



CENTRAL ASIA REGIONAL
ECONOMIC COOPERATION
CORRIDOR PERFORMANCE
MEASUREMENT AND MONITORING:
A Forward-Looking Retrospective

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Foreword

The Central Asia Regional Economic Cooperation Program (CAREC) Program is a committed partnership of 10 countries, working together with a support of six multilateral institutions to promote development through regional cooperation. The participating countries have together chosen the CAREC Program as their means of confronting and overcoming their common problems. To maximize its effectiveness, these countries have, since the program's establishment in 2001, consistently focused their joint efforts on four priority areas: energy, trade policy, transport, and trade facilitation. Through sector committees and other convening mechanisms, the program serves to build confidence among the participating countries, sustaining dialogue even when other issues and factors threaten to create an impasse.

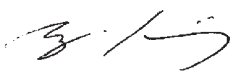
As their confidence in one another—and in their joint efforts—grew over the years, CAREC member countries recognized that their geographic situation presented both challenges and opportunities. The CAREC Transport and Trade Facilitation Strategy for 2008–2017 (TTFS), adopted in 2007, and its Implementation Action Plan, adopted in 2008, provided structure and focus (not least in the form of the CAREC corridors) for two of the four priority areas covered by the CAREC Program. Its two objectives, which drive the program's overall strategy, are to expand trade and to improve the region's competitiveness. By working to reduce transport costs regionally and to make distant markets more accessible, the CAREC Program has been supporting the coalescence of isolated landlocked countries into a land-linked regional economy generating benefits for all. To document the progress toward achieving these objectives, improve focus, and inform the development of solutions to common challenges, the TTFS introduced corridor performance measurement and monitoring (CPMM).

CPMM data are provided by private sector transport associations, and the analyses of the data help policy makers and practitioners better understand the underlying causes that hinder CAREC corridor performance. The methodology, which is based on internationally accepted tools for monitoring and measuring the performance of transport movements and trade flows, is described fully in this publication. It is a valuable process-based measurement tool that can aid policy reform efforts, particularly by identifying viable, cost-effective ways to circumvent or mitigate impediments to the movement of goods and people along CAREC corridors and throughout the region.

CPMM has been conducted now for 5 years, and has become more than just a tool for evaluating corridor performance: it now influences investment decision making, supports project evaluation, assesses the impact of policy implementation, and aids shippers in selecting routes and managing inventories. This publication examines CPMM, traces its evolution, and suggests ways to increase the value of CPMM and the analysis it supports. It also explores how CPMM can be expanded to capture additional information to enrich the monitoring and implementation of the refined TTFS (TTFS 2020), which was adopted in

2013 to account for changes in the CAREC Program (expanded membership, new strategic framework) that had taken place since the original strategy (ADB 2014) was implemented. TTFS 2020, which covers 2014–2020, provides continuity in the development of the corridor infrastructure while shifting the focus toward improving the quality of logistics service and increasing the level of connectivity. For infrastructure, there is a new emphasis on rail for long-distance freight movements. CPMM will endeavor to capture quantitative information on rail and logistics performance to complement the data obtained for automotive transport.

With this study, the Asian Development Bank underscores the value of CPMM for the CAREC member countries (and for countries participating in other subregional programs) as they design policies and propose investments to facilitate trade. The markets of the People's Republic of China, India, the Russian Federation, and Turkey are not too distant, and more robust and comprehensive CPMM analyses could help make them increasingly accessible to all the CAREC countries.



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Executive Summary

The Central Asia Regional Economic Cooperation (CAREC) transport corridors are key conduits, improving connectivity and facilitating cross-border movement in the region. Most CAREC countries are landlocked and rely almost exclusively on overland transport for trade within the region and with markets just outside. Comprising an extensive, but still underdeveloped, network of roads and railways spanning the region, the six CAREC corridors are intended to expand trade and improve competitiveness, and in the process augment regional economic cooperation. The Asian Development Bank (ADB) is working with other development partners to improve physical connectivity within Central Asia by implementing agreements facilitating cross-border and transit trade, and thus expand the region's economy. A refined CAREC Transport and Trade Facilitation Strategy (TTFS 2020), covering 2014–2020, is guiding this development. Monitoring and evaluating the implementation of TTFS 2020 requires measuring and improving the performance of the CAREC corridors, which will need to be improved. To facilitate trade and transport, bottlenecks and impediments along the corridors must be identified and removed.

This report describes how process-based corridor performance measurement and monitoring (CPMM) methodology captures data on the time and cost of moving freight within the CAREC region, particularly at border crossing points (BCPs), to spur operating efficiency, reduce bottlenecks along the CAREC corridors, and thus improve international and regional trade flows. The report presents the CPMM methodology and discusses the roles and responsibilities of key stakeholders, especially in the private sector. Despite the challenges of measuring corridor performance in the CAREC context, efforts are being made to provide accurate and reliable indicators. The depth of data and the richness of information provided by CPMM—which has been used to measure CAREC corridor performance since 2009—will contribute to detailed and well-grounded policy making and implementation.

Trade facilitation indicators (TFIs) have been developed for the CAREC Development Effectiveness Review (DEfR) to provide a basis of comparison or benchmarking between locations (BCPs or corridor segments). The comparisons consider (i) the efficiency of border management policies and of procedures for regulating trade, (ii) infrastructure quality, and, in due course, (iii) the quality and performance of trade logistics service providers. CAREC corridor performance indicators include standard measures of time and cost as main components. Selected data from a corridor performance report are then analyzed to identify the physical and nonphysical barriers to trade and transit traffic at specific locations, thereby helping to pinpoint the causes of excessive delays and costs.

CPMM evaluates corridor performance from both physical and nonphysical (operational and procedural) standpoints. The physical evaluation deals with the condition of corridor infrastructure (including vehicles and cargo handling equipment) and its used,

while the nonphysical evaluation examines the service factors (including the degree of automation) that affect the time and cost of moving goods from origin to destination. The nonphysical evaluation offers more insights into the trade facilitation issues, and allows the performance of corridors of similar length or characteristics to be compared, thereby fueling competition that will spur efforts to reach the desired transit times. In corridor monitoring, CPMM takes two main forms: (i) the monitoring of corridors in their entirety; and (ii) the detailed monitoring of specific locations or predetermined bottlenecks, typically at border crossings. Since 2009, the CPMM methodology has evolved through experience to a point where it can capture a range of ground-level information—views, feedback, and assessments of important aspects of logistics performance—directly from freight forwarders and carriers, thereby providing a fuller understanding of the obstacles en route. In this respect, CPMM is by far the most comprehensive measurement instrument available, but also the most time consuming.¹

Like any other assessment exercise, effective CPMM demands continual measurement. Proposed recommendations for extending the depth and scope of CPMM, particularly in light of the new corridor alignments and the increased focus on railways and on trade logistics services in the refined TTFS 2020, are as follows: (i) include country-level analysis; (ii) present a traffic speed map in the CPMM annual reports; (iii) fine-tune the corridor weights in calculating the TFIs; (iv) standardize the way in which BCPs are presented and analyzed in the CPMM quarterly reports; (v) gather data on the directions of trade flows; (vi) include trends and seasonal patterns; and (vii) supplement CPMM with other trade studies, such as the World Customs Organization's Time Release Study (TRS).

Ancillary transport and other logistics-related infrastructure can and must be developed; CPMM has made this clear. Better institutional frameworks must also be created or existing ones reformed, particularly as they relate to BCPs, where incidence analysis points to occasional unnecessary delays due to misunderstandings and operational issues. The corridors serve a variety of purposes, some unique and others overlapping. Since the corridors are the arteries for trade flows, initiatives that will facilitate trade through more efficient transportation, fewer choke points, and fewer unnecessary delays (either along a stretch of road or at a node during transit) must be supported. Through its formal implementation, CPMM has addressed this issue, with a particular focus on recording and understanding in detail the border-crossing activities for road and rail transport. As roads still carry most of the cargo flow within the CAREC region (80% of the total volume of goods by road; only 17% by rail), policy makers must be mindful of the implications of overdependence on the well-subscribed corridors. Sufficient redundancy must be built into the road network

¹ Appendix 2 of this report also reviews other core methodologies used to measure trade and transport improvements. Among these are the International Road Transport Union's New Eurasian Land Transport Initiative (NELTI), the World Customs Organization's Time Release Study (TRS), and the Transport Corridor Europe–Caucasus–Asia Route Attractiveness Index (TRAX). Initial observations suggest that most of these transport-related measurement tools are useful and driven from the ground up, relying to a great extent on primary data collection. If used in conjunction with CPMM and other strategic marketplace tools, such as those of the International Trade Centre, the resulting combination could be a potent source of benchmarking and market entry information for policy makers and the business community. The measurement framework elaborated in the Asia–Pacific Economic Cooperation's Supply-Chain Connectivity Framework Action Plan also deserves policy attention from ADB and its CAREC Program.

to ensure seamless cargo flow. Efforts are under way to extend selected corridors so that they connect with ports and intermodal logistics hubs. TTFS 2020 highlights the need to increase geographic coverage and interconnectivity between corridors through road and rail to maximize the effective flow of trade. CPMM will have to include these corridor extensions in its analysis.

Abbreviations

ADB	—	Asia Development Bank
APEC	—	Asia–Pacific Economic Cooperation
BCP	—	border crossing point
CAREC	—	Central Asia Regional Economic Cooperation
CAREC 2020	—	Central Asia Regional Economic Cooperation Program 2011–2020
PRC	—	People’s Republic of China
CFCFA	—	CAREC Federation of Carrier and Forwarder Associations
CPMM	—	corridor performance measurement and monitoring
DCF	—	data collection form
DEfR	—	development effectiveness review (CAREC)
ETA	—	expected time of arrival
ETI	—	Enabling Trade Index (World Economic Forum)
IDB	—	Islamic Development Bank
ITC	—	International Trade Centre
IRU	—	International Road Transport Union
IMAR	—	Inner Mongolia Autonomous Region, PRC
km	—	kilometer
kph	—	kilometers per hour
LPI	—	Logistics Performance Index (World Bank)
NELTI	—	New Eurasian Land Transport Initiative (IRU)
RIBS	—	Regional Improvement of Border Services (CAREC)
SCFAP	—	Supply-Chain Connectivity Framework Action Plan (APEC)
SOM	—	Senior Officials’ Meeting (CAREC)
SPS	—	sanitary and phytosanitary
SWD	—	speed with delay
SWOD	—	speed without delay
TCD	—	time/cost–distance methodology (UNESCAP)
TFI	—	trade facilitation indicator
TIR	—	Transports Internationaux Routiers (International Road Transport)
TRACECA	—	Transport Corridor Europe–Caucasus–Asia
TRAX	—	TRACECA Route Attractiveness Index
TRS	—	time release study (WCO)
TSI	—	trade support institution
TTFA	—	Trade and Transport Facilitation Assessment (World Bank)
TTFS	—	Transport and Trade Facilitation Strategy (CAREC)
TTFS 2020	—	refined Transport and Trade Facilitation Strategy (CAREC)
UNESCAP	—	United Nations Economic and Social Commission for Asia and the Pacific
WCO	—	World Customs Organization
WEF	—	World Economic Forum
WTO	—	World Trade Organization
XUAR	—	Xinjiang Uygur Autonomous Region, PRC

In a globalized world, trade and transport are inexorably linked. They should therefore improve in tandem to expand trade and increase competitiveness in Central Asia—the main goals of the Central Asia Regional Economic Cooperation (CAREC) Program. Transport facilitation policies should take into account the need to increase intraregional and interregional economic activity, and trade facilitation policies should pay special attention to the impact of cross-border transport procedures and infrastructure.

The United Nations' Almaty Declaration (2003) recognized the key role of transport cost in international trade competitiveness (UN-OHRLLS 2003). A 10% drop in transport costs, in fact, increases trade by 25% (Limão and Venables 2001). Moreover, transport delays along the production chain have significant ramifications up and down the integrated production value chain. Transport costs are typically higher in developing, than in developed, countries because of poor infrastructure, ill-defined processes, weak regulations, and a low regard for transport facilitation, among other reasons.

Landlocked countries suffer most from high transport costs, which can be three times higher than the tariffs on imported and exported goods (Hummels 2004). Further, the standards and strategies for trade and transport facilitation may vary from country to country, and from region to region. The costs of transport should be reduced and its efficiency maximized (even as regulatory objectives are safeguarded) to facilitate the flow of goods across sovereign borders. To this end, the Islamic Development Bank (IDB), at an IDB–World Bank workshop on trade and competitiveness, put forth a set of prioritization criteria for transport corridors. Some of the criteria were: interregional and intraregional trade potential, transportation costs, facilitation of intermodal transport, distance from ports, connections between locations of economic importance (including cities), and congestion (Yadikar 2011). Standards for measuring the impact of transport facilitation must also be set. It should be noted, however, that many existing transport facilitation strategies and development plans have a time frame of 10 years or more.¹

The notion of a “corridor” was developed to address the trade and accessibility problems of landlocked countries (Arvis, Smith, and Carruthers 2011). The corridor concept has since evolved to include transport, trade, logistics, economic, and even supply chain corridors (Arvis, Raballand, and Marteau 2010). In addition, these corridors have exceeded their primary functions, and are now indispensable in promoting global and regional economic development.

¹ See, for example: East African Community Secretariat. The East African Trade and Transport Facilitation Project: East African Transport Strategy and Regional Road Sector Development Program. http://www.eac.int/infrastructure/index.php?option=com_docman&task=doc_download&gid=150&Itemid=127

For instance, in discussing the Greater Mekong Subregion (GMS), Ruth Banomyong (2013) highlighted the differences between transport, logistics, and economic corridors. A *transport corridor* provides physical links to an area or region. Some of the literature distinguishes between transport and intermodal transport corridors. A *logistics corridor* not only provides physical links to an area or region, but also harmonizes the institutional framework in that area or region to facilitate the efficient movement of freight, people, and information. An *economic corridor* attracts investments to—and generates economic activities in—the areas or regions served by the corridor, especially in the more remote, less developed parts of a country. For an economic corridor to function effectively, the physical links and logistics facilitation must already be in place (Banomyong 2013). The concept was first mentioned and set as a goal in the GMS Development Plan (Wiemer 2009).

Essentially, corridor management focuses on two aspects: the value of time and the reliability of logistics. In a report on corridor management, John Arnold (2005) highlighted six criteria for monitoring and improving corridor performance: (i) interconnections with other corridors (at border crossing points [BCPs], gateways, and major nodes), (ii) border clearance procedures, (iii) interoperation of transport modes and infrastructure in transit, (iv) transport access to markets, (v) allocation of liabilities, and (vi) route capacity.

This report looks into some of the more commonly used measurement tools for gauging the logistics performance of economic corridors in developing economies. Its main focus, however, is corridor performance measurement and monitoring (CPMM), the tool adopted in 2009 by the countries participating in the CAREC Program.

The report is structured as follows:

- Chapter 2 introduces the CAREC Program, describes its composition, and reviews briefly its operating priorities, including: (i) the pivotal roles of the CAREC Institute, the Asian Development Bank (ADB), and other development partners in sustaining the CAREC Program; and (ii) a knowledge framework to help with capacity building and knowledge dissemination. This chapter also describes the six CAREC transport corridors.
- Chapter 3 is the heart of this report. It explains the CPMM technique as applied to the CAREC Program, giving details about the evolution and mechanics of this process-based measurement tool to show how data are collected, validated, and aggregated for downstream bottleneck analysis and incidence management. Four trade facilitation indicators (TFIs) that are specific to CPMM are highlighted in this chapter as they apply to road and rail transport in the CAREC region. In particular, the report shows that transport efficiency and reliability along the transport corridors can be improved through careful monitoring of key variables such as speed without delay (SWOD) and speed with delay (SWD) for all cargoes carried.
- Chapter 4 considers CPMM in retrospect, especially its value-added contributions and assessment results.
- Chapter 5 concludes the report with suggestions for policy makers and the private sector.

The appendixes describe in detail the six CAREC corridors and their subcorridors, and analyzes existing studies on transport and trade facilitation done by multilateral institutions such as ADB, the World Bank, and the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), as well as the measurement tools used.

This publication is intended to inform and educate policy makers, business leaders, and logistics service providers, and convince them of the importance of standardized processes for more effective management, including the control of key transport corridors. It is hoped that this report will help guide the development of the CAREC economic corridors, and thus accelerate and sustain the momentum of national and regional growth.

2

ADB and the CAREC Program

Asian Development Bank

Founded in 1966, the Manila-based Asian Development Bank (ADB) is a multilateral development finance institution owned by 67 members, including 48 from the Asia and Pacific region. Its ultimate goal is to reduce poverty in the region, where about 1.7 billion people live on less than \$2 a day and have no access to essential goods, services, and opportunities. ADB engages with developing economies through policy dialogues and conferences, and by offering loans, grants, and technical assistance. With 31 offices around the world, ADB employs 3,000 development professionals from over 50 countries. ADB's regional approach to trade facilitation is grounded in the operating principles set forth in its charter, specifically: "The operations of the Bank shall provide principally for the financing of specific projects, including those forming part of a national, sub-regional or regional development programme" (ADB 1966). Trade facilitation projects include infrastructure network strengthening to support international trade and to modernize and streamline border procedures and regulations, including customs procedures.

Central Asia Regional Economic Cooperation

ADB began the Central Asia Regional Economic Cooperation (CAREC) Program in 1997 to foster economic cooperation and integration in Central Asia. The 10 member countries of the CAREC Program are Afghanistan, Azerbaijan, the People's Republic of China (PRC, specifically the Inner Mongolia Autonomous Region [IMAR] and the Xinjiang Uygur Autonomous Region [XUAR]), Kazakhstan, the Kyrgyz Republic, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan.

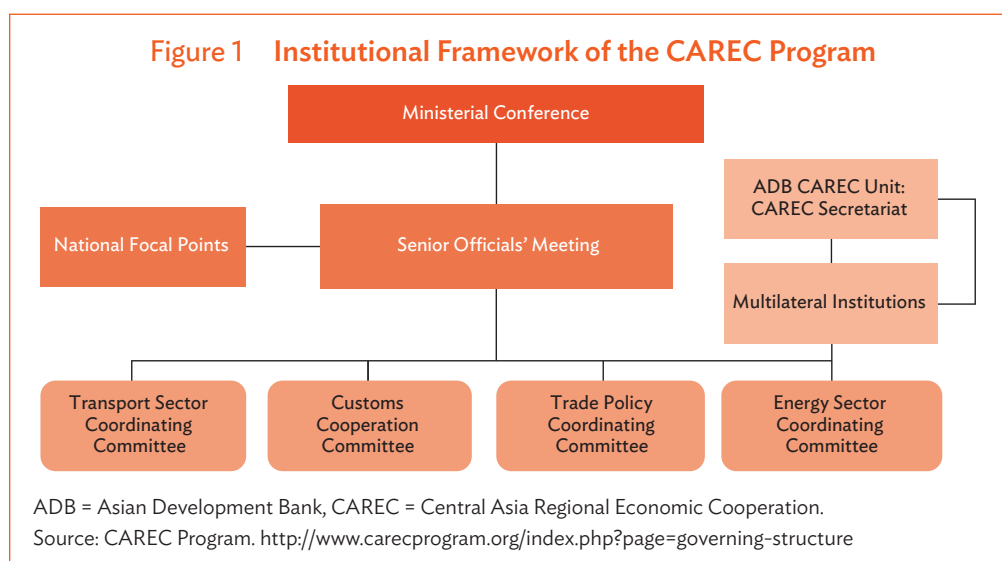
The CAREC Program's operations and results-based initiatives are guided by its long-term vision and strategy. These are embodied in the Strategic Framework for the Central Asia Regional Economic Cooperation Program 2011–2020 (CAREC 2020), which foresees the realization of the CAREC objectives (expansion of trade and improved competitiveness) through stronger coordination and cooperation among CAREC member countries. Priority investments and technical assistance requirements are geared toward providing support in the priority areas of transport, trade facilitation, energy, and trade policy, to maximize economic benefits and opportunities.

Institutional Structure

Each year, within the CAREC Program's institutional framework, there are Senior Officials' Meetings (SOMs) and a Ministerial Conference, where key policy and strategic decisions

on regional cooperation initiatives, as well as decisions pertaining to the progress and future directions of the CAREC Program itself, are discussed and agreed on. ADB serves as the CAREC Secretariat.

The CAREC Program has three coordinating committees and one cooperation committee. Each of them includes country and multilateral-institution representatives, and concentrates on issues and activities relating to a particular sector (transport, trade facilitation, trade policy, or energy). In addition, each CAREC member country appoints a senior government official to serve as national focal point, fostering effective coordination among the stakeholders, as well as sector focal points who participate in committee deliberations. Figure 1 shows the governing structure of the CAREC Program.



CAREC's Comprehensive Action Plan

The CAREC member countries are rich in natural resources, and are at the junction on some of the world's leading economies. The Comprehensive Action Plan developed in 2006 provides a strategic framework for regional cooperation in the four priority areas of energy, trade policy, transport, and trade facilitation. The intent is to transform Central Asia into a region of land-linked countries along a renewed Silk Road between Europe and Asia that gives local businesses easier access to regional and global markets. Figure 2 shows this regional economic cooperation arrangement, which is supported by six multilateral institutions: ADB, the European Bank for Reconstruction and Development, IDB, the International Monetary Fund, the United Nations Development Programme, and the World Bank.

The CAREC Institute

Since it started, the CAREC Institute has been a virtual entity, without a physical headquarters. Recognizing that a more physical presence could strengthen coordination and cooperation, the CAREC member countries agreed in October 2013 to replace the virtual entity with a permanent structure, based in Urumqi, PRC. The CAREC Institute is thus expected to support more effectively the knowledge-sharing and capacity-building pillar of the Comprehensive Action Plan. The institute will organize, generate, deliver, and disseminate knowledge that can be readily applied and shared among the member countries. To achieve the goals of CAREC 2020, the CAREC Institute has developed a strategic knowledge-sharing and capacity-building framework.

The three key components of this strategic framework are:

- knowledge generation, which entails research into pertinent economic cooperation issues that are of national, regional, and sectoral importance;
- knowledge services, which involve knowledge sharing through capacity building; and
- knowledge management, or the development and dissemination of knowledge products.

Using this three-pronged method, the CAREC Institute will work to ensure that the CAREC Program is more effective, sustainable, and visible by integrating knowledge and adopting a performance-oriented approach. The institute will also provide training to all CAREC partners, to build capacity and share knowledge.

The CAREC Transport and Trade Facilitation Strategy

Recognizing the pivotal roles of trade facilitation and transport connectivity in the economic growth of the region, the CAREC member countries cooperated in the development of the Transport and Trade Facilitation Strategy (TTFS) in 2007, to be applied in 2008–2017. The TTFS had an integrated approach that centered on the development of six priority CAREC corridors through transport infrastructure investments and trade facilitation initiatives. It supported the CAREC Program's goal of development through regional cooperation and integration, improve the movement of goods through these corridors, across the region, and to world markets.

The TTFS mandated the monitoring and periodic measurement of the performance of the six priority transport corridors

- identify the causes of delays and unnecessary costs along the links and nodes of each CAREC corridor, including BCPs and intermediate stops;
- help authorities determine how to address the identified bottlenecks; and
- assess the impact of regional cooperation initiatives.

In 2012–2013, a midterm review of the TTFS sought to optimize its implementation over 2014–2020, and to streamline the strategy to reflect recent developments, such as the

accession of Pakistan and Turkmenistan to the CAREC Program. After the midterm review and considering its results, the CAREC Program approved a refined version of the strategy, TTFS 2020, along with the associated Implementation Action Plan. The TTFS 2020 confirms the status of priority projects in the pipeline, but redefines corridor alignments on the basis of updated projections of traffic and trade flows. It highlights the importance of strengthening trade facilitation efforts and integrating physical infrastructure, and of expanding the involvement of the private sector, particularly in multimodal transport and logistics development.

The CAREC Corridors

The CAREC Program has identified six priority corridors and supports their development into economic corridors through greater economic cooperation and stronger trade integration (Box 1). The corridors are intended to reinforce links among countries in the region, with neighboring regions whose booming economies offer unique opportunities for further growth, and with global markets. These corridors were carefully chosen on the basis of the following criteria:

- current traffic volume;
- projected traffic growth and economic potential;
- future capacity to link economic and population hubs;
- future potential to reduce transport delays;
- economic and financial sustainability through investment in infrastructure, technology, and management; and
- multimodal aspects (road and rail when possible; road only, if rail is not available).

Box 1 The CAREC Corridors

Corridor 1:	Europe–East Asia (Kazakhstan, the Kyrgyz Republic, and XUAR)
Corridor 2:	Mediterranean–East Asia (Afghanistan, Azerbaijan, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan, and XUAR)
Corridor 3:	Russian Federation–Middle East and South Asia (Afghanistan, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan)
Corridor 4:	Russian Federation–East Asia (IMAR, Mongolia, and XUAR)
Corridor 5:	East Asia–Middle East and South Asia (Afghanistan, the Kyrgyz Republic, Pakistan, Tajikistan, and XUAR)
Corridor 6:	Europe–Middle East and South Asia (Afghanistan, Kazakhstan, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan)

IMAR = Inner Mongolia Autonomous Region; XUAR = Xinjiang Uygur Autonomous Region. Both are regions of the People's Republic of China.

Source: ADB. 2014. *CAREC Transport and Trade Facilitation Strategy 2020*. Manila.

As these corridors by definition cross at least two countries, their development is considered a “tier-one” activity in support of transport connectivity, making it a top priority for strengthening connectivity between member countries, and thus for increasing regional competitiveness and cross-border trade. Economic development of any one country is not the aim of corridor development, but can be a by-product of the improvement of a transport or economic corridor.

The TTFS 2020 also introduced selected corridor extensions, mainly to achieve the following:

- develop connectivity with seaports within and outside the CAREC region;
- introduce alternative routes to shorten travel time along existing corridors;
- develop missing links to increase geographic coverage and interconnectivity between corridors; and
- develop designated rail corridors to realize the comparative advantage of rail transport for long-distance and bulk transport (Yang 2013).

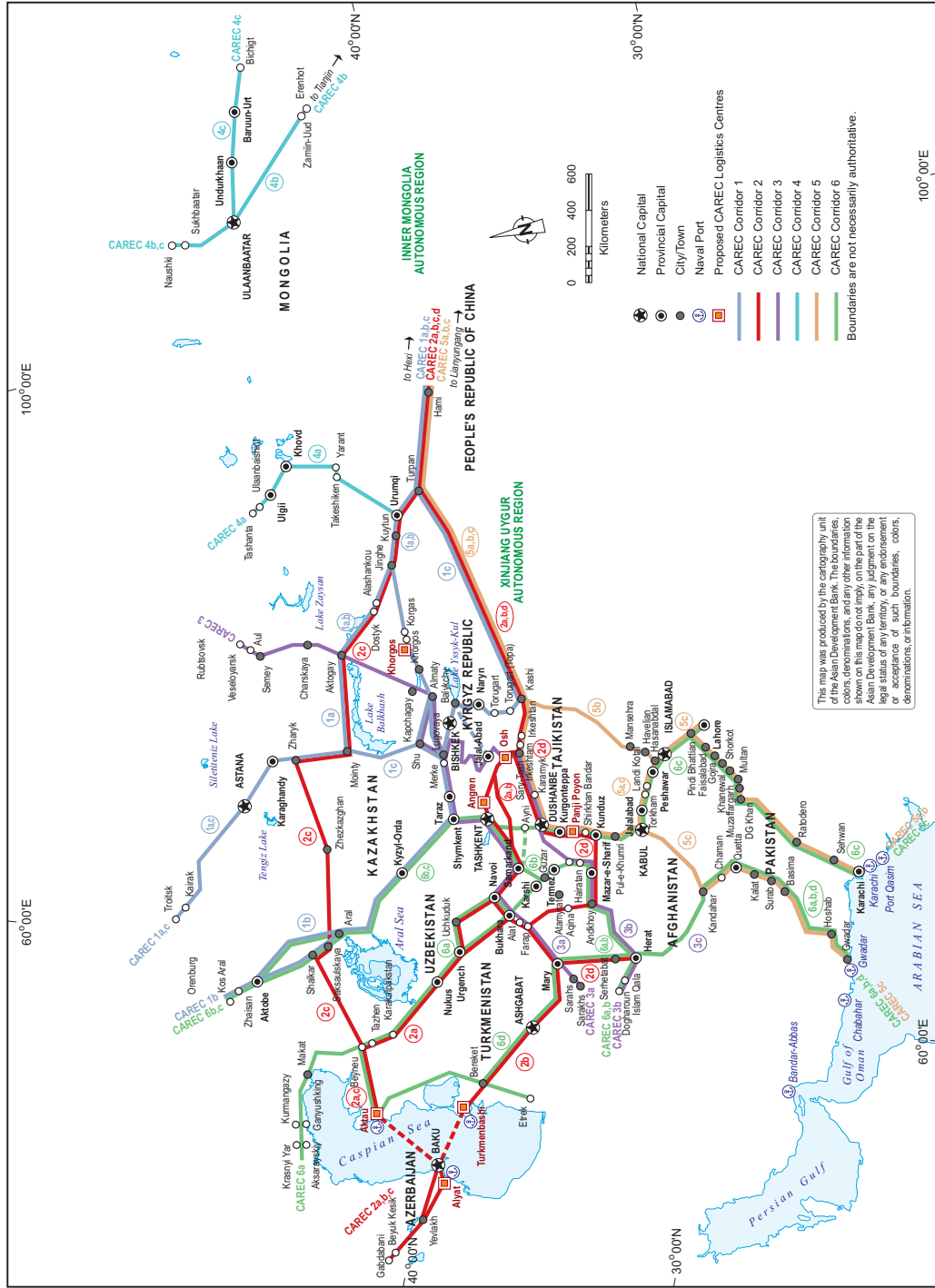
Figure 2 is a map of the six CAREC corridors, including the corridor extensions.

As shown in Table 1, the choice of the six CAREC corridors depended heavily on current traffic volumes and on projected rates of trade growth. With their very wide network of roads and railways spanning the region, the CAREC corridors are foreseen to expand trade and accelerate regional economic growth. Data from the national governments in the region, and site visits, brought out the traffic density along each corridor (Figure 3).

Estimates of road traffic density are based on measurements of average daily traffic—the number of vehicles passing through a selected point in a given year, divided by 365 days. The results give rise to the following observations:

- Heavy traffic from the Xinjiang Uygur Autonomous Region (XUAR) to Kazakhstan and to the Kyrgyz Republic suggests that traffic along corridor 1 is heavy. Further examination reveals that much of the traffic passes through the Khorgos (PRC)–Khorgos (Kazakhstan) BCP, on subcorridor 1b, and through the Torugart (PRC)–Torugart (Kyrgyz Republic) BCP, on subcorridor 1c. The highway linking Bishkek to Astana (subcorridor 1c) is also heavily traveled.
- There is heavy traffic from Azerbaijan to Europe, implying that corridor 2 could become a gateway for goods shipments from Central Asia to Europe. Although (Caspian Sea) ferry density seems relatively low compared with road, findings suggest there is significant vehicle movement from Baku to Georgia and to points west.
- There is substantial traffic between Bishkek and Tashkent (subcorridor 3a), with the segment in Uzbekistan the most heavily traveled road section of corridors 2, 3, 5, and 6. The Uzbek section links the fertile region of Kokand with a key transport hub in Navoi and with major Uzbek cities such as Tashkent, Samarkand, and Bukhara. The BCPs along this stretch are Konysbaeva (Kazakhstan)–Yallama (Uzbekistan) in the east and Farap (Turkmenistan)–Alat (Uzbekistan) in the west. This suggests that, if regional trade increases, subcorridor 3a (as well as 1b) may attract increased traffic volumes.

Figure 2 The CAREC Corridors



cars 13-2196 HR

CAREC = Central Asia Regional Economic Cooperation.
 Source: ADB, 2014. CAREC Transport and Trade Facilitation Strategy 2020. Manila.

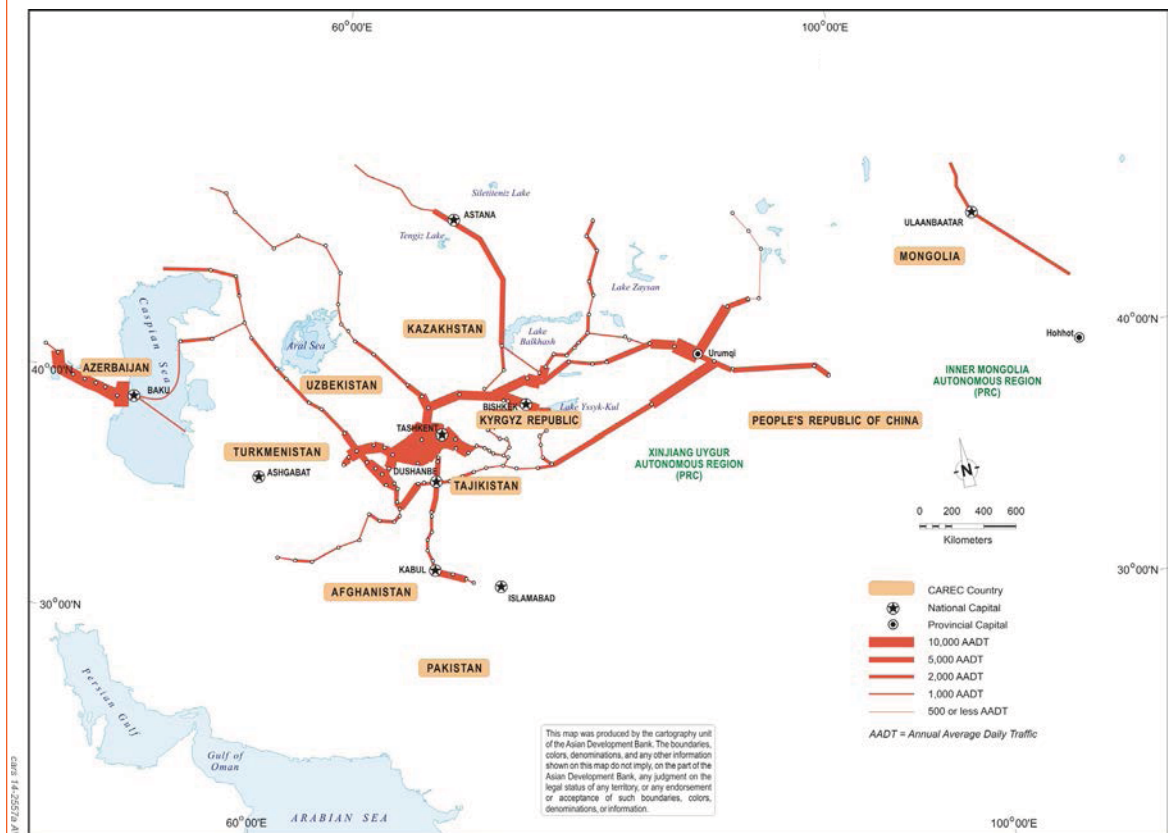
Table 1 Economic Corridor Development Potential of the CAREC Corridors

Corridors/Countries	Current Traffic Volume	Economic and Traffic Growth Prospects	Capacity to Increase Connectivity between Economic and Population Centers	Potential to Mitigate Delays and Other Hindrances	Economic and Financial Sustainability of Investments in Corridor Improvement
CAREC Corridor 1 Europe–East Asia (Kazakhstan, the Kyrgyz Republic, and XUAR)	This is the most active corridor for CAREC export, import, and transit traffic by both road and rail.	Economic growth prospects remain very good because of the high growth in trade between Europe and the PRC, and the completion of the new rail connection via Khorgos.	Corridors 1b and 1c are near large populations, and have economic connectivity potential, as they pass through Astana and Almaty (1b), and Bishkek and Kashi (1c).	The new Khorgos rail line will resolve capacity problems. The line passes through few border crossings, and delays are therefore less likely.	There are good prospects for investment along this corridor. EDI is already being used to a limited extent, and logistics centers already exist or are being formed.
CAREC Corridor 2 Mediterranean–East Asia (Afghanistan, Azerbaijan, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan, and XUAR)	This is a TRACECA corridor, with significant volumes of Central Asia exports and imports.	Trade prospects along the corridor are very good. The transport pattern is currently dominated by oil products, but that will change over time with the construction of new pipelines.	This corridor offers strong connectivity to both economic and population centers throughout Central Asia.	This corridor has strong intermodal transport potential (Black and Caspian seas; road and rail elsewhere in the Kyrgyz Republic), but scores only average on this criterion because of its many BCPs.	The prospects for establishing logistics centers along this corridor are good, but the fact that the corridor traverses several countries may be a limiting factor.
CAREC Corridor 3 Russian Federation–Middle East and South Asia (Afghanistan, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan)	There is only limited transit volume between Russia and Bandar Abbas, and between Iran and Bandar Abbas, through the CAREC region.	Prospects are good for the export of timber, minerals, and metals from Russia and Kazakhstan, with general goods coming from the Persian Gulf.	There is good connectivity to population and economic centers, and between northern forest and mining areas and the oil-producing Persian Gulf.	Because of the numerous border crossings, and changes in railway gauges, this corridor scores low on this criterion.	This is a railway corridor that should make use of block trains, but the fact that it traverses many countries may be a limiting factor.
CAREC Corridor 4 Russian Federation–East Asia (IMAR, Mongolia, and XUAR)	Western corridor (4a) traffic is low. Eastern corridor traffic (4b), both rail and road, is high.	When the western road expansion between the PRC and Russia is completed, traffic on corridor 4a will grow. Corridor 4b traffic will also grow now that the Choir–Zamiin–Uud road project has been completed.	There is little population connectivity, but some good connectivity to economic centers on 4a, and economic and population connectivity on 4b.	The prospects for the mitigation of delays along this corridor are very good.	There are good possibilities for technology improvements, e.g., the introduction of EDI.
CAREC Corridor 5 East Asia–Middle East and South Asia (Afghanistan, the Kyrgyz Republic, Pakistan, Tajikistan, and XUAR)	Traffic varies along stretches but remains low in the Kyrgyz Republic and Tajikistan except between Kabul and Peshawar.	There are substantial prospects for the PRC–Pakistan trade via this corridor, which is an alternative to the Karakoram Highway.	There is potential for increased economic exchange between the PRC and Pakistan.	This is a typical intermodal corridor. Because of the many border crossings, the corridor scores low on this criterion.	The situation in Afghanistan and the inefficiency of the Pakistani railway system may limit the prospects for improvement.
CAREC Corridor 6 Europe–Middle East and South Asia (Afghanistan, Kazakhstan, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan)	Rail traffic is relatively high on the Uzbek and Kazakh sections and at the Afghan–Pakistani border.	This corridor could compete with the all-sea route, especially for some countries between the two ends, because it offers hinterland connections between landlocked CAREC countries.	There is potential for increased economic exchange between northern Europe and the Gulf region.	Because of the many border crossings and railway gauge changes, the corridor scores low on this criterion.	The situation in Afghanistan and the inefficiency of the Pakistani railway system may limit the prospects for improvement.

CAREC = Central Asia Regional Economic Cooperation, PRC = People's Republic of China, EDI = electronic data interchange, IMAR = Inner Mongolia Autonomous Region (PRC), TRACECA = Transport Corridor Europe–Caucasus–Asia, XUAR = Xinjiang Uygur Autonomous Region (PRC).

Source: TERA International Group.

Figure 3 Road Traffic Density along CAREC Corridors



AADT = annual average daily traffic, CAREC = Central Asia Regional Economic Cooperation.

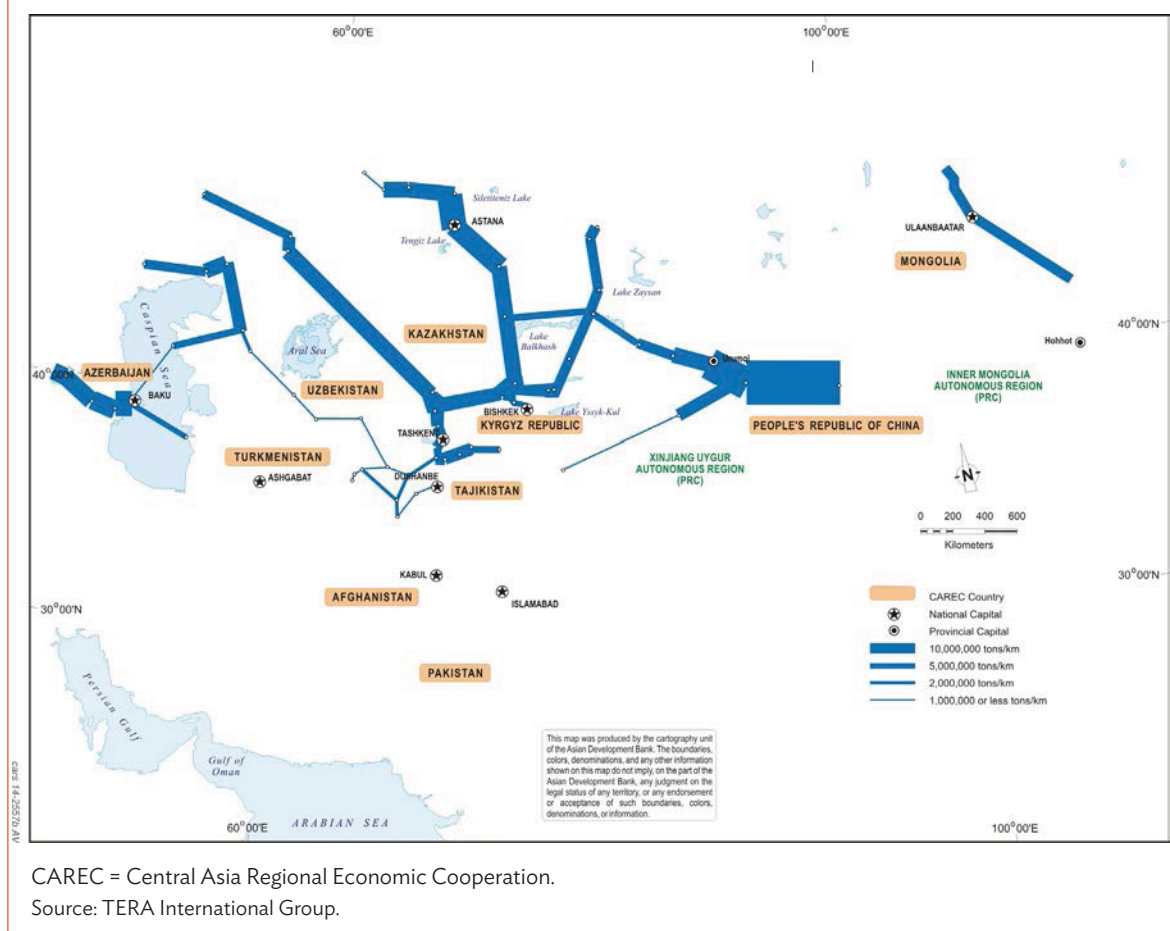
Source: TERA International Group.

- Corridor 5 faces considerable challenges, including terrain, climate, and elevation. Although it may grow in importance, as there is some traffic between Afghanistan and Pakistan through the border crossing at Peshawar (Pakistan)–Torkham (Afghanistan), a military drawdown in the region is likely to reduce traffic volumes. Traffic may increase once security improves and stabilizes, cross-border transport agreements are concluded and implemented, and key BCPs, such as Karamyk, are made accessible to vehicles from all CAREC countries.

Rail traffic density is estimated on the basis of gross tonnage (Figure 4). The total tonnage of goods that pass through the selected points is recorded and compared. Since railways are typically used to carry bulk cargo, tonnage, rather than the number of rail wagons, is a better indicator of traffic density. The key observations based on the findings, are:

- The highest rail traffic density is found in the Chinese railways in the XUAR. Previous studies that reported the problem of unbalanced cargo volume (low tonnage, high unit value) moving from east to west, versus west to east, could indicate that much of the tonnage comes from the movement of raw materials and commodities (such

Figure 4 Rail Traffic Density along CAREC Corridors



as minerals) from Urumqi to cities farther inland. The Alashankou (PRC)–Dostyk (Kazakhstan) BCP, on subcorridor 1a, experiences the highest traffic among the BCPs in the six corridors.

- Rail traffic density within Kazakhstan is very high along corridors 1 and 3. As regional transport is the focus of CPMM, domestic traffic is not a major factor in this report. Still, the high densities shown suggest that corridor 1 will be an important subject of study concerning rail traffic in Central Asia.
- Before 2010, corridor 2 showed signs of heavy rail traffic, but only over a short distance between Tajikistan and Uzbekistan. A major challenge here is the fact that trains must cross two pairs of BCPs: Kokand (Uzbekistan)–Kanibadam (Tajikistan) and Spitamén (Tajikistan)–Bekabad (Uzbekistan). Transit traffic through Tajikistan dropped significantly in 2010, when Uzbekistan launched its transloading center in Angren, and it may well cease altogether when Uzbekistan completes the Angren–Pap railway. There is substantial rail traffic at the western end of corridor 2, between Azerbaijan and the rest of the South Caucasus and Europe. Kazakhstan’s KazTransOil,

a subsidiary of KazMunaiGaz, owns and operates a terminal in Georgia's Batumi seaport. It acquired the terminal to diversify Kazakhstan's oil-export options. Corridor 2 serves the traffic to Georgia by way of the Caspian Sea and the South Caucasus.

- Unlike roads, railways are a key mode of bulk transport in international trade. This explains the significant rail traffic density along corridor 4, which links Nauskhi (Russian Federation)–Sukhbaatar (Mongolia), in the north, and Zamiin-Uud (Mongolia)–Erenhot (PRC), in the south.
- There is a respectable volume of rail traffic in parts of subcorridors 2a and 6a. These two sections are in western Kazakhstan, where traffic volumes may relate to the transport activities of the energy sector.

Appendix 1 contains profiles of the six CAREC corridors, with more information, including maps showing each corridor's network of subcorridors.

Chapter Summary

This chapter presented an overview of the two ADB strategic initiatives, TTFS and TTFS 2020, and described their roles in transport and economic corridor development in the region. It identified the CAREC Institute as the driver of capacity building and knowledge transfer. The chapter also brought out the peculiarities of each corridor in terms of its dominant modes of transport (road and rail), traffic volume and density, commonly traded goods, and potential for economic and financial sustainability. However, the corridors' collective (or individual) impact on the region can be assessed only through continual measurement of the performance of the CAREC corridors. To facilitate trade and transport, bottlenecks and impediments along the corridors must be clearly identified.

The next section is an in-depth discussion of the CPMM methodology, which uses a strong process-based approach to gauge logistics quality and institutional openness (particularly at BCPs along the CAREC corridors). It explains in detail how the methodology can help to improve international and regional trade flows by strengthening operating efficiency and bottleneck management along the six CAREC corridors.

3

Corridor Performance Measurement and Monitoring Methodology

Monitoring Corridor Performance: Key Challenges in the CAREC Region

The unavailability of objective time series data to illustrate the changes in border crossing times and other transport and transit measures over time has been a major gap in evaluating trade facilitation interventions. In the past, the impact of interventions (e.g., development projects) was typically measured before and after a shock to a system had been introduced. However, this produced only ad hoc snapshots of BCP and corridor performance, and could not provide an adequate representation for a region as big as Central Asia. This is especially true given the region's unique set of characteristics and challenges.

Landlocked Countries

Most CAREC economies are landlocked.² Without access to a seaport, landlocked countries are severely disadvantaged, as more than 80% of international shipments are made via maritime transport. Landlocked countries need a level playing field, but they must depend on their transit neighbors to provide better access to world markets (Hagen 2003). In addition, Central Asia has a difficult topography, which complicates the transport links between CAREC countries and other parts of the world.

Dominance of Land Transport

The fact that most CAREC countries are landlocked increases the importance of reliable land and air transport, but the reliability of these modes of transport is subject to periodic inclement weather. At the same time, different patterns are observed in different countries. For countries with large geographic areas such as the PRC, Kazakhstan, Mongolia, Turkmenistan, and Uzbekistan, railways provide indispensable links, especially for goods in transit. For smaller, mountainous countries like the Kyrgyz Republic and Tajikistan, road transport is paramount. As many of these countries export large, bulky, and low-value-density commodities, air transport accounts for a low percentage of total tonnage sent. Any methodology used for the CAREC region has to acknowledge that road and rail are the main modes of transportation.

² These include the participating autonomous regions of the PRC: the Inner Mongolia Autonomous Region (IMAR) and the Xinjiang Uygur Autonomous Region (XUAR). Uzbekistan is doubly landlocked (surrounded by landlocked countries). Only Pakistan has direct access to the sea.

High Unofficial Payments

Unofficial payments are reportedly prevalent in Central Asia. However, the sensitive nature of this topic and the lack of consistent and reliable methods for capturing such information, apart from anecdotal reports from drivers based on individual incidents and personal experience make it difficult to gauge the extent of the problem. The challenge for the CAREC Program is to eliminate these illicit payments by identifying and punishing the perpetrators.

Inefficient and Restricted-Access Border Crossings

A key problem in the CAREC region is the high costs (both in time and money) associated with border crossings. The costs are not due to BCP inefficiency alone, but are also with a result of the “bilateral”³ classification of some BCPs and the indefinite closure of others, forcing vehicles to travel much greater distances to cross borders, possibly at more inefficient BCPs. Seasonality also leads to periodic closures of remote BCPs. These closures constitute nontariff trade barriers, adding costs and lowering the overall trade and investment potential of CAREC countries. Studies done by international organizations have consistently ranked the CAREC region low on border-crossing and logistic performance because of the extraordinarily long time it takes to cross borders. Thus, any new methodology for studying the transport situation in the CAREC region must identify the causes, characteristics, and length of delays at border crossings.

To realize the objectives set for the six CAREC corridors in the TTFS and TTFS 2020, corridor performance must be monitored and measured consistently and accurately. The findings will enable policy makers to understand the performance of each corridor and the underlying factors. Objective measurements will indicate bottlenecks and the ways of mitigating or eliminating them. Decision makers will also have the information they need to prioritize investment proposals and maximize returns. Possible courses of action include investing in infrastructure (particularly at busier BCPs), improving transport operations, and strengthening border management regulations and procedures. Freight forwarders can use this information to explore alternative routes that offer faster and more reliable transit.

These data, though resource intensive and expensive, will provide an accurate and evidence-based foundation for policies aimed at resolving delays at BCPs and making transport operations there more cost effective. Continuous monitoring will also establish an evidence-based regional platform that ADB and the region’s policy makers can use.

With all this, further analysis could be done over time to compare corridor performance on transit trade movements. Such analysis could be used either to monitor the performance of a corridor over a specific period for seasonality and trends, or to review the effectiveness of projects implemented to improve corridor performance.

³ A bilateral BCP on the border between two countries bans transit traffic and prohibits access to vehicles from a third country.

The performance of different corridors or different stretches of a busy corridor could also be compared to provide useful benchmarking references, guide the setting of investment priorities across projects, and extend the conclusions to corridors with similar historical challenges.

Developing a Methodology for the CAREC Program

The challenges described in the previous section establish the need for a methodology that addresses the specific problems of the CAREC countries. In 2008, ADB and a team of international consultants began deliberating the development of such a methodology. Various existing tools for measuring and monitoring corridor performance were carefully considered for the CAREC Program. Appendix 2 presents some of the more popular international measurement and monitoring methodologies—such as the time release study (TRS), the New Eurasian Land Transport Initiative (NELTI), and the TRACECA⁴ Route Attractiveness Index (TRAX)—and highlights the efforts of the international agencies that developed them.

After the different methodologies were compared, the time/cost–distance (TCD) approach, developed by UNESCAP was viewed most favorably, as it is a simple-to-use tool that offers an excellent visual display of speeds and costs along selected routes, and thereby zeroing on bottlenecks. The TCD methodology can also provide a high level of directly interpretable data (especially for road and rail) on an expansive region like Central Asia, which relies on overland transport.

A consultant hired for the CAREC Program attended a UNESCAP workshop on TCD in November 2008, and then developed a version of the methodology for application to the CAREC region. At the same time, a team of consultants visited each CAREC member country to identify the leading organizations in transport and logistics. Meetings were held with private sector transport and forwarding organizations and national associations to find potential partners that could help implement the methodology, particularly the regular monitoring and the collection of critical data. The first meeting in Guangzhou, PRC, in February 2009, included representatives from the prospective partner organizations. The team later named the CAREC Program’s new TCD-based methodology “corridor performance measurement and monitoring” (CPMM), and selected participating national associations to be CPMM partners. Table 2 records the major milestones in the evolution of CPMM.

The CPMM methodology had a three-phase evolution: CPMM 1.0, 2.0, and 3.0. These phases are described in Figure 5.

⁴ TRACECA = Transport Corridor Europe–Caucasus–Asia.

Box 2 Time/Cost–Distance Methodology

The time/cost–distance (TCD) methodology developed by the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) draws attention to the time and costs involved in transportation and analyzes transport inefficiency and bottlenecks. It lays out the cost and time components of the door-to-door movements of a vehicle on a transport corridor, and tracks delays at borders and other inspection points along the corridor.

Methodology. The minimum amount of information needed is the route from origin to destination, including border crossings, the mode of transport for each leg of the trip, the distance traveled, and the travel time and cost of each leg or mode of transport. TCD data are typically collected through brief telephone interviews with either a freight forwarder or a transport operator engaged in such transit activities. In CAREC corridor performance measurement and monitoring (CPMM), however, the data are collected by the drivers themselves, so that delays for each sample shipment are measured with greater accuracy.

Benefits. The UNESCAP TCD methodology is easy to use because it (i) provides a visual snapshot of the situation; (ii) tracks changes over time; (iii) allows comparison of alternative routes; (iv) is easily understood by all, including policy makers and transport operators; (v) serves as a powerful instrument for international cooperation; and (vi) easily supplements other existing BCP comparisons using cost or time ratios, including those concerning modal transfers. The TCD template could be modified to include the impact of emissions and the prevalence of accidents experienced or observed.

Limitations. The structure of the TCD methodology limits its measurement of trade and transport facilitation to time and cost factors only. However, it must consider other factors, such as the reliability of a transit corridor; the consistency, frequency, and quality of service; competition among service providers; the directional balance of freight volumes (incidence of empty returns); the predictability of costs; informal controls and checkpoints; and transport safety and security. During the pilot phase of CPMM, some of these dimensions were observed and incorporated into the CPMM questionnaire to provide additional input and perspectives for policy making.

The methodology can also furnish more details, such as the contributory cost and time associated with border crossings, which may be particularly helpful to policy makers by focusing their attention on the most critical issues. Similarly, the inclusion of data on inventory costs for particular commodities, demurrage charges, and other indirect costs may be useful in evaluating the logistic performance of specific export and import industries. Other tools may need to be developed, however, to capture safety and security data.

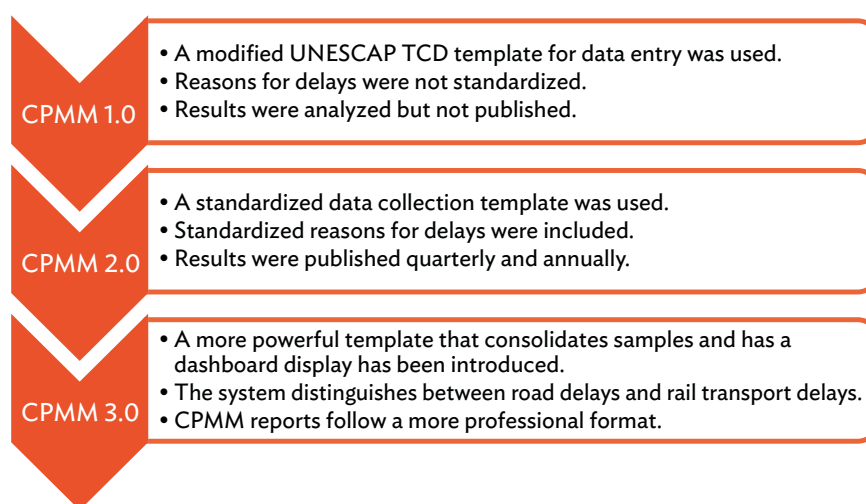
Table 2 Key Events in the Development of CPMM

Date	Meetings/Country	Objectives
November 2008	UNESCAP TCD Workshop, in Bangkok, Thailand	To understand the TCD methodology and consider how it could be adapted by the CAREC Program
February 2009	First CPMM Meeting, in Guangzhou, PRC	To acquaint all potential CPMM partners with ADB and with the CAREC Program, and introduce them to CPMM
October 2009	CPMM 1.0 Workshop, in Seoul, Republic of Korea	To review the trial data and identify areas in need of improvement, and to standardize data collection
March 2010	Inaugural CFCFA/CPMM Workshop, in Almaty, Kazakhstan, and visit to Khorgos	To launch the CFCFA formally; discuss refinements in the CPMM; and conduct a field trip to Khorgos, during which the delegates visited the Kazakhstan and the PRC sides of the border
July 2010	CPMM 2.0 Workshop, in Urumqi, PRC	To review the application of a new data collection template and the common errors made, and to share the key findings from the CPMM annual and quarterly reports
March 2011	CPMM 3.0 Workshop, in Chongqing, PRC	To train CPMM partners in the latest version of the data collection template, which summarizes results automatically
August 2011	Review of CPMM Findings, in Issyk-Kul, Kyrgyz Republic	To identify the key findings of CPMM and introduce the interactive charts on the CFCFA website (www.cfca.net)
March 2013	CPMM International Workshop, in Almaty, Kazakhstan	To share the CPMM methodology and findings, and discuss how the private and public sectors could benefit from CPMM and how CPMM could be improved to suit their needs

ADB = Asian Development Bank, CAREC = Central Asia Regional Economic Cooperation, CFCFA = CAREC Federation of Carrier and Forwarder Associations, PRC = People's Republic of China, CPMM = corridor performance measurement and monitoring, TCD = time/cost–distance, UNESCAP = United Nations Economic and Social Commission for Asia and the Pacific.

Source: CAREC Program. <http://www.carecprogram.org/index.php?page=events>

Figure 5 The Evolution of CPMM



CPMM = corridor performance measurement and monitoring, TCD = time/cost–distance, UNESCAP = United Nations Economic and Social Commission for Asia and the Pacific.

Source: Authors.

The CPMM methodology continues to change and adapt on the basis of feedback from CPMM partners and various stakeholders, so that the data will more closely resemble reality and data collection and analysis will be more productive. The current version, CPMM 3.0, has reached a maturity, and is rather comprehensive in addressing the needs of the CAREC economies.

Trade Facilitation Indicators

UNESCAP's TCD methodology offers an extensive picture of the time and cost dimensions of transport and trade facilitation, particularly with regard to border crossings and other impediments along a transit corridor. Aside from time and cost, derived measures such as speed can be used to assess traffic density and road quality. With these factors, several measures and indicators can be developed for the monitoring of border crossing and customs service efficiency, as well as road and rail infrastructure performance along corridors. When the corridors are monitored regularly, policy makers can easily pinpoint areas that need improvement and financial investment.

ADB tracks the performance of the CAREC Program through the Development Effectiveness Review (DEfR), a process using a detailed set of indicators and targets within a results framework, as well as a management tool that helps ADB to communicate with stakeholders in a factual and transparent manner. The results framework of the CAREC program has three sets of indicators for evaluating progress in all components of the program toward the objectives laid out in the Central Asia Regional Economic Cooperation Program 2011–2020 (CAREC 2020).⁵ The second set of indicators (level 2) tracks the output of projects and activities under the CAREC Program, and examines whether those projects and activities have been effective in implementing the sector strategies and action plans. For transport, the indicators are rather straightforward: the length of roads completed, for instance. However, TFIs are less easy to quantify because they depend on a variety of factors such as (i) the quality and availability of physical infrastructure, (ii) national policies and regulations for transit and trade, (iii) border crossing procedures, and (iv) the degree of harmonization among countries. A great deal of effort has been made to develop four key TFIs through CPMM studies. With data from TCD-format questionnaires, the following four TFIs are being monitored and reported regularly to allow improvements in the CAREC corridors to be assessed.

- **TFI1: Time taken to clear a BCP.** This TFI refers to the average length of time (hours) it takes to move cargo across a border from the exit point of one country to the entry point of another. The entry and exit points are typically primary control centers where customs, immigration, and quarantine are handled. Along with the standard clearance formalities, this measurement includes waiting time, unloading or loading time, and time taken to change rail gauges, among other indicators. The intent is to capture both the complexity and the inefficiencies inherent in the border crossing process.

⁵ The three sets of indicators of the CAREC results framework are: CAREC countries' development outcomes (level 1), CAREC priority sector outputs (level 2), and operational and organizational effectiveness (level 3).

- **TFI2: Costs incurred at a BCP.** This is the average total cost, in US dollars (\$), of moving cargo across a border from the exit point of one country to the entry point of another. Both official and unofficial payments are included. This indicator assumes 20 tons of cargo, so that the average costs across various samples are comparable.
- **TFI3: Costs incurred while traveling along a corridor section.** This is the average total costs, in US dollars (\$), incurred for a unit of cargo traveling along a corridor section within a country or across borders. A “unit of cargo” refers to a cargo truck or train with 20 tons of goods. A “corridor section” is defined as a stretch of road 500 kilometers (km) long. Both official and unofficial payments are included.
- **TFI4: Speed of travel along a corridor section.** This is the average speed, in kilometers per hour (kph), at which a unit of cargo travels along a corridor section within a country or across borders. Again, a “unit of cargo” refers to a cargo truck or train with 20 tons of goods, and a “corridor section” refers to a stretch of road 500 km long. Speed is calculated by dividing the total distance traveled by the duration of travel. Distance and time measurements include border crossings.

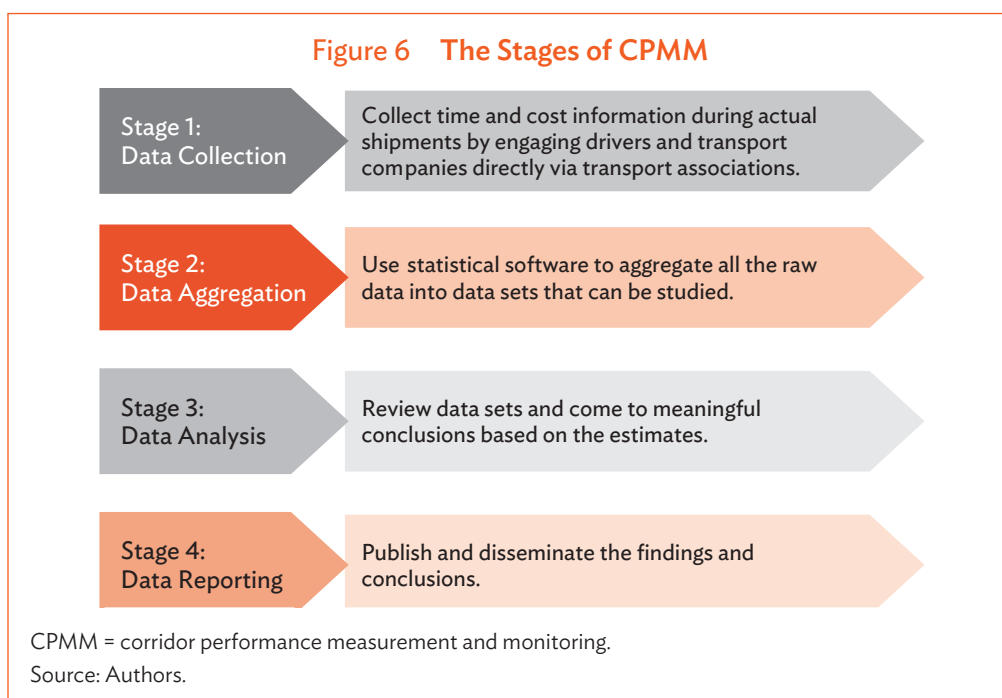
CPMM uses two measures of speed: speed without delay (SWOD) and speed with delay (SWD). SWOD is the ratio of the distance traveled to the time spent by a vehicle in motion between origin and destination (actual traveling time). SWD is the ratio of distance traveled to the total time spent on the journey, including the time the vehicle was in motion and the time it was stationary. In CPMM, all activities that delay transit (customs clearance, inspections, loading and unloading, and police checkpoints, among others) are recorded by drivers. SWOD represents a measure of the condition of physical infrastructure (such as road and railways), while SWD is an indicator of the efficiency of BCPs along the corridors. Appendix 3 explains in detail the statistical derivation of the TFIs.

The CPMM Methodology

The current CPMM methodology is a result of modifications in the original UNESCAP TCD that have optimized its ability to measure and monitor effectively the border crossing and corridor performance of CAREC corridors over time. The methodology has been refined and expanded to encompass more metrics. For instance, CPMM defines a comprehensive list of possible activities pertaining to border clearance inspections and other inspections along the corridors, and seeks to quantify the time delays and costs of each activity. In addition, CPMM includes data collection to gauge the extent of unofficial payments. Other measurement methodologies measure the perceptions of respondents, which could be subjective; CPMM, on the other hand, collects concrete and well-defined data to quantify each indicator. Besides the distance, time, and cost of a shipment, data such as tonnage carried, use of TIR carnets,⁶ and other key details are collected. After data have been collected over a long period, seasonal and cyclical patterns can be traced with the help of time series studies.

⁶ TIR = Transports Internationaux Routiers. The TIR carnet is issued by the Union Internationale des Transports Routiers (International Road Transport Union). http://www.iru.org/en_iru_tir_tircarnet.

CPMM has four distinct stages. Figure 6 presents an overview of the process. Various stakeholders are involved at different times. Transport associations and drivers have a critical role in data collection. Raw data are submitted monthly to international consultants for review. Once verified, the data are then forwarded to ADB for aggregation. This stage also includes data validation to detect inconsistencies. Data sets in the form of tables and charts are then produced. The international consultants and the ADB team work together to analyze the data sets, and conduct drill-downs, and test hypotheses, where applicable. The results are then presented in quarterly and annual reports, which are made available to the public. Each of these stages is discussed further after the next main section.



Stage 1: Data Collection

All CPMM data for road transport come directly from the truck drivers, marked contrast to the methodologies of other international organizations, which gather data from the survey responses of transport company managers or freight forwarders. CPMM relies on the drivers who transport the shipments across borders, and who are therefore the best qualified to describe the transport and border-crossing issues and challenges along the CAREC corridors. For rail data, several collection methods are being tested. A new TCD form that translates road transport terminology into rail transport terminology has been developed. Pilot testing is under way to ensure that detailed data on cross-border rail movements are captured accurately. Appendix 4 details the data collected. Selected CPMM partners have established relationships with freight forwarders responsible for tracking shipments from origin to destination. The rest of this section provides more detailed descriptions of the documents and data elements used in CPMM.

CPMM Data Collection Form

Drivers record data on the DCF. The form has been translated into the local languages. Most drivers in Azerbaijan, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Uzbekistan understand Russian in addition to their native languages. In Afghanistan and Pakistan, however, while some drivers understand English, most are more proficient in Dari, Pashto, or Urdu. Mongolian drivers typically use Mongolian, while some might know Russian. The form is simple, user friendly, and quick to complete. It consists of one to three pages.

ADB commissions the national transport associations to identify, qualify, and select reputable transport companies that have reliable drivers, and that ship cargoes within and outside the CAREC region, to fill out the DCFs. ADB works with these transport associations to develop and fine-tune the DCF (a sample is shown in Figure 7). Every form has a control number that allows the CPMM coordinator to identify the driver who recorded the data and to follow up on or verify information, as needed. On this form, several variables and other key transport and border-crossing information are recorded. A complete list of the variables is given in Appendix 3.

TCD Template

This is arguably the most important CPMM document, as it contains all the data from the drivers' handwritten reports that are entered into the database and synthesized. The TCD template has evolved through the three phases of the CPMM's evolution. The current template, version 3.0, contains three key components: (i) an individual worksheet, (ii) a summary worksheet, and (iii) a performance dashboard.

The individual worksheet (Figure 8) allows the CPMM coordinator to enter the drivers' data from the handwritten DCFs they submit.⁷ During this stage, the CPMM coordinator checks and validates the data (e.g., by considering if the distance, time, and cost recorded on a DCF make sense). If there are questions, the CPMM coordinator contacts the driver and makes the necessary corrections in the data. Whenever unexpected incidents disrupt shipments, the CPMM coordinator provides explanatory notes in the text box provided. This information presents a rich context for CPMM studies. For instance, at the end of 2010, a snow avalanche disrupted the normal functioning of the Salang Tunnel, in Afghanistan, severely affecting normal traffic between Puli Khumri and Kabul along corridors 5 and 6c. Abnormal delays and high costs were detected in the DCFs, and later explained after CPMM coordinators verified the data with the drivers.

Previous versions of the CPMM TCD template required partners to submit 20 to 30 individual files, but summarizing all that data proved to be difficult. In CPMM 3.0, each partner association's monthly submission is encoded in a single file (Figure 9) to enable monthly data profiling and summaries, using formulas linking to all the worksheets. As a

⁷ The CPMM coordinator is chosen by the CPMM partner to be the focal point for ADB and the drivers. Usually, this person is a transport specialist who is knowledgeable in road or rail transport and has a good working relationship with the transport companies. The CPMM coordinator should be proficient in basic English.

Figure 7 CPMM Data Collection Form

Please fill out form properly and return to your association upon completion of the trip. Shaded areas are to be filled in by the CPMM Coordinator.

Route	Commodity		Commodity Classification							
	Cargo Weight	Container	TIR?							
STOP No.	STOP 1		STOP 2		STOP 3		STOP 4			
City										
Country										
CAREC Corridor										
Mode of Transport										
Distance from previous stop (km)	0									
Duration of travel (hrs)	0									
Vehicle Operating Cost										
BCP?										
Reason for Stop	1	2	3	4	5	1	2	3	4	5
ROAD/RAIL	hr	min	min	min	hr	hr	min	min	hr	min
Border Security/Control										
Customs (Single Window)										
Customs Control										
Health/Quarantine										
Phytosanitary										
Veterinary Inspection										
Visa/Immigration										
GAI/Traffic Inspection										

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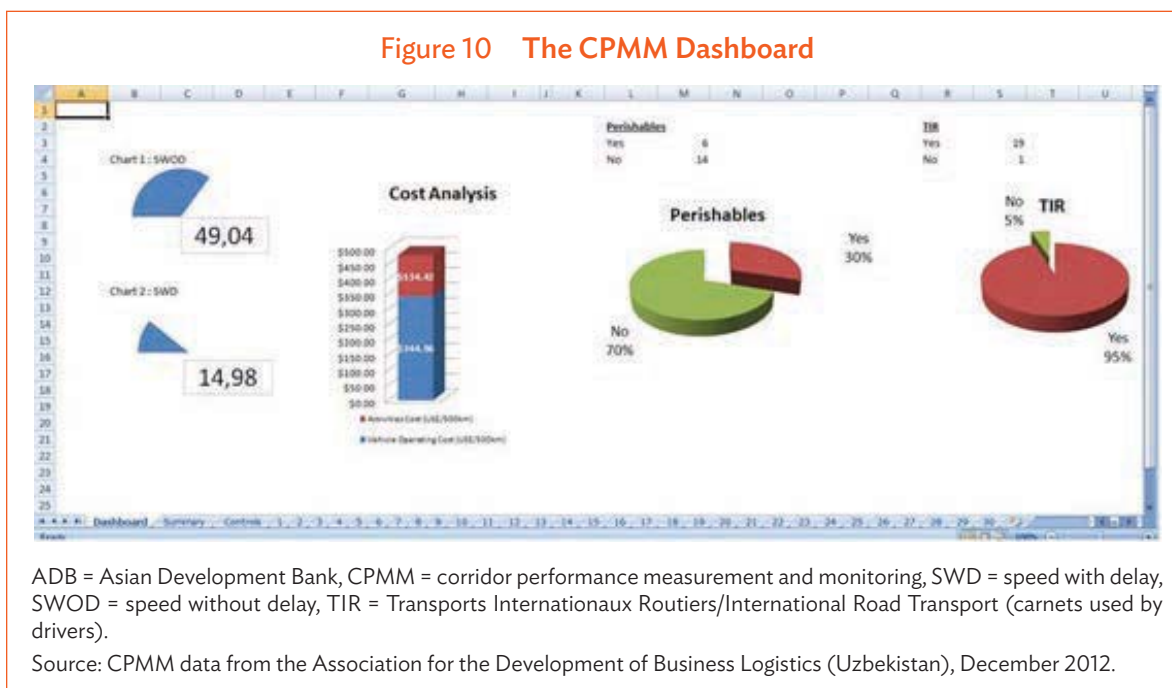
Figure 9 CPMM Time/Cost-Distance Template: Summary Worksheet

	A	B	C	D	E	F	G	H	I	J	K
	FILE ID	1	2	3	4	5	6	7	8	9	10
1	Route										
2	Commodity										
3	Commodity Classification										
4	Perishable										
5	Cargo Weight (tons)										
6	Container?										
7	TIR?										
8	Date of questionnaire completion										
9											
10	Distance (km)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Transit Time (hrs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	Activities Time (hrs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Total Time (hrs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	Vehicle Operating Cost (US\$)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
15	Activities Cost (US\$)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
16	Total Trip Cost (US\$)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
17	SWOD (km/h)										
18	SWD (km/h)										
19	Vehicle Operating Cost (US\$/500km)										
20	Activities Cost (US\$/500km)										
21	Total Trip Cost (US\$/500km)										
22											
23											
24											
25											
26											
27											
28											

CPMM = corridor performance measurement and monitoring, hrs = hours, km = kilometers, km/h = kilometers per hour, TCD = time/cost-distance. Source: ADB, Central Asia Region Economic Cooperation (CAREC) Program.

result, the summarized data are provided in a dashboard-type worksheet (Figure 10) that provides immediate feedback regarding key indicators such as speed, cost, number of samples carrying perishables, and which drivers are using International Road Transport (TIR) carnets. Aside from providing a snapshot of the sample, this dashboard enables coordinators to easily detect any errors made during data entry.

Figure 10 The CPMM Dashboard

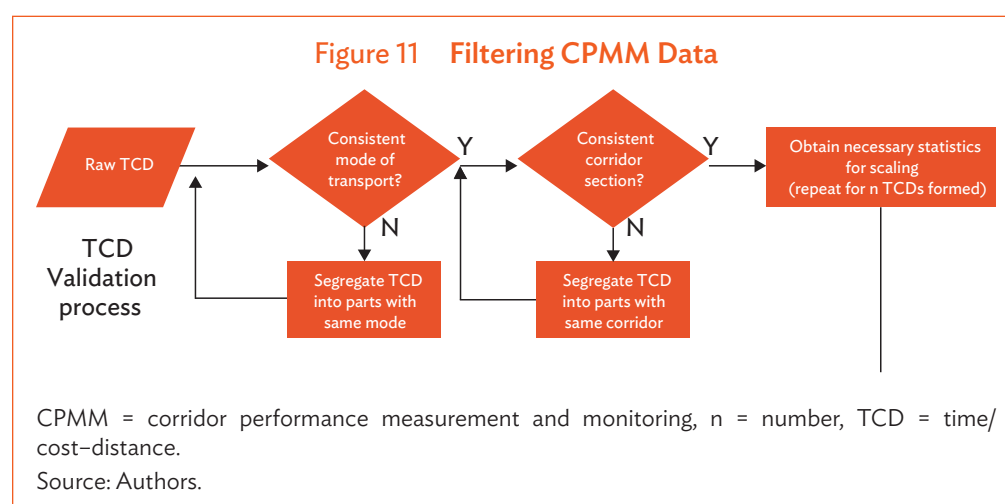


The contribution of the CPMM coordinator is one of the most critical success factors of the CPMM methodology. Besides collaborating with the drivers and entering data into the system database, the CPMM coordinator has several other responsibilities, the most important of which is maintaining a high standard for the forms submitted for aggregation. For instance, payments recorded in local currency (to avoid unnecessary calculations on the driver's part) need to be recalculated and entered in US dollars. To ensure data accuracy and integrity, a significant amount of time is spent selecting the right CPMM partners and training them.

Stage 2: Data Aggregation

After the CPMM TCD template has been completed by the CPMM coordinator, the file is sent to the international consultants for review and verification of the data. Once approved, the file is then forwarded to the CPMM database manager at ADB for data aggregation. During this step, another round of consistency and data completeness checks is carried out to ascertain the quality of the data.

Before any analysis is made, certain measures are taken to ensure the comparability of each sample across different categories (such as mode of transport and corridor) for statistical estimation and reporting purposes (Figure 11). Since routes can vary by corridor and mode of transport, there can be problems in aggregating and rescaling data. The CAREC corridors are dissimilar and hence are not very comparable. The fact that these corridors are spread out among the CAREC countries means that, in terms of road development, length, and cross-border protocols, one corridor can be very different from another. The same holds true for mode of transport. Road and rail movements have different standards and protocols that set each one apart from the rest, causing some freight forwarders to prefer one mode over another.

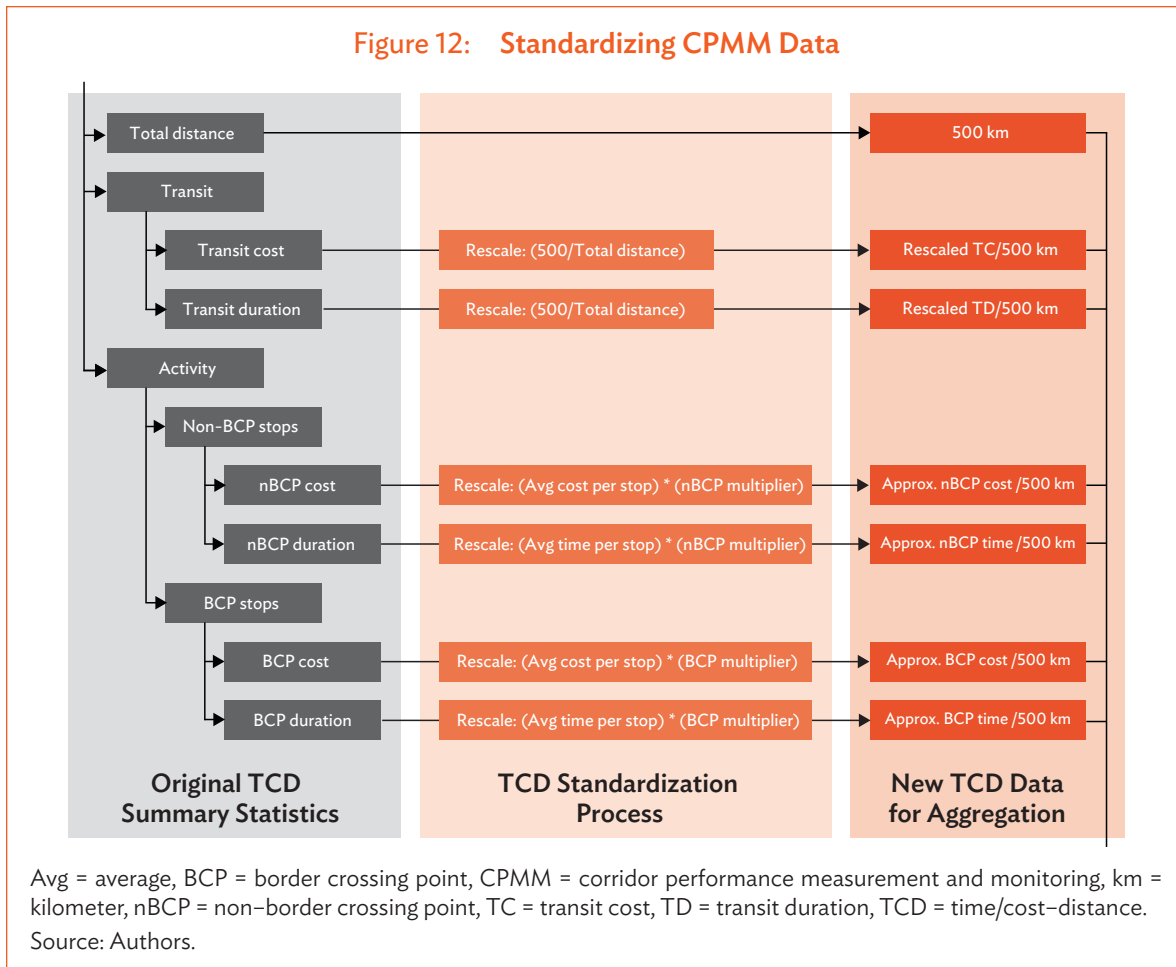


TCD templates are classified before being further standardized, to improve estimation. This is done not just for the mode of transport but for the corridor as well. Of course, the standardization of TCDs per 20-ton cargo and per 500 km must still apply.

Although both the BCP and non-BCP components of the trips are normalized for each 500 km segment, because of the complexity of TCD data and the indicators that CPMM monitors, standardization is not always straightforward (Figure 12). Transit cost and duration can easily be rescaled, as both of these variables are directly affected by distance. However, activity cost and duration are less easy to adjust, as they depend on the number of stops made during a trip before the final destination is reached. The number of stops is somehow affected by distance, though not directly. For example, for a trip of 1,000 km, where a truck makes four stops, for an average of two stops per 500 km, a stop multiplier of 0.5 is applied to the average total activity cost and duration throughout the trip.

Furthermore, the frequency of stops for border crossing activities is not similar to those for non-BCP stops. Multipliers to be applied to BCP stops should therefore be computed separately from those applied to non-BCP stops. Different multipliers for different corridors and modes of transport should also be obtained, given the inherent incomparability of trips classified according to these categories.

Figure 12: Standardizing CPMM Data



Aside from these measures, other forms of standardization are made before the data are analyzed. As CPMM deals with vast amounts of information, it was decided early on that a standardization platform would be important for ensuring consistency and accuracy. For instance, when dealing with an extensive collection of data sourced from different countries, the need to cope with the variations in name and spelling of cities and BCPs is inevitable.

Variations in the English spelling of city and BCP names must be taken into account at this stage. Otherwise, aggregated data may yield two or more estimates for the same city or BCP. However, requiring the CPMM coordinators to use a standard name can be difficult, as English is not their native language. Using lists of place names for data validation can help, but this tends to make the TCD template inflexible, and may result in frequent revisions due to additions to the list. For these reasons, the standardization of names is also done at the aggregation stage.

Because of the massive number of cities and nodes that populate the CPMM database, standardizing the names of all stops is a very lengthy and tedious process. Thus far, only the names of BCPs have been standardized in the database, while the variant spellings of key cities and other nodes are checked as needed.

The database accepts all keyed-in BCP names, and then matches the variants of a BCP name to the preferred version of that name. Whenever the database encounters a BCP name that is not found on the standard list, all variants of the name are checked and then renamed before aggregation. In this case, terms like “Huoerguosi” and “Korgos” are changed to the standard name “Khorgos” for corridor 1. Likewise, “Erlian” and “Erlianhaote” are changed to “Erenhot” for corridor 4. Table 3 contains a list of the standardized names of major BCPs.

Stage 3: Data Analysis

At this stage, aggregated data are subjected to various statistical analyses, and the results are usually translated into tables and charts, which are then provided to the international consultants for further analysis. These consultants work to understand better what the estimates mean and what insights can be gleaned from the values. Aside from the TFIs, various time and cost indicators (at different levels of comparison) are also computed, and the results are considered in the light of existing trade flow and dynamics in the region. These estimates help to identify the sources of excessive costs and delays encountered during the transport of goods along corridors and through border crossings.

In the data analysis stage, CPMM aims to identify and explain observed peculiarities in the data gathered over an extended period. Trends and seasonal patterns are revealed among the corridors, highlighting consistent top and bottom performers. With sustained monitoring over a period of time, changes in indicators and estimates will provide an understanding of whether interventions, either physical or procedural, have had the desired impact.

Data Profile and Summary Statistics

As with all other survey studies, understanding the sample and the population it represents is a vital concern. This section shows the nature and profile of CPMM data. All pertinent information gathered from the submitted samples is summarized to provide a description of the data. These include trade-relevant factors such as mode of transport, the use of TIR carnets, commodity classifications, and the direction of trade flows. To convey the information better, frequency tables and summary statistics are generated in tabular and graph formats. Estimates such as means and medians are also generated to show the distribution of the data. A summary analysis of annualized CPMM findings is presented in the 2012 CAREC DEfR. Table 4 presents the results for the first half of 2013, compared with the same period in the 3 previous years.

Discussions of the results generally highlight changes and patterns observed in the TFIs, down to the corridor level. The analyses are then supplemented by key trends and observations at the BCP level. The top- and worst-performing corridors and BCPs are highlighted as part of a profile of important nodes and sections along the transit corridors. Estimates of time and cost factors during border crossings, including the collection of both official and unofficial payments, are also reported, to accurately depict border crossing conditions on the ground. Also reported are irregular characteristics and patterns that may have happened because of certain policies, weather conditions, or terrain along corridors or at major BCPs during the reporting period.

Table 3 CPMM-Standardized Names of Border Crossing Points

No.	Corridor	Country	BCP1	Country 2	BCP2	Mode
1	1a, 2c	PRC	Alashankou	KAZ	Dostyk	rail, road
2	1a, 1c	KAZ	Kairak	RUS	Troitsk	rail, road
3	1b	PRC	Khorgos	KAZ	Korgas	rail, road
4	1b, 6b, 6c	KAZ	Zhaisan	RUS	Kos Aral/Novomarkovka (Sagarchin)	rail, road
5	1c	PRC	Torugart/Topa	KGZ	Torugart	road
6	1c, 3b	KAZ	Merke	KGZ	Chaldovar	rail, road
7	2a, 2b, 2d, 5a, 5c	PRC	Yierkeshitan	KGZ	Irkeshtam	road
8	2a, 2b	KGZ	Kara-Suu (Dostuk)	UZB	Kara-Suu/Savay (Dustik)	rail, road
9	2a, 2b	TAJ	Kanibadam	UZB	Kokland	rail
10	2a, 2b	TAJ	Nau	UZB	Bekabad	rail
11	2a, 6a	KAZ	Beyneu (rail)/Tazhen (road)	UZB	Karakalpakstan (Daut-Ata)	rail, road
12	2a, 2c	AZE	Baku	KAZ	Aktau	seaport
13	2a, 2b, 2c	AZE	Red Bridge (road)/Beyuk Kesik (rail)	GEO	Red Bridge (road)/Gabdabani (rail)	rail, road
14	2b, 3a	UZB	Alat	TKM	Farap	rail, road
15	2b	AZE	Baku	TKM	Turkmenbashi	seaport
16	2d, 3b, 5a, 5c	KGZ	Karamyk	TAJ	Karamyk	road
17	2d, 5a, 5c, 6c	AFG	Shirkhan Bandar	TAJ	Panji Poyon	road
18	3a, 3b	KAZ	Aul	RUS	Veseloyarsk	rail, road
19	3a, 6b, 6c	KAZ	Zhibek Zholy (rail)/Saryagash/Yallama (rail)	UZB	Gisht Kuprik (road)/Keles (rail)	rail, road
20	3a	TKM	Saraks	IRN	Sarakhs	road
21	3b	TAJ	Pakhtaabad	UZB	Sarayasia (road)/Kudukli (rail)	rail, road
22	3a, 6a, 6b	AFG	Hairatan	UZB	Termez/Airatom	rail, road
23	3b, 6b, 6d	AFG	Islam Qala	IRN	Dogharoun	road
24	4a	MON	Ulaanbaishint/Tsagaanur	RUS	Tashanta	road
25	4a	PRC	Takeshikent	MON	Yarant	road
26	4b, 4c	MON	Sukhbaatar (rail)/Altanbulag (road)	RUS	Naushki (rail)/Khiagt (road)	rail, road
27	4b	PRC	Erenhot	MON	Zamiin-Uud	rail, road
28	6a, 6d	KAZ	Kurmangazy (road)/Ganyushking (rail)	RUS	Krasnyi Yar (road)/Aksaraskaya (rail)	rail, road
29	6c	TAJ	Istaravshan	UZB	Khavast	road
30	6d	KAZ	Bolashak	TKM	Serkhetyaka	rail
31	2d	AFG	Aqina	TKM	Imam Nazar	road
32	2d, 6d	AFG	Torghondi	TKM	Serkhet Abad	road
33	5b	PRC	Khunjerab	PAK	Sost	road
34	5c, 6a, 6b, 6d	PAK	Chaman	AFG	Spin Buldak	road
35	5a, 6c	AFG	Torkham	PAK	Peshawar	road
36	4c	PRC	Zuun Khalavch	MON	Bichigt	road

AFG = Afghanistan, AZE = Azerbaijan, BCP = border crossing point, PRC = People's Republic of China, CPMM = corridor performance measurement and monitoring, GEO = Georgia, IRN = Iran, KAZ = Kazakhstan, KGZ = Kyrgyz Republic, MON = Mongolia, PAK = Pakistan, RUS = Russian Federation, TAJ = Tajikistan, TKM = Turkmenistan, UZB = Uzbekistan.

Note: Each row represents BCP pairs, i.e., adjacent points on opposite sides of the border.

Source: ADB, Central Asia Regional Economic Cooperation (CAREC) Program. CPMM database.

Table 4 CPMM Semiannual Year-on-Year Analysis

		2010 (Baseline Value)		2011		2012		2013	
		Mean	Median	Mean	Median	Mean	Median	Mean	Median
TFI1	Time taken to go through a BCP (hours)	7.9	4.0	8.4	4.3	11.7	4.3	8.0	4.0
TFI2	Costs incurred at a BCP (\$)	202.6	120.0	150.3	87.5	153.5	74.9	218.2	100.0
TFI3	Costs incurred traveling on a CAREC corridor section (\$) ^a	737.7	410.9	924.7	649.7	911.7	605.4	1,320.5	803.2
TFI4	Speed of travel on a CAREC corridor section (kph), SWOD ^a	34.9	37.2	36.5	37.8	37.4	35.5	36.1	34.2
	Speed of travel on a CAREC corridor section (kph), SWD ^a	24.0	22.1	20.9	19.4	23.7	29.4	20.4	19.7

BCP = border crossing point, CAREC = Central Asia Regional Economic Cooperation, CPMM = corridor performance measurement and monitoring, km = kilometer, kph = kilometers per hour, SWD = speed with delay, SWOD = speed without delay, TFI = trade facilitation indicator.

^a The standard is a truck carrying 20 tons or a train wagon with 1 twenty-foot equivalent unit, traveling a corridor section that is 500 km in length.

Source: ADB, Central Asia Regional Economic Cooperation (CAREC) Program. 2013. Trade Facilitation Sector Progress Report and Work Plan. Presentation at the CAREC Senior Officials' Meeting. Astana, Kazakhstan. 13 October.

Anecdotal Evidence and Recent Developments

CPMM gathers information from several sources. Aside from empirical evidence sourced from questionnaires, drivers and coordinators offer their own insights to contribute to a better understanding of transport conditions on the routes and BCPs in their countries (Box 3). Irregularities during transport are also recorded by the drivers in the comments section of the DCF. Anecdotal evidence and experience, though an informal source of information, are nevertheless valuable for conveying the complexity of circumstances in some BCPs.

Key projects and policies affecting transport and trade facilitation are also reported. These include national projects developed to address transport issues such as congestion or lengthy border clearance procedures. Even tariff regulations and transport-cost fluctuations are often reported, so as to describe better the transport economics of a given corridor.

Reliability Indicators and Sample Variation

Lengthy delays, whether during border crossings or encountered elsewhere in transit, affect transportation costs. They can also strongly affect inventory holdings, particularly of perishable cargoes, which are predominant in CAREC economies. In an uncertain environment, logistics companies and freight forwarders take measures to guarantee the

Box 3 Anecdotal Evidence—Border Crossing Points and Bottlenecks

Irkeshtam (PRC)–Irkeshtam (KGZ) and Karamyk (KGZ)–Karamyk (TAJ) are the key BCPs along corridor 5. CPMM data showed significant increase from 2011 to 2012 in the average border crossing time at Irkeshtam (PRC), from 15.2 hours to 51.1 hours; and at Karamyk (KGZ), from 9 hours to 15.8 hours. Although these two BCP pairs have been identified previously as bottlenecks, the observed durations of delays were unexpectedly long. CPMM partners and drivers attributed the extremely long waiting time indicated in some of the samples to adverse weather conditions and temporary closure of the border. Excluding these few outlier samples, the result showed improvement in border crossing time.

BCP = border crossing point, PRC = People's Republic of China, CPMM = corridor performance measurement and monitoring, KGZ = Kyrgyz Republic.

Source: ADB, Central Asia Regional Economic Cooperation (CAREC) Program. 2013. *CAREC Corridor Performance Measurement & Monitoring Annual Report 2012*. Manila.

predictable and efficient delivery of their shipments. Hence, accurate measures of reliability, uncertainty, and delays along the corridors are crucial to the supply chain.

In CPMM, reliability and data variation are approached through different measures. Statistics such as standard deviation, maximum and minimum values, coefficient of variation, and confidence margins (presented as one standard deviation away from the mean value) are provided along with key TFIs to represent the spread of the sampled data for all levels of comparison.

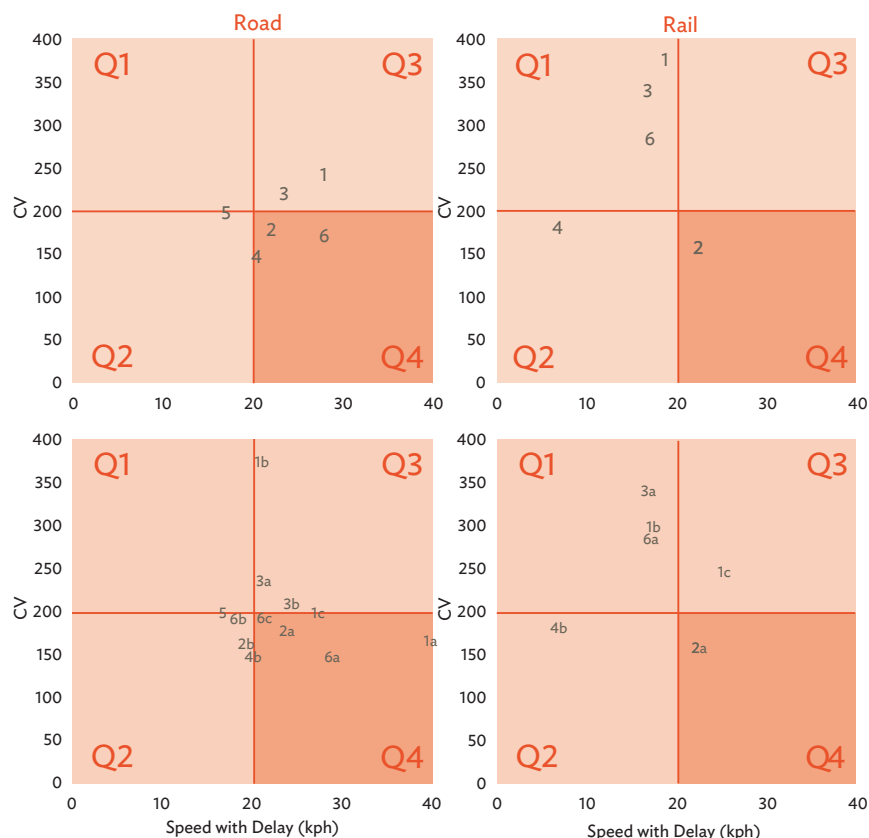
The median is normally presented along with the average estimates to provide a quick snapshot of the data distribution. Usually, transit time and delay distributions conform to an asymmetric curve skewed to the right, where delays occur less often but are significantly longer than what drivers are accustomed to. Most of the observed samples tend to fall toward the shorter range of delay times under normal conditions, but the less frequent but significantly longer delays are experienced by a few drivers, reflecting the capacity constraints of certain BCPs with regard to handling heavy traffic, congestion, or other adverse conditions.

CPMM also compares the efficiency of corridors in terms of speed, with a view to offering alternative routes, when needed, to drivers and freight forwarders. While the findings based on SWOD indicate the quality of infrastructure and road conditions along a given corridor, findings based on SWD show the speed reduction when border crossing delays and other impediments are factored in. The percentage drop between these two speed indicators is highlighted, and possible reasons are given to account for the results. In addition, CPMM reports elaborate on the “reliability” of each corridor, using a “speed reliability plot” (Figure 13).

Interventions and Hypothesis Testing

In its reports, CPMM uncovers interesting and noteworthy data trends and patterns to explain transport dynamics in CAREC countries. Similarly, CPMM data can be used as

Figure 13 Speed Reliability Plot



CV = coefficient of variation, kph = kilometers per hour, SWD = speed with delay.

Source: ADB, Central Asia Regional Economic Cooperation (CAREC) Program. 2012. *CAREC Corridor Performance Measurement & Monitoring Annual Report 2012*. Manila.

This figure compares the SWD and the CV of all the CAREC corridors (top squares) and of some subcorridors (bottom squares). The spatial position of each corridor provides a relative sense of how each corridor is performing vis-à-vis the others.

Quadrant 1: This is the low-speed, high-CV quadrant. In corridors located in this quadrant, the speed is slow and the timing is uncertain.

Quadrant 2: This is the low-speed, low-CV quadrant. The speed is slow but arrival times are more or less predictable. An improvement could be achieved if better infrastructure were put in place to increase the SWD, or if the border crossing times were reduced.

Quadrant 3: This is the high-speed, high-CV quadrant. While vehicles can move at high speeds, there are systematic variations in shipment times. The reasons for these variations have to be identified and eliminated or alleviated. Since travel times can be consistent (unless there are unpredictable traffic jams or adverse weather), the likely cause could be inconsistent practices at border crossing points.

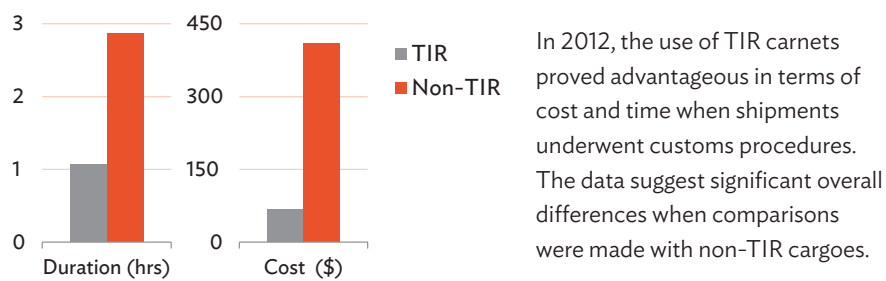
Quadrant 4: This is the high-speed, low-CV quadrant, which is the most desirable, as the vehicles can move rapidly and the travel times are consistent.

Source: Authors.

benchmarks for future interventions in the region, and the impact of those interventions and related policies can be evaluated, as the data permit. In the past, these types of analyses proved difficult to manage because of the lack of a data collection mechanism covering the entire region. When available, the data were often limited to select countries and time frames. However, infrastructure projects rely on impact evaluation measurements to assess outcomes and gauge success on the basis of concrete evidence and empirical indicators.

With the vast amount of data collected, CPMM allows for the conduct of inferential statistics. Rather than relying on simple metrics, CPMM can measure statistical significance in order to assign a level of certainty to claims and assertions. This is usually done using hypothesis testing, which assesses whether significant differences exist between samples of interest. Previous CPMM reports explored the effectiveness of the TIR carnet (Figure 14) and the impact of the Customs Union, which currently includes Belarus, Kazakhstan, and the Russian Federation (Figure 15).

Figure 14 Hypothesis Testing: Analysis of TIR Carnets along CAREC Corridors



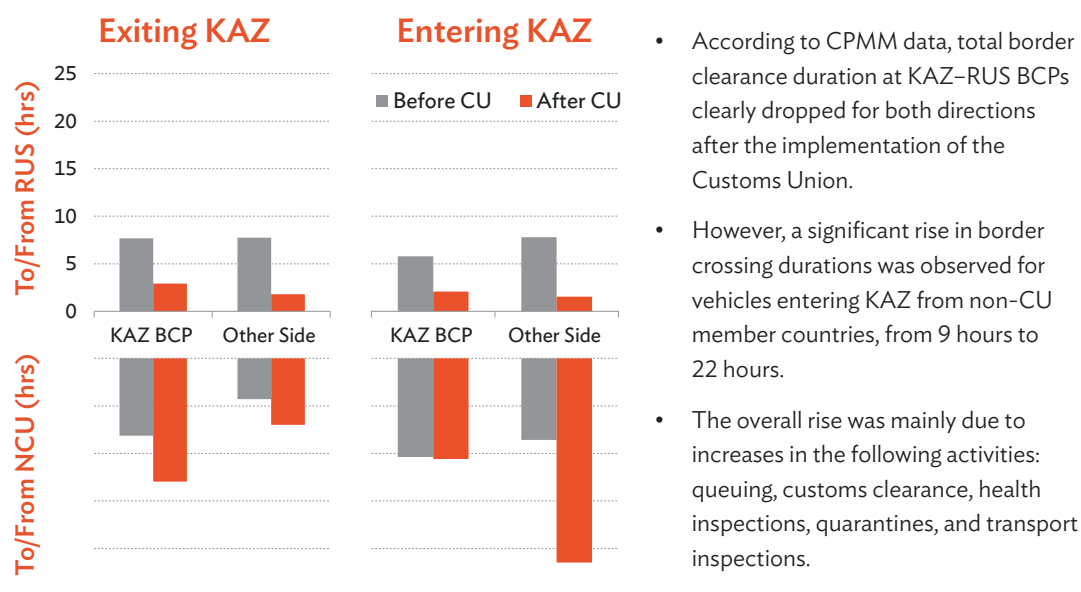
Methodology

T-tests of independent samples were used to gauge the differences in customs clearance costs and delays between cargo transports that used the TIR carnet and those that did not. This technique is generally used to conduct significance tests of the means of two independent groups. An F-test was also conducted, to gauge the homogeneity of the variance of border-crossing duration data. Sample data in the analysis included only TCD findings during January–December 2012.

hr = hour, TCD = time/cost–distance, TIR = Transports Internationaux Routiers (International Road Transport).

Source: ADB, Central Asia Regional Economic Cooperation (CAREC) Program. 2013. *CAREC Corridor Performance Measurement & Monitoring Annual Report 2012*. Manila.

Figure 15 Hypothesis Testing: Impact of Customs Union^a on Border Crossing in Central Asia



- According to CPMM data, total border clearance duration at KAZ–RUS BCPs clearly dropped for both directions after the implementation of the Customs Union.
- However, a significant rise in border crossing durations was observed for vehicles entering KAZ from non-CU member countries, from 9 hours to 22 hours.
- The overall rise was mainly due to increases in the following activities: queuing, customs clearance, health inspections, quarantines, and transport inspections.

BCP = border crossing point, CPMM = corridor performance measurement and monitoring, CU = Customs Union, KAZ = Kazakhstan, NCU = non-CU member country, RUS = Russia.

^a The Customs Union, implemented in July 2010, comprises Belarus, Kazakhstan, and Russia.

Source: ADB, Central Asia Regional Economic Cooperation (CAREC) Program. 2013. *CAREC Corridor Performance Measurement & Monitoring Annual Report 2012*. Manila.

As the CPMM database is further populated, the potential for future analyses and better understanding of CAREC-region trade flows and dynamics will be huge. In the database's early stages, the capacity for statistical analyses was limited, but years of collected BCP and corridor data will open up opportunities for more complex statistical and time-series studies.

Stage 4: Data Reporting

As mentioned above, CPMM findings are published in quarterly and annual CPMM reports (Figure 16). These reports are available in English, Russian, and Chinese, and in print and electronic versions. The reports can be downloaded from the CAREC website (www.carecprogram.org) and from the CFCFA (<http://www.cfca.net>). The CFCFA website also features CPMM interactive charts that allow users to customize the search criteria (e.g., period, country) and see transport-related information. Further, the website contains links to the websites maintained by CPMM partners.

CPMM results are also disseminated to the public via several other channels. First, the results are presented and discussed at CFCFA meetings, traditionally held twice a year.

Box 4 Technical Note on Hypothesis Testing

To prove or disprove an opinion (technically called “hypothesis testing” in statistics), an individual can make observations and, for economic reasons, base those observations on some samples.

The average (mean) and the standard deviation can be calculated from the samples. For instance, if one is interested in finding out if shipments carrying perishables clear border crossing points (BCPs) faster than shipments carrying nonperishables, the data can be split into two groups: perishables and nonperishables. For each group, the sample mean (\bar{x}) is calculated, so as to approximate the population mean (μ); also, the sample standard deviation (s) is calculated to approximate the population standard deviation (σ). Appropriate t-tests based on the differences can be undertaken at certain significance levels to assess for statistical significance.

For instance, we could have:

Null Hypothesis (H_0): There is no difference in the border crossing times for perishable shipments compared with shipments carrying nonperishables.

Alternative Hypothesis (H_1): Shipments carrying perishables have shorter border crossing times compared with shipments carrying nonperishables.

If the results show that the average time for perishables shipments to clear a BCP is 4 hours, while the average time for nonperishables is 6 hours, can one claim that shipments of perishables can clear a BCP faster? Alone, these results would not be sufficient to justify that conclusion because one also needs to consider the sample sizes as well as the standard deviations. Thus, to adopt a more robust methodology, inferential statistical techniques are used to test the opinions.

In CPMM, two test statistics are generally used: the t-test and F-test. The t-test is used to compare the means of two samples (such as shipments carrying perishables and nonperishables) to see if they are significantly different. A one-tailed test is typically employed to see if sample A is shorter than sample B, etc. A t-test can be paired-sample or independent-sample, depending on whether the variances are equal (homoskedastic) or unequal (heteroskedastic). To assess the nature of the variances, an analysis of variance (ANOVA) using the F-test is undertaken. Thus, by comparing the p-values, which determine the significance of the results, one can decide whether there is sufficient justification for rejecting the null hypothesis.

CPMM = corridor performance measurement and monitoring.

Source: Authors.

Figure 16 CAREC CPMM Annual Reports



CAREC = Central Asia Regional Economic Cooperation, CPMM = corridor performance measurement and monitoring.

Source: ADB, Central Asia Regional Economic Cooperation (CAREC) Program. CAREC Corridor Performance Measurement & Monitoring Annual Reports.

This provides a feedback mechanism to the CPMM partners, in which trends observed in the data are validated or modified by the freight forwarders through their accounts of their own experiences. Second, results are presented at the CAREC Senior Officials' Meeting (SOM) and Ministerial Conference allowing policy makers to understand the implications of the results and to identify areas that need improvement. The first CPMM annual report (based on data collected from April 2009 to March 2010) was presented at the 9th CAREC Ministerial Conference, in 2010 in Cebu, Philippines. Meetings of the CAREC Transport Sector Coordinating Committee also serve as a means of dissemination and a forum for discussion.

Presentations of CPMM findings and estimates are not limited to these venues. CPMM is also a valuable tool for policy making, and its results serve as input for other areas of development studies. For instance, it serves as an instrument and a primary knowledge and data source for studies relating to trade flows within the CAREC region. The impact of interventions can be verified and tested using CPMM data, provided that sufficient data are available. Estimates and data tabulations that are not presented in the CPMM reports can be provided to interested data users and analysts.

Key Stakeholders in CPMM

CPMM relies on the close cooperation its various stakeholders. Its sustainability since 2009 is due to the careful consideration given to the methodology, the identification and selection

of CPMM partners, the establishment of an institution representing the national transport associations and the support extended to that institution, the provision of training and capacity building by experts (especially through the CAREC Institute), and the commitment of ADB.

In essence, CPMM is a joint effort of four groups of stakeholders:

- drivers and freight forwarders,
- national carrier and forwarder associations,
- international consultants, and
- the ADB CAREC trade facilitation secretariat.

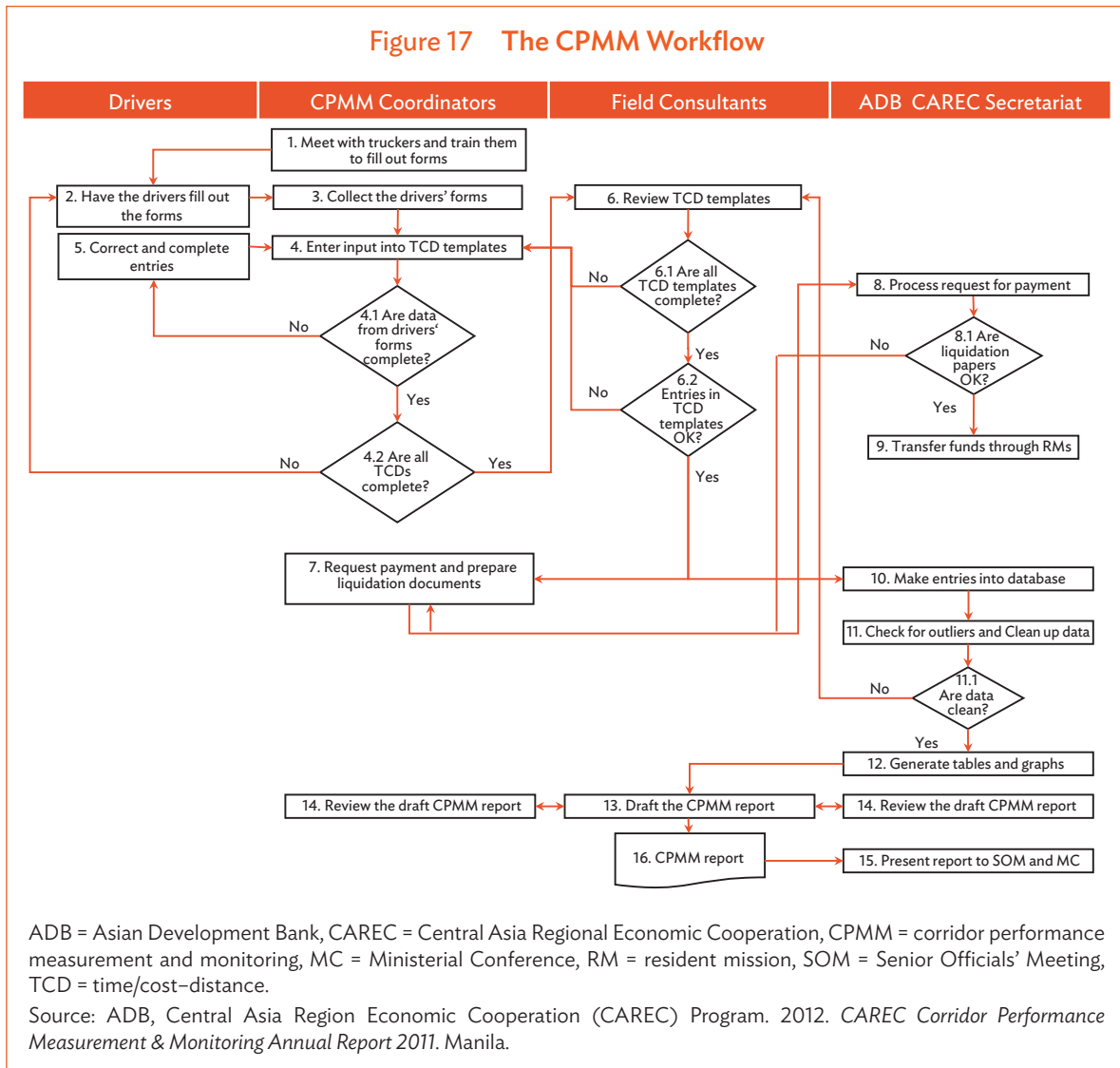
The contributions of each category of stakeholders are summarized in Table 5, and their involvement in the CPMM workflow is presented in Figure 17.

Table 5 Summary of the Roles and Responsibilities of Key CPMM Stakeholders

Stakeholders	Roles	Deliverables
Drivers and freight forwarders	<ul style="list-style-type: none"> • Record data and fill out the customized CPMM data collection forms • Submit the filled-out data collection forms to the national transport associations after each trip 	<ul style="list-style-type: none"> • Completed CPMM data collection forms
National carrier and forwarder associations	<ul style="list-style-type: none"> • Provide customized CPMM data collection forms to drivers • Prequalify each trip as a sample • Conduct training in CPMM for national transport associations and drivers • Enter data or fill out the TCD template • Answer questions raised by the international consultants • Visit the BCP, meet the drivers, and coordinate data collection, as necessary 	<ul style="list-style-type: none"> • Verified CPMM data collection forms • Completed TCD templates
International consultants	<ul style="list-style-type: none"> • Design the CPMM methodology • Select national transport associations as CPMM partners • Conduct training for national transport associations • Meet with companies and drivers involved in CPMM and discuss findings • Review the TCD templates submitted monthly and forward them to the ADB secretariat • Audit the work of national transport associations • Approve invoices for work done 	<ul style="list-style-type: none"> • Reviewed TCD templates • Quarterly and annual CPMM reports • Presentations during CPMM workshops
ADB CAREC trade facilitation secretariat	<ul style="list-style-type: none"> • Aggregate monthly submissions • Advise on key changes in methodology or policies under CPMM • Organize CPMM workshops • Process payments for verified TCD samples 	<ul style="list-style-type: none"> • Aggregated data sets of CPMM samples • Quarterly and annual CPMM reports published • CPMM workshops held

ADB = Asian Development Bank, BCP = border crossing point, CAREC = Central Asia Regional Economic Cooperation, CPMM = corridor performance measurement and monitoring, TCD = time/cost-distance.

Source: Authors.



It was decided early on that CPMM should involve national transport associations, rather than transport companies, as CPMM partners. Although ADB could work directly with drivers or large transport companies (e.g., freight forwarders, carriers, trucking firms), CPMM will gain wider influence and recognition only by working with national transport associations. While private companies have commercial objectives, national transport associations have a greater degree of national and social objectivity, and more frequent interaction with policy makers and other public sector stakeholders, making them better partners because CPMM also needs to address socioeconomic issues.

CPMM partners are selected according to various criteria, such as the following:

- **Nature of the organization.** The first and most important criterion is the relevance of the organization to transportation. Naturally, organizations affiliated with

international transport federations or associations (e.g., the International Road Transport Union [IRU] and the International Federation of Freight Forwarders Associations) are viewed favorably. An organization with a mandate from government (such as through a presidential decree) to improve transit and trade facilitation could also be considered, as it would have access to transport data that could be otherwise hard to collect.

- **Relationship with the transport sector.** The organization must be influential at the national level (as opposed to the district or local level) because CAREC corridors pass through many cities and districts. If the organization has limited national influence, it may not be able to collect a wide enough sample of data. In addition, the composition of the corporate membership and the working relationship between the organization and the transport companies will directly affect the ability of the organization to collect sufficient and accurate transport data.
- **A physical location, with personnel.** As CPMM requires a sizable amount of time and effort, the organization must have a proper office with appropriate personnel. This criterion ensures that the organization has the resources to perform its duties productively. Without a physical location, it would be hard to conduct meetings and training sessions, and to keep proper records of the CPMM data collection forms (DCFs) and TCD templates. The organization must therefore have a physical location to qualify as a CPMM partner.

Taking these criteria into consideration, the international consultants spent 1–2 months visiting each country to identify, evaluate, and recommend prospective CPMM partners to ADB, which then confirmed the selection and subsequently signed memorandums of understanding mentioning the selected CPMM partners.

ADB has taken a further step to reinforce collaboration with CPMM partners. With ADB support, the CAREC Federation of Carrier and Forwarder Associations (CFCFA) was formed in October 2009 and formally convened in February 2010 the CPMM partners composed the majority of the founding members. The CFCFA charter was drafted, discussed, and approved. The CFCFA serves as both a platform for closer dialogue among national transport associations of CAREC member countries and a cooperation mechanism for solving topical issues. More broadly, the CFCFA is seen as an instrument for strengthening public–private collaboration in the development of a transport and logistics system in the region, including the launching of new projects to be financed under the CAREC Program. The CFCFA is formally registered in the Hong Kong Special Administrative Region of the PRC. Its members meet at least once a year.

Chapter Summary

This chapter reviewed the mechanics of CPMM and the roles and responsibilities of the stakeholders. It emphasized the importance of measuring the reliability and speed of transport, which is important for bottleneck and incidence analyses. Of note is the development of two transport attributes that are critical for time-based logistics—speed with delay (SWD) and speed without delay (SWOD). In particular, this chapter highlighted (i) the dominant modes of transport used in the CAREC region (road and rail), (ii) the challenges of measurement and

testing, and (iii) the evolution toward a standardized platform for data collection. It showed how the extensive data collected, and the depth and richness of information they contain, are useful for detailed policy making and implementation. This chapter also highlighted the peculiarities of each CAREC corridor with regard to road and rail transport.

An excellent supplement to this chapter is Appendix 2, which describes some of the more popular international performance measurement and monitoring methodologies developed by international agencies. Used in tandem with CPMM, these tools and indices could validate, enrich, and refine CPMM findings, thereby reinforcing efforts to improve transport conditions in the interest of better logistic connectivity and trade facilitation.

CPMM Features and Advantages

Since 2009, CPMM has endeavored to trace the actual patterns of transportation and logistics along the CAREC corridors. Much of the research being done by several international financial institutions is based on one-time efforts to measure transport effectiveness. Resource constraints have also limited the scale and scope of such exercises. So why is CPMM any different? The unique features and advantages of CPMM are:

- **Scale.** CPMM works directly with national transport, freight forwarding, and carrier associations. These “CPMM partners” are carefully selected to ensure that they can provide accurate data reliably and consistently. Working with more than a dozen associations based in nine CAREC countries, with each association contributing 10 to 20 samples per month since 2010, CPMM has entered thousands of samples into the database. As of mid-2014, CPMM remains the first and only exercise featuring data on such an unprecedented scale.
- **Scope.** Transportation and logistics are very complex subjects for analysis. CPMM has been clear from the very beginning about its mission, set forth in the original CAREC TTFS: it focuses on the six CAREC corridors, emphasizing only two modes of transport (road and rail), and paying particular attention to the causes and costs of delays encountered along the corridors. This approach is directly related to the CAREC Program’s mandate, and serves to guide CAREC interventions (e.g., building new roads, funding equipment and facilities for BCPs). CPMM does not claim to provide comprehensive annualized data on traffic and trade volume. Also, it intentionally excludes other areas, such as industry and market structure, that could be inherently difficult to change.
- **Duration.** Planning for CPMM began in late 2008, and was pilot-tested the following year. After a year of methodological refinement, the CAREC DEfR established 2010 as the baseline year for CPMM, which is now into its sixth year.

Thus, CPMM offers several benefits to users, in that it

- compares the transport efficiency of the six corridors;
- identifies key bottlenecks (typically BCPs, but possibly internal nodes);
- assesses changes in cost and trip duration over time (time series studies); and
- presents the time and cost performance of each corridor in the CPMM quarterly and annual publications.

Public programs, such as infrastructure development and policy interventions, are designed to attain certain goals and deliver benefits. To understand whether such programs actually work requires a measurement and monitoring system that will gauge the level and nature

of impact on the intended beneficiaries. CPMM serves this purpose. It produces TFIs that assess the impact of CAREC interventions on corridor development. It has served as the basis for the monitoring the implementation of the TTFS and TTFS 2020. CPMM can help improve policy design and implementation, as well as promote accountability and dialogue between policy makers and stakeholders. Its sustained conduct has yielded an extensive collection of data, providing the CAREC Program with a reliable source of information and analysis during an implementation period that has included many interventions.

The measurement and comparison of development interventions across several countries spanning a vast region is a very ambitious endeavor. CPMM has overcome many hurdles, such as the limited human resources for collecting and recording information, by involving the private sector in its implementation. Since March 2009, CPMM has been collecting extensive data on road and rail shipments within the CAREC region, and from the region to major interconnection points with the global economy. In its early stages, CPMM underwent multiple refinements of its methodology, especially relating to data collection and analysis, that improved its ability to compare and contrast key sections and BCPs along the CAREC transport corridors.

To identify the causes of delays and associated costs along each CAREC corridor, CPMM collects and aggregates detailed and accurate data on the impediments to the smooth flow of traffic. Appropriate data can assist in pinpointing regional components that are not working well, so that infrastructure, regulatory, and institutional reform interventions, or simply operational improvements, can be better targeted. It is therefore critical that data on corridor operations be collected systematically.

Aside from its general monitoring and measurement functions, CPMM serves as a point of reference for diverse groups, for use in diverse ways. These ways are described in the following sections of this chapter.

Investment Decision-Making and Impact Assessment

The primary objective of CPMM is to measure and monitor CAREC corridor performance and, by extension, the impact of initiatives and investments elaborated in the TTFS and TTFS 2020. Trade support institutions (TSIs) in the CAREC region help to assess which policy reforms and physical investments might have greatest impact, and whether CAREC investments have produced the intended results. The aim of the CAREC Program is to expand trade and increase competitiveness, but its success can only be measured over time. With 5 years' worth of empirical data, CPMM can now help policy makers decide how to allocate limited resources to achieve these goals, and to assess the progress already made.

CPMM indicators can be used to evaluate past and current projects under the CAREC Program's TTFS 2020, if there are sufficient data for statistical testing. This approach provides empirical support for determining whether projects have achieved their stated objectives. For example, the 2013 midterm review of the original TTFS examined completed and ongoing projects across the region and along corridors. Among these projects, a select number of completed road projects were evaluated using CPMM data from 2009 to 2013.

These projects were selected according to the availability and sufficiency of relevant data for statistical testing. Moreover, only completed road projects were selected, so their impact could be fully assessed. In particular, travel times from one key node to another before and after project completion were measured to test whether road rehabilitation projects had positively affected the delivery of goods along key sections of the CAREC corridor network. In general, better roads mean increased market access and faster travel times—key factors of economic growth in otherwise underserved areas. Time in transit, or speed of travel, is but one of the indicators that can be tested using CPMM data. Other cost and time factors available in the CPMM database can be tested to assess road projects, and can serve as input for future analysis.

These four CAREC road projects were evaluated using CPPM data (the years of their completion are given in parentheses):

- Southern Transport Road Rehabilitation: Osh–SaryTash–Irkeshtam (2012) (KGZ IP2);
- Regional Road Corridor Improvement: Irkeshtam–SaryTash–Karamyk (2012) (KGZ IP3);
- Dushanbe–Karamyk (2011) (TAJ IP1); and
- Kurgan Tyub–Panji Poyon (2011) (TAJ IP4).

Table 6 summarizes the average duration of transit (based on SWOD) from origin to destination along the roads rehabilitated under the four CAREC projects selected for study. Direction of travel was also considered, to provide a more complete analysis. Among the four projects, significant improvement in speed was observed in truck shipments on the Irkeshtam–Karamyk route (with transit duration reduced by 3.2 hours), Irkeshtam–Sary Tash (0.9 hours), and Karamyk–Dushanbe (3.9 hours). A marked decrease in transit time was also observed on the Osh–Irkeshtam stretch of road, but the data available after project completion were not sufficient for a conclusive analysis. The remaining routes showed marginal increases or decreases that were not as statistically significant as those detected in the aforementioned routes. Moreover, some of the routes lacked baseline data, limiting the project assessment. In these cases, the opportunity to assess the impact of road rehabilitation was lost.

CPMM-based impact evaluations can be applied to almost every other project outlined in the TTFS, providing a holistic approach to project assessment and monitoring. As demonstrated above, confidence in the analysis is predicated on the availability and sufficiency of data. Thus, to open opportunities for richer statistical analysis, and serve as a primary tool for decision making and impact assessment, the CPMM database must be continually expanded, so that it can eventually cover more routes across the region.

Understanding and Improving Cross-Border Trade

Published data provide only a general view of the value of imports and exports. Under the CAREC Program, there is an information lag, so recent data are not immediately available. For this reason, there are no clear up-to-date data on tonnage, routes taken, activities at

Table 6 Average Transit Duration on CAREC-Rehabilitated Roads

Origin	Destination	Distance (km)	Time in Transit		Remarks
			Before Project Completion	After Project Completion	
Southern Transport Road Rehabilitation: Osh–SaryTash–Irkeshtam (KGZ IP2)					
Completed: 2012					
Osh	Sary Tash	207	6.7	6.5	Not significant
Sary Tash	Osh	207	6.9	6.3	Not significant
Sary Tash	Irkeshtan	84		2.2	No baseline data
Osh	Irkeshtan	291	10.9	7.7	No sufficient data after project completion
Irkeshtan	Osh	291	9.7	10.6	Not significant
Regional Road Corridor Improvement: Irkeshtan–SaryTash–Karamyk (KGZ IP3)					
Completed: 2012					
Irkeshtan	Karamyk	253	10.3	7.1	Significant at 5%
Karamyk	Irkeshtan	253			No data
Karamyk	Sary Tash	169		3.9	No baseline data
Sary Tash	Karamyk	169	3.3	3.7	Not significant
Sary Tash	Irkeshtan	84		2.2	No baseline data
Irkeshtan	Sary Tash	84	3.2	2.3	Significant at 5%
Dushanbe–Karamyk (TAJ IP1)					
Completed: 2011					
Dushanbe	Karamyk	352		10.7	No baseline data
Karamyk	Dushanbe	352	13.4	9.5	Significant at 5%
Kurgan Tube–Nizhni Pianj (TAJ IP4)					
Completed: 2011					
Kurgan Tube	Panji Poyon	102		3.4	No baseline data
Panji Poyon	Kurgan Tube				No data

CAREC = Central Asia Regional Economic Cooperation, KGZ = Kyrgyz Republic, km = kilometer, TAJ = Tajikistan.

Note: The hours are based on speed without delay (SWOD), i.e., not counting the time spent during stops.

Source: ADB, Central Asia Regional Economic Cooperation (CAREC Program). CPMM database.

BCPs, and the choices of modes of transport, yet these are important considerations from a supply chain perspective for improving regional cross-border trade.

For instance, CPMM has shown the high cost and long waits involved in loading and unloading at many BCPs. But further examination has revealed that lack of containerization, coupled with protectionist measures (to benefit domestic trucking industries), creates the need to transload cargoes onto different licensed vehicles. This problem is then compounded by inefficiency, attributed to a shortage of cargo handling equipment; the frequent malfunction of equipment that is on hand; and excessive paperwork when goods cross borders.

Why is this important? Yearly CPMM data show that 20% of all shipments carry perishables. If this is a reliable reflection of the proportion of all shipments in regional trade, then inefficient border crossings due to the transloading of cargoes will necessarily increase spoilage rates, limit the radius of export destinations, and push up the prices of goods. After addressing these issues, an exporting country could send goods farther, with a lower spoilage rate, and possibly secure new markets that were previously inaccessible because of distance.

Integrated Performance Reviews

As a representation of economic activity in the CAREC region and a system for monitoring the impact of CAREC strategy, CPMM provides input for the CAREC DEF, all components of the CAREC Comprehensive Action Plan. CPMM also provides a consolidated snapshot of the progress made under the TTFS (and TTFS 2020).

This is true even for the trade facilitation priority area, which is particularly difficult to measure. CPMM underlies the assessments pertaining to trade facilitation, including progress toward the goals of the CAREC Program 2011–2020 (CAREC 2020) and of the TTFS/TTFS 2020. In contrast to the other priority areas, however, trade facilitation is not so easily quantified in terms of CPMM indicators. But progress in trade facilitation has been measured by CPMM through a monitoring mechanism composed of four TFIs:

- the time taken to clear a BCP,
- the cost incurred when clearing a BCP,
- the time taken to traverse a 500 km corridor section, and
- the costs incurred in traversing a 500 km corridor section.

Another complication is that the effects of trade facilitation interventions are not immediate. It is only over time that progress can be assessed with confidence. Fortunately, CPMM can measure trends over time, and its sustainability helps to ensure confidence in its assessments of the impact of trade facilitation projects.

Table 7 shows the progress in trade facilitation from 2010 to 2012 as measured by the four TFIs, using three color-coded ratings based on change from the baseline year (2010): green for improvement, amber for no improvement or mixed results, and red for worse results. The 2012 results for these four TFIs present a mixed picture. The average delay and cost incurred

Table 7 Trade Facilitation Indicators, 2010–2012

Indicator	Indicative Target	2010 Baseline Year	2011	2012	Progress
Time taken to clear a border crossing (hours)	▼	8.7	7.9	10.9	A
Costs incurred at a border-crossing clearance (\$)	▼	186	156	157	A
Speed of travel along a corridor section (km per hour) ^a	▲	24	22	23	G
Costs incurred to travel corridor section (\$)	▼	712	959	999	R

Note: The green circle with a “G” indicates progress, amber circles with an “A” indicates no progress or mixed results, and the red circle with an “R” indicates a worse outcome.

^a Speed is measured “with delays” for a 20-ton truck or train.

Sources: ADB, CAREC Program. 2010–2012. CAREC Corridor Performance Measurement and Monitoring (CPMM) quarterly and annual reports.

when clearing a BCP both went down in 2011, but then rose in 2012, prompting an “amber” rating. The average time taken to traverse a 500 km section of a CAREC corridor improved, suggesting that the costs and delays encountered at BCPs were offset by improvements in road infrastructure; so this indicator was rated “green.” The average cost of traversing a 500 km corridor section, however, increased for the second consecutive year, resulting in a “red” rating for this TFI. Since the BCP cost increase was relatively slight, the increase in activity cost at non-BCP stops must be the principal cause for this “red” rating.

Available and Current Information

Aside from the DEfR, CPMM’s own quarterly and annual reports provide valuable statistical data for evaluating the composition and direction of freight flows and the costs along the six CAREC transport corridors, including (i) data and tables on cargo movement, to describe the direction of trade; (ii) margins of error, indicating the reliability of the TFIs; (iii) decomposition of time and cost information; and (iv) analyses of road and rail transport. The reports also identify bottlenecks, unofficial costs, and other impediments to the smooth flow of goods.

This sets CPMM apart from research done by other organizations, most of which publish their results only once a year. Annually published data are not likely to capture new and emerging trends and developments. For instance, the change in route imposed on Chinese cargoes destined for Afghanistan and Tajikistan, which were diverted from Karamyk (Kyrgyz Republic) starting in late 2012, was captured by CPMM. While other, more sporadic, surveys might overlook the resultant changes in time, cost, and distance, CPMM documented the sudden increase in longer routes taken through Batken and Isfara. Through the CPMM quarterly updates, readers can understand and respond faster to developments in the CAREC region, and make more informed decisions that will, in turn, affect their supply chains.

CPMM for the Private Sector

At first glance, CPMM's primary target audience seems to be the CAREC SOM and the Ministerial Conference. Given the responsibility of CAREC member governments to meet the CAREC 2020 and TTFS/TTFS 2020 objectives, this is understandable. But CPMM is also a valuable tool for businesses active in international trade and relying on transportation service providers to deliver their goods to market.

On the microeconomic level, CPMM is used to improve the functioning of transport operators and road carriers, including their route selection and inventory management. When monitoring and comparing the performance of key routes and BCPs along the CAREC corridors, CPMM aligns its performance measures—such as time, cost, and reliability—with those used by the transport and logistics industry. Moreover, CPMM's constant monitoring provides customers of transport operators with comparisons and a consistent flow of data, thereby giving them greater confidence as they manage their shipments and inventories.

Comparisons of time and cost factors of alternative routes provide customers of transport operators with options for managing deliveries of goods. With improvements in corridor conditions, competition between routes in terms of time and cost is beginning to emerge, giving shippers more options for getting merchandise to their final destinations more efficiently. Coupled with measures of reliability, CPMM estimates provide them with a sense of how traffic and congestion might induce manufacturers to adopt a more aggressive “just-in-time” approach to deliveries. Such information is especially valuable to shippers of perishable commodities, as they adjust their harvest schedules and inventory to minimize spoilage.

The CAREC business community is already taking note of CPMM, and figuring out how to make the best use of the information it generates. For instance, the Kyrgyz Republic's Association of International Automobile Carriers has noted that border management activities at the Torugart (PRC)–Torugart (Kyrgyz Republic) BCP, on corridor 1c, tend to impose long waiting times at the border. The association has communicated this information to policy makers, so that they could explore the use of containerization and investment in cranes to handle the transloading process. Similarly, in the information portal of the Association for Development of Business Logistics (www.logistika.uz), a CPMM partner association in Uzbekistan, CPMM has prompted the development of an atlas detailing highway infrastructure and service stations—valuable information for drivers transporting goods along Uzbekistan roads. Also, the lengths of road segments and observations on road surface conditions are provided to aid route selection by operators. Another good example stems from the difficulty of establishing the use of TIR carnets in Afghanistan. Although Afghanistan acceded to this international convention in 2010, CPMM revealed that there were no shipments using TIR coverage in 2012 and 2013. The Afghan business community has explained that various implementation problems prompted neighboring countries to refuse to accept TIR carnets from Afghan trucks. This information offered the CAREC Program an opportunity to step in and mediate. After all, regional cooperation is precisely what the CAREC Program can facilitate.

Transportation Infrastructure

CPMM started out as a tool for monitoring and evaluating TTFS implementation and for conducting the midterm review of TTFS implementation. But the depth and extent of its capacity and utility have opened up opportunities to cover other areas of program evaluation. CPMM's primary mandate of identifying the causes of delays and unnecessary costs along the links and nodes of CAREC corridors, including BCPs and intermediate stops, has evolved and expanded to encompass policy making, in the sense that CPMM informs policy discussions and helps identify investment needs. CPMM is also being noticed by managers of other subregional cooperation programs with a trade facilitation dimension: the Greater Mekong Subregion, South Asia Subregional Economic Cooperation, and the Greater Tumen Initiative.

The increasing value of CPMM in identifying investment needs and measuring project performance has led to its use as a primary source of benchmark studies and baseline data for other development projects. CPMM helped to determine the BCPs to be included in the CAREC Regional Improvement of Border Services (RIBS) project, which supports the renovation of BCPs. Specifically, the project will focus on improving the Karamyk BCP on the Kyrgyz side of the Kyrgyz–Tajik border, located on CAREC corridors 3b and 5, and the Guliston BCP, on the Tajik side of the Tajik–Kyrgyz border, located on a key conduit: the Osh–Batken–Isfara–Khujand highway. The RIBS project will upgrade the inspection facilities, including customs, sanitary and quarantine, and veterinary checkpoints, so these BCPs can handle traffic growth and improve their inspection processes. Also, the RIBS project will provide power, water supply, and sewerage facilities; communications facilities; and office and inspection equipment.

Soft Infrastructure and Policy Reforms

The contributions of CPMM to transport and trade facilitation are not limited to identifying priorities for physical infrastructure improvements. They also include highlighting the need for procedural and administrative reform, as well as for broader policy interventions. The CAREC strategy calls not only for physical connectivity, but also for the harmonization of cross-border procedures, the automation of information systems, the adoption of single-window facilities, and better risk-management systems for border control. Such reforms are essential for maximizing the economic benefits derived from infrastructure investments, and for realizing the seamless integration of the CAREC corridors into the global supply chain networks.

In its reports, CPMM evaluates and measures the impact of policy interventions. Previous reports measured the impact on the CAREC region of the Customs Union including Belarus, Kazakhstan, and the Russian Federation, which saw their customs borders effectively removed from July 2011. One positive consequence was that the average border crossing time for trucks entering the Russian Federation from Kazakhstan fell sharply, from 7.7 hours in 2011 to 2.9 hours, in 2012. On the other hand, average crossing times between Kazakhstan and non-Customs Union countries lengthened considerably, from 8.6 hours to 21.5 hours, over the same period. Such long delays, occurring mainly at a handful of BCPs, have distorted overall corridor performance.

CPMM reports also tackle the sensitive issue of unofficial payments, other than the stated official cost of an activity. These payments remain a major factor in keeping costs high. Although the sensitive nature of unofficial payments makes it difficult to capture full information, CPMM collects data on unofficial payments at each stop along a journey, and then tallies the data to estimate the overall cost of shipments along each corridor. This provides CPMM users with a picture of how and where unofficial payments affect the delivery of goods.

CPMM is also instrumental in providing benchmark studies that flesh out the design of proposed regional development projects included in the TTFS list of priority investment and technical assistance projects. One such proposal will support the Regional Upgrade of Sanitary and Phytosanitary Measures for Trade (RUST). Intended to improve the application of sanitary and phytosanitary (SPS) measures to serve regional demand along key CAREC corridors, the proposed project will support the modernization of CAREC SPS measures by rationalizing and updating SPS facilities and developing mechanisms for the mutual recognition of SPS-related certifications issued by CAREC member countries. In the early stages of the project's conceptualization, CPMM played a pivotal role in determining the time SPS procedures take at various CAREC-region BCPs. Without CPMM data, this kind of information on such specific procedures would be difficult to estimate regionally.

With CPMM's extensive coverage of trade-related data, there are a variety of opportunities to fill information gaps and identify further room for improvement in the trade facilitation and trade policy agenda. The CAREC Institute, national associations, and other interested parties are therefore invited to request customized data sets to support independent research.

Lessons Learned

Since its initial implementation, the conduct and analysis of CPMM has evolved significantly to better suit the needs of its stakeholders. As with any other project, issues and problems during implementation were inevitable, but also vital for further project development. The following provides some insights into the challenges that CPMM has encountered, as well as recommendations for implementing solutions.

Since it was first implemented, CPMM has undergone several methodological refinements, including a modification of its DCF. Since the first questionnaire, various key variables, such as unofficial payments, have been integrated into the forms, and the list of activities has been revised to cover common road and rail delays. Correspondingly, the data templates filled out by partner coordinators have been meticulously enhanced to mitigate human input errors.

The integration of the TCD methodology into a monitoring system that is conducted over extended periods of time is, in itself, an enormous challenge. Issues of sustainability, reliability, and data consistency are inherent in any monitoring scheme that continues measuring regularly. Over the years, several partner associations have been involved in populating the CPMM database. To mitigate the accumulation of system and human errors in the data, rigorous training is provided regularly to drivers and CPMM coordinators to ensure

that consistent guidelines observed by data collectors and checkers across all participating associations. To maintain the consistency of CPMM data, future partners will also be obliged to take part in such training programs.

Data from multiple freight forwarders covering various routes across the region pose problems of comparability in several ways. CPMM faces the challenge of summarizing and analyzing transport data encompassing varying distances, cargo tonnages, directions of travel, and modes of transport. Furthermore, CAREC-corridor road and railway networks allow a journey to shift from one corridor to another. To facilitate analysis and comparison, cost and time data were standardized to emulate a truck or train shipment of 20 tons traveling 500 km along the same route before being aggregated according to corridor and mode of transport. These benchmarks are based on the average tonnage and distance traveled for trips reported in the first year of CPMM. Whenever necessary, the direction of travel is also indicated in the reports, to distinguish import from export costs and delays.

Moreover, working with several data collectors in a large region poses the problem of multiple English spellings of the same place names, which hinders straightforward comparison. As an initial solution, CPMM keeps a database of variants of names, but only those of BCPs. In the future, to enrich its analysis, CPMM will maintain a similar list for cities and other key stops and nodes along the CAREC corridors.

CPMM partner associations are also vital for the development of CPMM. Serving as primary data collectors, their performance greatly affects the quality of data that feed into the analysis. Regular reviews of their performance ensure that their data are accurate and meet the standards the CPMM methodology requires. However, with the huge volume of data collected, opportunities to submit fabricated, or previously submitted, data may arise. Safeguards are in place and, coupled with the consultants' own background knowledge, will suffice to detect such spurious intent.

Aside from their role as data collectors, freight forwarders and carriers are among the intended users of CPMM. However, their anecdotal feedback on how they regard CPMM is not always coherent. At the annual CFCFA meeting in December 2012, much anecdotal information was shared, but it provided no clear sense of how operators actually use CPMM data. One problem could be the fact that CPMM reports estimates by corridor, and not at the country level, of thereby inhibit the sense of ownership among partner associations. This problem could be addressed through a survey among truckers and freight forwarders to determine what they look for in a monitoring system, and what kind of monitoring system they think would be best for the industry.

CPMM's primary mandate is to help policy makers and authorities determine the courses of action to take vis-à-vis problem areas in CAREC-region transport and trade facilitation. However, until recently, efforts to further this objective and the venues in which to do so were somewhat limited. A conference held in Almaty in March 2013 suggested that policy makers are beginning to scrutinize CPMM analyses and to consider what they might do to help improve corridor performance. Again, country-level analysis could provide an incentive for national governments and country-based associations, and would be useful for benchmarking purposes. Furthermore, CPMM analysis at the BCP level could help

CAREC member customs services to identify the BCPs at which to conduct their own time release studies.

Over the years, CPMM has captured the interest of other stakeholders. Organizations have recognized CPMM for its achievement in eliminating gaps in data on Central Asia, data that had proved difficult to quantify or even to obtain without a regional effort. The Open Society Institute and the United States Agency for International Development (USAID), among others, are using CPMM data to examine the Northern Distribution Network and the impact of investments on Afghanistan's borders. And Google Analytics reports that Russian observers have been examining CPMM data on the CFCFA website.

Clearly, CPMM is making a mark by delivering valuable information that can be instrumental in developing the economy of the entire CAREC region.

5

Evaluation and Next Steps

Thus far, some of the prevailing performance measurement tools applied to transport corridors have pointed out the potential of, and the need for, further ancillary transport and other logistics-related infrastructure, as well as tools such as CPMM, for better transport and logistics management and performance measurement. Establishing proper measurement tools will facilitate institutional reform and allow logistics performance to be more manageable. However, there is still room for improvement in CPMM. This topic will be addressed later in this chapter. First, the discussion will center on the indicators of corridor performance under CPMM and under other measurement methodologies.

How Is CPMM Doing on Corridor Performance?

As mentioned in Chapter 3, corridor performance indicators have been developed to provide a basis for comparison or benchmarking of one location (a BCP or stretch of a transit corridor) against the others in terms of the efficiency of customs and border clearance, infrastructure quality, and the service quality of logistics provision. In the case of the CAREC Program, the main corridor performance indicators are based on the standard measures of time and cost. Appropriate data generated from a corridor performance study are then analyzed to identify the physical and nonphysical barriers to trade and transit traffic encountered at a BCP or along a corridor, thereby providing a means of pinpointing specific causes of delays and high costs. This information should then drive an effort to make improvements in infrastructure, policy, and operations.

Corridor performance is generally evaluated from two perspectives:

- The infrastructure perspective, which focuses on the physical connectivity of a corridor and how it is being used, is currently a basis for measurement under CPMM for the CAREC Program. It is useful when looking at the physical capacity constraints of the existing infrastructure, particularly for transit. However, to derive a definitive conclusion on logistics performance, analysis from the infrastructure perspective must be complemented by analysis from the service perspective.
- The service (operational or procedural) perspective is evaluated on the basis of the time and cost of moving goods through a corridor. With the exception of the high-income countries, this remains a serious constraint worldwide. The service perspective offers more insight than the infrastructure perspective when it comes to improving trade facilitation, as it allows one to compare corridors of similar length or characteristics. This comparison, in turn, will drive efforts to reach the desired optimal transit times. CPMM has some indicators that deal with the service perspective, but to stimulate improved performance, it should expand this perspective to studies of stretches of road along the same corridor.

Typically, corridor monitoring takes two main forms: (i) corridor-wide monitoring; and (ii) detailed monitoring at specific locations, such as predetermined bottleneck locations, typically BCPs within a corridor. Corridor-wide monitoring can be done through questionnaires, interviews, drivers' trip diaries, and so on, while bottleneck monitoring is typically focused on border crossing times and is based on independent surveys. CPMM is well equipped to cover both aspects.

During the 1990s, the methodologies of corridor performance measurement took the form of surveys, open-ended questions, and Likert perceptual scales to measure perceptions of corridor performance. Over time, the methodologies have evolved through experience and learning, and have come to focus on ground-level operators such as freight forwarders and carriers, which are deemed the most suitable sources of views, feedback, and assessments of the important aspects of the logistic performance, thereby enabling the methodologies to target specific pinch points. In this area, CPMM is by far the most comprehensive measurement instrument available, but also the most time consuming.

Recommendations for CPMM

As with any other assessment procedure, corridor performance measurement will be effective only if it is done continually and consistently. The rest of this section presents analyses and recommendations on how CPMM can be further improved in terms of depth and scope, particularly in light of the new corridor alignments and the increased focus on railways and trade logistics services under the refined TTFS (TTFS 2020).

- **Include country-level analysis.** There is a perceived lack of ownership among the CAREC member countries with regard to CPMM. This is because CPMM findings are reported by corridor, and no one corridor traverses all the CAREC member countries. An initial CPMM country-level analysis for Kazakhstan, Mongolia, and Uzbekistan was presented during the CPMM International Workshop in Almaty in March 2013.⁸ Notable feedback included responses from several officials who said that CPMM recommendations regarding which segments along specific corridors need improvement to facilitate trade in the region would be helpful for their investment decisions on road and highway improvement.

If CPMM data were analyzed by country—as the World Bank does with its Doing Business rankings and Logistics Performance Index (LPI)—then there would be more incentive for national governments and country-based associations to use the data either for external benchmarking or for internal improvement. While ranking a country's performance with respect to a certain corridor may incite controversy, it could spur action by the country concerned to correct the deficiencies in its

⁸ ADB, Central Asia Regional Economic Cooperation (CAREC) Program. 2013. CPMM Country Tables: Corridor Performance Measurement and Monitoring. Presentation at the CPMM International Workshop: CAREC Experience and International Prospects. Almaty, Kazakhstan. 1 March. http://www.carecprogram.org/uploads/events/2013/CPMM-Intl-Workshop/008_103_209_Country-Tables-Kazakhstan-Mongolia-Uzbekistan.pdf

infrastructure or institutional framework in order to place higher in the rankings the next time around.

- **Present a traffic speed map in CPMM annual reports.** Travel speeds can vary along different sections of the same corridor. Presenting these travel speeds graphically or visually on a travel heat map (according to international standards: colored red for slow speeds, amber for moderate speeds, and green for normal speeds) could help in identifying investment priorities for specific corridors and offer transporters options for designing transit routes that would be more cost effective.

Related to this point is the issue of environmental quality. Typically, the travel heat maps can show the higher levels of carbon dioxide emissions on certain stretches of a corridor when travel speed slows down significantly. Collecting and presenting information in this form is useful when building a case for imposing an emissions-based charge for travel through the slower stretches of a corridor. The CPMM quarterly and annual reports could consider a separate section on the environmental quality of the corridors, which could be monitored seasonally. And the reports could present a comparison of truck operating costs (including an emissions component) for different corridors and during different seasons. Ideally, this information should be coupled with the value of the shipment transported through the corridors to assess the true cost of delays, unpredictability, and unreliability along a corridor. The World Bank (2007) has estimated that such delays and unreliability can sometimes force transporters to use higher-cost alternatives, which are estimated to be about 8% of the value of shipments daily.

- **Fix the weights for each corridor in calculating the TFIs.** A major problem now is how to explain the quarterly changes in the TFIs. It is sometimes difficult to track the underlying causes. One problem is the different compositions of the samples taken each month, as they vary between modes of transport and between corridors. CPMM could consider fixing the weight of each corridor: it could derive a TFI based on the assigned weight of one-sixth for each corridor, or it could assign a greater weight to a high-density corridor. It would be ideal if CPMM could consider trade flows within the region, but these would be difficult to measure because of the unavailability of data. Earlier exercises that attempted to resolve this issue used trade-related data such as intraregional trade as proxies. However, without a definitive basis for weights, proxy variables can only approximate the true distribution of trade.
- **Standardize the border crossing point data to be presented in the quarterly reports.** There is a need to standardize data regarding BCPs to be presented in the CPMM quarterly reports, and to include visual displays in the reports to highlight the performance status of each key BCP. Doing so would allow stakeholders to see if the efficiency of key BCPs has improved or deteriorated over time. In addition, this information would enable the relevant government ministries and agencies in CAREC member countries to take corrective action where it is most needed, according to CPMM benchmarks and subsequent analyses of key BCPs.

- **Gather data on the direction of trade.** The direction of trade is crucial in any discussion of border crossings, as inbound customs procedures differ significantly from outbound, and transit trade, imports, and exports are all treated differently. Hence, reports should distinguish between these types of trade to give a better picture of where and how delays occur during border crossings.
- **Include trends and seasonal patterns.** Past CPMM reports only showed trends by comparing year-on-year and quarter-on-quarter changes in the indicators. However, more underlying patterns could be revealed, providing better insights to readers if seasonality is considered. Seasonality refers to the systematic, although not necessarily regular, patterns within a given year caused by changes in the weather or procedures. Knowledge of these changes could be vital for decision making by freight forwarders, shippers, and policy makers. Formal statistical tests for seasonality require at least 4 years of quarterly data, a requirement that CPMM can now support.
- **Integrate CPMM with other trade studies.** As emphasized in previous discussions, other trade studies could be used to supplement CPMM data. One example is the time release study (TRS). CPMM's objective of identifying bottlenecks and measuring the efficiency of customs procedures in BCPs parallels TRS objectives. While CPMM could provide input and guidance during the conduct of such studies, the results of TRSs could also supplement and verify CPMM observations. CPMM could also provide a counterpoint to overly rosy TRS results, fostering greater rigor and professionalism in the conduct of TRSs, as well as effective ways of addressing recorded inefficiencies.

Concluding Observations and Next Steps

This report began with an overview of the CAREC Program's strategic initiative to expand trade and improve competitiveness by strengthening priority transport corridors in the interest of regional economic development. In a globalized competitive context, in which goods must reach the market in the least amount of time, and prudent cost management is a requisite for success, it is imperative that regional blocs such as CAREC improve the main modes of transport into and out of their regions, through their regions, within their regions, and within each country in their regions. In this regard, regulatory obstacles such as border controls, and other causes of delays encountered in transit, can impede trade.

The CAREC region is trying to grow economically, and is seeking to compete on a global level. Since most CAREC economies rely on overland transport, the support given by international financial institutions such as ADB and the World Bank for building reliable transport infrastructure in the region will be critically important.

The six priority CAREC corridors are regional arteries for trade flows. Initiatives that will facilitate trade through a more efficient transportation system, one that has fewer choke points and minimal unnecessary delays, must be supported. The corridors serve a variety of purposes, some unique and others overlapping. The purpose of CPMM activities is to identify transport and trade facilitation issues and challenges along these six priority

corridors by providing practical, reliable, and actionable information. CPMM collects data to better record and understand complex border crossing activities and speeds of travel for road and rail transport. CPMM is a standardized way of capturing, validating, and aggregating transport data. This exhaustive study of the six CAREC corridors has revealed the necessity of, and the potential for, the development of further ancillary transport and other logistics-related infrastructure. There is also a need for better institutional frameworks and reforms, particularly at the BCPs, where incidence analysis points to sometimes unnecessary delays due to operational issues.

CPMM provided valuable input for the TTFS midterm review, in 2012–2013. The refined TTFS (TTFS 2020), adopted after the midterm review, introduced selected corridor extensions to develop connectivity with ports, create shorter routes along existing corridors, and improve interface with the regional rail network. TTFS 2020 highlights the need to increase geographic coverage and interconnectivity between corridors via road and rail to maximize effectiveness in enabling increased trade flows. CPMM will need to include these corridor extensions in its analysis.

One should also take into account the efforts made by international organizations such as the World Customs Organization (WCO) and UNESCAP to promote monitoring initiatives (e.g., the TRS and the TCD) aimed at improving the conditions for transport, logistics, and trade. The efforts of governments in the region to undertake such studies show a genuine commitment to ensuring that trade is not compromised by weak infrastructure or unsatisfactory institutional frameworks. Industry recognizes that international transport must be better, faster, and cheaper, despite the challenges of distance and borders, and the inaccessibility of seaports.

With the proper measurement tools, institutional reform and logistics performance become easier to manage. This report has evaluated the core methodologies of various international tools used for trade and transport measurement and improvement. Clearly, policy making must be informed by such tools, and CPMM is no exception. Accumulated transport and trade data gathered by CPMM would be useful in determining the needed reforms and infrastructure at the national level that would also have positive regional impact.

The benefits of technology must likewise be considered. Given the state and extent of technological advancement, smartphones, the global positioning system (GPS), and other floating sensors should be made easily accessible to ground operators, so that they can collect data as efficiently and as cheaply as possible. Tachographs, for example, can easily record all stops (including those within BCPs), driving periods, and speeds of driving. However, the CAREC Program cannot guarantee sustainable funding for this technology. ADB is supporting the development of a greater revenue-generating capability for the CFCFA, in the hope that it will choose to fund and sustain the conduct of CPMM. Over time, some of these new technologies may become more affordable, and this development may prompt CPMM partners to use the technologies for improved data collection.

Information visibility would help ensure that a suitable dashboard for reporting and monitoring purposes remains relevant and timely. In this regard, through its Excel template, CPMM can serve to highlight the impact and extent of BCP bottlenecks over an extended period. Such

analysis can help develop appropriate policies regarding BCPs and goods reclassifications, in the interest of faster transit. For instance, green lanes for transport should remain green on a dashboard or visualizer. Transport lanes or corridor sections with long stretches of “red” because of low values of speed with delays (SWDs) should trigger an alert to freight forwarders well in advance, so they can divert their traffic accordingly.

As discussed in Chapter 3, initial observations suggest that most of the corridor performance measurement tools are useful and are driven from the ground up, largely relying on primary data collection. If CPMM joins forces with other strategic marketplace resources, such as the International Trade Centre (ITC), which provides trade-related technical assistance, the resulting combination can be a potent source of useful benchmarking and market-entry information for policy makers and the business community. At the same time, CAREC notwithstanding, other regional blocs are implementing some ambitious programs, especially in the case of the Asia-Pacific Economic Cooperation (APEC). APEC’s Supply-Chain Connectivity Framework Action Plan (SCFAP) is a measurement framework worthy of policy attention by CAREC and ADB. “Smart” (i.e., specific, measurable, attainable, relevant, and time-bound) target setting for the improvement of CAREC corridors, as represented by the TTFS 2020 results framework, should be the next step. And CPMM could prove very useful in that regard.

Finally, this report has painstakingly provided a fine-tooth combing of the birth and evolution of CPMM, including the roles and responsibilities of its stakeholders, and its advantages over other tools, specifically its ability to delve into the factors of reliability and speed of transport, which are important for bottleneck and incidence analyses. Through this activity, two transport attributes that are critical for time-definite logistics—speed with delay (SWD) and speed without delay (SWOD)—have been established and measured diligently. Understanding data is a logical next step to building knowledge. In the case of CAREC, the ratio of SWD:SWOD provides a good yardstick for appreciating corridor subsection performance. Some operational TFIs have also been presented. These TFIs are simple, but effective and objective. Further, they show the value of continuing with the CPMM approach, and this puts CPMM’s TFIs on the same plane as the indicators now being used by APEC, ITC, the World Bank, and the WCO.

It is hoped that this report will serve as an instructive read to many, and for many years to come.

Appendix 1

Profiles of CAREC Corridors

CAREC Corridor 1: Europe–East Asia (Kazakhstan, the Kyrgyz Republic, and Xinjiang Uygur Autonomous Region)

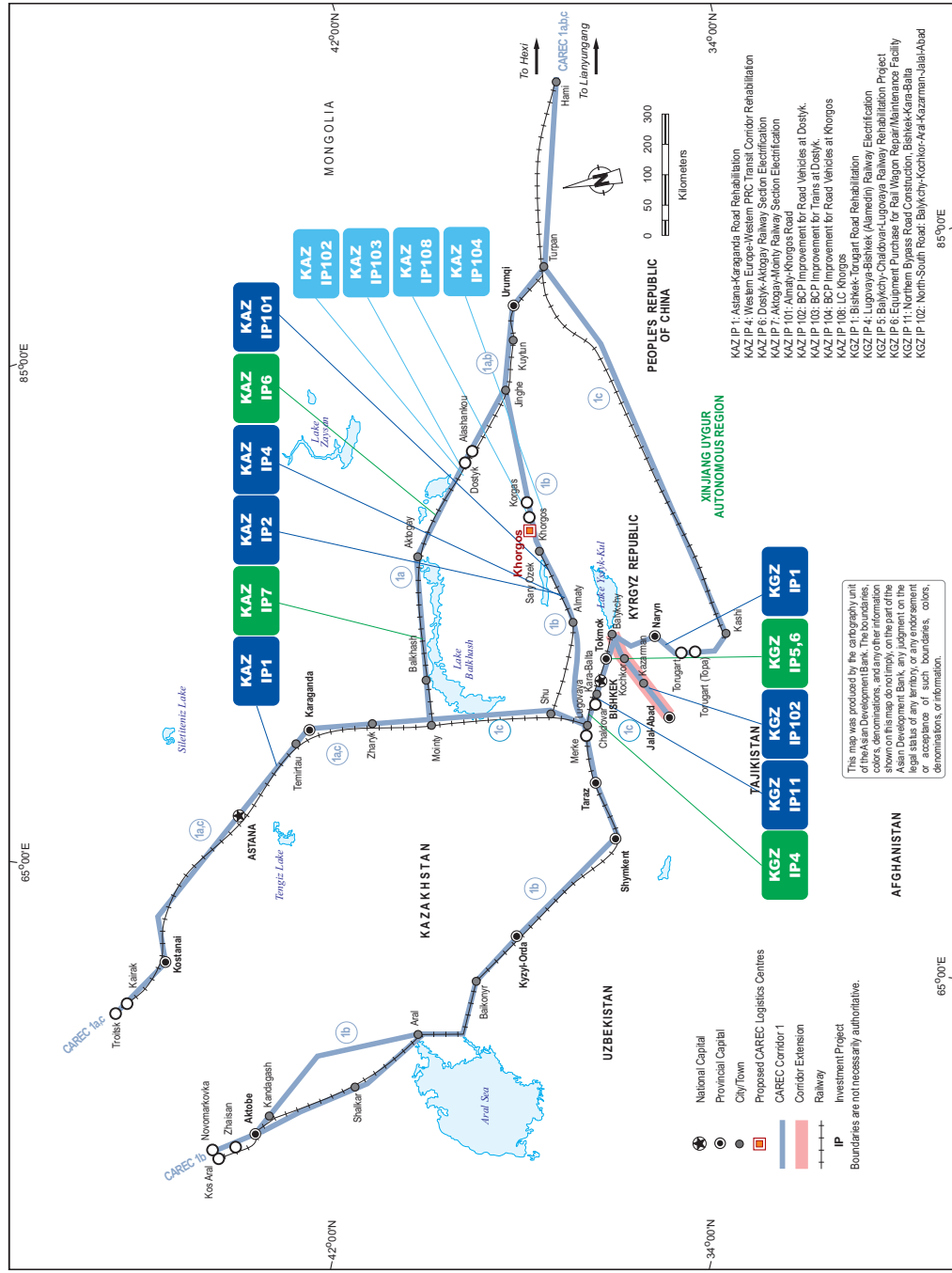
CAREC Corridor 1 (Figure A1.1) is the most active of the six corridors of the Central Asia Regional Economic Cooperation (CAREC) region and serves as the key transit route for Chinese exports. It links Europe to the People’s Republic of China (PRC) and the rest of East Asia via the Russian Federation. All goods are shipped to Russian cities such as Moscow and Kazan, and then a number of shipments continue on to Europe. The journey starts from the Xinjiang Uygur Autonomous Region (XUAR), PRC, and ends at the Russian border, via Kazakhstan and the Kyrgyz Republic.

Corridor 1 has three subcorridors, with a comprehensively integrated road and railway network. Manufactured consumer goods are mostly transported by road because road transport is more flexible and able to provide door-to-door service. Perishables such as vegetables and fruit, which compose 40% of total cargo movements along corridor 1 (ADB 2013b), are shipped by truck within a country or across borders as exports. Rail transport is used for moving industrial products, raw materials, and bulky goods (such as minerals, metals, wood, and vehicles) because it is more economical over longer distances. Most cargoes are transported by delivery trucks or in standard rail wagons, but containers are not widely used on corridor 1, unless required by the PRC to ensure fast transshipment at Lianyungang.

Subcorridor 1a uses road and rail transportation. Road conditions are generally good. Merchandise is shipped by train and passes through the Ala Shankou (PRC)–Dostyk (Kazakhstan) border crossing point (BCP) on the way to Astana or Almaty.

Subcorridor 1b is an east–west highway, and a key segment of the Western Europe–Western PRC International Transit Corridor. This subcorridor offers many economic benefits, among them, the fact that it is the shortest ground transport route from the PRC to Europe. The shipments pass through the Khorgos (PRC)–Khorgos (Kazakhstan) BCP on the way to Almaty for redistribution. Some cargoes continue westward through Shymkent and Kyzylorda to Aktobe, all in Kazakhstan, while others are transported to other parts of the CAREC region. Shipments may pass through the Zhaisan (Kazakhstan)–Novomarkovka (Russian Federation) BCP to enter the Russian Federation and eventually reach Europe.

Figure A1.1 Central Asia Regional Economic Cooperation (CAREC) Corridor 1



cars 13-2196b AV

Source: ADB. 2014. CAREC Transport and Trade Facilitation Strategy 2020. Manila.

Subcorridor 1c traverses the southern part of the XUAR from Urumqi to Kashi, an important consolidation and deconsolidation center. Cargoes are transported by truck to the Kyrgyz Republic, passing through the Torugart (PRC)–Torugart (Kyrgyz Republic) BCP. Shipments are cleared and sold in Dordoi. Most of these goods stay in the Kyrgyz Republic, but a portion of them are sold to Kazakh traders, moved across the border via shuttle carriers, reconsolidated, and again put on trucks to continue to their final destinations. Much cargo from the PRC to Kazakhstan goes from Urumqi through the Khorgos–Khorgos BCP. This subcorridor serves as an important link between the Kyrgyz Republic and the Russian Federation, via Kazakhstan.

According to the refined Transport and Trade Facilitation Strategy (TTFS 2020), there are four new proposed projects on corridor 1 within Kazakhstan, all of which reflect the increased emphasis on trade facilitation and logistics. Three will improve BCPs at Dostyk (road and rail) and Khorgos (road). The fourth will develop a major logistics center at Khorgos. There is also a proposed project to construct a bypass to ease road congestion on subcorridor 1c, in the vicinity of Bishkek. Five railway projects involve electrification, rehabilitation, and wagon repair facilities, reflecting a shift in investment from road to rail.

CAREC Corridor 2: Mediterranean–East Asia (Afghanistan, Azerbaijan, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan, and Xinjiang Uygur Autonomous Region)

CAREC Corridor 2 (Figure A1.2) is the longest corridor, with a wide-ranging network connecting East Asia with the Caucasus, Mediterranean, and southern Europe. The corridor covers seven CAREC countries—from Azerbaijan, in the west, to the PRC, in the east. For this reason, it is considered an essential pathway for regional trade (even though corridor 1 is seen as more efficient in terms of transporting goods from the PRC to Europe).

Azerbaijan and Uzbekistan are the important transit countries for suppliers. A large number of shipments go through these two countries to enter southern Europe via Turkmenistan, Iran, and Turkey. There is also high demand for regional and domestic cargo movements of manufactured goods; industrial machinery and metals; and (for export) food, cotton, and yarn.

Subcorridor 2a is used heavily by the Russian Federation and Europe to import commodities and materials from Central Asia. Subcorridor 2b is an important route connecting Central Asia to the Mediterranean. Subcorridor 2c is particularly significant because of its intended use by the Silk Wind trans-Caspian container block train service linking the PRC to Turkey and, with the opening of the Bosphorus Tunnel, to Europe.

CAREC Corridor 3: Russian Federation–Middle East and South Asia (Afghanistan, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan)

Corridor 3 (Figure A1.3) is a regional transit corridor that links the Russian Federation, in the north, to the Middle East, in the southwest. The corridor starts in the north from the BCP at Veseloyarsk (Russian Federation)–Aul (Kazakhstan), and passes through several Kazakhstan cities (Semey, Charskaya, and Aktogay) on the way to Almaty.

Subcorridor 3a runs west into Uzbekistan, and then enters Turkmenistan at Alat (Uzbekistan)–Farap (Turkmenistan). Machinery and equipment move through Iran into Central Asia using subcorridor 3a. Alternatively, subcorridor 3b, which enters the Kyrgyz Republic at the Kordai (Kazakhstan)–Ak Zhol (Kyrgyz Republic) BCP, is also used for these cargo movements.

There are two popular routes in Corridor 3. One is the road transit of imported goods from Iran to Uzbekistan, which can continue to Kyrgyz Republic and Tajikistan. Trucks usually pass through Sarakhs–Sarakhs and Saryasia–Dusti... Manufactured items and machineries are transported along this route... The origin is usually Sarakhs in Iran, while the destination varies: Andijan, Tashkent, Dushanbe, or Bishkek.

The second route is cargo movement between Russia and Central Asia. The goods start from Uzbekistan and travel into Kazakhstan, going to the designated Russian cities. Agricultural products and textiles are sent in along this route from Central Asia to Russia, while equipment and manufactured goods come from Russia destined for Central Asia.

—CAREC Corridor Performance Measurement & Monitoring Annual Report 2011

The corridor 3 railway follows almost the same route as subcorridor 3a. Most of the railway investments identified in TTFS 2020 and the associated Implementation Action Plan are allocated to this subcorridor.

CAREC Corridor 4: Russian Federation–East Asia (Inner Mongolia Autonomous Region and Xinjiang Uygur Autonomous Region in the People’s Republic of China, and Mongolia)

This is a trans-Mongolia corridor that offers road and rail connectivity between the Russian Federation and East Asian markets, including the PRC, Japan, and the Republic of Korea. The eastern section of corridor 4 (Figure A1.4) is separated from the rest of the six CAREC corridors. It connects the Russian Federation with the PRC through Ulaanbaatar, Mongolia. For road shipments, Russian and Chinese exports terminate in Ulaanbaatar. For both rail and road shipments, imports into Mongolia are more expensive than exports because of the trade imbalance between Mongolia and its neighbors, the PRC and the Russian Federation.

Corridor 6a was used heavily by Uzbek drivers, both for imports and for exports. For exports, products such as fruits, vegetables, and textiles were carried from Uzbekistan to Moscow, or Samara, in Russia. For imports, on the other hand, machineries and agricultural products were transported from Moscow, Ekaterinburg, and St. Petersburg.

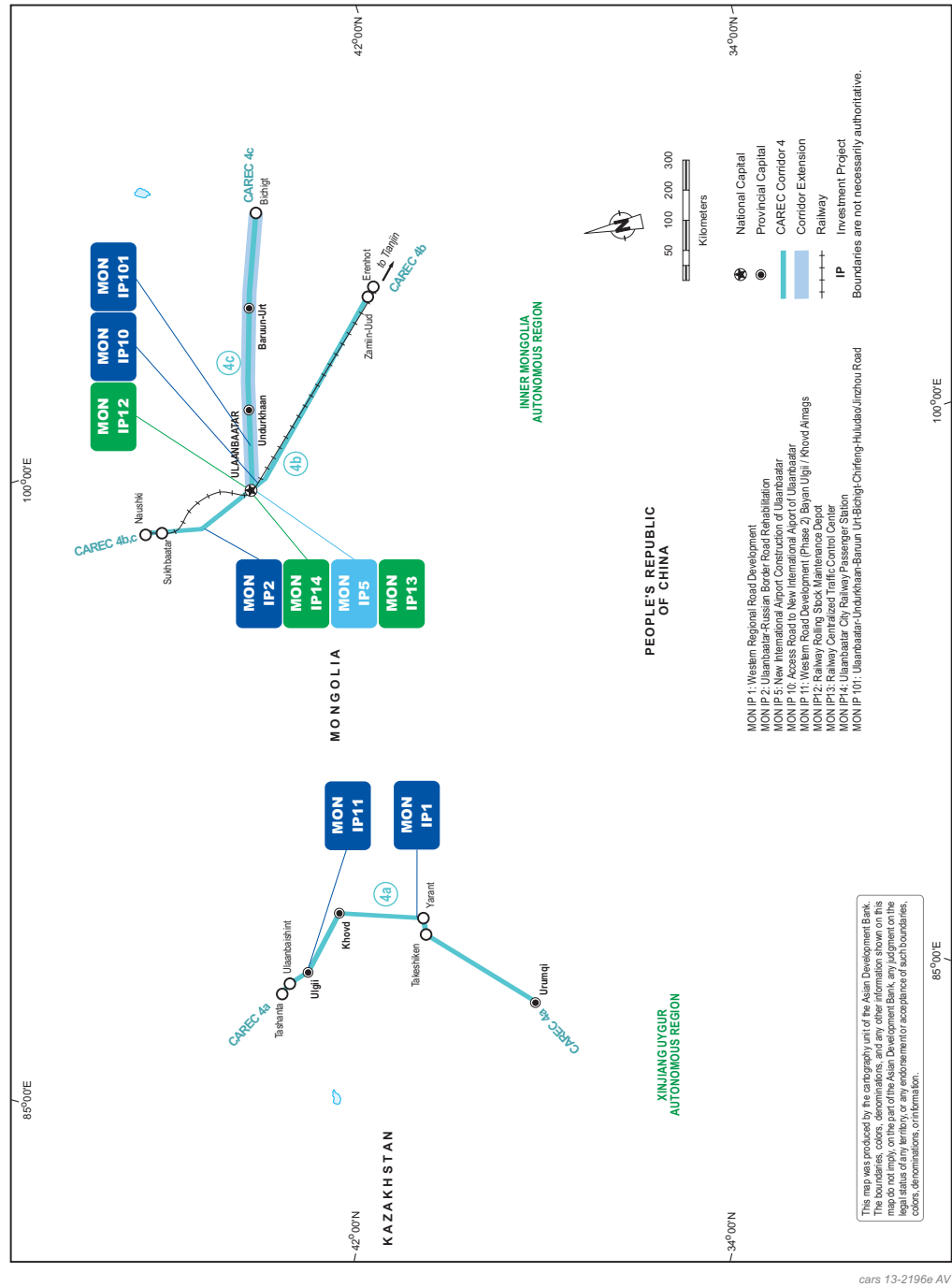
—CAREC Corridor Performance Measurement & Monitoring Annual Report 2011

Subcorridor 4a connects Urumqi with the Russian Federation through western Mongolia. Truck drivers pass through the BCP at Takeshikent (PRC)–Yarant (Mongolia) to reach Mongolia, then travel through the Mongolian cities of Olgii and Hovd. Farther north, they enter the Russian Federation at the Ulaanbaishint (Mongolia)–Tashanta (Russian Federation) BCP. However, the number of shipments in subcorridor 4a is significantly less than that in 4b.

Subcorridor 4b is a very important route for Mongolia’s imports, exports, and especially for transshipment cargo between the Russian Federation and the East Asian markets. The road traverses eastern Mongolia, passing through the Khiagt (Russian Federation)–Altanbulag (Mongolia) BCP in the north, and the Zamiin-Uud (Mongolia)–Erenhot (PRC) BCP in the south. Since most of Mongolia’s exports are destined for Japan and the Republic of Korea, the Erenhot–Jining–Tianjin route, which is about 980 kilometers (km) long and has access to the Xingang seaport, offers the most direct route.

Meanwhile, trains pass through the BCP at Naushki (Russian Federation)–Sukhbaatar (Mongolia) in the north and the BCP at Zamiin-Uud (Mongolia)–Erenhot (PRC) in the south. Imports into Mongolia by train begin in Tianjin, travel through the Erenhot–Zamiin-Uud BCP, and end up in Ulaanbaatar. The point of departure for Mongolian exports by rail is Ulaanbaatar, and the route ends in Tianjin. Mongolia exports zinc cathodes, copper cathodes, and a large number of minerals to the PRC.

Figure A1.4 Central Asia Regional Economic Cooperation (CAREC) Corridor 4



Source: ADB. 2014. CAREC Transport and Trade Facilitation Strategy 2020. Manila.

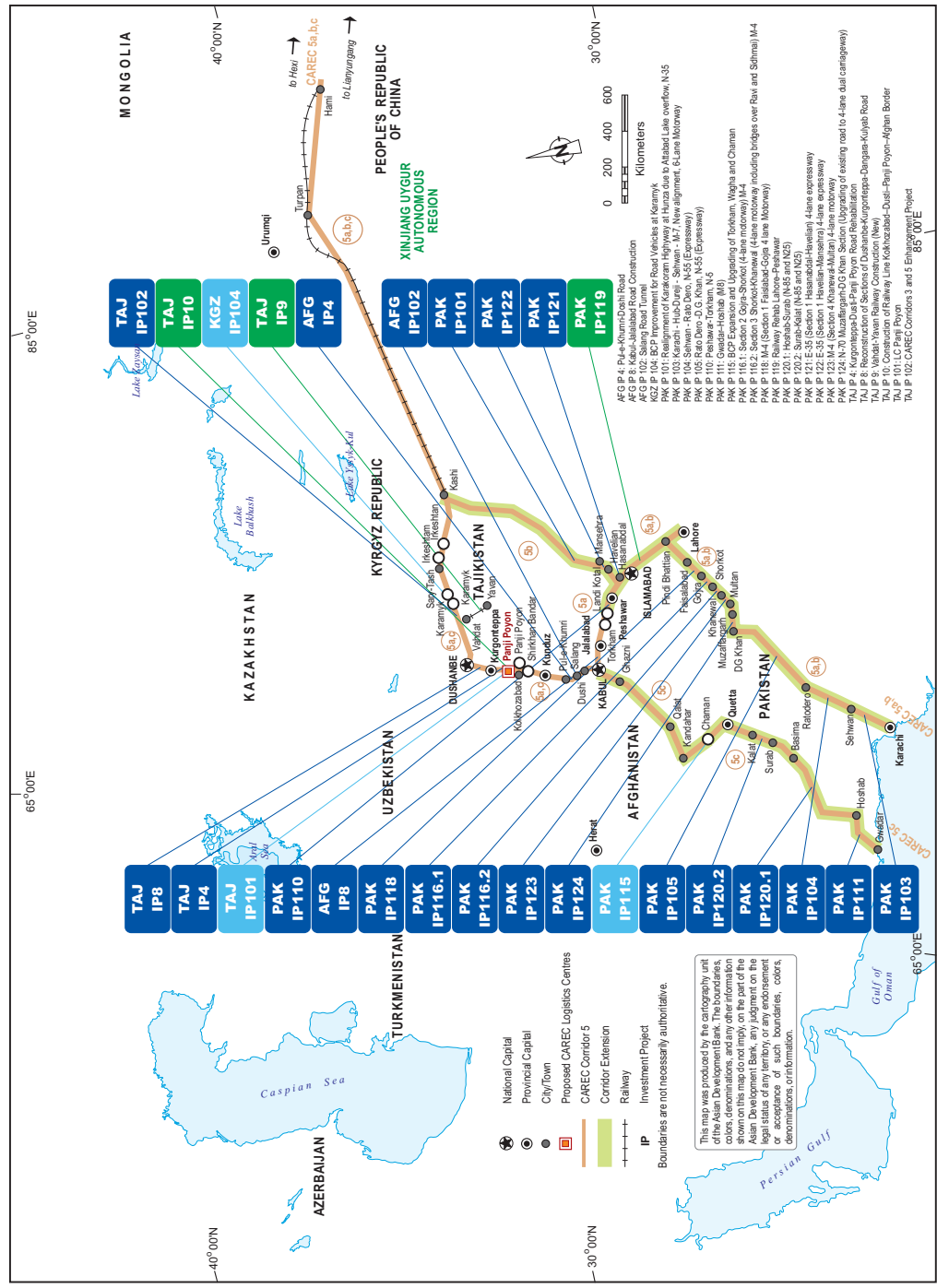
CAREC Corridor 5: East Asia–Middle East and South Asia (Afghanistan, the Kyrgyz Republic, Pakistan, Tajikistan, and Xinjiang Uygur Autonomous Region)

This corridor (Figure A1.5) has the potential to offer the shortest route from Central Asia to Pakistani seaports in the south, such as Karachi and the new port at Gwadar. It is mainly used for regional road transit, and facilitates trade flows among East Asia, Central Asia, and South Asia. From Karachi to the BCP at Torkham (Afghanistan)–Peshawar (Pakistan), the distance is about 1,750 km, which is the shortest route from Central Asia to a seaport. In the PRC, road and rail are available from Urumqi to Kashi, beyond which trains go no farther. The railway networks in the Kyrgyz Republic and Tajikistan are not well connected. In Afghanistan, there is virtually no rail at all. Shipments on this corridor pass through the BCP at Yierkeshitan (PRC)–Irkeshtam (Kyrgyz Republic) to enter the Kyrgyz Republic. They continue southward and cross into Tajikistan at the Karamyk (Kyrgyz Republic)–Karamyk (Tajikistan) BCP.

The physical terrain in Tajikistan is mountainous. Corridor 5 continues through this terrain and reaches Afghanistan at the Panji Poyon (Tajikistan)–Shirkhan Bandar (Afghanistan) BCP. Shipments cross south into Afghanistan, go through a few major Afghan cities, and then enter Pakistan at the BCP at Torkham (Afghanistan)–Peshawar (Pakistan). Shippers face higher premiums in cargo insurance and freight costs when crossing into Afghanistan and Pakistan, because of security concerns.

With Pakistan now a member of CAREC, plans are under way to extend corridor 5 to the Arabian Sea.

Figure A1.5 Central Asia Regional Economic Cooperation (CAREC) Corridor 5



Source: ADB. 2014. CAREC Transport and Trade Facilitation Strategy 2020. Manila.

CAREC Corridor 6: Europe–Middle East and South Asia (Afghanistan, Kazakhstan, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan)

This is a north–south corridor that offers access to Pakistani and Iranian seaports in the south.¹ It traverses a number of countries and shares sections with other corridors. For almost its entire length, it overlaps other corridors (corridors 1, 2, 3, and 5).

Corridor 6 (Figure A1.6) branches out into three subcorridors—6a, 6b, and 6c. Subcorridors 6a and 6b include both roads and railways. Subcorridor 6b is the east–west link that allows cargo movements between 6a and 6c. Corridor 6 is a route used heavily by Uzbek freight forwarders to ship exports to and imports from Iran and the Russian Federation. Through this route, Uzbekistan plays the role of a transit country for shippers in the Middle East and the Russian Federation sending goods into Central Asia. Goods originate from as far as Turkey, Estonia, and Latvia. Corridor 6 is also the only corridor that connects both Iranian and Pakistani seaports to Central Asia.

Subcorridor 6d connects Turkmenistan’s Turkmenbashi with Pakistan’s Gwadar, linking two CAREC seaports. A new rail corridor extension has been added, and is now known as subcorridor 6e. This rail corridor connects Kazakhstan to Iran by way of Turkmenistan.

¹ ADB, Central Asia Regional Economic Cooperation (CAREC) Program. 2013. *CAREC Corridor Performance Measurement & Monitoring Annual Report 2012*. Manila.

Appendix 2

Internationally Accepted Tools for Measuring Performance and Monitoring Transport and Trade Facilitation Programs

With the growing emphasis on improving trade and supporting economic development, there have been many studies on transport and trade improvement by various international agencies. There is a consensus in the international community that “transport corridors represent an accumulation of flows and infrastructures of various modes and their development is linked with economic, infrastructural and technological processes” (Rodrigue, Comtois, and Slack 2009). One important international methodology—time/cost–distance (TCD), developed by the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)—was discussed in Chapter 3, with an account of how it served as a basis for the corridor performance measurement and monitoring (CPMM) methodology. To underscore the merits of CPMM, a discussion of notable ongoing studies on trade facilitation, transport, and logistics by international donor organizations or nongovernment organizations follows.

World Bank: Doing Business¹

Overview

The first Doing Business report was published by the World Bank in 2003, with five indicator sets measuring business regulation in 133 economies. By 2013, the tenth Doing Business report had grown to 11 indicator sets and 185 economies. *Doing Business 2013* used data measured in 2011–2012 (World Bank 2013).

Doing Business measures the business regulatory environment for domestic firms. In particular, the report focuses on small and medium-sized enterprises, which are the key drivers of competition, growth, and job creation, especially in developing economies.

Stakeholders

Research for over 1,000 journal articles included Doing Business data. For policy makers, the Doing Business report goes beyond just identifying problems; it also specifies which regulations or regulatory procedures are impeding the conduct of business in a particular country.

Methodology

Doing Business data are based on the domestic laws and regulations of each country, as well as the administrative requirements. The 11 indicators presented and analyzed in the Doing Business report measure business regulation and the protection of property rights—and

¹ World Bank. Doing Business reports. <http://www.doingbusiness.org> (accessed 17 June 2014).

Table A2.1 Indicators in the World Bank Doing Business Report

Indicator Set	Topics Covered
Starting a business	Procedures, time, cost and paid-in minimum capital to open a new business
Employing workers	Maximum length of a single fixed-term contract (months); maximum length of a fixed-term contract, including renewals (months); minimum wage for a 19-year old worker or apprentice (\$/month); ratio of minimum wage to value added per worker
Enforcing contracts	Procedures, time, and cost to resolve a commercial dispute in court
Resolving insolvency	Recovery rate in bankruptcy
Getting credit	Strength of legal rights index, depth of credit information index
Registering property	Procedures, time, and cost to register a transfer of commercial real estate
Protecting investors	Indices of the extent of disclosure, extent of director liability, and ease of shareholder suits
Paying taxes	Number of tax payments, time to prepare and file tax returns and pay taxes, total taxes as a share of profit before all taxes are paid
Trading across borders	Documents, time, and cost to export and import
Dealing with construction permits	Procedures, time and cost of obtaining construction permits, inspections, and utility connections
Getting electricity	Procedures, time, cost

Source: World Bank. 2013. *Doing Business 2013: Smarter Regulations for Small and Medium-Size Enterprises*. Washington, DC: World Bank Group.

their effects on business (Table A2.1). The indicators cover distinct topics, measuring such factors as the complexity of regulations, the time and cost of achieving a regulatory goal or of complying with regulations, the extent of legal protection of property, the tax burden on business, and the different aspects of employment regulations.

The Doing Business team first designs a questionnaire. Then there are several rounds of interactions, such as conference calls; written correspondence; and visits with local experts, including lawyers, business consultants, accountants, freight forwarders, government officials, and other professionals routinely administering or advising on legal and regulatory requirements. With the input from these interactions, the team completes the questionnaire. The data collected from the questionnaire are verified, revised, and expanded.

Results

The World Bank report *Doing Business 2013* presents results for two aggregate measures: the ease of doing business and distance to frontier. The rankings for ease of doing business compare the economies with one another. In contrast, the distance to frontier is an absolute measure of business regulatory efficiency. It shows the distance of each economy from a “frontier” that represents the best performance for each indicator.

Ease of Doing Business

The rankings in *Doing Business 2013* on the ease of doing business in 2011–2012 were based on the average of the economies' percentile rankings on 10 of the 11 indicator sets (excluding “employing workers”).

Distance-to-Frontier Measure

First, the scores for each individual indicator are normalized. Then, for the economy in question, the scores obtained for the individual indicators are aggregated through simple averaging into one distance-to-frontier score. The frontier is a score that represents the best observed results across all economies. It is derived from the highest score for each of 9 of the 11 indicator sets (excluding “employing workers” and “getting electricity”) by any economy since 2005.

World Bank: Logistics Performance Index²

Overview

The Logistics Performance Index (LPI) is a joint venture involving the World Bank, logistics service providers, and academe. The LPI survey has been conducted every 2 years since 2007, and the LPI 2012 measured stakeholder sentiment regarding the trade logistics performance of 155 countries, based on data collected in 2011.

The LPI uses a simple, global benchmark to measure perceptions of logistics performance, filling the gaps in data sets by providing systematic, cross-country comparisons. It is an indicator that shows how a country rates on logistics performance, a benchmark that could motivate researchers to take on deeper, more nuanced country-specific assessments of the determinants of logistics performance. The LPI assesses large companies as well as small and medium-sized enterprises.

Stakeholders

Trade analysts, policy makers, and practitioners interested in measuring logistics performance all use the LPI. The World Bank and other international organizations are using it more and more in their advisory and implementation activities concerning trade facilitation in developing countries. The LPI allows leaders in government, business, and civil society to better assess the competitive advantages created by good logistics, and to understand the varying importance of the different intervention areas.

² World Bank. Logistics Performance Index. <http://lpi.worldbank.org> (accessed 17 June 2014).

Methodology

A new web engine was designed for the 2012 LPI survey, to which the participants responded online. The ratings in the 2012 LPI survey were based on 6,000 individual country assessments by nearly 1,000 international freight forwarders, which were asked to rate the eight foreign countries their companies served most frequently. Six core performance components (Table A2.2) were evaluated on the basis of a 5-point Likert scale of 1 (worst) to 5 (best). The LPI is a summary assessment of logistics sector performance, combining data on six core performance components into a single aggregate measure, using principal components analysis. The weights are chosen to maximize the percentage of variation in the LPI's original six indicators.

Table A2.2 Indicators in the World Bank Logistics Performance Index

Component	Weight	Measures
Customs (efficiency of customs and border clearance management)	0.41	Speed, simplicity, and predictability of formalities of border control agencies, including customs
Infrastructure (quality of trade and transport infrastructure)	0.41	Ports, railroads, roads, and information technology
International shipments (ease of arranging competitively priced shipments)	0.40	
Logistics quality and competence (competence and quality of logistics services)	0.42	Transport operators and customs brokers
Tracking and tracing (ability to track and trace consignments)	0.41	
Timeliness (frequency with which shipments reach consignees within scheduled or expected delivery times)	0.40	

Source: World Bank. 2012. *Connecting to Compete 2012*. Washington, DC: World Bank Group.

This approach is different from that of the Doing Business reports, which assign equal weights to their topics. In addition, the LPI report provides information on domestic logistics performance indicators, such as the quality of infrastructure; performance of core services; and the timing, cost, and reliability of the import and export supply chains. This information is also gathered through perceptual surveys, but is presented in terms of ratio scales based on days, dollars, and percentages, rather than in a Likert-scale format.

Under the LPI, logistics operators provide feedback on the logistics “friendliness” of the countries in which they operate or with which they trade. The final outcome of the LPI is a country’s rank and score for each component, as well as captured pertinent information on logistics, such as the clearance time with physical inspection (days), clearance time without physical inspection (days), physical inspections (%), multiple inspections (%), lead time for export at ports and airports, median case (days), lead time for import at ports and airports, median case (days), number of agencies for exports, number of agencies for imports, typical charge for a 40-foot export container or a semitrailer (\$), and typical charge for a 40-foot import container or a semitrailer (\$).

Limitations

Some of the logistics information listed above is useful, as it measures the speed of movement and time spent at a logistics node. However, unlike CPMM, the LPI does not examine the reasons for the delays.

Overall, the LPI reflects the perceptions of the international business community regarding how countries are globally connected through their main trade gateways. For this reason, it might not fully capture changes at the country level. The LPI complements, rather than substitutes for, the in-depth country assessments that many national governments have increasingly undertaken on their own.

International Road Transport Union: New Eurasian Land Transport Initiative³

Overview

The New Eurasian Land Transport Initiative (NELTI) was conducted by the International Road Transport Union (IRU) from 2006 to 2008, with the aim of developing regular commercial freight haulage by road transport between the People's Republic of China (PRC), Central Asia, and Europe. The project was officially launched on 16 September 2008 in Tashkent, Uzbekistan. After the presentation of the successful outcome of the NELTI pilot phase (phase 1) at the IRU's 5th Eurasian Conference, in Almaty, Kazakhstan, on 11 July 2009, the second phase of NELTI began. Phase 2 of the NELTI project was carried out in close collaboration between the IRU and ADB under the Central Asia Regional Economic Cooperation (CAREC) Program. It entailed working to boost Euro-Asian trade by improving the efficiency of road transport services. Cargo transportation within the framework of phase 2 covered a vast land area, encompassing 18 countries in Europe and Asia. A special feature of phase 2 was the inclusion of an analysis of the PRC's transportation data, provided by ADB. Phase 2 of NELTI involved 37 road transport companies from 13 countries in Europe and Asia (eight companies had earlier participated in phase 1). At the end of phase 2, in April 2011, one of the transport companies in Kazakhstan submitted the last driver's logbook, bringing the total number of logbooks submitted to 459.

Methodology

Phase 1 (pilot phase)

The careful monitoring of shipments was an important element of the IRU NELTI project. UNESCAP methods served as the basis for NELTI monitoring practices, though adapted to international road haulage. Logbooks were developed in which drivers noted down all relevant data on movements, border crossings, enforced stops, road conditions and ancillary

³ International Road Transport Union. About NELTI. 2014. http://www.iru-nelti.org/index/en_about

infrastructure, official dues, and illegal levies, as well as any other problems and infringements encountered en route. Again, this appears to have been a process-oriented approach to transport traffic management, similar to the approach of the UNESCAP framework.

Phase 2

One of the most important aspects of phase 2 of the NELTI project was also the monitoring of haulage operations using practices adapted from UNESCAP, but this time the NELTI methodology had been improved. Taking into account the lessons learned during phase 1, and considering the forms of monitoring applied within the CAREC Program framework, phase 2 used an advanced version of the driver's logbook that contained even more details.

Benefits

As a result of phase 2 of the IRU's NELTI project, there is increasing recognition of the importance of road transport between Europe and Asia, in particular to and from the PRC. Further, the procedural impediments unearthed through this project highlighted the need for better and deeper process measurement. In particular, NELTI found that the average cargo movement was 18.4 kilometers per hour (kph), or about 150 kilometers (km) per day. Next, some of the causes of the impediments were found to be related to truck stoppages due to refueling, meals, rest, road traffic regulations, waiting times at borders, customs clearance, and extensive vehicle and cargo controls. The dwell time at border crossing points (BCPs) consumed 40% of total transport time.

Limitations

NELTI is comparable to CPMM's methodology, and its findings largely correspond to CPMM data. However, its data collection was only intermittent—unlike CPMM, which regularly collects data monthly. In addition, not all of the six CAREC corridors were covered under the two NELTI phases. And railway data were not included in the scope of NELTI.

TRACECA Route Attractiveness Index⁴

Overview

The Transport Corridor Europe–Caucasus–Asia (TRACECA) Route Attractiveness Index (TRAX) for 2009 measured the attractiveness of a transport corridor (a euphemism for a physical logistics route) to the logistics chain, i.e., its power to attract or accommodate intermodal freight traffic. The World Bank defines “transport corridors” from a physical perspective, as a collection of road segments constructed from the transport networks of adjoining countries and bounded by gateways. TRAX currently features an intermodal index

⁴ Transport Corridor Europe–Caucasus–Asia (TRACECA). 2008. *TRACECA Route Attractiveness Index–TRAX Road Index Calculation Methodology*. Baku.

that is useful for contemporary global supply chains in certain industries, such as automobiles, apparel, and electronics. The intermodal index relies on the road index (developed in 2010) and the rail index (developed in 2011). The World Bank has an interest in this methodology, is working closely with the IRU to develop and apply it.

Objectives

The main objective of TRAX is to assess the attractiveness of the TRACECA routes in comparison with competing or alternative routes. In one sense, this is a natural follow-up to the NELTI project for Central Asia: TRAX reveals the route preferences of transport operators, which, in turn, help determine which BCPs are more costly because of unofficial payments and levies. In this way, TRAX helps to identify the shortcomings of the TRACECA routes, and to develop solutions that will improve the attractiveness of these routes to freight operators. This can be an economic way of prioritizing actions with maximum impact on the TRACECA routes' attractiveness. And the use of benchmarking under TRAX could lead to periodic monitoring as a basis for a route attractiveness index.

Methodology

A set of criteria are chosen and weighed on the basis of several interviews with the transport operators in the TRACECA region and in Western Europe (Table A2.3).

Table A2.3 Indicators in TRAX

Criteria	Explanation
Time	Time and cost needed to move cargo from origin to final destination
Costs	
Reliability	Essential preconditions for state-of-the-art logistics transport providers in the global business
Safety and security	

TRAX = Transport Corridor Europe–Caucasus–Asia Route Attractiveness Index.

Source: Transport Corridor Europe–Caucasus–Asia (TRACECA). 2008. *TRACECA Route Attractiveness Index–TRAX Road Index Calculation Methodology*. Baku.

The TRAX methodology comprises four steps:

- **Step 1: Data collection.** TRAX uses the IRU NELTI project data collected from the drivers' journals. As mentioned above, the NELTI data set is quite comprehensive, and it also includes details such as minimum and maximum costs per trip, time spent per trip, time spent waiting to enter the BCP, and dwell times at BCPs.
- **Step 2: Interaction with the industry.** Interviews were carried out with freight forwarding agents and with representatives of the transport industry in Europe, the Southern Caucasus, and Central Asia to determine the weight of each criterion. This is similar to an analytic hierarchy process undertaken to create a comparison matrix

(including criterion weights). These interviews provided insights into the operators' decision-making processes regarding the choice of routes.

- **Step 3: Doing the calculations.** Each route was divided into a number of stretches (roads or ferry routes) and nodes (BCPs, ports, logistics centers) along an entire corridor. The route index comprises two subindices: a stretch subindex and a node subindex. The stretch subindex is calculated by first adjusting the main stretch criteria (transport costs, time, reliability, and safety and security) according to the length of the stretch in question. Then all the criteria are multiplied by their respective weights, the results are added up, and the total is the stretch subindex. The node subindex is calculated by multiplying the main node criteria (average total costs, time, and reliability throughout the node) by their respective weights, the results are added up, and the total is the node subindex.
- **Step 4: TRAX analysis.** The index has been analyzed in the following ways: (i) an overall comparison of TRAX ratings for routes, stretches, and nodes with regard to the trans-Russian Federation, trans-Turkey, and trans-Caucasus corridors; (ii) an assessment of time and reliability on stretches; (iii) an assessment of time and reliability at logistics nodes; (iv) transport costs for the stretches and nodes; (v) time costs for the stretches and nodes; (vi) reliability costs for the stretches and nodes; (vii) safety and security costs along a specific route; and (ix) a comparison of routes and regions in terms of transportation costs, time, reliability, and risk.

Generally, the lower the index value, the more attractive the route, and the approach is one of cost minimization.

Benefits

Its measurement indicators show TRAX to be a useful corridor performance measurement tool that helps ensure better options when it comes to safety, reliability, cost, and transit time of shipments. In contrast to the LPI, another performance measurement instrument, TRAX is based on real data that are measured on the ground and are verifiable, while the LPI is mainly perception based.

World Economic Forum: Enabling Trade Index⁵

Overview

The *Global Enabling Trade Report 2008*, from the World Economic Forum (WEF), covered 118 major and emerging economies. The crux of the report was the Enabling Trade Index (ETI), which was developed in the context of the WEF's Supply Chain and Transportation Industry Partnership program. The ETI measures the extent to which individual economies have developed institutions, policies, and services that facilitate cross-border trade in goods

⁵ World Economic Forum. Reports. <http://www.weforum.org/reports/>

and the transport of goods to their destinations. In 2012, the ETI ranked 132 economies using data from different sources, among them the International Air Transport Association, the International Trade Centre (ITC), the United Nations Conference on Trade and Development (UNCTAD), the World Bank, World Customs Organization (WCO), the World Trade Organization (WTO), and various private sector transport companies that are part of the supply chain (Lawrence, Hanouz, and Doherty 2012).

Methodology

The structure of the ETI, summarized in Table A2.4, is made up of four subindices that reflect the main enablers of trade. The subindices contain up to three pillars that assess different aspects of a country's trade environment.

Each of the pillars is made up of a number of individual variables, such as tariff and nontariff measures, the costs of customs clearance, the efficiency of border procedures, the efficiency of the financial and business environment. The ETI uses both hard data and survey data from the World Economic Forum's Executive Opinion Survey, normalized to a 1-to-7 scale. The survey is conducted annually in all 132 economies and captures the views of top business leaders on the business environment, so there are qualitative data on specific issues related to trade. Survey data from the LPI are also included in the analysis. Each pillar has been calculated as an unweighted average of the individual component variables. The subindices are then calculated as unweighted averages of the included pillars.

Table A2.4 Structure and Composition of the Enabling Trade Index

Subindex	Pillars
Market access subindex: measures the extent to which a country's policy framework is conducive to imports and enables access to foreign markets for the country's exporters	Pillar 1: Domestic and foreign market access
Border administration subindex: assesses the extent to which the administration at the border facilitates the movement of goods	Pillar 2: Efficiency of customs administration Pillar 3: Efficiency of import-export procedures Pillar 4: Transparency of border administration
Transport and communications infrastructure subindex: considers whether or not the country has the appropriate transport and communications infrastructure to facilitate the movement of goods within the country and across the border	Pillar 5: Availability and quality of transport infrastructure Pillar 6: Availability and quality of transport services Pillar 7: Availability and use of information and communication technology
Business environment subindex: examines the quality of governance and of the regulatory and physical security environment influencing the importers and exporters doing business in the country	Pillar 8: Regulatory environment Pillar 9: Physical security

Source: Lawrence, Robert Z., Margareta Drzeniek Hanouz, and Sean Doherty, eds. 2012. *The Global Enabling Trade Report 2012: Reducing Supply Chain Barriers*. Insight Report. Geneva: World Economic Forum.

World Customs Organization Time Release Study⁶

Overview

The Time Release Study (TRS) measures the time required between the arrival of a goods shipment at a BCP and its release, as well as each intervening step (including interventions by other agencies). It measures the actual performance of customs activities as they directly relate to trade facilitation at the border.

The TRS software was jointly developed by the WCO and the World Bank to help their collecting agents capture data easily and to minimize the need for data reentry, especially in a single-window environment. In so doing, it provides a natural link to the other trade facilitation indicators measured by the World Bank (e.g., under the LPI and Doing Business indices) and by the World Economic Forum (under the ETI). In short, the TRS, especially its cross-border time procedures, sits at the nexus of the three earlier indices.

Stakeholders

The international trading community uses the TRS to assess the effectiveness of border procedures, including customs procedures. Customs agencies use the TRS to address trade requirements. National and international institutions have become increasingly interested in performance measurement tools used at borders. According to Article 7, Section 6 of the WTO's Agreement on Trade Facilitation, adopted in December 2013, "Members are encouraged to measure and publish their average release time of goods periodically and in a consistent manner, using tools such as, *inter alia*, the WCO Time Release Study" (WTO 2013).

Objectives

The TRS is a practical mechanism (time based, but cost related) that helps identify bottlenecks in the international supply chain or the constraints hindering the release of cargo by customs. The TRS can be used to assess the impact of newly introduced or modified techniques, procedures, technologies, and infrastructure, as well as the impact of administrative changes involving border management. In so doing, the TRS is intended to contribute to the establishment of baseline trade facilitation performance indicators. The TRS helps to identify opportunities for trade facilitation improvements at borders. It also helps estimate the competitive trade facilitation ranking of countries with regard to their borders, given the universality of this benchmarking tool.

⁶ World Customs Organization. 2011. *Guide to Measure the Time Required for the Release Of Goods, Version 2*. http://www.wcoomd.org/en/topics/facilitation/~media/WCO/Public/Global/PDF/Topics/Facilitation/Instruments%20and%20Tools/Tools/Time%20Release%20Study/Time_Release%20_Study_ENG.ashx

Methodology

The methodology is applied in three phases, as highlighted below:

Phase 1: Preparation of the study

- Establishment of a working group
- Determination of the scope and design of the study
- Development of the methodology
- Drawing up of a detailed plan
 - duration and timing of the study
 - geographic scope
 - types of goods
 - choice of transport mode(s)
- Determination of sampling methods
- Development of a data collection form
- Development of a simplified data collection form
- Test run

Phase 2: Collection and recording of data

This phase is done with the predesigned forms.

Phase 3: Analysis of the data and conclusions

- Verification of data
- Analysis of data
- Press release
- Proposals for changes
- Continuous improvement

Benefits

Given the importance of border facilitation in international trade, and the recognition that BCP dwell time accounts for almost half of total transit time, the TRS is an especially useful methodology. It provides benchmarking and helps identify the relative attractiveness of gateway BCPs, especially those with the potential to support major transshipment hubs. A “green” lane for goods flow is just as important as a “green” node for cargo clearance, and the objective identification of such lanes and nodes could be done through a judicious use of the TRS.

World Bank Trade and Transport Facilitation Assessment⁷

Overview

The Trade and Transport Facilitation Assessment (TTFA) 2010 is another practical data-driven tool for identifying the obstacles to fluidity in the trade supply chain. The TTFA helps design action plans to improve the logistics performance along three main dimensions: infrastructure, services, and procedures and processes.

Objectives

The World Bank TTFA was created in the hope that this “toolkit” would appeal to policy makers in developing countries who may require help in setting directions with regard to trade and transport facilitation, and to professionals in the development community who need a useful assessment instrument to monitor the implementation of trade assessments in developing countries.

Methodology

For primary data, the TTFA results are obtained from facts and data collected from a series of meetings and interviews with the main public and private stakeholders of international supply chains. These include representatives of customs and other border agencies, transport regulators, freight forwarders, transport operators, ports, and so on. This is especially true for data related to border crossings, which are normally not easily found in the public domain.

For secondary data, the TTFA relies on public data such as the ITC database and systems such as the Trade Map for pertinent trade statistics. For transport data, the TTFA makes use of sources such as United Nations Conference on Trade and Development (UNCTAD), Drewry Shipping Consultants, and the International Air Transport Association. A flowchart of the TTFA field methodology is shown in Figure A2.

International Trade Centre Trade Map⁸

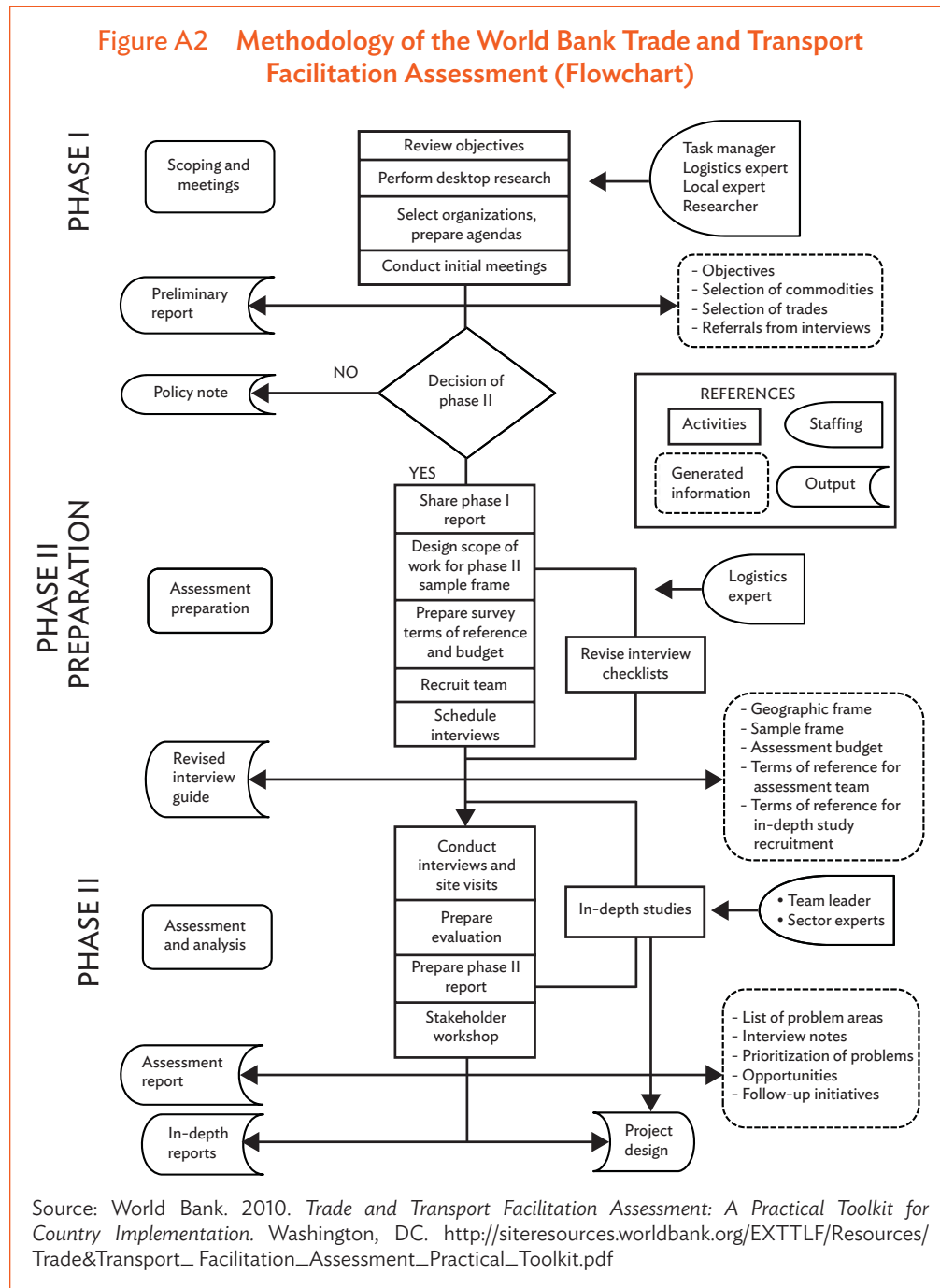
Overview

The International Trade Centre (ITC) developed its Trade Map (Figure A2) to facilitate strategic market research, monitor both national and product-specific trade performance, reveal comparative and competitive advantages, identify the potential for market or product diversification, and design and prioritize trade development programs for both firms and trade support institutions (TSIs).

⁷ World Bank. 2010. *Trade and Transport Facilitation Assessment: A Practical Toolkit for Country Implementation*. Washington, DC. http://siteresources.worldbank.org/EXTTLF/Resources/Trade&Transport_Facilitation_Assessment_Practical_Toolkit.pdf

⁸ International Trade Centre. Trade Map. <http://www.trademap.org/> (accessed 17 June 2014).

Figure A2 Methodology of the World Bank Trade and Transport Facilitation Assessment (Flowchart)



Source: World Bank. 2010. *Trade and Transport Facilitation Assessment: A Practical Toolkit for Country Implementation*. Washington, DC. http://siteresources.worldbank.org/EXTTLF/Resources/Trade&Transport_Facilitation_Assessment_Practical_Toolkit.pdf

Box A2 Corridor Project Cycle, the World Bank

The motivation underlying the World Bank's Transport and Trade Facilitation Assessment (TTFA) is to help policy makers and development professionals monitor transport and trade facilitation activities. The same can be said for the World Bank's Corridor Project Cycle Model (top, right). In stage I, the current corridor performance indicators are measured and benchmarked. During stages II to IV, analysis is carried out to identify problem areas, and the improvement project is planned. In stage V, the project is implemented, and performance is once again measured and monitored. Lastly, the impact of the project on trade and transport are analyzed during stage VI, effectively closing the loop.

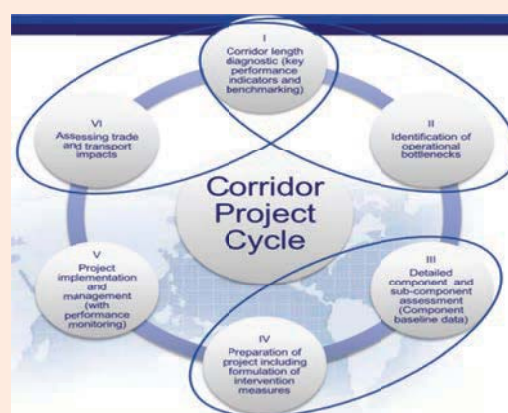
The World Bank looks at corridor performance by taking three aspects into account: infrastructure, service, and ease of movement. The measures put in place include reliability, flexibility, and security.^a

Reliability, in the case of corridor performance, is measured in terms of the variation in transit times for a specific route or transport mode. The variation is typically presented in the form of the standard deviation in the transit times (bottom, right). It is important to measure the reliability of a corridor because of the impact corridor problems could have on the sequential activities along a supply chain. For example, a delay in a shipment of raw materials will have a direct effect on production schedules, and will cause delays in the subsequent stages of a global supply chain. More often than not, an increase in the reliability of a corridor will translate into lower costs and shorter times for transit-related logistics services.

Flexibility is measured by the range of logistics services and options that are available. This would include the existence of different routes and transport modes, as well as options regarding the size of shipments. Security refers to the safety of both the goods and the system, and is usually represented by annual accident rates.

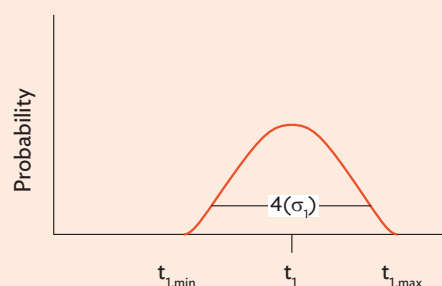
^a Raballand, G., et al., 2008. Lessons of Corridor Performance Measurement, Sub-Saharan Africa Transport Policy Program. Discussion Paper No. 7. Washington, DC: World Bank.

Corridor Project Cycle Model



Source: Mustra and Kunaka. 2012. *Trade and Transport Corridor Management: A Toolkit for Performance Improvement*. Colombo, Sri Lanka: World Bank.

Variation in Transit Time



Source: Arnold, J. 2005. *Best Practices in Corridor Management*. Washington, DC: World Bank.

Objectives

Understanding the structure and evolution of international markets is essential for both firms and TSIs. With globalization, export-oriented firms need to search globally for strategic opportunities to diversify their products and markets, and to find suppliers. For this reason, one objective of the ITC Trade Map is to help such firms understand the following: the structure of the world market for a given product, the trading relationship of the exporting country with its trading partners, key opportunities for market diversification, tariffs in specific markets, and competitors in specific markets and globally.

Another objective of the ITC Trade Map is to help TSIs set priorities regarding trade promotion, sectoral performance, partner-country engagement, and trade development strategies, so they can use scarce resources more effectively. Strategic market research with detailed statistical information on international trade flows helps TSIs to gauge the competitiveness of national and sectoral trade performance and to focus on priority products and markets. Specifically, the Trade Map helps to (i) identify priority markets and products for trade promotion, (ii) select the main supplier countries for imports, (iii) find alternative sources of supply, (iv) pinpoint areas of competitive advantage for a country, (v) assess the country's current trade performance, (vi) determine which products have strong bilateral trade potential, and (vii) discern the prevailing trade patterns between the country and a specific group of trading partners.

Methodology

By transforming a large volume of primary trade data into an accessible, user-friendly, and interactive web-based format, the Trade Map provides a visual presentation of indicators concerning country performance, product performance, product demand, alternative markets, and competitors. It presents this information in tables, charts, and maps, and responds to queries about imports and exports regarding a product, group of products, country, or regional country grouping.

Limitations

While useful on the strategic level for planning and market entry (especially for developing economies), the ITC Trade Map is not process based, so it neglects the value of “from the ground up” data, which are currently provided by NELTI, TRAX, and the TRS, as well as by CPMM. However, there is a potential for integrating into the Trade Map secondary data from more process-based tools.

Asia–Pacific Economic Cooperation Supply-Chain Connectivity Framework Action Plan⁹

Overview

The Asia–Pacific Economic Cooperation (APEC) Supply-Chain Connectivity Framework Action Plan (SCFAP) is a bold and ambitious initiative to improve supply chain connectivity among the 21 APEC-member economies. The SCFAP's measurement framework plays a critical role, as it keeps APEC members informed regarding the extent to which SCFAP actions are indeed contributing to supply chain improvement.

Stakeholders

In 2010, the APEC Committee on Trade and Investment decided to focus the attention of the member countries on supply chain performance. Under the SCFAP, APEC adopted the target of improving performance on the quantitative measures of time, cost, and reliability by 10% by 2015, a target that APEC leaders had earlier committed to under the 2010 Yokohama Vision. The Yokohama Vision has a stronger emphasis on logistics and transport facilitation issues, while also adopting a holistic approach designed to ease the conduct of business for the private sector by creating better supply chain connectivity.

To track and assess the progress of the SCFAP, the APEC Policy Support Unit worked with member countries to build a measurement framework that would be as transparent and useful as possible.

Methodology

The three elements of the current SCFAP measurement framework are:

- external indicators, which track the effects of SCFAP actions on measurable supply chain processes and outcomes;
- internal indicators, which track the degree to which actions under the SCFAP are being implemented; and
- a self-assessment survey, in which the APEC members (including representatives from their business communities) detail the actions taken, provide their views on the potential impact, and offer recommendations for improving SCFAP activities in the future.

⁹ Asia–Pacific Economic Cooperation (APEC) Supply-chain Connectivity Framework Action Plan. <http://www.apec.org/Groups/Committee-on-Trade-and-Investment>

The SCFAP has, through consultations, identified eight choke points in APEC supply chains that a combined effort by the public and private sectors could help ease or remove, thus ensuring that supply chains operate more quickly, efficiently, and reliably. The choke points are:

- **Transparency:** lack of transparency and public awareness regarding the full scope of regulatory issues affecting logistics, lack of awareness and coordination among government agencies regarding policies affecting logistics, and the absence of a single focal point or champion agency to handle logistics matters;
- **Infrastructure:** inefficient and inadequate transport infrastructure, and the lack of cross-border physical links (e.g., roads, bridges);
- **Logistics capacity:** lack of capacity among local and regional logistics subproviders;
- **Clearance:** inefficient border clearance procedures for goods shipments, lack of coordination among border agencies, especially with respect to the clearance of regulated goods;
- **Documentation:** burdensome procedures for customs documentation and other functions (including preferential trade);
- **Connectivity:** underdeveloped multimodal transport capabilities and inefficient air, land, and multimodal connectivity;
- **Regulations and standards:** country-to-country variations in cross-border standards and regulations for the movement of goods, services, and people; and
- **Transit:** lack of regional customs and cross-border transit arrangements.

Under the SCFAP measurement framework, the eight choke points are grouped into three performance clusters, which capture information relevant to supply chain performance at the aggregate level (Table A2.5).

Table A2.5 APEC Performance Clusters and Choke Points under SCFAP

Performance Cluster	Choke Points
Building infrastructure and capacity	<ul style="list-style-type: none"> • Infrastructure • Logistics capacity • Connectivity
Streamlining procedures	<ul style="list-style-type: none"> • Clearance • Documentation
Strengthening rules and institutions	<ul style="list-style-type: none"> • Transparency • Regulations and standards • Transit

APEC = Asia-Pacific Economic Cooperation, SCFAP = Supply-Chain Connectivity Framework Action Plan. Source: APEC, Committee on Trade and Investment. 2010. *2010 CTI Annual Report to Ministers*. Singapore.

Benefits

There would be value in understanding and adopting a similar framework for the CAREC Program, as it would help to assess attempts to achieve better logistics performance through richer connectivity. In this case, ADB and the CAREC member countries could determine if tools such as CPMM are indeed helping to improve supply chain performance by focusing on quantitative targets relating to time and cost reductions.

Comparing Indices

The methodologies and indices discussed above have different units of analysis and cover distinct aspects of transport and trade facilitation. They also have different regional and functional foci. For instance, the World Bank's Doing Business reports and LPI provide information on countries around the world, whereas APEC's SCFAP, NELTI, and TRAX are all regional in scope. The ITC Trade Map provides information at the company and market levels, and it is more of a directory than an index. The World Bank's TTFA is not really an index, either, at least not in the strict sense. It combines primary as well as secondary information from indices such as Doing Business and the LPI to arrive at detailed assessments for each country. Thus, the TTFA could be categorized as a derived assessment.

Overall, it seems that these indices and methodologies cover aspects related to institutional norms that facilitate or hinder trade, and to infrastructure capabilities that are crucial to trade facilitation. The Doing Business reports comprehensively cover institutional norms, whereas the LPI covers infrastructure and related capabilities. The time/cost–distance methodology also covers infrastructure capabilities, though indirectly, as the time and cost for each mode of transport are infrastructure characteristics. Likewise, NELTI, TRAX, and the SCFAP cover infrastructure capabilities. The Time Release Study (TRS) covers institutional norms associated with customs.

Summaries of the various international tools and methodologies are presented in Table A2.6. Initial observations suggest that most of them are useful and are driven from the ground up, relying to a great extent on primary data collection. If they are blended properly with CPMM and other strategic marketplace tools, such as the ITC's Trade Map, the resulting combination could be a potent source of information and analysis for policy makers and members of the business community. Other regional blocs are implementing ambitious efforts of their own. This applies to APEC, of course, but also to the Africon 2011 conference in Zambia. And, as mentioned above, ADB and the CAREC Program would be well advised to pay attention to the measurement framework spelled out in APEC's SCFAP.

Table A2.6 Summary of International Tools

Tool	Data Source	Method	Focus	Concept	Frequency	Significance	Reach	Others	Driver	Note
World Bank Doing Business	In-country entities with knowledge of business regulations	Survey	Small and medium-sized enterprises	Detailed breakdown in component procedures	Yearly since 2003	11 indicator sets that measure the business regulatory environment and protection of property rights	185 economies in 2013	Two aggregate measures: ease of doing business, and distance to frontier	World Bank	-
World Bank LPI	International freight forwarders	Online survey	Large companies, also small and medium-sized enterprises	Rating of logistics sector's performance	biennially since 2007	Provides simple, global benchmarks to measure on-the-ground trade logistics performance.	155 countries	Single aggregated measure from six weighted core performance components	World Bank	Complementary rather than in-depth country assessment
World Bank TTFA	Main public and private participants in international supply chains	Meetings and interviews	Infrastructure, services, procedures and processes of international trade supply chains	Trade and transport facilitation assessment tool	Started 2010	Identifies obstacles to fluidity in trade supply chains; helps design action plans	-	three-phase assessment: scoping and meetings, assessment preparation, and analysis	World Bank	Uses national trade statistics and international compilations, reports and interviews with authorities, the LPI, Doing Business reports, and shipping and global competitiveness indices
UNESCAP TCD	Freight forwarders and transport operators	Telephone interviews	Freight forwarders and transport operators	Transport efficiency analysis	-	Visual presentation of transport process to identify problems	-	Provides snapshot of situation and tracks changes over time	UNESCAP	Simple but powerful, easy to understand
WEF ETI	Mainly hard data on trade from publicly available sources and international organizations	Data mining and online surveys	Business leaders	Rating of individual country's trade performance	Started 2008	Measures the extent of development of institutions, policies, and services in economies re facilitating free flow of goods across borders and to destinations	132 economies globally	Uses four subindices as basis for evaluation: market access, border administration, transport and communications infrastructure, and business environment	WEF	-

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Table A2.6 continued

Tool	Data Source	Method	Focus	Concept	Frequency	Significance	Reach	Others	Driver	Note
WCO TRS	Time stamps for each step of customs clearance process, with pre-designed forms	Three-phased process: study preparation, data collection, and analysis	Customs	Analysis of actual performance of customs activities	Started 2004	Measures time required for release of goods at BCPs, identifies bottlenecks and opportunities	-	-	WCO	-
CAREC CPMM	Ground operators in transport and logistics sectors	Drivers' forms; UNESCAP methods	Six CAREC corridors	Detailed time-cost study	Quarterly from 2009	Four trade facilitation indicators evaluating the performance of CAREC corridors	10 CAREC countries and 14 CPMM partner associations	Two measures of speed: speed without delay (SWOD) to evaluate physical infrastructure; speed with delay (SWD) to measure BCP efficiency	CAREC	-
ITC Market Analysis Tools	-	Data mining and web-based analytical tools	Developing countries	Market analysis tools	Free to users since 1 Jan 2008	Five web portals (trade map, market access, investment, trade competitiveness, and standards) to enhance transparency of global trade, market access, and to identify opportunities for product and market diversification.	-	Various navigation options and a powerful set of analytical outputs	ITC	-
APEC SCFAP	Stakeholders from the public and private sectors.	Internal indicators, external indicators (Doing Business and LPI data) and self-assessment survey	APEC SCFAP	Performance measurement framework	Interim assessment 2013, and final assessment in 2016 (SCFAP: 2010-15)	Measures interim progress of SCFAP implementation and feedback for further improvement	APEC	-	APEC	Eight SCFAP choke points are grouped into three performance clusters for evaluation

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Table A2.6 continued

Tool	Data Source	Method	Focus	Concept	Frequency	Significance	Reach	Others	Driver	Note
TRACECA TRAX	Transport operators in the TRACECA region and Western Europe	Drivers' journals, and interviews with industry representatives	Three Europe-Caucasus-Asia routes	Four-step approach of TRAX analysis	2008	Four criteria are weighted to measure the attractiveness of a transport corridor to the logistics chain	TRACECA region and Western Europe	-	TRACECA	-
IRU NELTI	37 road transport companies from 13 countries (Europe and Asia)	Drivers' logbooks; UNESCAP methods	Road transport among the People's Republic of China, Central Asia, and Europe	Eurasian land transport analysis	Phase I started 2008; Phase II started 2009	Monitor haulage operations based on UNESCAP methods	18 countries (Europe and Asia)	-	IRU	-

APEC = Asia-Pacific Economic Cooperation, BCP = border crossing point, CAREC = Central Asia Regional Economic Cooperation, CPMM = corridor performance measurement and monitoring, ETI = Enabling Trade Index, IRU = International Road Transport Union, ITC = International Trade Centre, LPI = Logistics Performance Index, NELTI = New Eurasian Land Transport Initiative, SCFAP = Supply-Chain Connectivity Framework Action Plan, TCD = time/cost-distance, TRACECA = Transport Corridor Europe-Caucasus-Asia, TRAX = TRACECA Route Attractiveness Index, TRS = time release study, TTFA = Transport and Trade Facilitation Assessment, WCO = World Customs Organization, WEF = World Economic Forum, UNESCAP = United Nations Economic and Social Commission for Asia and the Pacific.

Appendix 3

CPMM Trade Facilitation Indicators

Trade Facilitation Indicator (TFI) 1: Time taken to clear a border crossing point (hours)

This indicator highlights bottlenecks at border crossing points (BCPs), which typically involve lengthy border crossing procedures and serious delays. Each component activity can be further examined to pinpoint the principal cause of delays.

Item	Formula	Remarks
Formula, per time/cost–distance (TCD) calculation	$TFI1_i = \sum_{j=1}^a t_j$ <p>t_j = time spent on each activity j $j = 1, 2, \dots, a$ = number of activities in each border crossing $i = 1, 2, \dots, n$ = number of TCDs</p>	The sum is taken from all of the activities carried out in each border crossing. However, for comparison purposes, activities recorded under “others” are not included.
Aggregation, average value per corridor and per mode of transport	$\sum_{i=1}^n TFI1_i$ <p>n = number of TCDs qualifying a given filter (per mode/per corridor) $i = 1, 2, \dots, n$ = number of TCDs</p>	The computation of the average is straightforward; no weights are necessary.

TCD = time/cost–distance.

TFI 2: Costs incurred at a BCP (\$)

This indicator highlights BCPs that have relatively expensive border crossing procedures, including unofficial payments. Each component activity can be further examined to pinpoint the drivers of cost.

Item	Formula	Remarks
Formula, per time/cost–distance (TCD) calculation	$TFI2_i = \sum_{j=1}^a c_j$ <p>c_j = cost incurred on each activity j $j = 1, 2, \dots, a$ = number of activities in each border crossing $i = 1, 2, \dots, n$ = number of TCDs</p>	The sum is taken from all of the activities carried out in each border crossing. However, for comparison purposes, activities recorded under “others” are not included.
Aggregation, average value per corridor and per mode of transport	$\sum_{i=1}^n TFI2_i$ <p>n = number of TCDs qualifying a given filter (per mode/per corridor) $i = 1, 2, \dots, n$ = number of TCDs</p>	The computation of the average is straightforward; no weights are necessary.

TCD = time/cost–distance.

TFI 3: Costs incurred traveling along a corridor section (\$)

This indicator provides an insight into the cost structure of a corridor and how it compares with those of other corridors. By examining each component, one can develop measures to minimize transit cost.

Item	Formula	Remarks
Formula, per time/cost–distance (TCD) calculation	$TFI3_i = v_i + b_i + s_i$ <p> v_i = cost incurred during transit, per 500 kilometers (km) b_i = cost incurred during border crossing, per 500 km s_i = cost incurred during intermediate stops, per 500 km $i = 1, 2, \dots, n$ n = number of TCDs </p>	The normalized cost incurred, per 500 km and per 20 tons of cargo (road) or one 20-foot equivalent unit (rail), in traveling a corridor section is the sum of normalized vehicle-operating or rail-wagon-operating cost during transit and normalized cost during intermediate stops and border crossings.
Aggregation, average value per corridor and per mode of transport	$\sum_{i=1}^n TFI3_i$ <p> n = number of TCDs qualifying a given filter (per mode/per corridor) $i = 1, 2, \dots, n$ n = number of TCDs </p>	The computation of the average is straightforward; no weights are necessary.

TCD = time/cost–distance.

TFI 4: Speed of travel along a corridor section (kilometers per hour, kph)

Speed indicators provide insights into the level of infrastructure development of CAREC corridors by providing information on the speeds that cargo trucks and trains can attain while traversing specific corridor sections. Under CPMM, speed is measured by two indicators: speed without delay (SWOD) and speed with delay (SWD).

Another factor to consider is the weighting of the observations in the aggregation. As the computed speed represents the transport of the truck or train, speed should be weighted by the tonnage of cargo to represent the weighted average of speed of the cargo itself.

- **Speed without delay (SWOD)**, in kph. This metric considers traveling speed only, i.e., when the delivery truck is moving on the road, or when the train is moving on the tracks. When the vehicle or train is stationary, the time is not counted.

Item	Formula	Remarks
Formula, per time/cost–distance (TCD) calculation	$SWOD_i = \frac{D_i}{T_i}$ <p> D = distance traveled from previous stop T = duration of travel $i = 1, 2, \dots, n$ n = number of TCDs </p>	

Aggregation, average value per corridor and per mode of transport	$\sum_{i=1}^n (w_i)SWOD_i$ <p>n = number of TCDs qualifying a given filter (per mode/per corridor)</p> $w_i = \frac{c_i}{\sum_{i=1}^n c_i}$ <p>i = 1, 2, ..., n n = number of TCDs</p>	<p>Since computation is per-TCD calculation, each TCD is normalized and treated independently. Also, speed average is not weighted by duration of travel (mathematical computation), and equal weights are given to each record. This method does not give more importance to longer trips than to shorter ones. But records should be weighted by tonnage to measure the average speed of a unit of cargo, and not of the trips.</p>
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TCD = time/cost–distance.

- **Speed with delay (SWD)**, in kph. This application of SWD considers the total time taken for the entire journey, including stoppage time due to various reasons.

Item	Formula	Remarks
Formula, per time/cost–distance (TCD) leg	$SWD_i = \frac{D_i}{T_i + A_i}$ <p>D = distance travelled from previous stop T = duration of travel A = duration of activities (BCP and non-BCP) i = 1, 2, ..., n n = number of TCDs</p>	
Aggregation, average value per corridor and per mode of transport	$\sum_{i=1}^n (w_i)SWD_i$ <p>n = number of TCDs qualifying a given filter (per mode/per corridor)</p> $w_i = \frac{c_i}{\sum_{i=1}^n c_i}$ <p>i = 1, 2, ..., n n = number of TCDs</p>	<p>Since computation is per-TCD approach, each TCD is normalized and treated independently. Also, speed average is not weighted by duration of travel (mathematical computation), and equal weights are given to each record. This method does not give more importance to longer trips than to shorter ones. But records should be weighted by tonnage to measure the average speed of the cargo, and not of the trips.</p>

TCD = time/cost–distance.

Appendix 4

Data Collected under CPMM

The data collection form is divided into two parts: part 1 covers general information about the trip being recorded, and part 2 covers the cost and time details for each leg and stop of the trip.

Part 1: General Information about the Trip

- **File ID:** The unique identification assigned by an association for a particular trip. The association should maintain a ledger of all trips monitored under corridor performance measurement and monitoring (CPMM) in chronological order. The coordinator shall write this number in the data collection form after collecting it from the driver.
- **Route:** The line of travel that begins in the city or town of origin and ends in the town or city of final destination.
- **Commodity:** The description of goods transported. Examples are clothing, fruit and vegetables, canned goods, oil processing equipment, construction materials, and mixed commodities.
- **Commodity classification:** The general categorization of transported goods according to the HS Nomenclature, 2007 edition (WCO 2007).¹ In the case of multiple commodities, the report only includes the transported goods with the highest volumes. In cases where the most important or main commodity cannot be determined, cargoes are classified under the TCL or less-than-container load (LCL) options for mixed cargoes.
- **Perishable:** Goods or cargoes that deteriorate or decay quickly. Examples are fruit and vegetables.
- **Cargo weight:** The total weight in tons of goods being transported.
- **Container:** Indicator as to whether the vehicle is transporting the goods using a 20- or 40-foot container, or otherwise.
- **TIR:** Transports Internationaux Routiers (or International Road Transport). TIR is an international customs transit system that allows goods to transit from a country of origin to a country of destination in sealed load compartments with minimal customs formalities along the way.

Part 2: Details per Stop

A stop should be recorded if either of the following is true: (i) the stop lasted at least 15 minutes, or (ii) the stop involved a significant activity, such as a police checkpoint or unofficial payments. The record of each stop must include the following information:

¹ “HS” stands for “Harmonized System.”

- **Stop number:** The number assigned each stop under CPMM.
- **City or town:** The name of the major city or town, or nearest major city or town, where the driver stopped.
- **Country:** Country in which the driver stopped.
- **CAREC corridor:** The CAREC corridor or subcorridor number if the city or town where the driver stopped is *at least within 20 kilometers* of the corridor or subcorridor.
- **Mode of transport:** Whether by road, rail, or ship, this indicates how the goods were transported from previous stop
- **Distance from previous stop:** Number of kilometers (km) from previous stop.
- **Duration of travel:** Amount of time in hours or minutes traveled from previous stop (e.g., 4 hours).
- **Vehicle operating cost:** Cost of transporting the goods from the previous stop, including the driver's wage, fuel cost, depreciation cost of the truck or trailer, repair and maintenance cost, and insurance; but this excludes the cost of the activities listed in the data collection form.
- **BCP indicator:** A record of whether the driver stopped at a particular border crossing point (BCP).
- **Reason for stop:** The reason why the vehicle stopped, whether the stop was at the point of departure, at an intermediate stop, at a BCP, or at the final destination. An "intermediate stop" is defined as any stop other than that those made at the departure point, when exiting or entering a country, or at the final destination.

In addition, the time spent and payments made (official and unofficial) at each stop are recorded by activity. The list of activities encompasses all anticipated checks and procedures, both at BCPs and at intermediate stops along the transit corridor. However, as CPMM focuses on BCPs, the list comprises mainly customs procedures and inspections during border crossings.

List of Stop Activities (Road Transport)

- **Health inspection or quarantine:** Activity usually undertaken by the health authorities that involves checking for the presence of malignant or contagious human diseases. As part of the inspection, the driver fills out health or quarantine forms, pays fees, etc.
- **Phytosanitary inspection:** Activity usually undertaken by the agricultural authorities that involves the inspection of cargo for the possible presence of harmful pests and plant diseases. As part of the inspection, the driver fills out phytosanitary forms and pays fees.
- **Veterinary inspection:** Activity usually undertaken by the veterinary authorities that involves the inspection of cargo for the possible presence of infectious animal diseases and the regulation of the flow of animals and animal products to a particular location. As part of the inspection, the driver fills out veterinary forms and pays fees.
- **Border security and control:** Inspection of goods and checking of documents by security personnel (i.e., police or military) at the BCPs. As part of the inspection, the driver pays fees (official or unofficial).

- **Visas and immigration:** Activity usually undertaken by the immigration authorities at the BCPs to check visas, or the activities required to apply for a visa, or to enter or exit the country when the driver has no valid visa. As part of the inspection, the driver fills out immigration or visa forms and pays fees.
- **Customs clearance:** Activity undertaken by the customs authorities that involves the inspection of documents and goods entering or exiting a country. As part of this activity, the driver fills out customs forms and pay fees.
- **Waiting or queuing:** Waiting in queues to enter the BCPs. Note that this activity does not include waiting time for other activities, such as waiting in line to fill out or submit customs clearance documents (which should be recorded as part of the duration of customs clearance).
- **Loading and unloading:** The loading of goods at the point of origin, loading and unloading at intermediate stops to deconsolidate cargo (i.e., transfer goods to another vehicle), or unloading upon delivery at the final destination.
- **Escort or convoy:** A convoy is a row of vehicles that move together. The vehicles are accompanied by escorts, which can be customs officials or traffic police, for the purpose of protecting the cargo.
- **Weight or standard inspection:** The checking of the dimensions and weight of a vehicle with cargo, including queuing or waiting time, payment of fees, etc.
- **Police checkpoint or stop:** Road blocks or checkpoints set up by the traffic police along a route that take time to get through or require payment to proceed.
- **GAI transport inspection:** Inspection undertaken by a state traffic inspectorate or by a state traffic safety inspectorate. “GAI” stands for *Gosudarstvennaya Avtomobilnaya Inspektsiya*.
- **Vehicle registration:** Registration of the vehicle, transport inspection, or payment of applicable road-use taxes or transit fees.
- **Road toll:** Fees payable when drivers use a special section of a road or highway, thereby shortening travel time.

List of Stop Activities (Rail Transport)

Material Handling

- **Loading cargo:** The movement of goods from storage or warehouse to the train. If the goods are moved to a temporary storage facility such as a staging area or loading dock before being relocated to the train, then only the time from the staging area or loading dock to the train is counted.
- **Unloading cargo:** The movement of goods from the train to storage or warehouse. If the goods are moved to a temporary storage facility such as a staging area or loading dock before being relocated to the warehouse, then only the time from the train to the staging area or loading dock is counted.
- **Preventing cargo shift:** This activity refers to the securing of cargo inside the container or wagon. When items are stuffed into containers, the workers may perform “choking,” or securing of the cargo. Automobiles, for instance, also need additional securing. This

is to ensure that the cargo stays in position during transit. Normally, this is a problem related to manufactured products transported on pallets or in cartons, and may not concern bulk commodities.

- **Removing excess cargo:** The removal of excess goods to comply with weight requirements. The time spent in this activity does NOT include the inspection time. This activity starts only when the officer declares the cargo to be “overweight” and orders a removal, and ends when the excess goods have been relocated from the train.
- **Transloading at gauge-change point:** This only happens at the Chinese or Polish borders with a member country of the Commonwealth of Independent States (CIS). As the CIS uses 1,520 millimeter (mm) gauge, but non-CIS countries use 1,435 mm gauge, cargoes need to be transloaded. This is done by changing the wheel sets or by relocating the goods with forklifts.

Transporting

- **Picking up and delivering wagons:** This includes the movement of loaded containers or wagons between terminals and the consignee’s premises.
- **Replacing or repairing an inoperable wagon:** This activity applies only if at least one train wagon is found to be in need of service. This action only includes the movement time from the tracks to the servicing center, as well as the time and effort to repair the wagon in the servicing center. This activity normally applies to wagons that are damaged significantly, and cannot be characterized as “emergency repair.”
- **Emergency repair:** This activity refers to the time taken to service a wagon on the tracks in the marshaling yard, without removing the wagon from the train. In this case, the condition of the wagon is such that the wagon is considered salvageable, in contrast to the more serious problems addressed under the previous activity.
- **Classification of trains:** This activity relates to the internal regrouping of goods, wagons, and containers to form a new train. This is needed when goods that have arrived at a station are bound for different final destinations and are scheduled to leave at different times. This normally happens at major rail terminals.

Documents

- **Document errors:** This applies to special situations when there are errors in the documents (freight bill, cargo manifest, packing list, etc.). The time taken to correct these errors should NOT be included in the normal processing time. This activity starts when an error is found, and continues as action is taken to correct the error. It stops when the authorities confirm that the error has been corrected. However, at BCPs this correction may require substantial effort and many days to complete.
- **Reissue of transit documents:** This typically applies to Chinese rail shipments to the CIS. Not all Chinese railway stations can handle international shipments, but loading and unloading can happen in domestic stations. Thus, a domestic document is used for movement from a domestic station to an international terminal (e.g., in Urumqi, in the Xinjiang Uygur Autonomous Region), where a set of international documents is used. At this point, the data are manually rewritten or translated.

Inspections

- **Customs inspection:** A measure of the time taken by customs officers to conduct the customs inspection. The main purpose of the inspection is to assess compliance with the customs code. The customs officers also check for any dutiable goods, forbidden items, or dangerous goods.
- **Technical inspection:** A measure of the time taken by engineers or technicians to conduct the technical inspection. The main purpose of this inspection is to ascertain cargo security and safety, as well as the condition of the train and its equipment.
- **Commercial inspection:** A measure of the time taken by the valuation officers to conduct the commercial inspection. The main purpose of this inspection is to determine if the valuation of the physical cargo and the declared values are aligned.
- **Border control:** A measure of the time taken by border guards to conduct security checks. The main purpose of the security checks is to ensure that the shipment poses no hazards or risks to the country of entry.
- **Sanitary and phytosanitary control:** A measure of the time taken by the phytosanitary team to conduct the regular sanitary and phytosanitary checks. The main purpose of these checks is to assess the sanitation standards of the train, as well as the acceptability of goods such as agricultural products (including meat), other food products, and other consumable products. This action also covers health requirements, such as health certificates of the staff working on the train.

Waiting/Queues

The reasons for time spent waiting are now divided into the categories listed below. Note that the category “congestion” refers to a “no-pass” order from the rail authorities. This could be due to a bottleneck at a BCP or to a lack of rolling stock on a rail line.

- Transloading
- Loading and unloading
- Documentation
- Inspection
- Congestion
- Other reasons

The CPMM time/cost–distance (TCD) template contains a text box labeled “others.” Should a respondent incur a delay (or payment) for a reason that cannot be categorized under any of the available options, the respondent can put the information in this text box. The reason will then be reviewed, and possibly included in the next revision of the TCD template.

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Central Asia Regional Economic Cooperation Corridor Performance Measurement and Monitoring A Forward-looking Retrospective

This report describes how Central Asia Regional Economic Cooperation (CAREC) corridor performance measurement and monitoring (CPMM) helps to achieve the objectives of the CAREC Transport and Trade Facilitation Strategy and its Implementation Action Plan. It presents the CPMM methodology and discusses the roles and responsibilities of key stakeholders, especially the private sector. It highlights ongoing efforts to provide accurate and reliable indicators despite the challenges of measuring corridor performance in the CAREC context. The extensive depth of data collected and the richness of information that CPMM has been providing since 2009 supports detailed policy analysis and formulation. Trade facilitation indicators have been developed to inform CAREC's Development Effectiveness Review. These indicators provide a basis of comparison or benchmarking of one location (border crossing point or corridor segment) against another in terms of (i) the efficiency of border management agency policies and procedures in regulating trade, (ii) infrastructure quality, and, in due course, (iii) the quality and performance of trade logistics service providers. The four indicators include the standard measures of time and cost as the main components. Selected corridor performance data are then analyzed to identify the physical and non-physical barriers to trade and transit traffic encountered at specific locations, helping to pinpoint the causes of excessive delays and costs. With this study, ADB underscores the value of CPMM for CAREC countries (and for countries participating in other subregional programs) as they craft policies and consider investments to facilitate trade.

About the Central Asia Regional Economic Cooperation Program

The Central Asia Regional Economic Cooperation (CAREC) Program is a proactive facilitator of practical, results-based regional projects and policy initiatives that foster trade expansion and sustainable development. The Program promotes and facilitates regional cooperation in the priority areas of transport, trade facilitation, trade policy, and energy. CAREC is a partnership of 10 countries: Afghanistan, Azerbaijan, the People's Republic of China, Kazakhstan, the Kyrgyz Republic, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan. ADB, the European Bank for Reconstruction and Development, the International Monetary Fund, the Islamic Development Bank, the United Nations Development Programme, and the World Bank support the CAREC Program. ADB serves as the Secretariat.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to approximately two-thirds of the world's poor: 1.6 billion people who live on less than \$2 a day, with 733 million struggling on less than \$1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

