



DISCUSSION PAPER

**Public inquiry into the potential declaration
of certain wholesale mobile
telecommunications services**

Issued on 2nd August 2013

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1 Executive summary

The *National Information and Communications Technology Act 2009* (the Act) provides for NICTA to conduct public inquiries into whether or not particular wholesale services should be made 'declared services' by the Minister. An operator licensee that supplies a declared service must comply with particular non-discrimination obligations. The terms and conditions of supply of a declared service must be consistent with the general pricing principles specified in the Act and the service-specific principles that must be specified by NICTA for each declared service. NICTA may also be called upon to arbitrate a dispute between two operator licensees regarding the terms and conditions of supply of a declared service.

NICTA has decided to conduct a public inquiry to consider the potential declaration of certain wholesale mobile telecommunications services, in particular domestic mobile roaming services and facilities access services associated with mobile network facilities as envisaged in section 131 of the Act. The terms of reference for this inquiry are provided at Attachment A. As per the terms of reference NICTA will only consider a wholesale service against the declaration criteria if the relevant wholesale market is not found to be effectively competitive—that is, if there are one or more participants in that market that have significant market power (SMP). Where SMP is found to exist, consistent with international regulatory best practice only the supply of the relevant wholesale service by the licensee(s) with SMP will be considered for declaration.

As set out in this discussion paper, NICTA staff's preliminary view on the key matters under inquiry is that:

- the relevant market is the wholesale mobile access and call origination market (often referred to, including hereunder, as the 'MACO' market, for convenience), which includes SMS and MMS, and that market is susceptible to ex ante regulation of SMP;
- Digicel has SMP in the wholesale MACO market and that position is potentially harmful to the development of effective competition in the downstream retail mobile services market; and
- these circumstances warrant NICTA's consideration of the possible declaration of Digicel's supply of potential wholesale MACO services, namely domestic mobile roaming services and facilities access services associated with passive mobile network facilities..

NICTA invites written comments in response to these preliminary conclusions. A list of discussion questions is provided at page 26. Submissions should be submitted via email to inquiry.submission@nicta.gov.pg and must be received by 12 noon Friday 30th August 2013.

2 Background

Operator licensees may, at any time, supply wholesale services to other Operator Licensees under terms and conditions that are commercially agreed. In addition, a regulated wholesale access regime is provided for in Part VI of the *National Information and Communications Technology Act 2009* (the Act). Under that regime:

- (a) NICTA may, following an inquiry, recommend to the Minister that certain wholesale services should be made **declared services**;
- (b) The supply of declared services is subject to the **general pricing principles** specified in the Act and also to **service-specific pricing principles** that are determined by NICTA;
- (c) Access providers (i.e. operator licensees) that supply declared services are required to comply with certain **non-discrimination obligations** in relation to their supply of declared services (unless exempted). This means that an access provider must:
 - supply the declared service to, and interconnect relevant facilities with, any access seeker that requests such (s.136);
 - supply the declared service and associated interconnection services to access seekers with a technical and operational quality of service equivalent to that which the access provider supplies to itself (s.136);
 - supply the access seeker with ordering and provisioning and fault handling services that are equivalent to that which the access provider supplies to itself (s.136); and
 - supply the access seeker, if requested, with billing information necessary to enable the access seeker to supply retail services using the declared service (s.136).¹
- (d) The **terms and conditions** on which an access provider fulfils its non-discrimination obligations are to be commercially agreed between the access provider and the access seeker. An access provider may also set out terms and conditions in a **reference interconnection offer** (RIO). A RIO must be approved by NICTA;
- (e) NICTA may specify **model non-price terms and conditions** relating to the supply of a declared service (s.133);
- (f) In the event that an agreement on the terms and conditions relating to an access provider's fulfilment of its non-discrimination obligations cannot be reached, the terms and conditions of access will be as set out in any relevant RIO that the access provider has submitted to NICTA and which NICTA has accepted (s.138). In the absence of both an agreement and a RIO, the terms and conditions of access are those determined by NICTA through **arbitration** (s.138). In making such a determination, NICTA must have regard to any relevant model non-price terms and conditions it has previously specified (s.133) and among other factors (s.149).

2.1 Declared services

There are currently five declared services, as follows:

- three services were deemed to be declared from the commencement of the Act in accordance with section 131 of the Act, namely:
 - domestic mobile terminating access service;

¹Section 21 of the National Information and Communications Technology (Operator Licensing) Regulation, 2010 specifies the

- domestic fixed terminating access service; and
- all facilities access services that may be supplied by means of any facility constructed under a universal access Project Agreement for the life of that facility (of which there is currently none); and
- two services were declared by the Minister, on NICTA's recommendation, on 21st March 2013, namely:
 - International submarine cable transmission capacity services; and
 - International submarine cable gateway access services.

Subsection 131(7) of the Act envisages that NICTA will, within the years immediately following the commencement of the Act, inquire into the potential declaration of the following wholesale services or any similar wholesale services:

- domestic mobile roaming services;
- facilities access services associated with mobile network facilities (including telecommunications transmission towers).
- facilities access services associated with fixed network facilities (including exchanges);
- domestic inter-exchange transmission services;
- domestic transmission tail services;
- domestic digital data and/or voice resale services (whether access tails or end-to-end services), such as xDSL services and/or Ethernet services; and
- unbundling of specified facilities located between a local exchange and the network boundary, whether unconditioned and/or conditioned (including spectrum sharing).

The first two of the above mentioned services, together with any related services, are the focus of the current inquiry.

2.2 The inquiry and declaration process

NICTA may only recommend that the Minister declare a particular wholesale service if NICTA is satisfied that such a declaration would satisfy all of the declaration criteria set out in section 128 of the Act as follows:

The "declaration criteria" are as follows –

(a) that declaration of the wholesale service will further the achievement of the objective of this Part as set out in Section 124; and

(b) specifically, in relation to the competition objective, that –

(i) access or increased access to the wholesale service (as a consequence of declaration) is necessary for the promotion of effective competition in at least one market other than the market for the wholesale service; and

(ii) the wholesale service is supplied in whole or in part via a facility that cannot feasibly be substituted, as a matter of commercial reality, via another facility in order to supply that wholesale service; and

(c) specifically, in relation to the efficiency objective, that –

- (i) declaration would not materially compromise the incentives for efficient investment in any facility over which the wholesale service may be supplied; and
- (ii) access or increased access to the wholesale service (as a consequence of declaration) is technically feasible having regard to the specific factors identified in Section 124(2)(a); and
- (iii) in the case of wholesale services that are facilities access services, increased access to the wholesale service would avoid inefficient replication of underlying facilities that may be efficiently shared.

Before NICTA can consider whether or not the declaration of a particular service would satisfy the declaration criteria it must first identify suitable candidate services for consideration. Although some potential wholesale services are specified in subsection 131(7) of the Act, NICTA staff have used the market analyses process to identify suitable candidate wholesale services consistent with international best practice in ex ante competition regulation. That process is explained below together with the factors that NICTA staff took into account during each of the key stages.

2.2.1 Approach to market definition

The theory of market definition is well-understood. Markets are formed at the intersection of the three dimensions listed below:

- **Customers:** A group of customers has a common set of objectives that are satisfied by services/products.
- **Product/service:** A supplier offers services/products to a market to satisfy customer objectives.
- **Geography:** Customer objectives, and the services/products that meet those objectives, have to be available in a common location, for a transaction to take place, and a market to exist.

The customer dimension is particularly relevant because the existence of distinct sub-sets of customers with different service requirements may well indicate that there are really two distinct markets. Most obviously there is a clear distinction between retail markets (serving end users) and wholesale markets (providing services to intermediary licensees which on-sell to end users). As the present inquiry is for the purposes of section 127 of the Act, the customer dimension must be defined as 'wholesale customers'. A wholesale customer is defined in the Act as 'an operator licensee, but excluding circumstances where that operator licensee acquires an ICT service for that operator licensee's own personal use rather than to facilitate the supply of an ICT service by that operator licensee'.

The boundaries that separate different markets are understood in terms of the services/products that comprise each market, and specifically in terms of the ability of one product to be substituted for another. The degree of demand-side and supply-side substitutability will depend on factors such as the characteristics of the underlying technology, the utility of the product, costs and prices, and trends in each of these areas (e.g. convergence of technologies, costs or service features).

Markets may also be defined in terms of geography. Within telecommunications regulation there is a general pre-disposition to define markets as national unless there are demonstrable regional variations in supply or demand. For example, the European Commission, which is generally regarded as setting best practice in market definition, makes the rebuttal presumption that all telecommunications markets are national in scope.²

²SEC(2007) 1483, Explanatory Note accompanying [European] Commission Recommendation on Relevant Product and Service Markets, p12

Finally, it must be noted that the point of the exercise is not to define markets generally or for any purpose, but to explore the boundaries of supply and demand substitution that assist in defining the market for the purpose of economic (competition) regulation.

2.2.2 The hypothetical monopolist test

The concept of the hypothetical monopolist test is often a useful tool to identify close demand-side and supply-side substitutes. A product is considered to constitute a separate market if a hypothetical monopolist supplier could impose a small but significant (taken to mean a 5–10% increase), non-transitory (at least one year's duration) increase in price without losing sales to such a degree as to make the exercise unprofitable. Whether or not the small but significant non-transitory increase in price (SSNIP) is profitable will depend on the number of customers that move to a substitute service or/and the extent to which alternative suppliers are enticed into the market.

The hypothetical monopolist test starts by identifying a focal product, i.e. the most narrowly-defined product that is obviously in the named market. Other candidate products will then be included in the same market depending on the extent to which any of the following forms of substitution applies between the candidate product and the focal product:

- Wholesale supply-side substitution;
- wholesale demand-side substitution; and
- retail demand-side substitution.

If the SSNIP would be unprofitable because customers/users would switch to other products or because suppliers of other products would begin to compete with the monopolist, then the market definition should be expanded to include the substitute products in the same market. If the SSNIP would be profitable then this will be evidence of the absence of appropriate substitutes and therefore that a discrete market exists.

2.2.3 Approach to determining whether a market is susceptible to ex ante regulation

The European Commission has adopted a set of three threshold criteria to be applied to markets under consideration for regulation before a full-scale market analysis is undertaken.³The application of this threshold test has been well documented by the Body of European Regulators for Electronic Communications (BEREC)⁴and has since been adopted in many countries outside of Europe, such as Moldova, Oman, Saudi Arabia and the United Arab Emirates. NICTA staffs regard the test as an important filter for determining whether or not a particular market warrants consideration for the potential introduction of ex ante regulation such as that provided for in Part VI of the Act.

Under this approach a particular market will be considered susceptible to ex ante regulation if:

- (1) it has high and continuing barriers to entry;
- (2) it is not tending towards being effectively competitive; and
- (3) ex post regulatory controls are unlikely to be sufficient to address concerns associated with market dominance.

³European Commission (2007), Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications and service, OJ L344/25 of 28 December 2007. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:344:0065:01:EN:HTML> See also the Explanatory Note - Accompanying document to the Commission Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications and services, SEC (2007) 1483 final.

⁴European Regulators Group (2008), Report on guidance on the application of the three criteria test, Available at www.erg.eu.int/doc/publications/erg_08_21_erg_rep_3crit_test_final_080604.pdf

A market that satisfies all three criteria is susceptible to ex ante regulation—that is, the application of ex ante regulation may be warranted. In such a case, a further more detailed analysis of the market is in order. However, even if a particular market fulfils all three criteria it does not automatically mean that ex ante regulation is necessary in that market. NICTA may still forbear from regulation to monitor the way the market develops, particularly if there are other constraints that might discourage or prevent the exercise of any significant market power (SMP) or dominance.

2.2.4 Approach to market analysis

Significant market power (SMP) is not a concept that is defined in the Act. NICTA staffs are therefore obliged to consider the usual meaning of the term in relevant literature, including the literature on market dominance, and equivalent term or near equivalent term in other jurisdictions such as in Europe.

SMP is the ability of a participant in a market to act substantially independently of its competitors and consumers, and not be unduly constrained in decision-making on price or service by the possible reactions of competitors and customers. In an effectively competitive market competitors are constrained by each other and by customers. They know that if they increase prices or reduce output they will lose customers to competitors and will sustain commercial damage as a result. However, if they are dominant they know that these constraints either do not apply or will apply only if the decisions involve very large changes in price or production.

A number of considerations typically impact on whether there is SMP in a market. None of these considerations is determinative of the issue when taken alone.

2.2.5 Period of analysis

NICTA staff considered the above mentioned factors that are relevant to SMP in a forward looking analysis of the relevant market covering the period to the beginning of 2015. Applying economic definitions in a clear and easily administered way is a major challenge in any sector of the economy. However, in the ICT sector there are further difficulties that result from the dynamic nature of the sector, such as:

- Rapid pace of underlying technological development. Services are defined in market and in technical terms. As the technologies change or merge the service characteristics change as well. In telecommunications the fundamental shift to common IP platforms for the provision of services, rather than discrete technology and discrete service platforms has significant impact at the service and supplier levels.
- Fast changing cost structures and cost relationships. The 'distance' between services and markets, in terms of substitutability, may be measured in many ways, including cost. As unit costs fall, or cost relationships change through convergent technologies, the market boundaries that we established when earlier technologies held sway come under question.
- Fast changing patterns of demand and of substitution between services and applications, that follow from changes in the underlying technological and cost realities.
- Convergence of services and technologies, underpinned by the extension of ubiquitous digital technologies and particularly packet technologies.
- Convergence of suppliers resulting from changes in the value chains associated with the sector, and the changing value relationships of functions and those who undertake them, and from the commoditisation of many services in the sector.

These factors make it difficult to segment and define specific service markets in the first place, and to ensure that they remain relevant in future as a basis for regulation. For that reason NICTA staff

considers it desirable to adopt a time horizon for market definition and analysis of 18 months to 2 years at most. After that period a new review of the state of the market may be warranted.

2.3 Submissions in response to this discussion paper

NICTA invites written submissions in response to the specific questions and issues raised in this discussion paper from any interested parties. Arguments and assertions (as distinct from statements of opinion) should be supported with evidence and data, particularly if they are contrary to the current understanding or proposed conclusions of NICTA staff as set out in this discussion paper.

Submissions should be submitted via email to inquiry.submission@nicta.gov.pg and must be received by 12 noon Friday 30th August 2013.

Copies of all submissions received will be published on NICTA's Public Register consistent with the requirements on NICTA under subsection 229(3) of the Act. Claims for confidentiality over any written information submitted to NICTA in response to this public consultation process are governed by section 44 of the Act. Under section 44 of the Act, NICTA ultimately determines whether or not it will accept a claim for confidentiality and exclude from publication the information that is subject to that claim. The process for claiming confidentiality is set out in the *Guidelines on the submission of written comments to public consultations and public inquiries*, which are available from NICTA's Public Register. Any respondent that wishes to claim confidentiality over information that it submits in response to this discussion paper should follow the procedures described therein.

3 Definition of the relevant market

There are three dimensions to the definition of a relevant market for the purposes a market analysis process. Markets need to be defined in terms of customer, service and geography.

3.1 The customer dimension

As this inquiry relates to Part VI of the Act, the customer dimension of the market must be defined as 'wholesale customers'. The Act defines a wholesale customer as:

'an operator licensee, but excluding circumstances where that operator licensee acquires an ICT service for that operator licensee's own personal use rather than to facilitate the supply of an ICT service by that operator licensee'.

NICTA staffs are using that definition of wholesale customer for the purposes of this inquiry. Under this definition, the customers in the wholesale market are the suppliers in the downstream retail market.

3.2 The service dimension

To define the relevant wholesale service market, it is necessary to first identify the relevant retail service market. This is because demand for wholesale services derives from the demand for retail services. The wholesale service dimension will then typically be as broad as the demand-side substitutes in the relevant retail service market.

In September 2012, following an unrelated public inquiry into need for a retail service determination regarding certain mobile telephony services, NICTA defined a national retail mobile services market that comprised mobile access and mobile call origination, included SMS and MMS services, but excluded fixed telephony access and mobile data.⁵ NICTA staffs believe that that market is the relevant retail market for the purposes of the present inquiry. As retail customer's demand for mobile access and mobile call/SMS origination corresponds at the wholesale level to access and call/SMS origination on a mobile network, NICTA staff concluded that the relevant wholesale market is the market for wholesale mobile access and call origination (MACO), which includes SMS and MMS services. NICTA staff considered the potential for supply-side and demand-side substitution of wholesale MACO services but concluded that, given the mobility capabilities of retail mobile telephony services and the barriers to entry (such as the high sunk costs of mobile networks), there are no realistic substitutes for access to a mobile network if one wishes to supply retail mobile services.

There are a number of ways in which MACO services could be acquired by a wholesale customer in order to serve retail customers in the retail mobile services market. An overview of those alternatives is provided in Figure 1. The only option currently available in PNG though is the self-supply by a vertically integrated MNO (hence the other alternatives mentioned in Figure 1 are described as potential services). Particular alternatives among those listed in Figure 1 would generally appeal to one of two types of wholesale customer, namely either:

⁵ See the Discussion Paper available at <http://nicta.gov.pg/Consultative%20Papers/2nd%20Discussion%20Paper%20-%20Retail%20Service%20Determination%20regarding%20certain%20mobile%20telephony.pdf> and the subsequent Recommendation Report at <http://nicta.gov.pg/publicinquirynew/Reports%20%20Retail%20Service%20Determination/NICTA%20Recommendation%20Report%20-%20Introduction%20of%20a%20Retail%20Service%20Determination.pdf>

- An existing MNO or a new entrant MNO that has or is building its own mobile network, but whose network does not yet extend nationwide or into particular geographic areas; or
- A new entrant service provider that does not have its own mobile network and does not presently intent to build one.

Figure 1: Alternatives forms of supply of wholesale MACO services

Ref.	Name of wholesale service	Working definition of the wholesale service (i.e. for the purposes of discussion)	Nature of the service	Example of a potential customer
A	Self-supply of MACO	The self-supply of wholesale mobile access and mobile call/SMS origination services by a vertically integrated MNO	A current wholesale service	The retail arm of a vertically integrated MNO
B	Facilities access services associated with passive mobile network facilities	A facilities access service that enables one MNO to access certain passive elements of another MNO's radio access network ('passive elements' in this context are non-electronically active elements such as sites, buildings, towers, ducts and the like).	A potential wholesale service	An existing or new entrant MNO
C	Domestic mobile roaming services	A network service that enables a retail customer of one MNO in PNG to use the retail mobile services of another MNO in PNG when within the latter's network coverage area and beyond the network coverage area of the first MNO.	A potential wholesale service	An existing or new entrant MNO
D	Facilities access services associated with active mobile network facilities	A facilities access service that enables one MNO to access certain active elements of another MNO's radio access network ('active elements' in this context are network elements other than passive elements and include mobile switching, transmission and access to network systems and services). This would cover, for example: <ul style="list-style-type: none"> • mobile access bundled with wholesale mobile call origination (which would enable an MVNO to supply retail mobile services); and/or • mobile access bundled with wholesale airtime (which would enable the resale of retail mobile services). 	A potential wholesale service	An new entrant MVNO or reseller
E	Wholesale mobile call origination	A network service that enables indirect access operators to supply mobile calls/SMS by way of pre-selection (assuming that mobile calls/SMS were made pre-selectable)	A potential wholesale service	A new entrant supplier of pre-selectable services

NICTA staffs believe that the relevant wholesale market includes all of those alternative means for supplying MACO services (together with any other alternatives not mentioned but which are technically feasible). This is because from a supply-side perspective, a supplier of any one of those services could commence supply of any of the other listed services with relative ease (assuming sufficient capacity). Further, from a demand-side perspective, each of the listed services is a means of supplying retail customers with an equivalent retail service. Indeed from the perspective of a retail customer, mobile telephony is fundamentally the same service whether it is supplied by a vertically integrated MNO or by a service provider that is utilising one of the alternative means of obtaining

wholesale MACO services identified in Figure 1. Retail customers may of course have a preference for a particular service provider based on such considerations as price, brand, quality of service or supplementary services, but the mobile telephony service is basically the same regardless of the means by which the wholesale MACO inputs are supplied.

NICTA staff also considered whether wholesale MACO services that are supplied on different mobile networks are in the same product market. Unlike the case of the domestic mobile terminating access service (DMTAS), it is arguable that wholesale customers of MACO services do not require access to such services on all mobile networks. More specifically, the access required will depend on the business model of the access seeking wholesale customer and on the particular MACO service being sought, as indicated in the examples below:

- a wholesale customer utilising passive facilities sharing or roaming services (i.e. services B and C in Figure 1) would not be concerned about the relative size of the wholesaling MNO's customer base as it would only be using the facilities of the wholesale MNO in order to serve its own directly connected customers. In addition, such a wholesale customer would not need to have access to all mobile networks if adequate coverage can be provided by using only one network. Alternatively, if the coverage of two mobile networks differs, the wholesale customer might want coverage from one in some areas and the other elsewhere;
- a wholesale customer utilising active facilities sharing (i.e. service D) would not generally be concerned about the relative size of the wholesaling MNO's customer base as it would be directly acquiring its own customers (i.e. beyond the existing customer base of the MNO);
- a wholesale customer utilising indirect access (i.e. service E) may find it sufficient to have access to a single MNO that has the majority of mobile subscribers given that the wholesaling MNO's customer base would determine the boundaries of the indirect access operator's target market. For example, if the wholesale customer used call selection and carrier pre-selection to support its international calling service, and if one mobile network had a retail market share of (say) 80%, it might be sufficient to have the service on only that mobile network.

In the case of call termination on a mobile network, the access seeking wholesale customer must deal with each of the mobile network operators to terminate calls from its network. The wholesale customer must deliver calls made by its own customers. If the operator of the terminating mobile network refuses to terminate calls from the wholesale customer's network there are limited choices. The regulator might be involved to assert the any-to-any connectivity principle, or the wholesale customer might seek to interconnect via another network operator that already has an interconnection agreement with the terminating network operator. Either way the terminating network operator must be involved. For this reason each network is considered to be a separate market. However, the active role of the call originating end-user distinguishes the way in which originating interconnect differs from call termination. If the caller expects his/her operator to have made call origination arrangements with another network or service provides and it has not occurred, the caller can elect to switch operators. The originating network operator thus has every reason to conclude access arrangements and to charge its own retail customer accordingly for the calls. It is not necessary to conclude that each network is a separate market for call origination purposes. The possibility of substitution is one for the calling retail customer. Many customers have both fixed and mobile services and can often readily determine to use one or the other to make a call. This is not the case with call termination (leaving aside exceptional scenarios that might be envisaged). The decision on which service to call is made by the calling party, not the receiving party.

3.3 The geographic dimension

The geographic dimension of the relevant market is a national one because:

- there are no geographical differences in the retail pricing of mobile services, service options, or in the terms and conditions under which mobile services are supplied;
- licensees operate nationally with national brands, with intended national coverage and connectedness, and with common national back-of-house functions; and
- the dimensions of competition are national.

However, as the network coverage areas of the three licensees differ significantly, there are different supply conditions for wholesale MACO services in different parts of PNG in terms of availability and competition. This may warrant a narrower definition of the geographic dimension of the market, or it may mean that there are multiple sub-markets that can be defined beneath the national market (for example, regional or provincial markets).

On balance though NICTA is inclined to the view that the relevant market is national is its scope and thus inclined to consider the implications of any geographic differences in the level of competition in the relevant wholesale market during the analysis phase (instead of during the market definition phase). In the case of roaming, for example, this would mean treating the market as national but only requiring service to be provided in all areas or nominated areas in which there is network coverage on a certain date.

3.4 Proposed conclusion

NICTA staff considers that the relevant market is the national market for wholesale MACO services, which includes access to voice, SMS and MMS services, and comprises all of the various means by which such services can be supplied over a mobile network and the facilities of a mobile network to which access can be feasibly provided.

Question 1: Do you agree with the proposed definition of the relevant market as the market for wholesale mobile access and call origination services? Please provide argument and if appropriate evidence to support your views.

4 Participants in the market

4.1 On the supply-side

There are three Operator Licensees (hereafter referred to collectively as “the three MNOs”) that are authorised to supply public cellular mobile services⁶ and public cellular services⁷ (hereafter referred to collectively as “mobile services”):

- bemobile;
- Digicel; and
- Telikom

NICTA staffs are not aware of any other existing Network Licensees or potential new entrants that intend to deploy their own mobile network infrastructure within the next two years, although NICTA staffs receive a number of enquiries about the availability of licences and spectrum from prospective entrants from time to time.

There are a number of satellite-based mobile services available in PNG but, subject to the comments received in response to this discussion paper, NICTA is inclined to regard those services as marginal in terms of their impact, including substitutability, on the wholesale MACO market.

Each of the three licensees owns and operates its own mobile network and is subject to certain network coverage obligations under the terms of their respective Network Licences that require mobile network coverage to be progressively rolled out to specific geographic areas in four geographic bands (listed in full in Annex B). The obligation to provide network coverage in the areas in Bands 3 and 4 may be fulfilled through a reliance on, or the sharing of, the facilities of another Network Licensee.⁸ However, any such facility sharing is currently on an entirely commercial basis (i.e. access is not mandatory) and none of the three MNOs have yet entered into any such agreement with another MNO.

4.1.1 bemobile

bemobile operates a GSM network in the 900 MHz band that provides network coverage in:

- all eight of the geographic areas in Band 1;
- all 14 geographic areas in Band 2;
- 48 of the 87 geographic areas in Band 3; and
- 42 of the 120 geographic areas in Band 4.

In April 2013 it was announced that bemobile had a new key investor in the form of the Fiji National Provident Fund and that it would be establishing a new management contract with Vodafone Fiji Limited. That announcement relates to the operation and management of an existing mobile network business and does not change the market structure by varying the number of competitors in the market.

⁶A public cellular mobile service is defined in the *National Information and Communications Technology (Operator Licensing) Regulation, 2010* as a network service where: (a) an end-user can use a network service while moving continuously between places; and (b) the cellular mobile access device used for or in relation to the supply of the network service is not in physical contact with any part of the facility by means of which the network service is supplied; and (c) the network service is supplied by use of a facility that has intercell hand-over functions.

⁷A public cellular mobile service is defined in the *National Information and Communications Technology (Operator Licensing) Regulation, 2010* as an applications service involving a network of base stations and cells for the delivery of voice and data communications.

⁸Refer paragraph 2(3) of Schedule 3 to the Standard and Special Conditions of Individual Licenses Rule, 2011.

4.1.2 Digicel

Digicel operates a GSM network in the 900 MHz and 1800 MHz band that provides network coverage in:

- all eight geographic areas in Band 1;
- all 14 geographic areas in Band 2;
- all 87 geographic areas in Band 3; and
- all 120 geographic areas in Band 4.

Digicel has completed its network rollout in fulfilment of its licence obligations. Its network also extends beyond the mandatory coverage areas.

In addition Digicel operates 58 communications towers installed in Western Province under the Western Province Communications project which, under the terms of that project, are available on an open access basis. Passive facilities sharing (i.e. service B in Figure 1) is thus available today on those 58 towers.

4.1.3 Telikom

Telikom operates a CDMA network in the 850 MHz band. It has 34 base stations in PNG that provide network coverage in the twenty geographic areas in Band 1. Under the terms of its Network Licence, Telikom must have network coverage in all 14 of the Band 2 areas by 30th October 2013, at least 56 of the Band 3 areas by 30 October 2014, and at least 69 of the Band 4 areas by 30th October 2016.

4.1.4 Other relevant licensees

In addition there are a number of other Network Licensees—namely broadcasters—that own and operate network facilities relevant to the present inquiry, such as telecommunications transmission towers⁹. Such licensees include:

- EMTV;
- Kundu 2;
- PNG Air Services;
- PNG FM; and
- Post PNG.

4.2 On the demand-side

Mobile has demonstrated an interest in accessing both passive facilities (i.e. tower sharing) and domestic roaming services but to date has not been able to negotiate a commercial agreement to that effect with any other MNO.

There are currently no resellers or mobile virtual network operators (MVNOs) operating in PNG and NICTA staff are not currently aware of any existing licenses or potential new entrants that seek wholesale MACO services in a form that would enable such entry.

⁹A telecommunications transmission tower is defined in the Act as a tower, pole, mast or similar structure used to supply an ICT service by means of radiocommunication.

Question 2: Do you agree that satellite-based mobile services may be regarded as marginal in terms of substitutability and therefore of little import for the purposes of this inquiry? Please support your comments with arguments and where possible with factual evidence.

5 The susceptibility of the market to ex ante regulation of SMP

If an ICT market can become effectively competitive within the short-medium term without regulatory intervention then it should be allowed to do so. This view of regulation is based on the recognition that regulatory intervention in markets has its own risks and there may be inadvertent distortion of market development as a result.

The internationally recognised test for determining whether a market is susceptible to ex ante regulation of market failures involves three criteria. A market is considered susceptible to ex ante regulation in cases where:

- (a) there are high and non-transitory barriers to market entry;
- (b) there is no tendency towards competition behind such barriers; and
- (c) ex post control by competition law alone is insufficient to address adequately the market failures concerned.

Although the application of the three criteria test is not a statutory requirement in PNG as it is within European Union countries, NICTA considers it to be an important filter for determining whether a market is susceptible to ex ante regulation of dominance and thus an important (if non-mandatory) part of NICTA's process for determining whether it is necessary to consider ex ante regulation in the form of a recommended service declaration under Part VI of the Act. NICTA regards the application of the three criteria test in such circumstances as a regulatory best practice even though it is not specifically required of NICTA under the Act.

NICTA staffs have considered the wholesale MACO market against these criteria and believe that all three criteria are satisfied.

5.1 Barriers to entry

The wholesale MACO market is characterised by two significant structural barriers to entry in the form of sunk costs and economies of scale, scope and density. The large sunk costs of network construction generally relate to the installation of a network of masts and antennae with supporting power and road access; a backhaul and transmission network along with switches and routers; and extensive computer hardware and software to support billing, customer service and operational systems. Although some of these costs are scalable, much of these costs will still need to be sunk before commercial launch is feasible and are unlikely to be recovered on exit. The size of those sunk costs constitutes a significant barrier to entry and introduces an asymmetry between existing MNOs and any new entrants as the new entrants must recover their sunk costs in addition to avoidable fixed and variable costs while the existing MNOs need only to recover the avoidable costs to remain in the market.

The significant economies of scale, scope and density put newer (typically smaller) entrants at a competitive disadvantage to the larger incumbent(s) or first-movers that have a lower per-unit cost base. Economies of scale in mobile networks typically do not cover the whole of the demand of the market and it is possible for 2-3 operators to achieve sufficient scale to reap the bulk of the economies on offer. These barriers are high but not impossibly so. However the situation becomes markedly different when subsequent operators seek to enter the market. In the market as now structured in PNG, Digicel will have largely exhausted scale economies when its market share exceeded 40%. Neither bemoile nor Telikom have exhausted the economies available to them. This means that scale economies equivalent to those achieved by Digicel are still theoretically available to a new

entrant, if a new entrant were to emerge. NICTA staffs have concluded that the barriers associated with scale are high, but not impossible to achieve.

Consequently NICTA staffs believe that the main contribution to high and enduring barriers is sunk costs.

There are also legal and regulatory barriers to entry to the market, most notably in the form of Operator Licences and Spectrum Licences, however NICTA staff currently regard such barriers as relatively low given the currently availability of spectrum resources and open licensing.

5.2 Tendency towards effective competition

NICTA staff do not believe that there is a trend towards effective competition in the wholesale MACO market. Digicel controls the only mobile network with near-national coverage (24% of total land area and 72% of population). Bemobile's and Telikom's networks are substantially smaller. There is potential that the recent new investment in bemobile and its establishment of a management contract with Vodafone Fiji Limited will lead to the expansion of bemobile's network. However, there is no certainty that bemobile's network will be expanded beyond the requirements of its licence conditions within the next two years, which would leave Digicel's network coverage only partly duplicated.

Figure 2: Mobile network coverage

MNO	Network coverage as a proportion of the total area of PNG		Network coverage as a proportion of the total inhabited areas of PNG		Percentage of population in network coverage area	
	As at Dec 2011	Est. as at Dec 2012	As at Dec 2011	Est. as at Dec 2012	As at Dec 2011	Est. as at Dec 2012
Digicel	23.8%	24.4%	81%	83%	72%	74%
Bemobile	4.4%	5.8%	15%	20%	23%	36%
Telikom	5.9%	TBA	20%	TBA	18%	22%

There has been no commercial negotiation of any wholesale access agreements (such as tower sharing) despite some clear demand for such access.

Further, the downstream retail mobile services market is not effectively competitive. Digicel's high market shares in terms of both subscribers (75%)¹⁰ and revenues (88%)¹¹ have remained very high despite the activities of bemobile and Telikom; market concentration (as measured by the Herfindahl Hirschman Index) remains extremely high (with index levels of 5,888 based on subscribers and of 7,859 based on revenues¹²); and average revenue per voice minute carried for the market as a whole has effectively remained unchanged since 2010 at approximately 31 toea.

NICTA staff are satisfied that this criterion is fulfilled with respect to the period under analysis. However, NICTA staff note that the changes in the ownership and, potentially, the strategy of bemobile

¹⁰Based on 2011 data

¹¹Based on 2011 data

¹²Based on 2011 data

may prove to be a catalyst for the development of effective competition in the wholesale MACO market.

Figure 3: Market share data

MNO	Total services in operation				Total market revenues			Total mobile-originated national voice minutes		
	2009	2010	2011	2012	2010	2011	2012	2010	2011	2012
Digicel	81.0%	83.7%	74.6%	TBA	91.9%	87.9	TBA	94.2%	90.6%	TBA
Bemobile	19.0%	16.3%	12.8%	TBA	8.1%	11.5%	TBA	5.8%	8.8%	TBA
Telikom	0.0%	0.0%	12.6%	TBA	0.0%	0.6%	TBA	0.0%	0.6%	TBA
	100%	100%	100%		100%	100%		100%	100%	

5.3 Sufficiency of ex post competition law

On balance NICTA staff considers that the arrangements for ex post intervention in the market to address anti-competitive behaviour after it occurs will not adequately serve the public interest in competition and consumer welfare, and that it would be an inadequate substitute for ex ante action to remedy the risks associated with SMP in this market. Ex post regulatory intervention would involve substantial data collection and analysis and would likely be a protracted exercise. The exercise would be made more difficult because the processes involved are untried and untested in PNG. In the meantime substantial damage may have been done to competition and consumer welfare – damage that may not be readily undone by later remediation. Accordingly, NICTA staffs are satisfied that this criterion is fulfilled.

Question 3: Do you consider that the wholesale mobile access and call origination market is susceptible to ex ante regulation for significant market power? If not, please provide argument and if appropriate evidence to support your views.

6 Analysis of the market for SMP

As all three participants in the wholesale MACO market are vertically integrated and there is currently no wholesale supply of MACO services beyond such self-supply, the state of competition at the retail level is the only available reflection of competition at the wholesale/network level.

In September 2012, NICTA found that Digicel had SMP in the retail mobile services market¹³. The factors that—in totality—NICTA found most compelling in reaching this conclusion were:

- (a) Digicel's high and prevailing market shares (Digicel's has 74% of all mobile subscribers in PNG, earns 88% of the total market revenues, and generates 91% for the total voice traffic in the market);
- (b) Digicel's network reach and being first in with a high coverage of both territory and population;
- (c) Digicel's price leadership and its ability to sustain on average higher prices than its competitors; and
- (d) Digicel's use of strong network effects (specifically tariff mediated network externalities derived from the scale of its discrimination between on-net and off-net prices) to reinforce its market share and overall market position.

NICTA's finding of SMP was confirmed by the ICT Appeals Panel in December 2012.

The tariff mediated network externalities mentioned in (d) above are being addressed by the Minister's making of *Retail Service Determination No 1 of 2012*, which caps the level of Digicel's on-net/off-net price discrimination. Nevertheless, given the extent and sources of the Digicel's SMP, and as the retail service determination has been in place for about 11 months, NICTA staff believe that Digicel retains its position of SMP in the retail services market and that that position is likely to persist during the period under consideration.

After taking Digicel's SMP in the retail mobile services market into consideration together with certain structural characteristics of the wholesale MACO market, NICTA staff concluded that Digicel also has a position of SMP in the wholesale MACO market. The principal structural characteristics that were relevant to this conclusion were:

- Digicel's control of infrastructure that is not easily duplicated—although it is technically possible to duplicate the coverage of Digicel's mobile network, it would be a high cost venture to do so completely within the period under analysis;
- Digicel's vertical integration—although the other MNOs are also vertically integrated, Digicel's mobile network is by far the largest in terms of coverage;
- High barriers to market entry in the form of Digicel's sunk costs and the economies of scale that it is likely to have been able to achieve given its larger customer base and traffic volumes;
- The absence of any countervailing buying power—as Digicel has the largest mobile network, it has little need for wholesale MACO services that may be offered by other MNOs (e.g. reciprocal access to passive infrastructure);
- The absence of any relevant commercial agreements between MNOs for the supply of wholesale MACO services despite there being some clear demand for some such services (such as passive infrastructure sharing).

¹³ See the Recommendation Report at

<http://nicta.gov.pg/publicinquirynew/Reports%20%20Retail%20Service%20Determination/NICTA%20Recommendation%20Report%20-%20Introduction%20of%20a%20Retail%20Service%20Determination.pdf>

Question 4: Do you agree with the proposition that Digicel has a position of significant market power in the wholesale mobile access and call origination market? Please explain the reasons for your answer and support it with evidence where possible.

7 Consideration of Digicel's SMP

To have SMP in a market is neither illegal nor necessarily problematic. However, SMP is problematic if it poses a material risk of harm to the development of effective competition in the market or otherwise to consumer's long term interests.

After considering the key sources of Digicel's SMP in the wholesale MACO market, NICTA staffs believe that there is potential that that SMP may impede the development of effective competition in the downstream retail mobile services market. This concern is summarised in Figure 4.

Figure 4: Potential problems arising from Digicel's SMP in the wholesale MACO market

Source of SMP	Potential abuse of SMP
Control of infrastructure not easily duplicated	Refusal to supply / denial of access
Vertical integration	Given its SMP and its control of the largest mobile network infrastructure in PNG, Digicel has the incentive and ability to strengthen unfairly its position in the downstream retail mobile services market by denying access (either outright or through delaying tactics) to wholesale MACO services to other licensees that compete against Digicel in the retail mobile services market, particularly in relation to those geographic areas where demand for retail mobile services is very limited or fragile and it thus may be uneconomical for a MNO to duplicate certain mobile network infrastructure. This can have the effect of raising the costs of Digicel's rivals, reinforcing a first mover advantage in favour of Digicel, and impeding the development of competition in the retail mobile services market.

Question 5: Do you agree with the proposition that Digicel's SMP in the wholesale MACO market is potentially harmful to the development of effective competition in the downstream retail mobile services market? Please explain the reasons for your answer and support it with evidence where possible.

8 Consideration of wholesale services for potential declaration

Having found Digicel to have SMP in the wholesale MACO market, and that position of SMP to be potentially harmful to effective competition in the downstream retail mobile services market, NICTA staff determined that it would be appropriate and reasonable to consider the potential declaration of specific wholesale services within that market.

Of the services listed in Figure 1 (on page 9), NICTA staff determined that it would be appropriate to consider the potential declaration of two specific wholesale MACO services, namely:

- domestic mobile roaming services; and
- facilities access services associated with passive mobile network facilities.

NICTA staffs are aware of some unmet demand for these particular wholesale services but are not aware of any demand for other potential wholesale MACO services. Further:

- the declaration of self-supply (i.e. service A) is not logical given the purpose and effect of declaration;
- the declaration of facilities access services associated with active mobile network facilities is undesirable at this time because licence rollout obligations are still being met, and, after making allowance for those unmet obligations, it is unclear if there is a residual need for mandated access at this time; and
- the declaration of wholesale mobile call origination is undesirable at this time because no demand has been expressed.

The focus on roaming and the sharing of passive facilities also accords with the expectation in subsection 131(7) of the Act.

The working definitions of the two candidate services for declaration are reproduced in Figure 5. As only Digicel was found to have SMP in the wholesale MACO market, only the declaration of Digicel's supply of the candidate services is being considered.

Figure 5: Working definitions of the candidate services for declaration

Name of wholesale service	Working definition
Domestic mobile roaming services	A network service that enables a retail customer of one MNO in PNG to use the retail mobile services of another MNO in PNG when within the latter's network coverage area and beyond the network coverage area of the first MNO.
Facilities access services associated with passive mobile network facilities	A facilities access service that enables one MNO to access certain passive elements of another MNO's radio access network ('passive elements' in this context are non-electronically active elements such as sites, buildings, towers, ducts and the like).

Figure 6: Overview considerations of the declaration criteria in relation to each candidate service.

[Note that even though issues are raised below NICTA reserves its position on the way that each such issue might be best considered.]

Declaration criterion		Domestic mobile roaming services	Facilities access services associated with passive mobile network facilities
A	That declaration will further the achievement of the objective set out in Section 124	NICTA reserves its position on whether a declaration would have this effect, and will consider responses to this Public Consultation in the course of forming a view on the matter	
B(i)	In relation to the competition objective, access or increased access to the wholesale service is necessary for the promotion of effective competition in at least one market other than the market for the wholesale service.	Declaration of these services could help to promote competition in the retail mobile services market, at least in the short to medium term (taking into account the five year maximum allowable duration of a declaration). It might do this by facilitating the prompt expansion of the network coverage of the other two existing MNOs and any potential new entrants. However, although it might be apparent that declaration would be conducive to the development of retail competition, it is not similarly apparent that declaration is <i>necessary</i> to promote the development of retail competition. The other two existing MNOs are in the process of rolling out their networks pursuant to their licence conditions and the recent change in ownership and management (and potentially strategy) of bemobile means that there are forces in play that might promote effective competition in the retail market. A wholesale declaration could probably facilitate or assist competition, but may not be necessary in the sense that effective competition cannot result without it. This is, however, a conclusion that may change with time. NICTA reserves its position at this time, pending public consultation.	
B(ii)	In relation to the competition objective, the wholesale service is supplied in whole or in part via a facility that cannot feasibly be substituted, as a matter of commercial reality, via another facility in order to supply that wholesale service.	Wholesale mobile roaming on Digicel's network is a service that could be supplied wholly by means of mobile network facilities that are owned and operated by Digicel. There appear to be no substitutable facilities that would enable roaming on Digicel's network.	Facilities access services associated with Digicel's passive mobile network facilities are services that are supplied wholly by means of mobile network facilities that are owned and operated by Digicel. Whether or not such facilities can be substituted 'as a matter of commercial reality' essentially depends on the geographic area concerned. In certain areas there may indeed be substitutable facilities in the form of another MNO's network,

			<p>or the transmission towers of a broadcaster, or the 58 open access communications towers in Western Province. However in other areas they may not be substitutable facilities and it may be uneconomic to establish substitute facilities. NICTA staff have analysed the availability of substitutable passive facilities by district but do not yet have sufficient insight into which particular areas it may be uneconomical to establish substitutable facilities. This should become clearer once the existing MNOs have fulfilled their mandatory coverage licence conditions, the network plans/strategy of the new owners and management of bemoible become apparent, and the new Universal Access and Service Regime is implemented.</p>
C(i)	<p>In relation to the efficiency objective, declaration would not materially compromise the incentives for efficient investment in any facility over which the wholesale service may be supplied.</p>	<p>Declaration of these services has the potential to affect the investment incentives of Digicel, particularly in relation to new deployments of telecommunications transmission towers. Digicel uses its superior network coverage as a key differentiator in the retail mobile services markets. However, as declaration of either of these services would potentially neutralise that differentiator (at least in the short to medium term duration of any declaration), declaration risks softening Digicel's incentives to continue investing in new tower infrastructure, particularly in unserved areas. Whether or not such a softening of investment incentives would constitute a "material compromise" of those incentives is currently unclear.</p>	
C(ii)	<p>In relation to the efficiency objective, access or increased access to the wholesale service is technically feasible having regard to the specific factors identified in section 124(2)(a) of the Act</p>	<p>The technical feasibility of domestic roaming and passive facilities sharing has been demonstrated in numerous countries. Provision exists to address any capacity or similar constraints that may exist or arise under paragraphs 134(1)(d) and 136(4)(b) of the Act.</p> <p>The potential effects on Digicel's investment incentives are noted above. The effect of a declaration on the investment incentives of other existing and potential licensees is also a relevant consideration under this criterion. As these wholesale services are alternatives to the self-supply of wholesale MACO services, there is a risk that declaration would distort the incentives of the existing (vertically integrated) MNOs to continue/expand their investment in</p>	

		<p>the expansion of network infrastructure at a time when they are in the process of building out their networks (at least to the extent required by their licences) and establishing a basis for infrastructure-based competition in the long-term. Declaration may also distort others' incentives to invest in communications infrastructure, such as that which led to the establishment of 58 transmission towers under the Western Province Communications Project. The potential effects of declaration on the investment incentives of the existing MNOs will likely be different once their mandatory coverage obligations have been fulfilled.</p>	
C(iii)	<p>In relation to the efficiency objective, in the case of wholesale services that are facility access services, increased access to the wholesale service would avoid inefficient replication of underlying facilities that may be efficiently shared.</p>	<p>The roaming service would appear to be a network service, not a facilities access service.</p>	<p>The sharing of passive facilities may avoid the inefficient duplication of Digicel exists mobile network facilities and enable other MNOs to focus their network builds in unserved areas and/or redirect their investments into other parts of the sector.</p>

Question 6: The views of operators and interested parties are sought as to whether the declaration criteria would be met. Please explain the reasons for your answer and support it with evidence where possible.

9 Next steps

NICTA has reserved its position on the issues pending, amongst other things, conclusion of this public consultation. Once those views have been assessed, the NICTA Board will re-examine the matter.

10 Summary list of discussion questions

Question 1: Do you agree with the proposed definition of the relevant market as the market for wholesale mobile access and call origination services? Please provide arguments and if appropriate, evidence to support your views.

Question 2: Do you agree that satellite-based mobile services may be regarded as marginal and therefore of little importance for the purpose of this inquiry? Please support your comments with arguments and where possible, with factual evidence.

Question 3: Do you consider that the wholesale mobile access and call origination market is susceptible to ex ante regulation for significant market power? If not, please provide arguments and if appropriate, evidence to support your views.

Question 4: Do you agree with the proposition that Digicel has a position of significant market power in the wholesale mobile access and call origination market? Please explain the reasons for your answers and support it with evidence where possible.

Question 5: Do you agree with the proposition that Digiel's SMP in the wholesale MACO market is potentially harmful to the development of effective competition in the downstream retail mobile service market? Please explain the reasons for your answer and support it with evidence where possible.

Question 6: The views of the operators and interested parties are sought as to whether the declaration criteria would be met. Please explain the reasons for your answer and support it with evidence where possible.

11 ANNEX A: Inquiry terms of reference

Under the authority of section 127 of the *National Information and Communications Technology Act 2009* (the Act), NICTA has decided to inquire into and report on whether certain wholesale services relating to the supply of public cellular services in Papua New Guinea should be declared under section 130 of the Act. In doing so, NICTA will:

- (a) analyse the extent of competition in domestic mobile telecommunications markets, with a particular focus on the geographical areas outside the provincial capitals;
- (b) consult with the Independent Consumer and Competition Commission, operator licensees, and any other relevant parties or government agencies;
- (c) form a view as to whether or not those markets are sufficiently competitive; and, if any is not sufficiently competitive,
- (d) consider whether the declaration by the Minister of any particular wholesale service or services in that market, in particular facilities access services associated with mobile network facilities and/or domestic inter-network mobile roaming services, would satisfy the declaration criteria specified in section 128 of the Act;
- (e) determine whether or not NICTA should recommend to the Minister that one or more wholesale services in that market be declared under section 130 of the Act; and, if such a recommendation should be made,
- (f) specify the recommended terms of the declaration(s) and the recommended expiry date(s) for any such declaration(s); and
- (g) prepare for the purposes of section 135 of the Act draft service-specific pricing principles in relation to the wholesale service(s) recommended to be declared.

12 ANNEX B: Areas covered by the mandatory network coverage obligations

12.1.1 Band 1: Main centres of Papua New Guinea

Reference No.	Province	Main Centre
1	National Capital District	Port Moresby
2	Morobe	Lae
3	Western Highlands	Mount Hagen
4	Eastern Highlands	Goroka
5	Madang	Madang
6	East Sepik	Wewak
7	West New Britain	Kimbe
8	East New Britain	Kokopo

12.1.2 Band 2: Mid-sized centres of Papua New Guinea

Reference No.	Province	Mid-sized centre
1	Western	Kiunga
2	Western	Daru
3	Gulf	Kerema
4	Milne Bay	Alotau
5	Oro(Northern)	Popondetta
6	Southern Highlands	Mendi
7	Enga	Wabag
8	Chimbu	Kundiawa
9	Eastern Highlands	Kainantu
10	Morobe	Wau/Bulolo
11	Saundau (West Sepik)	Vanimu
12	Manus	Lorengau
13	New Ireland	Kavieng
14	Autonomous Region of Bougainville	Buka

12.1.3 Band 3: Administrative district centres of Papua New Guinea

Reference No.	Province	District Centre
1	Autonomous Region of Bougainville	Arawa
2		Buin
3	East New Britain	Vunadirdir
4		Rabaul
5		Pomio
6	Manus	Lorengau
7	West New Britain	Kandrian
8		Talasea
9	New Ireland	Taskul
10		Namatanai
11	Chimbu	Chuave
12		Gumine
13		Karimui
14		Kerowagi
15		Gembogl
16		Sinasina
17	Eastern Highlands	Daulo
18		Bena
19		Henganofi
20		Ungai
21		Lufa
22		Obura
23		Okapa
24	Enga	Kandep
25		Kompiam
26		Laiagam
27		Wapenamanda
28		Porgera
29	Southern Highlands	Ialibu
30		Imbongu
31		Kagua
32		Magarima
33		Tari
34		Kutubu
35		Nipa

36		Pangia
37	Western Highlands	Minj
38		Banz
39		Jimi
40		Baiyer
41		Tambul
42		Anglimp
43		Kotna
44	East Sepik	Ambunti
45		Drekirkir
46		Angoram
47		Maprik
48		Wosera
49		Sausia
50	Yangoru	
51	Madang	Bogia
52		Middle Ramu
53		Rai Coast
54		Sumkar
55		UsinoBundi
56	Saundaun (West Sepik)	Aitape
57		Lumi
58		Nuku
59		Telefomin
60	Morobe	Bulolo
61		Gagidu (Finschafen)
62		Huon
63		Kabwum
64		Sialum (Tewae)
65		Mutzing (Markham)
66		Menyamyam
67		Boana (Nawae)
68	Central	Kupiano
69		Tapini
70		Bereina
71		Abau
72		Hiri
73		Kwikila

74	Gulf Province	Malalaua
75		Kaintiba
76		Kikori
77		Ihu
78		Baimuru
79	Milne Bay	Bwanabwana
80		Losuia
81		Esa'ala
82	Oro (Northern)Oro	Tufi
83		Afore
84		Kokoda
85	Western Province	Balimo
86		Lake Murray
87		Tabubil

12.1.4 Band 4: Small centres of Papua New Guinea

Ref.	Province	District	LLG/Ward	Small Centre
1	Autonomous Region of Bougainville	Central Bougainville	Wakunai	Wakunai
2		North Bougainville	Buin	Tinputz
3		South Bougainville	Siwai	Torikina
4	East New Britain	Gazelle	Central Gazelle Rural	Kerevat Township
5		Kokopo	Bitapaka Rural	Ulaveo
6		Pomio	Sinivit Rural	Warongoi Dam
7			West Pomio / Mamusi Rural	Kembubu
8		Rabaul	Balanataman Rural	Watom
9	Manus	Manus	Aua-Wuwulu Rural	Lombrum (Naval Base)
10			Pobuma Rural	Bundrahei / Sabondralis
11	West New Britain	Kandrian-Gloucester	Kove/Kalai Rural	Akivilik
12		Talasea	Bialla Rural	Bialla station
13			Mosa Rural	Bugal
14	New Ireland	Kavieng	Lavongai Rural	Meteselen
15			Tikana Rural	Lemakot
16		Namatanai	Nimamar Rural	Mahur
17				Kuanie (Lihir Gold mine)
18	East Sepik	AmbuntiDreikikir	Ambunti Rural	Avatip
19		Angoram	Angoram / Middle Sepik	Gavien Settlement 1
20		Maprik	AlbigesMamblep Rural	Ningalim

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21			YamiTamui Rural	Yenigo
22		Wewak	But / Boiken Rural	Dogur (Dagua)
23			Wewak Rural	Passam station
24		WoseraGaui	North Wosera Rural	Sarikum
25		YagoruSausia	Numbo Rural	Kubalia station
26			West Yagoru Rural	Bebandu
27	Madang	Bogia	Almami Rural	Malala station
28		Middle Ramu	Simbai Rural	Simbai Station
29			Arabaka Rural	Aiome station
30		Rai Coast	NahoRawa Rural	Tauta station
31		Sumkar	Sumgilbar Rural	Talidik
32		UsinoBundi	Bundi Rural	Brahman station
33			Usino Rural	Ramu (sugar factory)
34	Saundaun (West Sepik)	Aitape-Lumi	East Wapei Rural	Tabale
35		Nuku	Maimai / Wanwan Rural	Mukili Station
36			Yankok Rural	Auguganak Station
37		Telefomin	Oksapmin Rural	Oksapmin Station
38			Yapsie Rural	Yapsie Station
39		Vanimo – Green River	Amanab Rural	Amanab Station
40			Bewani / WutungOnei Rural	Bewani Station
41	Morobe	Bulolo	Watut Rural	Watut Station
42		Finschaffan	Hube Rural	Pindiu Station
43		Huon Gulf	Wampar Rural	Huon District Office
44		Kabwum	Seko Rural	Kabwum Station
45		Markham	Umi / Atzera Rural	Mutzing Station
46		Menyama	Aseki Rural	Aseki Station
47		Nawae	Labuta Rural	Labuta Station
48			Napak Rural	Boana Station
49		Tewai-Siassi	Sialum River	Kanome Station
50				Sialim Station
51			Siassi Rural	Lablab Station
52	Chimbu	Chuave	Elimbari Rural	Giru
53		Gumine	Gumine Rural	Dirima station
54		Karimui-Nomane	Nomane Rural	Nomane station
55		Kerowagi	Kerowagi Rural	Kewamugl (school)
56			Kup Rural	Kup
57		Kundiawa	Mitnande Rural	Kugulkane 2
58		Sinasina-Yonggomugl	Tabare Rural	Koge

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59			Yongomugul Rural	Molg
60	Eastern Highlands	Daulo	Asaro/Watabung Rural	Asaro station
61				Watabung Station
62		Henganofi	Henganofi Rural	Kombri
63		Kainantu	Kainantu Rural	Yonki Power Dam
64				Aiyura station
65		Lufa	Lufa Rural	Kotomi
66		Obura-Wonenara	Marawaka Rural	Marawaka station
67		Okapa	Okapa Rural	Tarabo station
68		Unggai-Bena	Unggai-Bena Rural	Kabiufa
69			Bena Rural	Kapakamarigi station
70	Enga	Kandep	Kandep Rural	Kokas
71		Kompam-Ambum	Ambum Rural	Par
72			Kompam Rural	Pomanda
73		Laigam-Porgera	Lagaip	Surunki station
74			Maip/Mulitaka Rural	Muritaka
75			Porgera Rural	Paiyala station
76		Wabag	Wabag Rural	Birip
77		Wapenamanda	Wapenamanda Rural	Tsak Valley
78	Western Highlands	Angalimp	Anglimp Rural	Kindeng tea plantation
79			South Wahgi Rural	Kudjip Hospital
80		Baiyer-Mul	Baiyer Rural	Tinsly Health centre / station
81				Baiyer station and Zoo
82		Dei	Dei Rural	Gumanch 1&2 tea planation
83				Muglamp station
84		Hagen	Mt Hagen Rural	Baisu (CIS, PAnation)
85		Jimi	Jimi Rural	Maipka/Kol Station
86		North Wahgi	North Wahgi Rural	Kimil tea and coffee planation
87			Nondugl Rural	Nondugl (PNGDF base)
88	TambulNebilyer	Nebilyer Rural	Pabarbuk Mission station	
89	Southern Highlands	lalibu-Pangia	Kewabi Rural	Tindua
90		Imbonggu	Imbongu Rural	Kisenapoi
91		Kagua-Erave	Erave Rural	Erave station
92		Komo-Magarima	Hulia Rural	Dauli teachers college
93			Komo Rural	Komo station
94		Koroba-L/Kopiago	Lake Kopiago Rural	Kopiago station
95		Mendi	Lower Mendi Rural	Buiyebi (CIS station)
96			Lai Valley Rural	Kema

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97		Nipa-Kutubu	Lake Kutubu Rural	Harigapo
98			Poroma Rural	Poroma Station
99	Central	Abau	Amazon Bay Rural	Magarida – Health centre
100			Aroma Rural	Maopa
101		Goilala	Tapini Rural	Woitape
102			Woitape Rural	Tolokuma Gold Mine
103		Kairuku	Mekeo-Kuni Rural	Waima station
104			Kairuku Rural	W15-Pinu
105		Hiri	Hiri Rural	W1-Porebada
106			Koiari Rural	Sogeri station
107		Rigo	Rigo Central Rural	Boregaina
108			Rigo Rural	Hula
109	Gulf	Kerema	Central Kerema Rural	Karama
110			East Kerema Rural	Heavala
111		Kikori		Lese
112			Ihu Rural	Harevavo
113	Milne Bay	Alotau	Huhu Rural	Harevavo
114		Esa'ala	West Ferguson Rural	Morima station
115		KiriwinaGoodenough	Kiriwina Rural	Losuia Station
116		Samarai-Murua	Louisiade Rural	Misima (Gold mine)
117	Western	Middle Fly	Lake Murray Rural	Mepu
118		North Fly	Kiunga Rural	Kiunga station
119	Oro (Northern)	Ijivitari	Oro Bay Rural	Oro Bay
120		Sohe	Higaturu	Higaturu (oil palm)