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A Results-oriented approach to APEC's Supply Chain Connectivity Initiative

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EXECUTIVE SUMMARY

A holistic approach to supply chain connectivity requires a holistic framework for monitoring progress and evaluating outcomes

At the Senior Officials Meeting (SOM) in July 2009, the Policy Support Unit (PSU) was requested to develop holistic measurement tools that are applicable to APEC's Supply Chain Connectivity Initiative (SCI). It was recognized that the World Bank's Logistics Performance Index (LPI) was one possible tool, but that other measures could also be used. In particular, the SOM highlighted the need to be able to measure achievements in such areas as enhancing multimodal connectivity, improving harmonization of cross-border standards, and promoting competition.

The PSU agrees that the LPI could be augmented with additional measures and proposes the use of a results framework to capture the performance measurement of the SCI in a holistic manner. A results framework is a performance measurement tool to assist with achieving and measuring specific objectives. It lays out the logic of a strategy by linking high-level objectives to program-level outcomes (and ultimately individual activities) and then sets out a means by which achievement at all levels of the hierarchy can be measured.

Building a results framework must be based on a good understanding of the issues and possible approaches or solutions to the problem. Theory and empirical evidence should be able to support the linkages between higher level objectives and lower level actions.

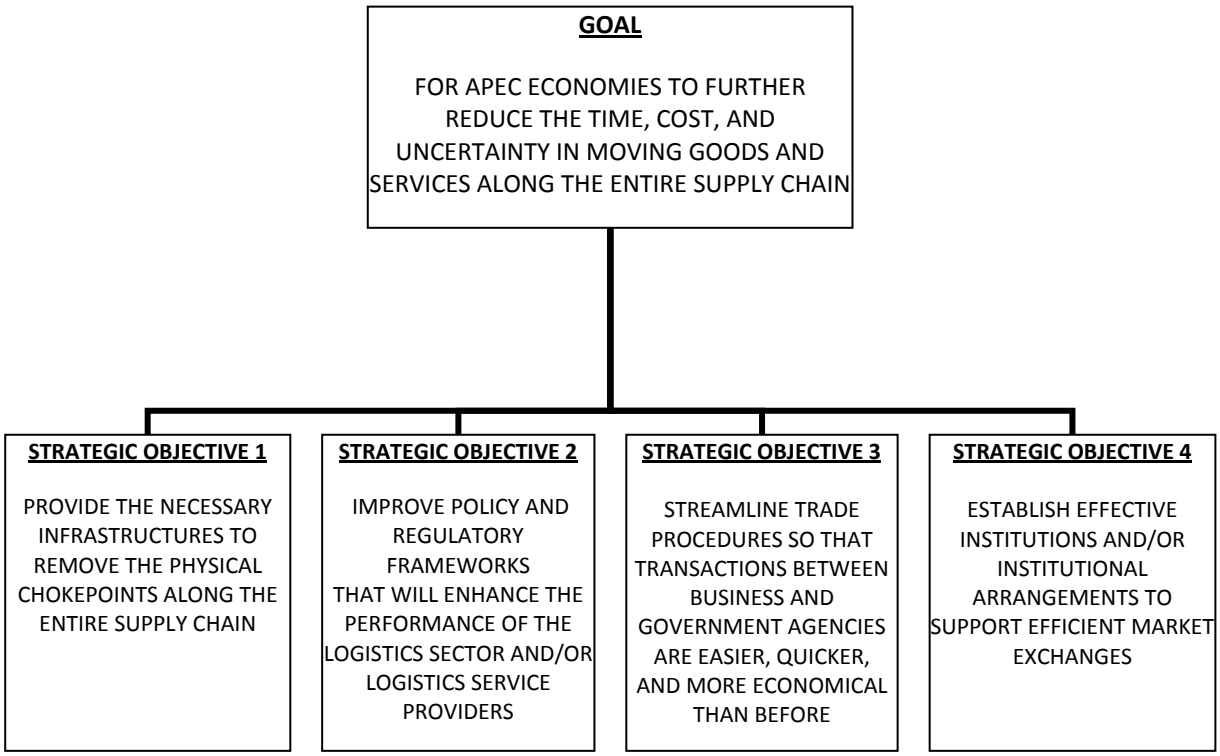
A review of the logistics performance of APEC economies reveals commonalities in the factors which explain performance but highlights differences in their significance to each economy. The chokepoints to supply chain connectivity (i.e. factors which contribute to higher cost, time delays, and/or greater uncertainty in moving goods and services along the supply chain) can be categorized under four general groups – physical or hard infrastructure, policies and regulations governing the logistics sector or logistics service providers, trade procedures, and institutions aimed at supporting market exchanges.

Infrastructure chokepoints could exist in terms of availability, capacity or quality. Policy and regulation chokepoints could mean the presence of regulations that constrain service delivery and quality or the absence of policies that would promote efficient industry outcomes (e.g. competition policy). With respect to trade procedures, chokepoints include burdensome requirements and time-consuming procedures. Finally, chokepoints that emanate from ineffective institutions could arise from arbitrary decision making or non-transparent rule making. As the movement of goods and services along the supply chain involves many sectors, agencies, and jurisdictions, the lack of policy coordination or a weak mechanism for policy coordination also constitute a major chokepoint under ineffective institutions.

If the goal of the SCI is to be evaluated in terms of reducing cost, time, and uncertainty in moving goods and services along the entire supply chain then in order to achieve the goal, APEC must address the factors which contribute to driving up cost, time, and uncertainty in all four fronts although specific chokepoints will have varying degrees of relative importance among the economies.

The results framework seeks to link the high level objective (goal) that is to be achieved, and how it is to be achieved by identifying a range of key strategic objectives.

As applied to the case of the SCI, the following objective tree could be derived:



Under each strategic objective, actions that will contribute to achieving the objective are identified.

It is recognized that the complexity and dynamism of global supply chain management is such that external factors will continuously affect any results framework for APEC's Supply Chain Connectivity Initiative (these are typically built into the results framework under assumptions or risks). Given the very dynamic nature of global logistics, attribution of logistics performance to specific public sector actions would be very difficult to measure in precise terms. The desired impact of reduced cost, time, and uncertainty will result from a confluence of many factors, not all of which are within the control of policy-makers. However, the logic behind the SCI is that further improvements in cost, time and uncertainty reductions can be achieved by addressing chokepoints that are within the purview of the public sector. If we cannot attribute the achievement of the goal solely to the SCI, we should at least be able to link successes in achieving the strategic objectives to APEC actions.

The results framework sets out the performance information that will demonstrate that these objectives are being met and how this performance information (whether qualitative or quantitative) is to be gathered. It also sets out what else needs to happen to achieve success which is outside the control of the managers of the initiative but is crucial for the objectives to be realized.

For the case of the SCI, top level (strategic) and bottom level (implementation) results framework could be as follows:

STRATEGIC LEVEL RESULTS FRAMEWORK

RESULTS OF ACHIEVING SCI GOAL AND STRATEGIC OBJECTIVES	PERFORMANCE OR SUCCESS INDICATOR	MEANS OF VERIFICATION	ASSUMPTIONS
IMPACT The time, cost, and uncertainty in moving the goods and services along the entire supply chain have been reduced.	Relevant LPI Indicators Relevant Trading Across Borders Indicators CIF-FOB Shipping cost	World Bank surveys Special studies	
OUTCOME 1 The necessary infrastructures have been provided	Infrastructure Index Infrastructure Quality Indicators	Various secondary sources	The state of the global and national economies is favorable The private sector takes advantage of the improved infrastructure by investing in appropriate conveyance and storage and locating their businesses appropriately
OUTCOME 2 Policy and regulatory frameworks have been improved	Trade Restrictiveness Index Perception of cost per sub-sector Perception of competence per sub-sector Trade in transport and communications	Special studies World Bank surveys IMF Statistics	The state of the global and national economies is favorable Stakeholders have the knowledge, capacity and incentive to consistently implement the new policies and regulations
OUTCOME 3 Trade procedures have been streamlined	Relevant Trading Across Borders Indicators Relevant LPI Indicators	World Bank Surveys	The state of the global and national economies is favorable Stakeholders have the knowledge, capacity and incentive to consistently implement streamlined procedures
OUTCOME 4 Effective institutions and/or arrangements have been established	Corruption Index Governance Indicators	World Bank Surveys	The state of the global and national economies is favorable On-going learning process in place for stakeholders in institutional process to ensure institutions/ institutional arrangements continue to operate effectively

IMPLEMENTATION LEVEL RESULTS FRAMEWORK

Actions that will contribute to achieving the objective are identified along with corresponding performance indicators. These could be a range of projects/programs each with its own objectives, outputs, activities and inputs.

Actions identified below are for illustrative purposes only. Moreover, it is acknowledged that technical expertise is required to develop appropriate performance or success indicators.

STRATEGIC OBJECTIVE 1 Provide the necessary infrastructures to remove the physical chokepoints along the entire supply chain.			
POSSIBLE ACTIONS	PERFORMANCE OR SUCCESS INDICATOR	MEANS OF VERIFICATION	ASSUMPTIONS
Establish an APEC PPP logistics infrastructure fund	Total value of fund Number of projects financed through fund	Reports from fund manager(s) Reports from each economy regarding infrastructure projects	Viable infrastructure projects are developed and implemented through APEC funding
Exchange of best practice in models of PPPs and in infrastructure finance	Information-sharing conferences on PPPs for logistics infrastructure are established.	Conferences occur on a regular basis (e.g. annually)	Lessons learned are shared and adopted by member economies
Link national transport plans to national and international needs in multi-modal platforms	Transport Plans are developed and approved Budgets are approved	Reports from each economy National budgets	Transport Plans are funded and implemented
Organize SCI financing conferences to showcase pipeline of viable infrastructure projects to private sector investors	Number of projects showcased Value of financing secured Number of participants	Funding targets for infrastructure projects are achieved Report from organizers	Resources and requirements are matched Partnerships are able to implement projects smoothly with visible and tangible results

STRATEGIC OBJECTIVE 2 Improve policy and regulatory frameworks that will enhance the performance of the logistics sector and/or logistics service providers.			
POSSIBLE ACTIONS	PERFORMANCE OR SUCCESS INDICATOR	MEANS OF VERIFICATION	ASSUMPTIONS
Remove need for drop and pull operations (Output: Removal of relevant regulatory restrictions)	Reduction in delivery time	Reports from economies APEC surveys	Drop and pull can be eliminated APEC economies are willing to ease restrictions on across borders movements of trucks.
Allow foreign licensed transport providers to move freely from port to factory in APEC member economies (Output: Mutual Recognition Agreements for drivers of vehicles and transport craft across borders Removal of relevant regulatory restrictions)	Reduction in delivery time No change to provider's trailer, chassis or driver Documented agreements	Annual survey of foreign licensed transport providers Reports from economies	All transport providers are treated uniformly APEC member countries are prepared to ease the restrictions on unhindered passage of foreign licensed logistics and transport providers
Accelerate the removal of restrictions on all-cargo services (Output: Air Services Agreements)	Designations Frequencies Capacity	Industry reports Reports from economies	The state of the global and national economies is favorable

STRATEGIC OBJECTIVE 3 Streamline trade procedures so that transactions between business and government agencies are easier, quicker, and more economical than before.			
POSSIBLE ACTION	PERFORMANCE OR SUCCESS INDICATOR	MEANS OF VERIFICATION	ASSUMPTIONS
Bonded Logistics Parks customs adopt common standards of inspection (once cleared always cleared policy) (Output: Goods are routinely cleared according to APEC standards of inspection Activities: • Implement a proper procedure manual for reporting lines and decision making • Ensure proper training of employees (including regular updates on new rules). • Ensure communication between Customs and industry is conducted by qualified employees. • Conduct periodic compliance checks with both employees and Customs Broker. • Obtain rulings on controversial areas from the Customs authority.)	Drayage cost at the BLP for standard container moves (e.g. TEU, FEU, and per pallet basis) Dwell time at the BLP waiting for connection Drop in complaints from exporters/importers Reduction in clearance times	Surveys of Importers and exporters Industry sources monitoring such barriers Minutes of APEC working groups	Trained personnel remain available Standards are uniformly applied at national customs agencies

STRATEGIC OBJECTIVE 4 Establish effective institutions and/or institutional arrangements to support efficient market exchanges.			
POSSIBLE ACTIONS	PERFORMANCE OR SUCCESS INDICATOR	MEANS OF VERIFICATION	ASSUMPTIONS
Promote regular consultations with the private sector (Output: Agreed action plan on priority issues affecting private sector performance)	Actions are taken on priority issues	Minutes of consultation meetings	Appropriate representatives from government agencies and industry involved. Agenda is narrowed to workable action plan. Stakeholders willing to disclose information.
Create single contact point for information on logistics regulations	Percent of APEC economies with single contact point	Reports from economies Business feedback Website Web-based client survey	Resources are provided to ensure that information is always complete and up-to-date

Conclusion

An overall holistic approach to supply chain connectivity is extremely ambitious. Moreover, committing to an SCI-wide agenda would give rise to high expectations for a broad range of outcomes. It leads to many objectives which include many more actions for which there are no comprehensive direct data alignments or sources. APEC efforts could be partially successful even if it only realizes some of the four outcomes but partial success would then be viewed against the higher initial expectations of holistic outcomes. It is important that APEC members focus their efforts on addressing respective priority chokepoints. Facilitating progress in the other outcome areas, or at least monitoring that progress, will ensure that expectations on what APEC can achieve will be more realistic and manageable. Alternatively, APEC could agree on a holistic approach to guide priority areas and objectives and publicly refer these particular issues as the deliverables. This may better attune performance expectations to the publicized scope of the SCI.

To increase the chances of successful implementation of the SCI, it is possible to assign one senior committee to champion each strategic objective. For example, the Senior Finance Officials Meeting (SFOM), the Economic Committee (EC), and the Committee on Trade and Investment (CTI) could be assigned to drive strategic objectives 1 (infrastructure), 2 (policy and regulatory frameworks), and 3 (trade procedures), respectively. The EC could also be responsible for strategic objective 4 (institutions and institutional arrangements) or alternatively, the SOM as the overall driver of the SCI could take charge with advice from the Anti-Corruption and Transparency Experts' Task Force. As champions, they would provide strategic direction in identifying related actions and activities and also implement some of these. The various relevant APEC sub-fora or sectoral working groups (e.g. services, transport, customs, etc.) should be involved in contributing to any one or more of the strategic objectives by focusing on the implementation of specific actions or activities which reflect their own areas of technical expertise.

An important issue that is not discussed in this paper is funding for the SCI. Once the action plan is developed, the plan must be translated into a budget and the required resources mobilized. To ensure that the results framework is implemented, an adequate budget must also be allocated for monitoring and evaluation of the SCI

Next Steps

The proposed results framework captures how APEC can measure success at each level of the SCI. A logical framework-type analysis such as this is meant to be done interactively with the stakeholders involved and evolve over time. Its advantage is the huge amount of information and analysis condensed in a page or two which serves strategic thinking with the implementation plan developed around this framework.

If there is agreement on the approach, then the next steps would be:

For the top level results framework (i.e. strategic level)

- rationalize indicators;
- establish baseline figures; and
- set targets.

For the bottom level results framework (i.e. implementation level)

- develop actions/activities;
- identify performance indicators for each action;
- establish baseline figures, and
- set targets.

This would be done on an ongoing basis as new actions are proposed throughout the life of the SCI.

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I. INTRODUCTION

A. APEC'S SUPPLY CHAIN CONNECTIVITY INITIATIVE

In response to the APEC Ministerial Meeting instructions in 2008 to make trade logistics a focus, APEC Senior Officials in February 2009 agreed to look into improving logistics and transport networks to enhance physical connectivity "across the border" to further reduce the time, cost, and uncertainty in moving the goods and services along the entire supply chain.[1] One estimate of the benefits to APEC of a 10% improvement in the efficiency of transporting goods between the borders of APEC economies were USD 21 billion (in 2004 real dollars). [2]

Recognizing that the efficiency of the supply chain is dependent on the weakest link, Singapore and Australia hosted the APEC Supply Chain Connectivity Symposium in May 2009 which broadly focused on the weak links or chokepoints in the trade arteries to which priority could be ascribed within a wider holistic approach to the entire supply chain. Key chokepoints that were identified along the three stages in the movement of goods and services include:

Behind the border:

- Lack of awareness and coordination among government agencies on policies affecting the logistics sector; Absence of a single contact point or champion agency on logistics matters
- Inefficient or inadequate transport infrastructure. Need for 'informed' infrastructure – roads, port capacity, air links. Align quality standards eg. Road links.
- Lack of capacity of local / regional logistics sub-providers.

At the border:

- Inefficient clearance of goods at Customs; Lack of coordination among border agencies especially relating to clearance of regulated goods 'at the border'.
- Lack of harmonization of customs documentation and procedures.

Across the border:

- Inefficient air connectivity
- Underdeveloped multi-modal transport capabilities
- Lack of harmonisation of cross-border standards and regulations
- Lack of regional cross-border customs-transit arrangements

For each chokepoint APEC's current actions were identified for the purpose of adopting existing work or identifying gaps which required further work. New actions and suggested coordinating groups to continue progress were also proposed.[3]

B. A HOLISTIC APPROACH TO PERFORMANCE MEASUREMENT USING A RESULTS FRAMEWORK

At the Senior Officials Meeting (SOM) in July 2009, the Policy Support Unit (PSU) was requested to develop "holistic tools that are applicable to APEC's Supply Chain Connectivity

[1] See Discussion Paper on REI "Across the Border": Chokepoints in the Supply Chain (SOM 2 Retreat 2009).
[2] See The Centre for International Economics (2009).
[3] See "APEC Supply Chain Connectivity (SCC) Framework and Action Plan," Committee on Trade and Investment Meeting on 25-26 July 2009 Singapore (2009/SOM2/CTI/008)

Initiative." It was recognized that the World Bank's Logistics Performance Index (LPI) was one possible tool but that other measures could also be used. In particular, the SOM highlighted the need to be able to measure achievements in such areas as enhancing multimodal connectivity, improving harmonization of cross-border standards, and promoting competition. The PSU agrees that the LPI could be augmented with additional measures and proposes the use of a Results Framework to capture the performance measurement of the Supply Chain Connectivity Initiative (SCI) in a holistic manner.

How do we know if we are making progress in achieving a goal? How do we know if the elements of a work plan are useful or contribute to achieving the goal? At the end of the life of the initiative, how will we know if it has made a tangible impact? To address these questions at the outset, the PSU considers the initiative should be developed – and a decision to proceed with that initiative – within a Monitoring and Evaluation (M&E) framework. In particular, a Results Framework is a performance measurement tool to assist with achieving and measuring specific objectives. It lays out the logic of a strategy by linking high-level objectives to program level outcomes (and ultimately individual activities) and then sets out a means by which achievement at all levels of the hierarchy can be measured. (AusAID 2005) The Results Framework must be applied and confirmed at inception so that there is a shared vision of what success looks like and agreement on what is an acceptable yardstick for success. Equally important to establish at the beginning of the initiative is to share responsibilities among the key players in achieving the desired results.

The discipline involved in developing such a framework will allow APEC to better understand the logic behind the SCI, identify key elements of the strategy, and suggest performance measurements as well as appropriate assessments. The Results Framework will thus reflect both a holistic approach in improving connectivity in the region and in measuring the performance of the SCI, as requested by SOM. Moreover, a results-driven approach to the SCI is in line with the new mission statement of APEC stating, among other things, that "Our initiatives turn policy goals into concrete results and agreements into tangible benefits."

II. KEY ELEMENTS OF THE RESULTS FRAMEWORK FOR AN INITIATIVE

A. THE RESULTS FRAMEWORK

The results framework seeks to set the high level objective (goal) that is to be achieved, and how it is to be achieved by identifying a range of key strategic objectives. It sets out the performance information that will demonstrate that these objectives are being met and how this performance information (whether qualitative or quantitative) is to be gathered. It also sets out what else needs to happen to achieve success which is outside the control of the managers of the initiative but is crucial for the objectives to be realized. These elements are classified as external factors or risks, or included as assumptions about the external environment.

Each strategic objective can itself be broken down logically into the outputs, or deliverables, that must be produced, the actions and activities needed to produce these outputs and the inputs (human, capital and financial) that are needed.

The framework can be represented by an objective tree/hierarchy which sets out positive statements from inputs to activities to outputs, intermediate objectives and higher order objectives. It can be formulated in terms of the problems or challenges that have to be addressed and converting these to positive objective statements.

For SCI, the positive goal statement of enhancing connectivity has been addressed by considering the problems and challenges that need to be overcome. These have been identified in terms of key barriers or choke points. It is in alleviating these choke points and overcoming the barriers that the goal of reducing the cost, time and uncertainty of moving the goods and services along the entire supply chain can be achieved.

B. DEFINING AND ACHIEVING THE GOAL

Goal is a term referring to the higher-order objective to which an intervention is intended to contribute. The goal refers to the medium or long-term change that is desired. It is recognized that there are exogenous factors (risks) beyond the control of the initiative to affect impact. There are also unintended and indirect effects or byproducts of the initiative.

How is achievement of the goal evaluated? At this level, measures of change (the impact) may involve complex information from a range of sources, such as the collection of quantitative and qualitative information from sample surveys or special studies.

C. FORMULATING THE STRATEGIC OBJECTIVES

Strategic Objectives reflect the short and medium-term effects desired. There can be one or more strategic objective. The strategic objectives must, individually and collectively, contribute to achieving the goal and address key constraints. Meeting a strategic objective usually requires the collective efforts of different actors. The objectives to be achieved can also be called the outcomes to be achieved. When evaluating performance, in addition to assessing whether the intended outcomes were achieved, in whole or in part, there will also be a range of intended and unintended outcomes which need to be taken into account in evaluating performance.

The strategic objectives/outcomes deal more with the direct effect of actions or interventions on the intended beneficiaries and represent changes in conditions which occur between the

completion of the actions and the achievement of the goal. Special studies or surveys targeted at the direct beneficiaries as well as sectoral statistics could also be used to measure the success in meeting the respective strategic objectives.

D. IDENTIFYING SPECIFIC ACTIONS

To achieve each strategic objective, the necessary relevant actions should be identified and implemented. Monitoring the progress of each action and determining if its objective has been achieved also entails performance measures in terms of inputs, process, and outputs.

Inputs are the financial, human, and material resources used for the action. They are quantified and time-bound statements of resources provided. Input indicators are most useful to the manager of the project or lead shepherd of the activity. Such information will also be useful for the Project Monitoring Unit of APEC.

The **Process** is the work performed in a project to produce specific outputs by using inputs. Process indicators measure ways in which services and goods are provided (e.g. quality, error rates). They measure what happens during implementation.

The **Outputs** are the products, capital goods and services which result from the action. Output indicators show the immediate tangible outputs, or deliverables, of the action or project: physical quantities, organizational strengthening, initial flows of services. They are typically specified in terms of quality, quantity and timeliness.

E. ANALYTICAL FOUNDATIONS

Building the SCI framework must be based on a good understanding of the issues and the possible approaches or solutions to the problem. Theory and empirical evidence should be able to support the linkages between higher level objectives and lower level actions. To ensure that the strategy behind the SCI is logical, either of the two questions could be asked:

1. In descending order of the hierarchy (i.e. from goal to strategic objective to actions) – How will we achieve this?
2. In ascending order of the hierarchy (i.e. from action to strategic objective to goal) – Why are we doing this?

F. MONITORING AND EVALUATION

Monitoring the progress of individual actions is done periodically (preferably yearly), depending on the economies involved and the management needs. Ex-post, or summative, *evaluation* of the outcomes and impact is done after the SCI has been implemented. Prior to implementation, an ex-ante evaluation may be undertaken to assess the adequacy of the design. Such evaluations form part of a formative evaluation process where periodic assessments are undertaken in order to make the program work better. Hence a midterm assessment or assessment at key milestones could be undertaken within the SCI period to obtain feedback and to assess whether adjustments need to be made. Establishing the baseline situation and value of each performance or success indicator to be adopted should also be done before implementation.

At each level of the SCI there must be a common or shared understanding by the relevant stakeholders of what success looks like. Key elements to measure success include:

Performance or Success Indicator

An Indicator is a quantitative or qualitative factor or variable that provides a simple and reliable means to measure achievement, to reflect the changes connected to an intervention, or to help assess the performance of key players. A proxy measure or indicator is a variable used to stand in for one that is difficult to measure directly.

Means of Verification

Identifies sources of information and methods used to collect and report it.

Baseline

Facts about the condition or performance of the subjects prior to implementation of the initiative, program, action, or project. In the case of the SCI, the baseline could be the value of the indicator (i.e. the situation) in 2009.

Benchmark

Reference point or standard against which performance or achievements can be compared. A benchmark might refer to what has been achieved in the past, by other comparable organisations, or what could reasonably have been achieved under the circumstances. In the case of the SCI, the benchmark could be the target by 2013.

Assumptions

Refer to conditions which could affect the progress or success of the project, but over which project managers have no direct control, e.g. price changes, weather changes, non-enforcement of supporting legislation. An assumption is a positive statement of a condition that must be met in order for project objectives to be achieved. A risk is a negative statement of what might prevent objectives from being achieved. For each level, the assumptions should refer to those concerning that level and the higher level linkage (e.g. assumptions for a particular strategic objective refer to the assumptions concerning the strategic objective/goal linkage, assumptions for a particular action refer to the assumptions concerning the action/strategic objective linkage, etc).

G. OUTCOME VS. INPUT AND PROCESS MONITORING

In summary, a results framework focuses on what is to be achieved, rather than what activities are to be undertaken. Hence performance is not measured by indicators relating to the extent to which activities are undertaken, and inputs consumed, but on results. The results chain includes the tangible outputs, or deliverables produced, but more importantly the extent to which higher level outcomes (reflected in the case of SCI, by the four strategic objectives) are being achieved and progress made towards achieving the goal.

III. DEVELOPING THE SUPPLY CHAIN CONNECTIVITY INITIATIVE

A. ANALYSIS OF THE SITUATION/PROBLEM

1. Background

In simple terms, the supply chain refers to "The system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer." Thus, quite literally, the supply chain covers the "who?", "what?", "when?" and "where?" of moving the goods and services. The "how?" is the concern of logistics, which is "The management of the flow of goods, information and other resources, including energy and people, between the point of origin and the point of consumption."

There are many different supply chains with corresponding logistical requirements. One could envisage a unique supply chain for every conceivable product and end-user. The following table provides a general description of the logistical requirements in key industries:

Industry	Characteristics of the Industry	Logistical Requirements
High tech (including electronics)	Short product life, fast time to market, high trade in components (intra-industry trade)	Faster mode of transport, less bulky packaging, faster clearance. Geographical fragmentation of production process requires highly efficient transport (just-in-time)
Apparel	Seasonal, obsolescence, prone to theft	Fast response to market, good IT systems to connect to customer, intermediate storage facilities, security
Automotives	Large supplier base in Asia, fragmented systems of communicating, much outsourcing	Network, mutual recognition of commodities or parts, standardised bill of lading
Food	Quality, perishable, reliability of supply	Security, RFID tagging, coolport technology
Chemicals	Highly transport intensive, large supply base in Asia (China, Thailand, Singapore)	Reliable and secure ocean transport, understanding of dangerous goods management during transit

Using the latest merchandise trade data available for each economy at the Harmonized System (HS) 2-digit level, the top commodities exported to APEC and imported from APEC for each economy have been ranked by value. This allows a better understanding of the types of goods most traded among the APEC economies, and therefore, which supply chains

are most important in the region. For many of the member economies, the following commodity groups are among their top three exports and/or imports with the APEC region: electrical and electronic equipment (HS 2-digit 85); machinery and mechanical appliances (HS 2-digit 84); vehicles (HS 2-digit 87); and mineral fuels, oils and distillation products (HS 2-digit 27). Annex 1 shows the breakdown of the top three exports and imports between each member economy and APEC.

Domestically, perhaps the most important supply chain is the food supply chain. Improved transport, handling and storage of food products are critical factors for achieving food security. See Box

Food supply chain connectivity is focused on the transitional movements of food and food products to consumers. This can be the movement of grain from farm to storage facilities, from storage to rail or inland barges or from ships through port facilities. It includes not only the movement of physical product but also inspection and certification systems and the creation and exchange of documentation.

The agrifood system has a number of specialised **transport** needs: (i) Food production tends to be geographically dispersed through regions dominated by a single or limited number of food products; (ii) The transport task is often seasonal and subject to considerable variation from season to season; and (iii) Products are often bulky, perishable and may require specialised equipment, as for example, with live animals or milk.

There are a number of areas in which improved food transport can increase food security. Some of these rely on improved infrastructure. Improvements to road and other transport networks allow larger load per vehicle which, in turn, increases the efficiency of transport. Centralised transport hubs support a greater use of containerisation. Some of these improvements rely on technological innovations, such as real time monitoring of truck performance and fuel consumption. Improved loading practices, better containers and improved refrigeration can reduce wastage and damage. Improved logistics also improve capacity utilisation.

The largest differences between developing and developed APEC economies in terms of the transport task are that developing economies have: (i) A greater level of geographic dispersion in food production, often in remote areas with poor transport infrastructure; (ii) A limited level of investment in modern transport vehicles, such as refrigerated trucks and specialised livestock carriers; and (iii) Larger, more density populated urban areas with highly congested transport infrastructure.

Food storage occurs at every level of the food marketing chain and is an integral part of both food safety and reliability. Storage is required to manage seasonality of fresh food supplies, to facilitate processing and distribution and manage shortfalls in production. One of the largest differences between the agrifood sectors of developing and developed APEC economies is in food distribution systems and the level of investment in storage infrastructure throughout the agrifood system. Improved storage facilities can substantially reduce wastage and improve food quality and safety.

Source: Concept Economics (2009), pages 137-157.

2. Logistics performance of APEC Economies[4]

a. The Logistics Performance Index

The World Bank and Turku School of Economics, Finland developed and conducted a survey among logistics professionals worldwide to capture a comprehensive measurement of global logistics performance. The Logistics Performance Index (LPI) survey and report involve three parts: [5]

- Perceptions of the logistics environment of trading partner countries
- Information on the logistics environment in the home country of operation
- Real time-cost performance data for country of operation

The LPI Index which is used to rank countries is based on the first part (i.e. perceptions of trading partner countries). However, all three aspects of the survey are important and each of them covers different aspects of logistics performance that could be used to identify chokepoints and priorities for improvement. As it provides both soft (perception-based) and hard (real time-cost) data, the LPI report is a rich source of possible indicators of logistics performance.[6]

This section is based on the first survey and results (LPI 2007). Data collection for LPI 2009 is underway and the World Bank is aiming for the new dataset and report to be released at the end November-beginning of December 2009. Once LPI 2009 is released, it could be used for setting the baseline and targets of the SCI.

i. Performance of APEC economies as perceived by trading partners[7]

Respondents were asked to rate performance in seven logistics areas for eight countries with which they conduct business. The LPI was aggregated as a weighted average of seven areas of logistics performance, namely: effectiveness and efficiency of the clearance process, quality of the infrastructure in use for logistics operations, ease and affordability associated with arranging shipments, competence of the logistics industry, ability to track and trace consignment, domestic logistics costs, and frequency of timely delivery. In order to improve the confidence intervals, the index was constructed using Principal Components Analysis.

Overall, the best performing economy in the world and in APEC is Singapore. In terms of the individual dimensions however, the Netherlands tops all countries in 4 out of the 7 dimensions. At the regional level, Russia has the lowest overall LPI score and in 4 out of 7 dimensions. Papua New Guinea has the highest score in terms of domestic logistics cost but is rated the lowest in two areas while Japan received the lowest in domestic logistics costs. See Table 1.

[4] TFAP2 Interim Assessment due October 2009 will help to throw considerable light on how well APEC supply chains have performed at both the regional and national levels over the 2006 to 2008 period. In particular, that Assessment will measure the cost and time that are imposed by APEC governments on APEC supply chains and will break down that cost and time into their major components, notably the domestic land transport, port and international sea transport components. It will also provide a basis for the continuation of this performance assessment into the future.

[5] cited from the World Bank LPI website: http://web.worldbank.org/lpi.

[6] See Arvis, Mustra, Panzer, Ojala, and Naula (2007).

[7] Brunei is not available in this part.

Table 1 Summary of International LPI and its components

	World Best		APEC			
			Best		Worst	
LPI	4.19	Singapore	4.19	Singapore	2.37	Russia
Customs	3.99	Netherlands	3.90	Singapore	1.94	Russia
Infrastructure	4.29	Netherlands	4.27	Singapore	2.00	Papua New Guinea
International shipments	4.05	Netherlands	4.04	Singapore	2.48	Russia
Logistics competence	4.25	Netherlands	4.21	Singapore	2.29	Papua New Guinea
Tracking & tracing	4.25	Singapore	4.25	Singapore	2.17	Russia
Domestic logistics costs	4.00	Chad	3.43	Papua New Guinea	2.02	Japan
Timeliness	4.53	Singapore	4.53	Singapore	2.94	Russia

As the LPI dimensions are indexed on the same scale (5 points as maximum), the performance across the dimensions for each economy could be compared. In particular, we can compare the economy's rating for a particular aspect vis-à-vis world best practice. World best represents the level that could potentially be achieved at that period and thus could represent the benchmark. We take the absolute value of the difference between the score of one economy and the score of the world best practice in one particular LPI component as the performance gap. We can then rank the various dimensions according to the gap, with the largest gap representing the worst aspect of the logistics performance of the economy as perceived by trading partners.

On average, in the APEC region, "domestic logistics cost" and "infrastructure" have the largest gap from the world best practice with a score of 1.15 and 1.06 points, respectively. In contrast, the "ease and affordability associated with arranging shipments" and "timeliness of deliveries" are closest to the world's best practice with a score of 0.73 and 0.79, respectively.

The following table (Table 2) provides a summary of the worst two and best two dimensions (vis-à-vis world best practice) for each economy. As can be seen, "Infrastructure" appears most often (14 times) in the top two worst performing dimensions. It emerged as the worst dimension in 9 of the 20 APEC economies covered and is the second worst dimension in 5 economies. "Domestic logistics costs" is the next most common dimension in the bottom two. It is the worst dimension in 10 out of the 20 APEC economies notably in all the high income economies of APEC.[8] International shipments and timeliness are the two items which most frequently appear in the "top 2 smallest gap" list.

It should be noted that the LPI dimensions with "largest" and "smallest" differences are comparisons within one economy. It could be possible that the smallest performance gap for one economy is even larger than the largest gap for another economy. For example, customs efficiency is identified as the smallest gap (0.67) in Chile, while the gap is still much larger than that (0.09) in Singapore. Thus, it is a way to show economy-specific priorities by ranking the LPI dimensions within an economy.[9] Annex 2 shows the performance gap against world best practice with respect to all seven LPI dimensions for each economy.

[8] Note that the best cases in the world and in APEC in terms of domestic logistics cost are low-income economies. A comparison within the same income group is done in the next part.

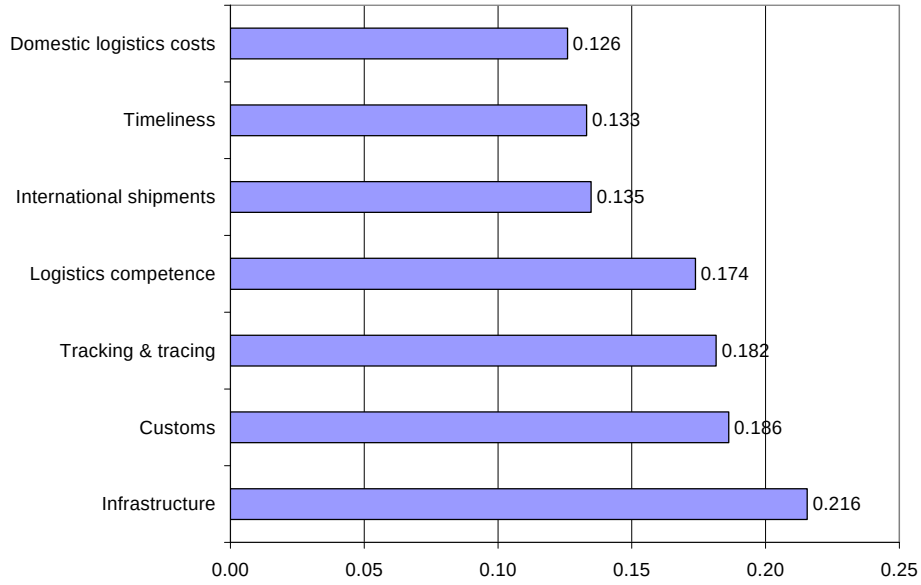
[9] Of course, it is also possible to rank economies by the LPI or its dimensions.

Table 2 Performance gap summary (International LPI)

Country	Top 2 Largest gap with the world best				Top 2 Smallest gap with the world best			
	1st Item	**Gap**	**2nd Item**	**Gap**	**1st Item**	**Gap**	**2nd Item**	**Gap**
APEC Average	Domestic Logistics Costs	1.15	Infrastructure	1.06	International Shipments	0.73	Timeliness	0.79
Frequency of appearing on the top 2 list	Infrastructure (14 times) Domestic Logistics Costs (12 times)				International Shipments (14 times) Timeliness (8 times)			
Australia	Domestics Logistics Costs	1.20	Infrastructure	0.64	Tracking & Tracing	0.28	International Shipments	0.33
Canada	Domestics Logistics Costs	1.16	Logistics Competence	0.40	Customs	0.17	International Shipments	0.27
							Tracking & Tracing	
Chile	Domestics Logistics Costs	1.32	Infrastructure	1.23	Customs	0.67	International Shipments	0.84
China	Infrastructure	1.09	Domestics Logistics Costs	1.03	International Shipments	0.74	Logistics Competence	0.85
							Timeliness	
Hong Kong, China	Domestic Logistics Costs	1.34	International Shipments	0.27	Customs	0.15	Tracking & Tracing	0.19
Indonesia	Infrastructure	1.46	Logistics Competence	1.35	Tracking & Tracing	0.95	International Shipments	1.00
Japan	Domestic Logistics Costs	1.98	International Shipments	0.28	Logistics Competence	0.13	Tracking & Tracing	0.17
Korea, Rep.	Domestic Logistics Costs	1.27	Infrastructure	0.85	International Shipments	0.61	Logistics Competence	0.62
Malaysia	Infrastructure	0.96	Domestic Logistics Costs	0.87	Timeliness	0.58	Customs	0.63
Mexico	Infrastructure	1.61	Customs	1.49	Timeliness	1.13	International Shipments	1.14
New Zealand	Domestic Logistics Costs	1.14	Infrastructure	0.68	International Shipments	0.28	Customs	0.42
Papua New Guinea	Infrastructure	2.29	Customs	1.99	Domestic Logistics Costs	0.57	Timeliness	1.39
Peru	Infrastructure	1.72	Tracking & Tracing	1.55	Domestic Logistics Costs	1.00	International Shipments	1.14
Philippines	Infrastructure	2.03	Tracking & Tracing	1.60	Domestic Logistics Costs	0.73	International Shipments	1.28
			Logistics Competence					
Russia	Tracking & Tracing	2.08	Infrastructure	2.06	International Shipments	1.57	Timeliness	1.59
Singapore	Domestic Logistics Costs	1.30	Customs	0.09	Timeliness	0.00	International Shipments	0.01
					Tracking & Tracing			
Chinese Taipei	Domestic Logistics Costs	0.90	Customs	0.74	Timeliness	0.35	International Shipments	0.40
Thailand	Infrastructure	1.13	Tracking & Tracing	1.00	Timeliness	0.62	Domestic Logistics Costs	0.79
United States	Domestic Logistics Costs	1.80	International Shipments	0.47	Infrastructure	0.22	Tracking & Tracing	0.24
			Customs					
Viet Nam	Infrastructure	1.79	Logistics Competence	1.45	Domestic Logistics Costs	0.70	International Shipments	1.05

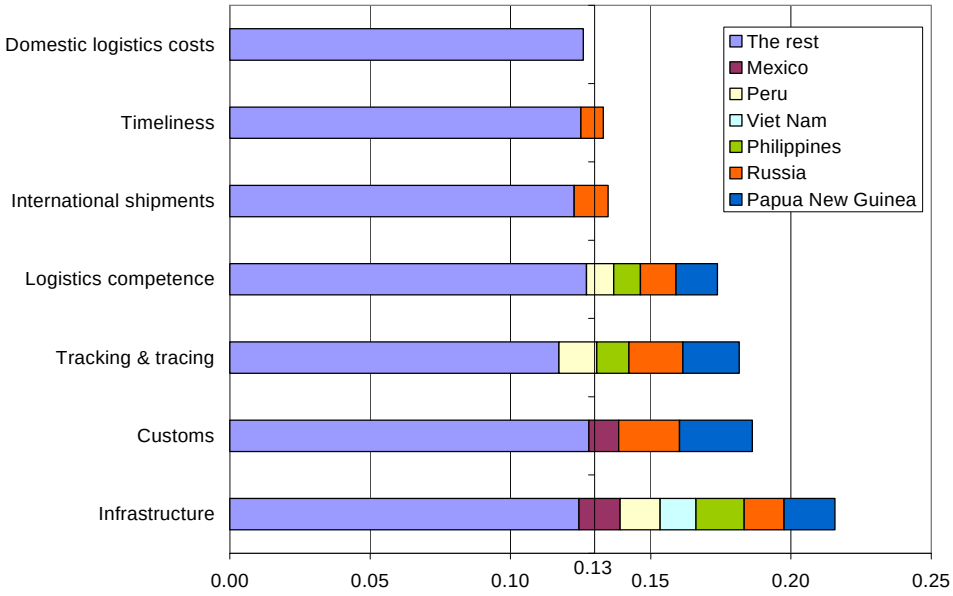
At the regional level, domestic logistics costs is the LPI dimension that is the least dispersed (i.e. performance in this aspect varies the least among economies) while the performance in terms of infrastructure is the most dispersed LPI dimension (Figure 1).

Figure 1 Coefficient of Variation of LPI Dimensions in APEC



A further analysis of the variability of the performance of APEC economies in terms of the LPI dimensions reveal which economies account for the wide dispersion (i.e. the outliers), and therefore could be considered as the "weak links" in APEC's logistics environment.[10] Figure 2.

Figure 2 Coefficient of Variation of LPI Dimensions in APEC, with breakdown



[10] The economy with the lowest score in each dimension is excluded and the CV for the remaining APEC members is calculated until the CV reaches 0.13 (the lowest CV or least variable of the seven dimensions).

ii. Performance of APEC economies as perceived by in-country operators[11]

The survey also asked the respondents to evaluate the logistics performance and the environment and institutions in support of logistics operation in the country in which they are based.

To get a sense of the performance gap based on this part of the LPI survey, we compare the economy specific results against the results for the income group to which an economy belongs according to World Bank classification. If the perception from the respondents in that economy is not as good as the average level for its income group, this could be considered an area of improvement for that economy.

Taking Australia as an example, the percentage of respondents answering high/very high to the port or airport charges is higher than the income group (high income) to which Australia belongs. It indicates in terms of port/airport charges, the logistics operational environment is less favorable in Australia compared with the average level of its income group. It could be considered as a weak point and serve as focus of further analysis and future development.

Table 3 Aspects of Australia's logistics environment which are not as good as its income group

		Australia	**High income: all**
	Logistics operational environment	Percent of respondents answering high/very high	
1	Port/Airport charges are	66.67	46.97
2	Overall, logistics costs (e.g. port charges, domestic transport, agent fees), are	50	46.31
3	Less than full truck load services rates are	66.67	32.82
4	Full truck load rates are	50	27.24
	Effectiveness and efficiency of processes	Percent of respondents answering high/very high	
5	Do traders demonstrating high levels of compliance receive expedited Customs clearance?	50	53.60
6	Are export shipments cleared and shipped as scheduled?	83.33	95.30
	Evolution of factors over the past 3 years	Percent of respondents answering better/much better	
7	Overall business environment	33.33	56.60
8	Good governance and eradication of corruption	33.33	44.36
9	Availability of private sector services	40	57.53
10	Quality of telecommunications infrastructure	66.67	84.70
11	Quality of transport infrastructure	50	56.12
12	Other border crossing-related government agencies clearance procedures	33.33	42.84
	Incidence on your activity of the following constraints in your country of work	Percent of respondents answering high/very high	
13	Major delays due to compulsory warehousing	16.67	12.80

The following table reflects the number of aspects where the economy's performance is below the average for its income group. The details can be found in Annex 3.

[11] Brunei, Korea, Papua New Guinea, Chinese Taipei are not available in this part.

Table 4 Incidence of below average scores as compared to same income group

Economy	Number of Underperforming Aspects of the Logistics Environment (out of a possible 36)
Australia	13
Canada	11
Hong Kong, China	9
Japan	14
New Zealand	12
Singapore	12
United States	13
Chile	9
Malaysia	17
Mexico	26
Russia	24
China	7
Indonesia	12
Peru	13
Philippines	24
Thailand	10
Viet Nam	2

iii. Time-cost performance[12]

Finally, the survey also asked the respondents to provide time and cost data reflecting the logistics performance in the country in which they are based. Although a couple of economies define APEC best practice in half of the 10 areas (and are equal to or very close to the world's best), other economies are also best performers in some other aspects. See Table 5 below.

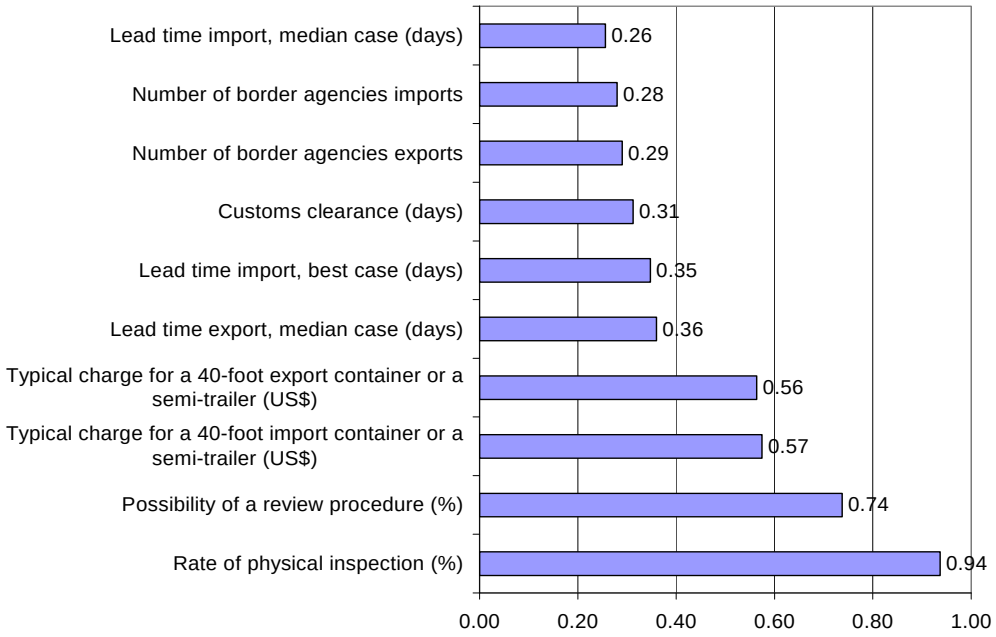
Table 5 Summary of time-cost performance

	World Best	APEC			
		Best		Worst	
Rate of physical inspection (%)	1	1	Korea	32	Philippines
Customs clearance (days)	0.5	0.5	New Zealand	1.9	Thailand
Lead time export, median case (days)	1	1.7	Peru	6.3	Philippines
Lead time import, best case (days)	1	1	Chile	3.7	Philippines
Lead time import, median case (days)	1	2.2	New Zealand; Singapore	5.3	Philippines
Number of border agencies exports	0	1.5	Australia; Singapore	4.5	Viet Nam
Number of border agencies imports	1	1.7	Singapore	6	Chinese Taipei
Possibility of a review procedure (%)	100	100	Australia; Japan	0	Chile; Mexico; New Zealand; Russia; Thailand
Typical charge for a 40-foot export container or a semi-trailer (US$)	150	194	Viet Nam	1565	Russia
Typical charge for a 40-foot import container or a semi-trailer (US$)	150	224	New Zealand	1732	Russia

[12] Brunei and Papua New Guinea are not available in this part.

Across the region, lead time to import (median case) is the least variable performance measure while the most variable is the rate of physical inspection as can be gleaned from the following figure.

Figure 3 Coefficient of variation of time-cost performance measures in APEC



As in the analysis of LPI Part 1, we compare economy specific performance with the world best practice in order to rank the areas in terms of the size of the gap and thus could provide an indication of priority choke points in that economy. Since they are expressed in different units, in order to compare the performance measures within one economy we divide the absolute value of the gap by the standard deviation of the entire sample (i.e. world) to standardize the value.

The following summary table (Table 6) presents the top two items with largest gap and the smallest gap from the world best practice with the absolute value of the difference also shown. Number of border agencies exports or imports, and the possibility of review procedure are almost exclusively identified as top largest gap from the world's best practice, with only one exception that in Australia, the lead time export, median case (50 percent of the shipments arriving time), is on the top two largest gap list. It implies that the APEC region generally has too many border agencies, especially for exports, and the possibility for logistics operators to make use of a simple and inexpensive review procedure is also a key issue in a number of economies. On the other extreme, performance in terms of the rate of physical inspection appears as the most common among the top two smallest gap followed by lead time to import for best case (up to 10 percent of the shipments are precarried / oncarried), charge of import container, and customs clearance all tied at 6 occurrences each.

See Annex 4 for the performance gap against world best practice with respect to all 10 time-cost performance measures for each economy**.**

Table 6 Performance gap summary (Time-Cost performance)[13]

Country	Top 2 largest gap with the world best				Top 2 smallest gap with the world best			
	1st item	Gap	2nd item	Gap	1st item	Gap	2nd item	Gap
APEC Average	Number of border agencies exports	2.99	Possibility of review procedure	53.89%	Physical inspection	7.11%	Lead time import, best case	0.97 day
Frequency of appearing on the top 2 list	Number of border agencies exports(19 times) Number of border agencies imports(9 times) Possibility of review procedure (9 times)				Physical inspection (12 times) Lead time import, best case (6 times) Charge for import container (6 times) Customs clearance(6 times)			
Australia	Number of border agencies exports	1.5	Lead time export, median case	2.5 days	Possibility of review procedure	0%	Physical inspection	2 %
Canada	Number of border agencies exports	2.7	Number of border agencies imports	2.8	Physical inspection	1%	Customs clearance	0.3 day
Chile	Possibility of review procedure	100%	Number of border agencies exports	2.5	Lead time import, best case	0 day	Physical inspection	3%
China	Number of border agencies exports	4	Possibility of review procedure	64%	Charge for import container	238 $US	Physical inspection	6%
Hong Kong, China	Number of border agencies exports	2.5	Number of border agencies imports	2.7	Physical inspection	1%	Customs clearance	0.1 day
Indonesia	Number of border agencies exports	2.7	Possibility of review procedure	62%	Charge for import container	94 $US	Charge for export container	116 $US
Japan	Number of border agencies exports	3	Number of border agencies imports	2	Possibility of review procedure	0%	Physical inspection	2%
Korea, Rep.	Number of border agencies exports	2.3	Number of border agencies imports	1.7	Physical inspection	2%	Customs clearance	0.5 day
Malaysia	Number of border agencies exports	2.5	Number of border agencies imports	2.3	Physical inspection	5%	Lead time import, best case	0.7 day
Mexico	Possibility of review procedure	100%	Number of border agencies exports	3.3	Charge for import container	361 $US	Physical inspection	9%
New Zealand	Possibility of review procedure	100%	Number of border agencies exports	2.3	Customs clearance	0 day	Charge for import container	74 $US

[13] We use the standardized value to be able to rank smallest to largest gap; however, the figures displayed are the absolute value of the difference between actual and best practice to show the real performance gap. It represents the days, cost, number of agencies or percentage of imports physically inspected that need to be reduced or with respect to the possibility of making use of a simple and inexpensive review procedure in case of dispute, this should be increased, in order to close the gap.

Peru	Number of border agencies exports	3.3	Possibility of review procedure	75%	Lead time export, median case	0.7 day	Physical inspection	6%
Philippines	Number of border agencies exports	4	Number of border agencies imports	3	Charge for export container	571 US$	Charge for import container	644 $US
Russia	Number of border agencies exports	4	Possibility of review procedure	100%	Lead time import, best case	1 day	Lead time import, median case	2 days
Singapore	Number of border agencies exports	1.5	Possibility of review procedure	33%	Lead time import, best case	0.2 day	Physical inspection	2%
Chinese Taipei	Number of border agencies imports	5	Number of border agencies exports	3	Lead time import, best case	0.4 day	Customs clearance	0.5 day
Thailand	Number of border agencies exports	4.3	Possibility of review procedure	100%	Lead time import, best case	0.4 day	Lead time import, median case	1.3 days
United States	Number of border agencies exports	2.9	Number of border agencies imports	2.2	Physical inspection	2%	Customs clearance	0.6 day
Viet Nam	Number of border agencies exports	4.5	Number of border agencies imports	3	Charge for export container	44 $US	Charge for import container	144 $US

b. Other studies and surveys

Studies involving APEC economies reveal the importance of various cost, time, and uncertainty drivers. In a survey covering ASEAN countries conducted by de Souza, Goh, Gupta and Luo (April 2007), logistics operators in the respective countries were asked to rate different logistics barriers from 1 (not significant) to 6 (critically significant) for that particular country. Results show that the barriers are not perceived to be of the same significance across the ASEAN countries. For example, operators in Indonesia rated "time consuming documentation requirements" as critically significant but operators in the other ASEAN member states did not rate it as much. "Multiple uncoordinated offices" was deemed a 5 (or very significant) in the Philippines but was rated less so in the others. The same is true for "Licensing requirements" (very significant in Viet Nam) and "Discriminatory licensing" (very significant in Malaysia). See Box below for a list of specific logistics barriers and the respective economies where it was rated as critically significant or very significant.

BARRIERS RELATED TO CUSTOMS PROCEDURES AND INSPECTIONS

- Time consuming documentation requirements – Indonesia
- Burdensome inspection – Indonesia
- Regulations that limit foreign firms' ability to provide brokerage services – Malaysia and Viet Nam
- Different classification of goods in different countries – Indonesia and The Philippines
- Arbitrary independent rulings – Indonesia
- Lack of border crossing coordination with regional neighbours – Brunei, Indonesia, and Malaysia
- Volatility in border traffic – Malaysia
- Multiple uncoordinated offices – The Philippines
- Improper penalties – Indonesia
- Customs department raises fees unilaterally – Indonesia and The Philippines
- Inefficiency of inbound clearance process – Indonesia and Thailand

BARRIERS DUE TO CROSS-SECTORAL INVESTMENT, LICENSING REQUIREMENTS, TRANSPARENCY, AND LABOUR LIMITATIONS

- Foreign ownership regulations – Indonesia, Malaysia, and Thailand
- Licensing requirements – Viet Nam
- Discriminatory licensing – Malaysia

BARRIERS DUE TO MARITIME SPECIFIC RESTRICTIVE LAWS AND REGULATIONS

- Cabotage regulations – Indonesia and The Philippines
- Cargo reservation laws – Indonesia
- Restriction on foreign maritime firms to provide their own or third party port-related services – Indonesia, The Philippines, Thailand, and Viet Nam
- Directional imbalance – Brunei and Viet Nam
- Absence of adequate warehousing and specialized storage facilities – Indonesia and The Philippines

- Reliance on trans-shipment and feeder services – Indonesia and Singapore

BARRIERS DUE TO AVIATION SPECIFIC RESTRICTIVE LAWS AND REGULATIONS

- Cabotage regulations – Singapore
- Limited lift capacity and directional imbalance – Viet Nam

BARRIERS DUE TO ROAD TRANSPORTATION SPECIFIC RESTRICTIVE LAWS AND REGULATIONS

- Limitation on equipment usage – Malaysia
- Limitation on fleet size and hours of operation – Indonesia, Malaysia, The Philippines, Thailand, and Viet Nam

BARRIERS DUE TO ISSUES SUCH AS MALPRACTICES, CRIMES ETC.

- Criminal practices – Indonesia
- Malpractices (facilitation money) – Indonesia and The Philippines

Source: de Souza et al. (2007), Appendix 2

Hollweg and Wong (2009) build on the work of de Souza et al (2007) to examine the extent of the barriers facing logistics service providers (LSPs) in ASEAN+6. They constructed a regulatory index of the entire logistics sector which includes customs restrictions as well as the main modes of international transport and find that restrictions on LSPs vary significantly among the economies. In particular, they find that Malaysia, China, Indonesia, Lao PDR, the Philippines and Viet Nam are the most restricted economies among ASEAN+6 for logistics services in the region. In contrast, Singapore and Australia are the most open economies for trade in logistics services, along with Japan and New Zealand.

A study that focuses on Latin American Countries (LAC) found that transport costs are the dominant form of trade costs. Moreira et al. (2008) find that in general, the region spends proportionally more on transport to trade its goods than the United States, Europe, and Asia. They examine the factors that may affect ocean and airfreight and begin by providing a general description of possible factors. The expected relationships between the ad valorem freight rates and their determinants are shown in the following Table 7:

Table 7 Determinants of Freight Rates

Determinants	Expected Sign	Brief Explanation/Intuition
Weight-Value	(+)	Holding value constant, heavier goods normally pay higher (i.e. reflects transportability)
Distance	(+)	The greater the distance, the higher the charges
Volume of Imports	(-)	Scale economies (either at vessel or port level). However, if there is congestion at the port then the effect could be the opposite - sign is (+).
Trade Imbalance	(-)	Shipper normally pays for forgone capacity (i.e. revenues) on either inbound or outbound trip
Containerization	(-)	Container shipments allow large cost reductions in cargo handling; therefore, lower shipping

		prices should be expected as the level of containerization increases.
Number of shippers	(-)	Shipping companies have less market power the larger the degree of competition on a commercial route.
Elasticity of Import Demand	(-)	Price discrimination is a characteristic of the shipping industry. Larger markups are expected on goods whose import demand is not very sensitive to price changes.
Tariff Rate	(+)	Anything that raises the price of a good, like a tariff, lowers the percentage impact of a given transportation charge on the delivered price and therefore increases the optimal shipping markup.
Exporter Port Efficiency	(-)	Improvements in efficiency are expected to lead to lower transport cost
Importer Port Efficiency	(-)	Improvements in efficiency are expected to lead to lower transport cost

Source: Table 2.1 and pages 46-51 of Moreira et al. (2008)

They proceed to estimate the cost of LAC's export freight rates with those of other exporters to the US and decompose the difference among the various determinants. For ocean freight, they find that (i) LAC's exports to the US pay freight rates around 70 percent higher than those from the Netherlands (the benchmark used); (ii) the main factors explaining the differences are the weight-to-value ratios and port efficiency, followed by the levels of competition among shipping companies and to a lesser degree, the volumes of trade, (iii) differences in the level of containerization and in the demand elasticity have very small roles in explaining differences in shipping costs; and (iv) the differences in the tariff rates, trade imbalance and distance tend to play in favor of Latin America in the sense that imports from the LAC face, on average, lower tariff in the United States, are associated with more favorable trade imbalances and are shipped from shorter distances than the imports from the Netherlands (pages 54-55). Among APEC economies in the LAC, Chile had the highest freight rates, 130 percent higher than the Netherlands, followed by Peru and Mexico. Port efficiency and number of shippers are the top two policy-relevant factors that contributed to the overall higher transport costs.

Table 8 Decomposing Differences in Ocean Freight Rates between LAC and Netherlands Exports to the US (2000-2005)

	LAC Simple Average (%)	**Chile (%)**	**Mexico (%)**	**Peru (%)**
Ad Valorem Shipping Costs	168	230	142	153
Contribution to Differences in Fitted Values:				
Weight-to-Value Ratio	72	79	88	47
Exporter Port Efficiency	33	19	44	55
Number of shippers	5	3	8	7
Volume	2	3	2	2
Containerization	0	0	0	0
Demand Elasticity	0	0	0	0
Tariff	-1	-1	-4	-1
Trade Imbalance	-1	0	10	-3

Distance	-9	3	-49	-7

Source: Table 2.2. page 54 (Moreira et al. 2008)

Using a similar framework of analysis to airfreight rates but using EU-15 countries as the benchmark in this case, LAC's exports to the US pay airfreight rates around 27 percent higher and the main factors explaining the differences are the weight-to-value ratios (meaning that LAC's export basket involves the transportation of goods that are on average heavier than the export basket from other countries) and airport efficiencies (Table 9).

Table 9 Decomposing Differences in Ocean Freight Rates between LAC and the EU-15 Exports to the US (2000-2005)

	LAC Simple Average (%)	**Chile (%)**	**Mexico (%)**	**Peru (%)**
Ad Valorem Shipping Costs	127	142	106	122
Contribution to Differences in Fitted Values:				
Weight-to-Value Ratio	70	57	125	45
Airport Efficiency	45	36	185	65
Demand Elasticity	0	-1	1	-1
Tariff	-1	-2	-35	0
Distance	-14	9	-176	-9

Source: Table 2.3 page 60 (Moreira et al. 2008)

Similar analyses were done for the transport costs to imports, comparing the freight rates of LAC and the US.[14] In the case of ocean freight imports, shipping costs in LAC were higher by 76 percent on average due to weight-to-value ratio (39 percent), port efficiency (36 percent) and tariff (16 percent). Chile and Peru, whose rates were 63 percent and 120 percent higher will benefit from improvement in port efficiency as it contributes around 46 percent and 35 percent respectively to the higher ocean freight costs. In terms of airfreight costs of imports, shipping costs was 178 percent higher for LAC. For Chile it was 184 percent higher and for Peru 211 percent higher. Again, airport efficiency plays a major role and it contributed 40 percent of the higher airfreight rates in LAC, with the value for Chile and Peru are 40 percent and 35 percent, respectively.

3. Factors that affect logistics performance

There are many different factors that may affect logistics performance. Whether part or all of the logistics function is done within the firm or is outsourced (e.g., by hiring a freight forwarder), there are common sources of cost, time and uncertainty drivers in moving goods and services along the supply chain although the significance of these drivers will vary. Indeed, differences in logistics performance across countries arise from differences in the quality and cost of infrastructure services, as well as differences in policies, procedures and institutions. (Hausman, Lee and Subramanian, 2005)

The availability of infrastructure (e.g. roads, rails, airports and seaports) provides access to markets and affects routing options while the quality of infrastructure affects both the cost side (e.g., bad roads result in higher vehicle maintenance and more fuel consumption thereby leading to higher variable costs) as well as the revenue side (e.g. fruits that are in better condition may be sold at a higher price, time sensitive products lose value or are not accepted

[14] Mexico is not included in this part.

at all if they arrive late). Limao and Venables (2001) study the determinants of transport costs and the extent to which transport costs choke off trade. They find that infrastructure is a significant and quantitatively important determinant of transport costs and of bilateral trade flows. Nordas and Piermartini (2004) as cited in Brooks (2008, pp. 4-5) identify four main aspects of the relationship between infrastructure and trade transaction costs: (i) *Direct monetary outlays* on communications, business travel, freight, insurance, and logistics services are affected by the quality of infrastructure and the cost and quality of related services; (ii) *Timeliness*, even more than freight rates, is likely to be influenced by geography and infrastructure; (iii) *Risk* of damaged cargo and resulting increased losses and insurance costs is higher when infrastructure quality is poor; and (iv) *Lack of access* to transport or telecommunication services can have a high opportunity cost, limiting market access and reducing the likelihood of realizing the full benefits of trade.

Logistics performance is also determined by the availability, price and quality of transport services, which although typically provided by private operators are affected to a large extent by the operational, regulatory and licensing policies that govern the transport sector. Examples of these include (Lee and Hine, 2008, p. 35):

- Market entry – easing restrictions but retaining basic standards of financial, management and safety performance as qualification for a license.
- Pricing – allowing operators to set prices based on costs and affordability.
- Choice of technology – allowing operators to choose the vehicle or vessels they consider most suitable for the task.
- Route structure – allowing operators to allocate vehicles or vessels to routes as they choose, raising productivity and lowering unit costs.
- Operations (timetable, frequency of service and so on) – allowing operators to schedule their services so as to maximize productivity.

Restrictions on any of the above factors may explain lack or under provision of certain transport services. Likewise, as pointed out by McGuire and Findlay (2005), by limiting competition then restrictions on trade in services can be price-increasing or cost-increasing. Regulatory failure (either under or over regulation) can also influence the conduct of transport service providers, for example, in terms of pricing, investment (including in human resources), and anti-competitive or collusive behavior.[15] Of course, transport is not the only sector involved and in general, policies and regulations that affect logistics services providers or specific logistics services[16] help determine logistics performance in terms of price, efficiency and the quality of service (or competence level), among other things.

Fink, Mattoo and Neagu (2002) examine maritime services and find that restrictive trade policies and private anticompetitive practices affect the price of liner services. De Souza and Findlay (2008) observe that a number of sector-specific and economy-wide reforms done in Australia during the 1990s appear to have yielded positive results from the perspective of logistics service suppliers as well as international traders. Such reforms include privatization/deregulation and market access commitments in rail, road and sea freight (including port reform) and the adoption of a national competition policy. Positive effects

[15] There is an on-going study commissioned by the PSU on "The impacts and benefits of structural reforms in transport, energy and telecommunications sectors" which will provide in-depth analysis on the effects of policy and regulation on sector performance in APEC economies. Draft report due in April 2010.

[16] According to de Souza et al (2007), a specific checklist for logistics services is presently not available. Following the United States International Trade Commission (USITC) and the Coalition of Service Industries (CSI) they categorize logistics services as (i) core freight (e.g. cargo handling, storage and warehousing, etc.), (ii) related freight (e.g. maritime, inland waterways, air, rail, and road transport services), and (iii) non-core freight logistics services (e.g. packaging, real estate, leasing and rental of logistics related equipment, etc.)

include a drop in the real road, rail, sea and air freight rates. Micco and Serebrisky (2006) provide evidence that a deregulated air cargo market leads to a reduction in air transport costs by about 9 percent and increase the share of imports arriving by air by 7 percent. However, the effect of Open Skies Agreements is not the same for all countries. In particular, they find that for low-income developing countries such agreements do not reduce air transport costs and this could be due to other barriers to competition or due to their limited market size.

Burdensome regulatory requirements and administrative procedures constitute another set of factors that contribute to higher transaction costs and therefore affect logistics performance.[17] According to Grainger (2008, p. 19), "every time one of the parties within the supply chain is required to submit information to government agencies, trade transactions costs occur." He distinguishes between direct and indirect transactions costs. Direct costs include compliance costs such as those associated with collecting, producing, transmitting, posting, faxing and processing information required to prepare and submit documents (paper or electronic); charges and fees with setting up and financing customs bonds and guarantees; testing and use of laboratories; inspections; and stamping of documents. Indirect costs result from delay at the border, uncertainty about procedures and requirements, and missed or lost business opportunities. Trade facilitation seeks to reduce such transaction costs between business and government and although there is no single definition of trade facilitation,[18] Grainger (2008, p. 20) points that "the UN/CEFACT, in its Recommendation No. 4 (1974) is quite explicit on the reformatory objectives of trade facilitation, stating that the trade facilitation program ought to be guided by the '…simplification, harmonization and standardization [of trade procedures] so that transactions become easier, quicker and more economical than before…'. Simplification is '…the process of eliminating all unnecessary elements and duplications in formalities, process and procedures…; harmonization is the alignment of national formalities, procedures, operations and documents with international conventions, standards and practices; [and] standardization is…the process of developing internationally agreed formats for practices and procedures, documents and information'."

Finally, another set of factors which affect logistics performance involve "institutions and/or institutional arrangements." As examined by de Groot, Linders, Rietveld and Subramanian (2004), incomplete or asymmetric information and uncertainty in exchange can act as barriers to trade. To overcome such barriers, institutions[19] are formed in order to reduce the uncertainty in exchange, and lower transactions costs. For international trade and transactions which involve multiple governance systems, they find that institutional quality has a significant, positive and substantial impact on bilateral trade flows. Also important is the finding that the similarity of the quality of governance matters as well. A large divergence in the effectiveness of institutions reduces trade due to the adjustment costs and extra uncertainty involved when traders do not share a sufficiently effective institutional framework.

Relevance of external factors and risks

The logistics environment is obviously shaped by external factors. With globalization, so much is happening rapidly both the private and the public sectors are responding dynamically to the challenges.

[17] As earlier mentioned, there is an on-going mid-term assessment of the TFAPII that will greatly inform this and other sections.

[18] In APEC, "trade facilitation generally refers to the simplification, harmonization, use of new technologies and other measures to address procedural and administrative impediments to trade. (APEC Principles on Trade Facilitation 2002)

[19] "Institutions" as defined by North (1993) and cited in de Groot, et al (2004) are the "humanly devised constraints that shape human interaction."

Global trends - example of shipping

As a practical example of how global trends in trade affect the logistical environment of commodity management, it is reported that China has this year overtaken Japan as Asia's largest importer of crude oil (importing 126 m. tonnes versus Japan's 122 m. tonnes in the year to date). This trend is expected to continue as Japan reduces its need for imported oil as it increases its nuclear power generation capacity. (McCarthy, Lloyd's List Media Centre, 18 September 2009, http://www.lloydslist.com).

In addition, the state of the world economy also changes the environment for enhancing global supply chain connectivity as indicated in the most recent Annual Review (2009) of Global Container Terminal Operators 2009 by DREWRY. "The contraction in global container port throughput in 2009 is likely to be in excess of 10 percent. In 2010, Drewry expects to see little or no growth, and anticipates that it will be 2011 before a modest recovery in demand growth will return...and 2012-2013 before most regions see their throughput regain its 2008 level.

As recently as a year ago, there were still widespread concerns over a growing shortage of capacity in the container terminal sector relative to demand, causing periodic supply chain bottlenecks. Now, container terminal capacity will come under much less pressure over the next few years as the world's container trades shrink, or at least grow much more slowly than originally forecast. Most of the leading global container terminal operators are forecast to add capacity to their networks by 2014. However, this report makes clear that the changed economic situation means they have adopted a more cautious assessment of future prospects. Capacity expansion projects are being shelved, deferred or cancelled on an unprecedented scale, although there is a lack of transparency about global operator plans which makes accurate assessment of capacity development plans very difficult." (DREWRY News release, 7 August 2009, http://www.drewry.com.uk/news.php).

B. IMPLICATIONS FOR THE SCI

1. A proposed objective tree

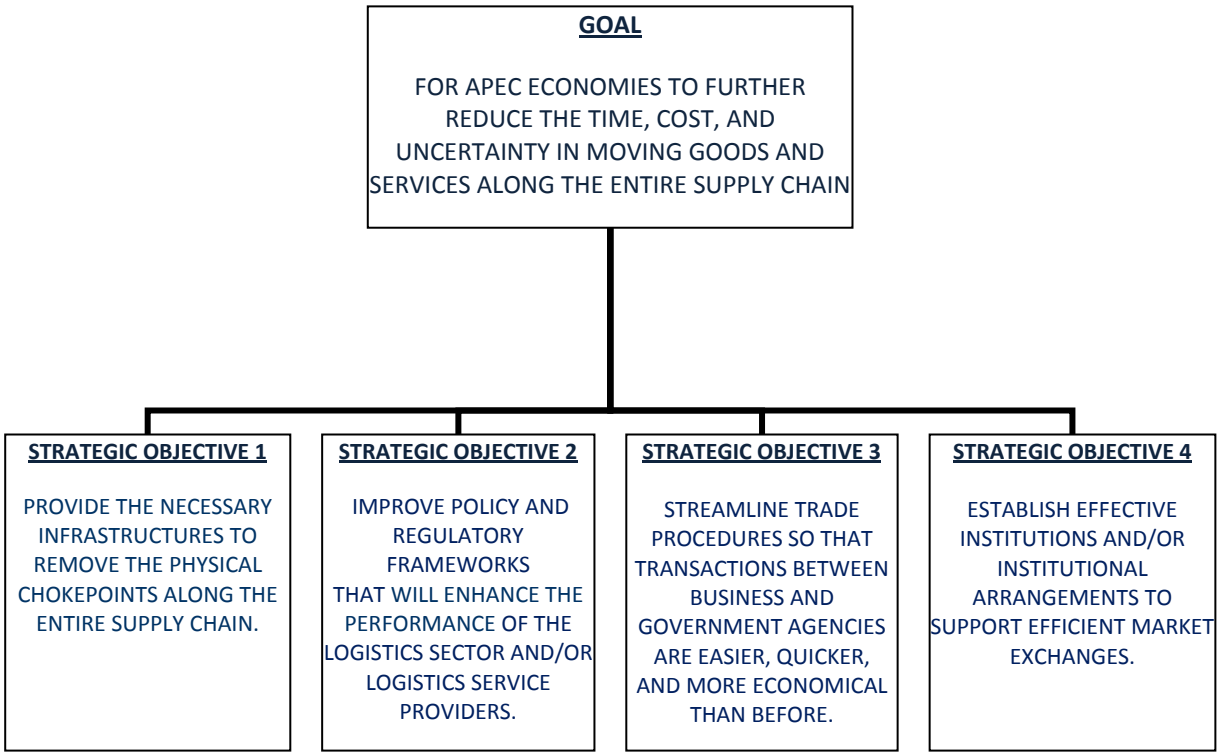
Based on the previous discussion, the chokepoints to supply chain connectivity (i.e. factors which contribute to higher cost, time delays, and/or greater uncertainty in moving goods and services along the supply chain) can be categorized under four general groups – physical or hard infrastructure, policies and regulations governing the logistics sector or logistics service providers, trade procedures, and institutions supporting market exchanges.

Infrastructure chokepoints could exist in terms of availability, capacity or quality. Policy and regulation chokepoints could mean the presence of regulations that constrain service delivery and quality or the absence of policies that would promote efficient industry outcomes (e.g. competition policy). With respect to trade procedures, chokepoints include burdensome requirements and time-consuming procedures. Finally, chokepoints that emanate from ineffective institutions could arise from arbitrary decision making or non-transparent rule making. As the movement of goods and services along the supply chain involves many sectors, agencies, and jurisdictions, the lack of policy coordination or a weak mechanism for policy coordination also constitute a major chokepoint under ineffective institutions.

If the goal of the SCI is to be evaluated in terms of reducing cost, time, and uncertainty in moving goods and services along the entire supply chain then in order to achieve the goal, APEC must address the factors which contribute to driving up cost, time, and uncertainty in all four fronts although specific chokepoints will have varying degrees of relative importance among the economies.

The following objective tree[20] could be derived:

Figure 4 Proposed High-level SCI Objective Tree



Under each strategic objective, actions that will contribute to achieving the objective must be identified. It could be a range of projects/programs each with its own objectives, outputs, activities and inputs.

It must be noted that training or skills upgrading, human resource development and capacity building are critical to improving logistics performance. The issue of skills shortage or low competence levels should be addressed under any of the four strategic objectives as appropriate. For example, training for Customs officials could be included as an activity under the third objective to ensure that modernization efforts to streamline procedures are sustained. To enhance capabilities and competence of logistics service providers, the role of the public sector could be through appropriate policies and regulations (the second objective).[21]

As mentioned, the complexity and dynamism of global supply chain management is such that external factors will continuously affect any results framework for APEC's Supply Chain Connectivity Initiative (these are typically built into the results framework under assumptions or risks). Given the very dynamic nature of global logistics, attribution of logistics performance to specific public sector actions would be very difficult to measure in precise terms. The desired impact of reduced cost, time, and uncertainty will result from a confluence of many factors, not all of which are within the control of policy-makers. However, the logic

[20] An objective tree is simply a pictorial representation of the analytical framework on which the SCI strategy is based.

[21] Identifying the appropriate intervention here would require further analysis of the sector. What could be the causes of the low levels of competence - Lack of competition? Limited FDI that could be the channel for technology transfer or spillover of knowledge? Poor standards of training schools? Need to privatize so that, among other things, with market-based incentives workers are more motivated or good workers can be attracted?

behind the SCI is that further improvements in cost, time and uncertainty reductions can be achieved by addressing choke points that are within the purview of the public sector. If we cannot attribute the achievement of the goal solely to the SCI, we should at least be able to link successes in achieving the strategic objectives to APEC actions.

2. Identifying actions and actors

As earlier discussed, building the SCI framework must be based on a good understanding of the issues and the possible approaches or solutions to the problem. Having proposed a goal and the strategic objectives that will contribute to achieving that goal, the next step is to ask - how will we achieve this? What actions or measures should be pursued so that each of the strategic objectives would be achieved (or its corresponding desired outcomes realized)?

How will we provide the necessary infrastructure? Possible actions include:

- Increase access to financing for infrastructure projects
- Link national transport plans to national and international needs in multi-modal platforms

How will we improve policy and regulatory frameworks? Possible actions include:

- Remove need for drop and pull operations
- Allow foreign licensed transport providers to move freely in APEC member economy from port to factory without having to change trailer, chassis, or driver

How will we streamline trade procedures? Possible actions include:

- Establish national single windows
- Business Logistics Park (BLP) customs to recognize common APEC standards for inspection – once cleared always cleared policy

How will we establish effective institutions and/or institutional arrangements? Possible actions include:

- Create a single contact point for information on logistics regulations
- Promote regular consultations with the private sector

The more specific the action is defined, the easier it is to measure success in achieving the action. Often further analysis is needed to clearly identify what needs to be done. For example, in order to identify specific policy and regulatory barriers that seriously impede trade in logistics services, it would be useful to undertake a study to review the existing policies and regulations. The review or stocktaking exercise in itself is not an action but could be considered as a necessary activity to better identify the appropriate action. Once the barrier is clearly identified, then addressing the barrier is the action that will contribute to improved policy and regulatory frameworks. Another example is in the provision of infrastructure. Public-Private Partnerships (PPP) is a way to finance infrastructure projects and training seminars for government officials on infrastructure finance that will strengthen their capacity to plan and manage PPPs will likely contribute to successful PPP infrastructure projects but it is not in itself an action that will directly lead to improved infrastructure. Creating a PPP logistics infrastructure fund is perhaps a more direct and measureable action (e.g. total value, number of projects financed, etc.) that will lead to increased infrastructure and supply chain connectivity in APEC.

This is not to say that research or capacity building activities are not important actions. The appropriate "action" depends on where the actor sits in the hierarchy of the results chain. One group's output is another group's input. Indeed, what constitutes an input, output or outcome depends on whose perspective you are looking out. The results or logic chain is a

logical chain of cause and effect which can potentially go on and on as we continuously ask the question "Why?" from lower to higher level (or “How?” from higher to lower level). For example, production of a mutual recognition agreement may be the outcome that a department seeks from consultative and legal activities with various stakeholders, including the partner government officials. But at the APEC level, the mutual recognition agreement may be a necessary output (or even an input) which is combined with other outputs (or inputs) towards achieving increased trade. The art of this approach is to have some strategic/intermediate objectives not too far above the output levels. By definition outputs are deliverables that are tangible and easily verifiable, as well as having reasonable control over their production.

Responsibility for taking an action ultimately rests with the individual member economies. Thus, improving connectivity in the region through the removal by each economy of its priority chokepoints essentially requires some element of an individual action plan approach in order to achieve results at the regional level. As an organization APEC operates on a non-binding and voluntary basis. The role of APEC has been most prominent in types of activities, which provide guidance and impetus for actions. The value of APEC, it has been recognized, is to provide a platform for sharing best practice, knowledge and experiences – both good and bad. It can also provide member economies with guidance by way of establishing principles, model measures or codes of conduct. Given that its role is somewhat limited, APEC must strengthen the linkage of activities with higher level actions and strategic objectives to ensure that each activity makes a concrete contribution. In other words, activities should also be results focused.

In terms of specific APEC fora, one way to implement the approach suggested in the Objective Tree would be that one senior committee be responsible or champion each strategic objective. For example, the Senior Finance Officials Meeting (SFOM), the Economic Committee (EC), and the Committee on Trade and Investment (CTI) could be assigned to drive strategic objectives 1 (infrastructure), 2 (policy and regulatory frameworks), and 3 (trade procedures), respectively. The Finance Ministers Process (FMP) has been discussing infrastructure issues since 2007 (managing contingent liabilities from PPPs) and 2008 (capital market impacts of PPPs). It may be the most appropriate forum for sharing of information and best practices on infrastructure finance. The SFOM is also best placed to engage multilateral funding agencies to assist with the infrastructure needs of APEC as well as mobilize resources perhaps not only for infrastructure but for the whole SCI. The EC has been leading the structural reform agenda of APEC and therefore provides the most suitable platform for exchanging experiences, analysis and advice to improve regulations and policies affecting the performance of logistics sectors. The EC could also provide strategic direction in identifying related actions and activities as well as engage international bodies that play a role in determining global regulatory frameworks for transport services. In terms of strategic objective 3, the CTI is the most appropriate committee to spearhead this area as it has overall responsibility for APEC’s Trade Facilitation Action Plan, which focuses on the simplification and rationalisation of customs and other trade-related administrative and procedural requirements. With respect to strategic objective 4 on establishing effective institutions and institutional arrangements, the EC could lead this area as well since structural reform is also concerned with institutional frameworks that support the efficient functioning of markets. Alternatively, the Senior Officials Meeting (SOM), as the overall driver of the SCI could take charge of the fourth strategic objective with advice from the Anti-Corruption and Transparency Experts' Task Force. As champions, the senior committees would provide strategic direction in identifying related actions and activities and also implement some of these. The various relevant APEC sub-fora or sectoral working groups (e.g. services, transport, customs, etc.) should be involved in contributing to any one or more of the strategic

objectives by focusing on the implementation of specific actions or activities which reflect their own areas of technical expertise.

While this paper is intended for APEC and the member economies, a significant portion of the beneficiaries of the supply chain connectivity initiative is the private sector. It is important that both business and consumers benefit from efficiency gains through the SCI. Indeed, from an economic perspective, the main driver for better connectivity and hence speed to market is the private businesses who have a commercial agenda to meet. Hence any action suggested must directly benefit the private sector albeit without adding unnecessary risk to the overall supply chain throughout compromises in security or safety. In this regard, any action suggested especially those pertaining to logistics and transport infrastructure such as logistics parks, airport, and container terminals must have some degree of public-private partnerships to ensure commitment and well utilised operations.

The role of public and private collective intervention could be framed as follows:

	PUBLIC	PRIVATE
'Hard' Infrastructure (physical infrastructure)	Roads Rails Ports Free Trade Zones	Logistics Centres Multi-modal Centres Cargo Terminals Container Terminals
'Soft' Infrastructure (policies and initiatives)	Single Electronic Window Transport services regulation Industry incentives	Training and Development New Logistical Services ICT Applications

The modalities for entering into partnerships to improve supply chain connectivity should be flexible but nonetheless focused on achieving results.

Implementation of various actions could be phased. For example, short term (less than a year e.g. easing of regulations or harmonization of some regulations), medium term (1-3 years such as capacity building to improve connectivity e.g. single window), long term (3 or more years such as common accreditation of service providers). This will serve to provide a meaningful roadmap of the effort and results expected of this strategic initiative. At the same time, the actions must recognize and support supply chain risks or uncertainty faced by firms. For instance, a good and reliable track and trace system at the border, across the border and behind the border of any APEC economy is essential to a firm in providing supply chain visibility. Second, the choice of policy, absence or presence of transport and trade related regulatory barriers, and the availability of optimal infrastructure have an impact on a firm's supply chain network design.

3. Measuring success

This section presents possible indicators that could be used to measure the success of the SCI in terms of achieving the strategic objectives and the goal.

a. Outcome Indicators – "How do we know that the strategic objectives have been achieved?"

i. Indicators of success in making available the necessary infrastructure[22]

Hard data

1. Infrastructure index

- Limao and Venables (2001, p. 35) - constructed an infrastructure index from four variables (km of road, km of paved road, km of rail (each per sq KM of country area), and telephone lines per person).
- De (2008, p. 303) - considered the following nine variables which are directly involved in moving merchandise between countries: (a) railway length density (km per 1,000 km2 of surface area); (b) road length density (km per 1,000 km2 of surface area); (c) air transport freight (million tons per km); (d) air transport, passengers carried (percentage of population); (e) aircraft departures (percentage of population); (f) a country's percentage share in the world fleet (per cent); (g) container port traffic (TEUs per terminal); (h) fixed line and mobile telephone subscribers (per 1,000 people); and (i) electric power consumption (kWh per capita).

Perception-based data

1. Quality of overall infrastructure - from the Global Competitiveness Report of the World Economic Forum
2. Quality of roads - from the Global Competitiveness Report of the World Economic Forum
3. Quality of railroad infrastructure - from the Global Competitiveness Report of the World Economic Forum
4. Quality of port infrastructure - from the Global Competitiveness Report of the World Economic Forum
5. Quality of air transport infrastructure - from the Global Competitiveness Report of the World Economic Forum
6. Quality of infrastructure in use for logistics operations (e.g. ports, railroads, information technology) – from LPI Part 1
7. Evolution of the quality of telecommunications infrastructure, over the past three years – from LPI Part 2
8. Evolution of the quality of transport infrastructure, over the past three years – from LPI Part 2

[22] As mentioned earlier, there is an on-going PSU study on structural reform in the infrastructure sector. As part of the exercise, they will collect and analyze information on policies and regulations as well as performance indicators for transport, energy and telecommunications in APEC Member economies. These could be used as indicators for meeting the Strategic Objectives 1 and 2.

ii. Indicators of success in improving policy and regulatory frameworks

Hard data

1. Trade restrictiveness index – Hollweg and Wong (2009) construct a logistics regulatory restrictiveness index which groups the types of restrictions under six headings: customs, investment, movement of people, and sector-specific restrictions for maritime, aviation, and road transport. Sector-specific trade restrictiveness indices have also been developed elsewhere (e.g. telecommunications, international air passenger transport, maritime, etc). See Box.

The trade restrictiveness index - classifying and quantifying restrictions on trade in services

The extent of government regulation of a particular service is quantified using a trade restrictiveness index. Trade restrictiveness indexes summarize the nature and extent of restrictions on trade in services for each economy. The more restrictions and the greater their severity, the more restrictive an economy is judged to be under the index.

Information is collected for each economy on the government regulation of a particular service and classified according to whether the restrictions are:

1. imposed on establishment or ongoing operations; and
2. non-discriminatory (treat domestic and foreign service suppliers equally) or discriminatory (treat foreign service suppliers differently from (typically less favorably than) domestic service suppliers).

Restrictions on establishment often include licensing requirements for new firms, restrictions on direct investment in existing firms and restrictions on the permanent movement of people. Restrictions on ongoing operations often include restrictions on firms conducting their core business, the pricing of services and the temporary movement of people. Depending on how each of these restrictions apply to domestic and foreign service suppliers, they could be non-discriminatory or discriminatory.

A trade restrictiveness index score is calculated for each economy using a methodology of scores and weights. Restrictions that are common to a number of economies are grouped into restriction categories. Scores are then assigned to each restriction on the basis of a judgment about how stringent it is. The more stringent the restriction, the higher the score. Scores range from 0 to 1. The restriction categories are then weighted together according to a judgment about their relative economic cost. The weights are generally chosen so that the total restrictiveness index score for an economy ranges from 0 to 1.

An index score is calculated separately for domestic and foreign service suppliers. A foreign index is calculated to measure all the restrictions that hinder foreign firms from entering and operating in an economy. It covers both discriminatory and non-discriminatory restrictions. A domestic index represents restrictions that are applied to domestic firms and it generally only covers non-discriminatory restrictions. The difference between the foreign and domestic index scores is a measure of discrimination against foreigners.

(http://www.pc.gov.au/research/researchmemorandum/servicesrestriction) [23]

2. Trade in transport and communications services - Transport and communications payments and receipts from BOP statistics.

[23]Based on Findlay, C. and Warren, T. (eds) 2000, Impediments to Trade in Services: Measurement and Policy Implications, Routledge, London and New York, December. See also McGuire and Findlay (2005).

Perception-based data

1. Port/Airport charges – from LPI Part 2
2. Full truck load rates – from LPI Part 2
3. Less than full truck load services rates – from LPI Part 2
4. Rail transport rates – from LPI Part 2
5. Warehousing service charges – from LPI Part 2
6. Competence of the logistics industry (e.g. transport operators, customs brokers) – from LPI Part 1
7. Level of competence of customs brokers – from LPI Part 2
8. Level of competence of road transport service providers – from LPI Part 2
9. Level of competence of rail transport service providers – from LPI Part 2
10. Level of competence of air transport service providers – from LPI Part 2
11. Level of competence of warehousing and distribution operators – from LPI Part 2
12. Level of competence of consignees or shippers – from LPI Part 2
13. Level of competence of freight forwarders – from LPI Part 2
14. Level of competence of trade and transport related associations – from LPI Part 2
15. Evolution of the availability of private sector services, over the past three years – from LPI Part 2

iii. Indicators of success in streamlining trade procedures

Hard data

1. Customs clearance (days) – from LPI Part 3
2. Number of documents needed to export/import – from the WB Doing Business Trading Across Borders
3. Number of border agencies to export/import – from LPI Part 3
4. Percentage of import shipments that are physically inspected – from LPI Part 3
5. Possibility of a simple and inexpensive review procedure in case of dispute (percent) – from LPI Part 3

Perception-based data

1. Effectiveness and efficiency of the clearance process – from LPI Part 1
2. How often traders demonstrating high levels of compliance receive expedited customs clearance – from LPI Part 2
3. How often customs declarations can be submitted and processed electronically – from LPI Part 2
4. How often one receives adequate and timely information when regulations change – from LPI Part 2
5. How often customs clearance is a transparent process – from LPI Part 2
6. Level of competence of customs agencies – from LPI Part 2
7. Level of competence of other border crossing-related government agencies – from LPI Part 2
8. Evolution of other border crossing-related government agencies clearance procedures, over the past three years – from LPI Part 2
9. Evolution of customs clearance procedures, over the past three years – from LPI Part 2

iv. Indicators of success in establishing effective institutions and arrangements:

Perception-based data

1. Incidence of criminal activities (e.g. stolen cargo) – from LPI Part 2
2. Incidence of informal payments – from LPI Part 2

3. Evolution of the overall business environment over the past three years – from LPI Part 2
4. Evolution of good governance and eradication of corruption, over the past three years – from LPI Part 2
5. Evolution of the regulatory regime, over the past three years – from LPI Part 2
6. Corruption perception index – Hausman et al. (2005, p. 17) use the Corruption Perception Index from Transparency International (the index has a scale of 0–10, with 10 being least corrupt). Alternative variables to represent institutional quality were also tried, such as rule of law, regulatory quality, and control of corruption (all from the World Bank's Governance Research Indicator Country Snapshot) and contract enforcement and registering property indices (from the World Bank's Doing Business database). Because these alternative variables all turned out to be strongly correlated with the Corruption Perception Index, that index is the only one retained in their model.

Corruption Perceptions Index (CPI) 2008 – Methodology Overview

Effective institutions and institutional frameworks are quantified using Transparency International's Corruption Perceptions Index (CPI), which ranks economies in terms of the degree to which corruption is perceived to exist among public officials and politicians. Corruption is defined as the abuse of public office for private gain (e.g. the bribing of public officials) and does not distinguish between administrative and political corruption, but excludes political instability.

Given the difficulty in assessing the overall level of corruption in an economy based on hard empirical data, the CPI uses perceptions-based data from business polls and surveys and assessments by country analysts. It is a composite index – the CPI 2008 uses 13 sources originating from 11 independent institutions. Each source must rank the economies to ensure that a consistent methodology is used and comparison is feasible. The source must also measure the overall extent of corruption.

The reliability of the CPI differs across economies. Research shows that economies with a high number of sources and small differences in the evaluations provided by the sources convey greater reliability in terms of their score and ranking. A minimum of three reliable sources is required for an economy to be included in the CPI. The overall reliability of the data used in the index is demonstrated in the high correlation between the sources.

The CPI provides a snapshot of the perceptions for the current or recent years, with less of a focus on year-to-year trends. To the extent that changes can be traced to a change in the assessments provided by individual sources (rather than from a change in the CPI's sample and/or source methodology), trends can be identified. Changes in scores of at least 0.3 over the previous year can be considered substantial on the basis of data from sources that have been consistently used for the index. The CPI 2008 is based on data primarily from the past two years and relates to perceptions that may have been formed even further in the past. Therefore, substantial changes in perceptions of corruption are only likely to emerge in the index over longer periods of time.

The index is not capable of measuring whether a region or the world as a whole has improved since local experience is systematically processed to determine whether one economy has improved relative to other economies. Absolute improvements are therefore outside the scope of the CPI.

Source: Transparency International, Corruption Perceptions Index (www.transparency.org)

7. Quality of Governance – De Groot et al. (2004, p. 106) use six indicators of perceived institutional quality that were constructed by Kaufman et al. (2002, 2009):
    a. 'Voice and Accountability' reflects the extent to which citizens can participate in selecting government and hold it accountable for the actions taken. This score includes various characteristics of the political process as well as assessments of the independence of the media. It reflects whether citizens and business can prevent arbitrariness in the behaviour of government and enforce good governance when needed.
    b. 'Political Stability' refers to the perceived likelihood of the government being destabilised or overthrown by unconstitutional interference or excesses of violence against persons and possessions. These factors are highly detrimental for the continuity of policy and the stability of the economic environment.
    c. 'Government Effectiveness' is a measure for the quality of government inputs. It represents, amongst others, the perceived quality and independence of the bureaucracy. This indicates the ability of government to formulate and implement good policies.
    d. 'Regulatory Quality' is directly focused on the quality of implemented policies. It includes the perceived incidence of policies that inhibit the market mechanism, and excessive regulation of foreign trade and business development, and as such closely reflects the transaction costs that result from policy intrusion by the state in private trade.
    e. 'Rule of Law' indicates the quality of the legal system. It indicates society's perceived success in upholding fair and predictable rules for social and economic interaction. Essentially, it focuses on the quality of the legal system and the enforceability of contracts.
    f. 'Control of Corruption' represents the extent of 'lawless' or unfair behaviour in public-private interactions. It complements regulatory quality and rule of law indicators, pointing at the impact of bad governance on economic interaction. Corruption, like regulatory intrusion, affects transaction costs by adding a 'third-party' involvement to private transactions. An added component of corruption to trading costs is its arbitrary, uncertain nature.

Worldwide Governance Indicators – Overview

The World Bank's Worldwide Governance Indicators (WGI) measure six dimensions of governance: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. Governance is broadly defined as the traditions and institutions by which authority in an economy is exercised.

The 2009 update of the WGI is based on 441 specific measures of various dimensions of governance using 35 sources from 33 different organizations. These data sources consist of surveys of firms and individuals, as well as assessments of commercial risk rating agencies, non-governmental organizations, and a number of multilateral aid agencies and other public sector organizations. The WDI are based exclusively on perceptions-based data on governance and reflect the views of a diverse range of informed stakeholders.

The individual data measures are combined into the six aggregate governance indicators using an unobserved components model. The aggregation procedure first rescales the individual indicators from each underlying source in order to make them comparable across data sources. It then constructs a weighted average of each of these rescaled data sources to arrive at an aggregate indicator of governance. The weights assigned to each data source are based on the estimates of the precision of each source that are produced by the unobserved components model. The assumption in the unobserved components model is that any observed correlation between two measures of corruption, for example, is due to their common, but unobserved, signal of corruption. It follows that data sources that are more correlated with each other provide more reliable information about corruption, and so receive greater weight.

This statistical methodology also generates margins of error for the governance estimates reported for each economy to reflect the inherent difficulties in measuring governance. Taking into account these margins of error allow users of the WGI to make comparisons across economies and to monitor the progress over time for a single economy. A useful rule is that when confidence intervals for governance based on the reported margins of error overlap when comparing two economies, or a single economy over time, then the data do not reveal statistically significant differences in governance.

The authors of the paper caution that the aggregate indicator can be a blunt tool for policy advice at the economy level and encourage the use of the underlying data to help users to identify and act upon more specific aspects of governance that may be problematic in a given economy.

Source: Kauffman, D., A. Kraay and M. Mastruzzi. Governance Matters VIII: Aggregate and Individual Governance Indicators 1996-2008 (June 2009).

b. Impact Indicators – "How do we know that the goal of further reducing time, cost, and uncertainty has been achieved?"

i. Cost

Hard data

1. Typical charge to export/import a 40-foot dry box container or a semi-trailer (i.e. total cost/charges to transport and port services – from the LPI Part 3
2. Cost to export/import a 20-foot container - from the WB Doing Business Trading Across Borders. On request, the WB provides further breakdown by steps:

- Document preparation
- Customs clearance and technical control
- Ports and terminal handling

- Inland transportation and handling

3. Ratio of cif/fob – 1 represents the ratio of unit transport costs to the fob price. Provides a simple summary statistic of the transport cost rate on imports. (Limao and Venables, 2001 p. 7). Also used in Pomfret and Sourdin (2009) as an indicator of trade cost.
4. Shipping cost – Limao and Venables (2001) used the cost of shipping a standard 40' container from Baltimore to different destinations in the world. The mode is surface (as opposed to air), type is freight (as opposed to household goods) and packing is loose (as opposed to lift van where the cargo is packed into wooden containers). The cost does not include insurance. The data was provided by a firm that handles forwarding for the World Bank and covers 64 destinations cities.

Perception-based data

1. Domestic logistics costs (e.g. local/transit transportation, (air)port and terminal handling, warehousing) as viewed by logistics professionals from trading partners– from LPI Part 1
2. Overall domestic logistics costs (e.g. port charges, domestic transport, agent fees) as viewed by logistics professionals based in own country – from LPI Part 2
3. Ease and affordability associated with arranging shipments – from LPI Part 1

ii. Time

Hard data

1. Lead time export/import, best, median, and worst case (days) – 2006 LPI questionnaire Part 3 asks best case (up to 10 percent of the shipments are precarried/oncarried within x days), median case (50 percent of the shipments arrive within), and worst case (the slowest 10 percent of the shipments are precarried/oncarried within x days) lead time for export pre-carriage (shipper to port of loading) and import on-carriage (port of discharge to consignee). However only the results for lead time export (median case), lead time import (best case) and lead time (median case) were reported in the 2007 report.
2. Time to export/import – from the WB Doing Business Trading Across Borders. On request, the WB provides further breakdown by steps:

- Document preparation
- Customs clearance and technical control
- Ports and terminal handling
- Inland transportation and handling

3. Average time for all procedures – used in the augmented gravity model estimation of Hausman et al. (2005)

Perception-based data

1. Incidence of major delays due to pre-shipment inspection – from LPI Part 2
2. Incidence of major delays due to compulsory warehousing – from LPI Part 2

iii. Uncertainty

"Uncertainty" could mean both variability in time and reliability of the shipment in terms of damage and pilferage of goods in transit.

Hard data

1. Maximum number of days minus Average number of days - used in the augmented gravity model estimation of Hausman et al. (2005) to measure variability.
2. Maximum and minimum lead time for exports and imports – from LPI Part 3
3. Another measure of uncertainty is to treat the coefficient of variation (CV) of the LPI measures across APEC economies as a proxy for SC connectivity uncertainty. In this

case, we can rely on the LPI results and provide the CV (we chose this as it is normalized and hence is scale invariant) of the various measures (cost, time, etc) as an indication of the uncertainty evident during the movements of goods and services. For example, if the results of the LPI 2007 Part 1 is used as the reference, for ease of benchmarking we can assume the value of 0.13 (i.e., or 0.126 which is the smallest CV - the CV of the LPI dimension with least variability) as the point where we have reduced all subjective uncertainty and are left only with objective uncertainty (see http://en.wikipedia.org/wiki/Uncertainty for the details).

4. The question "What is the percentage of damaged shipments including pilferage?" is in the 2006 LPI questionnaire Part 3 but the results were not reported in the 2007 report.

Perception-based data

1. Ability to track and trace consignments – from LPI Part 1
2. Export shipments cleared and shipped as scheduled – from LPI Part 2
3. Import shipments cleared and shipped as scheduled – from LPI Part 2

As discussed in the earlier section, logistics performance and its determinants affect bilateral trade flows. Other aspects of the economy are expected to benefit from improved logistics environment as well. See Box

The ultimate measures of success?
- Beyond cost, time, and uncertainty reduction

Trade (as measured by the volume and value of import/ exports/ transshipments) – SCI should facilitate greater trade competitiveness and hence greater trade volumes in the same amount of time, ceteris paribus. The decrease /increase in the value and volume of trade and even the types of trade moved will help determine the performance of the existing system and the need to make future changes to ensure unimpeded flow of goods and services along the various transport corridors.

Foreign Direct Investment (FDI) – there could be an increase in absolute terms, net inflow as a % of GDP due to the ease of doing business and the maturity of relevant infrastructure, both hard and soft. Good connectivity necessarily ensures greater inflow of FDI.

c. Conceptual, measurement, and data issues

i. Conceptual issues

The previous sections presented possible indicators that could be used to measure success in achieving the strategic objectives and the goal of the SCI. However, implementation of these suggested performance measures is not straightforward. There would need to be an examination of the measures in greater detail in order to rationalize the number of indicators, estimate baseline figures, and suggest a proper way of setting targets.

The choice of cost indicator is most critical as this is the main measure of success of the SCI. The advantage of the cost information provided by the LPI and the Trading Across Borders indicator is that the data are readily available and therefore relatively inexpensive to collect (from the perspective of APEC). The disadvantage is that these indicators do not capture the entire cost of moving goods and services along the supply chain. Furthermore, because these indicators use standardized measures (e.g. cost to ship cargo by ocean transport), they will not reflect cost reductions from efficiency improvements in other transport sectors.

The other possible cost indicators that have been presented may offer more insight, but they also require substantial resources in order to collect the data. According to Limao and Venables (2001), the advantages of using shipping company quotes to measure transport costs are that they reflect the true cost of transporting a homogenous good and they also provide the cities of origin, landfall, and final destination. The disadvantages are that it is not clear how the experiences of one city (Baltimore in their case) can be generalized since freight charges are affected by the particular routes, frequencies, and opportunities for back-hauling and for exploiting monopoly power.

With respect to the use of import cif/fob ratios reported by the IMF, these are more representative since they cover the entire imports of each reporting economy. However, there are some concerns regarding the quality of the data and this measure is also weakened by the fact that it is an aggregate over all commodity types. Another cif/fob metric can be calculated by following a methodology used by Pomfret and Sourdin (2009). They used annual import-weighted cif and fob values of Australia's imports at the HS six-digit level to calculate import-weighted average *ad valorem* trade costs for imports to Australia from selected Asian partners in order to examine the price gap between cif and fob. The authors find that part of the cif/fob price gap is exogenously determined by geography and by the commodity composition of trade, so these factors would need to be controlled for if this indicator were to be used as a policy-relevant measure. Also, these data would have to be sourced (i.e. purchased) directly from the national statistics offices of APEC economies.

Selection of appropriate outcome indicators can also be problematic. As mentioned earlier, an outcome is the result of many factors, which may not necessarily fit neatly within a specific strategic area. Therefore, attribution of success to a particular action may be incomplete or imprecise. Since APEC is focused on a holistic approach to supply chain connectivity, this may not be so much of an issue as long as the desired result is achieved. Ultimately, assessment of the success of the SCI will require a combination of different methods of analysis (e.g. surveys, case studies, interviews, etc.) to adequately interpret what the indicators reveal and to provide a complete picture.

ii. Measurement issues

There are several methodological issues related to the measurement of baseline SCI performance indicators for the APEC region. There are inherent problems in aggregating to a regional level for some of the indicators, especially those that use soft, or perceptions-based, data. Since many of these indicators, such as the LPI, are based on responses to polls and surveys, they reflect local experience in a particular economy in order to determine whether one economy has improved relative to others. Absolute improvements are usually outside of the scope of these indices. Since aggregating to APEC would not be appropriate, the measure of success at the regional level could be expressed as a ratio by concluding, for example, that 13 of the APEC member economies have improved their performance.

Additionally, when using composite indices based on perceptions-based data, it is often difficult to make year-to-year comparisons. Transparency International's Corruption Perceptions Index (CPI) is a composite index based on several different sources. Therefore, a change in an economy's CPI score from one year to the next may actually be the result of a change in one of the underlying sources, including a change in that source's methodology. Since perceptions have often been formed in the past, substantial changes are only likely to be realized over longer periods of time. Therefore, for outcome and impact indicators that use perceptions-based data, measurement would only occur at the beginning of the initiative (to set the baseline), at mid-term, and after the life of the initiative.

Also, there is the problem of potentially including indicators that may not be calculated and published on a regular basis. For example, the LPI which is used extensively in this report has only been constructed once and, although a 2009 survey is underway, it is not clear if the LPI will be produced in the future and/or the timing of the survey will coincide with the term of the SCI evaluation.

The number of data points collected for each economy using perceptions-based surveys can be a limitation as well. For example, the LPI survey was completed by more than 800 logistics professionals; however, given the number of economies covered by the index, this results in an average of eight respondents for each economy. This is especially significant for the questions asked to measure the perceptions of in-country operators and time-cost performance since respondents only rated the economy in which they operated. Even for questions asked to measure the perceptions of trading partners (in which each respondent rated eight other economies), the confidence interval is still very large if there were not many respondents for that economy, an important consideration for small economies that may not have many trading partners covered by the survey.

Bias on the part of the respondents is also a reasonable concern in perceptions-based surveys. Since their perceptions are based on their own local experiences, they may not actually be comparable between economies. Furthermore, the respondents may perceive the survey terminology differently (e.g. very low, average, very high, etc.) due to their own cultural background and business conditions. Finally, any monitoring system built on the analysis of a perceptions-based index, such as the LPI, will be subject to the consistency of future surveys, including question structure, economy coverage, and sample size.

iii. Data availability

Another major consideration in the selection of indicators is data availability. Annex 5 describes the data coverage for most of the possible indicators that we have identified. Except for the impact (specifically, cost) and policy and regulatory indicators, such as the trade restrictiveness indices which would require special studies, we have relied on indicators that are based on data that are collected regularly and cover most if not all of the APEC economies.

While it is very useful to have macro-level performance measures, it could be equally informative to monitor progress by modes of transport or by commodity supply chain or corridor. Such information could complement macro-level assessments and help focus on priority areas. However, these efforts would be more resource intensive (in terms of both time and money). According to Raballand et al. (2008, pp. 3-5), monitoring corridor performance can take two forms: (i) corridor-wide monitoring and (ii) detailed monitoring at specific locations, or choke-points, within a corridor. Corridor-wide monitoring involves data collection and surveys covering the length of a corridor, while bottlenecks' monitoring comprises data at specific locations that constrain transit movement. Three main methodologies have been used to date, each with a different cost and focus: (i) corridor-wide monitoring based on drivers' trip diaries or questionnaires filled in by truck drivers, (ii) bottleneck monitoring based on independent surveys with the focus usually on border-crossing time, and (iii) corridor-wide monitoring based on interviews of freight forwarders and a partnership with port authorities and/or customs. For this level of monitoring, APEC should work with regional and international agencies that have the expertise, resources and interest given that developing economic corridors, of which transport and logistics are critical components, is consistent with poverty reduction strategies. As for performance measures per mode of transport, the indicators and/or the underlying data are not publicly available. The development of mode-specific performance indicators that are comparable across economies

could be an area of further work of the sectoral working groups (in the same manner that TFAPII sub-fora have developed respective performance indicators).

Ultimately, the inherent difficulties in monitoring and evaluating performance within APEC must be recognized. For instance, not every economy collects accurate data on the ratio of logistics costs to GDP. One possible reason for this is that as the supply chain gets longer due to globalization, the difficulty in measuring the true logistics costs increases non-linearly with distance, whether it is in the areas of warehousing, transport or value adding. Even for a corridor performance measurement, we would need to control the choice of industry used since different industries require different modes of transport and terms of carriage such as cif or fob. For some economies, government agencies face the challenges of appropriate and effective monitoring and evaluation of specific corridors at the national level since the information required may not be very forthcoming, thereby delaying the process of learning from past experience.

In this paper, the LPI and related indicators are used extensively to measure the performance of the SCI. More recently, Memedovic et al. (2008) have proposed to construct a new index to monitor logistics capability.[24] The Logistics Capability Index (LOCAI) is a composite index that will be based on five underlying factors, including modern infrastructure, traditional infrastructure adapted to multi-modal transportation, trade facilitation, quality of logistics services and soft infrastructure. If this index is eventually developed, it would be a very useful indicator and source of information for performance monitoring and evaluation of the SCI, especially since information on non-APEC economies would also be collected on a systematic and regular basis. This would allow APEC to benchmark against world best practice, which should always be preferred. The component indicators and data sources for the proposed Logistics Capability Index are shown in Annex 6.

Industry and independent sources of performance information

APEC can also monitor changes in industry and global trends by making use of using existing sources of performance information already gathered internationally but are available at cost. For instance:

Llloyd's List - Lloyd's List covers shipping, marine insurance, offshore energy, logistics, global trade and law. (www.lloydslist.com). For instance, it reports the Baltic Dry Index which measures the demand for shipping capacity versus the supply of dry bulk carriers and provides an assessment of the price of moving raw materials by sea. The demand for shipping varies with the amount of cargo that is being traded or moved in various markets. The index indirectly measures global supply and demand for the commodities shipped aboard dry bulk carriers, such as building materials, coal, crude oil, metallic ores, and grains. Because dry bulk primarily consists of materials that function as raw material inputs to the production of intermediate or finished goods, such as concrete, electricity, steel, and food, the index is used as a leading economic indicator of future economic growth and production. However, it does need to be used cautiously, particularly given the volatility in the world economic environment.

ICAOData - ICAOData (http://www.icaodata.com) is a new website that increases the availability and visibility of the International Civil Aviation Organization (ICAO) statistical data on the air transport industry. The database contains detailed financial, traffic, personnel and fleet information for commercial air carriers. It also holds Traffic by Flight Stage (TFS)

[24] One of the authors of this paper, Dr. Lauri Ojala, is the Initiator and co-author of the *Logistics Performance Index*.

information and On-flight Origin/Destination statistics for air carriers. Additionally financial and traffic data for airports are available.

Containerisation International (CI) - Same as Lloyd's list, CI is one of the products of Informa Plc. Its online database (www.ci-online.co.uk) contains (1) world ranking, ship fleet breakdown, operating capacity, financial performance of public companies covering a five-year period; (2) dynamically updated information on world's container fleet, including aggregate TEU capacity for each company, vessel types, age and size, and ownership and deployment information with searches possible by region and trade lane showing where a line's vessels are in service; (3) a five year snapshot of freight rates on the transpacific, transatlantic and Asia/US/Asia trades; and (4) a directory of all the world's container ports including information on berths, terminals, facilities and direct call services along with 30 years of container handling statistics.

See Annex 7 for other sources of information.

Engagement with industry would be very valuable in this regard. Logistics is a huge global industry and there are many commercial players who would have real incentive to get the supply chain costs down. They have sets of information to use, and their involvement in the SCI would gain access to these. It has implications for Outcome 4 on institutional arrangements as well.

IV. A PROPOSED RESULTS FRAMEWORK FOR THE SCI

A. EVALUATING THE OUTCOMES AND IMPACT OF THE SCI

Using the proposed objective tree presented in the previous section and taking into consideration the measurement and data issues, the following Top Level or Strategic Level Results Framework for the SCI is proposed to evaluate the achievement of the strategic objectives and the goal:

RESULTS OF ACHIEVING SCI GOAL AND STRATEGIC OBJECTIVES	PERFORMANCE OR SUCCESS INDICATOR	MEANS OF VERIFICATION	ASSUMPTIONS[25]
IMPACT The time, cost, and uncertainty in moving the goods and services along the entire supply chain have been reduced.	Relevant LPI Indicators Relevant Trading Across Borders Indicators CIF-FOB Shipping cost	World Bank surveys Special studies	
OUTCOME 1 The necessary infrastructures have been provided	Infrastructure Index Infrastructure Quality Indicators	Various secondary sources	The state of the global and national economies is favorable The private sector takes advantage of the improved infrastructure by investing in appropriate conveyance and storage and locating their businesses appropriately
OUTCOME 2 Policy and regulatory frameworks have been improved	Trade Restrictiveness Index Perception of cost	Special studies World Bank surveys IMF Statistics	The state of the global and national economies is favorable Stakeholders have the

[25] As mentioned in an earlier section, an assumption is a statement of a condition that must be met in order for the next higher level objectives to be achieved. Thus the goal is achieved if the outcomes are achieved and the conditions listed in the assumption column are met. In this table, the four key sources of choke points needing to be addressed to achieve the goal are covered by the four outcomes stated. Hence the assumptions column covers those and any conditions beyond the control of management which will affect achievement of the goal.

	per sub-sector Perception of competence per sub-sector Trade in transport and communications		knowledge, capacity and incentive to consistently implement the new policies and regulations
OUTCOME 3 Trade procedures have been streamlined	Relevant Trading Across Borders Indicators Relevant LPI Indicators	World Bank Surveys	The state of the global and national economies is favorable Stakeholders have the knowledge, capacity and incentive to consistently implement streamlined procedures
OUTCOME 4 Effective institutions and/or arrangements have been established	Corruption Index Governance Indicators	World Bank Surveys	The state of the global and national economies is favorable On-going learning process in place for stakeholders in institutional process to ensure institutions/ institutional arrangements continue to operate effectively

A logical framework would indicate that success in achieving goal/impact is dependent on (i) all four strategic objectives/outcomes being realized (since the range of potential choke points limiting achievement of impact has been categorized under one or more of the four strategic objectives/outcomes) and (ii) the external environment (reflected in the assumptions column) is favorable. Thus, ***if*** the four general sources of choke points have been addressed, ***then*** the goal would be attained, subject to any other external factors/risks/assumptions being favorable. If APEC through member economies is only involved in achieving some of the outcomes, this would imply one of two propositions - that the remaining outcomes have been achieved or the goal/impact will not be realized. This suggests that an overall holistic goal is an extremely ambitious one. As this paper indicates, it gives rise to many objectives which include many more actions for which there is no comprehensive direct data alignments or sources. APEC efforts can be partially successful even if it only realizes some of the four outcomes as it realistically cannot address all the choke points, and it is important that APEC members focus their efforts on respective priority areas. But facilitating progress in the other outcome areas, or at least monitoring that progress, will ensure that expectations on what APEC can achieve will be more realistic and manageable.

B. MONITORING THE IMPLEMENTATION AND PROGRESS OF THE SCI ACTION PLAN

To monitor the implementation and progress of SCI actions, each action or activity must have a corresponding performance measure. Actions identified below are for illustrative purposes only. Moreover, it is acknowledged that technical expertise is required to develop appropriate performance or success indicators.

A Bottom Level or Implementation Level Results Framework for the SCI could be as follows:

STRATEGIC OBJECTIVE 1

Provide the necessary infrastructures to remove the physical chokepoints along the entire supply chain.

POSSIBLE ACTIONS	PERFORMANCE OR SUCCESS INDICATOR	MEANS OF VERIFICATION	ASSUMPTIONS
Establish an APEC PPP logistics infrastructure fund	Total value of fund Number of projects financed through fund	Reports from fund manager(s) Reports from each economy regarding infrastructure projects	Viable infrastructure projects are developed and implemented through APEC funding
Exchange of best practice in models of PPPs and in infrastructure finance	Information-sharing conferences on PPPs for logistics infrastructure are established.	Conferences occur on a regular basis (e.g. annually)	Lessons learned are shared and adopted by member economies
Link national transport plans to national and international needs in multi-modal platforms	Transport Plans are developed and approved Budgets are approved	Reports from each economy National budgets	Transport Plans are funded and implemented
Organize SCI financing conferences to showcase pipeline of viable infrastructure projects to private sector investors	Number of projects showcased Value of financing secured Number of participants	Funding targets for infrastructure projects are achieved Report from organizers	Resources and requirements are matched Partnerships are able to implement projects smoothly with visible and tangible results

STRATEGIC OBJECTIVE 2

Improve policy and regulatory frameworks that will enhance the performance of the logistics sector and/or logistics service providers.

POSSIBLE ACTIONS	PERFORMANCE OR SUCCESS INDICATOR	MEANS OF VERIFICATION	ASSUMPTIONS
Remove need for drop and pull operations (Output: Removal of relevant regulatory restrictions)	Reduction in delivery time	Reports from economies APEC surveys	Drop and pull can be eliminated APEC economies are willing to ease restrictions on across borders movements of trucks.
Allow foreign licensed transport providers to move freely from port to factory in APEC member economies (Output: Mutual Recognition Agreements for drivers of vehicles and transport craft across borders Removal of relevant regulatory restrictions)	Reduction in delivery time No change to provider's trailer, chassis or driver Documented agreements	Annual survey of foreign licensed transport providers Reports from economies	All transport providers are treated uniformly APEC member countries are prepared to ease the restrictions on unhindered passage of foreign licensed logistics and transport providers
Accelerate the removal of restrictions on all-cargo services (Output: Air Services Agreements)	Designations Frequencies Capacity	Industry reports Reports from economies	The state of the global and national economies is favorable

STRATEGIC OBJECTIVE 3

Streamline trade procedures so that transactions between business and government agencies are easier, quicker, and more economical than before.

POSSIBLE ACTIONS	PERFORMANCE OR SUCCESS INDICATOR	MEANS OF VERIFICATION	ASSUMPTIONS
Bonded Logistics Parks customs adopt common standards of inspection (once cleared always cleared policy) (Output: Goods are routinely cleared according to APEC standards of inspection Activities: • Implement a proper procedure manual for reporting lines and decision making • Ensure proper training of employees (including regular updates on new rules). • Ensure communication between Customs and industry is conducted by qualified employees. • Conduct periodic compliance checks with both employees and Customs Broker. • Obtain rulings on controversial areas from the Customs authority.)	Drayage cost at the BLP for standard container moves (e.g. TEU, FEU, and per pallet basis) Dwell time at the BLP waiting for connection Drop in complaints from exporters/importers Reduction in clearance times	Surveys of Importers and exporters Industry sources monitoring such barriers Minutes of APEC working groups	Trained personnel remain available Standards are uniformly applied at national customs agencies

STRATEGIC OBJECTIVE 4

Establish effective institutions and/or institutional arrangements to support efficient market exchanges.

POSSIBLE ACTIONS	PERFORMANCE OR SUCCESS INDICATOR	MEANS OF VERIFICATION	ASSUMPTIONS
Promote regular consultations with the private sector (Output: Agreed action plan on priority issues affecting private sector performance)	Actions are taken on priority issues	Minutes of consultation meetings	Appropriate representatives from government agencies and industry involved. Agenda is narrowed to workable action plan. Stakeholders willing to disclose information.
Create single contact point for information on logistics regulations	Percent of APEC economies with single contact point	Reports from economies Business feedback Website Web-based client survey	Resources are provided to ensure that information is always complete and up-to-date

V. CONCLUSION

This paper was prepared in response to the request by the Senior Officials Meeting (SOM) in July 2009, for the Policy Support Unit (PSU) to develop holistic measurement tools that are applicable to APEC's Supply Chain Connectivity Initiative.

The PSU has proposed using a results framework to reflect both a holistic approach in improving connectivity in APEC and in measuring the progress of the SCI.

We interpreted the ultimate success of the SCI to be evaluated in terms of reducing cost, time, and uncertainty in moving goods and services along the entire supply chain and then formulated strategic objectives to be able to measure achievement in addressing the drivers of cost, time, and uncertainty (i.e. the chokepoints). The strategic objectives were formulated by grouping the chokepoints according to meaningful policy areas for intervention. To increase the chances of successful implementation of the SCI, the PSU also considered aligning the strategic objectives with the architecture of APEC's committee system.

An overall holistic approach to supply chain connectivity is extremely ambitious. Moreover, committing to an SCI-wide agenda would give rise to high expectations for a broad range of outcomes. It leads to many objectives which include many more actions for which there are no comprehensive direct data alignments or sources. APEC efforts could be partially successful even if it only realizes some of the four outcomes but partial success would then be viewed against the higher initial expectations of holistic outcomes. It is important that APEC members focus their efforts on addressing respective priority chokepoints. Facilitating progress in the other outcome areas, or at least monitoring that progress, will ensure that expectations on what APEC can achieve will be more realistic and manageable. Alternatively, APEC could agree on a holistic approach to guide priority areas and objectives and publicly refer these particular issues as the deliverables. This may better attune performance expectations to the publicized scope of the SCI.

An important issue that is not discussed in this paper is funding for the SCI. Once the action plan is developed, the plan must be translated into a budget and the required resources mobilized. To ensure that the results framework is implemented, an adequate budget must also be allocated for monitoring and evaluation of the SCI

The proposed results framework captures how APEC can measure success at each level of the SCI. The previous section gives a good flavor of the approach. A logical framework type analysis such as this is meant to be done interactively with the stakeholders involved and evolve over time. Its advantage is the huge amount of information and analysis condensed in a page or two which serves strategic thinking with the implementation plan developed around this framework.

If there is agreement on the approach, the next steps would be:

For the top level results framework: (1) Rationalize indicators; (2) Establish baseline figures; and (3) Set targets.

For the bottom level results framework: (1) Develop actions/activities; (2) Identify performance indicators for each action; (3) Establish baseline figures, and (4) Set targets. This will be done on an ongoing basis as new actions are proposed throughout the life of the SCI.

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GLOSSARY

Air Transport and Airport Operations
Air logistics is that part of the supply chain process which plans, implements and controls the efficient, cost-effective, time-sensitive, transportation of cargo by air; the ground handling, clearances, and multi-modal transfers of that cargo, and the unimpeded flow of related information. (Source: http://www.gfptt.org/)

Bonded Logistics Parks (BLP)
This BLP concept is similar to the logistics park except that goods are now held in bond. This approach is particularly useful for counties involved in international logistics and keen on favourable foreign currency control policy. We quote an example of China below.

Shanghai Wai Gao Qiao Bonded Logistics Zone (WGQ), with 100,000 square meters of warehouse, and container yard, is the first such free trade zone that has put into operation in China since early 2004. Import and export exceed US$ 500 million and are poised for high speed of growth. Major enterprises registered in Customs are operating in WGQ including international logistics and shipping companies, engaging in international purchase and delivering, providing complete logistics chain services for domestic and international enterprises (source: http://forum.hktdc.com/forum/Forum1/HTML/000706.html, accessed on 9 Sep 2009).

Container terminal
A facility where cargo containers are transshipped between different transport vehicles, for onward transportation. The transshipment may be between ships and land vehicles, for example trains or trucks, in which case the terminal is described as a **maritime container terminal**. Alternatively the transshipment may be between land vehicles, typically between train and truck, in which case the terminal is described as an **inland container terminal**.

Maritime container terminals tend to be part of a larger port, and the biggest maritime container terminals can be found situated around major harbours. Inland container terminals tend to be located in or near major cities, with good rail connections to maritime container terminals.

Both maritime and inland container terminals usually also provide storage facilities for both loaded and empty containers. Loaded containers are stored for relatively short periods, whilst waiting for onward transportation, whilst unloaded containers may be stored for longer periods awaiting their next use. Containers are normally stacked for storage, and the resulting stores are known as container stacks. (Source: Wikipedia accessed on 30 August 2009)

Coolport technology
Coolport is a temperature controlled facility comprising three multi-tiered zones with different temperatures ranging from -28C to 18C, to handle a range of perishables cargo such as live seafood and ornamental fish, fresh produce, meats, flowers and pharmaceutical products including vaccines. This is used for cold chain operations in accordance with the internationally recognised Hazard Analysis and Critical Control Points (HACCP) guidelines for food safety.

Drayage cost
Drayage is sometimes defined as the short distance road transport of cargo (containerized) between the nearest terminal (port side) and the stuffing/unstuffing place (warehouse, container freight station). In simple terms, this is the physical movement of a container from an intermodal terminal to a customer facility for loading/ unloading. This cost

(this is not freight cost), is usually provided by a logistics company or shipment broking firm, and includes the following activities:

1. Completing an inbound carrier's receiving documents.
2. Unloading and delivery of the goods to the destination from the receiving dock
3. Pickup of the goods from destination to the receiving dock and loading back into the carrier
4. Completing outbound carrier's shipping documents.

Drayage costs are high because they include the behind the scene costs such as documentation, renting of materials handling equipment involved in the activity, administration, labour, management, etc.

Drop and pull

Truck (drayman) drops loaded or unloaded unit at shipper or receiver and hooks up to unit which was previously dropped and returns it to the ramp. For example, in terms of truck-to-truck operations, trucks have to drop their containers at the border (because of licensing issues) and then allow another truck to pull the container behind the border. This delays the transport time, adds to fuel/ environmental emission because of idling trucks waiting for container, and dead heading as the second truck has to travel empty sometimes to the pick up point. In terms of intermodal operations, if countries use different gauges for their rail then they need to offload the container and then reload to another train/truck. Delays to each train/truck depend on how many cranes can operate simultaneously. Clearly the more cranes, the more idle time that they have and the more staff needed, so this is an economic decision vs. the longer waiting time for drop and then pulling the container to the final destination.

Logistics

That part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point of origin to the point of consumption in order to meet customers' requirements (Source: de Souza et al (2007))

The management of the flow of goods, information and other resources, including energy and people, between the point of origin and the point of consumption in order to meet the requirements of consumers (frequently, and originally, military organizations). Logistics involves the integration of information, transportation, inventory, warehousing, material-handling, and packaging, and occasionally security. Logistics is a channel of the supply chain which adds the value of time and place utility. (Source: Wikipedia accessed on 25 August 2009)

The process of planning, implementing, and controlling the efficient, effective flow and storage of goods, services and related information from their point of origin to point of consumption for the purpose of satisfying customer requirements. (Source: Wiktionary accessed on 25 August 2009)

Logistics Parks

Logistics Park, sometimes called freight village or logistics centre, is an industrial park created to support activities related to trade and cargo especially if it is located in a free trade zone to facilitate transshipment and shipping of cargo into the region. The park is a notable example of cooperation between the government and business to increase the business competitiveness of the country. Such parks can be served by one or more predominant modes of transport e.g. ALPS.

Maritime Transport and Port Operations
Maritime transport is the shipment of goods (cargo) and people by sea and other waterways. Port operations are a necessary tool to enable maritime trade between trading partners. To ensure smooth port operations and to avoid congestion in the harbor it is inevitable to permanently upgrade the port's physical infrastructure, invest in human capital, fostering connectivity of the port and upgrade the port operations to prevailing standards. Hence, port operations can be defined as all policies, reforms and regulations that influence the infrastructure and operations of port facilities including shipping services. (Source: http://www.gfptt.org/)

Multimodal Transport
Multimodal Transport is commonly known as referring to a transport operation that is carried out using different modes of transport and organised by a single operator. Multimodal Transport is also a legal concept strictly defined in the United Nations Convention on the International Transport of Goods and other international instruments, where the specified liability regime of the operator differs from those applicable in modal operations. (Source: http://www.gfptt.org/)

Rail transport
Rail transport is the conveyance of passengers and goods by means of wheeled vehicles running along railways (or railroads in US English). Railway transport is part of the logistics chain, which facilitates international trade and economic growth. (source: en.wikipedia.org/wiki/Rail_transport, accessed on 9 Sep 2009). This mode of transport is particularly helpful for journeys involving more than 1, 000 kms typically and for non parcel operations.

Road Transport and trucking operations
Road transport is transport on roads of passengers or goods (source: http://en.wikipedia.org/wiki/Road_transport, accessed on 9 Sep 2009). Trucking operations refers to the conveyance of freight by trucks (source: http://en.wiktionary.org/wiki/trucking, accessed on 9 Sep 2009).

Some countries in APEC such as Australia rely heavily on road transport due to Australia's large area and low population density in considerable parts of the country. This transportation mode is highly inefficient and results in large cross subsidies sometimes.

Supply Chain
A logistical management system which integrates the sequence of activities from delivery of raw materials to the manufacturer to delivery of the finished product to the customer into measureable components. "Just in time" is a typical value-added example of supply chain management. (Source: de Souza et al (2007))

1. starting with unprocessed raw materials and ending with the final customer using the finished goods, the supply chain links many companies together.
2. the material and informational interchanges in the logistical process stretching from acquisition of raw materials to delivery of finished products to the end user. All vendors, service providers and customers are links in the supply chain. (Source: Logistics Glossary Fall 2008 Definitions compiled by: Kate Vitasek www.scvisions.com)

The system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer. Supply chain activities transform natural resources, raw materials and components into a finished product that is delivered to the end customer. In sophisticated supply chain systems, used products may re-enter the supply chain at any point where residual value is recyclable. Supply chains link value chains.

A typical supply chain begins with ecological and biological regulation of natural resources, followed by the human extraction of raw material, and includes several production links (e.g., component construction, assembly, and merging) before moving on to several layers of storage facilities of ever-decreasing size and ever more remote geographical locations, and finally reaching the consumer.

Many of the exchanges encountered in the supply chain will therefore be between different companies that will seek to maximize their revenue within their sphere of interest, but may have little or no knowledge or interest in the remaining players in the supply chain. More recently, the loosely coupled, self-organizing network of businesses that cooperates to provide product and service offerings has been called the Extended Enterprise. (Source: Wikipedia accessed on 25 August 2009)

Trade Logistics and Facilitation

The management of international flows of goods, and related documentation and payments, with a focus on reducing direct and indirect logistical costs through the simplification/harmonization of procedures and documentation. (Source: http://www.gfptt.org/)

ANNEX 1. TOP THREE EXPORTS AND IMPORTS BETWEEN EACH MEMBER ECONOMY AND APEC

Table 10 Top Three Exports and Imports (in current millions USD)

APEC ECONOMY	Exports to APEC		Imports from APEC	
	HS 2-digit Commodity Category	Value	HS 2-digit Commodity Category	Value
Australia (2008)	27: Mineral fuels, oils, distillation products, etc	36,724	27: Mineral fuels, oils, distillation products, etc	25,442
	26: Ores, slag and ash	31,005	84: Nuclear reactors, boilers, machinery, etc	19,591
	02: Meat and edible meat offal	5,209	87: Vehicles other than railway, tramway	16,273
Brunei Darussalam (2006)	27: Mineral fuels, oils, distillation products, etc	6,980	84: Nuclear reactors, boilers, machinery, etc	208
	61: Articles of apparel, accessories, knit or crochet	126	87: Vehicles other than railway, tramway	151
	84: Nuclear reactors, boilers, machinery, etc	51	73: Articles of iron or steel	109
Canada (2008)	27: Mineral fuels, oils, distillation products, etc	121,285	87: Vehicles other than railway, tramway	54,407
	87: Vehicles other than railway, tramway	49,378	84: Nuclear reactors, boilers, machinery, etc	49,747
	84: Nuclear reactors, boilers, machinery, etc	27,734	85: Electrical, electronic equipment	36,129
Chile (2007)	74: Copper and articles thereof	14,115	27: Mineral fuels, oils, distillation products, etc	5,106
	26: Ores, slag and ash	10,805	84: Nuclear reactors, boilers, machinery, etc	2,991
	03: Fish, crustaceans, molluscs, aquatic invertebrates nes	1,959	87: Vehicles other than railway, tramway	2,719
China, People's Republic of (2008)	85: Electrical, electronic equipment	233,895	85: Electrical, electronic equipment	241,718
	84: Nuclear reactors, boilers, machinery, etc	160,431	84: Nuclear reactors, boilers, machinery, etc	97,109
	72: Iron and steel	32,551	90: Optical, photo, technical, medical, etc apparatus	69,178
Hong Kong, China (2008)	85: Electrical, electronic equipment	131,053	85: Electrical, electronic equipment	149,571
	84: Nuclear reactors, boilers, machinery, etc	42,465	84: Nuclear reactors, boilers, machinery, etc	43,779
	71: Pearls, precious stones, metals, coins, etc	12,794	27: Mineral fuels, oils, distillation products, etc	14,219
Indonesia (2008)	27: Mineral fuels, oils, distillation products, etc	36,943	27: Mineral fuels, oils, distillation products, etc	21,546
	85: Electrical, electronic equipment	6,258	84: Nuclear reactors, boilers, machinery, etc	15,351
	40: Rubber and articles thereof	5,555	85: Electrical, electronic equipment	11,602
Japan (2007)	85: Electrical, electronic equipment	109,640	85: Electrical, electronic equipment	68,636
	87: Vehicles other than railway, tramway	104,076	27: Mineral fuels, oils, distillation products, etc	53,545
	84: Nuclear reactors, boilers, machinery, etc	98,165	84: Nuclear reactors, boilers, machinery, etc	45,655
Korea, Republic of (2007)	85: Electrical, electronic equipment	75,219	85: Electrical, electronic equipment	53,207
	84: Nuclear reactors, boilers, machinery, etc	28,132	84: Nuclear reactors, boilers, machinery, etc	27,049

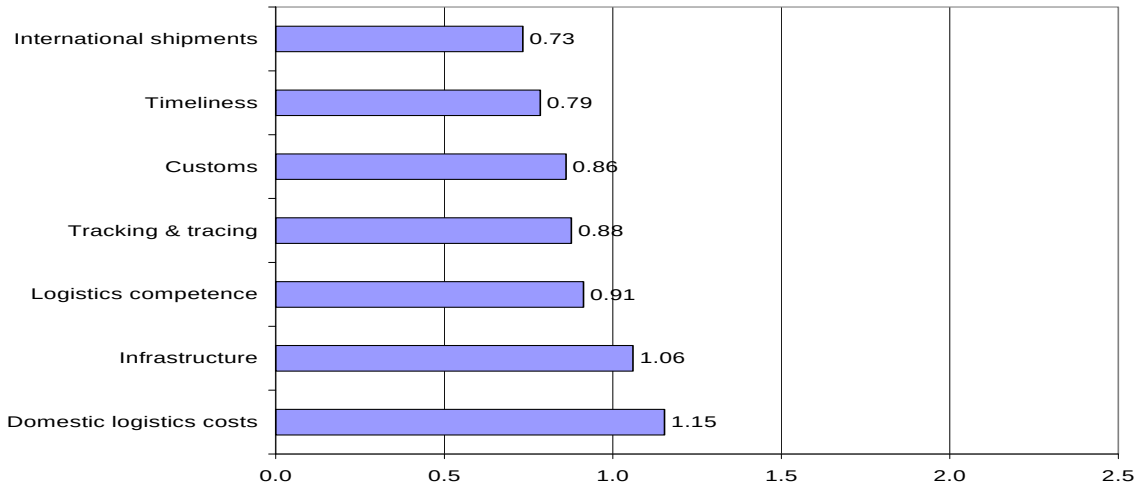
	87: Vehicles other than railway, tramway	24,175	27: Mineral fuels, oils, distillation products, etc	25,812
Malaysia (2008)	85: Electrical, electronic equipment	40,849	85: Electrical, electronic equipment	40,037
	27: Mineral fuels, oils, distillation products, etc	31,833	84: Nuclear reactors, boilers, machinery, etc	17,.608
	84: Nuclear reactors, boilers, machinery, etc	25,321	27: Mineral fuels, oils, distillation products, etc	10,487
Mexico (2008)	85: Electrical, electronic equipment	69,137	85: Electrical, electronic equipment	59,195
	27: Mineral fuels, oils, distillation products, etc	42,304	84: Nuclear reactors, boilers, machinery, etc	35,778
	87: Vehicles other than railway, tramway	35,686	87: Vehicles other than railway, tramway	20,584
New Zealand (2008)	04: Dairy products, eggs, honey, edible animal product nes	3,657	27: Mineral fuels, oils, distillation products, etc	4,057
	27: Mineral fuels, oils, distillation products, etc	2,085	84: Nuclear reactors, boilers, machinery, etc	3,192
	02: Meat and edible meat offal	1,747	87: Vehicles other than railway, tramway	2,502
Papua New Guinea (2004)	26: Ores, slag and ash	272	84: Nuclear reactors, boilers, machinery, etc	291
	44: Wood and articles of wood, wood charcoal	179	27: Mineral fuels, oils, distillation products, etc	254
	09: Coffee, tea, mate and spices	74	10: Cereals	113
Peru (2007)	26: Ores, slag and ash	6,430	84: Nuclear reactors, boilers, machinery, etc	1,838
	71: Pearls, precious stones, metals, coins, etc	2,316	85: Electrical, electronic equipment	1,467
	27: Mineral fuels, oils, distillation products, etc	1,711	87: Vehicles other than railway, tramway	982
Philippines (2008)	99: Commodities not elsewhere specified	12,852	99: Commodities not elsewhere specified	9,126
	85: Electrical, electronic equipment	7,374	85: Electrical, electronic equipment	8,259
	84: Nuclear reactors, boilers, machinery, etc	5,522	27: Mineral fuels, oils, distillation products, etc	5,911
Russia (2008)	27: Mineral fuels, oils, distillation products, etc	30,501	87: Vehicles other than railway, tramway	23,031
	72: Iron and steel	5,930	84: Nuclear reactors, boilers, machinery, etc	16,218
	76: Aluminium and articles thereof	4,638	85: Electrical, electronic equipment	14,065
Singapore (2008)	85: Electrical, electronic equipment	92,897	85: Electrical, electronic equipment	73,169
	27: Mineral fuels, oils, distillation products, etc	51,344	84: Nuclear reactors, boilers, machinery, etc	38,837
	84: Nuclear reactors, boilers, machinery, etc	42,900	27: Mineral fuels, oils, distillation products, etc	36,873
Chinese Taipei (2008)	85: Electrical, electronic equipment	69,967	85: Electrical, electronic equipment	38,709
	90: Optical, photo, technical, medical, etc apparatus	19,548	84: Nuclear reactors, boilers, machinery, etc	18,708
	84: Nuclear reactors, boilers, machinery, etc	17,981	27: Mineral fuels, oils, distillation products, etc	16,789
Thailand (2008)	84: Nuclear reactors, boilers, machinery, etc	21,839	85: Electrical, electronic equipment	26,439
	85: Electrical, electronic equipment	19,649	84: Nuclear reactors, boilers, machinery, etc	18,924
	87: Vehicles other than railway, tramway	9,036	72: Iron and steel	11,173
United States	84: Nuclear reactors, boilers, machinery, etc	119,425	85: Electrical, electronic equipment	225,369

(2008)	85: Electrical, electronic equipment	107,712	27: Mineral fuels, oils, distillation products, etc	184,548
	87: Vehicles other than railway, tramway	71,456	84: Nuclear reactors, boilers, machinery, etc	183,962
Viet Nam (2006)	27: Mineral fuels, oils, distillation products, etc	8,911	27: Mineral fuels, oils, distillation products, etc	6,583
	62: Articles of apparel, accessories, not knit or crochet	2,505	84: Nuclear reactors, boilers, machinery, etc	4,820
	03: Fish, crustaceans, molluscs, aquatic invertebrates nes	2,181	85: Electrical, electronic equipment	3,170

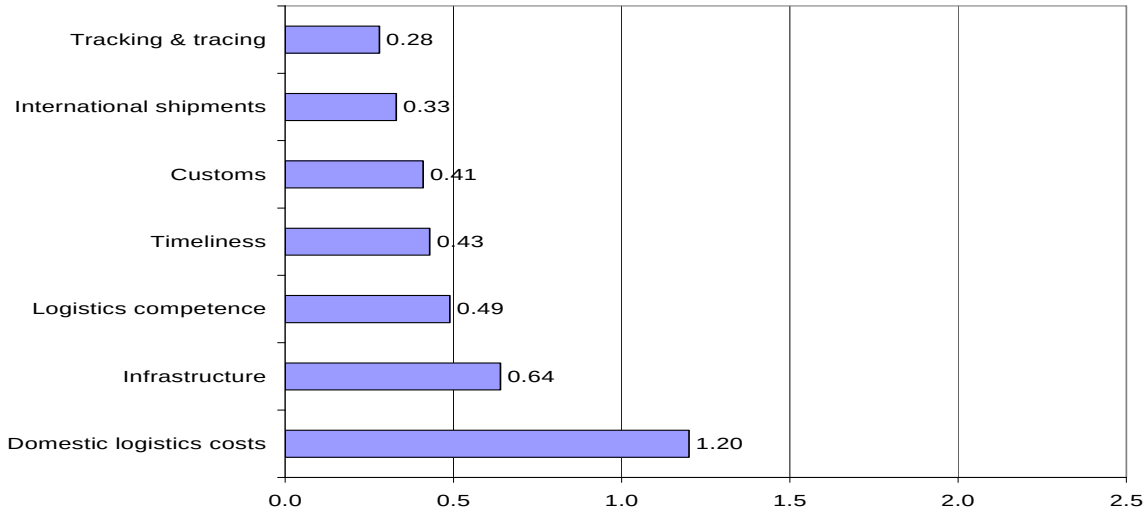
Source: International Trade Centre, Market Analysis Tools, Trade Map; www.trademap.org; Accessed: 26 August 2009

ANNEX 2. GAP IN PERFORMANCE BY LPI DIMENSION: PRESENTED FROM SMALLEST TO LARGEST GAP IN PERFORMANCE VS. WORLD BEST PRACTICE [26]

APEC AVERAGE

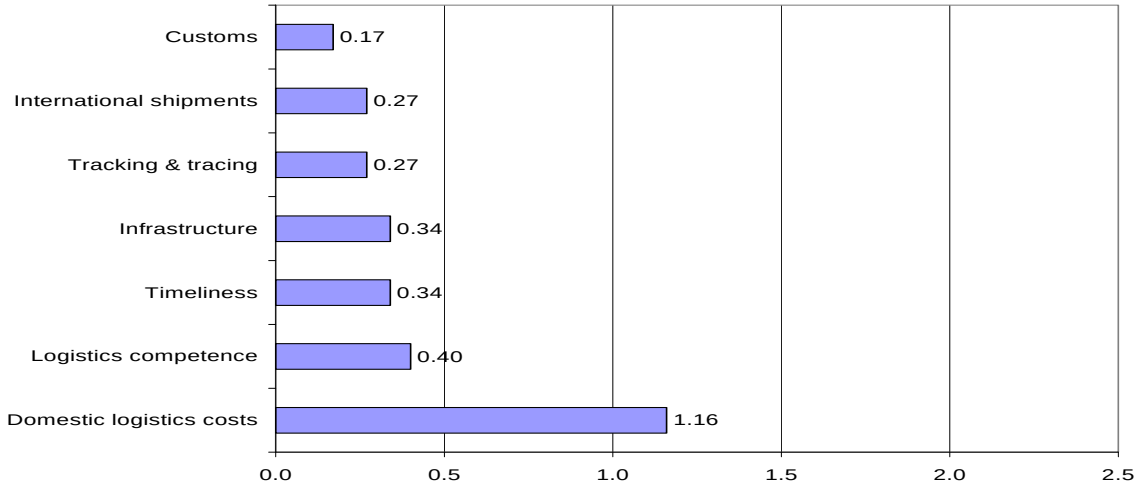


AUSTRALIA

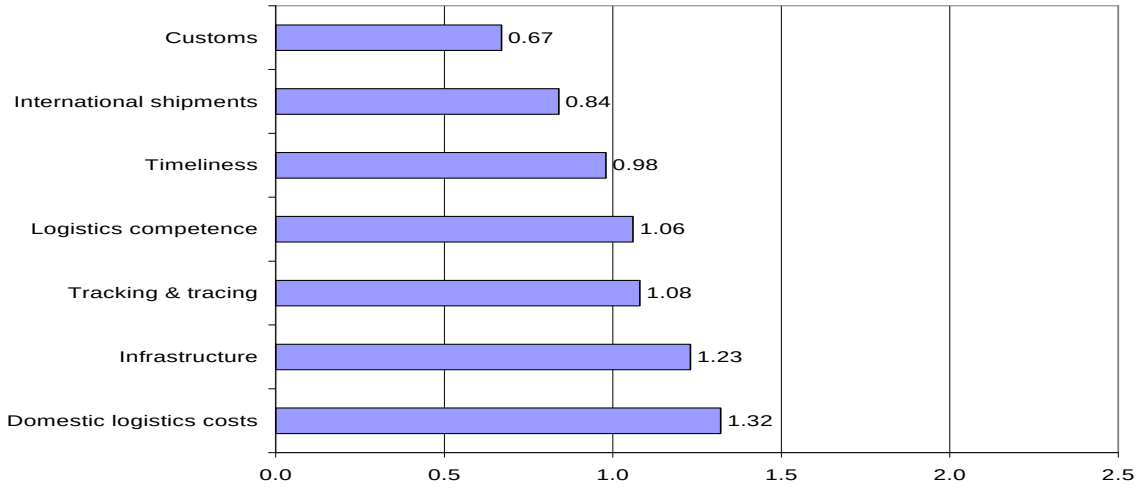


[26] The scale on all the figures has been fixed at 2.5 for ease of comparison across dimensions.

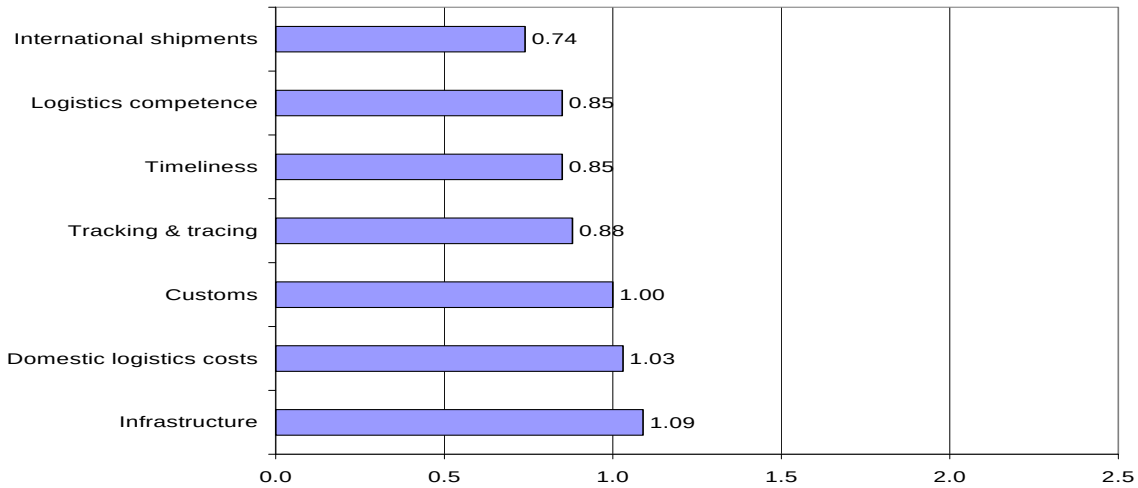
CANADA



CHILE

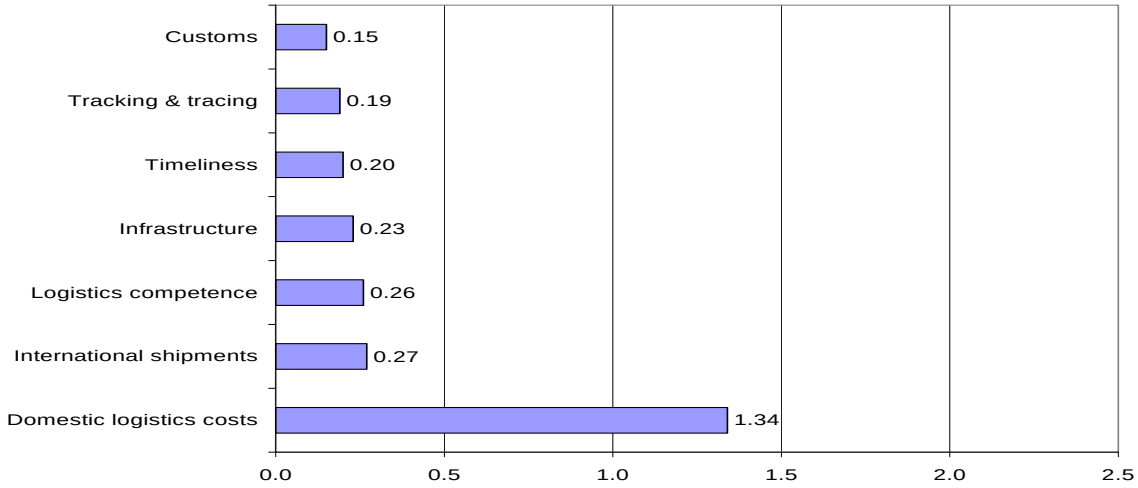


CHINA

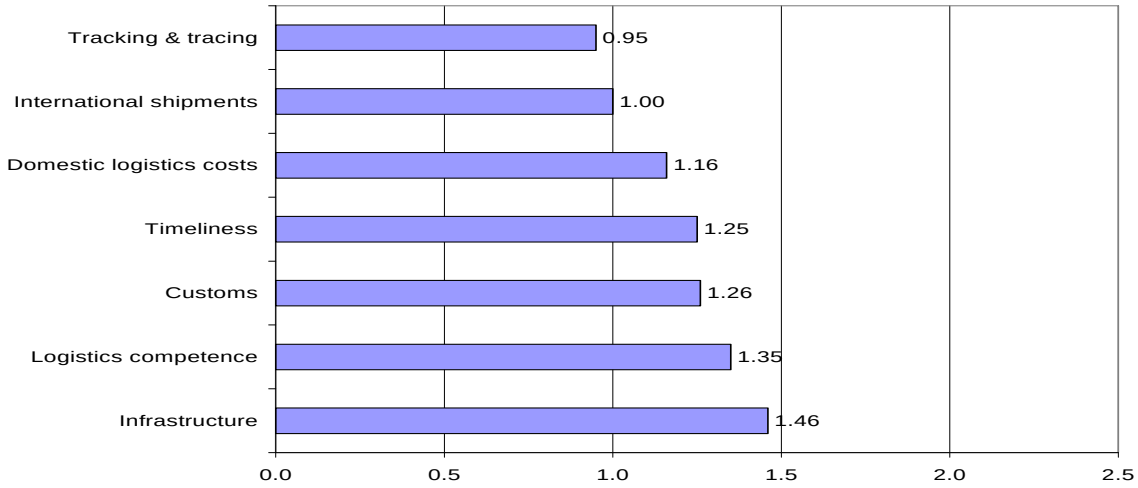


Annex 2 – Gap in performance by LPI: presented from smallest to largest gap in performance vs world best practice

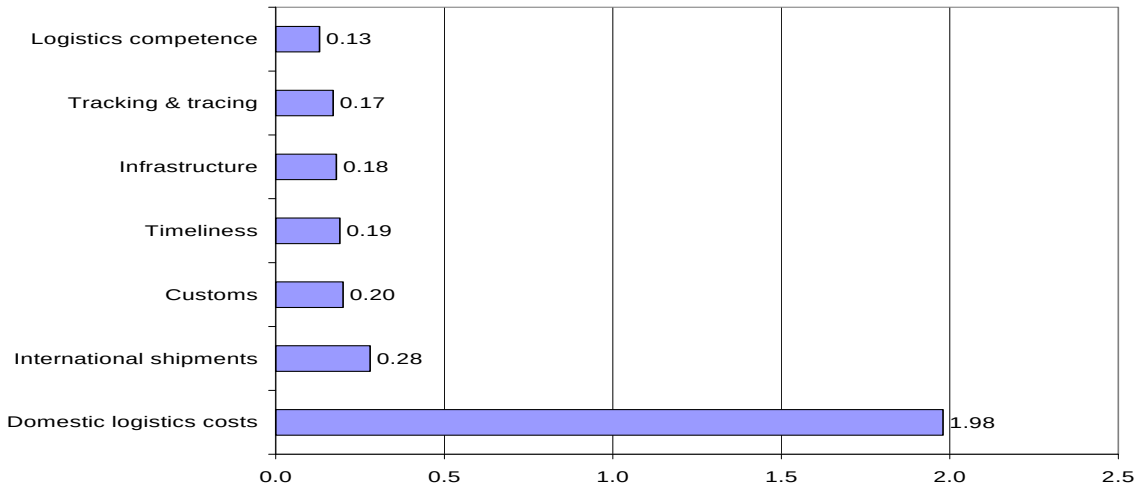
HONG KONG, CHINA



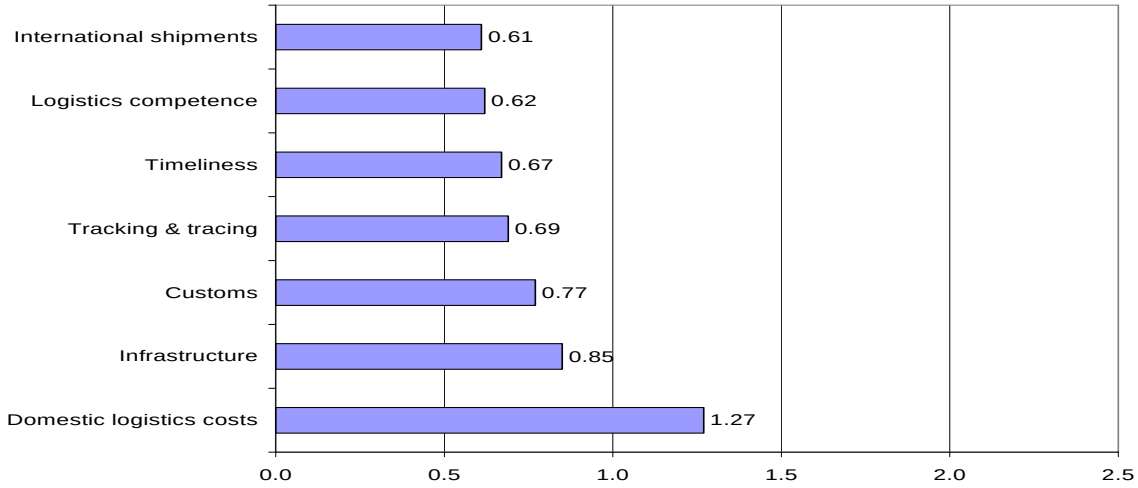
INDONESIA



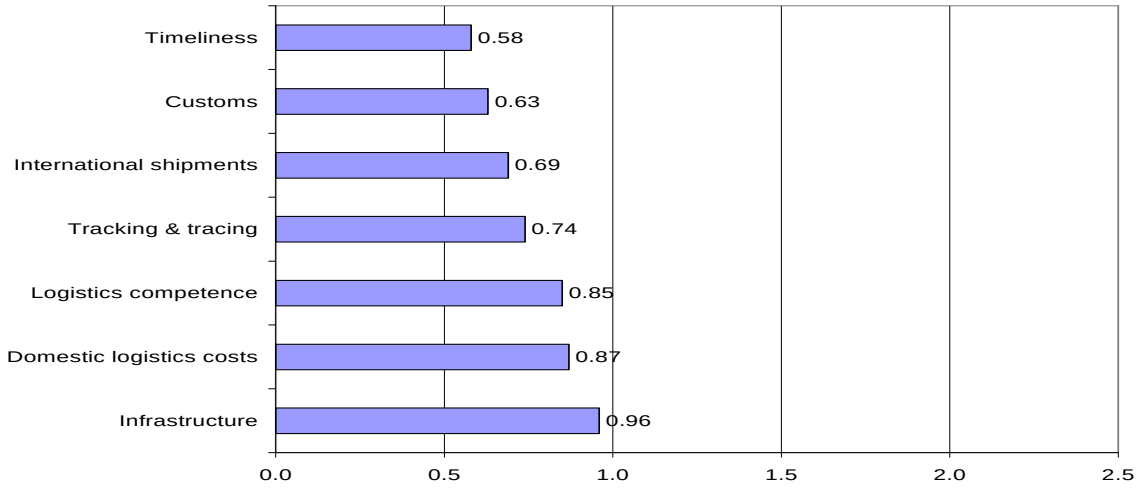
JAPAN



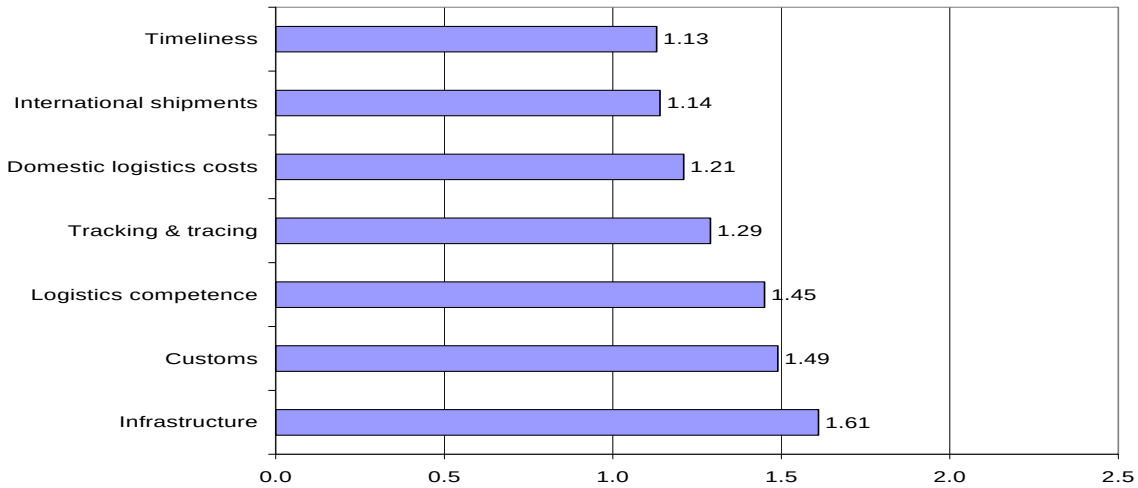
KOREA



MALAYSIA

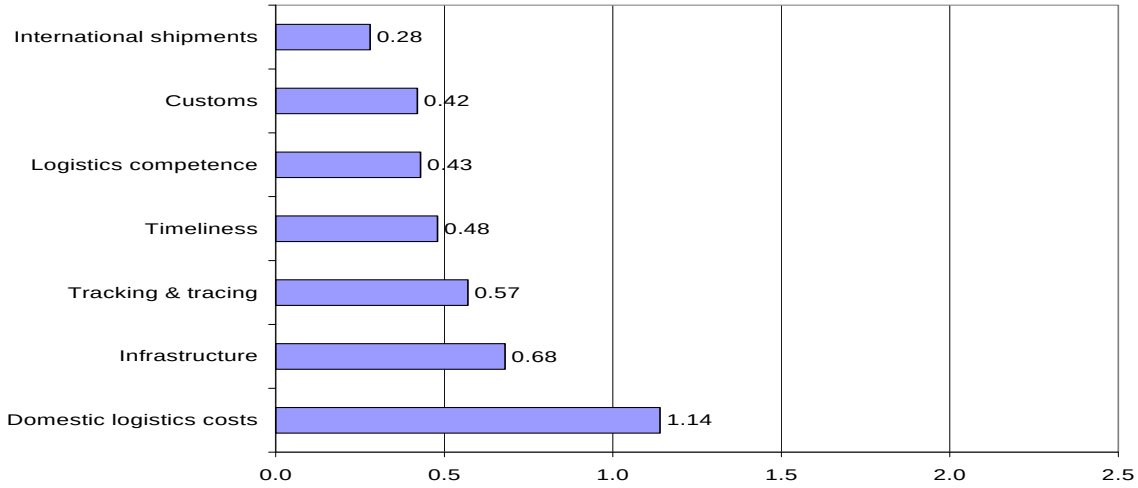


MEXICO

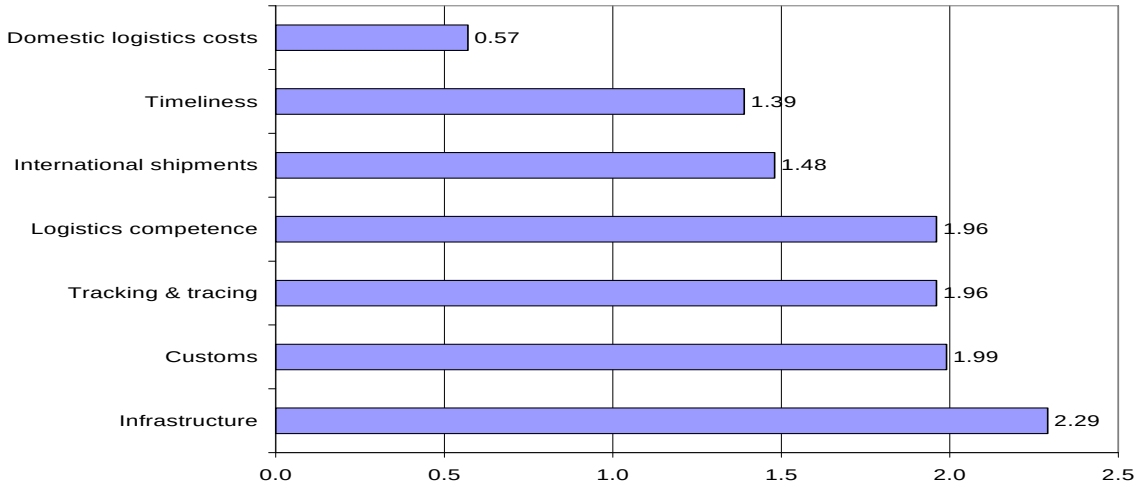


Annex 2 – Gap in performance by LPI: presented from smallest to largest gap in performance vs world best practice

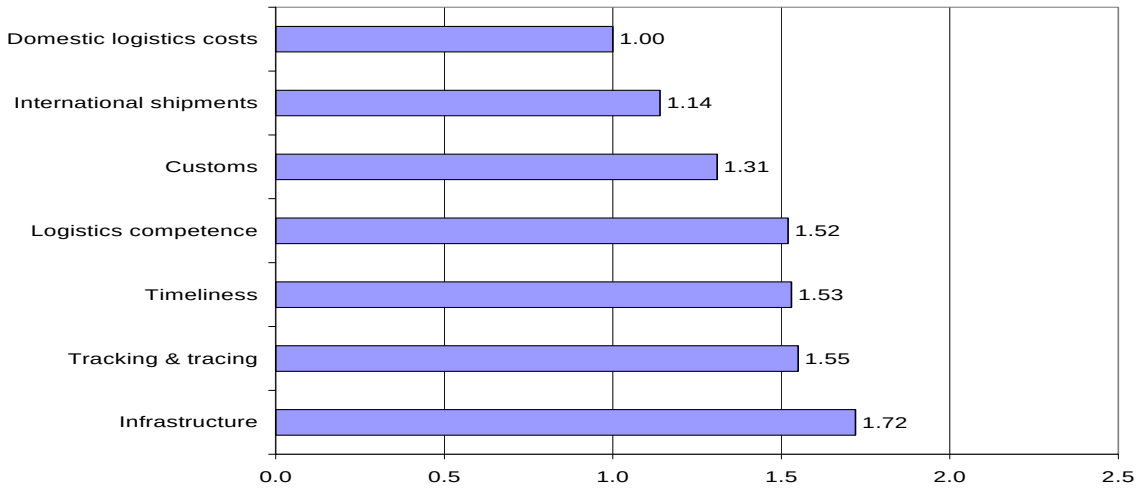
NEW ZEALAND



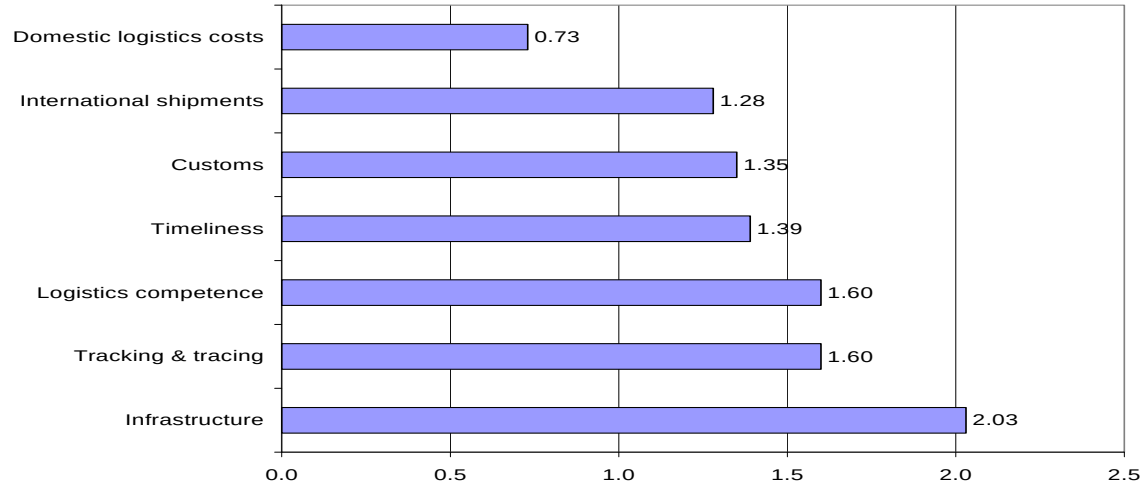
PAPUA NEW GUINEA



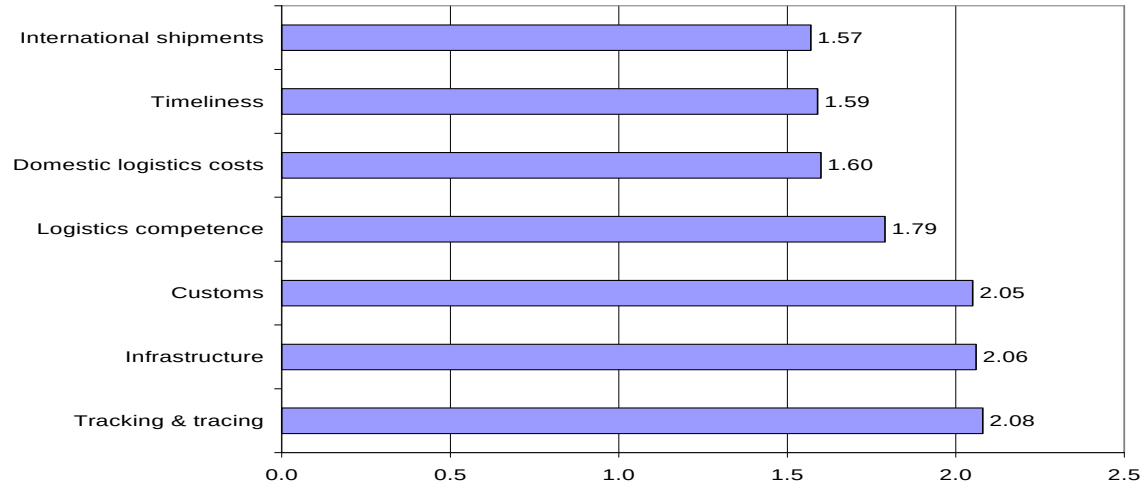
PERU



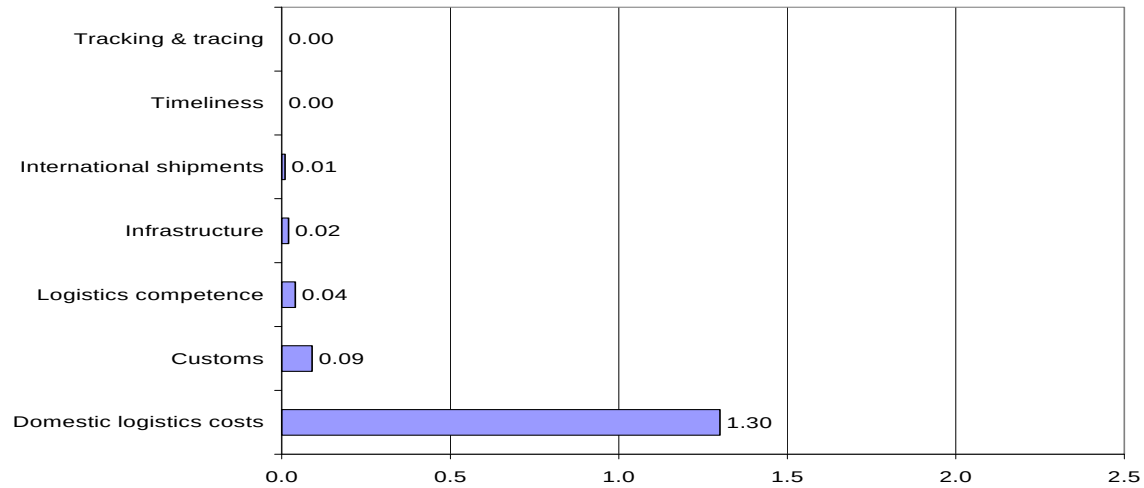
PHILIPPINES



RUSSIA

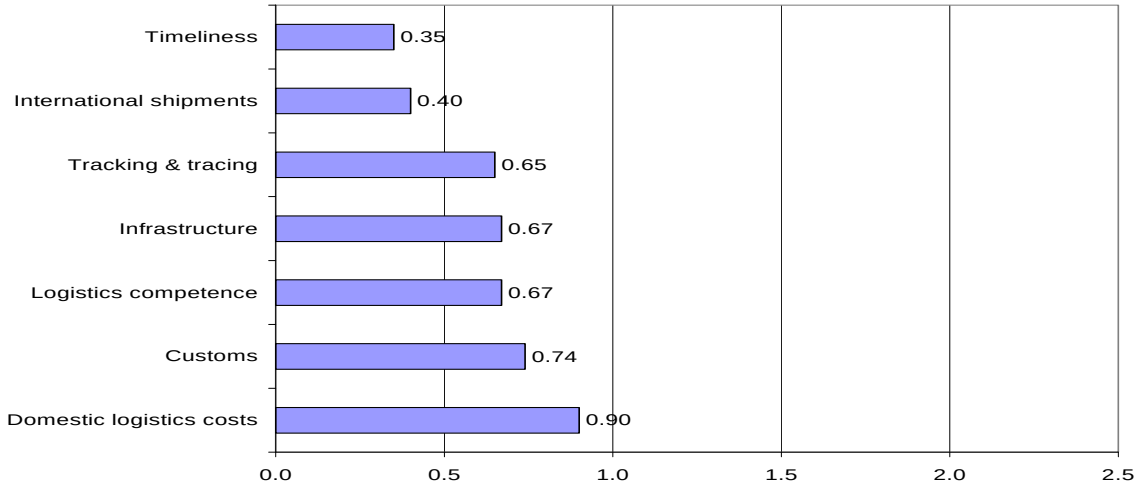


SINGAPORE

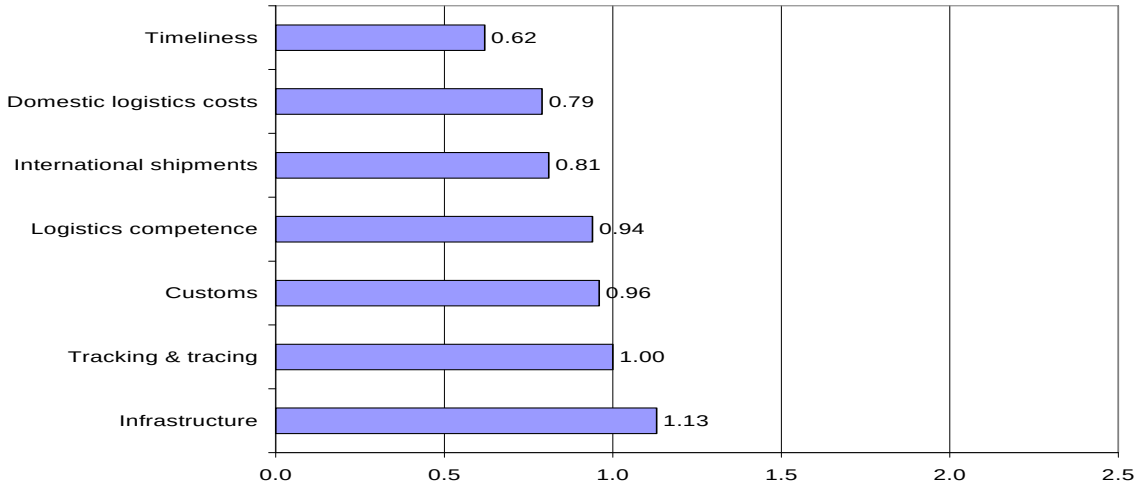


Annex 2 – Gap in performance by LPI: presented from smallest to largest gap in performance vs world best practice

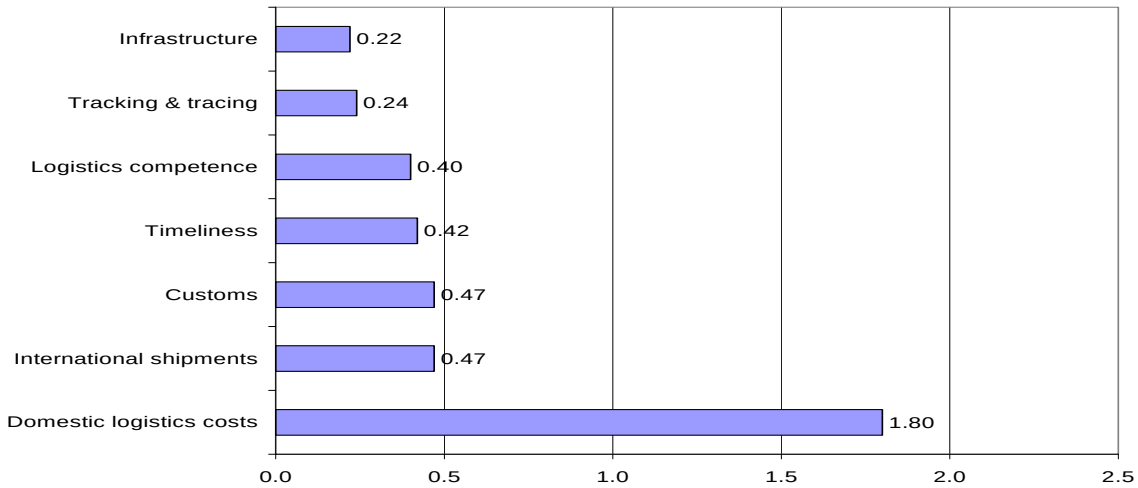
CHINESE TAIPEI



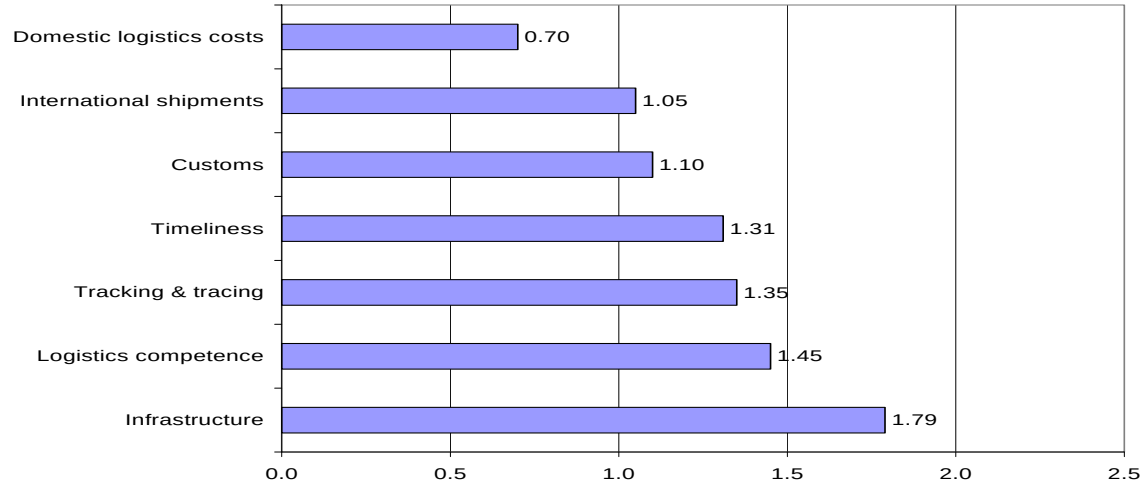
THAILAND



UNITED STATES



VIET NAM


Domestic logistics costs
0.70
International shipments
1.05
Customs
1.10
Timeliness
1.31
Tracking & tracing
1.35
Logistics competence
1.45
Infrastructure
1.79
0.0
0.5
1.0
1.5
2.0
2.5

ANNEX 3. GAP IN PERFORMANCE RELATIVE TO INCOME GROUP

Aspects of logistics environment and institutions that not as good as the economy's income group[27]

		Australia	High income: all
	logistics operational environment	Percent of respondents answering high/very high	
1	Port/Airport charges are	66.67	46.97
2	Overall, logistics costs (e.g. port charges, domestic transport, agent fees), are	50	46.31
3	Less than full truck load services rates are	66.67	32.82
4	Full truck load rates are	50	27.24
	effectiveness and efficiency of processes	Percent of respondents answering high/very high	
5	Do traders demonstrating high levels of compliance receive expedited Customs clearance?	50	53.60
6	Are export shipments cleared and shipped as scheduled?	83.33	95.30
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
7	Overall business environment	33.33	56.60
8	Good governance and eradication of corruption	33.33	44.36
9	Availability of private sector services	40	57.53
10	Quality of telecommunications infrastructure	66.67	84.70
11	Quality of transport infrastructure	50	56.12
12	Other border crossing-related government agencies clearance procedures	33.33	42.84
	incidence on your activity of the following constraints in your country of work	Percent of respondents answering high/very high	
13	Major delays due to compulsory warehousing	16.67	12.80
		Canada	**High income: all**
	logistics operational environment	Percent of respondents answering high/very high	
1	Full truck load rates are	27.78	27.24
	level of competence of professions	Percent of respondents answering high/very high	
2	Freight forwarders	52.94	59.21
3	Consignees or shippers	37.50	40.11
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
4	Overall business environment	38.46	56.60
5	Good governance and eradication of corruption	23.08	44.36
6	Regulatory regime	23.08	33.11
7	Availability of private sector services	38.46	57.53
8	Quality of telecommunications infrastructure	61.54	84.70
9	Quality of transport infrastructure	30.77	56.12
10	Other border crossing-related government agencies clearance procedures	30.77	42.84
11	Customs clearance procedures	61.54	65.32
		Hong Kong,	**High income: all**

[27] The income group classification is from the World Bank.

		China	
	logistics operational environment	Percent of respondents answering high/very high	
1	Port/Airport charges are	100	46.97
2	Overall, logistics costs (e.g. port charges, domestic transport, agent fees), are	100	46.31
3	Warehousing service charges are	66.67	37.75
4	Less than full truck load services rates are	33.33	32.82
	quality of infrastructure	Percent of respondents answering low/very low	
5	Telecommunications infrastructure and services	16.67	6.23
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
6	Overall business environment	16.67	56.60
7	Quality of telecommunications infrastructure	83.33	84.70
	incidence on your activity of the following constraints in your country of work	Percent of respondents answering high/very high	
8	Solicitation of informal payments	17	9.59
9	Major delays due to pre-shipment inspection	33.33	19.24
		Japan	**High income: all**
	logistics operational environment	Percent of respondents answering high/very high	
1	Port/Airport charges are	66.67	46.97
2	Overall, logistics costs (e.g. port charges, domestic transport, agent fees), are	66.67	46.31
3	Less than full truck load services rates are	33.33	32.82
4	Full truck load rates are	66.67	27.24
	effectiveness and efficiency of processes	Percent of respondents answering high/very high	
5	Do traders demonstrating high levels of compliance receive expedited Customs clearance?	33.33	53.60
6	Can Customs declarations be submitted and processed electronically?	66.67	70.40
7	Are import shipments cleared and delivered as scheduled?	66.67	79.82
	level of competence of professions	Percent of respondents answering high/very high	
8	Other border crossing-related government agencies	0	33.45
9	Customs agencies	50	52.24
10	Warehousing and distribution operators	50	51.29
11	Road transport service providers	0	50.28
12	Customs brokers	50	54.98
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
13	Quality of telecommunications infrastructure	66.67	84.70
14	Other border crossing-related government agencies clearance procedures	33.33	42.84
		New Zealand	**High income: all**
	logistics operational environment	Percent of respondents answering high/very high	
1	Rail transport rates are	50	43.23
	level of competence of professions	Percent of respondents answering high/very high	

2	Customs agencies	50	52.24
3	Freight forwarders	50	59.21
4	Consignees or shippers	25	40.11
5	Warehousing and distribution operators	25	51.29
6	Air transport service providers	50	61.81
7	Road transport service providers	50	50.28
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
8	Overall business environment	50	56.60
9	Regulatory regime	0	33.11
10	Quality of telecommunications infrastructure	50	84.70
11	Quality of transport infrastructure	25	56.12
12	Other border crossing-related government agencies clearance procedures	25	42.84
		Singapore	**High income: all**
	logistics operational environment	Percent of respondents answering high/very high	
1	Port/Airport charges are	50	46.97
	quality of infrastructure	Percent of respondents answering low/very low	
2	Telecommunications infrastructure and services	16.67	6.23
3	Fixed transport infrastructure (e.g. ports, roads, warehouses)	20	16.94
	effectiveness and efficiency of processes	Percent of respondents answering high/very high	
4	Can Customs declarations be submitted and processed electronically?	66.67	70.40
	level of competence of professions	Percent of respondents answering high/very high	
5	Trade and transport related associations	33.33	46.33
6	Other border crossing-related government agencies	33.33	33.45
7	Rail transport service providers	20	24.00
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
8	Overall business environment	50	56.60
9	Good governance and eradication of corruption	33.33	44.36
10	Quality of telecommunications infrastructure	83.33	84.70
11	Other border crossing-related government agencies clearance procedures	16.67	42.84
12	Customs clearance procedures	50	65.32
		United States	**High income: all**
	logistics operational environment	Percent of respondents answering high/very high	
1	Port/Airport charges are	54.05	46.97
2	Overall, logistics costs (e.g. port charges, domestic transport, agent fees), are	52	46.31
3	Less than full truck load services rates are	32.89	32.82
4	Full truck load rates are	32.89	27.24
	effectiveness and efficiency of processes	Percent of respondents answering high/very high	
5	Is Customs clearance a transparent process?	65.79	72.80
6	Are export shipments cleared and shipped as scheduled?	92.11	95.30
	level of competence of professions	Percent of respondents answering	

			high/very high
7	Freight forwarders	57.14	59.21
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
8	Overall business environment	50	56.60
9	Good governance and eradication of corruption	36.36	44.36
10	Regulatory regime	28.00	33.11
11	Quality of telecommunications infrastructure	76.62	84.70
12	Quality of transport infrastructure	44.16	56.12
13	Customs clearance procedures	57.14	65.32
		Chile	**Upper middle income**
	logistics operational environment	Percent of respondents answering high/very high	
1	Port/Airport charges are	50	41.85
2	Overall, logistics costs (e.g. port charges, domestic transport, agent fees), are	100	31.17
	effectiveness and efficiency of processes	Percent of respondents answering high/very high	
3	Can Customs declarations be submitted and processed electronically?	50	60.43
	level of competence of professions	Percent of respondents answering high/very high	
4	Customs agencies	0	29.87
5	Warehousing and distribution operators	0	29.72
6	Rail transport service providers	0	14.72
7	Road transport service providers	0	33.65
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
8	Other border crossing-related government agencies clearance procedures	0	50.88
9	Customs clearance procedures	50	68.80
		Malaysia	**Upper middle income**
	logistics operational environment	Percent of respondents answering high/very high	
1	Port/Airport charges are	50	41.85
2	Full truck load rates are	25	20.96
	level of competence of professions	Percent of respondents answering high/very high	
3	Trade and transport related associations	0	17.86
4	Other border crossing-related government agencies	0	16.07
5	Customs agencies	0	29.87
6	Freight forwarders	0	44.59
7	Consignees or shippers	0	24.28
8	Warehousing and distribution operators	25	29.72
9	Rail transport service providers	0	14.72
10	Road transport service providers	25	33.65
11	Customs brokers	25	46.70
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
12	Overall business environment	50	62.13
13	Quality of telecommunications infrastructure	50	78.98
14	Other border crossing-related government agencies clearance procedures	50	50.88
15	Customs clearance procedures	50	68.80

	incidence on your activity of the following constraints in your country of work	Percent of respondents answering high/very high	
16	Solicitation of informal payments	50	15.57
17	Major delays due to compulsory warehousing	25.00	13.51
		Mexico	**Upper middle income**
	logistics operational environment	Percent of respondents answering high/very high	
1	Port/Airport charges are	66.67	41.85
2	Overall, logistics costs (e.g. port charges, domestic transport, agent fees), are	75	31.17
3	Warehousing service charges are	66.67	26.74
4	Less than full truck load services rates are	44.44	30.72
5	Full truck load rates are	33.33	20.96
	quality of infrastructure	Percent of respondents answering low/very low	
6	Telecommunications infrastructure and services	11.11	10.59
7	Fixed transport infrastructure (e.g. ports, roads, warehouses)	28.57	34.14
	effectiveness and efficiency of processes	Percent of respondents answering high/very high	
8	Do traders demonstrating high levels of compliance receive expedited Customs clearance?	0	52.41
9	Can Customs declarations be submitted and processed electronically?	11.11	60.43
10	Do you receive adequate and timely information when regulations change?	22.22	45.25
11	Are import shipments cleared and delivered as scheduled?	44.44	72.78
	level of competence of professions	Percent of respondents answering high/very high	
12	Customs agencies	22.22	29.87
13	Freight forwarders	44.44	44.59
14	Consignees or shippers	22.22	24.28
15	Road transport service providers	33.33	33.65
16	Customs brokers	22.22	46.70
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
17	Overall business environment	55.56	62.13
18	Good governance and eradication of corruption	33.33	35.85
19	Regulatory regime	33.33	34.61
20	Availability of private sector services	66.67	74.61
21	Other border crossing-related government agencies clearance procedures	33.33	50.88
22	Customs clearance procedures	44.44	68.80
	incidence on your activity of the following constraints in your country of work	Percent of respondents answering high/very high	
23	Solicitation of informal payments	44	15.57
24	Criminal activities (e.g. stolen cargo)	56	9.49
25	Major delays due to pre-shipment inspection	66.67	14.32
26	Major delays due to compulsory warehousing	55.56	13.51
		Russia	**Upper middle income**
	logistics operational environment	Percent of respondents answering high/very high	
1	Port/Airport charges are	80	41.85

2	Overall, logistics costs (e.g. port charges, domestic transport, agent fees), are	75	31.17
3	Warehousing service charges are	40	26.74
4	Less than full truck load services rates are	60	30.72
5	Full truck load rates are	60	20.96
	quality of infrastructure	Percent of respondents answering low/very low	
6	Telecommunications infrastructure and services	40	10.59
7	Fixed transport infrastructure (e.g. ports, roads, warehouses)	75	34.14
	effectiveness and efficiency of processes	Percent of respondents answering high/very high	
8	Do traders demonstrating high levels of compliance receive expedited Customs clearance?	20	52.41
9	Can Customs declarations be submitted and processed electronically?	20	60.43
10	Do you receive adequate and timely information when regulations change?	40	45.25
11	Is Customs clearance a transparent process?	25	47.57
12	Are export shipments cleared and shipped as scheduled?	60	81.99
13	Are import shipments cleared and delivered as scheduled?	60	72.78
	level of competence of professions	Percent of respondents answering high/very high	
14	Other border crossing-related government agencies	0	16.07
15	Customs agencies	20	29.87
16	Consignees or shippers	20	24.28
17	Warehousing and distribution operators	20	29.72
18	Air transport service providers	40	47.89
19	Road transport service providers	20	33.65
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
20	Availability of private sector services	40	74.61
21	Other border crossing-related government agencies clearance procedures	20	50.88
22	Customs clearance procedures	40	68.80
	incidence on your activity of the following constraints in your country of work	Percent of respondents answering high/very high	
23	Solicitation of informal payments	20	15.57
24	Major delays due to compulsory warehousing	20.00	13.51
		China	**Lower middle income**
	effectiveness and efficiency of processes	Percent of respondents answering high/very high	
1	Do you receive adequate and timely information when regulations change?	30.77	34.57
	level of competence of professions	Percent of respondents answering high/very high	
2	Trade and transport related associations	16.22	16.94
3	Customs agencies	18.42	21.87
4	Freight forwarders	21.62	30.41
5	Consignees or shippers	18.42	20.68
6	Customs brokers	18.92	22.92

	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
7	Availability of private sector services	66.67	73.25
		Indonesia	**Lower middle income**
	effectiveness and efficiency of processes	Percent of respondents answering high/very high	
1	Do traders demonstrating high levels of compliance receive expedited Customs clearance?	25	39.73
2	Do you receive adequate and timely information when regulations change?	31.25	34.57
3	Is Customs clearance a transparent process?	31.25	38.95
	level of competence of professions	Percent of respondents answering high/very high	
4	Other border crossing-related government agencies	5.88	13.48
5	Rail transport service providers	11.76	13.42
6	Customs brokers	11.76	22.92
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
7	Overall business environment	40	62.56
8	Good governance and eradication of corruption	20	36.34
9	Availability of private sector services	40	73.25
10	Quality of telecommunications infrastructure	60	70.17
11	Other border crossing-related government agencies clearance procedures	26.67	36.18
12	Customs clearance procedures	53.33	60.28
		Peru	**Lower middle income**
	logistics operational environment	Percent of respondents answering high/very high	
1	Port/Airport charges are	80	47.16
2	Overall, logistics costs (e.g. port charges, domestic transport, agent fees), are	100	45.77
3	Warehousing service charges are	60	40.85
4	Rail transport rates are	33.33	23.86
	quality of infrastructure	Percent of respondents answering low/very low	
5	Fixed transport infrastructure (e.g. ports, roads, warehouses)	80	53.29
	effectiveness and efficiency of processes	Percent of respondents answering high/very high	
6	Are export shipments cleared and shipped as scheduled?	60	63.13
	level of competence of professions	Percent of respondents answering high/very high	
7	Consignees or shippers	20	20.68
8	Rail transport service providers	0	13.42
9	Road transport service providers	0	16.50
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
10	Customs clearance procedures	60	60.28
	incidence on your activity of the following constraints in your country of work	Percent of respondents answering high/very high	
11	Solicitation of informal payments	80	40.10
12	Criminal activities (e.g. stolen cargo)	40	13.93

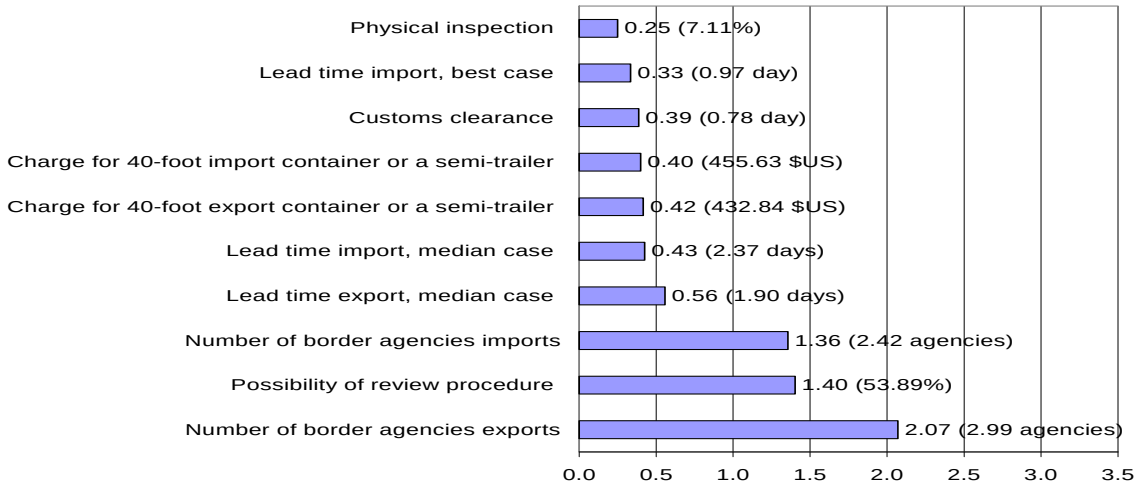
13	Major delays due to pre-shipment inspection	40.00	33.03
		Philippines	**Lower middle income**
	logistics operational environment	Percent of respondents answering high/very high	
1	Port/Airport charges are	66.67	47.16
2	Overall, logistics costs (e.g. port charges, domestic transport, agent fees), are	50	45.77
3	Rail transport rates are	100	23.86
4	Full truck load rates are	66.67	39.39
	quality of infrastructure	Percent of respondents answering low/very low	
5	Fixed transport infrastructure (e.g. ports, roads, warehouses)	66.67	53.29
	effectiveness and efficiency of processes	Percent of respondents answering high/very high	
6	Do traders demonstrating high levels of compliance receive expedited Customs clearance?	0	39.73
7	Can Customs declarations be submitted and processed electronically?	0	49.39
8	Do you receive adequate and timely information when regulations change?	33.33	34.57
9	Is Customs clearance a transparent process?	0	38.95
10	Are import shipments cleared and delivered as scheduled?	0	36.06
	level of competence of professions	Percent of respondents answering high/very high	
11	Trade and transport related associations	0	16.94
12	Warehousing and distribution operators	0	13.50
13	Air transport service providers	0	27.02
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
14	Overall business environment	33.33	62.56
15	Good governance and eradication of corruption	0	36.34
16	Regulatory regime	33.33	36.94
17	Availability of private sector services	33.33	73.25
18	Quality of telecommunications infrastructure	33.33	70.17
19	Quality of transport infrastructure	33.33	41.35
20	Other border crossing-related government agencies clearance procedures	0	36.18
21	Customs clearance procedures	33.33	60.28
	incidence on your activity of the following constraints in your country of work	Percent of respondents answering high/very high	
22	Solicitation of informal payments	100	40.10
23	Criminal activities (e.g. stolen cargo)	33	13.93
24	Major delays due to pre-shipment inspection	66.67	33.03
		Thailand	**Lower middle income**
	effectiveness and efficiency of processes	Percent of respondents answering high/very high	
1	Do traders demonstrating high levels of compliance receive expedited Customs clearance?	25	39.73
2	Can Customs declarations be submitted and processed electronically?	25	49.39
3	Do you receive adequate and timely	25	34.57

	information when regulations change?		
4	Is Customs clearance a transparent process?	0	38.95
	evolution of factors over the past 3 years	Percent of respondents answering better/much better	
5	Overall business environment	50	62.56
6	Regulatory regime	0	36.94
7	Quality of telecommunications infrastructure	50	70.17
8	Other border crossing-related government agencies clearance procedures	25	36.18
9	Customs clearance procedures	25	60.28
	incidence on your activity of the following constraints in your country of work	Percent of respondents answering high/very high	
10	Solicitation of informal payments	50	40.10
		Viet Nam	**Low income**
	effectiveness and efficiency of processes	Percent of respondents answering high/very high	
1	Can Customs declarations be submitted and processed electronically?	15.38	42.04
	level of competence of professions	Percent of respondents answering high/very high	
2	Rail transport service providers	0	7.82

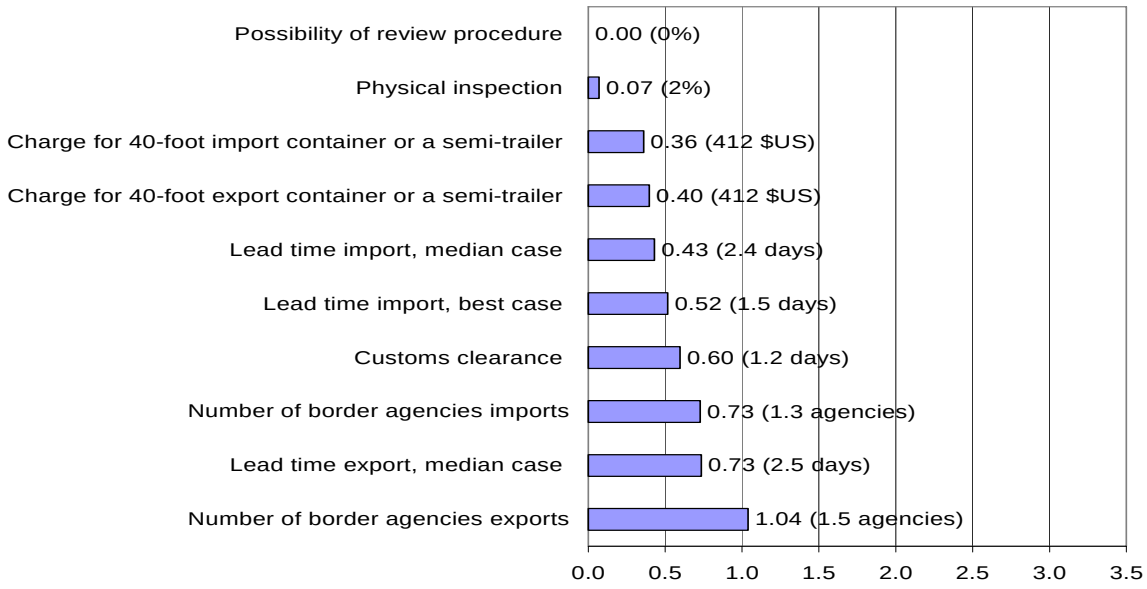
ANNEX 4. GAP IN PERFORMANCE IN TERMS OF TIME AND COST

Presented from smallest to largest gap in performance vs. world best practice[28]

APEC AVERAGE

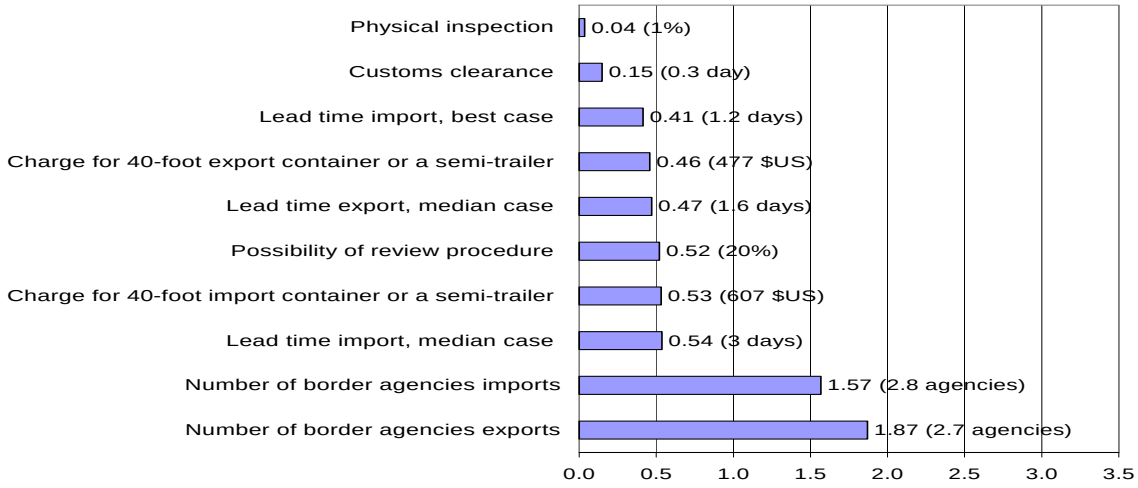


AUSTRALIA

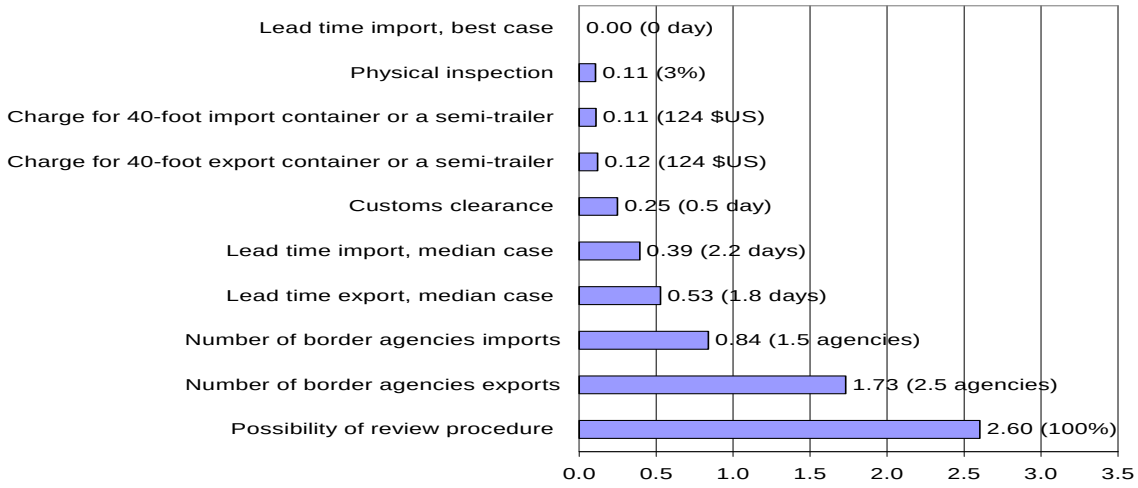


[28] The figure directly to the right of the bar is the standardized value of the difference with world best practice (i.e. the gap) and is obtained by dividing the absolute value of the difference by the standard deviation. This allows us to identify and arrange the performance measures from smallest to largest gap. The figure in brackets is the absolute value of the difference with world best practice. It represents the days, cost, number of agencies or percentage of imports physically inspected that need to be reduced or with respect to the possibility of making use of simple and inexpensive review procedures in case of dispute, this needs to be increased, in order to close the gap.

CANADA



CHILE



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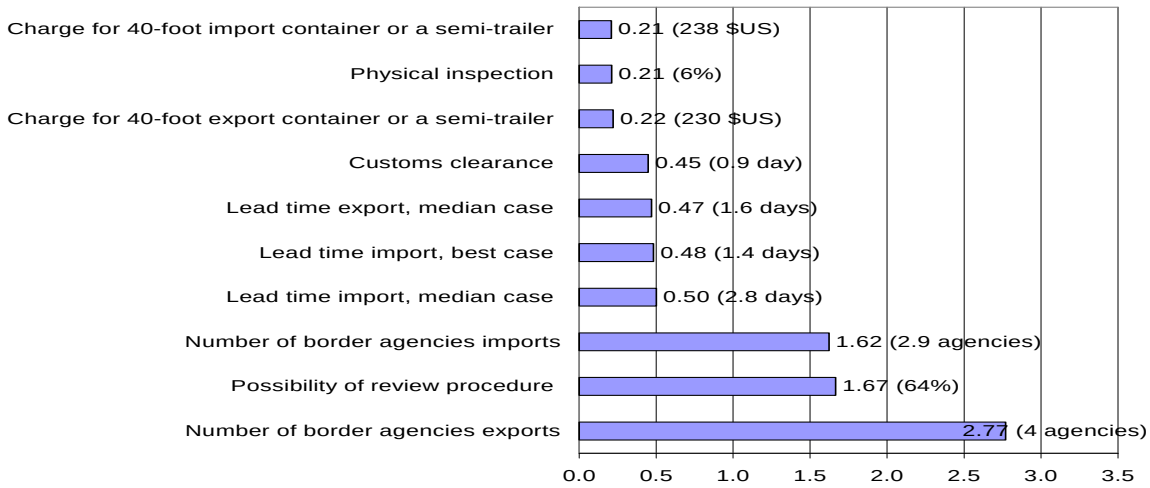

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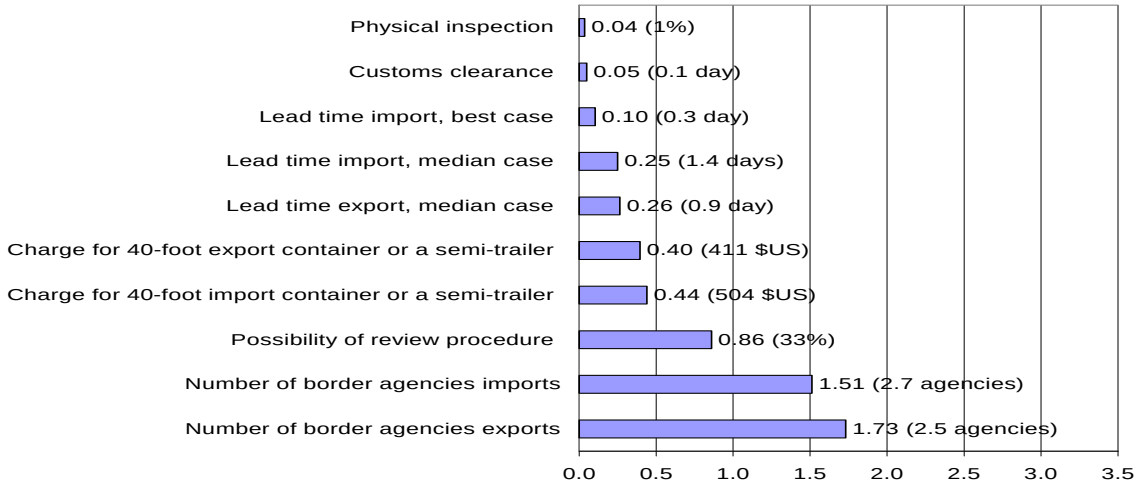
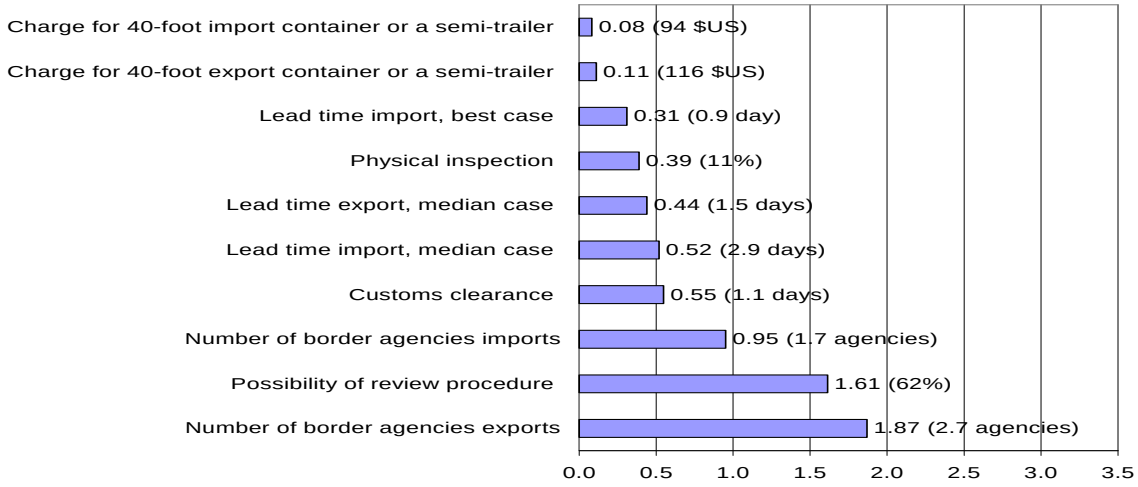
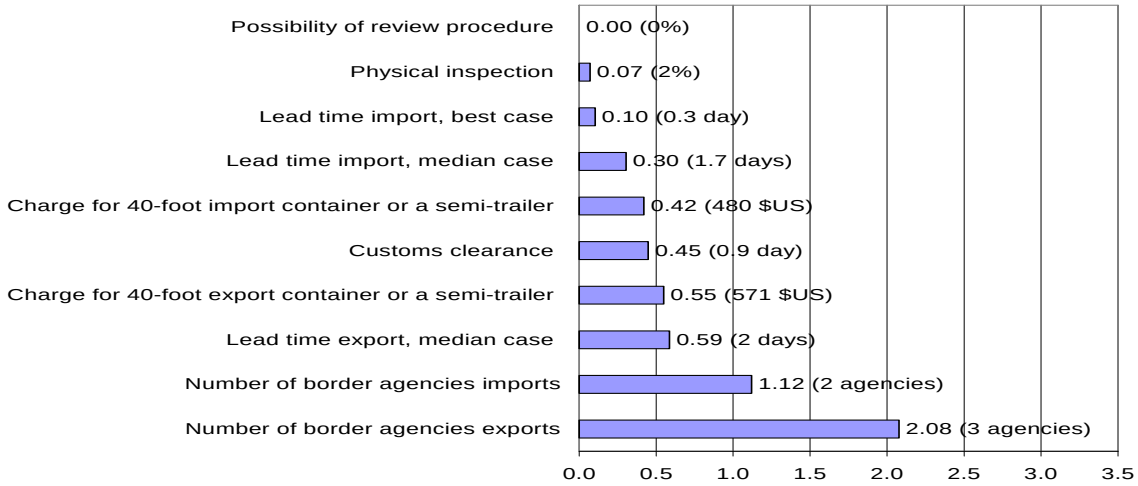


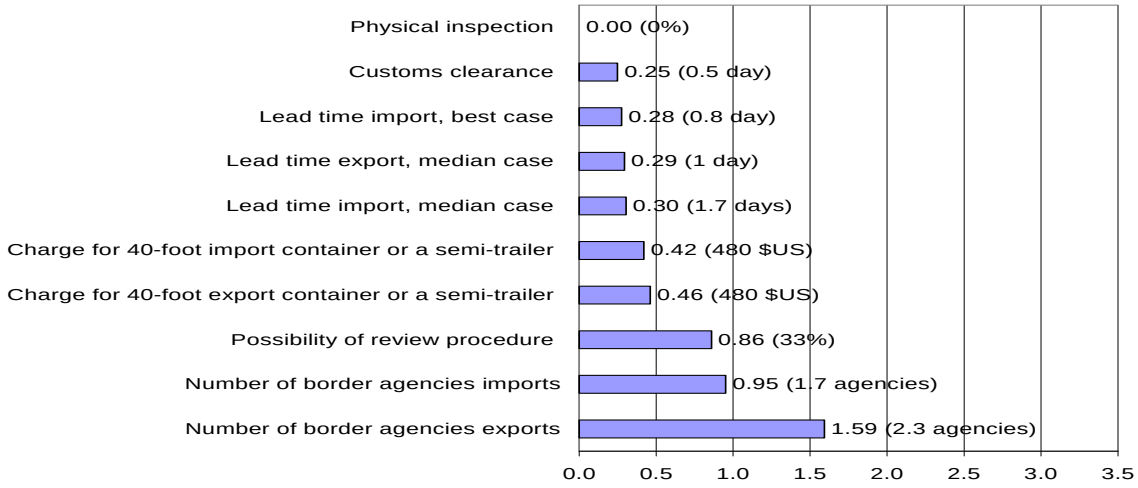
INDONESIA



JAPAN



KOREA



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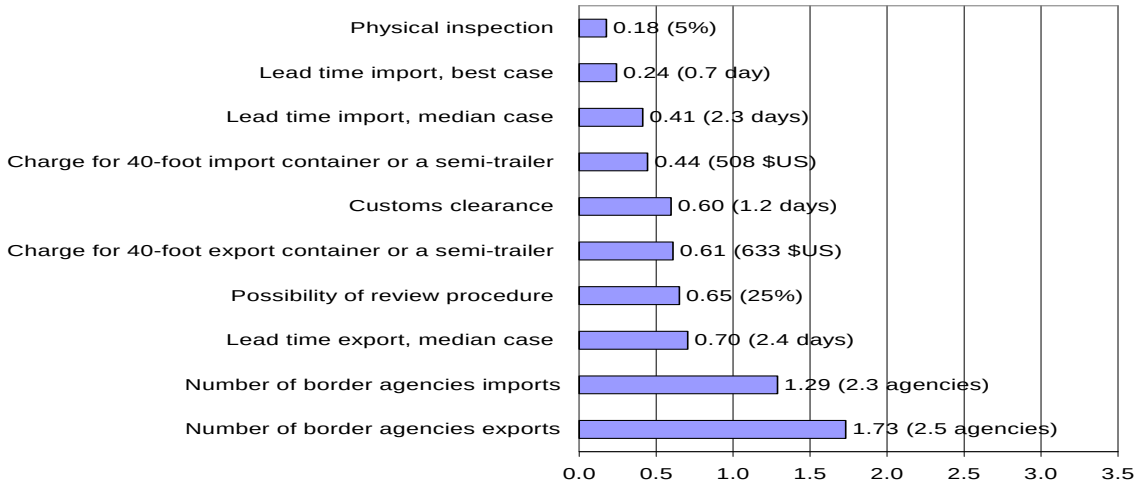

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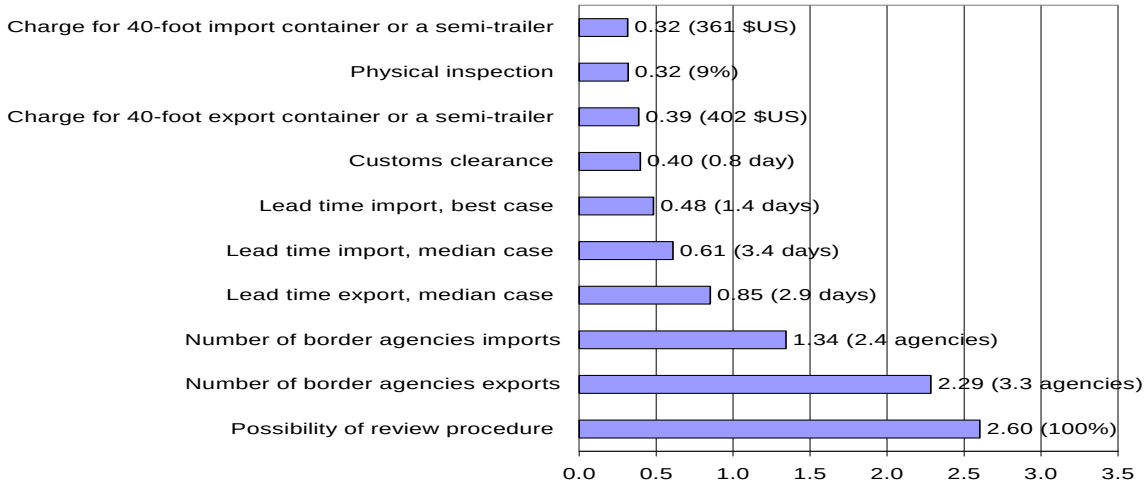
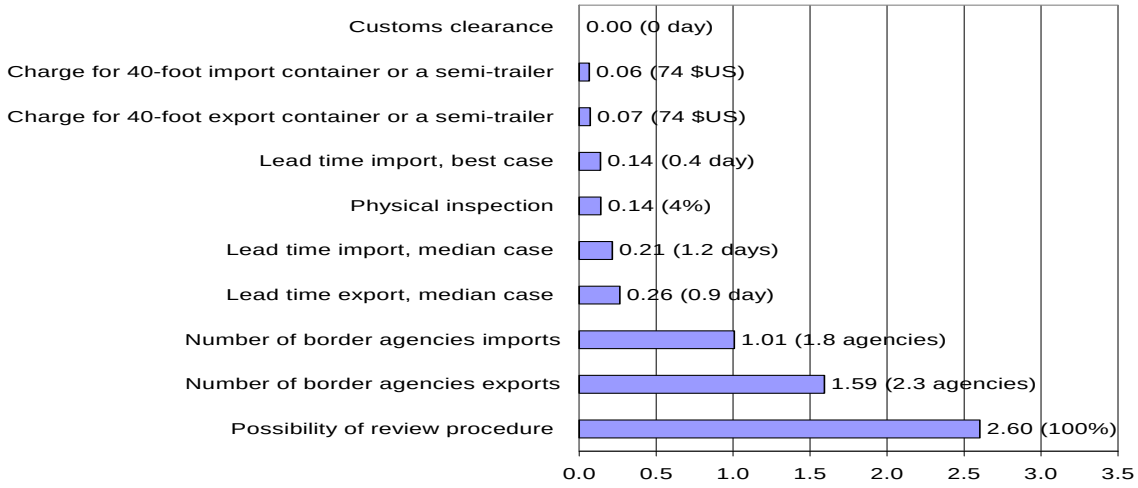
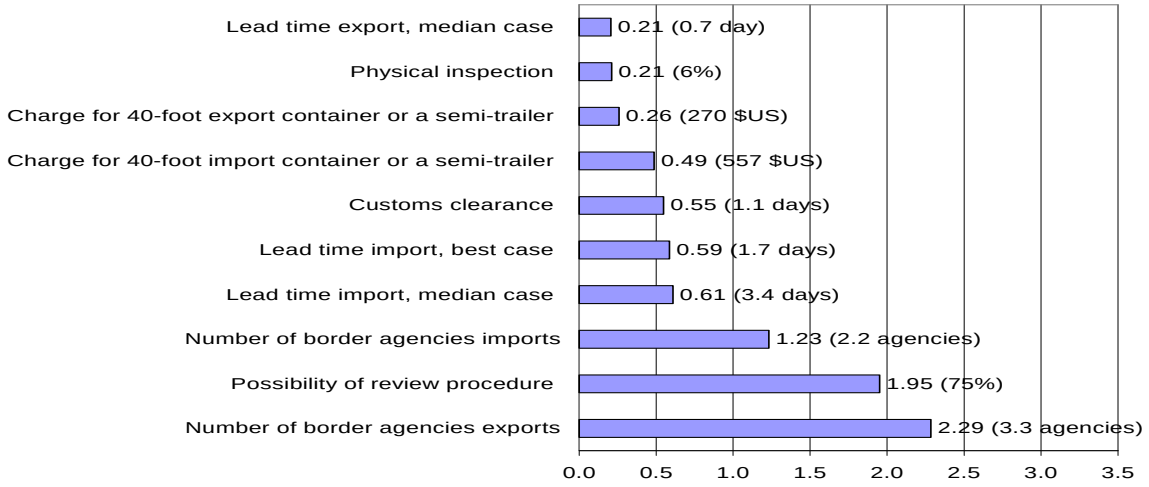


Annex 4 – Gap in performance in terms of time and cost

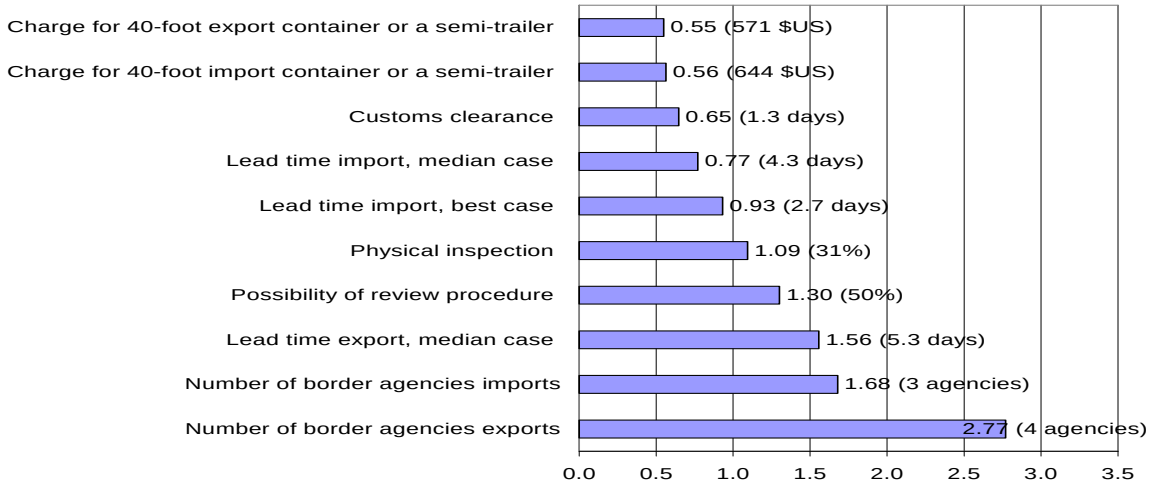
NEW ZEALAND



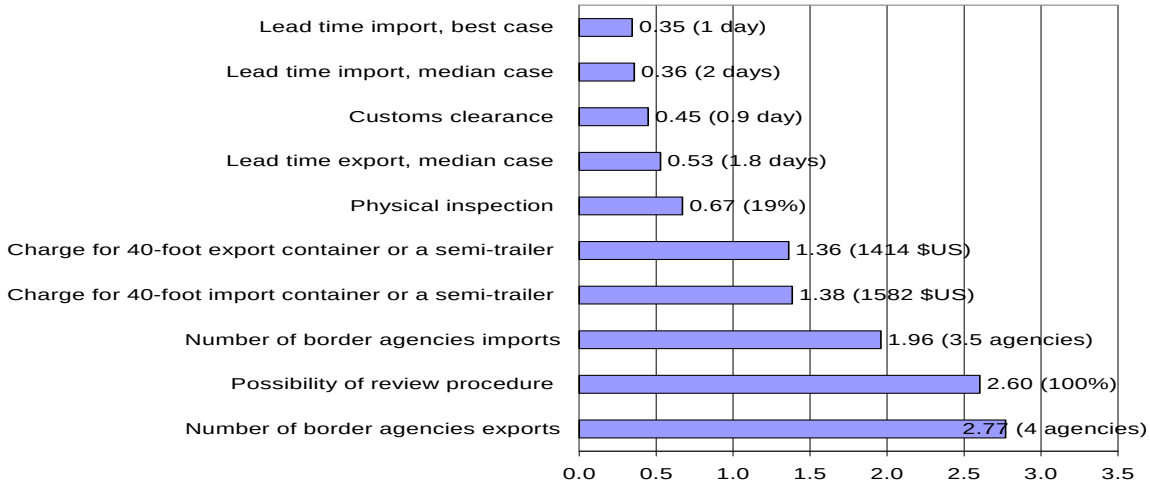
PERU



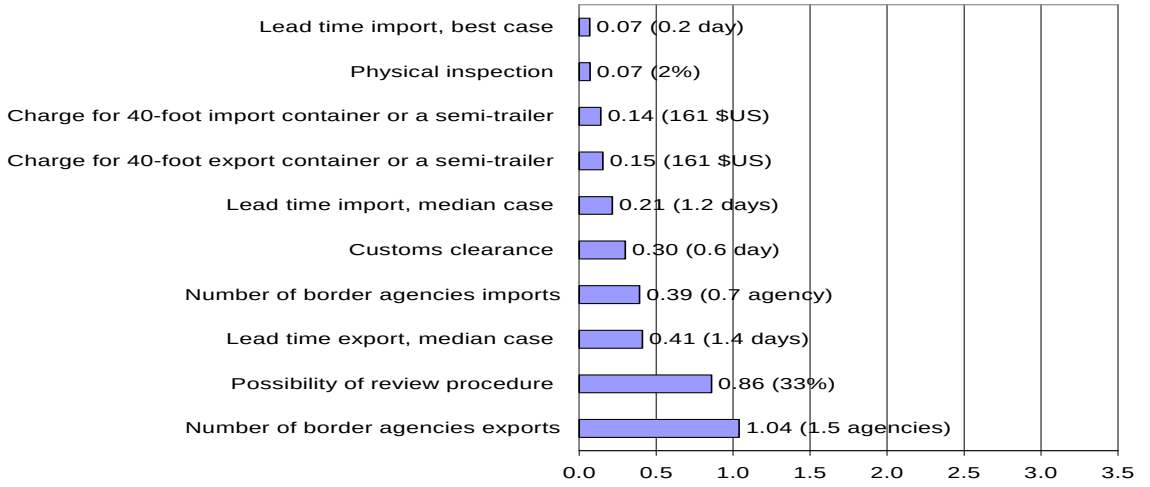
PHILIPPINES



RUSSIA



SINGAPORE



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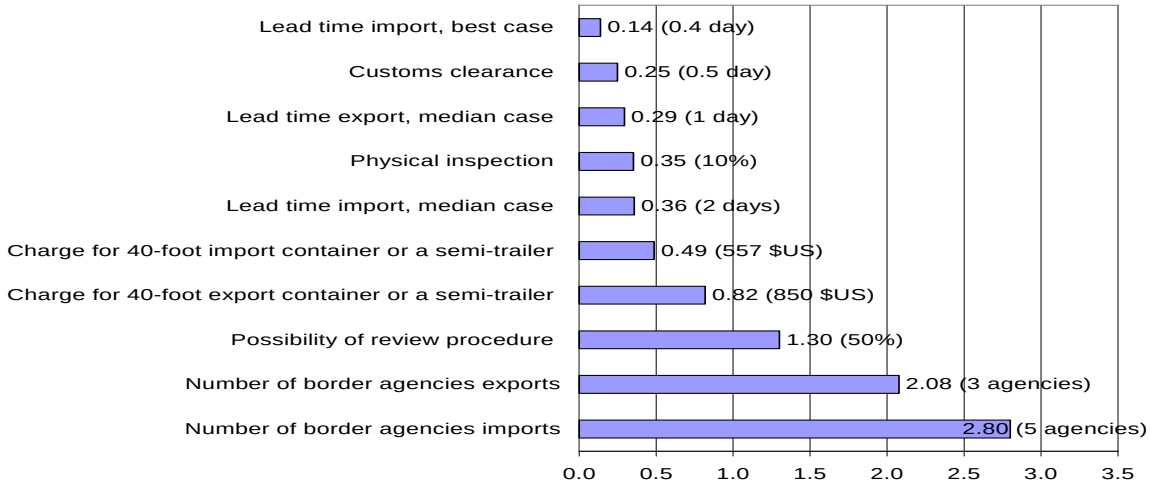
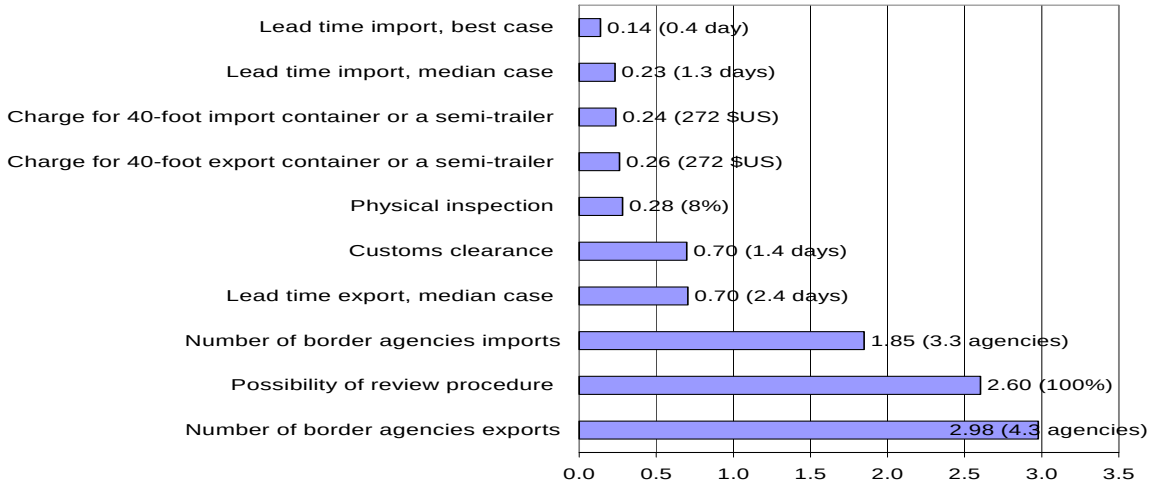
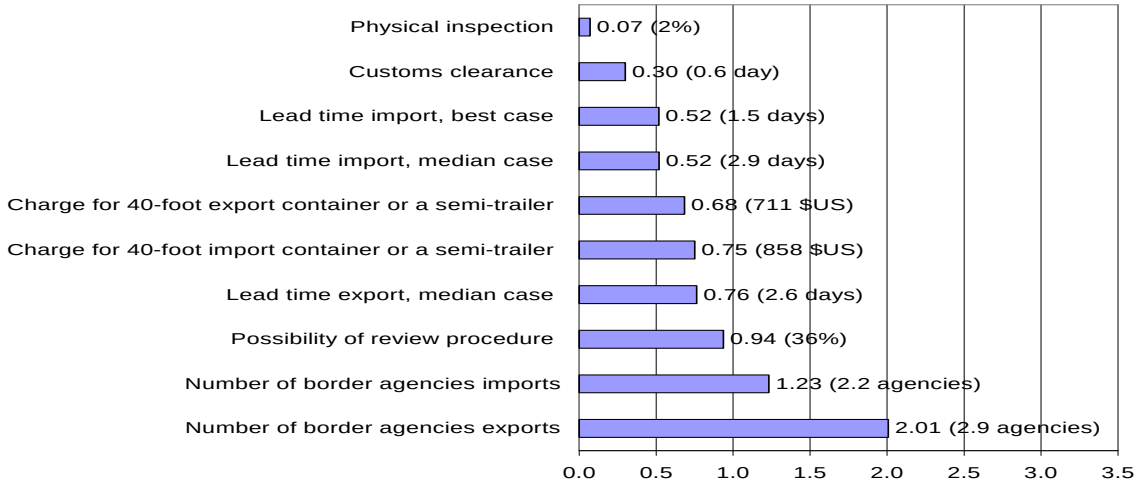


Annex 4 – Gap in performance in terms of time and cost

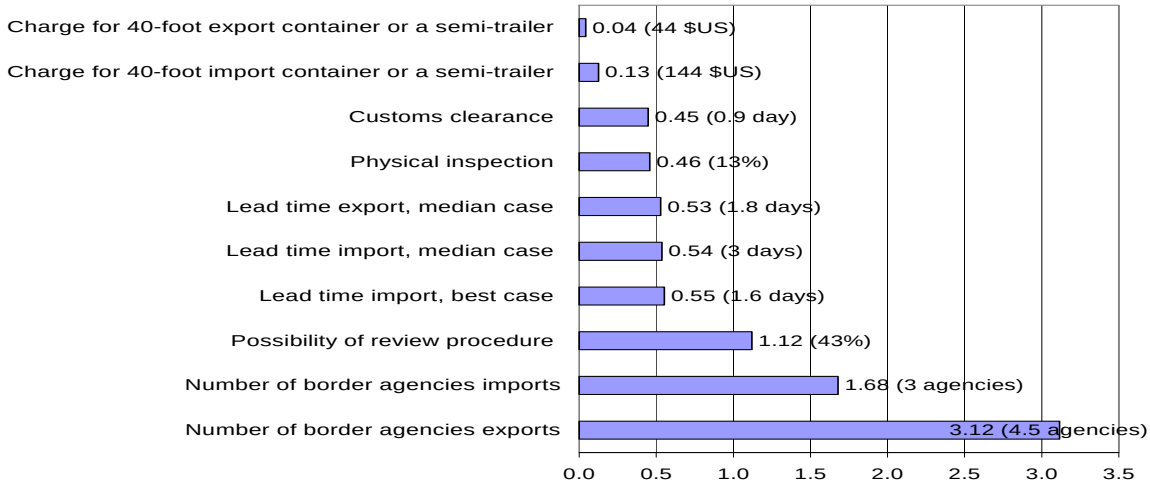
THAILAND



UNITED STATES



VIET NAM



ANNEX 5. METADATA

INDICATORS	Source	Coverage	Years	Definition
Logistics Performance Index				
Part I - International LPI				
Customs	World Bank, Logistics Performance Index (LPI)	20 APEC members (no BD)	2007	Based on responses to the question: "Rate the effectiveness and efficiency of the clearance process by Customs and other border control agencies in selected countries (very low - very high)".
Domestic logistics costs	LPI	20 APEC members (no BD)	2007	Based on responses to the question: "Rate domestic logistics costs (e.g. local/transit transportation, (air)port and terminal handling, warehousing) in selected countries (very low - very high)".
Infrastructure	LPI	20 APEC members (no BD)	2007	Based on responses to the question: "Evaluate the quality of infrastructure in use for logistics operations (e.g. ports, railroads, information technology) in selected countries (very low - very high)".
International shipments	LPI	20 APEC members (no BD)	2007	Based on responses to the question: "Assess the ease and affordability associated with arranging shipments to or from selected countries (very low - very high)".
Logistics competence	LPI	20 APEC members (no BD)	2007	Based on responses to the question: "Evaluate the level of competence of the logistics industry (e.g. transport operators, customs brokers) in selected countries (very low - very high)".
Timeliness	LPI	20 APEC members (no BD)	2007	Based on responses to the question: "When arranging shipments to the countries listed below, how often do they reach the consignee within the scheduled delivery time? (hardly ever - nearly always)".
Tracking & tracing	LPI	20 APEC members (no BD)	2007	Based on responses to the question: "Rate the ability to track and trace your consignments when shipping to or from selected countries (very low - very high)".

Part II - Domestic Environment and Institutions				
Effectiveness and efficiency of processes	LPI	17 APEC members (no BD, PNG, ROK, CT)	2007	Based on responses to the question: "Evaluate the effectiveness and efficiency of the following processes in your country of work: Do traders demonstrating high levels of compliance receive expedited Customs clearance? Can Customs declarations be submitted and processed electronically? Do you receive adequate and timely information when regulations change? Is Customs clearance a transparent process? Are export shipments cleared and shipped as scheduled? Are import shipments cleared and delivered as scheduled? (hardly ever - nearly always)".
Evolution of factors over the past 3 years	LPI	17 APEC members (no BD, PNG, ROK, CT)	2007	Based on responses to the question: "Evaluate the evolution of the following factors in your country of work, over the past 3 years: customs clearance procedures; other border crossing-related government agencies clearance procedures; quality of transport infrastructure; availability of telecom infrastructure; regulatory regime; good governance and eradication of corruption; overall business environment (much worse - much better)".
Incidence on your activity of the following constraints in your country of work	LPI	17 APEC members (no BD, PNG, ROK, CT)	2007	Based on responses to the question: "Evaluate the incidence on your activity of the following constraints in your country of work: major delays due to compulsory warehousing; major delays due to pre-shipment inspection; criminal activities (e.g. stolen cargo); solicitation of informal payments (nearly always - hardly ever)".
Level of competence of professions	LPI	17 APEC members (no BD, PNG, ROK, CT)	2007	Based on responses to the question: "Evaluate the level of competence of the following professions in your country of work: customs brokers; road transport service providers; rail transport service providers; air transport service providers; warehousing and distribution operators; consignees or shippers; freight forwarders; customs agencies; other border crossing-related government agencies; trade and transport related associations (very low - very high)".

Logistics operational environment	LPI	17 APEC members (no BD, PNG, ROK, CT)	2007	Based on responses to the question: "Based on your experience in international logistics, please select the options that best describe the logistics operational environment in your country of work: overall, logistics costs (e.g. port charges, domestic transport, agent fees) are; port/airport charges are; full truck load rates are; rail transport rates are; warehousing service charges are (very high - very low)".
Quality of infrastructure	LPI	17 APEC members (no BD, PNG, ROK, CT)	2007	Based on responses to the question: "Evaluate the quality of infrastructure in use for logistics operations in your country of work: fixed transport infrastructure (e.g. ports, roads, warehouses); telecom infrastructure and services (very low - very high)".
Part III - Real-time Cost				
Customs clearance (days)	LPI	19 APEC members (no BD, PNG)	2007	Based on responses to the question: "".Estimate the time taken between the submission of an accepted Customs declaration and Customs clearance?
Lead time export, median case (days)	LPI	19 APEC members (no BD, PNG)	2007	Based on responses to the question: "Estimate the following time and cost parameters for export pre-carriage and import on-carriage: Median case (50% of the shipments arrive within)".
Lead time import, best case (days)	LPI	19 APEC members (no BD, PNG)	2007	Based on responses to the question: "Estimate the following time and cost parameters for export pre-carriage and import on-carriage: Best case (up to 10% of the shipments are precarried/oncarried within)".
Lead time import, median case (days)	LPI	19 APEC members (no BD, PNG)	2007	Based on responses to the question: "Estimate the following time and cost parameters for export pre-carriage and import on-carriage: Median case (50% of the shipments arrive within)".
Number of border agencies exports	LPI	19 APEC members (no BD, PNG)	2007	Based on responses to the question: "Including Customs, how many border agencies do you typically deal with?"
Number of border agencies imports	LPI	19 APEC members (no BD, PNG)	2007	Based on responses to the question: "Including Customs, how many border agencies do you typically deal with?"
Possibility of a review procedure (%)	LPI	19 APEC members (no BD, PNG)	2007	Based on responses to the question: "In case of dispute with Customs or another agency, is it possible to make use of a simple and inexpensive review procedure?"
Rate of physical inspection (%)	LPI	19 APEC members (no BD, PNG)	2007	Based on responses to the question: "What percentage of your import shipments is physically inspected?"

Typical charge for a 40-foot export container or a semi-trailer (US$)	LPI	19 APEC members (no BD, PNG)	2007	Based on responses to the question: "Estimate the following time and cost parameters for export pre-carriage and import on-carriage: typical charge for a 40' dry box container or a semi-trailer (i.e. total cost/charges to transport and port services)".
Typical charge for a 40-foot import container or a semi-trailer (US$)	LPI	19 APEC members (no BD, PNG)	2007	Based on responses to the question: "Estimate the following time and cost parameters for export pre-carriage and import on-carriage: typical charge for a 40' dry box container or a semi-trailer (i.e. total cost/charges to transport and port services)".
Trading Across Borders				
Cost to export Subindicator	World Bank, Doing Business Report	21 APEC members	2004-2009	Cost per 20-foot-container (in USD), no bribes or tariffs included, to export.
Cost to import Subindicator	World Bank, Doing Business Report	21 APEC members	2004-2009	Cost per 20-foot-container (in USD), no bribes or tariffs included, to import.
Documents to export Subindicator	World Bank, Doing Business Report	21 APEC members	2004-2009	Number of documents required by customs and other agencies to export.
Documents to import Subindicator	World Bank, Doing Business Report	21 APEC members	2004-2009	Number of documents required by customs and other agencies to import.
Time to export Subindicator	World Bank, Doing Business Report	21 APEC members	2004-2009	Number of days for document preparation, customs clearance and technical control, ports and terminal handling, inland transport and handling to export.
Time to import Subindicator	World Bank, Doing Business Report	21 APEC members	2004-2009	Number of days for document preparation, customs clearance and technical control, ports and terminal handling, inland transport and handling to import.
Trading Across Borders Indicator	World Bank, Doing Business Report	21 APEC members	2004-2009	Measures the procedural requirements, including the number of necessary documents and the associated time and cost (excluding trade tariffs) for exporting and importing.
Trade in Services				
Commercial service exports (current US$)	World Bank, World Development Indicators (WDI); International Monetary Fund, Balance of Payments Statistics Yearbook and data files	20 APEC members (no CT)	Generally 1989-2008	Commercial service exports are total service exports minus exports of government services not included elsewhere. International transactions in services are defined by the IMF's Balance of Payments Manual (1993) as the economic output of intangible commodities that may be produced, transferred, and consumed at the same time. Definitions may vary among reporting economies.

	(BOPS).			
Commercial service imports (current US$)	WDI; BOPS	20 APEC members (no CT)	Generally 1989-2008	Commercial service imports are total service imports minus imports of government services not included elsewhere. International transactions in services are defined by the IMF's Balance of Payments Manual (1993) as the economic output of intangible commodities that may be produced, transferred, and consumed at the same time. Definitions may vary among reporting economies.
Computer, communications and other services (% of commercial service exports)	WDI; BOPS	19 APEC members (no CT, VN)	Generally 1989-2008	Computer, communications and other services (% of commercial service exports) include such activities as international telecommunications, and postal and courier services; computer data; news-related service transactions between residents and nonresidents; construction services; royalties and license fees; miscellaneous business, professional, and technical services; and personal, cultural, and recreational services.
Computer, communications and other services (% of commercial service imports)	WDI; BOPS	19 APEC members (no CT, VN)	Generally 1989-2008	Computer, communications and other services (% of commercial service imports) include such activities as international telecommunications, and postal and courier services; computer data; news-related service transactions between residents and nonresidents; construction services; royalties and license fees; miscellaneous business, professional, and technical services; and personal, cultural, and recreational services.
Insurance and financial services (% of commercial service exports)	WDI; BOPS	19 APEC members (no CT, VN)	Generally 1989-2008	Insurance and financial services cover freight insurance on goods exported and other direct insurance such as life insurance; financial intermediation services such as commissions, foreign exchange transactions, and brokerage services; and auxiliary services such as financial market operational and regulatory services.

Insurance and financial services (% of commercial service imports)	WDI; BOPS	19 APEC members (no CT, VN)	Generally 1989-2008	Insurance and financial services cover freight insurance on goods imported and other direct insurance such as life insurance; financial intermediation services such as commissions, foreign exchange transactions, and brokerage services; and auxiliary services such as financial market operational and regulatory services.
Transport services (% of commercial service exports)	WDI; BOPS	19 APEC members (no CT, VN)	Generally 1989-2008	Transport services (% of commercial service exports) covers all transport services (sea, air, land, internal waterway, space, and pipeline) performed by residents of one economy for those of another and involving the carriage of passengers, movement of goods (freight), rental of carriers with crew, and related support and auxiliary services. Excluded are freight insurance, which is included in insurance services; goods procured in ports by nonresident carriers and repairs of transport equipment, which are included in goods; repairs of railway facilities, harbors, and airfield facilities, which are included in construction services; and rental of carriers without crew, which is included in other services.
Transport services (% of commercial service imports)	WDI; BOPS	19 APEC members (no CT, VN)	Generally 1989-2008	Transport services (% of commercial service imports) covers all transport services (sea, air, land, internal waterway, space, and pipeline) performed by residents of one economy for those of another and involving the carriage of passengers, movement of goods (freight), rental of carriers with crew, and related support and auxiliary services. Excluded are freight insurance, which is included in insurance services; goods procured in ports by nonresident carriers and repairs of transport equipment, which are included in goods; repairs of railway facilities, harbors, and airfield facilities, which are included in construction services; and rental of carriers without crew, which is included in other services.
Travel services (% of commercial service exports)	WDI; BOPS	19 APEC members (no CT, VN)	Generally 1989-2008	Travel services (% of commercial service exports) covers goods and services acquired from an economy by travelers in that economy for their own use during visits of less than one year for business or personal purposes. Travel services include the goods and services consumed by travelers, such as lodging and meals and transport (within the economy visited).

Travel services (% of commercial service imports)	WDI; BOPS	19 APEC members (no CT, VN)	Generally 1989-2008	Travel services (% of commercial service imports) covers goods and services acquired from an economy by travelers in that economy for their own use during visits of less than one year for business or personal purposes. Travel services include the goods and services consumed by travelers, such as lodging, meals, and transport (within the economy visited).
Indicators to Institutional Arrangements and Policies				
Control of Corruption Indicator	World Bank, Worldwide Governance Indicators (WGI)	21 APEC members	1996, 1998, 2000, 2002-2008	Captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.
Government Effectiveness	WGI	21 APEC members	1996, 1998, 2000, 2002-2008	Captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
Political Stability and Absence of Violence	WGI	21 APEC members	1996, 1998, 2000, 2002-2008	Captures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.
Regulatory Quality Indicator	WGI	21 APEC members	1996, 1998, 2000, 2002-2008	Captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
Rule of Law	WGI	21 APEC members	1996, 1998, 2000, 2002-2008	Capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
Voice and Accountability	WGI	21 APEC members	1996, 1998, 2000, 2002-2008	Captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
Burden of government regulation	World Economic Forum, Global Competitiveness Report (GCR)	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "Complying with administrative requirements (permits, regulations, reporting) issued by the government is (1 = burdensome, 7 = not burdensome)?"

Business costs of crime and violence	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "The incidence of crime and violence (1 = imposes significant costs on businesses, 7 = does not impose significant costs on businesses)?"
Business costs of terrorism	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "The threat of terrorism (1 = imposes significant costs on businesses, 7 = does not impose significant costs on businesses)?"
Diversion of public funds	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "Diversion of public funds to companies, individuals, or groups due to corruption (1 = is common, 7 = never occurs)?"
Efficacy of corporate boards	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "Corporate governance by investors and boards of directors is characterized by (1 = management has little accountability, 7 = investors and boards exert strong supervision of management decisions)?"
Efficiency of legal framework	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "The legal framework for private businesses to settle disputes and challenge the legality of government actions and/or regulations is (1 = inefficient and subject to manipulation, 7 = efficient and follows a clear, neutral process)?"
Ethical behavior of firms	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "The corporate ethics (ethical behavior in interactions with public officials, politicians, and other enterprises) of firms are (1 = among the worst in the world, 7 = among the best in the world)?"
Favoritism in decisions of government officials	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "When deciding upon policies and contracts, government officials (1 = usually favor well-connected firms and individuals, 7 = are neutral among firms and individuals)?"
Institutions Pillar	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	The institutional environment forms the framework within which individuals, firms, and governments interact in the economy and is an aggregate based on the measures below.
Intellectual property protection	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "Intellectual property protection and anti-counterfeiting measures are (1 = weak and not enforced, 7 = strong and enforced)?"
Irregular payments in exports and imports	GCR	19 APEC members (no BD, PNG)	2008-2009	Based on responses to the question: "How frequently would you estimate that firms make undocumented extra payments or bribes connected with import and export permits (1 = common, 7 = never occurs)?"

Judicial independence	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "Is the judiciary independent from political influences of members of government, citizens, or firms (1 = no - heavily influenced, 7 = yes - entirely independent)?"
Laws relating to ICT	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "Laws relating to the use of information technology (electronic commerce, digital signatures, consumer protection) are (1 = nonexistent, 7 = well developed and enforced)?"
Organized crime	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "Organized crime (mafia-oriented racketeering, extortion) (1 = imposes significant costs on businesses, 7 = does not impose significant costs on businesses)?"
Property rights	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "Property rights, including over financial assets, are (1 = poorly defined and not protected by law, 7 = clearly defined and well protected by law)?"
Protection of minority shareholders' interests	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "Interests of minority shareholders are (1 = not protected by law, 7 = protected by law and actively enforced)?"
Public trust of politicians	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "Public trust in the financial honesty of politicians is (1 = very low, 7 = very high)?"
Reliability of police services	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "Police services (1 = cannot be relied upon to enforce law and order, 7 = can be relied upon to enforce law and order)?"
Strength of auditing and reporting standards	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "Financial auditing and reporting standards regarding company financial performance are (1 = extremely weak, 7 = extremely strong - the best in the world)?"
Transparency of government policymaking	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "Are firms usually informed clearly by the government of changes in policy and regulations affecting your industry (1 = never informed, 7 = always informed)?"
Wastefulness of government spending	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "The composition of public spending in your country (1 = is wasteful, 7 = efficiently provides necessary goods and services not provided by the market)?"
Bribe Payers Index	Transparency International (TI)	11 APEC members	1999, 2002, 2006, 2008	Evaluates the supply side of corruption by measuring the likelihood of firms from leading exporting nations to engage in bribery when doing business abroad.

Corruption Perceptions Index	TI	20 APEC members (no BD)	1995-2008	Relates to perceptions of the degree of corruption as seen by business people and country analysts and ranges between 10 (highly clean) and 0 (highly corrupt).
Global Corruption Barometer	TI	14 APEC members	2003-2007, 2009	Assesses general public's views of corruption and experiences of bribery around the world. (It assesses the extent to which key institutions and public services are perceived to be corrupt, measures citizens' views on government efforts to fight corruption, including the level of state capture and people's willingness to pay a premium for clean corporate behavior.)
Enforcing Contracts - Cost Subindicator	World Bank, Doing Business Report	21 APEC members	2004-2009	Attorney, court and enforcement costs as % of claim value.
Enforcing Contracts - Procedures Subindicator	World Bank, Doing Business Report	21 APEC members	2004-2009	Steps to file claim, obtain and enforce judgment.
Enforcing Contracts - Time Subindicator	World Bank, Doing Business Report	21 APEC members	2004-2009	Days to resolve commercial sale dispute before courts.
Enforcing Contracts Indicator	World Bank, Doing Business Report	21 APEC members	2004-2009	Measures the efficiency of the judicial system in resolving a commercial dispute based on time, cost and procedures to enforce a contract through the courts.
E-Participation Index	United Nations, Government E-Readiness	19 APEC members (no HKC, CT)	2004, 2005, 2007	Assesses the quality and usefulness of information and services provided for the purpose of engaging citizens in public policy making through the use of e-government programs. (It is indicative of both the capacity and the willingness of the state in encouraging the citizen in promoting deliberative, participatory decision-making in public policy and of the reach of its own socially inclusive governance program.)
E-Readiness Index	United Nations, Government E-Readiness	19 APEC members (no HKC, CT)	2004, 2005, 2007	Measures the state of e-government readiness in the economy. It is a composite measurement of the capacity and willingness of countries to use e-government for ICT-led development and comprises the Web Measure index, the Telecommunication Infrastructure index and the Human Capital index.
Web Measure Index	United Nations, Government E-Readiness	19 APEC members (no HKC, CT)	2004, 2005, 2007	Evaluates the integration of the public sector agencies with full cooperation and understanding of the concept of collective decision-making, participatory democracy and citizen empowerment as a democratic right.

Indicators to Physical Infrastructure				
Transport				
Quality of air transport infrastructure	World Economic Forum, Global Competitiveness Report (GCR)	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "How would you assess passenger air transport infrastructure in your country? (1 = extremely underdeveloped; 7 = extensive and efficient by international standards)".
Quality of electricity supply	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "How does the quality of the electricity supply in your country (lack of interruptions and lack of voltage fluctuations) compare with that of other countries? (1 = worse than in most other countries; 7 = meets the highest standards in the world)".
Quality of overall infrastructure	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "How would you assess general infrastructure (e.g., transport, telephony, and energy) in your country? (1 = extremely underdeveloped; 7 = extensive and efficient by international standards)".
Quality of port infrastructure	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "How would you assess port facilities in your country? (1 = extremely underdeveloped; 7 = well developed and efficient by international standards)".
Quality of railroad infrastructure	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "How would you assess the railroad system in your country? (1 = extremely underdeveloped; 7 = extensive and efficient by international standards)".
Quality of roads	GCR	20 APEC members (no PNG)	2001/2002 - 2008/2009	Based on responses to the question: "How would you assess roads in your country? (1 = extremely underdeveloped; 7 = extensive and efficient by international standards)".
Air transport, freight (million ton-km)	WDI	20 APEC members (no CT)	Generally 1989-2007	Sum of the metric tonnes of freight, express and diplomatic bags carried on each flight stage multiplied by the stage distance.
Air transport, passengers carried	WDI	20 APEC members (no CT)	Generally 1989-2007	Total number of domestic and international aircraft passengers.
Air transport, registered carrier departures worldwide	WDI	20 APEC members (no CT)	Generally 1989-2007	Domestic takeoffs and takeoffs abroad of air carriers registered in the country

Container port traffic (TEU: 20 foot equivalent units)	WDI	18 APEC members (no CT, BD, PNG)	2000-2007	Flow of containers from land to sea transport modes and vice versa in TEUs, a standard-size container. Data cover coastal shipping as wel as international jouneys. Transshipment traffic is counted as two lifts at the intermediate port (once to off-load and again as an outbount lift) and includes empty units.
Rail lines (total route-km)	WDI	17 APEC members (no CT, BD, HKC, PNG, SIN)	Generally 1989-2007	Length of railway route available for train service, irrespective of the number of parallel tracks
Railways, goods transported (million ton-km)	WDI	17 APEC members (no CT, BD, HKC, PNG, SIN)	Generally 1989-2007	Volume of goods transported by railway, measured in millions metric tons times kilometers traveled
Railways, passengers carried (million passenger-km)	WDI	17 APEC members (no CT, BD, HKC, PNG, SIN)	Generally 1989-2007	Number of passengers transported by rail times kilometers traveled
Roads, goods transported (million ton-km)	WDI	AUS, CDA, CHN, JPN, ROK, MEX, RUS, US	Generally 1990-2006	Volume of goods transported by road vehicles, measured in millions metric tons times kilometers traveled
Roads, passengers carried (million passenger-km)	WDI	AUS, CDA, CHN, JPN, ROK, MEX, RUS, US	Generally 1999-2006	Number of passengers transported by road times kilometers traveled
Roads, paved (% of total roads)	WDI	20 APEC members (no CT)	Generally 1990-2006	Roads surfaced with crushed stone (macadam) and hydrocarbon binder or bituminised agents, with concrete, or with cobblestones, as a percentage of all the country's roads.
Roads, total network (km)	WDI	20 APEC members (no CT)	Generally 1990-2006	Covers motorways, highways, main and national roads, secondary or regional roads, and all other roads in a country
Vehicles (per km of road)	WDI; International Road Federation, World Road Statistics and data files.	19 APEC members (no CT, VN)	Generally 1990-2006	Vehicles per kilometer of road include cars, buses, and freight vehicles but do not include two-wheelers. Roads refer to motorways, highways, main or national roads, secondary or regional roads, and other roads. A motorway is a road specially designed and built for motor traffic that separates the traffic flowing in opposite directions.

# of airports	CIA - The World Factbook	21 APEC members	2007 or 2008	Total number of airports or airfields recognizable from the air. The runway(s) may be paved (concrete or asphalt surfaces) or unpaved (grass, earth, sand, or gravel surfaces) and may include closed or abandoned installations. Airports or airfields that are no longer recognizable (overgrown, no facilities, etc.) are not included. Note that not all airports have accommodations for refueling, maintenance, or air traffic control.
# of airports with paved runways	CIA - The World Factbook	21 APEC members	2007 or 2008	Total number of airports with paved runways (concrete or asphalt surfaces) by length. For airports with more than one runway, only the longest runway is included according to the following five groups - (1) over 3,047 m (over 10,000 ft), (2) 2,438 to 3,047 m (8,000 to 10,000 ft), (3) 1,524 to 2,437 m (5,000 to 8,000 ft), (4) 914 to 1,523 m (3,000 to 5,000 ft), and (5) under 914 m (under 3,000 ft). Only airports with usable runways are included in this listing. Not all airports have facilities for refueling, maintenance, or air traffic control. The type aircraft capable of operating from a runway of a given length is dependent upon a number of factors including elevation of the runway, runway gradient, average maximum daily temperature at the airport, engine types, flap settings, and take-off weight of the aircraft.
# of airports with unpaved runways	CIA - The World Factbook	21 APEC members	2007 or 2008	Total number of airports with unpaved runways (grass, dirt, sand, or gravel surfaces) by length. For airports with more than one runway, only the longest runway is included according to the following five groups - (1) over 3,047 m (over 10,000 ft), (2) 2,438 to 3,047 m (8,000 to 10,000 ft), (3) 1,524 to 2,437 m (5,000 to 8,000 ft), (4) 914 to 1,523 m (3,000 to 5,000 ft), and (5) under 914 m (under 3,000 ft). Only airports with usable runways are included in this listing. Not all airports have facilities for refueling, maintenance, or air traffic control. The type aircraft capable of operating from a runway of a given length is dependent upon a number of factors including elevation of the runway, runway gradient, average maximum daily temperature at the airport, engine types, flap settings, and take-off weight of the aircraft.

# of heliports	CIA - The World Factbook	21 APEC members	2007 or 2008	Total number of heliports with hard-surface runways, helipads, or landing areas that support routine sustained helicopter operations exclusively and have support facilities including one or more of the following facilities: lighting, fuel, passenger handling, or maintenance. It includes former airports used exclusively for helicopter operations but excludes heliports limited to day operations and natural clearings that could support helicopter landings and takeoffs.
# of merchant marine (total, by type, foreign owned, registered in other countries)	CIA - The World Factbook	21 APEC members	2007 or 2008	Defined as all ships engaged in the carriage of goods; or all commercial vessels (as opposed to all nonmilitary ships), which excludes tugs, fishing vessels, offshore oil rigs, etc. This entry contains information in four fields - total, ships by type, foreign-owned, and registered in other countries. Total includes the number of ships (1,000 GRT or over), total DWT for those ships, and total GRT for those ships. DWT or dead weight tonnage is the total weight of cargo, plus bunkers, stores, etc., that a ship can carry when immersed to the appropriate load line. GRT or gross register tonnage is a figure obtained by measuring the entire sheltered volume of a ship available for cargo and passengers and converting it to tons on the basis of 100 cubic feet per ton; there is no stable relationship between GRT and DWT. Ships by type includes a listing of barge carriers, bulk cargo ships, cargo ships, chemical tankers, combination bulk carriers, combination ore/oil carriers, container ships, liquefied gas tankers, livestock carriers, multifunctional large-load carriers, petroleum tankers, passenger ships, passenger/cargo ships, railcar carriers, refrigerated cargo ships, roll-on/roll-off cargo ships, short-sea passenger ships, specialized tankers, and vehicle carriers. Foreign-owned are ships that fly the flag of one country but belong to owners in another. Registered in other countries are ships that belong to owners in one country but fly the flag of another.
lengths and types of pipelines	CIA - The World Factbook	21 APEC members	2007 or 2008	Lengths and types of pipelines for transporting products like natural gas, crude oil, or petroleum products.

lengths of railways	CIA - The World Factbook	21 APEC members	2007 or 2008	Total route length of the railway network and of its component parts by gauge: broad, standard, narrow, and dual. Other gauges are listed under note.
lengths of road network	CIA - The World Factbook	21 APEC members	2007 or 2008	Total length of the road network and includes the length of the paved and unpaved portions.
lengths of waterways	CIA - The World Factbook	21 APEC members	2007 or 2008	Total length of navigable rivers, canals, and other inland bodies of water.
list of ports and terminals	CIA - The World Factbook	21 APEC members	2007 or 2008	Major ports and terminals primarily on the basis of the amount of cargo tonnage shipped through the facilities on an annual basis. In some instances, the number of containers handled or ship visits were also considered.
Density of paved roads (km per sq km land area)	Economist Intelligence Unit (EIU) (Derived from World Bank, World Development Indicators; CIA World Factbook)	12 APEC members (AUS, CDA, HKC, INA, JPN, ROK, MAS, NZ, RP, SIN, THA, VN)	Generally 1990-2003?	Density of roads surfaced with crushed stone (macadam) and hydrocarbon binder or bituminised agents, with concrete, or with cobblestones in relation to land area of the country concerned.
Density of paved roads (km per m pop)	EIU, CIA World Factbook	12 APEC members (AUS, CDA, HKC, INA, JPN, ROK, MAS, NZ, RP, SIN, THA, VN)	Generally 1990-2003	Density of roads surfaced with crushed stone (macadam) and hydrocarbon binder or bituminised agents, with concrete, or with cobblestones in relation to population of the country concerned.
Length of railway network (km)	EIU, CIA World Factbook	12 APEC members (AUS, CDA, HKC, INA, JPN, ROK, MAS, NZ, RP, CT, THA, VN)	Generally 1990-1997	Total route length of the railway network in the country concerned.
Railroad density (km per sq km of land area)	EIU, CIA World Factbook	12 APEC members (AUS, CDA, HKC, INA, JPN, ROK, MAS, NZ, RP, CT, THA, VN)	Generally 1990-1997	Density of the railway network in relation to the land area of the country concerned.

Railroad density (km per m pop)	EIU, CIA World Factbook	12 APEC members (AUS, CDA, HKC, INA, JPN, ROK, MAS, NZ, RP, CT, THA, VN)	Generally 1990-1997	Density of the railway network in relation to the population of the country concerned.
EIU road rating (5=high)	EIU Country Forecasts	13 APEC members (AUS, CDA, HKC, INA, JPN, ROK, MAS, NZ, RP, SIN, CT, THA, VN)	1994-2008	The EIU's business environment rankings quantify the attractiveness of the business environment. The road rating scores countries between 1 and 5 on road density, with 1 being very low and 5 being very high .
EIU rail rating (5=high)	EIU Country Forecasts	13 APEC members (AUS, CDA, HKC, INA, JPN, ROK, MAS, NZ, RP, SIN, CT, THA, VN)	1994-2008	The EIU's business environment rankings quantify the attractiveness of the business environment. The rail network rating scores countries between 1 and 5 on rail density, with 1 being very low and 5 being very high .
EIU ports rating (5=high)	EIU Country Forecasts	13 APEC members (AUS, CDA, HKC, INA, JPN, ROK, MAS, NZ, RP, SIN, CT, THA, VN)	1994-2008	The EIU's business environment rankings quantify the attractiveness of the business environment. The ports rating scores countries between 1 and 5 on the quality of the port infrastructure, with 1 being very poor and 5 being very good .
Communications				
Telephone lines	GCR; International Telecommunication Union's (ITU) World Telecommunication Development Report Database	20 APEC members (no PNG)	2001/2002 - 2008/2009	Main telephone lines per 100 populations.

Cost of call to U.S. $ per 3 minutes	WDI (hard copy); ITU	19 APEC members (no CT, BD)	2005	Cost of a three minute, peak rate, fixed-line call from the country to the United States.
Faults per 100 mainlines	WDI; ITU	19 APEC members (no CT, BD)	2005	Number of reported faults for the year divided by # of telephone mainlines and multiplied by 100.
International voice traffic (minutes per person)	WDI; ITU	20 APEC members (no CT)	Generally 1989-2007	International voice traffic is the sum of international incoming and outgoing telephone traffic (in minutes).
Mobile and fixed-line telephone subscribers	WDI; ITU	20 APEC members (no CT)	Generally 1989-2008	Mobile and fixed-line subscribers are total telephone subscribers (fixed-line plus mobile).
Mobile cellular prepaid tariff (US$ per month)	WDI; ITU	19 APEC members (no CT, BD)	2008	Mobile cellular prepaid tariff is based on the Organisation for Economic Co-operation and Development's low-user definition, which includes the cost of monthly mobile use for 25 outgoing calls per month spread over the same mobile network, other mobile networks, and mobile to fixed-line calls and during peak, off-peak, and weekend times as well as 30 text messages per month.
Mobile cellular subscriptions	WDI; ITU	20 APEC members (no CT)	Generally 1989-2008	Subscribers to a public mobile telephone service using cellular tech.
Population covered by mobile cellular network (%)	WDI; ITU	18 APEC members (no CT, BD, PNG)	Generally 2000-2007	Percentage of people within range of a mobile cellular signal regardless of whether they are subscribers.
Residential fixed line telephone tariff (US$ per month)	WDI; ITU	19 APEC members (no CT, BD)	2008	Residential fixed-line tariff is the monthly subscription charge plus the cost of 30 three-minute local calls (15 peak and 15 off-peak).
Telecommunications revenue (% GDP)	WDI; ITU	20 APEC members (no CT)	Generally 1989-2007	Telecommunications revenue is the revenue from the provision of telecommunications services such as fixed-line, mobile, and data.
Telephone lines	WDI; ITU	20 APEC members (no CT)	1989-2007	Telephone lines connecting a subscriber to the telephone exchange equipment

Daily newspapers (per 1,000 people)	WDI; United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics.	19 APEC members (no CT, ROK)	Generally 1997-2004	Daily newspapers refer to those published at least four times a week and calculated as average circulation (or copies printed) per 1,000 people.
Households with television (%)	WDI; ITU	12 APEC members (no CT, AUS, BD, PRC, ROK, PNG, MAS, RUS, THA)	Generally 2000-2007	Households with television are the share of households with a television set. Some countries report only the number of households with a color television set, and therefore the true number may be higher than reported.
Personal computers (per 100 people)	WDI; ITU	20 APEC members (no CT)	Generally 1989-2007	Personal computers are self-contained computers designed to be used by a single individual.
Internet users (per 100 people)	WDI; ITU	20 APEC members (no CT)	Generally 1990-2008	Internet users are people with access to the worldwide network. .
International Internet bandwidth (bits per person)	WDI; ITU	20 APEC members (no CT)	Generally 1992-2007	International Internet bandwidth is the contracted capacity of international connections between countries for transmitting Internet traffic.
Secure Internet servers (per 1 million people)	WDI; Netcraft (http://www.netcraft.com/) and World Bank population estimates.	20 APEC members (no CT)	Generally 2001-2008	Secure servers are servers using encryption technology in Internet transactions. Note: Data are as of December 2008.
Fixed broadband subscribers (per 100 people)	WDI; ITU	20 APEC members (no CT)	Generally 1998-2008	Fixed broadband subscribers are users of the Internet who subscribe to paid high-speed access to the public Internet. High-speed access is at least 256 kilobits per second in one or both directions.
Fixed broadband Internet access tariff (US$ per month)	WDI; ITU	19 APEC members (no CT, BD)	2008	Fixed broadband Internet access tariff is the lowest sampled cost per 100 kilobits a second per month and are calculated from low- and high-speed monthly service charges. Monthly charges do not include installation fees or modem rentals.

Information and communication technology expenditure (% of GDP)	WDI; World Information Technology and Services Alliance, Digital Planet: The Global Information Economy, and Global Insight, Inc.	18 APEC members (no CT, BD, PNG)	2003-2007	Information and communications technology expenditures include computer hardware (computers, storage devices, printers, and other peripherals); computer software (operating systems, programming tools, utilities, applications, and internal software development); computer services (information technology consulting, computer and network systems integration, Web hosting, data processing services, and other services); and communications services (voice and data communications services) and wired and wireless communications equipment.
Information and communication technology expenditure per capita (current US$)	WDI; World Information Technology and Services Alliance, Digital Planet: The Global Information Economy, and Global Insight, Inc.	18 APEC members (no CT, BD, PNG)	2003-2007	Information and communications technology expenditures include computer hardware (computers, storage devices, printers, and other peripherals); computer software (operating systems, programming tools, utilities, applications, and internal software development); computer services (information technology consulting, computer and network systems integration, Web hosting, data processing services, and other services); and communications services (voice and data communications services) and wired and wireless communications equipment.
School connected to the internet (%)	WDI (hard copy)	11 APEC members (no BD, PRC, INA, MAS, CT, PNG, PR, RP, THA, VN)	2005	% of primary and secondary schools in the country that have access to the internet
# of internet hosts	CIA - The World Factbook	21 APEC members	2007 or 2008	Number of Internet hosts available within a country. An Internet host is a computer connected directly to the Internet; normally an Internet Service Provider's (ISP) computer is a host. Internet users may use either a hard-wired terminal, at an institution with a mainframe computer connected directly to the Internet, or may connect remotely by way of a modem via telephone line, cable, or satellite to the Internet Service Provider's host computer. The number of hosts is one indicator of the extent of Internet connectivity.
# of internet service providers (ISPs)	CIA - The World Factbook	21 APEC members	2000	

# of internet users	CIA - The World Factbook	21 APEC members	2007 or 2008	Number of users within a country that access the Internet. Statistics vary from country to country and may include users who access the Internet at least several times a week to those who access it only once within a period of several months.
# of mobile cellular	CIA - The World Factbook	21 APEC members	2007 or 2008	Total number of mobile cellular telephone subscribers.
# of radio broadcast stations	CIA - The World Factbook	21 APEC members	2007 or 2008	Total number of AM, FM, and shortwave broadcast stations.
# of radios	CIA - The World Factbook	21 APEC members	1997	
# of telephone main lines in use	CIA - The World Factbook	21 APEC members	2007 or 2008	Total number of main telephone lines in use.
# of television broadcast stations	CIA - The World Factbook	21 APEC members	2007 or 2008	Total number of separate broadcast stations plus any repeater stations.
# of televisions	CIA - The World Factbook	21 APEC members	1997	
Telephone system	CIA - The World Factbook	21 APEC members	2007 or 2008	General assessment of the system with details on the domestic and international components.

ANNEX 6. EXAMPLE OF A DATA AVAILABILITY MATRIX FOR A TENTATIVE LOCAI

Index factors	*Sources*	*Period covered (1997/1998 onwards)*	*Country or Region*
1 *Modern IT Infrastructure (MI)*	Digital access index, ITU, except education and literacy	All years covered	All years covered
Measured by penetration:			
• Telephones		Data available	Data available
• Internet access			
• PCs			
2 *Traditional Infrastructure adapted to Multi-Modal transportation (TIMM)*			
Defined as accessibility of ports and airports by road and rails, adapted to multi-modal transportation). Measured by:	UNCTAD/ WTO	All years covered	All years covered
• Transport costs as percentage of import value	World Bank		
• Roads and railroad tracks per 1000 sq km	Various sources	Data available but needs to be checked	Data available, but needs to be checked
• Road-transport of (standard) container			
• Number of seaports and cargo-airports			
• Possibilities to handle containers			
• Stations and border crossings			
• Inventories in port by vol. (sqc) or standard-container			
• Daily costs of inventory holding			
• Turnover time for big container ships			
• Vessels in queue			

3 *Trade Facilitation (TF)*			
Defined a wide range of rules, procedures, and mechanisms that can help the simplification, harmonisation, automation and speeding up of the goods and information flows across the borders. Measured by: • Customs clearance time • Raw material stocks in comparison • With developed countries as percentage of GDP • Utilisation rate of trucks, • Charging/discharging costs in ports in developing and developed countries for each unit of homogeneous good • Delay times in delivery	World Bank, EASTR Various sources	Data available but needs to be checked.	Data available but needs to be checked

Index factors	*Sources*	*Period covered (1997/1998 onwards)*	*Country or Region*
4 *Quality of Logistic Services (QS)*			
Defined as availability and quality of inter-modal transport services, freight forwarding, 3rd Party Logistics/4th party logistics. Measured by: • Number of companies offering inter-modal transport services; freight forwarding, 3PL/4PL market share	Transport intelligence	Data available but needs to be checked	Data available but needs to be checked
5 *Soft Infrastructure (SI)*			
Defined as regulatory (laws and regulations on trade facilitation, custom laws, standardisation in packaging and labelling). Measured by: • Transport laws and other regulations • Regulations on trade facilitation • Custom laws • Standardisation in packaging and labelling	WTO	Data available but needs to be checked	Data available but needs to be checked

Source: Memedovic, Ojala and Naula

Source: Table 2 from Memedovic et al. (2008)

ANNEX 7. SOURCES OF INDUSTRY INFORMATION

DREWRY publications - DREWRY publications cover performance information on the maritime sector from dry bulk to chemicals, LPG to ferries with detailed analysis and commentary on past, present and future sector performance (http://www.drewry.co.uk).

Cargo Systems - Cargo Systems (www.cargosystems.net) is also a key intelligence source provided by Informa Plc, covering all aspects of port development and privatisation, container handling, container technology and intermodalism. It also provides information on recent worldwide orders and deliveries of port equipment, and list of Top 100 Container Ports.

International Freighting Weekly (IFW) - IFW (http://www.ifw-net.com) is another brand of Informa Plc. It is one of the best sources for analysis, features and jobs across all aspects of the commercial transport chain, expertly covering worldwide up-to-minute news on container shipping, road haulage, rail freight, airfreight, logistics and supply chain developments. IFW has graduated into other, parallel areas of coverage outside of transport modes, such as, supply chain management/warehousing/logistics, intermodal transport, express services, technology, security, and customs.

Sea FREIGHT DATABASE - Sea FREIGHT DATABASE (http://freightdatabase.com) provides a strait overview on full container load (FCL) freight rates, with all possibilities to compare existing rates, services, timings and charges at the port of loading or discharging.

WorldACD - WorldACD (http://www.worldacd.com) is a provider of air cargo information, such as market information, news, reports, rates, rankings, trade data, trends, indices and statistics. Its database, WorldACD Market Database (http://www.worldacd.com/market_data.asp) contains information, such as net turnover/yield, actual chargeable weight, number of shipments, per product category for more than 200 countries and 125,000 city pairs. Its output is based on world wide data provided monthly by the participating airlines.

International Air Transport Association (IATA) - IATA (http://www.iata.org) provides data services on various aspects of air transport. The following is a list of its data services:

Business Intelligence

- Airport Intelligence Services (AirportIS)
- Cargo Intelligence Services (CargoIS)
- Passenger Intelligence Services (PaxIS)
- Market Intelligence Services (MarketIS) - Airline Data on Demand
- Data AirHouse
- Cargo e-chartbook
- Global Data Products
- Schedule Reference Service (SRS)

Market Research

- Cargo Service Tracker survey (CST)
- Passenger Satisfaction on long-haul filghts (GAP)
- Passenger Satisfaction on short-haul flights (Europe and Asia)

Statistics

- Carrier Tracker

CASStats
Freight Forecast
Monthly International Statistics
On-Flight Origin-Destination Statistics
Passenger Forecast
Route Area Statistics
Route Tracker
World Air Transport Statistics

Safety data

Flight Data Analysis (FDA)
STEADES - Safety Trend Evaluation, Analysis & Data Exchange System

Selected statistics are described below:

1. **Carrier Tracker -** Carrier Tracker is the first publicly available report for monitoring airline traffic. It provides international traffic figures for passenger and cargo markets on a monthly basis as well as an executive summary analysing key industry trends from IATA's Chief Economist Office. Industry and regional growth figures as well as top-line trends are from a sample representing around 90 percent of global international traffic. Covering over 130 individual carriers, Carrier Tracker variables include: Revenue Passenger Kilometres (RPK), Available Seat Kilometres (ASK), Passenger Load Factor (PLF), Freight Tonne Kilometres (FTK), Available Tonne Kilometres (ATK).
2. **Monthly International Statistics (MIS) -** Dated back to 1988, MIS is a collection of traffic and capacity statistics for passengers (in the form of RPK and ASK) freight (in the form of FTK) and combined (in the form of ATK) for the month's total international scheduled operations. MIS covers over 115 airlines and approximately 93 percent of IATA international scheduled traffic, and is delineated into 6 regions showing international and capacity developments by region and airline. MIS is typically updated 28 days after the end of the reference month.
3. **On-Flight Origin-Destination Statistics (ODS)** - ODS is a monthly collection of scheduled international passenger, freight and mail statistics. The units of measurements are passenger numbers by class of travel (first, intermediate/business and economy), accompanied by freight and mail kilograms. Passenger, freight and mail data is collected from individual airlines and aggregated at various levels starting with city pairs.
4. **Route Tracker** - Route Tracker is the timeliest monthly report for monitoring directional origin-destination traffic. From a sample of around 70 airlines, it provides international traffic figures by route area for passenger and cargo markets on a monthly basis as well as an executive summary analysing key industry trends from IATA's Chief Economist Office. Variables included per route area are: growth rates for passengers by class of travel (economy, premium, and total), and freight. For the international total and top-9 route areas, series are provided for the latest 12 months, also including RPK, ASK, FTK, and ATK growth rates, as well as Passenger and Weight Load Factors.
5. **World Air Transport Statistics (WATS)** - WATS 53rd edition draws from half a century of experience to assemble the key figures of over 250 airlines, including low cost carriers. Compiled from the data submissions of IATA Member airlines and non mermber, WATS leverages valuable insider information, such as (a) air transport supply and demand: traffic and capacity trends; performance of major route areas; forecasts for passenger and cargo traffic; key metric trends, rankings and benchmarks; (b) financial performance of the airlines: IATA member financial results, average fare information,

fuel data, employee growth, and safety statistics; (c) airline rankings: top 50 IATA member airlines and alliance statistics; rankings in terms of international, domestic and total scheduled passengers, freight tonnes, passenger kilometres, and number of aircraft; (d) CEO commentaries: their point of view on key industry challenges and their creative approaches; and (e) the ranking of top 50 airports worldwide, as well as total tourist-arrivals by region.

Database of the World's Air Services Agreements (WASA) - WASA (http://www.icao.int/cgi/ISBN_txt.pl?972) is published by ICAO for 2005, 2007. This database contains codified summaries of the main provisions of bilateral air services agreements filed with ICAO.

Air Transport Intelligence (ATI) - ATI airline data (http://www.rati.com) has full access to over 2,000 airline data profiles. It provides the latest data on fleets, alliances and code shares, routs, maintenance, ownership, financial figures, traffic data and senior executives' profiles for over 2000 airlines.

Quantitative Air Services Agreements Review (QUASAR) - The QUASAR (http://www.wto.org/english/tratop_e/serv_e/transport_e/review2_e.htm) focuses on scheduled air passenger services and seeks to offer a detailed and, as far as possible, comprehensive analysis of market access features of bilateral Air Services Agreements (ASAs). QUASAR combines the information contained in the Database of the World's Air Services Agreements (WASA) database, which has been assessed in terms of degree of openness in consultation with a group of aviation professionals, government experts, international civil servants and academics, with traffic data obtained from the International Air Transport Association (IATA). QUASAR data sources include ICAO (coding of bilateral agreements, fleet, number of international airports, etc), IATA (traffic statistics, existing services), Centre d'Études Prospectives et d'Informations Internationales (CEPII) (distance, historical ties, common borders, etc), other UN agencies (population density, size) and the WTO (various trade data relevant to air transport).