SPECIAL SESSION OF THE
URBAN INFRASTRUCTURE NETWORK
2-5PM 10 AUGUST 2015
MELBOURNE

Organised by the Australian APEC Study Centre at RMIT University

UiN

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Australian Government
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THE AUSTRALIAN APEC STUDY CENTRE
APEC
Asia-Pacific Economic Cooperation

RMIT UNIVERSITY

Special Meeting of the **Urban Infrastructure Network**

2-5pm 10 August 2015

Fitzroy Ballroom, Sofitel Melbourne, 25 Collins St, Melbourne

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13.45 – 14.00	**Registration**
14.00 – 14:10	**Welcome remarks:** Sir Rod Eddington AO, ABAC Australia
14.10 – 15:00	**Session 1: Overview of the work of the UIN to date** Moderator: Nofel Wahid, The Australian APEC Study Centre, RMIT **Mike Lindfield,** UIN Lead Technical Advisor & Coordinator Workstream 1 Coordinator: Policy and Planning for Sustainable Urban Development **Joe Lufkin,** Coordinator, Workstream 2: Project Development and Implementation Coordinator **Ken Waller,** Coordinator, Workstream 3: Financing for Sustainable Urban Development
15:00 - 16:00	**Session 2: Research work of the UIN** Contributors to interact and demonstrate their research and policy analysis work to participants. Opportunity for participants *(to move around the room)* to discuss and assess the technical aspects of research work with individual authors.
16:00 – 16:50	**Session 3: Draft holistic urban infrastructure policy framework and UIN recommendations to APEC Ministers** Moderator: Nofel Wahid, The Australian APEC Study Centre, RMIT **Panelists** Workstream Coordinators and Participants; Michael Lindfield, Joe Lufkin, Ken Waller, Bernardus Djonoputro, Marcela Allúe, Bill Luz Participants to discuss and critique the key elements of the holistic policy framework under development by UIN workstreams, the recommendations being prepared for ABAC and APEC Ministers, as well as discussions on next phase (action plans) of UIN work.
16:50 – 17:00	**Concluding Remarks:** Ken Waller and Michael Lindfield

UIN Policy Framework Report Executive Summary

Background

In its report to APEC Leaders in September 2014, the APEC Business Advisory Council (ABAC) recommended the formation of the Asia Pacific Urban Infrastructure Network (UIN) to develop a holistic policy framework and action plans for sustainable urban infrastructure development. The UIN concept emanated from a biennial Forum on urban infrastructure development organised in September 2014 and sponsored by the Australian Government. The work of the UIN has been categorized into three workstreams on: i) Policy and planning, ii) Program and project development and iii) Infrastructure financing.

Context

Achieving economic growth and development in the Asia Pacific will undoubtedly depend on the ability of the region's cities, which account for 80 per cent of national economic activity in some cases, to develop on a sustainable basis. Current institutional structures are failing to leverage the resources and innovation potential of both the private sector and the community to promote sustainable urban development.

Sustainable urban development involves a holistic approach to both the hard and soft infrastructure needed for transportation, power, communications, housing, health and education which provides a clean, green and livable environment to meet the diverse societal aspirations our municipalities and communities need to grow and prosper. The focus of each workstream to promote those outcomes are summarised below.

Workstream 1: Policy and Planning for sustainable urban development has focused on assessing the operations of national infrastructure delivery systems. Policy and planning issues affect the cost of 'doing business' and the financial sustainability of businesses in the long run. As such, the contribution of the private sector and the community at large in each of these areas is both important and symbiotic.

A best practice planning and policy framework must include a 'nested' set of implementation strategies between different levels of government, and cross-sectoral reach with guidance on implementation of other strategies. In addition to exhibiting these characteristics, best practice frameworks for planning should also be cross-jurisdictional in reach, nominate appropriate institutions and budgets for implementation and be flexible and responsive to changing circumstances to make them enforceable.

Governments must have a comprehensive national infrastructure strategy that can be relied upon to influence the planning of investments promoting sustainability, as well as its inter-relationship with state/provincial, and in some cases, city strategies. This recommendation also follows through to the sub-national level.

Workstream 2: Preparation of urban infrastructure projects*, found* there are two main levels of project development. They are: small scale investments to extend or expand existing infrastructure networks in the context of an established urban area and plan; and, large scale investments that will have a determining impact on the functioning of the infrastructure network and on the form of the urban area.

The contribution of the private sector and the community should be intrinsic to the methodology adopted. The potential for the private sector to contribute cutting-edge approaches, and to develop more efficient systems must be tapped. These processes should also investigate the knowledge base, and elicit the support, of the community in order to achieve a socially sustainable outcome.

Workstream 3: Financing for sustainable urban development*, focused on impediments to funding and financing of urban infrastructure delivery.* Capital expenditure financing for urban infrastructure is generally derived from three broad sources[1] - transfers from national, state/ provincial and local taxes; user charges, and private funding sources (including institutional investors and sovereign wealth funds). The framework for financing urban infrastructure needs to define structures in which these sources of finance are combined most efficiently at the national, state/provincial and local levels.

Given the sizeable funding gap that exists between government capital expenditure and required investments in sustainable urban development, global private savings must be channeled into green infrastructure investment with a focus upon leveraging such investments.

Supplementary to the work of the three workstreams, two pieces of research were commissioned by the UIN; one focuses on 'Global Logistic Cities, An Indicator Based Strategic Framework**';** the second on **'**Public Wi-Fi, Emergent Urban Infrastructure in the Asia Pacific and South Asia'. The reports of these research pieces and their findings are included in these papers.

Conclusion: The UIN proposes that ABAC, on behalf of the private sector, recommend to APEC leaders that concrete national action be taken by member economies to improve the enabling framework and to enhance coordination between institutions in the specific areas set out above in order to improve implementation of sustainable urban development policies.

APEC should foster partnerships between national governments at national, sub-national, city and municipal levels – both within and among member economies – for this purpose. The private sector, and multilateral development banks should be integral to these partnerships.

[1] Which all ultimately derive from the enterprises comprising the urban economy generations

UIN Policy Framework Report

Overview

The APEC Business Advisory Council (ABAC) recommended the formation of the Asia Pacific Urban Infrastructure Network (UIN) in its report to APEC Leaders in September 2014. The UIN concept emanated from a biennial Forum on urban infrastructure development organised in September and sponsored by the Australian Government.

Urbanisation and infrastructure experts who attended the forum proposed developing a holistic policy framework for policymakers at national and sub-national levels of government to meet the challenges of urban infrastructure planning, development and financing. Following the first biennial forum, the UIN was established by grouping experts from across the region into three workstreams focusing on the following areas:

i) Policy and Planning for sustainable urban development
ii) Project development, procurement and management
iii) Financing for Sustainable urban development

The workstreams were tasked with developing a reliable policy framework with practical applications to national, state, provincial and municipal level of governments in APEC economies, as well as more broadly across the Asia Pacific region.

The preliminary findings and recommendations of the three workstreams, which are reported below, will be discussed at an upcoming policy dialogue to be held in Melbourne in August 2015.

These recommendations build on discussions that were held at the first biennial forum. The report of the forum noted that urban infrastructure development should not only focus on addressing economic, financial and environmental challenges posed by rapid urbanisation, but should also take into account the societal and cultural facets of urban infrastructure design, form and use. The following critical factors were identified in the report:

- Contemporary challenges of urbanisation and city growth should have a central place in national policymaking since 80 per cent of national GDP is produced in urban areas.

- Cities are challenged by rapid, unregulated growth often resulting in inefficient spatial layout, which exacerbate the barriers between population groups, labour mobility and access to basic services.

- New systems of urban planning and development are emerging, based on specialisation and competitiveness in economic activity.

- Sustainability and resiliency of cities are important issues to consider in urban design and development due to the rising impact of national disasters and climate change-related risks.

- Governments need to have a holistic policy framework for urban infrastructure development and delivery.

- Successful planning and delivery requires whole-of-government processes that are integrated, inclusive and appropriately governed.

- Project analysis, development and implementation should be derived from rigorous and inclusive planning methodology.

- The capacity of governments to deliver publicly-funded infrastructure is declining, and different models to channel private savings into infrastructure are needed.

Preliminary findings of the UIN workstreams

In preparing this summary it is relevant to briefly describe the procedures followed by the three workstreams. All three have involved consultation between specialists in the three areas of focus, which was coordinated through a secretariat at the Australian APEC Study Centre at RMIT University.

The workstreams agreed to the development of diagrams (attached to this report) to show the relationships between national, state and provincial, and municipal levels of governments in selected APEC and non-APEC economies. Data on governmental organisational structures and the institutional relationships both for control, and less formal influence and coordination, were gathered from public.

In each economy, a city was selected – not necessarily the capital – to illustrate municipal level institutions, and the state or province where that city is located is used to illustrate the middle level of government. Where possible, the funding of illustrative key urban infrastructure assets was also illustrated, together with the respective funding entities such as commercial banks, national and international development agencies, national ministries (e.g. ministries of finance), or, in the case of the US, the tax-exempt municipal bond market.

The diagrams do not purport to present an exact description of each jurisdiction and they do not present a comprehensive overview of financing arrangements. They do, however, provide useful insights for a baseline analysis on interagency relationships and provide some examples of financing arrangements that have been used to deliver urban infrastructure.

Overall, APEC economies' institutional structures for urban infrastructure range from the simple single-level arrangements of Hong Kong, Singapore and Brunei to highly-evolved multi-level systems such as in the US (San Francisco/California) and Australia (Sydney/New South Wales).

One key area of differentiation which is immediately apparent is whether an economy is dependent upon national budget funding for local projects or if it has access to commercial markets offering a variety of project financing modalities. On one hand, there is the example of Brunei, a highly centralised economy where national-level public funding is integral to local infrastructure delivery. On the other hand, San Francisco represents an example of a decentralised LGU with access to a diverse mix of federal, state and local budgetary funding sources, as well as financing from the national municipal (tax-exempt) bond market.

There are also economies between those two ends of the spectrum which have access to predominantly top-down public budgetary funding, supplemented by foreign commercial bank lenders and foreign development finance institution (DFI) financing (e.g. Vietnam and

Thailand). Canada, New Zealand, Mexico and China are examples of economies with predominantly commercial bank funding but no project bond market.

Because access to commercial finance is largely a function of an economy's credit rating, the diagrams include the respective economy's sovereign ratings (in the case of San Francisco, each illustrative bond issue is labelled with its particular credit rating).

In addition to analysing the diagrams, the workstreams drew on the specialist knowledge of its members, as well as numerous reports of international and regional organisations, including multilateral development banks, official and commercial sources and the work of think-tanks and academic specialists.

Workstream 1: Policy and Planning for sustainable urban development

1.1 Framework

The workstream assessed the operations of national infrastructure delivery systems. From a policy perspective, it concluded that it is important for governments to have a comprehensive national infrastructure strategy which can be relied upon to influence the planning of investments, as well as its inter-relationship with state and provincial strategies (and in some cases city strategies), if any. At the sub-national level, the same criteria also apply.

When assessing the capacity of governments to implement its national policy and the strategies it may use in implementation, a number of key features are important. They are:

- The strategy *form*, which relates to whether a strategy assigns agency responsibilities with budget allocations, or if the national strategy is merely a set of a guidelines for planning agencies;

- A *nested* strategy, that highlights how well a national strategy complements strategies of other levels of government, and the degree collaboration between agencies in preparing strategies;

- The *cross-sectoral* reach, signifying the comprehensiveness of the national strategy in terms of whether it focuses on just one sector, such as roads, or encompasses all types of infrastructure; and

- *Guidance* on implementation of other strategies, which addresses questions over whether the national strategy has linkages with other specific strategies a government may have on climate change, low carbon development or PPP policies for infrastructure delivery.

The workstream also assessed the capacity of governments to implement an infrastructure plan. It found that the key features for implementing infrastructure plans are similar to what is important in strategies to implement infrastructure policies, in so far as they relate to a plan's *form*, *cross-sectional* and *nesting* features. However, it is also important for an infrastructure plan to have additional features, such as:

- A *cross-jurisdictional* approach, whereby a plan ensures inter-linkages and coordinated provision of infrastructure across administrative jurisdictions

- The appropriate *institutional setup*, to ensure that implementation of coordinated, cross-jurisdictional, and cross-sectoral plans are appropriately mandated and resourced

- *Flexibility*, which enables a plan to be amended and updated in response to changing circumstances; and

- *Enforcement* capacity, which focuses on how well plans can be enforced, and whether effective mechanisms are in place to reconcile any conflicts in planning across communities, agencies, levels of government and different jurisdictions.

Using this framework a review of current practices was carried out by the various resources in the workstream.

1.2 Review of Practice

General

- A key general observation is that infrastructure policy systems are not comprehensive. Where national infrastructure strategies do exist, they consist of general principles and are divorced from specific action in respect to implementing agencies and from funding.

- National strategies are also not nested and coordinated with state and provincial strategies, with the latter often involving notable gaps and having a focus on a few 'trophy projects', which should not be the focus at a strategy level.

  - National strategies were found to rarely have any significant impact on metropolitan urban infrastructure outcomes.

- Furthermore, infrastructure planning systems are found to be 'siloed', whereby various sector agencies develop their own plans largely independent of other sectoral agencies. This applies to agencies at national, state and provincial levels.

Implementation

- National planning and infrastructure ministries were found to be 'aggregators' of projects of national sectoral ministries, or worse, of state and provincial sectoral agencies (Australia). State and provincial infrastructure agencies also often exhibit the same tendency.

- No country was found to have a coherent set of 'nested' national, regional and city infrastructure plans.

  - It should be noted that the intermediate planning level is 'regional' reflecting the boundaries of urban economies and their hinterlands and the national urban hierarchy, not state and provincial jurisdictions.

  - Such jurisdictions are often arbitrary administrative constructs and planning can reflect the need for short-term 'trophy' announcements leading to unnecessary duplication of investments (Vietnam).

- The tendency to focus on 'trophy' announcements is even stronger at the city and local government level, compounded by the fact that many local government units (LGUs) are too small to cover an area sufficient for effective planning of infrastructure and their size allows ready capture by vested interests (Philippines, Australia/NSW).

- National agencies, which are normally not infrastructure agencies and do not report to them, do set guidelines applying to particular infrastructure issues.

  - For example, in relation to PPP projects (in many countries), Low Carbon Cities (China), service standards (Vietnam), national agencies have rarely set standards for coordination of infrastructure planning processes (such as in relation to economic development needs), or coordinated the formulation of their guidelines to integrate into such processes.

- Project preparation processes often require compliance with planning instruments, but in reality the planning process is changed to reflect the project proposal.

- Planning itself is often a purely physical design exercise driven by notional standards, delineating land use extrapolated from current trends – whether or not this makes economic or environmental sense (China) – and including infrastructure provision which is not grounded either in a solid institutional or financial basis for implementation.

- Enforcement of plans is ineffective (except OECD countries and China). Although the lack of enforcement of inappropriate plans is in essence an advantage, the practice undermines governance.

Metropolitan Issues

- Metropolitan Planning systems are not comprehensive.

  - In the geospatial sense, that they do not cover the area economic hinterland or the component jurisdictions.

  - Sectorally, they do not cover the gamut of infrastructure needed for guiding the development of an urban area in a sustainable direction – transport, water and waste water in particular.

  - Conflict resolution arrangements are often not formalised with the exception, at least in principle, of Australia/ NSW where a Land and Environment Court determines outcomes.

Workstream 2: Preparation of urban infrastructure projects

2.1. Framework

Definition and Assumptions

The term 'project preparation' is used herein to describe the process by which individual urban infrastructure projects are taken from the planning phase through to funding and implementation. This usually is through a series of increasingly detailed studies (e.g. prefeasibility and feasibility studies) which together comprise the extensive documentation and detailed design of a project, through to detailed engineering, architectural and financial designs according to which infrastructure assets are procured and constructed.

The interplay between physical, financial and legal planning (by which is meant the design of contractual relationships among the various parties involved in any major project) is critical, especially in the case of assets to be procured through public-private partnership (PPP) modalities.

Framework

There are two levels of approach used in project development and a distinction needs to be made between them. They are:

a) small scale investments to extend or expand existing infrastructure networks in the context of an established urban area and plan; and
b) large scale investments which will have a determining impact on the functioning of the infrastructure network and on the form of the urban area.

The terms 'small scale', 'large scale' and 'determining' are of course relative. 'Small scale' in China is decidedly 'large scale' in the Pacific. This said the approaches to the two types of investments differ and the framework for assessment needs to incorporate both.

Also intrinsic to the project development process for the second type of investment are over-arching principles of development which need to be addressed in the framework. These are:

a) Is the project needed at all? For example, will demand management measures suffice? – intrinsic to such fundamental questions is the need to define the objectives of the project in terms of performance and not in terms of a predetermined technology; and
b) Is the project structured to maximise the efficiency of use, and leverage, of public funds without compromising long term performance?

In this context, the key framework issues are:

For small scale extensions:

- Is there a *physical plan* into which the project fits?

- Is there an *asset management plan* identifying the investment and a budget for it?

- Has the project been subjected to *cost benefit analysis*?

For 'determining' projects:

- Was the *concept development* of the project concept done in the context of a comprehensive assessment of the contribution of the project to the economic functioning of the city?

- Were *performance criteria* for the project developed so investment options could be assessed in a 'technology agnostic' manner?

- Was a *prefeasibility study* done to assess investment options and potential implementation and financing structures – the latter including scope for PPP?

- Did the *feasibility study and due diligence* process preserve the potential for options for innovative project solutions from contractors and financiers, including planning for possible future changes in ownership and financing structures post-construction??

- Was a *market sounding and bid preparation* process conducted responsive to market conditions – to establish for the procuring party a reasonable understanding of current market conditions, preferences of potential bidders, and other competing projects in the market?

- Was the *bid process* efficient and effective – ensuring competition but providing incentives for physical and financial innovation?

- Were fair and transparent arrangements made for any required sharing among or recovery from, bidders of preparation costs (e.g. costs of a PPP agency's work)?

- Was the *bid assessment* based on defined criteria based on the performance measures set out above, include cost benefit analysis, and transparent?

2.2. Review of Practice

Analysis shows that projects can be prepared in four broad ways:

- By the host LGU within its own planning agencies to a standard acceptable to either itself as funder or a provincial or national public funder;

- By the host LGU with the support of a provincial or national project preparation facility (PPF) or project preparation entity (PPE). This practice prevalent in economies where a national or provincial PPP unit has been established to provide the technical support needed to structure project procurement to appeal to private participants;

- By a national body, with input from the host LGU; and

- By a bilateral agency or multilateral development bank, as in the case of project preparation technical assistance (PPTA) by the Asian Development Bank or the World Bank.

A comparison of the APEC economies' approaches to project preparation yields examples of each of the four types above, with a key differentiator being the presence or absence of a national entity with responsibility for the structuring and oversight of PPP projects.

- The Philippines and Korea are good examples of the first case, with national entities (The Philippines PPP Centre in the National Economic Development Administration, and the Public and Private Infrastructure Management Centre PIMAC, respectively).

- In economies with no such entity, the PPP approach to project preparation is either largely non-existent (e.g. Vietnam, Brunei) or engrained into local planning (e.g. Australia, Canada), obviating the need for a national Centre.

A few countries in the survey have been recipient of large amounts of donor support in the development of their PPP Centres, such as India and the Philippines.

- The Indian Infrastructure Project Development Facility (IIPDF) is housed in the Ministry of Finance. India also has numerous state-level PPP "cells".

In both countries PPP as a procurement modality for urban infrastructure is common and receives much support, as specialised legal and financial project teams are put together to prepare projects for bidding, paid for with the resources of the facility.

- In the case of India, the facility is an Indian-government-funded revolving fund from which LGUs can borrow to cover up to 75 per cent of project preparation costs. However, its management, projects screening and initial preparatory work is assisted by a consulting team procured by ADB through a technical assistance program.

- The Philippines PPP Centre is donor grant-funded (by Australia and Canada) and receives technical assistance from the ADB to support a Project Development and Management Facility (PDMF).

- The costs of project preparation are added to overall project costs, and repaid to the PDMF upon financial close, when projects are successfully bid out to private bidders.

Areas for Further Investigation

Areas for possible further research and analysis are:

- The relative utility of national vs. regional PDEs and PDFs;

- Optimal design of PPFs and PPEs within the context of a given economy's existing institutional system;

- Impact of national PPP Centres on the overall implementation rate and success rate of urban infrastructure projects;

- Best practices in the mainstreaming of PPP project preparation approaches into existing LGU planning agencies;

- Methods for recovering or equitable sharing of project preparation costs in the case

where projects are prepared for private bidding by either an LGU or by a single private proponent; and

- Approaches for cross-fertilising good practices and high standards in project preparation among APEC economies.

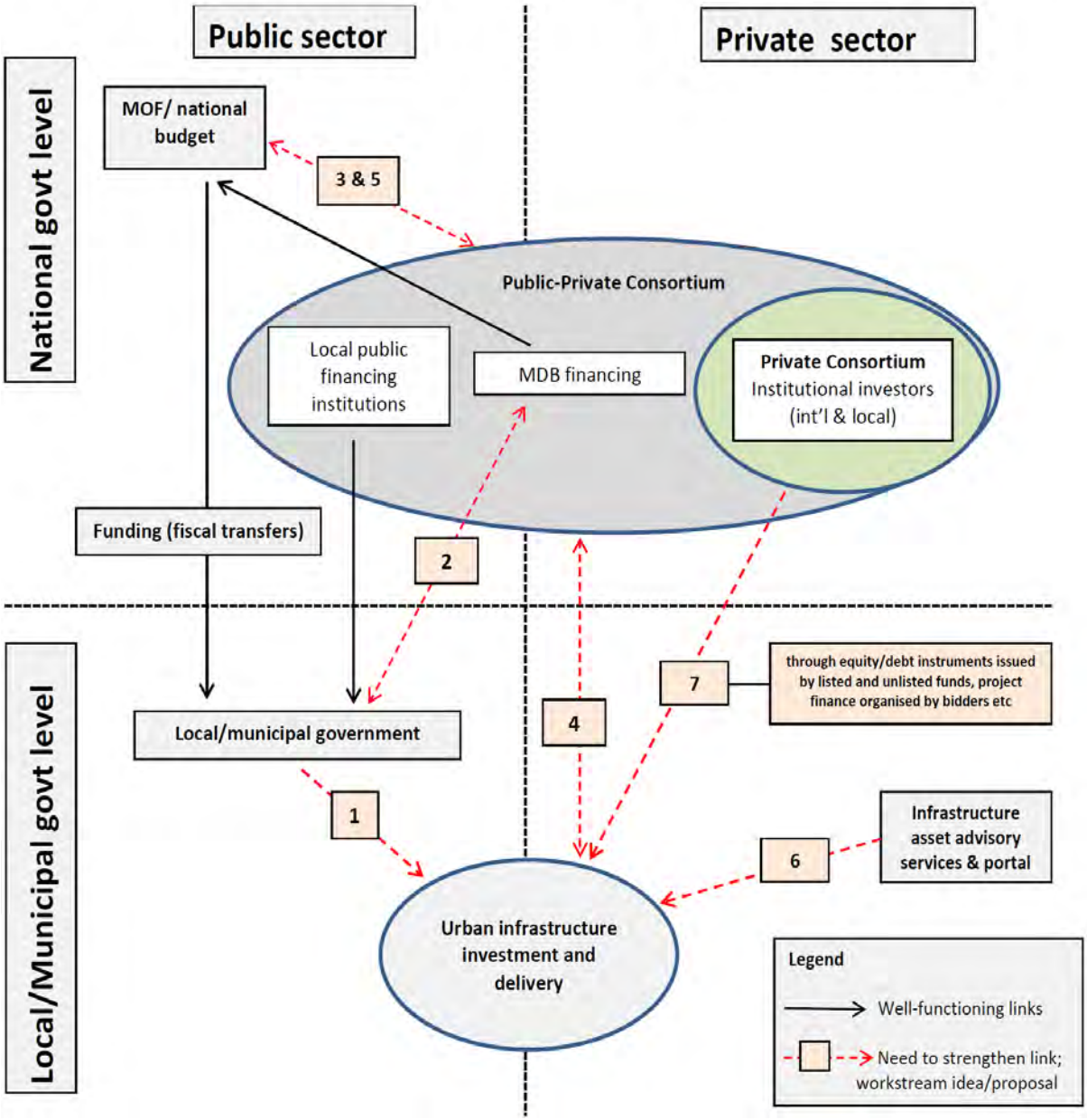
Workstream 3: Financing for sustainable urban development

3.1 Framework

Overview

The workstream analysed current trends in urban infrastructure financing, focusing on the main sources and types of financing available and the policy and regulatory impediments that are affecting the opportunity to finance more urban infrastructure delivery. The needs highlighted by this workstream are reported below, with Figure 1 providing an illustration of the main forms of financing relationships that exist and the needs to strengthen those financing relationships.

Figure 1: Illustration of developing economy financing relationships and needs



Framework

Capital expenditure financing for urban infrastructure derives from three broad sources[2] - transfers from national, state/ provincial and local taxes, user charges and from private funding sources (including institutions and sovereign wealth funds). The framework for financing urban infrastructure needs to define structures in which these sources of finance are combined most efficiently. These structures can best be described at the national, state/ provincial and local levels.

National level structures fall into two categories.

- National enabling frameworks, which especially relate to:

  a) *intergovernmental fiscal transfers* which correspond to infrastructure funding needs of each level of government;

  b) encouraging state/ provincial and local governments to fully utilize their *revenue base* (i.e. collect all taxes due) and to leverage this base by tapping community and private sector resources;

  c) encouraging the flow of *long term finance* to infrastructure – specifically from pension, insurance and sovereign wealth funds by removing constraints to their activity, through the development of project bond markets and loan pooling mechanisms for weaker local governments, by encouraging debt and equity funds focused on infrastructure investment, and by removing constraints to international capital flows (private and MDB) for urban infrastructure investment.

National financing structures that:

  a) Enable the establishment of *national challenge funds and funding instruments* designed to leverage effective government investment at state/ provincial and city levels, and private investments through the use of grants, loans, equity participation and guarantees;

  b) Are appropriately '*nested*' with structures below.

- State/ provincial level structures also fall into two similar categories.Enabling frameworks relating to:

  a) Local government *fiscal transfers* which correspond to infrastructure funding needs and mandates;

  b) Encouraging local governments to fully utilize their *revenue base* (ie collect all taxes due) and to leverage this base by tapping community and private sector resources;

- State/ provincial financing structures that:

  a) Enable the establishment of *challenge funds and funding instruments* designed to leverage effective government investment at state/ provincial and city levels, and private investments through the use of grants, loans, equity participation and guarantees;

[2] Which all ultimately derive from the citizenry across generations

b) Are appropriately '*nested*' with structures above and below.

Local level structures also fall into same two categories.

- Enabling frameworks relating to:

  a. *Institutional arrangements* at metropolitan level for implementation – metropolitan and sector structures to share revenue and expenses across jurisdictions corresponding to infrastructure funding needs and mandates;

  b. *Land acquisition and resettlement* cost determination and disbursement;

  c. Utilize the *revenue base* fully especially in terms of land value capture and leveraging this base by tapping community and private sector resources;

- Financing structures that:

  a. Enable the establishment of *city funds and funding instruments* designed to leverage government with private investments through the use of grants, loans, equity participation and guarantees, and through contribution/ lease of local government assets;

  b. Are appropriately '*nested*' with structures above.

3.2 Results from Practice

The key issues relating to the framework are set out below.

Issue 1: Understanding local funding constraints

Economies in the region have varying capacities and mechanisms in place to fund urban infrastructure. Advanced economies undoubtedly have a greater capacity to fund urban infrastructure projects due to well-established local government councils or metropolitan authorities capable of levying charges and fees and raising local tax revenue. Developing economies face greater challenges to fund urban infrastructure due to their weaker economic base, as well as administrative capacity and skills shortages and limited policy options to collect revenues and generate user charges.

Need

- Local governments need to develop tools to capture economic value stemming from urban land development and infrastructure projects.

  - LGUs are often at the forefront of community engagement on infrastructure development plans. Concrete steps to capture economic value from urban infrastructure projects can play a critical role in offsetting the need for high user charges or other forms of revenue collection.

Issue 2: Financing and coordination with MDBs needs to be streamlined

Multilateral development banks (MDBs) have historically played only a limited role in

directly financing local governments and municipal authorities. As a result, MDBs have had limited interaction with sub-national levels of government.

The excessive reliance of MDBs on channeling finance through national governments to deliver urban infrastructure has meant that urban infrastructure investment has been affected by bureaucratic inertia and lack of intergovernmental coordination between national and sub-national governments.

Need

- There is a pressing need for streamlining the financing relationship and coordination processes between national, sub-national governments and MDBs over questions related to the funding and financing mix, financial structures and instruments to be used for urban infrastructure projects.
    - Greater interaction between MDBs and sub-national levels of governments will also help MDBs to better understand project transaction capacity and skills constraints within different tiers of government, which they can seek to address through technical assistance programs.
    - Over the long term this is an important developmental need for more effective urban infrastructure delivery.

Issue 3: A national policy framework for sovereign guarantees

In most cases, national governments provide sovereign guarantees for infrastructure projects on a discretionary case-by-case basis, subject to opaque negotiations between government officials and investors. This can lead to market uncertainty over whether a specific project proposal or financing structure will attract a sovereign guarantee.

Need

- A national policy framework for sovereign guarantees and the creation of an independent body to administer policies would provide clear signals to investors on a government's criteria for mitigating and bearing sovereign risks for infrastructure projects.
- It would help address legacy issues around MDBs developing exclusive financing relationships with national governments in order to obtain sovereign guarantees and enable MDBs to provide more direct financing and technical assistance to sub-national governments.

Issue 4: Credit ratings and informatics on infrastructure assets has to be improved

A fundamental rethink of the way in which investors and governments view and use credit ratings of infrastructure projects is needed. Financial market practice of using sovereign bond yields as a proxy for sovereign risk may not be very relevant for assessing the riskiness of an infrastructure investment proposal.

Need

- Governments should play a significant role in addressing information asymmetries that can affect how financing instruments for infrastructure projects are rated.
  - A municipal authority that collects and publishes data on the operations of a metro network relative to the entire urban transport network can better facilitate its next municipal bond issue to finance a future transport project.
- Second, rating agencies' credit assessments of an urban infrastructure project should take more account of the idiosyncratic risks.
  - Urban infrastructure projects are intrinsically linked to broader infrastructure networks. Assessing the riskiness of a project proposal relative to the broader infrastructure network is more important than making trivial assumptions of sovereign risks based on sovereign bond yields.

Issue 5: Thinking of cross-border investment in infrastructure as FDI

Governments view often review FDI proposals based on national interest and/or commercial viability tests. Government investment promotion agencies also play a critical role in attracting and facilitating investment and managing stakeholder relations.

The policy regime and discourse on infrastructure investment tends to focus heavily on issues related to portfolio investment and fund flows. Yet from a public policy perspective, it is difficult to argue what the difference is between an investor building a factory to operate for 20 or 30 years and building infrastructure to operate for the same period of time.

Need

- Governments should consider aligning policies to attract infrastructure investment, particularly for Public Private Partnership (PPP) projects, with its broader suite of national policies and incentives to attract foreign direct investment.

Issue 6: Pooling urban infrastructure assets

Challenge

Aggregating small urban infrastructure assets into asset-backed investment vehicles that will be attractive to specialised institutional investors such as small private pension funds or sector-specific investment funds requires innovative approaches to marketing and promoting urban infrastructure investment.

This approach recognises that not all infrastructure projects need be of a scale that attracts only the largest investor groups, but that benefits can arise to communities and investors alike from smaller parcels of infrastructure financing.

Need

- Development of models to aggregate small projects from a metropolitan region, to rate them and to provide confidence to investors about the intrinsic quality and capacity of

municipal agencies to collect fees and charges to repay loans, or to make minimum equity investments.

- Fiscal incentives to attract investors are common in facilitating major infrastructure investments and would be needed for such smaller aggregated investments.

Issue 7: Attracting institutional investment in infrastructure

Work by the OECD shows that there are fundamental differences between asset managers (infrastructure funds) and owners (pension funds). The former often have shorter investment time horizons compared to pension funds, with most infrastructure funds being closed-end funds with a time horizon of 10-15 years and an investment period of 4-5 years.

On the other hand pension funds generally have a time horizon of 15 years or more, with a preference for open-ended funds that allow greater opportunity to match duration of assets with longer-term pension liabilities.

Need

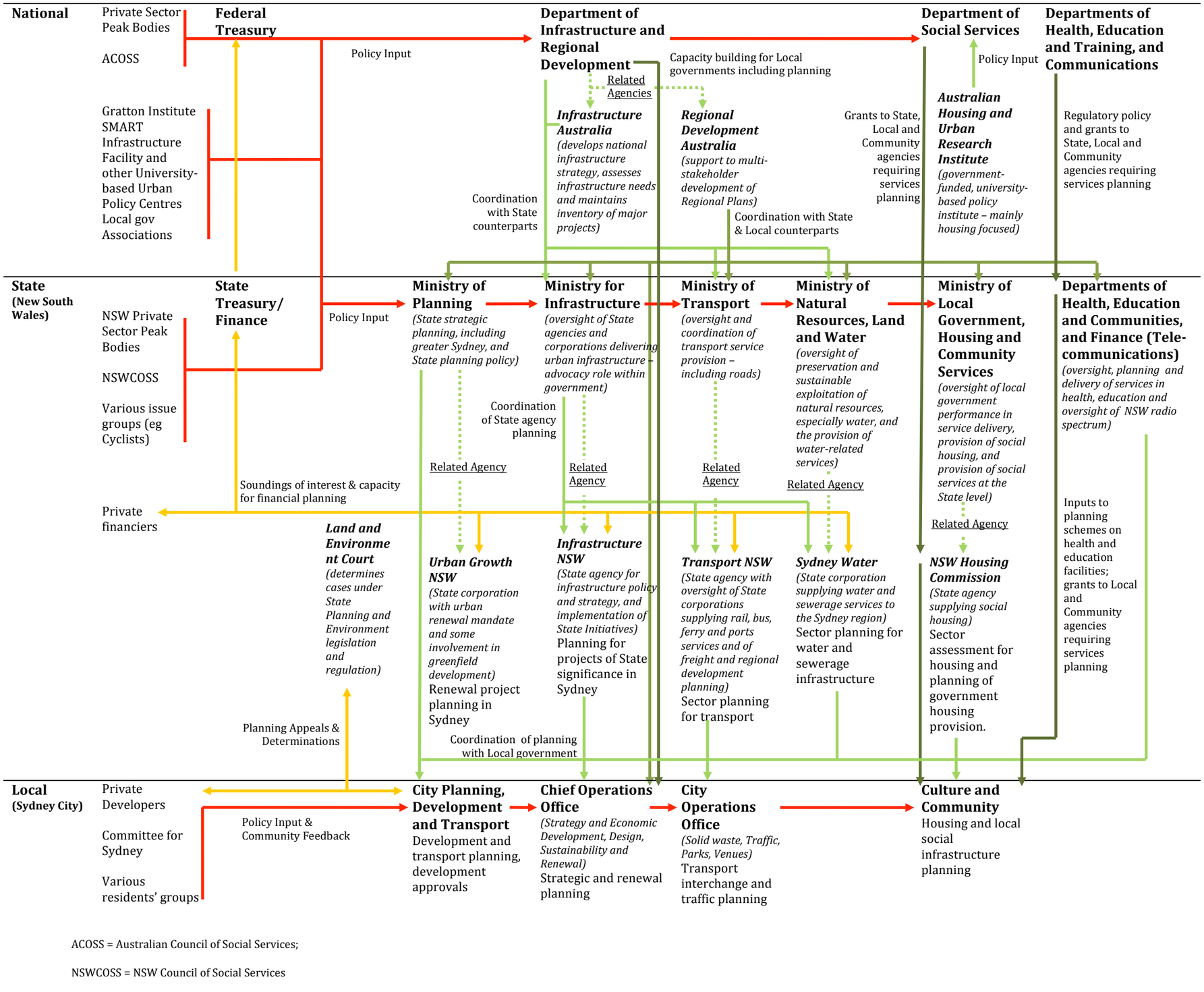
- Greater collaboration between different types of institutional investors is needed to develop more innovative co-investment models and mechanisms for infrastructure investment.

Next Steps

It is recognised that further work will need to be undertaken by the workstreams to support the continuing development of the ideas and proposals in this report. It is also intended that a second biennial Forum of the UIN will be convened in the early 2016 to discuss a holistic policy framework and plans that individual governments might wish to consider in implementing a best practice framework.

The second biennial Forum will also be an occasion to discuss funding opportunities for the continuing the work of the UIN, which could become a major advisory group to assist governments in improving urban infrastructure development, planning and financing.

Urban Infrastructure - Planning System Diagram for Australia using Sydney, New South Wales as case study



ACOSS = Australian Council of Social Services;

NSWCOSS = NSW Council of Social Services

In Australia, the primary planning agencies are usually found at the State level. In New South Wales (NSW), these agencies are: the Ministries and Departments of Planning and of Infrastructure (the State Premier heads the latter Ministry). The key sectoral Ministries undertaking planning for their sectors are: Transport; Natural Resources, Land and Water; and Local Government, Housing and Community Services. NSW State Treasury is important for financial planning.

The key coordinating agency is Infrastructure NSW which undertakes State infrastructure planning. Key sectoral agencies are: Transport NSW, Sydney Water and the Housing Commission. The focal renewal agency is Urban Growth NSW.

Health and education infrastructure for detailed planning and service provision are state responsibilities. The NSW Departments of Health and of Education and Communities are important in metropolitan planning.

At the Commonwealth (federal) level the Department of Infrastructure and Regional Development together with its related agencies, Infrastructure Australia and Regional Development Australia, are the key regulator and supporting agencies. The Department of Social Services oversees the housing sector, informed by the Australian Housing and Urban Research Institute, among others. The Commonwealth Treasury is involved in financial planning for large scale projects with Federal involvement.

At the state level, the NSW departments of Health and of Education and Training also have significant influence as they fund programs based on, and requiring, sector planning. In respect of communications, its regulation is a national responsibility, as is the funding of a national broadband network. Such regulation and financial incentives determine the scope of activity of private sector providers operating at the city level.

The specialist Land and Environment Court has a key role in determining the application of planning legislation.

Statutory planning functions focus on the development and administration of local development plans under State planning policies. Resources are available for Sydney's own strategic planning which, despite the small proportion of the land and population of the metro area under the jurisdiction of the Sydney City Council, are very influential owing to the City's economic importance and the nature of Sydney's infrastructure which focuses on the CBD and metropolitan Sydney.

Other actors including private, civil society and academic are shown down the left hand margin of the organigram.

Organigram Key:

→ Policy Input/Community Feedback

Formal Relationships/ Coordination roles. Different shades of green indicate direct relationships

↔ Informal Relationships

Institutional Structure for Delivering Urban Development
Bangladesh

S&P Sovereign Rating
Local Currency Rating: BB-
Foreign Currency Rating: BB-
T&C Assessment: BB-

National

Prime Minister

Ministry of Finance
Ministry of Industries
Ministry of Economic Affairs
Ministry of Education
Ministry of Primary and Mass Education
Ministry of Planning
Ministry of Power and Energy and Mineral Resources
Ministry of Water Resources
Ministry of Environment and Forest
Ministry of Land
Ministry of Road Transport and Bridge
Ministry of Raliways
Ministry of Housing and Public Works
Ministry of Social Welfare
Ministry of Civil Aviation and Tourism
Ministry of Health and Family Welfare

Board of Investments
Department of Private Public Partnership

Planning Commission
Industry and Energy Division
Physical Infrastructure Division
Socio-Economic Infrastructure Division

Chittagong (Region)

Deputy Commissioner

District Education Office
District Primary Education Office
Education Engineering Department
Local Government Engineering Department
Chittagong Development Authority
Bangladesh Power Development Board
Water Development Board
Public Works Department

Haemodialysis Centre National Institute of Kidney Diseases and Urology PPP (Pre-Financing)

Dhaka-Chittagong Express Way PPP (Pre Financing)

KfW

Shasthyo Shurokhsha Karmasuchi (SSK) or Health Protection Pilot Scheme for the Poor

Chittagong (District)

Bangladesh Rehabilitation Assistance Committee (BRAC)
Educate A Child
Qatar Foundation for Eduation

Boat Schools and Slum Schools

Mayor

Chittagong City Corporation

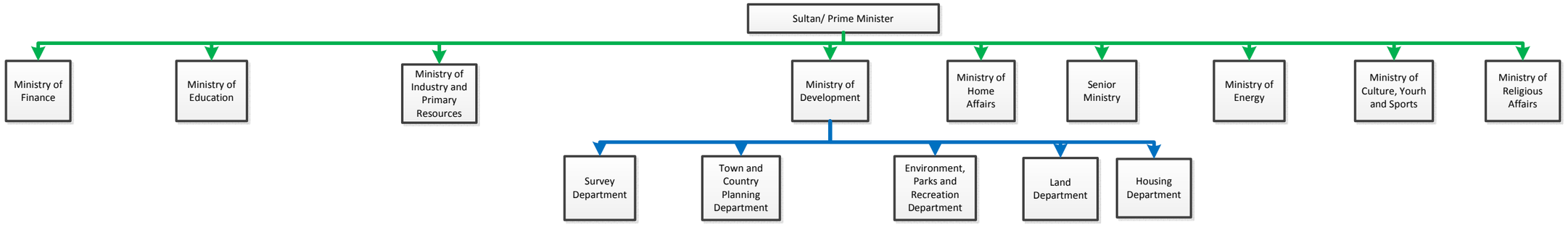
Identified Financial Partners:
ADB, AUSAid, GIZ, JICA, IDA, IBRD, USAid

Legend: reporting line of subordinate entities | coordination among national, local or state entities | financing flow | non-government funders (Primarily Debt)

Institutional Structure for Delivering Urban Development
Brunei

S&P Sovereign Rating
Local Currency Rating: A-
Foreign Currency Rating: BBB+
T&C Assessment: A

National



Legend: reporting line of subordinate entities; coordination among national, local or state entities; financing flow; non-government funders (Primarily Debt)

Institutional Structure for Delivering Urban Development
CAMBODIA- Phnom Penh

No Credit Rating

National

Prime Minister

Cambodia National Rescue Party
Cambodian People's Party
Cambodian Investment Board
Cambodian Special Economic Zone Board
Council for the development of Cambodia

Ministry of Economy and Finance
Ministry of Industry, Mining and Energy
Ministry of Education, Youth and Sport
Ministry of Land Management, Urban Planning and Construction
Ministry of Interior
Ministry of Planning
Ministry of Power
Ministry of Water Resources and Meteorology
Ministry of Public Works and Transport
Ministry of Posts and Telecommunications
Ministry of Environment
Ministry of Cults and Religion
Ministry of Health

Investment and Cooperation Department
PPP Unit
Financial Affairs Department

Administration Department
Budgeting Department
General Department of Construction

Public Investment Program
General Directorate of Planning

Department of ASEAN & Internal Cooperation

Department of Water Resources mgmt & Conversation

Roads Department
Waterways Department
Air Infrastructure Department

Department of Natural Resources Assesment & Environment Data Mgmt
Department of Environment Impact Assesment Review
Department of Environment Pollution Control

Department of Potable WaterSupply
Department of Hydropower

Mekong River Commission
Department of Hydrology & River Works

Department of Railway

Phnom Penh (Municipality)

JICA
¥851m YEN
Project for Expansion of Lower Secondary Schools (¥851m YEN)

Bureau of ASEAN and International Relations
Bureau of Land Management, Urban Planning and Construction

€1.5m EUR

KfW Development Bank
€17m EUR

Govt. Of Germany
€15.5m EUR

Social Health Protection Programme (€34m EUR)

Phnom Penh (City)

Governor
Chief of Cabinet
First Vice Governor

Deputy Chief of General Affairs
Deputy Chief of Planning and Finance Division
Deputy Chief of Administration and Personnel Office
Deputy Chief of Accounting and Finance Office
Deputy Chief of Qualification, Standards and International Relations Division
Deputy Chief of Registration and Monitoring Division
Deputy Chief of Legalization and Assessment

ADB
$84m USD

Government of Australia
$22.96m USD

OPEC Fund
$13m USD

Phnom Penh Railway System
$119.96m USD

Phnom Penh Water Supply Authority

Electricity Authority of Cambodia
El⁺ctricit⁺ du Cambodge

Identified Financial Partners

PPIAF, WorldBanK ,DANIDA, FINNIDA ,AusAID ,ADB, JICA, AFD

Legend: Reporting lines of subordinate entities; Coordination among national, local or state counter part; Financing Flow; Primarily Debt

Institutional Structure for Delivering Urban Development
Canada – Quebec, Montreal

S&P's Sovereign Rating
Local Currency Rating AAA
Foreign Currency Rating AAA
T&C Assessment AAA

National

Queen's Privy Council

Executive power
The Premier
Lieutenant Governor
Governor General of Canada
Prime Minister

Minister of State (Finance)
Minister of the Economic Development Agency of Canada for the Regions of Quebec
Minister of Industry
Ministry of Education
Minister of the Environment
Minister of Infrastructure, Communities and Intergovernmental Affairs
Minister of Transport
Minister of Public Works and Government Services
Minister of Health
Minister for Multiculturalism

Canada Foundation for Innovation
Canadian Environmental Assessment Agency
The Policy and Communications Branch
The Program Operations Branch
Policy, Planning and Communications

Canadian council for PPP
Building Canada Fund $37.5m USD
$37.5m USD
Sports and Physical Education Pavillion (PEPS) $37.5m USD

Quebec (Province)

Finance Canada (Department of)

A30 Quebec Toll Road P3 ($447.54 USD)
Regional Director General of Transport

Instituto de Credito Oficial (Spain)
Royal Bank of Canada
$67.62m USD
$56.54m USD

Montreal (City)

$42.62m USD
$56.54m USD
$56.32m USD
$54.62m USD
$56.54m USD
$56.54m USD

Societe Generale
Bank of Scotland
UniCredit
Banesto
Scotiabank
BBVA

Mayor
City Council
borough mayors
borough councillors

Representative Minister of Infrastructure, Communities and Intergovernmental Affairs
Montreal Transit Corporation public transport agency that operates transit bus, and rapid transit services

The Federal Montréal Bridges Branch
Centre for Expertise and Research on Infrastructure in Urban Areas to chart municipal water infrastructure.
Jacques-Cartier and Champlain Bridges Incorporated the federal crown corporation tasked with the management, maintenance and rehabilitation of federal bridges in the Greater Montréal Region

Montreal University Health Centre (CHUM) $2 B USD
$2 B USD
Roche

Public Works Department
Montreal's waste water treatment facility
The Montreal Water Supply

Identified Financial Partners

AusAid, USAid,FINNIDA,IMF,World Bank

Legend: Reporting lines of subordinate entities; Coordination among national, local or state counter part; Financing Flow; Primarily Debt

Institutional Structure for Delivering Urban Development
Chile - Santiago, Santiago

S&P's Sovereign Rating
Local Currency Rating AA+
Foreign Currency Rating AA-
T&C Assessment AA+

National

National Council on Innovation and Competitiveness → PRESIDENT

PRESIDENT →
- Ministry of Economy, Development and Tourism
  - Ministerial Committee of Innovation
  - Chilean Economic Development Agency
- Ministry of Finance
- Ministry of Education
  - Santiago de Chile University **€13m** ← €13m ← Isolux Corsán
- Ministry of Housing and Urban Planning
  - Housing and Urban Development Agency
  - Housing and Construction Services
- Ministry of the Interior and Public Security
- Ministry of Energy
- Ministry of the Environment
  - National Environment Commission
- Ministry of Transportation and Communications
  - Department of Planning and Development
  - **Santiago Metro lines 3 and 6 ($500m USD)**
    - $250m USD ← Deutsche Bank
    - $250m USD ← BBVA
  - Transantiago a public transport system local (feeder) bus lines, main bus lines and the Metro (subway) network.
- Ministry of Mining
- Ministry of Public Works
  - National Roads Department
  - Architecture Department
  - Coordination of Public Works Concessions
    - PPP unit
  - Hydraulic Works Department
  - Servicio Nacional de Obras Sanitarias Water Supply and Sanitation broke down to 2 sections
    - Empresa Metropolitana de Obras Sanitarias
    - Empresa de Obras Sanitarias de Valparaíso
- Ministry of Social Development
- Ministry of Health
  - **Hospital Metropolitano Occidente €236m** ← €236m ← Astaldi Group

Santiago (Province)

Provincial Delegate acts as a governor/intendent

Regional Ministries(SEREMI) → Sub-national administrative units (representatives of the ministry)

Santiago (City)

Mayor (alcalde):
- *Municipal Council*
  - National Environment Commission for the Metropolitan Region
  - *Economic and Social Council*

Identified Financial Partners

IDB, World BanK ,FINNIDA, AusAID, USAID , JICA, ICLD

*only exception is santiago
regional government
Intendente
Regional Council (Consejo Regional – CORE):

Legend: Reporting lines of subordinate entities; Coordination among national, local or state counter part; Financing Flow; Primarily Debt

Institutional Structure for Delivering Urban Development
China - Beijing, Dongcheng

S&P's Sovereign Rating
Local Currency Rating AA-
Foreign Currency Rating AA-
T&C Assessment AA-

National

Premier

National People's Congress

Vice-premier

Ministry of Finance`

Ministry of Education

Ministry of Industry and Information Technology

Minister in charge of the National Development and Reform Commission

Ministry of Supervision

Ministry of Environmental Protection

Ministry of Transport

Ministry of Housing and Urban-Rural Development

Ministry of Land and Resources

Ministry of Water Resources

National Health and Family Planning Commission

China Center for PPP

Department of International Cooperation

National Energy Administration

Directorate General of Highways

National Railway Administration

Department of Construction and Management

Department of Water Resources Management

Department of Irrigation, Drainage and Rural Water Supply

Gaountan Beijing Waste to Energy Plant Refinancing $87.6m USD

$14.60m USD

$43.80m USD

$29.20m USD

China Bohai Bank

Standard Chartered Bank

China Merchants Bank

Beijing (Municipality)

Mayor

Vice Mayors

Municipal Bureau of Finance

Municipal Commission of Education

Municipal Commission of Ecnomy and Information Technology

Municipal Commission of Development and Reform

Municipal Bureau of Supervision

Municipal Commission of City Planning

Municipal Commission of City Administration

Municipal Committee of Transportation

Municipal Commission of Housing and Urban-Rural Development

Municipal Bureau of Land and Resources

Beijing Water Authority

Public Schools

Beijing's fourth subway line

Beijing Suburban Railway

Beijing Electric Power Company
Private-Public Company

Beijing Water Supply company

Dongcheng (District)

Identified Financial Partners

WorldBanK ,ADB, JICA,

MTR-BCG Commonwealth

Mass Transit Railway Corporation (MTR)

Beijing Capital Group (BCG)

Beijing Infrastructure Investment Corporation

District Committee of the Communist Party of China

District Committee of the Chinese People's Political Consultative Conference

Public Hospitals

Legend: Reporting lines of subordinate entities; Coordination among national, local or state counter part; Financing Flow; Primarily Debt

Institutional Structure for Delivering Urban Development
Hong Kong

S&P Sovereign Rating
Local Currency Rating: AAA
Foreign Currency Rating: AAA
T&C Assessment: AAA

National

Chief Executive

Financial Secretary

Cenral Policy Unit

Secretary of Education

Chief Secretary for Administration

Secretary for Financial Services and the Treasury

Secretary for Commerce and Economic Development

Secretary for Development

Secretary for the Environment

Secretary for Transport and Housing

Secretary for Labour and Welfare

Secretary for Food and Health

Secretary for Home Affairs

Home Affairs Department

Home Affairs Bureau

Leisure and Cultural Services Department

Financial Services and Treasury Bureau

Inland Revenue Department

Treasury

Government Property Agency

Commerce and Economic Development Bureau

Development Bureau

Architectural Services Department

Drainage Services Department

Buildings Department

Water Supplies Department

Planning Department

Civil Engineering and Development Deparment

Lands Department

Environment Bureau

Environmental Protection Department

Housing Department

Transport and Housing Bureau

Transport Department

Highways Department

Marine Department

Civil Aviation Department

Social Welfare Department

Department of Health

Islands (District)

Education Bureau

Island District Council

Airport Authority

Public Schools and Direct Subsidy Schools

District Facilities Management Committee

Traffic and Transport Committee

Tourism, Agriculture Fisheries and Environmental Hygiene Committee

Community Affairs, Culture and Recreation Committee

Public Housing Program

Hong Kong Airport Third Runway (USD11,000 m) (Pre-financing)

DZ Bank	West LB	KBC Bank	Hongkong Land Holdings Limited	China National Aviation Corporation	Schiphol International	Fraport	Jardine Shipping Services
USD13.45m	USD16.01m	USD8.99m	USD5.11m	USD5.11m	USD5.11m	USD5.11m	USD5.11m

Tradeport Logistics Centre Hong Kong International Airport- Phase I (USD 64.00m)

Legend: reporting line of subordinate entities; coordination among national, local or state entities; financing flow; non-government funders (Primarily Debt)

Institutional Structure for Delivering Urban Development
INDIA – Gujarat, Ahmedabad

S&P's Sovereign Rating
Local Currency Rating BB-
Foreign Currency Rating BB-
T&C Assessment BB-

National

President
Vice President
Prime Minister
Planning Commission
Ministry of Finance`
Ministry of Commerce and Industry
Ministry of Human Resource Development
Ministry of Home Affairs
Ministry of Urban Development
Minister of Housing and Urban Poverty Alleviation
Ministry of Power
Ministry of Drinking Water and Sanitation
Ministry of Road Transport and Highways
Ministry of Indian Railways
Ministry Of Health and Family Welfare
Department of Expenditure
Department of Economic Affairs
PPP Unit
Punjab & Sind Bank
Department of Internal Security
Department of States
National Buildings Organisation
National Cooperative Housing Federation of India
Indian Roads Construction Corporation
National Highway Authority of India
Jawaharlal Nehru National Urban Renewal Mission
Central Public Health and Environmental Engineering Organisation
Central Public Works Department
National Capital Region Planning Board
National Institute of Urban Affairs
National Buildings Construction Corporation
$7.00m USD
Adani Energy Gujarat gas distribution $23.5m USD

Gujarat (Province)

Ministry State of Human Resource Development
Ministry of State of Urban Development
Chief Minister
Deputy Ministers
State Central Public Works Department
$11.75m USD
$4.75m USD
Secretariat for Infrastructure in the Planning Commission
Department of Drinking Water Supply
Road Construction Department
Indian Overseas Bank
Bank of Rajasthan
Janmarg bus rapid transit (BRT) system

Ahmedabad (City)

Public Schools
Ahmedabad Municipal Corporation
General Hospitals
City Central Public Works Department
Mayor
Ahmedabad Electricity Company Ltd.
Ahmedabad Urban Development Authority WATER SUPPLY & SANITATION
Deputy Mayor
Vice Mayor
Councillors

Identified Financial Partners

WorldBanK ,ADB, JICA,DANIDA,FINNIDA,AusAID

Legend: Reporting lines of subordinate entities; Coordination among national, local or state counter part; Financing Flow; Primarily Debt

Institutional Structure for Delivering Urban Development
Indonesia

S&P Sovereign Rating
Local Currency Rating: BB+
Foreign Currency Rating: BB+
T&C Assessment: BBB-

National

President

Minstry of Finance
State Finance Accountability Committee
Ministry of Economic Affairs
Ministry of Research, Technology and Higher Education
Ministry of Culture and Elementary and Secondary Education
National Development Planning Agency (Bappenas)
Ministry of Energy and Mineral Resources
Ministry of Forestry and Environment
Ministry of Land and Spatial Planning
Ministry of Transport
Village, Disadvantaged Regions and Transmigration
Ministry of Public Works and Public Housing
Minsistry of Health

Bank Negara Indonesia
Bank Mandiri (USD45.08m)
Bank DKI (USD12.74m)
Bank Jatim (USD19.47m)

State-owned banks

USD58.70m
USD45.08m
USD12.74m
USD19.47m

National Spatial Planning Coordinating Board

Head of Bappenas for Development Funding
Head of Bappenas Economics
Head of Bappenas Sector Development Performance Evaluation
Advisor to the Minsitrer of National Development Planning
Head of Bappenas for Regional Development and Autonomy

Head of Bappenas for Natural Resources and Environment
Head of Bappenas for Infrastructure
Indonesia State Electricity Company

Jakarta Metropolitan Area (Province/City)

Governor
Jabodetabekpunjur Development Cooperation Board

Board of Local Finance Management
Bureau of Economic Affairs
Department of Industry and Energy
Department of Education
Bureau for City Infrastructures and Facilities
Bureau of General Affairs
Bureau for City Spatial Planning and Environment
Department of Spatial Planning
Department of Transportation
Department of Public Works
Department of City Parks and Cemeteries
Department of Tourism and Culture
Department of Public Housing and Government Building Management
Department of Social Afffairs
Department of Health

District Finance Office
District Education Office
District Public Schools

33.86 Sokarno-Hatta International Airport Railway PPP (Pre-Financing)

41KM Ketosono Mojokerto Toll Road (USD153.70m)

Identified Financial Partners:
ADB, AusAid, GIZ, IBRD, IDA, JICA, USAid

Legend: reporting line of subordinate entities | coordination among national, local or state entities | financing flow | non-government funders (Primarily Debt)

Institutional Structure for Delivering Urban Development
Japan

S&P Sovereign Rating
Local Currency Rating: A-
Foreign Currency Rating: BBB+
T&C Assessment: A

National

Prime Minister

Ministry of Finance
Ministry for Economy, Trade and industry
Ministry of Education, Culture, Sports and Technology
Ministry of Land, Infrastructure, Transport and Tourism
Ministry of Internal Affairs and Communication
Ministry of Environment
Ministry of State for Reconstruction
Ministry of Health, Labour and Welfare
Ministry of Social Development and Human Security

Development Bank of Japan

USD224.38m

Director-General for Policy Planning
National Spatial and Regional Policy Bureau
Policy Bureau
Government Buildings Department
City Bureau
Land Economy and Construction Bureau
Water and Disaster Management Bureau
Road Bureau
Railway Bureau
Ports and Harbor Bureau
Road Transport Bureau
Civil Aviation Bureau
Housing Bureau

Achi (Prefecture)

Prefectural Assembly
Governor
Administrative Commission

Culture and Education Committee
General Affairs and Public Services Committee
Construction Committee
Health and Public Welfare Committee
Office of the Treasury
Department of Industry and Labor
Regional Development and International Affairs
Policy Office
Department of General Affairs
Department of Environment
Regional Development and Environment Committee
Department of Construction
Disaster Prevention Office
Department of Health and Public Welfare
Board of Education
Land Expropriation Commission

Achi Local Public Enterprise Bureau

Tahara (City)

Board of Education
Mayor
City Council

Industrial Development Department
Policy Promotion Department
General Affairs Department
Water Supply Department
Citizen's and Environment Department
City Construction Department
Health and Welfare Department

Local Bonds
Public Schools

77 MW Tahara Solar Co. (USD224.38m)

Legend: reporting line of subordinate entities | coordination among national, local or state entities | financing flow | non-government funders (Primarily Debt)

Institutional Structure for Delivering Urban Development
Korea

S&P Sovereign Rating
Local Currency Rating: AA-
Foreign Currency Rating: A+
T&C Assessment: AA

National

President

Ministry of Strategy and Finance
Ministry of Education
National Economic Advisory Council
Ministry of Science, ICT and Future Strategic Planning
Korea Development Institute
Ministry of Land, Infrastructure and Transport
Ministry of Environment
Public Procurement Service
Ministry of Culture Sports and Tourism
Ministry of Health and Welfare

KRW75.5b
80% of funding

Public & Private Infrastructure Investment Center
Multifunctional Administrative City Construction Agency

Gyeongsangbuk-do
(Province)

Provincial Council
Governor

Planning Office Bureau
East Coast Development Bureau
Balanced Regional Construction Bureau
Safety and Public Administration Bureau
Local Office and New City Bureau
Environmental and Forestry Resources Bureau
Construction and Transporation Bureau
Culture, Tourism and Sports Bureau
Welfare and Health Bureau

Balanced Development Business Division
Architectural Design Division
Urban Planning Division
Land Information Division
River Division
Road, Raliroad, and Airport Division

Pohang
(City)

Mayor

Parks Management Office
Construct and Urban Planning Bureau
Water Supply Office
Construction Environment Office
Welfare Environment Office
Public Health Centers/ Hospitals

Public Schools

Pohang Wastewater Reuse Project (KRW125.8b)
KRW50.b
P-Water (KB Asset Management and seven other private companies)

Legend: reporting line of subordinate entities; coordination among national, local or state entities; financing flow; non-government funders (Primarily Debt)

Institutional Structure for Delivering Urban Development
Mexico- Jalisco,Puerto Vallarta

S&P's Sovereign Rating
Local Currency Rating A
Foreign Currency RatingBBB+
T&C Assessment A+

National

President
Vice President
Ministry of Finance & Public Credit
Ministry of Public Education
Ministry of Territorial and Urban Development
Ministry of Interior
Ministry of Energy
Ministry of the Environment and Natural Resources
Ministry of Communications and Transportation
Ministry of Social Development
Ministry of Health & Assistance
Secretary of Finance and Public Credit
National Chamber of Industry Development and Promotion of Housing
National Housing Commission
Federal Electricity Commission
Administrative Office
Directorate General of Planning
Mexican Institute of Water Technology
National Water Commission
INFONAVIT
Mexican Chamber of the Construction Industry

Jalisco (State)

BOT Wastewater treatment plant
Construction and Housing Development Center
Governor
The World Bank
IFC initiative
Planning Secretary of Administration and Finance
Solicitor general
Secretary of Environment and Territorial Development
Director General of Administrative Services
Director General of Planning and Urban Management

Puerto Vallarta (City)

Official Representative Ministry of Territorial and Urban Development
Mayor
Official Representative Ministry of the Environment and Natural Resources
Municipal Bus Unions (Ixtapa, Mismaloya, Pitillal)
Public Hospitals and Health Care
Pubic Schools
Councilors
Vice Mayor
SEAPAL Vallarta
CFE elecrtric

Identified Financial Partners

WorldBanK ,PPIAF, IDB, AusAID, AFD, USAID,OPIC

Legend: Reporting lines of subordinate entities; Coordination among national, local or state counter part; Financing Flow; Primarily Debt

Institutional Structure for Delivering Urban Development
New Zealand

S&P Sovereign Rating
Local Currency Rating: AA+
Foreign Currency Rating: AA
T&C Assessment: AAA

National

Prime Minister

Treasury

Minister of Finance

Minister of State Owned Enterprises

Ministry of Education

Ministry of Business, Innovation and Employment

Minister of Economic Development

Minister of Energy and Resources

Minister of Tourism

Department of Internal Affairs

Minister of Internal Affairs

Minister of Local Government

Ministry for the Environment

Department of Conservation

Ministry of Transport

Transport Agency

National Land Transport Fund

Ministry for Culture and Heritage

Ministry of Social Development

Ministry of Health

Planning Institute

Auckland (City)

Mayor

Auckland City Council

Local Boards

Auckland Regional Amenities Funding Board

Auckland Council Property

Regional Facilities Auckland

Auckland Waterfront Development Agency

Watercare Services Auckland

Auckland Tranport

Auckland Tourism, Events and Economic Development

Aukland District Health Board

Public Hospitals

Land Transport Infrastructure

Westpac

HRL Morrison

Hawkins Construction

USD57.22m

USD20.44m

USD20.44m

Hobsonville Point Schools PPP (USD98.10m)

Aukland Harbour Bridge Skypath (Pre-Financing)

Legend: reporting line of subordinate entities; coordination among national, local or state entities; financing flow; non-government funders (Primarily Debt)

Institutional Structure for Delivering Urban Development
Papua New Guinea

S&P Sovereign Rating
Local Currency Rating: B+
Foreign Currency Rating: B+
T&C Assessment: BB

National

Prime Minister

National Parliament of Papua New Guinea

Department of Finance

Department of Treasury

Department of Education

Department of Higher Education Science, Research and Technology

Department of Public Enterprises and State Investments

Department of National Planning and Monitoring

Department of Housing and Urban Development

Department of Environment Conservation

Department of Lands and Physical Planning

Department of Transport

Department of Works and Implementation

Department of Religion, Youth and Community Development

Department of Public Services

Independent Public Business Corporation (IPBC)

District Development Authority

Joint District Planning and Budget Priority Committee

National Economic and Fiscal Commission

Office of Urbanization

Department of Provincial and Local Level Government

Port Moresby (City)

Governor

Asian Development Bank

Counterpart

USD66.7m

USD16.3m

Port Moresby Grid Development Project (USD83.0m)

National Capital District Commission

Board of Commissioners

Motu Koitabu Council

Port Moresby City Development Enterprises

City Manager

Director Finance and Administration

Director Corporate Affairs

Director Regulatory Services

Deputy City Manager Engineering

Deputy City Manager Community and Social Service

Public Schools (Based on Universal Basic Education Plan: Tuition Fee-Free Policy)

Public Hospitals

Identified Financial Partners:
ADB, AusAid, IBRD, IDA, JICA

Legend: reporting line of subordinate entities; coordination among national, local or state entities; financing flow; non-government funders (Primarily Debt)

Institutional Structure for Delivering Urban Development
Philippines

S&P Sovereign Rating
Local Currency Rating: BBB
Foreign Currency Rating: BBB
T&C Assessment: BBB+

National

President
Vice President
Dept of Finance
Dept of Education
Dept of Energy
Dept of Local and Interior Government
Dept of Public Works and Highways
Dept of Environmental and Natural Resources
NEDA Board
Dept of Transportation and Communications.
Dept of Health
Bureau of the Treasury
Bureau of Local Government Finance
PPP
National Power Corporation
Energy Regulatory Commission
Commission of Higher Education
Presidential Commission for the Urban Poor
National Solid Waste Management Commission
Land Registration Authority
Land Transportation Office
Philippine Ports Authority
Land Transportation Franchising and Regulatory Board
Mactan-Cebu International Airport Passenger Terminal Building
PHP 17.52 Billion | USD 0.38933 Billion

Cebu (Province)

Governor
Office of the Provincial Treasurer
Office of the Provincial Assessor
Prov. Environment & Natural Resources
Prov. Social Welfare & Devt. Office
Office of the Provincial Engineer
Cebu Provincial Health Office
GMR Infrastructure and Megawide Consortium

Cebu (City)

Office of the Mayor
Public Schools
Office of the City Administrator
City Budget Office
Office of the City Treassurer
Department of Engineering and Public Works
Cebu Bus Rapid Transit
General Hospitals
Local Electric Cooperatives
Local Water Districts

Identified Financial Partners

WorLd BanK, USAID, DANIDA, FINNID, JICA, ADB, AFD, AusAID

Legend: Reporting lines of subordinate entities; Coordination among national, local or state counter part; Financing Flow; Primarily Debt

Institutional Structure for Delivering Urban Development
Russia- Oblast, Moscow

S&P's Sovereign Rating
Local Currency Rating BBB-
Foreign Currency Rating BB+
T&C Assessment BB+

National

Prime Minister

President

Ministry Of Finance

Ministry of Industry and Trade

Ministry of the Economic Development

Ministry of Education and Science

Ministry of the Interior

Ministry of Natural Resources and Environment

Ministry of Construction, Housing and Utilities

Ministry of Energy

Ministry of Transport

Ministry of Healthcare

Ministry of Culture

Federal Service for Fiscal and Budgetary Supervision

PPP centre

Federal Treasury

Federal Service for Hydrometeorology and Environmental Monitoring

Federal Agency for Water Resources

Federal Service for Supervision of Natural Resources

Department of zoning and planning areas

Department of urban planning and architecture

Federal Agency for Rail Transport

Federal Road Agency

Federal Air Transport Agency

Oblast (Province)

Federal Agency for the Development of State Border Infrastructure

Governor

General Secretary

First Secretary

Moscow Sheremetyevo Airport Terminal 2
($220m USD)

$110m USD

$110m USD

Sberbank

HSH Nordbank

Pubic Schools

Public Hospitals and Health Care

Moscow (City)

MAYOR

Main Oversight Directorate

Department of Finance

DEPUTY MAYOR FOR HOUSING, UTILITIES AND AMENITIES

Department of Housing, Utilities and Amenities

Moscovodkanal
Russia's largest water company provides drinking water and sewerage for more than 13 million people in the city and surrounding area

DEPUTY MAYOR, CHIEF OF STAFF TO THE MOSCOW MAYOR AND MOSCOW GOVERNMENT

Administrative Department of the Mayor and Moscow Government

DEPUTY MAYOR OF MOSCOW IN THE MOSCOW GOVERNMENT AND HEAD OF THE DEPARTMENT OF TRANSPORT AND ROAD INFRASTRUCTURE DEVELOPMENT

Department of Transport and Road Infrastructure Development

Moscow metro
a rapid transit system

DEPUTY MAYOR FOR URBAN DEVELOPMENT AND CONSTRUCTION

Department of Urban Development

Department of Construction

DEPUTY MAYOR FOR ECONOMIC POLICY AND PROPERTY AND LAND RELATIONS

Identified Financial Partners

WorldBank, USAID, DANIDA, FINNIDA,GHDK(Australia), JICA, NORAD

Legend: Reporting lines of subordinate entities; Coordination among national, local or state counter part; Financing Flow; Primarily Debt

Institutional Structure for Delivering Urban Development
Singapore

S&P Sovereign Rating
Local Currency Rating: AAA
Foreign Currency Rating: AAA
T&C Assessment: AAA

National

President

Prime Minister

Ministry of Finance

Ministry of Education

School Planning and Placement Division

Finance Division

Ministry of National Development

Planning and Research Unit

Building and Construction Authority

National Parks Board

Infrastructure Division

Urban Redevelopment Authroity

Community Improvement Project Committee

Community Improvement Projects Executive Committee

Housing Development Board

Ministry of the Environment and Water Resources

Strategic Policy Division

Planning Division

Strategic Planning Division

Water Studies Division

Facilities and Operations Management

Public Utilities Board

Ministry of Transport

Strategic Planning Unit

Land Transport Authority

Public Transport Council

Ministry of Health

Maritime and Port Authority

Queenstown (Town)

Tanjong Pajar Group Representation Constituency

Public Schools

Public Hospitals

Sumitomo Mitsui Banking Corp

Dexia Group

HSBC

Bank of Tokyo-Mitsubishi UFJ

DZ Bank

USD46.68m

USD46.68m

USD46.68m

USD46.68m

USD46.68m

Institute of Technical Education College West PPP (USD233.40m)

Legend: reporting line of subordinate entities; coordination among national, local or state entities; financing flow; non-government funders (Primarily Debt)

Institutional Structure for Delivering Urban Development
Taiwan

S&P Sovereign Rating
Local Currency Rating: AA-
Foreign Currency Rating: AA-
T&C Assessment: AA+

National

President

Executive Yuan

Land Bank of Taiwan
Ministry of Finance
Financial Supervisory Commission
Ministry of Economic and Energy Affairs
Ministry of Education
National Development Council
Ministry of Interior
Mainland Affairs Council
Ministry of Environment and Natural Resources
Ministry of Transportation and Construction
Ministry of Culture
Ministry of Health and Welfare

USD31.62m

Bank of Taiwan
Taiwan Cooperative Bank

USD31.62m
USD36.99m

Changhua (County)

Magistrate

Department of Finance
Department of Economic Affairs
Department of Education
Department of Planning
Department of City and Tourism Development
Department of General Affairs
Department of Water Resources
Environmental Protection Bureau
Department of Land Administration
Land Office
Department of Public Works
Department of Social Affairs
Public Health Bureau

Mizuho Financial Group
Chang Hwa Commercial Bank
Hua Nan Commecial Bank
Cathay United Bank
SinoPac Financial Holdings

USD10.20m
USD17.00m
USD10.20m
USD10.60m
USD10.20m

490 MW Star Buck Power Plant Refinancing (USD139.39m)

Changhua (City)

Mayor

Finance Section
Public Utilities Section
General Affairs Section
Public Works Section
Tourism Industry Section
Social Affairs Section
Civil Affairs Section

Public Schools

Public Health Center

Legend: reporting line of subordinate entities; coordination among national, local or state entities; financing flow; non-government funders (Primarily Debt)

Institutional Structure for Delivering Urban Development
Thailand

S&P Sovereign Rating
Local Currency Rating: A-
Foreign Currency Rating: BBB+
T&C Assessment: A

National

Prime Minister

Bureau of the Budget

Office of National Economic and Social Development Board

Office of the Board of Investment

Office of the Public Sector Development Commission

Ministry of Finance

Ministry of Education

Ministry of Interior

Ministry of Energy

Ministry of Natural Resources and Environment

Ministry of Transport and Communication

Ministry of Social Development and Human Security

Ministry of Public Health

Department of Highways

Expressway and Rapid Transit Authority

State Railways of Thailand

Bangkok Metropolitan Area (Province/City)

Governor

Permanent Secretary of Bangkok Metropolitan Administration

Bangkok Metroplitan Council

Committee for Economics, Finance and Budget Utilization

Committee for Education and Culture

Committee for the Affairs of the Bangkok Metropolitan Council

Committee of the Cleanliness and Environment

Committee for the Public Works and Utilities

Committee for Traffic, Transport and Drainage

Committee for Tourism and Sports

Committee for Health

Committee for Community Development and Social Welfare

Finance Department

Budget Department

Strategy and Evaluation Department

Education Department

City Planning Department

Environment Department

Traffic and Transportation Department

Public Works Department

Drainage and Sewerage Department

Fire and Rescue Department

Culture, Sports and Tourism Department

Social Development Department

Health Department

Medical Service Department

Public Schools

Public Hospitals

Identified Financial Partners:
ADB, World Bank, Overseas Economic Cooperation Fund (Japan)

Tanayong Public Co Ltd

AIG Infrastructure Fund

Ital-Thai Development

KfW

IFC

Other Private Investors and Lending Institutions

Bangkok Transit System Corporation

USD79.7m

Bangkok SkyTrain (USD79.7 million)

Legend: reporting line of subordinate entities; coordination among national, local or state entities; financing flow; non-government funders (Primarily Debt)

Institutional Structure for Delivering Urban Development
USA- california,san francisco

S&P's Sovereign Rating
Local Currency Rating AA+
Foreign Currency Rating AA+
T&C Assessment AAA

National

PRESIDENT
VICE PRESIDENT
Office of Management and Budget
Council Of Economic Advisers
Department of the Treasury
Department of Commerce
Department of Education
Department of Housing and Urban Development
Environmental Protection Agency (EPA)
Department of the Interior (DOI)
Department of Energy
Department of Transportation
Department of Homeland Security
Department of Health and Human Services
Management
Economic Development Administration
Federal Housing Administration
Federal Housing Finance Agency
Office of Administration and Resources Management
Office of Water
Office of Solid Waste and Emergency Response
Bureau of Land Management
Operations Coordination & Planning
Office of Infrastructure Protection
Federal Emergency Management Agency
Federal Highway Administration
Maritime Administration
National Highway Traffic Safety Administration

California (State)

Governor
Office of Planning and Research
Secretary of Environmental Protection Agency
Secretary of Business, Transportation and Housing Agency
Department of Finance
Secretary of Natural Resources Agency
California Integrated Waste Management Board
State Water Resources Control Board
California Department of Housing and Community Development
California Housing Finance Agency
California Department of Transport
Department of Water Resources
California Energy Commission
240MW Crockett Cogen Power Plant $320.00m USD
$320.00m USD
BNP Paribas

San Francisco (City & County)

Board Of Supervisors
Mayor
City Administrator
Planning
General Services Agency
Public Works
San Francisco Public Utilities Commission
Providing our customers with high quality, efficient and reliable water, power and sewer services
San Francisco water Power sewer Company
Redevelopment Agency
Port Commission
Airport Commission
Municipal Transportation Agency
BART (Bay Area Rapid Transit) Provides regional transit service
Office of Education
Office of Housing and Community Development

US Tax-exempt Bond Market

San Francisco Bay Area Transit Financing Authority
Issued:$465 M
$65m 8yrs
Bond of 2007
S&P Rating:(A)
FA:Orrick, Herrington and Sutcliffe LLP

San Francisco City & County Redevelopment Financing Authority
Issued:$2 B
$48m 13yrs
Bond of 2024
S&P Rating:(AA+/A+)
FA:BMcB

San Francisco Community College District
Issued:$693 M
$31m 13yrs
Bond of 2024
S&P Rating:(AA+/A+)
FA:DS&C

San Francisco Unified School District
Issued:$2.7 B
$72m 20yrs
Bond of 2030
S&P Rating:(AA-)
FA:DS&C

San Francisco City & County Housing Authority
Issued:$136 M
$40m 45yrs
Bond of 2049
S&P Rating:(AA/A-1+)
FA:CSG Advisors

Issued:$2.9 B
$348m 30yrs
Bond of 2028
S&P Rating:(AA-/AAA)
FA:Matheson Financial

Issued:$133 M
$20m 30yrs
Bond of 2044
S&P Rating:(AAA/A-)
FA:BMcB

Issued:$2 B
$48m 13yrs
Bond of 2024
S&P Rating:(AA+/A+)
FA:BMcB

Issued:$135 B
$80m 30yrs
Bond of 2025
S&P Rating:(AAA)
FA:BMcB

Issued:$7.9 B
$332m 29yrs
Bond of 2042
S&P Rating:(AA-)
FA:PRA Group

Legend: Reporting lines of subordinate entities; Coordination among national, local or state counter part; Financing Flow; Primarily Debt; **FA:** Financial Advisors

Institutional Structure for Delivering Urban Development
Vietnam - Quảng Nam, Danang

S&P's Sovereign Rating
Local Currency Rating BB-
Foreign Currency Rating BB-
T&C Assessment BB-

National

Prime Minister

Vietnam Academy of Social Science

11th Central Committee of the CPV

General Secretary

Politburo

Ministry of Finance`

Ministry of Industry and Trade

Ministry of Education and Training

Ministry of Home Affairs

Ministry of Planning and Investment

Ministry of Natural Resource and Environment

Ministry of Transport

Ministry of Construction

Ministry of Culture, Sports and Tourism

Ministry of Health

Ministry of Labor, Invalids and Social Affairs

Quang Nam (Province)

Vietnam School Readiness Promotion $76.53M USD

$76.53M USD

World Bank

PPP Task Force

People's Council

Provincial People's Committee

City People's Committee (administrative)

Centre of Water Resource Planning and Investigation

Vietnam Green Bldg. Council

DISABILITY PROGRAM

USAID

National Institute For Urban Planning

Urban Development Agency

Centre for Research and Planning on Urban and Rural Environment

Institute for Social Development Studies

DA NANG'S TRANSPORT PLANNING AND MANAGEMENT

Singapore Cooperation Enterprise

World Bank

Directorate for Roads of Vietnam

Danang (City)

Department Of Finance

Energy Department

Department of Local Government

Department of Planning and Finance

Management Authority for Southern Area Development

Official Representative of MINRE

Official Representative of ministry of Construction

Department of Internal Cooperation

Department of Construction Management

Department of Organization and Personnel

Department of Planning and Finance

Institute of Strategy and Policy on Natural Resources and Environment

Department of Natural Resource and Environment

Urban Environment Company (URENCO)

Department of Water Resource Management

General Department of Marine Island

General Department of Environment

General Department of Land Management

Da Nang Drainage and Waste Water Management Company

Danang water supply Company

Identified Financial Partners

WorldBanK, USAID, DANIDA, FINNIDA,GHDK(Australia), JICA, NORAD, ADB, AFD

Legend: Reporting lines of subordinate entities; Coordination among national, local or state counter part; Financing Flow; Primarily Debt

GLOBAL LOGISTICS CITIES –
AN INDICATOR BASED STRATEGIC FRAMEWORK

Work-stream 1: Policy and Planning for Sustainable Urban Development

Key theme: Sustainable economic development of cities

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1. EXECUTIVE SUMMARY

There are two key purposes to urban infrastructure, which are: providing services such as utilities and transport systems to users; and establishing facilities such as hospitals, schools, offices and shops. Transportation and logistics are key elements to enabling the infrastructure. Cities in developed countries of Asia Pacific are under extreme pressure from ageing infrastructure, whilst at the same time, insufficient funding to build new urban infrastructure limits economic development of cities in least-developed and developing economies.

As such, the key objective of this project is to develop an indicator-based assessment framework for evaluating the strategic positioning of global logistics cities in terms of their transportation and logistics infrastructure capacity and service responsiveness. Furthermore, this project aims to develop a set of policy actions at a sub-national level in managing the varied and complex challenges in enhancing connectivity of cities in the Asia Pacific region to global trade hubs and commodity chains. The establishment of a Strategic Policy Framework, which will be guided by indicator based assessment approach using transportation and logistics urban infrastructure indicators, will achieve this.

A multi-stage indicator-based assessment method is adopted to assess the transport and logistics infrastructure capacity and service responsiveness for global logistics cities. The cities included in this analysis are: Dhaka, Manila, Bangkok, Bangalore, Melbourne, Hong Kong, Shanghai, Seoul, Mexico City, Jakarta, Ho Chi Minh City and Phnom Penh.

Cities were mapped on a two-dimensional space to portray the positioning of cities across four different quadrants. This assisted in generating four key strategic directions, as well as accompanying key policy actions via seven guiding principles.

Key findings from this study highlight the strength of ports in Melbourne, Hong Kong and Shanghai. Cities in the second tier, Seoul, Bangkok and Jakarta, need to maintain their current strengths whilst improving their logistics responsiveness. Third tier cities, Manila, Bangalore, and Mexico City, need further investment in both logistics responsiveness and infrastructure robustness. Fourth tier cities, Dhaka, Phnom Penh and Ho Chi Minh City, can further enhance their strategic location through significant investment in infrastructure and traffic maintenance strategies to improve their overall logistics responsiveness and logistics robustness.

1. INTRODUCTION

Cities are hubs or spatial accumulation of human activities and the built environment. Cities are also the physical infrastructure and bundling of services needed for the functioning of a community, such as transportation and communication systems, water and power lines, and public institutions including schools, post offices, and hospitals. The urban forms and structures are dynamic, volatile, and in a constant state of flux shaped by economic, social and cultural processes.

The urban infrastructure in cities serves two key purposes: first is to provide services such as utilities and transport systems to users, which involves distribution costs; and second is to establish facilities such as hospitals, schools, offices, shops, museums or theatres, which have costs to users to access those services. Transportation and logistics are the key services infrastructure that serves both as products that customers consume as well as an 'enabler' for production and consumption of other services.

Cities in developed countries of Asia Pacific are under extreme pressure from ageing infrastructure; whilst in contrast insufficient funding to build new urban infrastructure continues to thwart economic development of cities in the least-developed and developing economies. The funding required to finance global infrastructure, as estimated by McKinsey Global Institute (2013), is approximately US$57 trillion between 2013 and 2030 (Dobbs et al., 2013). Most of this investment is envisaged to be allocated in large cities, which are growing at an unprecedented rate.

The significance of building resilient urban infrastructure in cities of Asia Pacific is increasing as our dependence on international trade grows as a consequence of globalisation. As freight movements in the sub-regions of Asia Pacific increase as a result of increased demand for global products, the transport and logistics infrastructure will grow as high throughput hubs and clusters of high economic vibrancy, in terms of both the volume of activity, the scope of work, and the capabilities required (Chhetri et al., 2014).

With the gradual shifting of manufacturing from more advanced countries to Asia, the connectedness of cities with global production networks through a means of high-capacity logistics and transport infrastructure is a significant competitive advantage to ensure the success of city economies. Connectivity of cities to global trade hubs and transport corridors is thus paramount to reaching out to new markets and harnessing the potential of lucrative value-adding components of global supply chains.

The exponential growth of e-commerce and the rising volume of on-line shopping requires agile and just-in-time logistics infrastructure to support the timely delivery of goods and services within restricted time-windows. As the built environment of cities continues to get more compact with roads getting narrower, more congested, and shared between different users, the last mile delivery bottlenecks will continue to remain a major challenge for cities to remain competitive globally.

The economic liberalisation, deregulation and strategic reforms in the mid-1990s helped economies in Asia Pacific to enhance logistics efficiency of the key urban infrastructure to support seamless flow of goods and services in global markets. Public-private partnerships, in collaboration with lending organisations like the World Bank (WB) and the Asian Development Bank, have funded the key mega-projects in road, rail and port infrastructure (UNCTAD 2003; Tongzon and Heng 2005) to help enhance logistics chain efficiency, linking seaports with the hinterland that they serve (Limão and Venables 2001).

The key challenge however is the deterioration of existing transport and logistics urban infrastructure and its capacity constraint to accommodate future growth, which will be thwarting the sustainable development in cities in the Asia Pacific region. Inadequate logistics infrastructure also means that the cost of production and distribution remains prohibitive, resulting in low levels of trade and lack of competitiveness in the international market (Gekara et al, 2014). An analysis based on empirical data on transport and logistics infrastructure is now called upon to assess the current capacity and service responsiveness of the key cities in the Asia Pacific region to ascertain their global competitiveness and strategic positioning in the global market.

Project Objective

The key objective of this project is to develop an indicator-based assessment framework for evaluating the strategic positioning of global logistics cities in terms of their transportation and logistics infrastructure capacity and service responsiveness.

It aims to develop a set of policy actions at a sub-national level in managing the varied and complex challenges in enhancing connectivity of cities in the Asia Pacific region to global trade hubs and commodity chains.

This will be achieved by the establishment of a Strategic Policy Framework, which will be guided by an indicator based assessment approach using transportation and logistics urban infrastructure indicators.

This is achieved by answering the following four subsidiary research questions:

1. What are global logistics cities?

2. What are the key urban infrastructure indicators that define and characterise the global logistics cities?

3. How do we evaluate the relative strategic positioning of global logistics cities using transport and logistics infrastructure robustness and service responsiveness to global markets?

4. What strategies and action plans could be developed to improve the performance of cities to improve connectivity with global trading hubs and transport corridors?

1.2 Study Scope

This project is focussed on the assessment of transport and logistics urban infrastructure, which support the seamless movement of people, goods and services crucial to a city's ability to compete in the integration of global production networks. The scope of this project is therefore to identify the key strategies and potent areas, which if acted on would lead to improvements in transportation and logistics infrastructure efficiency and service responsiveness in cities in the Asia Pacific Region.

The analysis will point out the competitive and strategic positioning of cities and the pathways to transform aspiring city-regions into global trade hubs with high-performing transport and logistics infrastructure. The analysis and mapping of

competitiveness will enable cities to gather evidence to support investment in high performing infrastructure; identify infrastructure-related bottlenecks, develop new logistics capabilities; and allow greater access to global markets.

This work answers the fundamental research question of how to develop an indicator based assessment framework to form the basis of action plans to tackle the challenges in managing global logistics cities in the Asia Pacific region. However, to generate a framework which is of practical value to governments to generate planning actions, it is important to focus on a particular industry. Thus, an industry specific focus provides a strategic platform through which a policy framework will be developed to guide key action plans.

2. GLOBAL LOGISTICS CITIES – INFRASTRUCTURE CAPACITY AND SERVICE RESPONSIVENESS

2.1 What is a Global Logistics City?

Cities are conduits of transportation and communication that link the city economy to global markets. A rapid reduction in spatial and temporal distances between producers and the markets they serve have also increased dependence on increasingly sophisticated high-throughput global logistics hubs and networks (Sheffi, 2012). These global logistics clusters, or hubs as they are more commonly termed (Spengpeihl, 2011), are the nodes that tie together the complex web of international trade routes or domestic supply chain networks (Sheffi, 2012).

Global logistics clusters are built upon land-intensive, multimodal distribution hubs at the fringe of large metropolitan areas and are similar to what Christopherson and Belzer (2009) called “pass-through freight shipping”. These logistics clusters are also empowered to control and regulate the distribution of freight and thus they act as gateways to and from a region/country, shaping the way freight logistics operations are performed, as is the case in the established hubs of Rotterdam and Singapore.

Simmons and Hack (2000) conceptualise the notion of a global logistics city as a system of multi-lane roads, seaports and airports, all integrated as a spatial system. Lang and Dhavale (2005) noted the development of large city regions shaped by interstate highway systems, similar to what McCray (1998) refers as “rivers of trade” created by trucks plying the roads between the US to Mexico. Knapp and Schmidt (2003:16) have also identified the impact of new “spatial forms and functional specializations forming in line with infrastructural networks” on urban forms in European cities. Rodrigue and Nottebaum’s (2008:13) presented the notion of an “extended gateway” to represent the freight complex created within 100-150 km around the port of Antwerp, which further extend over 100 kilometres around Rotterdam. Mortimer (2008) identified similar clustering of freight and logistics activities between US west coast port traffic and the demand for warehouse space in west coast metropolitan areas, especially the link between the ports of Los Angeles-Long Beach and the Inland Empire. O’Connor (2010) developed a global logistics index for the key city regions in the world using freight data.

Hesse (2008) found empirical evidence to support the notion of the city as a terminal as opposed to a market place. The process of port regionalisation, in the case of

ports or as “logistics localization”, represents an agglomeration of logistics functions such as storage, consolidation and high throughput distribution nodes and is a part of the reconfiguration of urban land use. In some regions, economic activities concentrated at transport terminals such as seaports or airports create logistics hubs where there is a large spatial accumulation of logistics-related value-adding activities. The “district parks” of the likes of Rotterdam and Antwerp evidence this with numerous distribution centres located at the ports to break bulk shipments from the east and sort them for distribution to different markets within Europe (Spengpeihl, 2011).

Similar concentration of logistics and freight activities can be seen in Asian cities, where port-dominated cities begin to cooperate instead of competing with each other Song (2002). Regional ‘co-petition’ is now evident in the case of Shanghai and Ningo (Wang and Olivier (2007a), Hong Kong and Shenzen (Wang and Oliver 2007b), Singapore and Tanjung Pelapas (Tongzon (2007) and Busan and Gwangyang (Yeo and Cho 2007).

2.2 Global Logistics Cities as an Urban Development Strategy

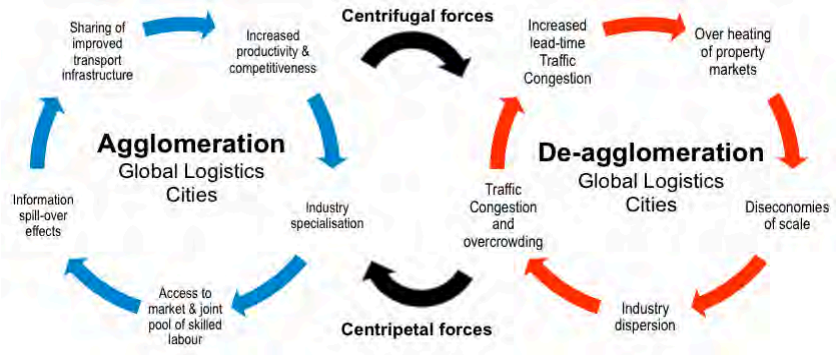
Global logistics hubs contribute significantly to a regional and national economy as well as to help achieve the economies of scale and scope afforded to global supply chains through agglomeration by encouraging firms to co-locate within clusters. The ‘International connectivity’ is one of the ten traits of global fluent metro areas, which represent the efficient connectivity of “people and goods to international markets through well-designed, modern infrastructure” (Moir et al, 2014: 4). The greater accessibility to economic hinterlands and more efficient connectivity to the key logistics hubs and transport corridors provide a competitive advantage for cities (Limão and Venables 2001). The clustering of logistics infrastructure in cities is critical to economic development as it generates additional economic activities through multiplier effects. It also enables more efficient use of underutilised resources, expands markets through more effective and efficient competition and increases the opportunity to enhance productivity or reduce costs.

Among others, a common characteristic of logistics clusters is the localisation of firms that compete and collaborate to achieve efficiency. In that sense, clusters are similar to networks. However, the difference is that networks represent “organisational proximity;” whilst clusters denote geographical proximity (Chhetri et al., 2014). A cluster is attached to space and often directed and planned; whereas a network creates relationships through understanding, collaboration and mutual trust.

Figure 1 shows the clustering and dispersion of transport and logistics activities and the circularity effects on city economies. The benefits emanating from information spillover, a joint pool of skilled labour, lower cost search and matching processes in labour and service/product markets, local intra-industry specialization, and availability of local specialised services (Gordon & McCann, 2000; Simmie, 2005; Chhetri et al., 2013). LeVeen (1998) and Doeringer and Terkla (1996) explain clustering as an outcome of the presence of positive externalities at a particular locality. Agglomeration economies provide two sources of efficiency gains. First is the great diversity of products, which are only exchanged inside the agglomeration and second is the incentive for firms to co-locate and to form an agglomeration to reduce forward and backward transactions and transportation costs due to proximity

effect (Florax and Plane, 2004). Hence, regionally agglomerated inter-firm networks can create distinct competitive advantage for the clustered firms and the regions in which they are located (Sheffi, 2012).

Figure 1: Circularity effects of agglomeration and de-agglomeration economies



External scale occurs outside a firm within an industry by increasing the scope of operation to benefit from factors such as better transportation services and reduced costs. Urbanisation externalities explain the benefits of spatial agglomeration of diverse firms often in a large urban setting to reap the advantages of inter-industry knowledge spillovers. In contrast, when firms operating in a same value chain segregate, they gain endogenous benefits from specialisation through localisation externalities.

Some studies (Innovation, 1999; Verbeek, 1999) relate clusters to the value-adding production chain concept created to achieve horizontal integration through augmented customer and firm linkages; whilst others such as Rosenfeld (1997) and Jacobs and DeMan (1996), contextualise clusters to reflect interdependencies among industries/firms for performance gain through co-location, alliance formation and shared input.

Furthermore, there is a growing view that enhanced inland connectivity, which is capable of providing landlocked countries with effective access to ports, requires the adoption of a holistic trans-border management approach (Ntamutumba 2010). Thus far, a corridor management approach has been embraced for the development, regulation and management of trade and transportation channels between key regional gateway ports and their hinterlands (Gekara et al 2014).

It is a strategy that is meant to facilitate greater harmonisation of regional transportation policies, coordinate cross-border investment in infrastructure and keep open channels for landlocked countries (AfDB 2010; Ntamutumba 2010). However, the effectiveness of this approach in encouraging inter-government collaboration, improving port-hinterland connectivity and facilitating a seamless flow of freight along the transportation channels is yet to be examined and evaluated (Gekara et al 2014).

2.3 Key Challenges for Global Logistics Cities in the Asia Pacific region

The popular argument in more developed cities favours more efficient use of existing infrastructure through urban consolidation and service centralisation rather than increased investment in new roads, rail and port infrastructure. In contrast, cities in

developing or emerging economies are increasingly adopting infrastructure-led regional economic development as a dominating planning paradigm to attract industry, employment and foreign investment.

Inadequate overland transport infrastructure, congested logistics networks, less sophisticated intermodal facilities and prohibitive transportation costs are identified as the major constraints that continue to undermine the effectiveness of the port as a key gateway to the region's international trade. Other constraining contextual factors are identified, including roadblocks, inefficient customs clearance procedures at inland frontiers and the poor state of security in the region (Gekara et al 2014).

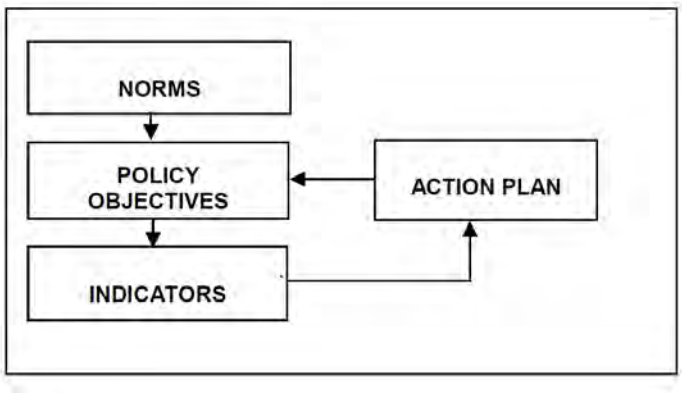
3. INDICATOR BASED ASSESSMENT FRAMEWORK

In this project, an indicator based assessment framework is adopted. This framework assesses useful information of urban conditions and trends, identifies areas of service delivery improvements and deploys a more targeted approach and strategy to improve logistics connectedness of cities. There are a number of initiatives that are currently underway that aim to create an indicator-related database of urban infrastructure, including the United Nations Centre for Human Settlements (UNCHS) and the World Bank's Urban Observatory; the Asian Development Bank and Agenda 21.

Indicators are the interface between policy and data. Indicators represent "elements of cause and effect, of social norms that constitute progress, and of policy actions and outcomes" (Newton, 2001: 3). Indicators are usually single numbers, mostly ratios, such as the unemployment rate or the economic growth rate, which permit comparisons over time and space and have normative and policy implications. They can be categorised as performance based, issue-based and needs based indicators.

A sectoral approach to urban infrastructure analysis is adopted with the aim of assessing the transport and logistics capacity and service responsiveness from a policy perspective. Figure 2 represents the methodology diagrammatically.

Figure 2: Indicator-based assessment methodology



An indicator based assessment methodology has been adopted using the UBCHS/World Bank Urban Indicator System (UNCHS 1994-96). The concept of norms is utilised in this study as a way of identifying commonly agreed upon expectations as part of global logistics cities through the use of policy. Heide and

John (1992: 34) define norms as “expectations about behaviour that are at least partially shared by a group of decision makers”. The concept of norms has received enormous importance as an alternative or supplementing governance mechanisms versus a legal and more formal control (Dahlstrom, McNeilly, and Speh, 1996; Dyer and Singh, 1998; Heide, 1994; Macauly, 1963).

In this study, we adopt the following norms as a baseline for developing policy and strategies. The underlying norms are established which assume that “high capacity and high efficiency of transport and logistics urban infrastructure improve productivity and trade” and “the development of high-volume trade gateways and logistics hubs is a preferred strategy to enhance trade efficiency”.

These norms are used to set out key objectives and indicators which assess the quality of urban infrastructure to support sustainable cities. Key concerns for each case study city were evaluated and prioritised through a comprehensive literature review and other media commentaries. The purpose is to develop a set of action plans to operationalize the strategy to help achieving key objectives and set out targets for improvement.

3.1 Transport and Logistics Infrastructure Robustness

Capacity constraints surrounding logistics ports have become particularly acute in many of Asia Pacific’s largest cities due to urban congestion, population growth and significant growth around global freight trade and movements. As such, it is critical that there is sufficient capacity to handle the current and growing freight task, however there are a number of challenges that need to be considered, including:

- Road Infrastructure Capacity
- Rail Infrastructure Capacity
- Port Infrastructure Capacity
- Airport Infrastructure Capacity

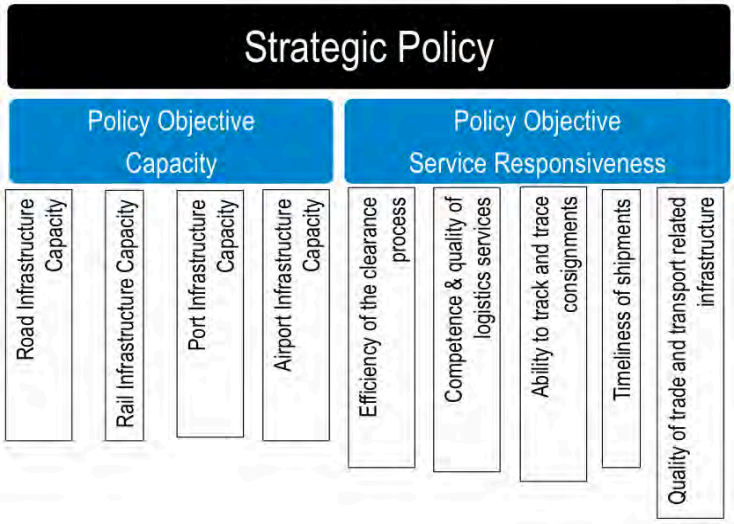
3.2 Logistics Service Responsiveness

Service responsiveness is typically concerned with the coordination of non-material activities necessary for the fulfilment of the service in a cost and customer service effective manner such as order processing, information systems, customer service and procurement (Ali et al, 2008). Global logistics cities require a logistics infrastructure and an integrated set of services that can adapt to the pressures of a changing environment. In a global logistics and infrastructure context, the following items are used as a measure of service responsiveness:

- Efficiency of the clearance process
- Competence and quality of logistics services
- Ability to track and trace consignments
- Timeliness of shipments
- Quality of trade and transport related infrastructure

This study aims to develop an indicator-based assessment framework for evaluating the strategic positioning of global logistics cities in terms of their transportation and logistics infrastructure capacity and service responsiveness. This aim is presented in Figure 3 below.

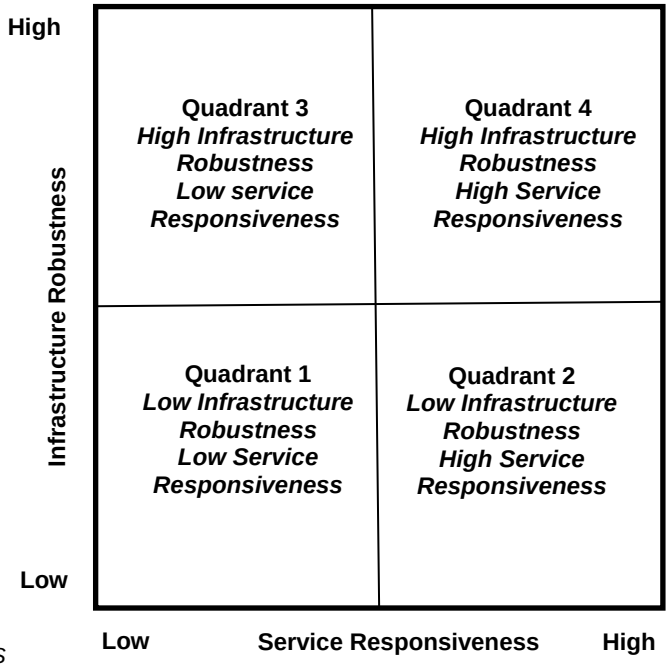
Figure 3: Overview of indicator based policy framework for this study



Through analysing the selected global logistics cities and where they are based on their current capacity and service responsiveness, a set of goals, objectives, strategies and programmes can be produced to help elevate the current position of the city.

In essence, the proposed 'Action Plan' enables us to standardise the responses for each selected city (section 1.8), based on the indicators (Figure 3) and map it onto the quadrant diagram below. We are then able to develop strategies to aid the different cities to further improve themselves against their infrastructure capacity and their service responsiveness.

Figure 4: Quadrant diagram used to rate each global logistics city



4. METHODOLOGY

4.1 Selection of Cities

Ten key cities are selected to account for levels of economic development, specialisation in transport and logistics functions and the size of the population. To this end, a systematic approach to city selection was adopted to ensure that a range of cities across the Asia Pacific Region and a diversity of geographic conditions were represented. The cities included in this analysis are: Dhaka, Manila, Bangkok, Bangalore, Melbourne, Hong Kong, Shanghai, Seoul, Mexico City, Jakarta, Ho Chi Minh City and Phnom Penh.

4.2 Identification of indicators

City connectedness to global markets is measured using a range of indicators, which represent the infrastructure capacity and logistics service responsiveness. The capacity based indicators represent the transportation and logistics infrastructure. These are broadly divided into four key components: road, rail, sea and air transport. As listed in Table 1, there are 20 indicators including road density, rail network length, good transported, carrier departed, freight volume, access to container port, connectivity of port and airport, logistics efficiency. Most of these are accessible at the country level and will be used to support the narratives of these case studies.

Table 1: Transport and logistics urban infrastructure capacity indicators

	Transport and Logistics Urban Infrastructure Capacity Indicators
Road Transport	Roads, Total Network (thousand kms)
	Road Density (kilometres of road per thousand square km of land area)
	Paved Roads (% of total roads)
	Number of registered heavy trucks
	Estimated road traffic deaths (per 100,00 pop)
Rail Transport	Rail network (length per land area)
	Passenger carried (million passenger-km)
	Goods transported (million ton-km)
	Carrier departure world-wide (number of take offs)
	Passenger carried (thousands)
	Rail Lines (total km)
Port Transport	Number of ports
	Network distance to the nearest container port
	Container Port Traffic (TEU)
	Average length of vessel waiting time
Air Transport	Number of international airports
	Network distance to the nearest international airport

	Total number of international flights per day or year
	Average length of Flight delay
	Number of flight cancellations
	Total air freight volume per day or year
	Air freight (million ton-km)

The logistics service responsiveness is measured using the six key dimensions (LPI, the World Bank, 2010). Country-level surrogates for responsiveness are used because the city level data were either not available or accessible. The use of country level data is appropriate for two reasons. Firstly, most of the case study cities have a high degree of primacy, which could mean that the logistics responsiveness of the country is similar to the city. Secondly, logistics and transport infrastructure is largely concentrated in the capital cities, particularly the containerised freight. The logistics performance (LPI) is the weighted average of the country scores on the six key dimensions:

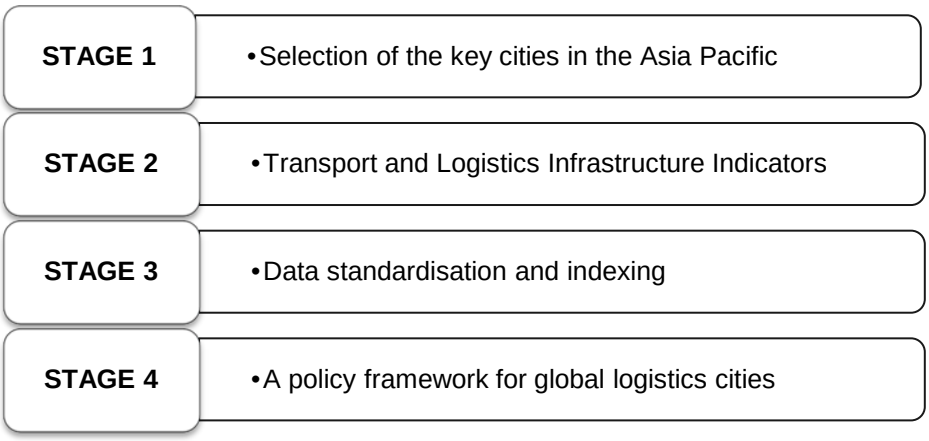
Table 2: Indicators of logistics service responsiveness

Dimensions	Logistics Service Responsiveness Indicators
Efficiency of the clearance process	speed, simplicity and predictability of formalities) by border control agencies, including customs
Quality of trade and transport related infrastructure	ports, railroads, roads, information technology
Ease of arranging competitively priced shipments	
Competence and quality of logistics services	Transport operators, customs brokers
Ability to track and trace consignments	
Timeliness of shipments	In reaching destination within the scheduled or expected delivery time

4.3 Methods

A multi-stage indicator-based assessment method is adopted to assess the transport and logistics infrastructure capacity and service responsiveness for global logistics cities. It includes the following stages. Stage 1 involves selecting the key global logistics cities in the Asia Pacific region. Stage 2 identifies the key transport and logistics infrastructure indicators in alignment with the key policies. Stage 3 standardises the data and create composite indices to reflect the capacity and service responsiveness of the transport and logistics infrastructure. Stage 4 describes the policy framework for the selected global logistics cities.

Figure 5: Multi-stage indicator-based assessment method



Data on transport and logistics infrastructure were collected from various sources, particularly from data available on the websites of port and airport authorities. The distance to the closest port or airport is computed via Google Maps, which, in the case of a port, shows the state of landlocked cities and the consequent heavy reliance on land transport. Data on logistics responsiveness is compiled from the survey-based data on logistics performance gathered and indexed by the World Bank. Logistics responsiveness data however are reported at a country level, which could be relatively less reliable for large countries such as China and India where significant disparities in service delivery exist among cities. This would be an issue of less significance for small sized countries such as Thailand, Vietnam and Mexico where the key transport and logistics infrastructure and business are concentrated in capital cities.

Data were available on different scales, which necessitated conducting standardisation of data. Using a max-min function, the data representing road, rail, port and airport are transformed on a scale of 1 to 5, where values closer to 1 represent a very low score and 5 very high. Network distance to the nearest port is inversely converted where a value of 1 indicates the longest distance (most inaccessible) and 5 shows the shortest distance (most accessible). The standardised scores of the indicators are then aggregated to compute a logistics infrastructure robustness index. The logistics responsiveness index was created using the indicators of logistics performance. Indicators were also aggregated to form a global logistics city index using a simple composite indexing technique.

5. THE DIMENSIONS OF GLOBAL LOGISTICS CITIES

Based on the analysis conducted and the classification of the different cities, each city was plotted on a quadrant matrix against the Infrastructure Robustness and the Responsiveness. This can be seen below in Figure 6.

Figure 6: Key dimensions of global logistics cities

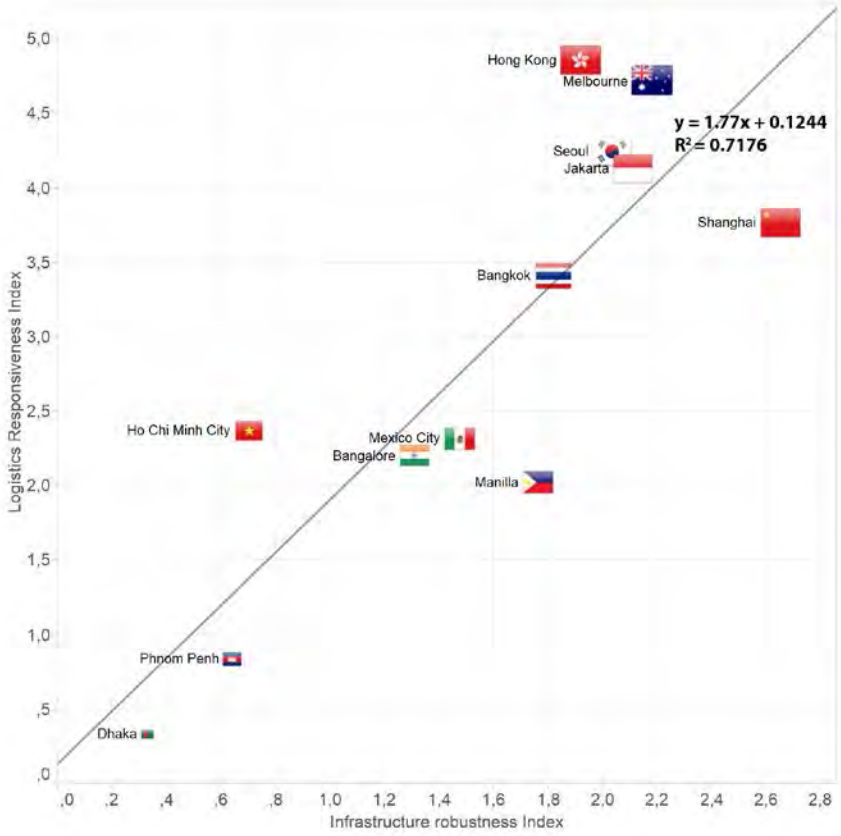


Figure 6 shows that the infrastructure robustness and responsiveness are highly correlated and interdependent. It also shows that if the cities have high infrastructure robustness, they are also more likely to be efficient and response to customer needs. Figures 7-9 indicate the different index scores for each city against the infrastructure robustness, logistics responsiveness and overall global logistics city index.

Figure 7: City-based Infrastructure Robustness Index

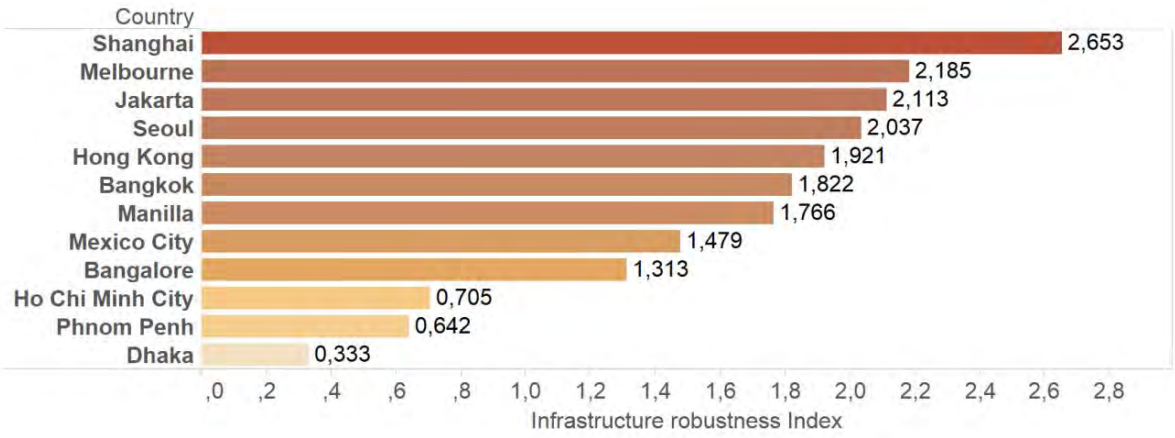


Figure 8: City-based Logistics Responsiveness Index

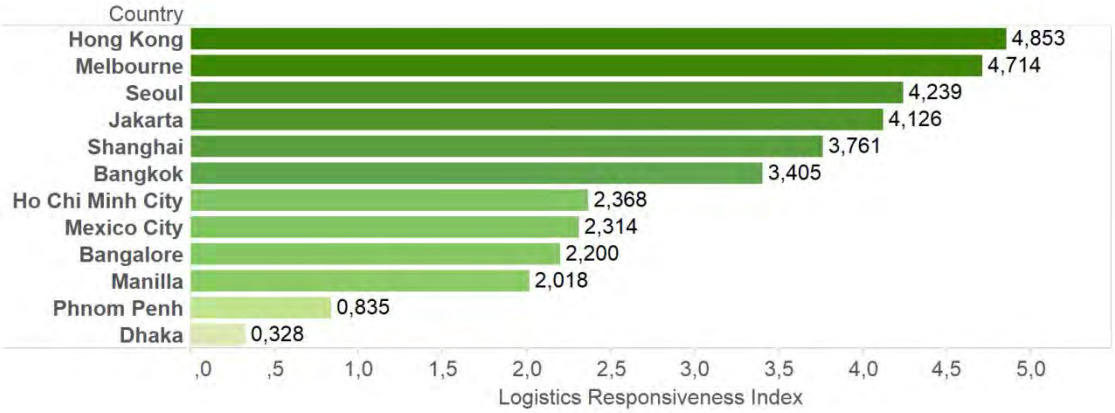
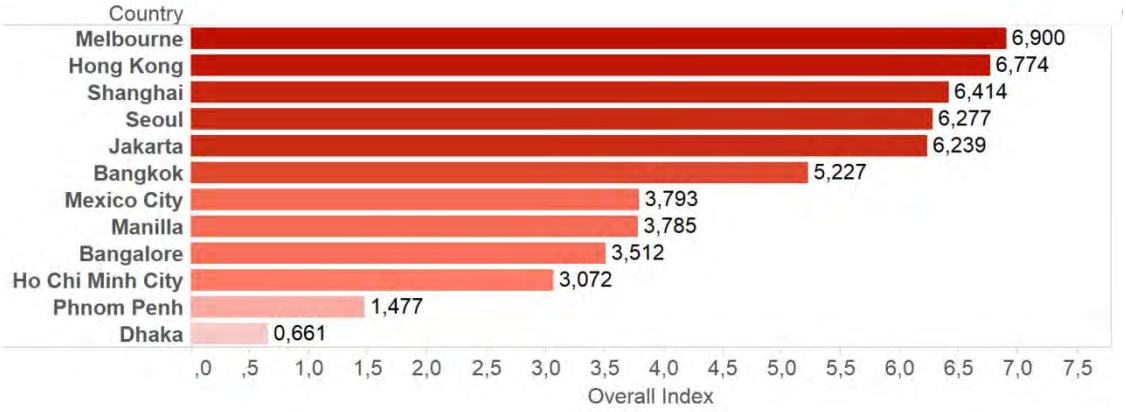


Figure 9: City-based Global Logistics Index



As mentioned previously, global logistics cities contribute significantly to the national economic development in the age of globalization by helping a country achieve economies of scale and scope in global supply chains, improve efficient connectivity to international logistics hubs, generate additional economic activities through multiplier effects, and expand markets through better utilization of resources, and increasing productivity with decreasing costs. Therefore, strategic positioning of cities in this global logistics framework plays an important role in determining whether the country in question receives the full benefits of globalization.

In the Asia Pacific region, apart from some key logistics hubs in developed countries such as Melbourne (Australia), Hong Kong, Shanghai (China), Seoul (South Korea), major cities in developing countries such as Dhaka (Bangladesh), Phnom Penh (Cambodia), Ho Chi Minh City (Vietnam), Bangalore (India), Manilla (Philippines), Mexico City (Mexico), Bangkok (Thailand), and Jakarta (Indonesia) are struggling to improve their infrastructure capacity and logistics service responsiveness to better realize their potential in terms of geopolitical location and economic prospects. This research will attempt to explain the strategic positioning of cities on a global logistics city framework using two key variables: Infrastructure Robustness Index and Logistics Responsiveness Index.

Among twelve cities in this study, Dhaka ranks at the bottom in terms of both Infrastructure Capacity and Logistics Services, according to World Bank calculation (year) (0.067 and 0.065, respectively). As being a capital city, Dhaka has not received careful planning considerations by the Government since 1971 when Bangladesh emerged as an independent country (Kalam, 2009). Like any other cities in developing countries, Dhaka faces serious problems in transportation and communication necessary to boost its economic growth and quality of life. Kalam (2009) argues that for future development, Dhaka requires an enormous quantity of land to build road, greenies, industrial and commercial parks, social and cultural facilities, etc.

Nevertheless, the land that is vacant is mainly low-lying, which makes it difficult to turn the land to urban open spaces, or industrial parks together with major roads and utilities connections. This is reflected in extremely low figures of total length of roads, rail lines, and road density, which results in an overall low number of goods and passengers carried. Secondly, the City Plan of Dhaka lacks a long-term vision to achieve multi-faceted development, especially in terms of public services (Kalam, 2009). The Logistics Services Responsiveness Index of this city is the lowest among the twelve cities in question in all aspects: customs clearance, ease of shipment, ease of tracking, logistics services and timeliness. Dhaka is located in the middle of the country with transportation links to many other cities, but obviously, it needs strategic planning to realize this geographical advantage.

Phnom Penh (Cambodia) and Ho Chi Minh City (Vietnam) have roughly the same Infrastructure robustness indices (ranging from 0.12 to 0.14) but in terms of Logistics service responsiveness indices, Ho Chi Minh City is far better than its neighbour (0.47 versus 0.16). According to the 2014 UNDP's report on "Cambodia Trade Integration Strategy 2014 – 2018", Cambodia has several connections to regional and international trade markets by domestic and international trade corridors. The main domestic corridor links Phnom Penh to the port of Sihanoukville, while the main international corridor connects Bangkok through Cambodia to Ho Chi Minh City in Vietnam. Most traffic originates in Bangkok and travels through the Poipet border post to Phnom Penh (734km) and/or between Phnom Penh and Ho Chi Minh City in Vietnam (228km.) Traffic volume is higher on the latter route and has been increasing, especially in containerized cargo. This is mainly due to shippers who prefer using Ho Chi Minh as their export gateway (UNDP, 2014).

Cambodia has an advantage of low labour cost, however, more sophisticated and integrated logistics services are necessary for Cambodia to leverage this advantage and expand the production network. Cambodia's Special Economic Zones (SEZs) are often complained about by foreign investors for high electricity and logistics costs, inadequate ports that require bulk handling capabilities and high levels of informal payment to clear cargo (UNDP, 2014). In addition, road infrastructure is not safe for truck drivers, and the railway is not connected to Thailand. Therefore, international shippers often rely on more efficient ports in Vietnam to reduce time and the cost of shipment.

Ho Chi Minh City – the largest city of Vietnam, is considered as the economic centre of the country and the region. Over the past decade, Ho Chi Minh City, Vung Tau and Binh Duong have been structured to become an economic triangle, with Ho Chi Minh City focusing on services, Vung Tau developing logistics and seaports, and

Binh Duong directing resources to industrialization and human capital development. High economic growth in recent years has led to higher income and more cars/motorcycles on the road, which results in high density residential areas and limited transportation space in the city (Phi, 2011). As being an economic centre of Vietnam, problems remain in how to improve the technical infrastructure system, especially transportation system, and connect this system with future international ports such as the Thi Vai Deep Water Seaport, and Long Thanh International Airport.

Modern India is located between the Middle East, Central Asia, China, Southeast Asia and the Indian Ocean. As such, India has leveraged this strategic location to become a central hub for transportation, communication and trade to foster economic development. As of 2011, India ranked 26th in terms of world exporters, contributing over 1.3% of globally consumed merchandise, with exports growing at a rate of 22%, and ranked 17th in terms of world importers, consuming over 2% of globally produced merchandise, with a consumption rate growing at 35% (Proffitt, 2011).

However, according to the World Bank's survey in 2010 regarding the ease of doing business, India ranked 134th out of 183 economies, mainly due to the lack of infrastructure for supporting fast paced economic growth, especially in transportation (Road and Railway), and logistics (Port, Warehousing, Distribution, Hinterland Connectivity and Domestic Consolidation hubs). Bangalore enjoys a favourable climate, quality of life, cosmopolitan ambience and social diversity. In addition, it has earned the title of the "Silicon Valley of India" or the "IT hub of Asia" (Bangalore Development Authority, 2015). However, like any other growing city, Bangalore also has critical challenges around transport, public services, logistics and overall infrastructure. The Logistics Performance Index of Bangalore was 3.08, which was slightly lower than the average (3.29) is due to inefficiency in customs clearance, infrastructure, timeliness, shipments, logistics competence, tracking and tracing (World Bank, year).

Manila (the Philippines) ranks seventh in the Infrastructure Robustness Index and tenth in the Logistics Service Responsiveness Index out of twelve countries in this study. In the Global Competitiveness Report 2013 – 2014, of 144 countries, the Philippines ranks very poor at 98th place in overall infrastructure, 116th in quality of port infrastructure and 113th in air transport infrastructure. Dr. Adoracion Navarro, Senior Research Fellow of the Philippine Institute for Development Studies (PIDS) attributes the major gaps in the country's roads, ports, airports, urban mass transit, water and energy to underinvestment in infrastructure and decreasing reliance on official development assistance (ODA), and weak public governance. A recent study by the Japan International Cooperation Agency (JICA) reported frequent congestions are due to inadequacy of mass transit (bus vehicle occupancy decreases from 46.5 to 35.5 passengers), most roads are operating at close to capacity, which leads to gridlocks and reduced travel speeds.

The city of Manila had imposed a truck ban scheme since 1978, and limiting the activities of eight wheelers and vehicles of 4,500 kg during rush hours. However, without alternative transport links to economic zones in the Cavite-Laguna-Batangas-Rizal-Quezon (CALABARZON) areas, Citigroup estimated the economic cost to be

around USD 7.25 billion (approximately 2.9% GDP). The truck ban scheme also caused implications on the cost of cargo shipping (KPMG, 2015). In September 2014, Manila temporarily lifted the truck ban in response to major losses of exporters and importers as well as congestion in the Port of Manila. For air infrastructure, according to the Deputy Director General John Andrews of the Civil Aviation Authority Thailand, airlines have been incurring losses of more than USD 158.56 million a year in fuel expense due to congestion at Ninoy Aquino International Airport.

Mexico City is the economic heart critical to North America and provides vital links in global supply chains to the US and Canadian companies. In addition, the Mexican road network covers over 350,000 kilometres, of which one seventh are federal roads. The railway network covers more than 26,000 kilometres, and is mainly used for carrying freight. The country also has 2,900 kilometres rivers and coastal channels, mostly connected via ports (PwC, 2014). Mexico's ports are ranked 75th over 142 countries by the World Economic Forum. In the past nine years, the logistics sector of the country has grown three times faster than GDP growth rates (PwC, 2013). Being located in an geographical advantageous position, together with sound government plans to improve infrastructure, Mexico seems to be the land of opportunities for both local and foreign companies.

Thailand is the second largest economy in South East Asia, only after Indonesia. However, low efficiency in logistics systems is coupled with high logistics costs in relation to GDP. In particular, logistics costs accounted for 15.2% GDP, which is broken down into transport costs (7.2%), inventory holding costs (6.7%) and administrative costs (1.2%) (Smith, 2014). Passenger transport in Thailand is dominated by personal vehicles (cars, trucks and motorcycles). Bangkok is famous for wide spread traffic congestion, which reduces the efficiency of the city's urban transport network, creates delays, excessive fuel consumption and polluting emissions (ADB, 2011).

Despite the in-land transport inefficiency, the logistics services industry in Thailand demonstrates impressive success contributing to expanding exports and imports. The World Bank's 2010 Logistics Performance Index ranked overall, logistic competitiveness in Thailand 31st out of 155 surveyed countries. The remaining problems in terms of infrastructure in Thailand are: ineffective integration and coordination of transport agencies, poor land use planning, limited effective traffic management, and infrastructure to bus systems, etc. (ADB, 2011).

Indonesia is an archipelago with more than 17,000 islands, hence it has to rely on transportation networks to link islands and regions together. In larger islands, road internal transport systems is dominated, with railway as a secondary mode, however, in smaller and underdeveloped islands, people have to rely on fragmented, and poorly maintained road networks for internal travel (ADB, 2012). Jakarta, as a major metropolitan city, faces the problem of serious traffic congestion, which is exacerbated by poor road conditions. This restricts vehicle speeds, and causes many safety problems, and limits economic growth in this key productive area. In terms of port, Tanjung Priok in Jakarta is the largest and most strategically important port, with a throughput in 2008 of 42mt, and 3.7 million TEUs (ADB, 2012).

6. MAPPING THE DIMENSIONS OF GLOBAL LOGISTICS CITIES

Figure 10 below indicates the logistics infrastructure robustness index for the selected cities. Infrastructure robustness index shows different levels of logistics infrastructure development and performance. Melbourne and Shanghai have more established and functioning infrastructure to support key transport and logistics functions. The scale of logistics operations is reflected in the current operational capacity of modal and intermodal facilities. Shanghai has a large scale port and airport infrastructure; whilst Melbourne has relatively sophisticated infrastructure relative to its size and market. The second tier includes cities such as Hong kong, Seoul, Jakarta and Bangkok. They all are large metropolitan cities with high capacity infrastructure and massive local and regional demand for global products. Hong Kong in particular has highly advanced and sophisticated infrastructure. The third tier represents New Mexico, Manilla and Bangalore; all of them represent the key emerging economies in the Asia Pacific. Manilla and Bangalore are globally known for IT and BPO industry. Bangalore however is an inland city, with access to a port 111 kilometres in the western Coast of India. It relies heavily on inland transport systems to support export and import operations. The last tier of cities includes Dhaka and Ho Chi Minh City.

Figure 10: Logistics Infrastructure Robustness Index

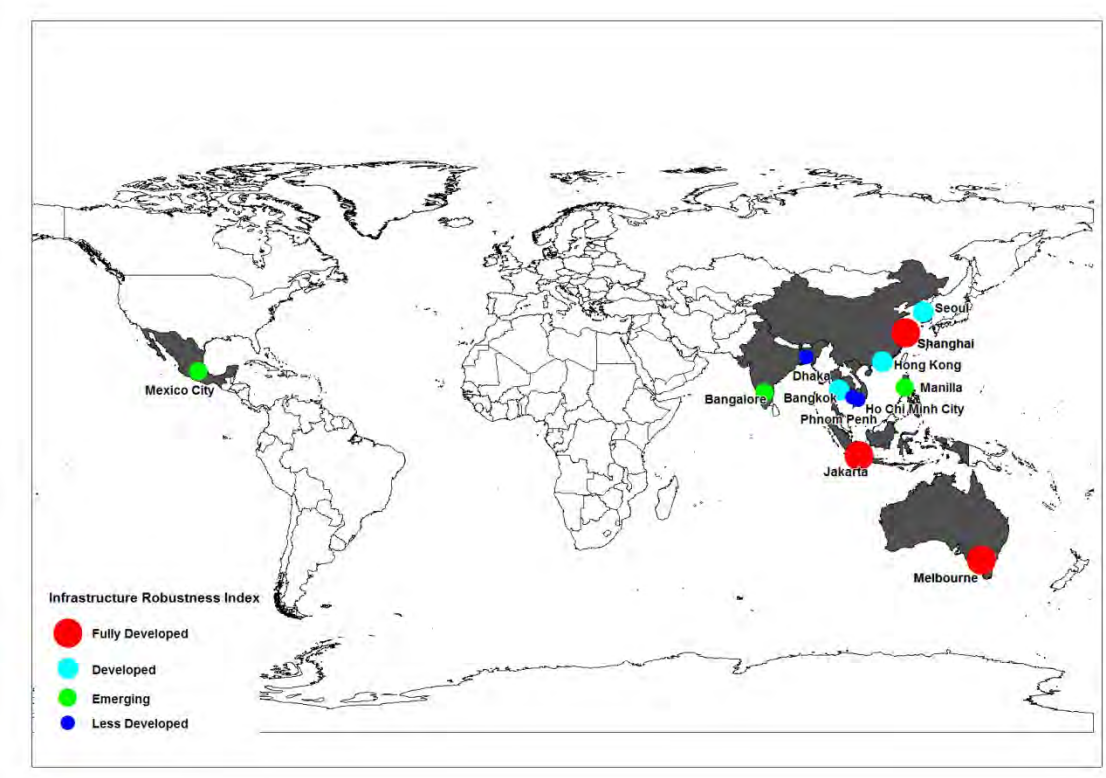
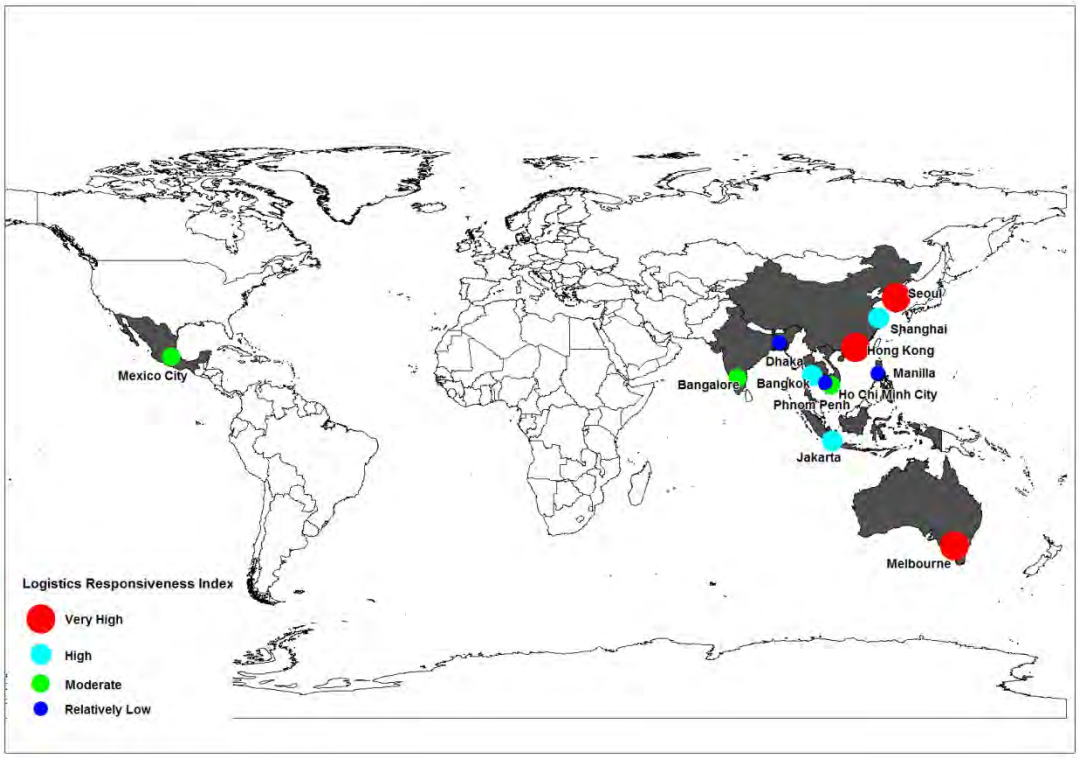


Figure 11 below indicates the logistics responsiveness index for the selected cities. Logistics responsiveness index identifies Melbourne, Hong Kong and Seoul to be highly responsive to customer demand. Key logistics operations such as tracking and tracing, custom clearance and timeliness of shipments are performed at a high standard. Shanghai, Bangkok and Jakarta, despite high infrastructure support,

belong to the second category, which shows the opportunities for improvement. Dhaka, Phnom Penh, Manilla have the lowest logistics responsiveness score.

Figure 11: Logistics Responsiveness Index

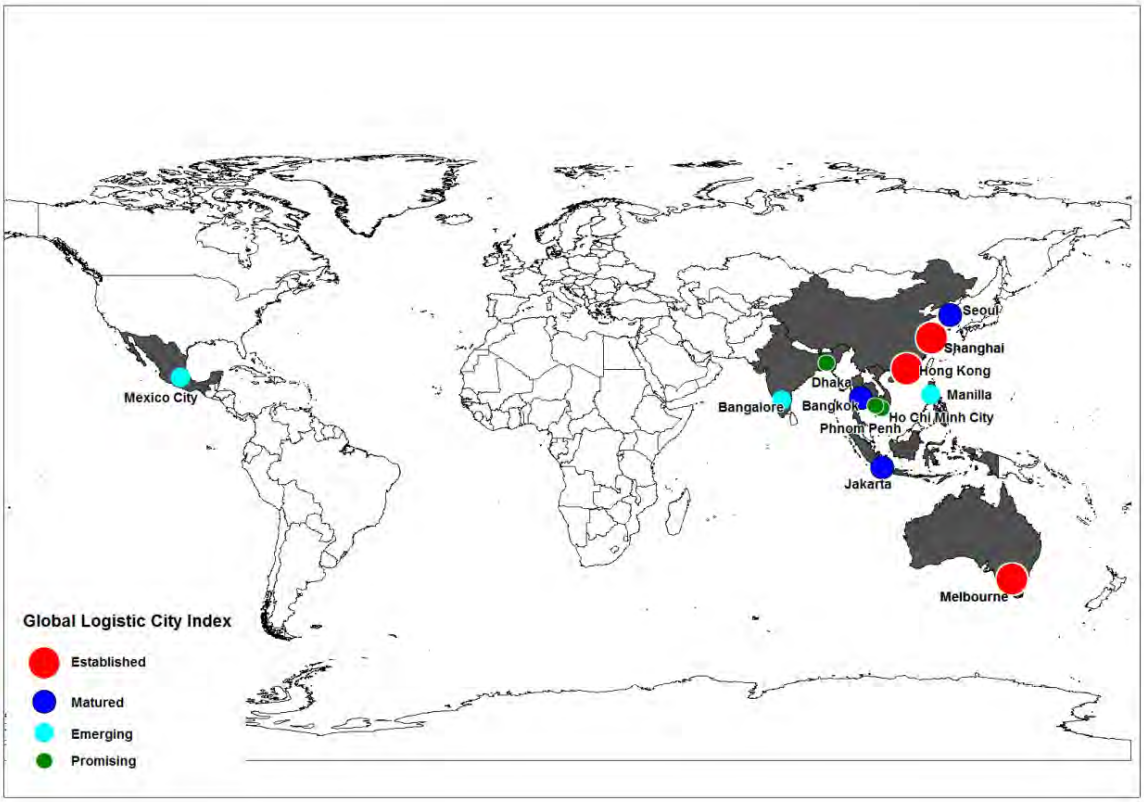


As can be seen in Figure 11 above, four cities were classified as highly responsive (Seoul, Hong Kong, Jakarta and Melbourne), four as moderately high (Mexico City, Shanghai, Bangkok and Ho Chi Minh City) and four as relatively low (Bangalore, Dhaka, Manila and Phnom Penh).

Figure 12 classifies the twelve different cities as part of a global logistics city index. As can be seen in Figure 5 above, four of the selected cities are classified as matured (Seoul, Shanghai, Hong Kong and Melbourne), four as emerging (Bangkok, Jakarta, Mexico City and Manila) and four as promising (Bangalore, Dhaka, Phnom Penh and Ho Chi Minh City).

The global logistics index, which combines the logistics infrastructure robustness and logistics responsiveness, shows the performance of the selected cities on a global city framework. The top tier includes Melbourne, Shanghai, and Hong Kong, which are known as global gateways for trade and commerce. Melbourne's positioning is strengthened due to high responsiveness to customer demand. Shanghai and Hong Kong are two key port cities with significant scale of export/import, consolidation and transhipment operations across international borders.

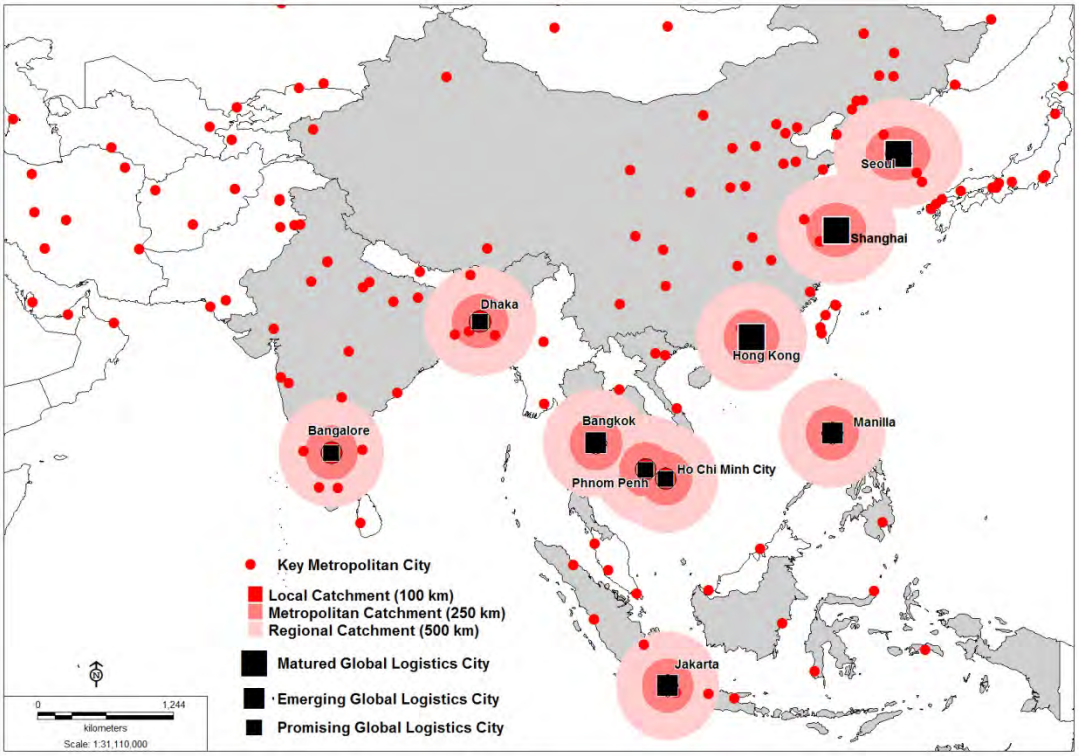
Figure 12: The Global Logistics City Index



As can be seen in Figure 12 above, three cities were highly developed in terms of infrastructure robustness (Seoul, Shanghai and Melbourne), five were emerging (Hong Kong, Manila, Jakarta, Bangkok and Mexico City) and four as developing (Bangalore, Dhaka, Phnom Penh and Ho Chi Minh City).

A catchment analysis of cities was also conducted (Figure 13) to compute the potential market demand within different buffers. Market demand is ascertained using two key criteria: the number of cities and the size of population within each buffer. Three buffers are generated using GIS with radii of 100, 250 and 500 kilometres.

Figure 13: Plot of the cities against infrastructure robustness and responsiveness



The results show that most of these case study cities are strategically situated close to the market. Among the three buffers, the size of the population is disproportionally larger in the inner ring than that of the outer ring. The greater proximity to population centres within the catchment could also mean greater accessibility to potential demand for logistics infrastructure and services to support global commodity supply chains. This would also suggest that these global logistics cities are not only a part of the global production network but are also the centres of mass consumption of global products and services.

In particular, Hong Kong, Shanghai, Melbourne, and Seoul are operating at high standards of freight logistics operations and services. They manage high volumes and multi-directional cross-border inbound and outbound trade. The analysis also identifies the high population threshold for cities such as Dhaka, New Mexico, and Ho Chi Minh. With the prevailing demand and the rising disposal income of rapidly growing middle class, these cities would soon be transformed into global logistics cities in no time.

Based on the plot above, four strategic quadrants were established (Figure 14).

7. Strategic Policy Framework

Cities' competitiveness in a globalised economy requires ensuring that businesses have access to, and are able to operate on a freight network that is efficient, sustainable and future proof. Innovative and sustainable infrastructure designs of cities to cope with unprecedented future demand for global products and rising

population pressure in a large urbanised economy whilst sustaining the standard of living and quality of life is critical for the establishment of global logistics cities of global significance. The results show that some of these cities such as Shanghai, Hong Kong and Melbourne have already attained such status; whilst others are making slow but steady progress in that direction.

Challenges associated with city logistics such as road congestion and bottlenecks, supply chain disruptions, capacity constraints, and productivity concerns however continue to hinder the seamless flow of freight and impose significant economic costs. In this report, a strategic policy framework is developed to set policy directions and formulate policy actions to ensure cities perform efficiently and effectively at high standards of service quality to businesses.

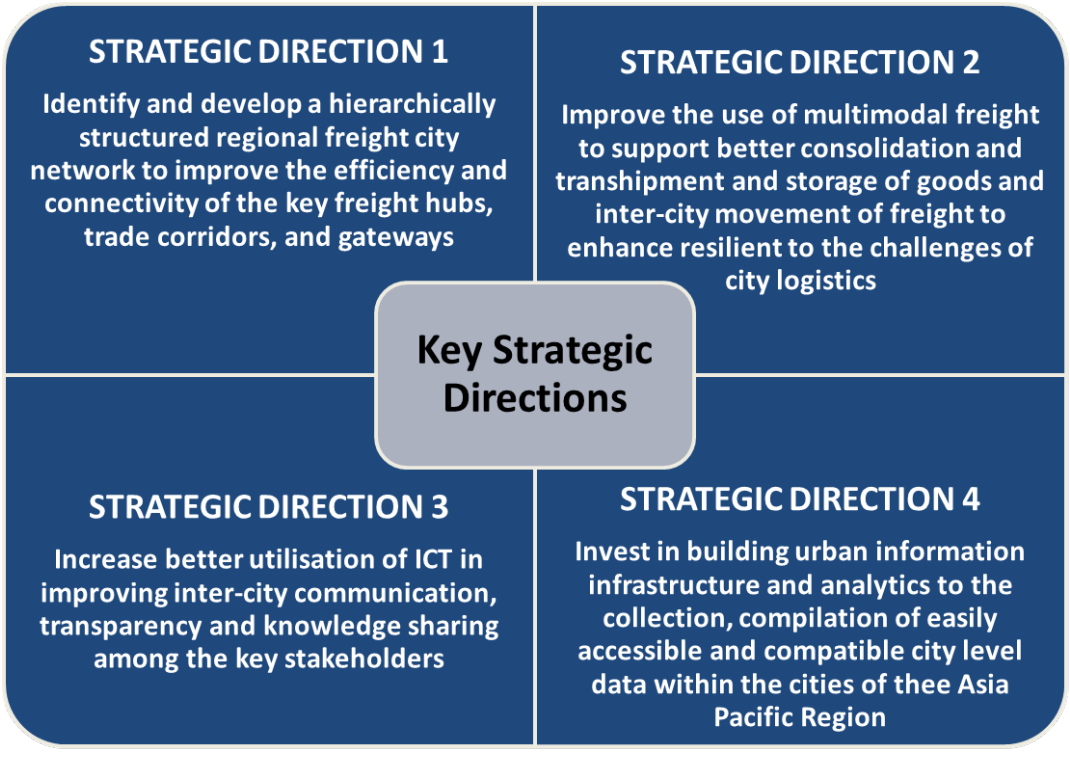
7.1 Key Goal – Global Logistics City

The purpose of global logistics city strategy is to "design and build logistics-oriented infrastructure (as a strategic trade node) to provide efficient, integrated, agile, and high capacity multimodal freight networks to support seamless movement of freight, people and information across international borders".

7.2 Strategic Directions

Figure 14 illustrates four key strategic directions, which should help the selected cities in the Asia Pacific region to improve intercity connectivity and the efficiency of logistics infrastructure and services.

Figure 14: Key Strategic Directions



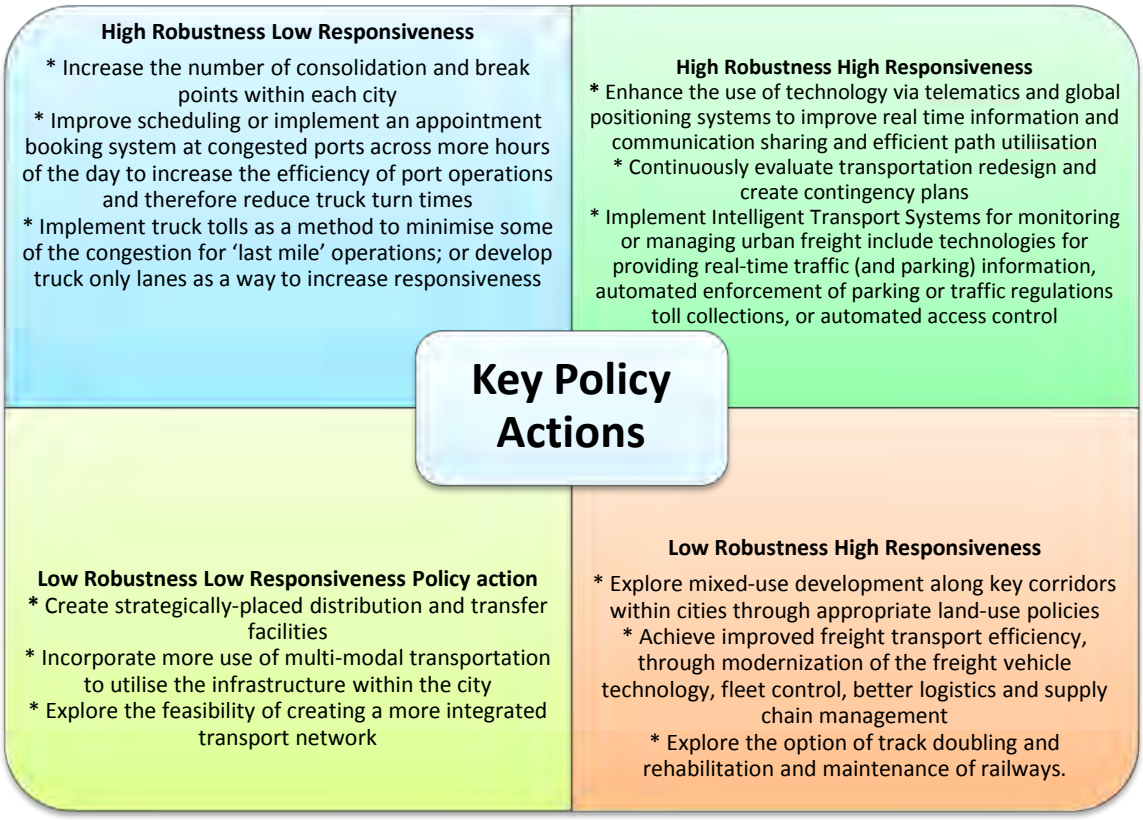
7.3 Guiding Principles

Seven-point guiding principles are proposed to help develop a set of policy actions. These guiding principles are developed to achieve the key strategic directions. These include:

Figure 15: Seven-point Guiding Principles

Finally, the following policy actions were proposed based on the analysis of the different cities (Figure 16).

Figure 16: Key policy actions



8. CONCLUSION

Global logistics city as a strategy for urban infrastructure development is a relatively new concept. However, it has been proven successful in dealing with an unprecedented increase in global trade in spatially fragmented global production networks. Using an indicator based assessment framework, the strategic positioning of a set of global logistics cities in the Asia Pacific region in terms of transportation and logistics infrastructure capacity and service responsiveness was evaluated.

In conclusion, this research set out to develop an indicator-based assessment framework for evaluating the strategic positioning of global logistics cities in terms of their transportation and logistics infrastructure capacity and service responsiveness. Utilising different transport and logistics indicators and standardising and indexing those indicators achieved this. Cities were mapped on a two-dimensional space to portray the positioning of cities across four different quadrants. This was then plotted on a variety of charts and maps, which enabled easy comparison between the different cities, thus generating four key strategic directions, as well as accompanying key policy actions via seven guiding principles.

Key findings from this study highlight the strength of ports in Melbourne, Hong Kong and Shanghai. However, these cities must remain flexible to adjust to the increasing demands of globalisation and the flow of goods as part of the supply chain. Cities in the second tier, Seoul, Bangkok and Jakarta, need to maintain their current strengths

whilst improving their logistics responsiveness by investing in new information and logistics infrastructure.

Third tier cities, Manila, Bangalore, and Mexico City, need further investment in both logistics responsiveness and infrastructure robustness, which could be achieved through strategic placement of distribution and transfer facilities, as well as improvements in the transport infrastructure. Finally, fourth tier cities, Dhaka, Phnom Penh and Ho Chi Minh City, cities that show promise, can further enhance their strategic location through significant investment in infrastructure and traffic maintenance strategies to improve their overall logistics responsiveness and logistics robustness.

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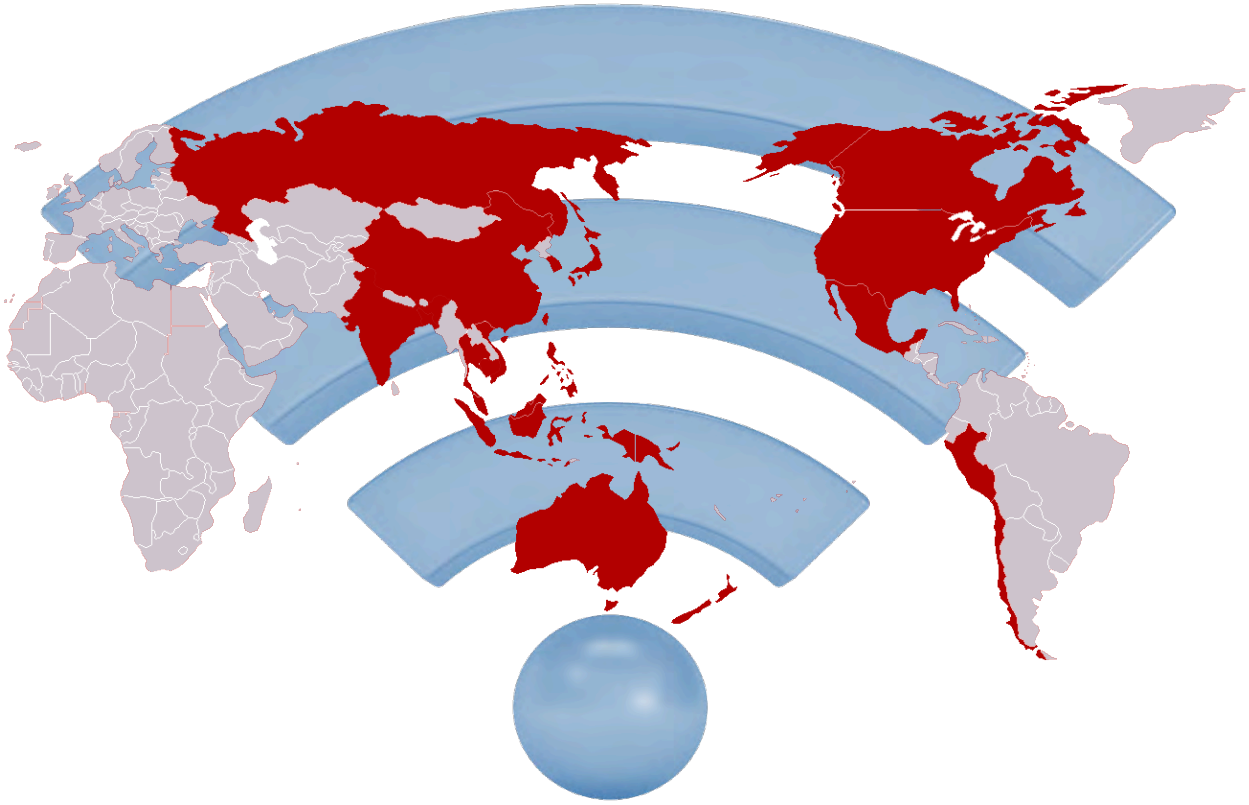
Public Wi-Fi

Emergent urban infrastructure in the Asia Pacific and South Asia



August 2015

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Executive Summary

Overview

Public wi-fi, the provision of internet connectivity in public areas using Wi-Fi™ wireless local area network technology operating in generally unlicensed radiofrequency spectrum, is emerging as a key part of the urban communications ecology. While the twenty four APEC+ economies[1] covered in this report make up a broad typology of public wi-fi provision, our research suggests that overall investment in wi-fi provision is increasing, and forecasts of mobile data usage suggest continued demand pressures.

Wi-fi is a localised technology, and, for reasons elaborated in this report, city governments or local government authorities are the most effective level of government to oversee its provision. However public Wi-fi provision is embedded in national and international regulatory systems, and connected with global flows of people, information, technology and capital. These systems are major determinants of local-level investment decisions and business models.

Analysing public wi-fi as urban infrastructure across the APEC+ economies, then, requires a multi-scalar approach as well as a multi-lateral one. Local investment decisions are nested within state (provincial) or national telecommunications policies, micro-economic settings, urban development policies and, where they exist, digital ICT policy frameworks. These settings are in turn nested within the regulatory frameworks of supra-national bodies such as the International Telecommunications Union, and multi-lateral initiatives to foster trade and development.

Ironically, though, the cheap and accessible nature of wi-fi technology, and its operation within a band of radio spectrum reserved for low-power, generally unlicensed uses, means that wi-fi is also an arena for experimentation and tactical deployment. The motivations of 'bottom-up' providers such as wireless activists, civic groups and not-for-profit organisations, may be similarly multi-scalar: from addressing hyper-local connectivity issues to preserving an internet commons.

Perhaps no other form of urban infrastructure exhibits this level of complexity. In undertaking the tasks of information discovery and analysing our research data, we have attended to the broader regulatory, policy and economic contexts that shape public wi-fi provision, to the business models through which public wi-fi operates as an increasingly indispensable part of urban infrastructure, and to vernacular and situated examples of experimentation, jerry-rigging and technological work-arounds that speak to distinctive social and economic conditions of APEC+ economies.

The country reports contained in this document attest to the patchy (if generally expanding) levels of public wi-fi provision across the APEC+ network, as well as the difficulty of information discovery. While in some cases, information discovery has been hampered by language limitations, the localised and sometimes informal nature of public wi-fi networks means that there may be little interest in documenting them for a wider audience. With little published academic or policy information on public wi-fi provision in the APEC+ economies, our research methodology focussed on general, business and technology-focussed media as the most comprehensive sources of in-country information. Although our contextual discussion attempts to overcome the limitations of a point-in-time analysis, rapid change in this field inevitably challenges claims to currency. In this light, we suggest that UIN may wish to circulate this report to APEC member economies to comment on their country profile and gather additional in-country information to supplement it. This process could be easily facilitated, and kept current, through a web portal.

[1] The 21 APEC economies plus India, Bangladesh and Cambodia.

Key Findings

(1) Public wi-fi is increasingly viewed as essential infrastructure, and city governments or local government authorities are the most effective level of government to oversee its provision.

(2) Almost all economies surveyed displayed some evidence of public wi-fi investment, although the level of activity varies significantly and data limitations preclude a complete comparative analysis.

(3) Mobile data forecasts suggest continuing rapid and significant growth, driven by video data. Liberalised and cooperative regulatory and technical development frameworks are assisting this growth.

(4) The characteristics of public wi-fi are fluid, with new business models and seamless network handover increasingly blurring the lines between public and private.

(5) Network design and business models have shifted from ambitious indoor-outdoor blanket urban coverage, to largely outdoor provisioning in high-demand areas, with 3G and 4G services providing infill coverage.

(6) Governments have a competitive advantage in facilitating public wi-fi developments through control or ownership of a distributed physical infrastructure (e.g. light poles) suitable for mounting wi-fi access points.

(7) Governments are increasingly looking to private partners for provision and operation of public wi-fi networks on a low or neutral cost basis. Partnership arrangements can be complex and poor contract assessment and due diligence has resulted in some inappropriate government investment decisions in the field.

(8) A range of rationales for public wi-fi network investment are advanced by governments, including tourist industry support, digital inclusion, e-government service access, local economic development (including fostering innovation and digital entrepreneurship), securing inter-city competitive advantage, public safety, urban management, reduced telecommunication congestion and resultant quality of service improvements.

(9) Little research has been conducted on the investment returns or outcomes of public wi-fi networks in relation to the array of rationales advanced.

(10) While city governments promote public wi-fi as urban infrastructure of the twenty-first century, there is limited evidence on the role public wi-fi plays in urban management. There are research and knowledge gaps in this area.

(11) There is limited evidence that public wi-fi services have contributed to emergency management, response and recovery. This is also an area where there has been limited research and documentation.

(12) The provision of public wi-fi is likely to play an increasingly important role in bridging digital divides in association with the broad diffusion of wi-fi and internet-enabled mobile devices.

(13) Mobile network operators are increasingly offering a wi-fi service to public, business and individual customers to gain market share.

(14) Revenue generation from wi-fi networks is focussing around advertising and location-based analytics.

(15) Wholesale carrier wi-fi provision is emerging as a new commercial market as mobile network operators seek access to networks onto which they can re-route customer data away from their congested and higher-provision-cost 3G networks.

Key Themes

Telecommunications Policy and Regulatory Settings

Competitive telecommunications markets operate in most APEC+ economies. Market liberalisation of telecommunications is evident throughout the APEC+ network, with the exception of PRC and Bangladesh, which have introduced limited market competition. Competition is restricted in several countries due to the dominance of major telcos, in some cases the privatised public monopoly. Several countries (India, New Zealand) have retained public monopoly of parts of their telecommunications infrastructure (e.g. satellite services, broadband network). All countries examined have national telecommunications regulators. Singapore is widely regarded as a regional leader in regulatory and market settings, and there is evidence that other countries (e.g. India) are looking to emulate these. A lack of current data for Brunei, Indonesia and Papua New Guinea precludes a comprehensive regional market structure comparison.

Provision

Wi-fi is emerging as a key component of urban communications ecology across the APEC+ network, with all economies, with the exception of Cambodia, displaying some evidence of public wi-fi investment. While public wi-fi provision is increasing, it is very uneven throughout the region. For instance, there is little evidence of network development in Bangladesh, Brunei and Peru, whereas numerous city and regional governments in India and Australia have recently announced extensive free networks in central business districts and on public transport, while extensive networks have been in place in Singapore, Taiwan and South Korea for some time.

There are diverse policy rationales for public wi-fi provision across member economies. A number of APEC+ economies have incorporated public wi-fi provision within national digital strategies, evidencing the growing profile and provision of this technology (for example, see Chile, Mexico, Bangladesh, Japan). A wide range of specific rationales for public investment in wi-fi provision are advanced in APEC+ economies including: economic development through promotion of the digital economy and/or inter-city competition (Chile, Philippines, Hong Kong, India, New Zealand), tourism (Japan, Hong Kong), e-government service access (India, Bangladesh), democratic participation (Philippines), and narrowing digital divides (Bangladesh, Malaysia, Chile, Japan, Mexico).

Public wi-fi provision is closely oversighted by higher governments and courts. While the litigious environment that has surrounded public wi-fi has moderated, several country profiles (most notably, the USA and India) show evidence of continued scrutiny by higher governments and courts to enforce competition and contract standards. Poor contract design may hinder public-private partnerships: the India country profile provides evidence that lack of contract specificity may halt PPP developments.

Technical Parameters and Business Models

Wi-fi has defining technical and regulatory characteristics that has made it an arena for experimental and tactical deployment – particularly with regards to public provision. Wi-fi uses generally unlicensed (free) spectrum in the 2.4GHZ and 5GHZ bands. As a result of the unlicensed regulation of these bands wi-fi is subject to interference from competing uses. To limit interference wi-fi transmission is limited to very low power – generating a range of 50-100 m. The free and unregulated nature of spectrum has led to widespread incorporation of wi-fi receiver technology in electronic devices and to experimentation in network development. Public wi-fi networks initially followed a hub and spoke model (relying on substantial wired backhaul) and access points (APs) were described as hotspots. Advances in APs have enabled the formation of mesh networks with APs connecting to each other as well as end use devices, mitigating the need for each AP to have wired network access and facilitating automatic handoff between APs in the mesh to provide users a roaming service. New IEEE standards will further enable

automatic handoff between wi-fi and 3G networks providing a seamless roaming wireless experience using multiple network technologies.

Public wi-fi provision models are evolving rapidly. The increasing range of providers, from commercial (such as, Australia's Telstra Air service), to community (such as, India's Tilla Shahbazpur village network), and complex public-private partnerships (such as, Singapore's Wireless@SG) challenge conventional notions of 'public' as provided and owned by governments. In addition, provision of network access to the public in privatised public space, such as shopping malls and sports stadiums, has also complicated notions of public provision.

City governments have a competitive advantage in wi-fi provision. Control or ownership of distributed physical infrastructure (e.g. utility poles, street lights, bus shelters, buildings etc.) facilitates deployment of the large number of access points (APs) required to create effective mesh networks. This makes government an excellent network developer or low transaction cost partner for commercial network developers. In addition to fixed infrastructure we are also seeing experimental use of city government vehicle fleets as wi-fi access points for public use as well as urban management purposes.

There is evidence that some government infrastructure has been underutilised as sites of public internet provision. Notwithstanding the above point, evidence from the International Telecommunications Union and Universal Postal Union suggests that public libraries and post offices under-provide public internet access. This situation is not confined to developing economies, but prevails in advanced economies such as Australia.

Governments are looking to alternatives to public funding of urban wi-fi networks. While inconsistent and disaggregated data limit the capacity to quantify this finding, there is clear evidence of a trend for governments to contribute to initial capital costs, but to seek cost-neutral arrangements for the ongoing operation of public wi-fi networks. The most common mechanism for this is through partnership with a MNO, but more complex partnerships have also emerged that engage multiple commercial partners and multiple levels of government (for instance national and local, e.g. Chile).

Provisioning models have evolved and matured. Early ambitions of city governments for blanket indoor and outdoor network coverage (in some US cities, for example) have been scaled back to focus on provision in high-demand and high-value areas, with commercial mobile services providing infill.

There are revenue pressures on commercial providers. Current private investment strategy is typically related to differentiation and customer retention rather than direct revenue generation. The average number of revenue streams that operators use to monetise public Wi-fi networks fell between 2013 and 2015. Few commercial operators are now charging subscribers directly for wi-fi network access, although wholesale network access is emerging as a new market with operators charging mobile network operators to access their networks to re-route customer data away from congested and higher-provision-cost 3G networks. There are also cases where Telcos will initiate a public wi-fi service as free promotion before seeking to monetise it by offering it only to existing mobile network or home broadband subscribers (both Indonesia's Indosat Super Wi-fi and Australia's Telstra Airs services were launched in this way). At a retail level advertising and proximity marketing and location-based analytics are common business models. Proximity marketing might include sending alerts or coupons to the devices of customers as they enter a shopping district, store or even a particular part of the store. Wi-fi is particularly suited to this application because of its limited range (Bangalore in India is exploring such commercial opportunities as the current government funded model looks unworkable). Data analytics involves provision of location based user data to venue operators or third-party marketers. One example of this is the Purple wi-fi tool used by Telstra in Australia.

Universal Service Obligation Funds may also provide resources for public wi-fi network development. Universal Service Funds operate in a number of APEC+ countries (e.g. India: *Universal Service Obligation Fund*; Taiwan: *Universal Service Fund*; USA: *Universal Service Fund*). These funds require telcos to allocate a designated portion of their net earnings to the fund to expand service provision. While universal service funds generally prioritize coverage for regions and/or populations without access to voice telephony (traditionally provided over fixed lines and public pay phones), many countries are now expanding definitions to include mobile telephony and internet access.

Use

Demand for mobile data will continue to increase. Forecasts of data downloads by mobile devices suggest continuing exponential rates of increase, principally through increased video streaming. This is likely to place increasing congestion pressure on commercial networks, and increase the value proposition for commercial telco to partner with city governments for offload onto public wi-fi networks.

Consumers are sensitive about advertisement exposure and data sharing: While advertising-led business models are common (see Peru country profile), there is evidence that poorly designed approaches to advertising and data sharing generate consumer resistance. Consumers are also sensitive to quality of service issues, leading some major cities in APEC economies (e.g. San Francisco) to withdraw services rather than suffer reputational risk.

There is limited evidence of the contribution of public wi-fi to emergency management and recovery. Two well-documented examples from the USA (Hurricanes Katrina and Sandy) indicate that public wi-fi networks were the only surviving telecommunication services.

Evaluation

There has been little robust evaluation of public wi-fi provision. Evaluation of the social and economic benefits of public wi-fi investment has significant methodological challenges. Available evaluation studies of networks in APEC+ countries generally paint a positive picture, but suffer from weak research design and data limitations.

Methodology

An electronic search methodology was used in the composition of this report.

SEARCH TERMS

- Researchers conducted an extensive online search using the framing terms 'community wifi', 'community wi-fi', 'public wi-fi' and 'public wifi' in combination with the names of the 24 APEC+ economies as well as broader regional terms such as 'APEC', 'ASEAN' and 'Asia Pacific'.

SOURCES

- Searches conducted through Google and Google Scholar yielded publicly accessible material from governments, supra-government agencies, academic institutions, community agencies, consultancies, and commercial ICT enterprises.
- A key dataset examined was the Factiva global newspaper, magazine and blog aggregator, which contains more than 9,000 academic and trade journals, company information, news and financial information sources. Researchers conducted searches for the period 2003 to 2015.
- Researchers deployed search terminology to examine the International Telecommunications Union website. ITU publications, including the 2014 ITU data yearbook and ICT-Eye, also informed this report.
- A range of ICT industry assessment websources were also consulted including: www.budde.com.au; www.telegeography.com; http://www.digital-review.org/
- The websites of national regulatory authorities were subject to general searching as well as more focussed examination – particularly in relation to digital development policy.
- All material included in this report has been sourced from the public domain. The authors acknowledge the contribution that research conducted by government, community and commercial agencies have made to our understanding of public wi-fi and broader ICT provision in the APEC+ economies.

Terminology and Abbreviations

- Internet Users – used the internet in last 12 months.
- Telco MARKET competition segments: Local Fixed Line Services, Domestic fixed long distance , International Fixed Long Distance, Mobile, IMT (3G, 4G, etc.), Wireless Local Loop, DSL, Cable modem C* P: 1991, Fixed Wireless Broadband, Leased Lines, International Gateways, Internet Services, Cable Television, Fixed Satellite Services (FSS), Mobile Satellite Services (MSS), VSAT. RATINGS: M: Monopoly, P: Partial competition (year when competition was introduced), C: Full competition (year when competition was introduced), N: N/A
- USOF – Universal Service Obligation Fund – used to finance expanded service provision, usually across a range of telecommunication segments
- LTE - Long-Term Evolution, commonly marketed as 4G LTE
- Triple play services – broadband, television and telephone.
- Carrier wi-fi – offered by telcos to enhance mobile service.
- MNO – Mobile Network Operator
- HFC - Hybrid fibre-coaxial is a broadband network that combines optical fibre and coaxial cable.

Country Profiles

Australia

The state of telecommunication and ICT provision, use and policy

- Regulator: Australian Communications and Media Authority (ACMA)

Market structure (level of competition)

- Competition in all telco segments

Mobile market

- 107% mobile subscription penetration
- The handset market is being driven by smartphone uptake. This is leading to greater mobile broadband and mobile data use, stimulating operators to fast-track investment in LTE technologies.
- All three mobile network operators now operate extensive 4G Long-term Evolution (LTE) networks.
- Mobile broadband access using 3G and 4G/LTE networks has expanded steadily as users continue to add tablets, modems and phones as alternative communication methods.
- Mobile broadband is a key contributor to the economy. A 2014 ACMA report found that mobile broadband had led to an increase in Australia's economic activity of $33.8 billion between 2006 and 2013 - of this, $7.3 billion reflects the impact of productivity growth within the mobile communications sector.
- Smartphone penetration reached about 90% by mid-2014, while surveys have shown that about 60% of respondents have a tablet. These figures will increase steadily into 2015 as a greater number of competitively priced units hit the market, and as the reach of LTE networks widen.

Home access (computer and internet)

- 83 per cent using the internet
- 83.5 per cent of households have a computer at home
- 83 per cent of households have Internet access at home

National policy framework

- The amended NBN architecture, with less emphasis on FttP, has also meant that the number of customers expected to migrate from copper to fibre-based services is far lower than initial NBN Co forecasts.
- NBN aims to reach 3.6 million premises by June 2016

Telco funding opportunities (USOF)

- USOF: carriers with eligible revenue over $AU25m pay an annual industry levy as a percentage of net revenues (turnover).
- In common with other maturing markets, growth in the number of broadband subscribers has slowed in recent years in the wake of higher penetration.
- There has also been a shift in consumers adopting mobile-only broadband solutions, commonly associated with customers choosing to forgo fixed-line telephony services.

Public wi-fi developments

- The Australian Communications and Media Authority (ACMA) released a report stating that comparatively to other nations, up until 2012, Australian cities were significantly lacking infrastructure and access to public wi-fi despite early roll out of programs by the two major telcos Telstra and Optus in 2003.
- There has been resurgent interest in wi-fi, with Telstra in mid-2014 announcing plans to invest more than $100 million to build a network of some two million hotspots across the nation within five years. This is complemented by a growing number of municipal-backed wi-fi zones.
- In 2014, Telstra launched a trial of 2,600 limited free (30 minutes) wi-fi hotspots to its customers across the country. The Company stated that during the trial period, they had 1.5 million unique devices connected to the network.
- A report released by Cisco, projects that by 2019, 72 per cent of all data traffic will be wireless and therefore greater investment should be made in places of user relevance: public places such as shopping centres, stadiums, parks.
- Concerns have been raised by ACMA regarding the large uptake of streaming and the impacts on bandwidth capabilities.

Bangladesh

The state of telecommunication and ICT provision, use and policy

- Regulator: Bangladesh Telecommunication Regulatory Commission

Market structure (level of competition)

- McKinsey Internet Barriers Index ranks countries on their performance in the face of inadequate infrastructure, affordability, user capability, lack of incentives challenges. Bangladesh in bottom five.
- Local Fixed Line Services M, Domestic fixed long distance P* P: 2009, International Fixed Long Distance P* P: 2011, Mobile C*, IMT (3G, 4G, etc.) P* P: 2009, Wireless Local Loop P* P: 2008, Fixed Wireless Broadband C*, Leased Lines P* P: 2009, International Gateways P* P: 2008, Internet Services C*, VSAT P* P: 2003

Mobile market

- The rapid expansion of the mobile market from 2007 was underpinned by deregulation, including encouragement of foreign investment. The state maintains one operator: Teletalk.
- Four mobile operators acquired 3G spectrum in September 2013. By March 2014 there were around 2.5 million 3G subscribers. 74 per cent mobile subscription penetration

Home access (computer and internet)

- Underpinned by the expansion of wireless services, Internet use has doubled in the last three years. This was from a very low base and usage is only 6.5 per cent of the population (2014).
- Households with a computer 5.8 per cent, Households with Internet access at home 4.6 per cent
- Bangladesh has a very small fixed-line segment and teledensity has stagnated at less than 1 per cent (the lowest in South Asia).

National policy framework

- Government has launched the Digital Bangladesh (DB) strategy aimed at creating: digitised government, ICT-enabled services, nationwide Internet connectivity, a high-tech park for businesses and ICT-trained human resources by 2021.

Telco funding opportunities (USOF)

- USOF: Have a Social Obligation Fund (SOF), 1 per cent revenue sharing.

Public wi-fi developments

- National policy interest in wi-fi as part of 'Digital Bangladesh' broadband policy. This policy platform aims for 40 per cent internet penetration by 2015, 70 per cent by 2018 and 100 per cent by 2021. As part of policy the government published wi-fi guidelines for the deployment of private telco operated wi-fi networks throughout the country. The Prime Ministers' Office with support from UNDP and USAID is committed to an Access to Information (a2i) program that also has a public wi-fi component.
- The Bangladesh Telecommunication Regulatory Commission (BTRC) stipulates that telcos cannot currently offer public wi-fi services unless partnering with an ISP. In 2013 first commercial wi-fi hotspot services offered by telcos. As of 2014 offered by Airtel, GrameenPhone, Robi Axiata and Banglalink in collaboration with iConnect and other partners.

- In 2014 State-run Bangladesh Road Transport Corporation (BRTC) introduced 10 public buses offering free wi-fi facility. Access to Information (a2i) programme under the Prime Minister's Office was extending technical support to BRTC for the wi-fi service.
- Free wi-fi service launched at Bangladesh Secretariat in 2014 – although unclear whether general public can access. Likewise universities (including Dhaka University) have rolled out wi-fi.
- The government has plans to establish 100,000 wi-fi hotspots with the assistance of China in different rural areas to provide free Internet connectivity with the aim to diminish the information and communication gap between the urban and rural areas. (Digital divide response).
- National government broadband policy set to encourage PPP (seeks to understand service gaps, and improve collaboration)
- Some regional activity – particularly urban. In 2015 Newly elected Dhaka South City Corporation (DSCC) Mayor Sayeed Khokon announced expansion of wi-fi into public places to ensure free Internet service for people. Free Wi-fi services will be offered in public places like the launch terminal, Nagar Bhaban and railway station. No specific rationale foregrounded.

Brunei Darussalam

The state of telecommunication and ICT provision, use and policy

- Regulator: Authority for Info-communications Technology Industry of Brunei Darussalam (AITI)

Market structure (level of competition)

- The telecommunications market is dominated by Telekom Brunei (TelBru), the corporatized successor of state-owned incumbent JTB (although there are plans to privatise the incumbent telco, it remains under the wing of the government).
- No current market structure data

Mobile market

- Strong wireless telecommunication demand based on high GDP per capita. Mobile penetration reached 115 per cent in 2014.
- Around half of Brunei's Internet subscribers are on a mobile broadband platform.

Home access (computer and Internet)

- 65 per cent using the internet
- Households with a computer 90.6 per cent, Households with Internet access at home 75.8 per cent
- More than 90 per cent of Brunei's Internet subscribers have high-speed broadband access, with around half of these on a mobile broadband platform (as mentioned above).

National policy framework

- A small wealthy nation in South East Asia, Brunei made early moves to ensure that it was delivering up to date telecommunications services to its population. Telecommunications infrastructure and services throughout Brunei are of a generally high standard and the country ranks well in Asia in terms of both telecom service penetration and infrastructure facilities.
- The government issued a National Broadband Blueprint, with a primary objective being to increase the ICT industry's contribution to GDP to 6 per cent by 2015.

Telco funding opportunities (USOF)

- No universal service fund

Public wi-fi developments

- No obvious policy outline for public wi-fi. It does not appear in the national government's ICT development plans (National Broadband Blueprint).
- 2011 talk of expansion of wi-fi into public schools to enhance education outcomes; schools still seeking improved Wi-fi in 2014 for game-based learning. It was expected that this would fall under the Ministry of Education's 6 year ICT 'e-Hijra' program for public schools.
- Free Wi-fi at airport since 2014.
- 2011 plan to introduce Wi-fi at mosques to attract young people.
- Rising mobile consumption has encouraged to telcos to initiate some wi-fi hotspot activity as well as investing in LTE data services and network optimisation.

Cambodia

The state of telecommunication and ICT provision, use and policy

- Regulator: Telecommunication Regulator of Cambodia

Market structure (level of competition)

- Cambodia has the least developed telecommunications market in Southeast Asia.
- Competition in all telco segments
- Cambodia largely by-passed building fixed-line infrastructure (teledensity is just 3 per cent) and has launched into alternative telecommunication technologies (digital and wireless).

Mobile market

- There are currently six mobile operators (2014), three of which account for 95 per cent of the total subscriber base. There has been some rationalisation in network providers over the past three years. Mobile subscription penetration is 134 per cent.

Home access (computer and internet)

- Given limited fixed-line infrastructure, Internet take-up rates remained low for many years, with the country claiming one of the lowest Internet penetrations in the region. The introduction of wireless broadband services in 2007 underpinned the expansion of Internet use. International estimates show 1.5 million mobile broadband subscribers by early 2014 (although the regulator claims 5 million internet subscribers in 2014 up from 3.86 m in 2013). The ITU report 6 per cent of the population are Internet users.
- Households with a computer 9.2 per cent; Households with Internet access at home 5.5 per cent.

National policy framework

- The independent Telecommunications Regulator of Cambodia (TRC) was established in 2012. By 2014 the TRC was already playing a key role in the local telecom industry and had prepared a National Broadband Policy.

Telco funding opportunities (USOF)

- No USOF exists (A section on USF is included in draft Telecommunications Law – 2013)

Public wi-fi developments

- There are no publicly funded wi-fi developments to report.
- Phnom Penh and Siem Reap have a number of Internet cafés, limited access outside main cities.
- Free wi-fi is available at hotels, restaurants, Mini Mart, Café and shopping mall.
- 2008-2010 pilot project by APT & MPTC to build up wi-fi connection from PP to 6 health centres and schools in Ang Snol.

Canada

The state of telecommunication and ICT provision, use and policy

- Regulator: Canadian Radio-television and Telecommunications Commission (CRTC) and Industry Canada

Market structure (level of competition)

- Competition in all telco segments
- Canada's comparatively low mobile penetration offers room for further subscriber growth.

Mobile market

- 81 per cent mobile subscription penetration
- Though voice services revenue growth remains stagnant, there is considerable promise in the mobile data sector. About 80 per cent of contract subscribers now have smartphones, and with higher data use. Telcos expect to extend their LTE network footprints to cover 99 per cent of the population. Operators have seen a steady migration among subscribers from feature phones to smartphones.

Home access (computer and internet)

- Broadband and wireless revenues are continuing to underpin Canada's telecom sector, offsetting the decline in the fixed-voice segment.
- 86 per cent using the internet
- 83.6 per cent of households have a computer at home
- 82.6 per cent of households have Internet access at home

National policy framework

- The government has endeavoured to encourage market competition by ensuring that blocks of spectrum have been reserved for new entrants, while blocking deals which would have concentrated spectrum either regionally or nationally among the three main networks operators.
- Canada has one of the highest broadband penetration rates among the OECD nations. Government policy has encouraged widespread broadband availability, particularly in rural and regional areas, resulting in near comprehensive accessibility to broadband services.
- Recent developments include government relaxing foreign company ownership rules in the telecom sector.

Telco funding opportunities (USOF)

- Have USOF: Companies contribute annually to a central fund based on their revenues, all operators (TSPs) with revenues greater than $10 million (CAD), Percentage: 0.63 per cent of an operator's contribution-eligible revenue.

Public wi-fi developments

- SaskTel closes the Saskatchewan! Connected wireless Internet network in 2013 due to low usage rates across the province. However, it kept some selected hotspots open with plans for future hotspot allocation based on demand.

- In 2015 BAI Canada and the Toronto Transit Commission (TTC) signed a free public wi-fi agreement for selected underground stations in preparation for the 2015 Pan Am and Parapan Am Games. In the deal BAI Canada will pay the TTC $25 million dollars over the next 20 years for the rights to install and operate the wi-fi system.
- Shaw Communications extends its wi-fi network making it the largest free wi-fi network in Canada with over 60,000 free hotspots.
- Rival company Telus launches 8000 wi-fi spots across B.C and Alberta in response to the Shaw's network expansion.

Chile

The state of telecommunication and ICT provision, use and policy

- Regulator: Subsecretaria de Telecommunicacaiones (Subtel)

Market structure (level of competition)

- Competition in all telco segments
- Chile's telecom sector is one of the most open and mature in Latin America, with full competition allowed in all areas, excellent infrastructure and a progressive regulatory system encouraging competition.
- Fixed-line services dominated by the incumbent Telefónica Chile, trading as Movistar, its main competitors are VTR Globalcom (wholly owned by Liberty Global), the GTD group, Entel, and Claro.

Mobile market

- 134 per cent mobile subscription penetration
- Fixed-mobile substitution is particularly strong in Chile. The consumer trend to adopt mobile services for both voice calls and broadband is further reducing demand for fixed-line infrastructure.
- Chile's mobile penetration is one of the highest in South America. Movistar and Entel are the market leaders. LTE services are offered by all three MNOs, which has stimulated the sale of smartphones as well as mobile data use among consumers.

Home access (computer and internet)

- 67 per cent using the Internet
- 57 per cent of households have a computer at home
- 49.6 per cent of households have Internet access at home

National policy framework

- Chile deregulated its telecom industry in the early 1980s and the national network was fully digitalised in 1996.
- Competition, investment and innovation have been key factors in the development of the country's telecommunications.
- Chile has one of the highest broadband connection rates in Latin America. This is largely attributable to the government policy to promote the use of broadband and the private sector commitment to its development. The government has a separate programme of installing broadband connections in less developed areas, schools and public places.
- A Digital Agenda for 2013-2020 has set out a roadmap for the development of Chile's ICT sector, including strategies and specific initiatives and goals to facilitate improved telecom access for all citizens. This includes Public wi-fi expansion.

Telco funding opportunities (USOF)

- The USO fund, known as Fondo de Desarrollo de las Telecommunications (Telecom Development Fund) administered by Subsecretaria de Telecomunicaciones (SUBTEL), the regulatory agency, was the main fund provider for connecting the schools with broadband. Government budget percentage: 0.04.

Public wi-fi developments

- McDonalds (2005) wi-fi market entry – common 'public wi-fi' leader.
- In May 2013, Chile's President Sebastián Piñera announced the Digital Agenda 2013-2020 under which the country aims for ICT to account for 10 per cent of GDP by 2020.
- One of the goals is to increase the current 40.7 per cent Internet penetration rate to 80 per cent in 2020. Chile's telecoms regulator Subtel will play a role in that aim, through its universal services fund (FDT), adding 1,036 free public wi-fi hotspots nationwide. Other goals include 100 per cent access to digital resources in Chile's schools by 2020 and 95 per cent of government paperwork carried out online. (Universal Service Funds operate in a number of countries. Essentially incumbent operators are required to allocate a designated portion of their net earnings to the fund to expand service provision (particularly used for rural development).
- In 2013 the national government (in collaboration with regional governments) launched a major PPP investment in free wi-fi hotspots to reduce digital divide. 1,364 wi-fi hotspots in 341 locations across Chile. Subtel will allocate funds up to a maximum of CLP7.845 billion (USD15.4 million) for the project, financed by the Telecommunications Development Fund (FDT) and regional governments. "This initiative aims to our goal of bridging the digital divide and facilitate citizen access to the knowledge society, therefore allow us to advance the enormous challenge of bringing Chileans to build a fairer country" said Minister of Transport and Telecommunications, Andrés Gómez-Lobo". These hotspots have 30 min sessions with unlimited logins.
- 2014 - final phase of wi-fi ChileGob program. Coverage now extended to all regions of the country. Mandate by President Michelle Bachelet to connect the entire country, following the logic of decentralisation and partnership between the public and private sector.
- Research has shown that the potential of libraries and post offices to provide public Internet access is currently not yet fully tapped. For example, worldwide, only 10 per cent of post offices provide public access to the Internet, even though 20 per cent of post offices have a broadband Internet connection. There is huge potential, if all post offices were provided with broadband Internet and offered this as a service to the public. According to the Universal Postal Union (UPU), increasing the proportion of post offices offering public Internet access to over 45 per cent would ensure that up to a third of all rural areas and small towns had access to the Internet, while with 60 per cent coverage half of all rural areas would be connected. (Measuring the Information Society Report 2014 Executive Summary ITU).

Hong Kong

The state of telecommunication and ICT provision, use and policy

- Regulator: Office of the Telecommunications Authority (OFTA)

Market structure (level of competition)

- Hong Kong is one of the most sophisticated and dynamic telecommunications markets in the world.
- Competition in all telco segments

Mobile market

- The country has substantial infrastructure supporting one of the world's highest population penetration of mobile and fixed telephone services at 237 per cent and 47 per cent respectively.
- All operators now operate LTE services. The strong up-take in 4G has seen an encouraging lift in ARPU. Data contributions to mobile revenue exceed 50 per cent.

Home access (computer and internet)

- Hong Kong supports access to broadband connectivity for more than 80% of all households. Internet usage is 74 per cent of population. The number of broadband subscribers represents about 75 per cent of the total Internet subscriber base and 80 per cent of broadband is Fibre-based service.
- 81.9 per cent of households have a computer
- 79.9 per cent of households have Internet access at home

National policy framework

- Hong Kong's regulator, the Office of the Communications Authority (OFCA), has played a major role in developing the telecom sector.

Telco funding opportunities (USOF)

- Have USOF: Starting from May 2009, commercial contribution is based on the quantity of telephone numbers allocated by the Regulatory Authority to the contributing parties.

Public wi-fi developments

- In 2014, the Hong Kong government consulted with IBM to plan the future of the city's ICT roadmap. It resulted in the 'Smarter City, Smarter Living' strategy and forms part of the larger, continuously evolving Digital 21 Strategy.
- As part of the 2014 Digital 21 Strategy, the Hong Kong government launched a free wi-fi service called Wi-fi.HK. This is a free or mostly free (time limit dependent) service supplied by both the private and public sector.
- In most public spaces such as parks there is a government run wi-fi service 'GovWiFi'.
- There are also specific tourist location based wi-fi services such as HKBN and Y5ZONE providing free wi-fi.
- The transportation system, MTR, also boasts its own free wi-fi service for commuters at stations.

- Another free wi-fi service known as csl hotspots are available at MTR stations, and cafes, fast food places and convenience stores. This service appears to be specifically aimed at tourists, offering free access to the tourism board website, for example.

India

The state of telecommunication and ICT provision, use and policy

- Regulator: Telecom Regulatory Authority of India (TRAI)

Market structure (level of competition)

- Competition in all telco segments except partial competition for IMG (3G, 4G), and monopoly Fixed Satellite services.
- Sweeping reforms introduced by successive governments from the mid-2000s has dramatically changed the telecommunications environment of India. The government committed to opening up the market to more competition and investment and in 2013 removed the 74 per cent FDI cap for the sector. The sector is home to a group of global operators working with local companies.

Mobile market

- From a humble start, growth in India's mobile sector rapidly picked up pace and developed a sustained momentum. After a brief stall in 2012/13 the market recovered in 2014 and there is now 71 per cent mobile subscription penetration (clearly there is room for more growth). The key drivers are also still in place: cheap call rates, low handset prices and rising incomes among a middle class numbering in the hundreds of millions.
- In recent years there has been a major push to take mobile services into poorer and rural areas of the country. Especially with the launch of the government's 'Digital India' campaign.
- 3G spectrum was not released until 2010. The roll-out of 4G/LTE networks began in 2012 and competition is increasing with Reliance Jio launching 4G in December 2014 and going head-to-head with Bharti Airtel.
- Mobile money services have become important including Vodafone mobile wallet service M-Pesa and Airtel Money.
- Mobile broadband is expected to lift broadband penetration significantly. 15 per cent using the internet.

Home access (computer and internet)

- 11.9 per cent of households have a computer at home
- 13 per cent of households have internet access at home
- The government has made an effort to promote broadband internet, by early 2014 there were only around 15 million fixed broadband subscribers – a penetration of slightly more than 1 per cent. According to the sector regulator this has shown an increase to 100 million broadband subscribers at the end of April 2015.

National policy framework

- Although it has less than 3 per cent fixed-line penetration, India has achieved a remarkable national coverage, with 99 per cent of the population having some form of access to a telephone. It has been the heavy investment in telecoms infrastructure over the last decade, plus a number of key regulatory initiatives that have combined to see India's huge population delivered at least some level of telephone service.

Telco funding opportunities (USOF)

- Have USOF: 5 per cent of Adjusted Gross Revenue (AGR), Administrator, Universal Service Obligation Fund, Ministry of Communications & IT

Public wi-fi developments

- There seems to have been limited public wi-fi activity in India during the 2000s and into the 2010s. Since 2014 there has been a flurry of activity with a range of stakeholders and business models. It is unclear how much duplication there is with Federal, State and Local government and private providers including state run telco BSNL.

- The government includes wi-fi as part of Digital India policy platform aiming to transform the country into a digitally empowered knowledge economy. The policy sets a target of 600 million broadband connections by 2020. The policy is heavily based on the growth of mobile broadband. Despite a growing number of smartphone users, 'seamless network experience' is still missing. 3G was expected to turn around things in the telecom segment, but slow expansion and lack of affordable data packs marred the plans. Now, sights are set on LTE – the next generation broadband technology. India's 'digital' campaign is certainly going to depend on the LTE growth. However, factors such as low-cost device ecosystem, data growth and additional spectrum in relevant bands are equally important factors that'll help achieve the Digital India vision. Heterogeneous networks will need to be established with a mix of macro sites, micro sites, small cells and wi-fi hotspots to manage coverage, capacity and network performance for maximum user experience.

- In June 2015 state run telco Bharat Sanchar Nigam Ltd. (BSNL) revealed plans to set up 40,000 public wi-fi hotspots in India by 2018 at a cost of USD1.2 billion. It has already rolled out 200 spots and expects to complete 2500 in 2015. It is currently calling for tenders. The service will provide limited free wi-fi services (30 minutes per 24 hours x three times per a month which visitors can utilise in multiple sessions. The service can be used on paid basis after the free sessions expire at nominal subscription plans starting from 30c US per 30 mins (USD1.1 per day). BSNL CMD Anupam Srivastava stated that the free wi-fi hotspots will help the state run telecom operator take on private telecom operators. “Our 3G reach is around 60% across 20 circles. By offering 40,000 wi-fi hotspots, we will be able to reach out to almost 85% of our total network with high-speed internet services,” said Srivastava. Wi-fi spots will also lower traffic burden on telecom networks.

- Bangalore/Bengaluru claimed to be first Indian city to have free wi-fi hotspots in Jan 2014. The Namma Wi-fi 6 location pilot phase allowed users 3 hours and 50mb per day with login requiring a mobile phone number to obtain a login passkey. The service funded by the Karnataka state government was built and operated by private ISP D-VoiS. D-VoiS also introduced two apps integrated into the wi-fi service that helped users identify city parking and waste disposal options. The service was extended to some limited locations in other cities including Bagalkot and the city bus stand in Mysore/Mysuru. Usage numbers for Bangalore sites were approximately 800 people per location per day by May 2014. At this time the government indicated it would extend the service more broadly to other cities. Officials in the Department of Information Technology revealed that an Expression of Interest (EOI) for the extended project would be developed by the end of May and the project launched within four months. In December 2014, the government revealed that within a month the wi-fi service would be extended to more than 100 junctions in Bangalore, including the city's tech corridors. The rationale for the extension was the desire to make it easier for people to access various services of the state government using wi-fi facilities. The government had recently launched its mobile governance programme and the wi-fi network would help facilitate its uptake. Despite the expanding investment in public wi-fi there complaints about useability of the network emerged as early as July 2014. The government explained at this time that it had no service agreement with D-VoiS as it provided the service free to the government and therefore was limited in how it could respond to QOS issues. In June 2015, the planned extension of the service across Bangalore had not be realised and questions emerged about the financial feasibility of the rollout.

The project was estimated to cost Rs 500 crore (USD100 million). The government is deliberating over whether it should make such a huge investment or should outsource it to private companies. The model would be PPP with the Minister indicating: “There is tremendous scope for investors to make profits through advertisements. But to make those profits, the government has to first invest a lot of money and only then we can think of the revenue. If the government decides to outsource the project to private companies, then we need to decide on the profit-sharing ratio. Hence we have forwarded the matter to the finance department, both to decide whether to make the investment and if not, what the profit-sharing ratio should be".

- In February 2014 the world's largest stretch of free wi-fi zone (20 KM) was launched in the city of Patna and IT minister Shahid Ali Khan said wi-fi would be provided at all tourist spots across the state of Bihar. There has been criticism of speed/useability of the network subsequently provided. The wi-fi zone is part of a broader policy suite seeking to establish Bihar as the IT State (Multiple IT parks are planned around the state in popular areas to capture the booming IT industry).

- In December 2014 the Indian Department of Telecom with the Ministry of Urban Development announced a plan to make wi-fi hot spots in cities with population of over 1 million and in tourist centres under its Digital India program. DoT held meetings with telecom operators for the scheme. The government has plans to empanel 3-4 wi-fi service providers for speedy roll out of wi-fi hotspots (expected by June 2015), but is yet to decide if the service will be free or chargeable (not sure on current status). The national government will facilitate permissions required from local authorities for network roll out. It is unclear whether they have reached this target time-frame.

- In June 2015, the Municipal Corporation of Gurgaon (MCG) outside New Delhi revealed it would roll out Wi-fi services at five locations in the city by mid-September. A 5 year contract has been awarded to Airtel to supply, configure and install Wi-fi services, provide a web-based portal for the user logins paying MCG Rs.10 lakh (USD15,000) to the MCG for using its infrastructure to provide the wi-fi services. The services will be an open platform for mobile phones users with wi-fi compatible devices in these localities with a daily quota limit of 30 minutes per day per device. Post 30 minutes while users can continue to use the wi-fi services, they will be charged a nominal amount and can also consume data from their data packs.

- In April 2015, the small village of Tilla Shahbazpur, eight kilometres from Dehli, rolled out a village wide wi-fi zone without government assistance. The community pooled together funds to contract a network developer to install a backhaul microwave tower and series of APs throughout the village. The wi-fi zone covers approximately 2.5 kms and currently services 2,700 mobile uses. The community has stated that the implementation of the wi-fi zone has improved economic conditions as people have better access to commodity pricing indexes to engage in trade.

- In February 2015 Kolkata’s city's first public wi-fi hotspot was established, paving the way for a gradual rollout in the rest of Kolkata by early 2016. The service, provided by Reliance JIO, will initially be free of charge.

- In 2015 contractual issues with relation to public wi-fi PPPs in New Delhi, stalled rollouts. This included conflict between tendering hardware and network suppliers and uncertainty around project specifications.

- In 2014 Ozone claimed to have over 1200 wi-fi hotspots in the country and provides free wi-fi to users around those hotspots. The network has partnerships with brands like Subway, Haldiram’s, McDonald’s, Mumbai International Airport, Baskin Robbins, Gloria Jean’s Coffees etc., to provide wi-fi connectivity in those locations, as well as to distribute advertising over its networks.

- Aircel started rolling out wi-fi hotspots in February 2011 and had claimed to have 50,000 wi-fi Zones across India, however the telco has stopped promoting the service during 2014 and it is not clear on where the initiative stands at the time of writing this article.

- In 2014 Vodafone provided a wi-fi zone for its customers at the Belvedere Rapid Metro Station in Gurgaon, as a part of its branding exercise at the Rapid Metro Station in Gurgaon while the government owned MTNL had stated plans to launch wi-fi hotspots with speeds of 8Mbps for its customers in Mumbai and Delhi.
- In 2014 Tata DOCOMO had an exclusive agreement with GMR Airports to offer wi-fi services at the Indira Gandhi International Airport in New Delhi, Tikona had planned to launch a wi-fi network at the Maharana Pratap Inter-State bus terminus (ISBT) in partnership with the Delhi Transport Corporation while Videocon Telecom had partnered with Chinese telecom equipment vendor Huawei to launch wi-fi hotspots in Punjab circle.
- By 2014 Idea Cellular had also launched a wi-fi service in 5 select cities – Ahmedabad, Cochin, Pune, Hyderabad, and Vizag.
- Indian Railways's have had a string of wi-fi pilot projects on Howrah Rajdhani Express, Mumbai-Ahmedabad Shatabdi Express, Chennai- Bangalore-Chennai Shatabdi Express and at New Delhi railway station. The proposal to provide wi-fi on Rajdhani was made in February 2011. The official announcement for the launch of the service was made in March 2012 stating that this service will go live by September 2012. Earlier, pilots to provide Wi-fi have also been implemented on the Mumbai-Ahmedabad Shatabdi Express and Chennai- Bangalore-Chennai Shatabdi Express, both in 2009. The Railway Budget 2013 again announced the launch of wi-fi service on trains during this course of this year. The other announcements made in the Railway Budget 2013 with respect to digital include real time train tracking for passengers, SMS service for passengers to check reservation status, SMS/Voice/email service for passengers to intimate on board train staff about cleanliness of their train, among others. Most of these services have been proposed in earlier budgets as well. The Indian Railways launched their train tracking app, Rail Radar in October 2012.

Indonesia

The state of telecommunication and ICT provision, use and policy

- Regulator: Badan Regulasi Telekomunikasi Indonesia / Indonesian Telecommunications Regulatory Authority (BRTI)

Market structure (level of competition)

- No current MARKET STRUCTURE data
- Particularly big challenge to successfully build telecommunications infrastructure required to support a large population spread over a complex geography.
- Two of the more significant challenges have been the crowded operator market, especially the mobile segment (recently experiencing some consolidation), and duration of regulatory decision-making.

Mobile market

- Strong mobile market with new consumer interest in the 3G services and 4G/LTE services. Mobile data service subscriptions and smartphone take up rising rapidly.
- 125 per cent mobile subscription penetration
- Market leader Telkomsel was continuing to dominate the mobile market, with its mobile subscriber base of around 45 per cent market share; Telkomsel and XL Axiata both launched 4G/LTE services commercially in December 2014.
- Data traffic is growing quickly and forecast to expand six-fold, between 2014 and 2020.

Home access (computer and internet)

- 16 per cent population using the internet
- 15.6 per cent of households have a computer at home
- 5.7 per cent of households have internet access at home
- Fixed-line market segment grew through fixed wireless (75 per cent of subs by 2012) but then stalled with mobile broadband growing.

National policy framework

- The government's initiative on national infrastructure will push for fibre and 4G coverage nationwide.

Telco funding opportunities (USOF)

- Have USOF: Percentage of total gross revenues (turnover) Percentage: 0.75

Public wi-fi developments

- In 2012 Indonesia's second largest telco PT Indosat introduced 'Super wi-fi' hotspots to cope with surge in data traffic. 700 locations in Java and Bali. The service was initially available for free for all Indosat customers as a promotion (access speed of up to 2 Mbps and unlimited data cap). In 2012 PT Telekomunikasi Indonesia (Telkom) announced launch of wi-fi up 100,000 hotspots in 30 cities across all major islands, and aims to have installed one million access points by 2013. (Seem to be delivered through chain businesses – 7Eleven, Dominos Pizza etc).

- As early as 2012 free hotspots deployed as part of political campaign strategies in Jakarta. Free wi-fi was already available in some parks at this time.
- A 2013 report on free park wi-fi noted it was fast – including streaming video.
- Parks program to be extended to all parks in 2015. Government sought to use corporate social responsibility programs of ISPs in facilitating the rollout.
- Early 2000s community wi-fi models developed by a broad coalition of telecentres, or Wartels, cybercafes, and internet activists loosely assembled in a movement known as RebelNe (e.g. RT/RW-Net initiative by Onno Purbo). After 2005 decision to liberate the 2.4GHz wi-fi band "neighborhood networks" popped up all over Indonesia. Now, using wi-fi boosting solutions such as the Wokbolik, these networks can extend up to several kilometres. Developed by Pak Gunadi in Indonesia, the Wokbolik is signal-boosting device made out of a regular USB wireless adapter, a three-inch PVC pipe, and a cooking wok. When connected to a computer and pointed directly at a wireless router from afar, the network reach is drastically increased. With only $35 worth of equipment, and through sharing the ISP costs, Indonesians formerly unable to afford a connection to the internet can now have access. The broad uptake of this model represents a global phenomenon unique to Indonesia in that it is a bottom-up infrastructure created by a self-supporting, growing cooperative of hackers.
- One grass-roots 'last mile' initiative is the RT/RW-Net initiative, a neighbourhood wi-fi project started by retired academic and long-time ICT proponent Onno Purbo. This uses wireless connections to link up to eight houses at minimal cost of around USD 50 to set up and USD 35-40 per month to run. It is unclear how many users have established this low-end system, but in response to the enduring digital divide, it is understood to be growing.

Japan

The state of telecommunication and ICT provision, use and policy

- Regulator: Ministry of Internal Affairs and Communications

Market structure (level of competition)

- Competition in all telco segments
- NTT DoCoMo still has a dominant market share, benefitting from its ex-monopoly status and a conservative customer base

Mobile market

- 118 per cent mobile subscription penetration
- With 3G subscriber numbers having peaked at around 97 per cent of all mobile subscribers coming into 2013, Japan has shifted its focus to 4G/LTE becoming the fourth country in the world to introduce this next generation platform. By 2016 there will be approximately 160 million mobile subscribers with the majority accessing services through LTE networks.

Home access (computer and internet)

- 86 per cent using the internet
- 76.2 per cent of households have a computer at home
- 86.2 per cent of households have internet access at home

National policy framework

- Clearly Japan has been a dynamic leader in many aspects of global and regional telecommunications. Japan's sophisticated IT infrastructure and high broadband penetration sets the scene for improved productivity, convergence of industries and a more flexible industrial structure.
- The government has been particularly active in regulating telecommunications in such a way as to introduce more effective competition. This competitive market has been challenged to develop the most effective business structures to achieve commercial success.

Telco funding opportunities (USOF)

- Have USOF: Telecommunications Carriers designated through provision of the telecommunications business law (Interconnecting Telecommunications Carriers, etc.). Telecommunications Carriers Association(Universal Telecommunications Service Support Institution)

Public wi-fi developments

- Congestion has led to offload investments in wi-fi and WiMAX. Pre-2014, wi-fi hotspots in public spaces were only offered by mobile network operators. This restricted tourist access.
- In 2014, Tokyo and Chiba prefectures began to deploy wi-fi hotspots to offer free internet for tourists as part of preparations for the 2020 Tokyo Olympics. The government stand on these proposed 30,000 hotspots is that its ease of access will be a driving factor in the increase of tourists to the country.
- The wi-fi spots also form part of Japan's strategic natural emergency disaster preparedness and response for tourists in the event of a natural disaster. It comes at a cost of roughly ¥31.1 billion and is funded through private and public investments.

- Japan boasts over 900,000 current wi-fi hotspots. However, as stated above, the majority of these hotspots are restricted to mobile carrier customers. In a new 2015 initiative, the government of Japan has negotiated a deal with the private telcos whereby in the event of a natural disaster, emergency wi-fi will be available across the entire network for the public within 72 hours.

Malaysia

The state of telecommunication and ICT provision, use and policy

- Regulator: Malaysian Communications and Multimedia Commission (MCMC)

Market structure (level of competition)

- MARKET STRUCTURE: Competition in all telco segments

Mobile market

- Telco market has been expanding with a significant number of new licences being granted. Fixed-line subscriber base is shrinking but mobile market has grown rapidly - penetration approaching 150 per cent.
- Multiple 4G/LTE licences issued in late 2012 and the launch of a series of advanced mobile broadband networks in 2013.
- The number of operators in Malaysia reduced from five to three and then, with 3G licences having been awarded in a two stage process, next generation services have since been rolled out and had started having a major impact on the market.
- Progress reported on closing the urban/rural divide, with expanding mobile infrastructure in rural areas

Home access (computer and internet)

- The country's broadband strategy was given a major boost when the government chose Telekom Malaysia to roll out a National Broadband Network (NBN). In 2014 government committed a further US$1 billion for the second phase of the project.
- High speed broadband reached 67 per cent household penetration in 2014. Of the six million broadband subscriptions around 60 per cent are wireless.
- 65.1 per cent of households have a computer at home
- 64.7 per cent of households have internet access at home

National policy framework

- Over the last two decades Malaysia has been working towards a clear national objective to see it ranked as a fully developed nation by 2020. The task of building an advanced telecom sector has been regarded as central to achieving Vision 2020.
- Substantial government participation in Information & Communications Technology (ICT) development has also been a particular characteristic of the Malaysian market.

Telco funding opportunities (USOF)

- USOF: 6 per cent of weighted net telecom revenue

Public wi-fi developments

- The 'Penang Free wi-fi' initiative was launched in 2009 and currently counts 1550 hotspots available at public places such as parks and recreation centres.
- The company providing the 'Penang Free wi-fi', Hotgate Technologies, claims that "on the whole, [Penang Free wi-fi] supports the government's efforts to build stronger internet penetration in the

country. It is also an effective way to assist the Penang state government to bridge the digital divide between the rural and urban areas." (Michael Yang quoted in Bloomberg, 2008: http://www.bloomberg.com/apps/news?pid=newsarchive&sid=agByvFBEExKs)

- Wireless Village initiative 1Malaysia (KTW) is a program under Commission in providing Wi-fi hotspots at selected locations mainly in rural areas.
- Ruckus Wireless Technologies have been in talks with the Malaysian government to expand the free wi-fi market in the country. The company has been focusing its efforts in promoting free public wi-fi as an effective tourism initiative.
- In 2014, the Malaysian Communications and Multimedia Commission (MCMC) raised concerns regarding the broadband speeds available across hotspots in the country. It has been at the forefront of a push to implement the High Speed Broadband Project under the National Broadband Initiative (NBI). This has resulted in issuing new spectrum to carriers and urging by the MCMC to businesses to upgrade their internet connections to increase wi-fi penetration and speed.
- In 2015, Pos Malaysia and the Malaysian Communications and Multimedia Commission announced it will roll out a free wi-fi service to 700 post offices nationwide in stages, with the main priority being post offices at rural areas.

Mexico

The state of telecommunication and ICT provision, use and policy

- Regulator: Instituto Federal de Telecomunicaciones (IFT) Federal Telecommunications Institute

Market structure (level of competition)

- Competition in all telco segments
- The market is dominated by the incumbent Telmex, with about 80 per cent market share, while the mobile market is dominated by Telmex's sister company Telcel, both owned by América Móvil.
- A telecom reform law passed in mid-2013 set up a new regulator, removed barriers to foreign investment and has introduced measures to reduce América Móvil's market share.
- With a population of around 109 million and a fixed-line teledensity of around 17 per cent, Mexico's telecom sector retains significant potential for growth.

Mobile market

- 86 per cent mobile subscription penetration
- Growth in the mobile market has begun to slow in response to higher penetration. Telcel dominates the market, accounting for about 70 per cent of subscribers.
- Mobile data is rapidly emerging as a key driver, with LTE infrastructure expanding across the country.

Home access (computer and internet)

- The broadband sector is one of the highest growth areas in Mexico's telecoms market. The country's broadband penetration is amongst the second lowest among the 34 OECD countries, and consumer prices remain high. 43 per cent using the internet.
- 35.8 per cent of households have a computer at home
- 30.7 per cent of households have internet access at home

National policy framework

- The government's CompuApoyo initiative targets 1.7 million homes for computers and broadband access

Telco funding opportunities (USOF)

- USOF seems to be voluntary contribution based (data from 2008).

Public wi-fi developments

- Access to Broadband internet through the Connected Mexico Program. Access to broadband internet in public places will be guaranteed by identifying the number of buildings to be connected each year, until universal coverage is achieved. Efforts will be made to ensure that in public places, broadband connectivity has sufficient capacity to meet demand and therefore the potential number of users at each site must be considered. Mexico will have a total of 100,000 sites nationwide providing free broadband access by the end of 2015, according to the country's President Enrique Pena Nieto. These sites will benefit a total of 28 million users across Mexico. The country currently has over 65,000 public sites. The national connectivity program Mexico Conectado (Connected Mexico) stipulates a total of 250,000 sites nationwide providing free broadband access by 2018. The project

stipulates the deployment of free connectivity in public areas including schools, parks, libraries government buildings and hospitals. 50% of sites have wi-fi.

- In order to increase the free wi-fi network, the government is auctioning off the available 700MHz in a shared telecoms network initiative.
- Mexico has wi-fi hotspots not only in major centres but also in the more rural areas, this push for wi-fi penetration is part of a government policy stance that would see internet connectivity as a right for any individual to access, like any other public service. Rural and remote connectivity is part of the 'Mexico Conectado' project to 'reduce the digital divide'. Most of the public investment under this project has been directed towards schools in remote areas, but there is strong support within government and communities to follow Colombia's lead and utilise satellite technology for these remote communities.

New Zealand

The state of telecommunication and ICT provision, use and policy

- Regulator: Commerce Commission of New Zealand (ComCom)

Market structure (level of competition)

- Competition in all telco segments, except monopoly in cable provision, partial competition in domestic long distance, fixed wireless broadband, fixed satellite (data from 2010).

Mobile market

- 106 per cent mobile subscription penetration
- The uptake of mobile broadband has been bolstered by the expansion of mobile technologies based on LTE, offered by all three network operators. With spectrum auctions allowing for the expansion of LTE networks, and further regional deployment of 3G coverage under the RBI, we expect to see steady subscriber growth across the networks.
- By late 2014 Vodafone NZ reported that more than 500,000 subscribers were on its LTE-enabled plans, and that LTE-capable devices accounted for a third of all device sales during the previous 12 months.

Home access (computer and internet)

- 83 per cent using the internet
- 77.3 per cent of households have a computer at home
- 76.8 per cent of households have internet access at home
- New Zealand has experience steady growth in fixed broadband penetration in recent years. The overall number of broadband subscribers grew by just under 10 per cent in 2013, maintaining the momentum seen since 2010.

National policy framework

- New Zealand's Ultra-Fast Broadband/Rural Broadband Initiative (UFB/RBI) is continuing to make steady progress with 536,000 premises (just under the projected 1.2 million of the completed projected) having been rolled out. Currently 55,000 premises have signed up for services (10 per cent uptake).

Telco funding opportunities (USOF)

- Have USOF: Industry levy paid direct to service provider, percentage of gross retail revenue

Public wi-fi developments

- In 2014, South Canterbury launched an initiative to make the region the 'most connected' in the country, with a joint deal between the Aoraki Development Business and Tourism (ADBT) and private firm, Vetta Technologies to bring free wi-fi throughout the region's town centres.
- This initiative formed part of a larger scheme called 'Gigatown' which was a nationwide competition aimed at raising awareness of internet connectivity and promoting development and investment in wi-fi access. The competition attracted 50 towns to enter (each required to develop a plan outlining how they would use the gigabit services in their town to promote connectivity. The Gigatown competition promoted earlier work undertaken in the US, namely another 'Gigatown' exemplar, Chattanooga, TN.

- ‘WifiGen’, a Pakistani start up company funded heavily by a former IBM vice president, landed its first contract in New Zealand. The business model of this company is predicated on a business embedding the WifiGen’s solutions to their existing wi-fi hotspot for data mining purposes. It works by offering free wifi to customers if they log on with their social media accounts such as Facebook, Google+ and Twitter, and offering bonus deals such as discounts if the customer chooses to share their location.
- Other wi-fi companies such as Purple WiFi are also investing in both New Zealand and Australia with data mining through social media logins. Purple WiFi claims they are working with major telecom providers in both New Zealand and Australia.

Papua New Guinea

The state of telecommunication and ICT provision, use and policy

- Regulator: National Information And Communication Technology Authority (NICTA)

Market structure (level of competition)

- No current MARKET STRUCTURE data
- The industry is moving from vertical to horizontal integration. PNG's state-owned incumbent Telikom is being restructured to focus on retail services and its network will be transferred to a new state-owned company, DataCo. Any service provider in PNG will be able to lease bandwidth at non-discriminatory wholesale prices from DataCo.

Mobile market

- Mobile broadband is proving far more successful than fixed-line broadband, having reached an estimated 9 per cent penetration. The number of mobile broadband users is expected to grow strongly as Digicel continues to expand its 3G and 4G networks.
- 41 per cent mobile subscription penetration
- Progress in telecommunications has come primarily from mobile networks, triggered by the start of competition in 2007, with accessibility expanding from less than 3 per cent population coverage in 2006 to almost 80 per cent in 2015. When it entered the market, Digicel brought mobile services to unserviced areas and slashed prices. The result was a substantial increase in mobile penetration – from 1.6 per cent in 2006 to 35 per cent in 2015. This is still extremely low and barriers to uptake remain. PNG is still one of the least affordable mobile markets in the Pacific.
- Despite the increase in mobile coverage, most rural areas still have only 2G services.

Home access (computer and internet)

- Network deployment costs are high in PNG due to the relatively low subscriber base, the impervious terrain, and the high proportion of the population living in rural areas. As a result, fixed telecom infrastructure is almost inexistent outside urban centres, leaving most of the population unserviced.
- 7 per cent using the Internet
- 3.4 per cent of households have a computer at home
- 2.9 per cent of households have Internet access at home
- Even since the introduction of competition Internet access has remained expensive and far beyond the means of the majority of the population. Throughout much of the country, Internet access is not available.

National policy framework

- To address communication infrastructure shortcomings, the government is deploying a National Transmission Network, which is expected to boost bandwidth and encourage market competition. It will be managed by state-owned PNG DataCo, which will act as wholesaler.

Telco funding opportunities (USOF)

- No USOF info

Public wi-fi developments

- Public wi-fi is only available in select locations in the capital, Port Moresby. It is prohibitively expensive for most public users.
- The lack of connectivity has been raised as a barrier to citizens being able to exercise their right to be part of the digital economy.
- In 2007, only one provider (Daltron) providing public wi-fi (note: not free wi-fi). The hotspots were located in affluent parts of the capital (including the local yacht club and the Crowne Plaza Hotel).
- In 2009, private communications technology company Online South Pacific launched 'WiMax', an initiative to provide wireless technology for businesses to provide wi-fi to customers. It was launched in both PNG and Fiji (known as Unwired Fiji).
- OSP provides wi-fi hotspots at both the domestic and international airport terminals in PNG, as well as at a number of hotels.

People's Republic of China

The state of telecommunication and ICT provision, use and policy

- Regulator: Ministry of Industry and Information Technology of the People Republic of China (MIIT).

Market structure (level of competition)

- MARKET STRUCTURE: Limited Competition: Local Fixed Line Services P* P: 1994, Domestic fixed long distance P* P: 1994, International Fixed Long Distance P* P: 1994, Mobile P* P: 1994, IMT (3G, 4G, etc.) P* P: 2009, Wireless Local Loop P* P: 1994, DSL P* P: 1994, Cable modem2009 N, Fixed Wireless Broadband P* P: 1994, Leased Lines P* P: 1994, International Gateways P* P: 1994, Internet Services C*, Cable Television2009 N, Fixed Satellite Services (FSS) P* P: 1994, Mobile Satellite Services (MSS) P* P: 1994, VSAT C*

Mobile market

- 89 per cent mobile subscription penetration
- 46 per cent using the internet
- Total mobile subscribers were close to 1.3 billion by the start of 2015, with almost 40 per cent of these being 3G. There had been a surprising surge in 4G/LTE services as China Mobile rapidly expanded its TD-LTE network. It claimed more than 50 million subscribers by late 2014.
- The number of internet users had passed the 650 million mark by mid-2014, increasingly accessing websites via mobile phones.

Home access (computer and internet)

- 43.8 per cent of households have a computer at home
- 43.9 per cent of households have Internet access at home

National policy framework

- The telecom market experienced a settling in period after the government initiated a major industry restructure in 2008 for fixed line mobile operators.
- China continues to build a substantial world-class telecommunications infrastructure and the investments show no sign of abating.
- China's National Broadband Plan aims to increase the number of fixed-line broadband households and public wi-fi hotspots, and provide 4M broadband for almost 500 million mobile Internet users.

Telco funding opportunities (USOF)

- No substantive USOF

Public wi-fi developments

- Lijiang Gaokuai Passenger Coach Station in China has installed a free wi-fi system on nearly 50 buses to provide Internet access for passengers.
- Chinese digital television advertising company VisionChina Media, has partnered with Qianhai Mobile to extend its free wi-fi (Vifi) on buses services. It currently offers free wi-fi on 15,000 buses throughout the country with a hit of 3 million users per day. This new deal has secured 35,000 buses including in major locales such as Shanghai and Schenzhen.

- China's National Broadband Plan aims to increase the number of fixed-line broadband households and public wi-fi hotspots.
- To ease pressure on the bandwidth, China Mobile, is deploying wi-fi within its network. The company claims to have the largest carrier wi-fi in the world with 6 million access points.
- In 2014, China and ASEAN proposed to develop a shared network to promote trade, information sharing, and a system capable of providing 'disaster assessment and precautions'. The proposal included provision of public wi-fi. It was proposed that the 'forthcoming Asian Infrastructure Investment Bank' would 'help with its construction'.
- As part of a 'Smart Cities' push in China, Ruckus Wireless secured a partnership with a large local telco, Shenzhen Topway Video Communication to roll out a 'Smart Wi-fi Municipal Area Network (MAN). It will include indoor and outdoor spaces, hospitals, transportation, shopping centres and restaurants.
- Wireless company Baidu, signed one of the country's largest wi-fi networking deals with 16WiFi and VisionChina Connected (the two largest wi-fi providers in the country). The investment is said to have cost in the vicinity of USD$27 million for Baidu.
- Skeleton Key apps that allow users to access free wi-fi without the need for passwords (through crowdsourcing passwords), have become increasingly popular in China, with one app company (Skeleton Key Wifi) claiming that they have 270 million active users in the country. This app in particular has access to all 8 million hotspots run by the country's largest telecom provider China Mobile.
- In 2014, China Mobile stated that it would stop expanding its wi-fi network due to its 'uneconomic' nature. Despite the company commanding 74% of all wi-fi data traffic in the country, but made up only 2.4 per cent of all revenue.

Peru

The state of telecommunication and ICT provision, use and policy

- Regulator: Organismo Supervisor de Inversión Privada en Telecomunicaciones (OSIPTEL)

Market structure (level of competition)

- Competition in all telco segments
- As of 2014 the telecommunications market has a number of commercial players including Telefónica (Movistar), América Móvil (Claro) , mericatel Perú (Emtel), Viettel– with Virgin Mobile planning to enter the market as a Mobile Virtual Network Operator (MVNO)

Mobile market

- 98 per cent mobile subscription penetration
- 39 per cent using the internet
- Peru's mobile penetration is below the regional average, and also hides the fact that about one quarter of the population has no mobile phone at all, while many Peruvians – especially urban dwellers – have multiple mobile subscriptions.
- Only a small fraction of the population use advanced devices

Home access (computer and internet)

- Peru's fixed-line teledensity is the third lowest in South America after Bolivia and Paraguay. Fixed-line infrastructure remains poor in many rural areas with mobile services the preferred alternative.
- 32 per cent of households have a computer at home
- 22.1 per cent of households have internet access at home
- Broadband penetration is considerably lower than the regional average. The country remains affected by wide-scale poverty, limited levels of literacy, low computer penetration, and poor competition, which has made broadband services among the slowest and most expensive in the region. A 2012 report stated that Internet at home penetration in rural areas 'barely reached' 0.5 per cent of homes (Galperin H et al., 2012, p.7)
- Strong broadband growth is predicted in the next five years as a result of the government's national broadband plan which aims to provide internet connectivity via a fibre-optic backbone to many less urbanised regions. Mobile broadband will be the main growth platform.

National policy framework

- Peru has made significant progress in privatisation and liberalisation over the past several years. In 1994 a legislative change opened the telecom market to competition, but protected the incumbent operator for a period of five years.
- The government has shown express interest in opening up competition and as part of the national broadband plan, it is exploring the possibility of a private partnership and further regulatory measures (Galperin H et al., 2012, p. 16)

Telco funding opportunities (USOF)

- USOF: The Fondo de Inversión de Telecomunicaciones (FITEL) or Telecommunications Investment Fund (1991), is regulated by the Ministry of Communications (formerly by OSIPTEL, the regulatory agency), and is part of the same instrument. It provides subsidies for telecom services in rural areas

and other places that are considered uneconomical (Main funding source (FITEL) consists of 1 per cent of all telecom and CATV operator gross revenues)

- As part of Movistar's licence renewal in January 2013, it must invest $1.15 billion to expand coverage to unserviced areas and provide free broadband connections to state schools, healthcare centres, and police stations.

Public wi-fi developments

- In 2013 Chilean based wi-fi company GestSol was finalising deals with the Peruvian government to provide public wi-fi (not free) in the country. GestSol's work includes wi-fi investments in low income urban areas where large telco presence is minimal and also on public transportation. The company is also working on a similar business initiative in Colombia.
- Ruckus Wireless also boasts a strategic presence in Peru with the 'WIGO Libre!' wi-fi service that provides free wi-fi in public places, both indoor and outdoor in the nation's capital, Lima. The wi-fi service has wi-fi spots throughout the city, including in the national stadium and high profile tourist destinations and shopping centres. It works by offering wi-fi access through social media accounts (such as Facebook) for a 30 minute period and offers bonus discounts, deals and advertising for local businesses.

Ref: Galperin H, Mariscal J and Viecens F M 2012. 'An Analysis of National Broadband Plans in Latin America', report prepared for: Centro de Investigación y Docencia Económicas A.C., December, No. 274.

Philippines

The state of telecommunication and ICT provision, use and policy

- Regulator: National Telecommunications Commission (NTC) - Revised legislation to create a new Department of Information and Communications Technology (DICT) was proceeding in early 2015.

Market structure (level of competition)

- Competition in all telco segments
- While the telecom sector in the Philippines has witnessed considerable investment and business activity since deregulation gained momentum from 1993, the market has continued to fall short of its full potential. PLDT had been the private monopoly holder prior to this.

Mobile market

- 114 per cent mobile subscription penetration
- 45 per cent using the internet
- The Philippines mobile market took off in 2000, with the rapid uptake of SMS as a means of communications. At its peak, around two billion SMS messages were being sent every day in the Philippines. While the SMS market has recently declined with the uptake of internet-based social media, the country reportedly continues to generate the largest SMS volume in the world.
- There is poor connectivity particularly in rural areas where return on investment concerns have curtailed 3G or 4G network rollout.
- The penetration of smartphones in the Philippines is behind other Southeast Asian countries (15 per cent compared to Indonesia 23 per cent; Thailand 49 per cent; Malaysia 80 per cent; and Singapore 87 per cent).
- In early 2015 BellTel entered the Philippines mobile market as the fourth mobile operator (others are PLDT, Globe and ABS-CBN Mobile).
- Smart was leading the deployment of 4G LTE mobile services across the country, with its 4G network covering more than 85 per cent of the population.

Home access (computer and internet)

- 18.7 per cent of households have a computer at home
- 22.9 per cent of households have Internet access at home
- The country's fixed-line subscriber penetration remains low and stagnant. Despite the effort of both the government and the operators to expand the national fixed network, fixed-line teledensity stood at just 3 per cent in 2015; a little more than half of all Philippine towns and cities had a basic fixed telephone service at that stage.
- Compared with most of its Asian neighbours, the Philippines has moved slowly on the adoption of Internet. Broadband is finally building a subscriber base. There has been good progress in the rollout of optical fibre, although not on the national scale envisaged. Instead broadband connectivity has been boosted by the considerable presence of mobile broadband services. While there are over 8 million broadband subscribers this still only represents 8 per cent population penetration.

National policy framework

- The Philippine Digital Strategy (2012-2016) and the National Broadband Plan has provided set targets for the provision of basic access to the Internet, with the goal to achieve seamless connectivity between government, business and the home. The government has attempted to implement the National Broadband Plan through a multi-stakeholder process.
- The "E-Government Master Plan: Where We Are Now?" and the "Government Network: Faster Delivery of Services to Citizens" addressed the state of government services in relation to the Free Wi-Fi Project. These programs will be augmented by the Free Wi-Fi Project's planned infrastructure and interlocked by the Project's final goal of Digital Empowerment. These were launched in July 2015 as part of National Science and Technology Week.

Telco funding opportunities (USOF)

- Has no USOF (2013)

Public wi-fi developments

- The Juan Konek! Digital Empowerment Program's Free wi-fi Internet Access in Public Places project of the Department of Science and Technology's Information and Communications Technology (ICT) Office is set to bring Internet connectivity to class 4, 5, and 6 municipalities in the country. It recently received a three billion peso upgrade from the Senate and will be a nationwide project. Sec. Montejo hopes to provide free wi-fi internet access in select public spaces in the country to include: public plazas and parks, public primary and secondary central schools, public libraries, rural health units and government hospitals, state universities and colleges train stations of the MRT and LRT systems, airports and seaports city and municipal halls and national government offices. According to DOST, once fully deployed, the project will serve 105,000 concurrent users with an average speed of 256 kbps each. It will be subjected to data volume based Fair Usage Policy to promote an equitable distribution of the public service.
- In order to address issues surrounding the 'digital divide' the Philippines government will deploy satellite technology to help speed up access for remote and low income areas. It is hoped that such an initiative will enhance connectivity penetration and smartphone uptake.

Republic of China (Taiwan)

The state of telecommunication and ICT provision, use and policy

- Regulator: Technologies Administration Department for Infrastructure Sharing and Planning Department for LLU of NCC

Market structure (level of competition)

- Chunghwa Telecom's Optical Era Project will see investment of US$1.8 billion to construct an island-wide fibre-optic network over five years. The company aims to have 97 per cent of its broadband network capable of speeds over 100Mb/s by 2016.
- Taiwan has one of the most advanced telecommunications networks in Asia. With excellent telecommunications infrastructure in place, continuing infrastructure investment and the innovative use of breakthrough information technologies, the country continues to be well placed to drive both mobile and data communications services.

Mobile market

- 127 per cent mobile subscription penetration
- 80 per cent using the internet
- Although expansion of the mobile subscriber base has stalled revenue growth has remained strong as users rapidly switch to new technologies. Subscriptions to 3G have grown rapidly on the basis of rising competition and the expansion of handset and applications availability. By 2013 3G accounted for 90 per cent of all subscriptions with the rapid uptake of smartphones subsequently driving data revenue – it now accounts for more than 35 per cent of total telecom service revenue. In 2014 4G services were launched.
- Mobile broadband is driving more vibrant online commerce, entertainment and advertising to 2015 and in particular mHealth.
- LTE licensing set to take place in 2014 following completion of spectrum auction. (Taiwan will remain the only major market without LTE in region for the next few years.)

Home access (computer and internet)

- The Taiwanese market has rapidly become a significant player in broadband internet access. By 2013 broadband penetration had exceeded 100 per cent (fixed-line and mobile services combined) with fibre connections the dominant access technology.

National policy framework

- Taiwan has a framework in which to implement universal services to bridge the 'digital divide' between rural and urban areas. In 2008 government project working with private telecommunication companies, *Broadband for Villages* was launched and rolled out in three provinces; with the government expecting a further rollout to include outlying islands and tribes.

Telco funding opportunities (USOF)

In 2006 Taiwan broadened its universal service obligation to include broadband in uneconomic areas.

Public wi-fi developments

- Taiwan was an early adopter of public wi-fi. In 2004 Taipei launched a municipal wi-fi project (WiFly) as a partnership between Taipei City Government and two commercial hardware and network

developers. By 2006 there were approximately 4,000 access points deployed with a coverage of 2.3 million people. Pre-dating tablet and smartphone device technology, this early development had little use, with some estimates of 30,000 regular logins.

- In 2011, Taiwan rolled out a 6 month free wi-fi hotspot trial across the country with 2,500 spots.
- By 2012, major mobile telco, Far EasTone Telecommunications planned to roll out 36,000 hotspots for its mobile users (up from its then current 25,000 hotspots). The company's executive director Jeffrey Gee stated that this was a concerted push to offload traffic onto the wi-fi network.
- In 2013, the company partnered with Aptilo Networks – a company that specialises in enabling wi-fi offloading.
- Tourists in Taipei are able to access free wi-fi in selected outdoor and indoor spots after registering an account at a Visitor Information Centre.

Russia

The state of telecommunication and ICT provision, use and policy

- Regulator: Ministry for Communications and Informatisation of the Russian Federation (Minsvyaz)

Market structure (level of competition)

- MARKET STRUCTURE Competition across some/all telco segments
- Russia's huge and fully liberalised telecom market is supported by a population of about 143 million. The market is dominated by the western regions where the main cities and economic centres are concentrated. Efforts continue to be made to improve infrastructure in remote areas, where many smaller towns still lack mobile or internet services.

Mobile market

- 153 per cent mobile subscription penetration
- 61 per cent using the internet
- Russia has the largest mobile market in Europe and a penetration rate of about 170 per cent. Although a number of operators offer services, the market is dominated by three major players that expanded nationally through the acquisition of smaller regional carriers.
- The deployment of HSPA and LTE networks presents a new growth opportunity through the offering of mobile broadband services.

Home access (computer and internet)

- 69.7 per cent of households have a computer at home
- 67.2 per cent of households have internet access at home

National policy framework

- Russia plans to make 100 Mbps, or Ultra-Fast Broadband (UFB), available to 80 per cent of Russian residents by 2018, with the ultimate goal of providing accessible and affordable broadband to 95 per cent of households by 2020.

Telco funding opportunities (USOF)

- No USOF info

Public wi-fi developments

- In 2009, Russian mobile operator Vimpelcom rolled out 16,000 wi-fi hotspots across 40 cities at a cost of USD$24 million. It had approximately 100,000 active users at the time. It was part of an earlier (2007), ambitious plan by Golden Telecom (that was later bought out by Vimpelcom) to have Moscow, the largest wi-fi network in Europe and second largest in the world.
- Moscow Metro tenders for Wi-fi contract across its network;
- In 2014, the Russian government made a contentious decision requiring all public wi-fi users to provide identification. It was part of a large crackdown on what was traditionally a largely unregulated internet space. The identity checks were part of the state's 'terrorism and security' regulations.

Singapore

The state of telecommunication and ICT provision, use and policy

- Regulator: Infocomm Development Authority of Singapore (IDA)

Market structure (level of competition)

- Competition in all telco segments
- With strong leadership from its government, a progressive regulatory environment and good support from its telecom service providers, Singapore is both a regional leader and a global player in telecommunications with a highly competitive local market. The nation is determined to maintain its status and in the process it has been embarking on new and innovative telecom and IT projects. Typical of this emphasis on taking the lead, in 2014 SingTel and Huawei agreed to collaborate on 5G research and trials.
- Although incumbent Singapore Telecommunications (SingTel) continues to play a major role in the local telecom sector, liberalisation has seen a significant number of new operators entering the market, helping to exploit the competitive situation. Singapore had one of the lowest mobile prices in the world as a proportion of income, according to the ITU's ICT development index.
- The arrival of strong competition in its own backyard saw SingTel expand offshore and, in what eventually turned out to be a successful strategy, the company has been able to establish a considerable presence in regional markets, including 100 per cent ownership of Optus, the second ranked mobile operator in Australia. Its offshore presence includes subsidiaries in India, Indonesia, the Philippines, Thailand, Pakistan and Bangladesh. Through its alliance with Bharti Airtel in India it has further market presence in Bangladesh, Sri Lanka and Africa.

Mobile market

- 156 per cent mobile subscription penetration
- 73 per cent using the internet
- Singapore's 3G market segment has been on a growth surge over recent years but by 2014 it had already moved into decline with the advent of 4G.
- By August 2014 there were already 2.8 million 4G subscribers, this being a remarkable 50% population penetration rate.

Home access (computer and internet)

- 86 per cent of households have a computer at home
- 86 per cent of households have internet access at home
- Singapore's fixed-line household penetration rate is around 100 per cent with many Singaporeans having two fixed telephone services at home.
- The Residential Wired Broadband Household Penetration Rate, for example, had reached around 108 per cent by mid-2014.

National policy framework

- In 2008 the IDA announced a USD725 million government investment to support development of a national optical fibre-based network as part of what was called the Next Generation National Infocomm Infrastructure (Next Gen NII). The strategy also included a wireless network. Despite slow rollout rates by 2014 the rate of take up of fibre-based services was impressive.

Telco funding opportunities (USOF)

- Has no USOF (2013)

Public wi-fi developments

- As part of the 'Intelligent Nation Masterplan (iN2015) in 2013, the new phase of the Wireless@SG programme saw an increase in access speeds for Singapore's free public wi-fi with estimates up to 2 Mbps. The push was for the development of seamless transition from carrier to wi-fi data.
- Inter-operator roaming will begin by the end of this month, enabling users to access the internet network island-wide.
- Like measures brought in in Russia, Singapore invested in SIM-based authentication 'to simplify the wireless login process'. Singaporeans have a one-stop access to over 400 government e-services via the eCitizen portal, and some 100 mobile government services via the mGov@SG mobile app. Singaporeans are also able to have quick access to letters from government ministries and agencies via their secure digital mailbox, OneInBox.
- Skyfii 2014 entry (pri-fi data mining) - With Indonesia having a vast population with a strong appetite and acceptance of free Wi-fi services, we see our expansion into the country as a natural fit for the Company."
- Joint agreement with Brunei, Indonesia and Malaysia to share the 700MHz bandwidth.
- Singapore is regarded as a leader of wireless infrastructure in the region.
- In 2015, telco Singtel will trial a wi-fi calling plan where customers will be able to make calls from either their own wi-fi or public wi-fi hotspots with seamless transitions being the key to its success.
- In 2015, the Infocomm Development Authority (IDA) launched the 'Smart Nations Innovations 2015' event. It was announced that there would be a major rollout of a plan in two phases with the ultimate goal being 100% connectivity, 100% of the time for all Singaporeans on the island through an initiative called: HetNet (abbreviated from Heterogeneous Network). The trial will start in the latter half of the year beginning at the Jurong Lake district and will focus on areas not traditionally earmarked for public wi-fi access points such as lifts and void decks.
- The proposed plan will included sensors for fitness trackers, smartwatches and other wearable technologies. Sensors placed across the city will be constantly transmitting all kinds of data, including communication, health, entertainment, traffic. They will all need to talk to each other, and to their own providers, whether to inform, for example, a person's doctor of their heart condition or to alert the authorities of possible traffic congestion. Interoperability and compatibility will be key factors in all this stream of data reaching its intended destination.
- The IDA states that all three telcos — Singtel, StarHub and M1 — and fibre broadband service provider MyRepublic will be involved in the trial.

South Korea

The state of telecommunication and ICT provision, use and policy

- Regulator: Korea Communications Commission (KCC)

Market structure (level of competition)

- Competition in all telco segments except Partial competition in Mobile, IMT (3G, 4G, etc.), Fixed Wireless Broadband, Cable Television (data is 2010)
- South Korea has one of the world's most active telecommunications and Information Technology markets backed by strong support from the government.
- Having invested significantly in 'basic' telecommunications infrastructure over past decades, the country now possesses well-developed national and international communications infrastructure.
- South Korea's operators have invested heavily in fibre based broadband deployments, laying the foundations for triple play services.

Mobile market

- 111 per cent mobile subscription penetration
- 85 per cent using the internet
- South Korea continues to be a booming mobile market as it rapidly takes up LTE and innovatively explores the options for value-added services. Strong LTE demand was supported by new LTE plans and introduction of more smartphones into the market resulting in ARPU trending upwards. 4G LTE now represents the majority of mobile connections after it was introduced in 2011. There has also been a rapid increase in mobile traffic, with potential profitability challenges ahead as operators are forced to spend on upgrading network capacity while at the same time reduce tariffs in response to competition.

Home access (computer and internet)

- 80.6 per cent of households have a computer at home
- 98.1 per cent of households have internet access at home
- South Korea has the world's highest number of broadband services per capita. Into 2015 approximately 40 per cent of the population and around 95 per cent of households were broadband subscribers. Into 2015, fibre technology accounted for almost 60 per cent of all broadband subscribers in South Korea while ADSL subscriptions had declined to less than 10 per cent, the remainder is due to cable modem subscribers.

National policy framework

- Government involvement continues with the aim of transforming the country into a knowledge-based information society in a 'smart-age'.

Telco funding opportunities (USOF)

- No USOF info

Public wi-fi developments

- Congestion has led to offload investments in Wi-fi and WiMAX.
- In 2011, Seoul had no wi-fi access to more than 83% of its outdoor areas. But with the rapid uptake of smartphones and tablets at that time, the government launched a US$44 million project with the three larger telcos investing the funds to roll out the wi-fi infrastructure that was first initiated on public transport, including taxis.
- In 2013, the government launched a new plan to roll out wi-fi to remote communities, with particular focus on public health and welfare places and community centres. It stated that this was imperative to help alleviate the costs associated with mobile technology for users. At the time of the launch of the new plan, 53% of the public wi-fi spots were located in Seoul alone.
- The Nation's capital, Seoul offers tourists free Instagram access via the public wi-fi service which is a government run free public wi-fi initiative with over 10,000 hotspots scheduled to be in place by the end of 2015 (there are many more free public wi-fi access points other than this specific initiative).

Thailand

The state of telecommunication and ICT provision, use and policy

- Regulator: The National Broadcasting and Telecommunication Commission (NBTC)

Market structure (level of competition)

- MARKET STRUCTURE: Partial Competition - Local Fixed Line Services C*, Domestic fixed long distance C*, International Fixed Long Distance C*, Mobile P*, IMT (3G, 4G, etc.) P*, Wireless Local Loop P*, DSL C*, Cable modem P*, Fixed Wireless Broadband C*, Leased Lines C*, International Gateways C*, Internet Services C*, Cable Television C*, Fixed Satellite Services (FSS) C*, Mobile Satellite Services (MSS) P*, VSAT P*.
- More than 99 per cent of the market-share belong to three large operators. The once all-powerful duopoly - AIS and DTAC – still dominates the market despite the challenge of the other players. In reality, number three in the mobile market, True Move, was the only one to challenge the big two in any fashion. Other operators include the state enterprises TOT Public Company Limited (TOT) with 0.57 per cent market share, and CAT Telecom with 0.15 per cent market share.

Mobile market

- 147 per cent mobile subscription penetration
- 39 per cent using the internet
- Majority of mobile subscribers are pre-paid.
- In 2013 3G introduced and rapid migration of users to that service – approx. 80 per cent of current mobile subscribers. 4G LTE introduced in 2013, but only represents less than 2 per cent of market. Auction of additional 4G spectrum due in late 2015 with new services expected in 2016.
- Operators are looking at a variety of delivery methods to augment internet penetration. The burgeoning mobile market in Thailand ensured that mobile phones, as well as set-top boxes, were high on the list of potential delivery devices. At the same time, the cybercafe in its different forms had already established itself as a key element in the country's access equation.
- Most importantly, with 3G and even 4G services being rolled out in a significant way, mobile broadband and the smartphone and tablet market is booming. 2014 claims that 90 per cent of 18-24 year olds access the internet via mobile phone. Social media is a significant driver of internet activity.

Home access (computer and internet)

- 28.7 per cent of households have a computer at home
- 22.7 per cent of households have internet access at home
- Fixed line penetration is less than 9 per cent of population and less than 6 per cent in rural areas.
- The Thai internet market has been continuing on a growth path over the last number of years. Thailand still has a lot of development work to do to catch up to some of the other countries in the region.

National policy framework

- The Thai telecom industry has experienced a stop-start approach to sector reforms and deregulation. An important step was taken with the Telecommunications Act being adopted as law in 2000, but successive governments have moved slowly on its implementation. A range of deregulation issues are still to be addressed. One of the big structural reform issues – the defining of the roles and the restructuring of state telecommunication enterprises TOT and CAT demands urgent attention.

Telco funding opportunities (USOF)

- USOF is 4 per cent total gross revenues all operators (turnover)

Public wi-fi developments

- The ministry kicked off the first phase of the nation's free public wi-fi service with 10,000 spots nationwide in late December 2011, such as in public areas, city halls, airports and inter-provincial bus stations. The Information and Technology Ministry targeted under this plan to expand the service to cover total of 250,000 spots nationwide by 2017.
- By 2012, the government launched a 'Smart Thailand' plan that included the expansion of wireless technologies, in particular, public wi-fi in remote areas. There was a pilot program called 'Smart Province' launched in Nakhon Nayok. Part of this pilot project was a requirement of the private sector to provide free wireless internet services that would benefit both locals and tourists visiting the area.
- 2012 also marked a number of other free (or low cost) wi-fi services throughout the country. The ICT Ministry will initiate free Wi-fi projects in collaboration with service providers, to offer the service in remote areas - called the last-mile areas - where fibre optic networks have not reached, and in cities throughout the country.
- In the initial phase, the project aimed to have 20,000 wi-fi hot spots at public areas such as airports, public transportation venues, government offices, and universities. It was earmarked to be provided by TOT Corporation and CAT Telecom. The next phase aimed to welcome private sectors to join the project and have 250,000 free wi-fi hot spots throughout the country by 2017.

United States

The state of telecommunication and ICT provision, use and policy

- Regulator: Federal Communications Commission (FCC); National Association of Regulatory Utility Commissioners (regulators of individual states) (NARUC); CTIA – The Wireless Association (CTIA)

Market structure (level of competition)

- MARKET STRUCTURE: Competition in all telco segments
- The US broadband market is currently witnessing significant investment activity in fibre deployments, HFC upgrades and mobile broadband network rollouts.
- Broadband services in most regions still lack effective competition, with the AT&T and Verizon managing an effective duopoly in many areas of the country.
- Municipal activity, often geared at breaking this stranglehold and introducing competition and innovation, continues to be stymied by lobbying pressure from these main telcos, which has led to at least 19 states banning or restricting municipal or state-led infrastructure projects. Much of the investment in fibre is being undertaken by a significant number of smaller players and municipalities rather than the two key telcos, which are concentrating on a hybrid fibre/copper network.

Mobile market

- 96 per cent mobile subscription penetration
- 84 per cent using the internet
- Mobile data use remains strong in line with the fast development of LTE networks and the high take-up of smartphones, which now account for about 80 per cent of all handset devices on mobile networks.

Home access (computer and internet)

- 80 per cent of households have a computer at home
- 77.3 per cent of households have internet access at home

National policy framework

- There is now a growing consensus, supported by the President in his 2015 State of the Union address (that intimated an end to state legislation banning municipal broadband networks), that such restrictions should be lifted. The FCC Chairman in February 2015 proposed measures which would reclassify broadband as a telecom service rather than a content service, and would extend network neutrality conditions to mobile broadband services. The FCC is also determined to use its authority to override restrictive state laws.

Telco funding opportunities (USOF)

- USOF The Commission has designated the Universal Service Administrative Company (USAC), an independent, not-for-profit corporation, as the administrator of the federal Universal Service Fund (see http://www.usac.org/default.aspx). Gain fees from Telecommunications carriers and certain other providers of telecommunications that provide service between states and internationally must pay a specified percentage of their interstate and international end-user revenues into the Universal Service Fund. This percentage is called the "contribution factor". The contribution factor changes four times a year (quarterly) and is increased or decreased depending on Universal Service program demand and the revenues reported by contributors.

Public wi-fi developments

- Public wi-fi development in the United States has been characterised by private companies seeking to inhibit free public wi-fi initiatives. Most notably were the wireless mesh network set up post hurricane Katrina in New Orleans (set up to provide emergency access) with incumbent providers (who were still struggling to re-establish) seeking to curb and dissuade local government support for its continued existence; as well as the broader national free public wi-fi plan that had been in talks for many years. Under the proposal, the FCC would provide free, baseline Wi-fi access in 'just about every metropolitan area and in many rural areas' using the same air wave frequencies that empower AM radio and the broadcast television spectrum. Under the plan, local television stations would sell a chunk of their air wave spectrum rights to the government. Those frequencies would be used for public wi-fi networks.
- Many of the major providers already provide 'free' public wi-fi to their customers. However, there is no universal access and the free public wi-fi proposed by the FCC seeks to rectify that.
- The term 'muni-wifi' refers to the mesh wi-fi networks set up in towns to provide free public wi-fi. Again, these initiatives are openly scorned by private corporations, telcos and lobbyists.
- In 2015, Google launched 'Sidewalk Labs' which proposes to bring free public wi-fi to the streets of New York City. It is part of a larger push by Google to have a system of cities globally linked with free public wi-fi under the more ambitious scheme 'Intersection'.
- Republic Wireless, a US based company sells mobile phones that will first access wi-fi to make calls, falling on the telco Sprint, if no wi-fi is available.

Vietnam

The state of telecommunication and ICT provision, use and policy

- Regulator: Vietnam Telecommunication Authority (VNTA); Ministry of Information and Communications

Market structure (level of competition)

- MARKET STRUCTURE: Competition in all telco segments except monopoly in mobile and fixed satellite
- Vietnam has for some years now been aggressively expanding its national infrastructure and growing its subscriber bases across all market segments.
- A general process of rationalisation has clearly been taking place in the market.

Mobile market

- 131 per cent mobile subscription penetration
- 44 per cent using the internet

Home access (computer and internet)

- 19 per cent of households have a computer at home
- 17.1 per cent of households have internet access at home
- The excellent national coverage of fixed-line infrastructure achieved is valuable but the fixed-line telco market segment has declined.
- The internet market, and particularly the roll-out of broadband internet, was still in a relatively early stage of development. The major push is in mobile rather than fixed line broadband.

National policy framework

- Over the years Vietnam's progress on regulatory reform in the telecom sector has moved along in an erratic fashion. Certainly good progress was made in the lead up to WTO accession in 2007, but many initiatives subsequently stalled. By 2014 the government was finally addressing the restructure of the incumbent state owned telco - VNPT.

Telco funding opportunities (USOF)

- USOF - 1 to 3 per cent (highest for Mobile)

Public wi-fi developments

- In 2014, the coastal city of Da Nang after a year long trial officially launched wi-fi coverage over its territory. It was introduced to promote tourism and to help build 'smart urban infrastructure'. Initially it will be a free service until the end of 2016, after which, users wanting a better connection will have to pay a fee.
- The central city's Information and Communications (IC) department in co-operation with Sai Gon Post and Telecommunication (SPT) Company has developed a digital marketing service, the S-wi-fi, for public wireless users. The S-wifi, developed on the World Bank-funded Information Technology infrastructure system in Da Nang city, allows 40,000 connections on the wireless public marketing service. This service is available in Ho Chi Min City and Can Tho respectively as well as in Dan Nang.