the MSAN equipment at each island. **Indicative cost 0.85 -1.0 million**

3. Complete modernisation of the fixed network facility with integration of the mobile service:

- All billing to be prepaid, establish new billing structure for mobile services;
- Convert inter island and international calling to subscriber control;
- Expand the existing MSAN equipment for new services (Mobile telecoms, Video on Demand, Internet radio, emergency warning by SMS);
- Introduction of a M-PAISA like service platform (mobile money) (separate specialist advice required).

Indicative cost US$200,000 -300,000 - exclusive of mobile money systems

4. Complete the Mesh satellite service across all islands. Capital costs understood to be in hand.

5. Expand international connectivity using the TNZI satellite mesh service as expanded to meet the needs of the 3G network - which is to include Internet delivery via the phone. Current service is 8Mbps total, which should be expanded with rollout of the 3G network in line with demand but likely to grow to about 30 Mbps total (near term) and 40 Mbps (medium term) . The backup Pactel service should be retained but not expanded. Teletok should renegotiate prices of this service or find alternative provider. **Indicative cost additional US$275,000 p.a.**

6. Teletok to get advice about mechanisms to contain the amount of bandwidth required from TNZI and about maximising utility of purchased bandwidth (local caching, remote processing such as spam removal). **Indicative cost US$50,000- 100,000 - advice with implementation**

7. Engage with Kacific and O3B to negotiate the capacity to be contracted down to a workable price point about the same as the start point (60Mbps) but certainly less than 100 Mbps. On the basis of success, migrate from the TNZI service to the O3B or Kacific service when it becomes available and terminate the SpeedCast service. The TNZI service may then be reduced and retained as backup.

8. Arrange three large (3.6 metre) dish and receivers for SKY TV reception (one at each Island). Get advice about and then implement the best distribution arrangement:

- via video on demand ADSL based service or
- laying a separate coaxial cable with a service connection (but not service unless purchased) at every residence.

(If the ADSL solution is better, it should be implemented by the same contractor responsible for other telecommunications components to simplify contracting and eliminate later performance disputation)

Indicative cost US$60,000- 120,000 per Island.

9. Subject to separate local discussion about the service (which may not be a Teletok responsibility), establish an FM broadcast transmitter on each island (FM antennas mounted on the 3G mobile network towers). The broadcast transmitters to be centrally controlled and managed from a single central studio facility. At the islands remote from the broadcast studio, the material broadcasted

is to be transferred during low satellite traffic periods (overnight) and stored at each transmitter site for transmission the following day. An emergency over-ride function is to permit emergency messages.

Indicative cost US$40,000- 60,000 per Island for transmitter system

US$150,000 for central studio and remote management and control - Total capital US$0.3 million)

Institutional Development

10. Reviewthetelecommunicationslegislationandsubordinateinstruments toward modernisation of Governance, Board composition and the Charter for Teletok, removal of exclusivities, establishment of oversight arrangement and reconsider borrowing for Teletok introduction of oversight, powers in relation to Spectrum and any other national resource, and inclusion of matters concerning security. **Indicative Cost US$ 100-250,000.**

11. Consider workability and acceptability of new management for Teletok, e.g. privateequity investment, management contract or other arrangement. **Indicative Cost US$ 50-70,000.**

12. Development legal under pinning, powers and resources of an oversight / regulatory body. This could use the PMU as a base, provide development aid (skills and training) to the PMU (ortheequivalententityunderrevisedlegislation)toeffectivelymonitoranddriveperformanceoftheincumben ttelecommunicationsoperator(which couldspillovertoregulationofothermonopolies e.g. electricity)**Indicative Cost US$ 200-300,000.**

13. Reviewthe Teletok corporation,networkandbusinessoperationswithaviewto:

- deviseaworkableplanforitsfuture(which might include continuation as an SOE, opening up to privateequityor an externalmanagementcontract)
- reducingnetworkcostsandexpandingservices;
- improvebusinessoperationsof Teletok

Indicative Cost US$ 60-100,000.

14. Plan the expansion of international capacity and capability to the country across all three islands. Such a plan would need to address the ongoing costs and application of any expanded bandwidth (Education, Medical, disaster management, etc.). This could be capital in a trustfund(perhapsalongthelinesofthe Tokelau TrustFund)forsustainingtheserviceforthelifeofthesatellite.**Indicative Cost US$ 40-50,000.**

15. Consider communications in all three islands as an underpinning of separate goals in relation to education, health, governance disaster management and safety of life at sea. (a convenient by product could be the reinstatement of Sky TV and the provision of broadcast services - e.g. via the telecoms network. **Indicative Cost US$ 60-100,000.**