CPMM Data Aggregation and Analysis

By Max Ee, International Consultant
Urumqi, People Republic of China (17-18 May 2016)

CAREC

Corridor Performance Measurement and Monitoring:
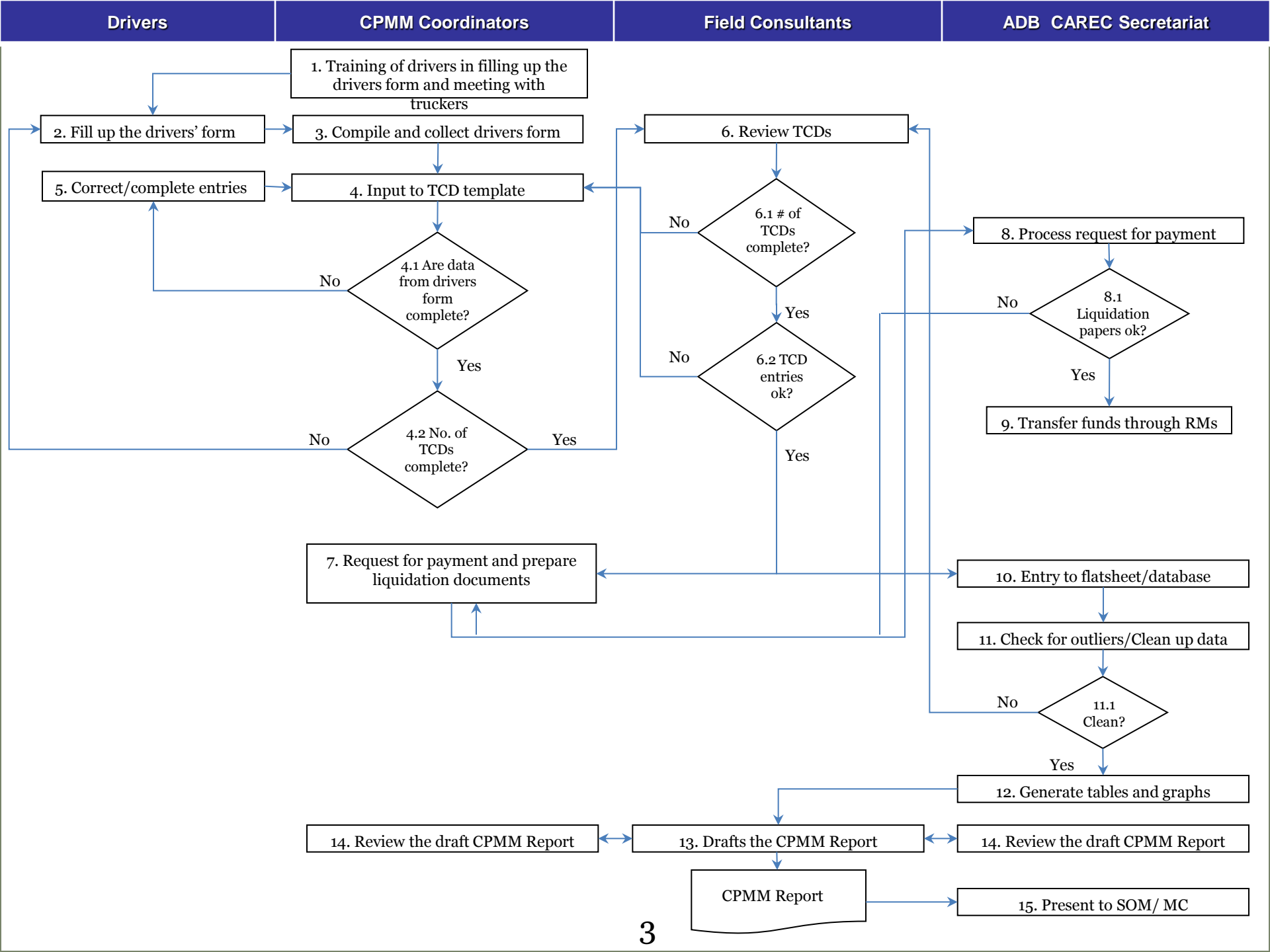CAREC Experience and International Prospects

Contents

Drivers	CPMM Coordinators	Field Consultants	ADB CAREC Secretariat

1. Training of drivers in filling up the drivers form and meeting with truckers

2. Fill up the drivers' form

3. Compile and collect drivers form

6. Review TCDs

5. Correct/complete entries

4. Input to TCD template

8. Process request for payment

4.1 Are data from drivers form complete?
— No
— Yes

6.1 # of TCDs complete?
— No
— Yes

8.1 Liquidation papers ok?
— No
— Yes

6.2 TCD entries ok?
— No
— Yes

9. Transfer funds through RMs

4.2 No. of TCDs complete?
— No
— Yes

7. Request for payment and prepare liquidation documents

10. Entry to flatsheet/database

11. Check for outliers/Clean up data

11.1 Clean?
— No
— Yes

12. Generate tables and graphs

14. Review the draft CPMM Report

13. Drafts the CPMM Report

14. Review the draft CPMM Report

CPMM Report

15. Present to SOM/ MC

3

Road – Border Crossing Activities

1. Border Security / Control
2. Customs Clearance
3. Health / Quarantine
4. Phyto-sanitary Inspection
5. Veterinary Inspection
6. Visa/Immigration
7. Traffic Inspection
8. Police Checkpoint / Stop
9. Transport Inspection
10. Weight/Standard Inspection
11. Vehicle Registration
12. Emergency Repair
13. Escort / Convoy
14. Loading / Unloading
15. Road Toll
16. Waiting/ Queue

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Rail Border Crossing Activities

Material Handling

1. Load Cargoes
2. Unload Cargoes
3. Fix Cargo Shift
4. Remove Excess Cargo
5. Trans-load at Gauge Change

Transport

1. Pickup and Deliver Wagons
2. Technical Inspection
3. Replace/Repair Inoperable Wagons
4. Emergency Repair
5. Train Classification

Documents

Inspection

1. Customs Inspection
2. Technical Inspection
3. Commercial Inspection
4. Sanitary/Phyto-Sanitary Control

Waiting/Queuing

1. Busy Reloading Facilities
2. Faulty Handling Equipment
3. No Wagons Available
4. Restriction on Entry
5. Marshalling
6. Waiting for Priority Trains to Pass
7. Other Reasons

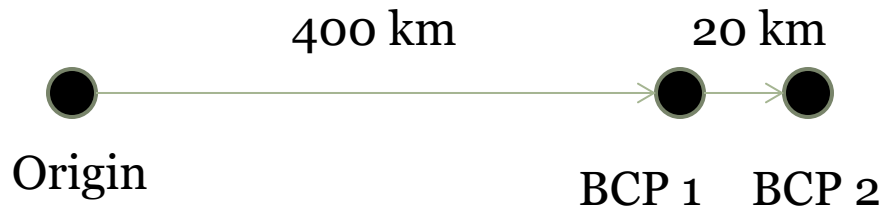CPMM uses two measures of speeds.

Speed Without Delay (SWOD)
Speed = Distance / Transit Time

Speed With Delay (SWD)
Speed = Distance / (Transit Time + Activities Time)

Measuring Speed

400 km   20 km

Origin   BCP 1   BCP 2

Parameters	Origin –BCP1	BCP1 – BCP 2	Total
Distance	400 km	20 km	420 km
Transit Time	6.5 hours	0.5 hours	7 hours
Activities Time	1 hour	6 hours	7 hours

SWOD = 420 / 7 = 60 km / hr

SWD = 420 / (7+7) = 30 km / hr

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Measuring Cost

400 km   20 km

Origin

BCP 1   BCP 2

Parameters	Origin –BCP1	BCP1 – BCP 2	Total
Distance	400 km	20 km	420 km
Vehicle Operating Cost	$1,120	$20	$$1,140
Activities Cost	$60	$600	$660

Total Cost = $520+$660 = $1,180

Cost / 500 km = ($1,180 x 500) / 420 = $1,404.76

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Contents

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- The written records from drivers are manually entered into a CPMM custom-designed Excel Template.
- Consultants will review the template and send to ADB.
- ADB will aggregate the data from all templates.
- The template consists of a dashboard, summary and detailed worksheets for shipment samples.

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Summary Worksheet

FILE ID	1	2	3	4	5
Route	Kuldzha-Moskow	Korgas-Troitsk	Bakhty-Tashkent	Dortmund-Shymkent	Stambul-Bishkek
Commodity	Footwear	Equipment	Consumer Goods	Rubber discs	Home appliances
Commodity Classification	CC12 Shoes	CC16 Machineries	CC20 Manufactured Items	CC7 Plastics	CC16 Machineries
Perishable	No	No	No	No	No
Cargo Weight (tons)	20	20	22	19	15
Container?	No	No	No	No	No
TIR?	Yes	Yes	Yes	Yes	Yes
Date of questionnaire completion	10-Jan-13	10-Jan-13	11-Jan-13	11-Jan-13	11-Jan-13
Distance (km)	2,485.00	2,451.00	1,765.00	2,106.00	2,458.00
Transit Time (hrs)	43.78	38.47	29.95	33.08	38.12
Activities Time (hrs)	86.25	78.18	46.33	27.50	35.83
Total Time (hrs)	130.03	116.65	76.28	60.58	73.95
Vehicle Operating Cost (US$)	$1,441.30	$7,132.41	$2,389.81	$2,232.36	$4,936.90
Activities Cost (US$)	$402.01	$98.17	$137.34	$82.01	$139.35
Total Trip Cost (US$)	$1,843.31	$7,230.58	$2,527.15	$2,314.37	$5,076.25
SWOD (km/h)	56.76	63.72	58.93	63.66	64.49
SWD (km/h)	19.11	21.01	23.14	34.76	33.24

Detail Worksheet (Header)

	A	B	C–H	I–N
1	**STOP**		**STOP 1 (ORIGIN)**	**STOP 2**
2	**Place of stop**	Name of city:	Namamgan	Kokand
3		Name of country:	UZB	UZB
4		CAREC Corridor	3a	3a
5		**Mode of transport**	Road	Road
6		**Distance from previous stop (km)**	0	110
7		**Duration of travel (hr:min)**	0	2 hrs 15 mins
8		**Vehicle Operating Cost**		$88.00
9		**BCP?**	No	No
10		**Reason for stop**	Place of Departure	Intermediate Stop

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Detail Worksheet(Footer)

	A	B	C	D	E	F	G	H
1		STOP	STOP 1 (ORIGIN)					
11		Activities	Duration				Official Cost	Total Cost
12		**Road/Rail**						
13		Border Security / Control		hrs		mins		
14		Customs Clearance	3	hrs		mins		
15		Health / Quarantine		hrs		mins		
16		Phytosanitary		hrs		mins		
17		Veterinary Inspection		hrs		mins		
18		Visa/Immigration		hrs		mins		
19		GAI/Traffic Inspection		hrs		mins		
20		Police Checkpoint / Stop		hrs		mins		
21		Transport Inspection		hrs		mins		
22	Description of stop	Weight/Standard Inspection		hrs		mins		
23		Vehicle Registration		hrs		mins		
24		Emergency Repair		hrs		mins		
25		Escort / Convoy		hrs		mins		
26		Loading / Unloading	3	hrs	50	mins		
27		Road Toll		hrs		mins		
28		Waiting/ Queue		hrs		mins		
29		**Other Activities**						
30		Activity 1		hrs		mins		
31		Activity 1 (Specify here.)						
32		Activity 2		hrs		mins		
33		Activity 2 (Specify here.)						
34		TOTAL	6	hrs	50	mins	0	0

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1	Data Collection and Entries
2	CPMM Excel Template
3	Visual Dashboard
4	Data Elements
5	Statistical Analysis

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Dashboard

62.95
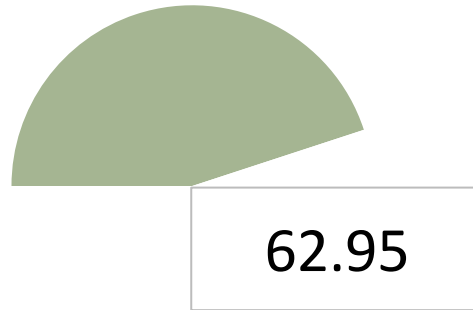
Chart 1 : Speed Without Delay (SWOD)

28.40
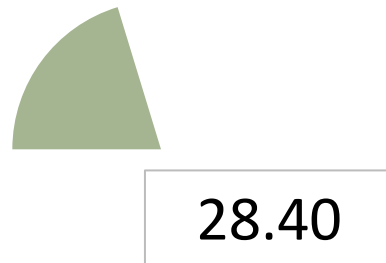
Chart 2: Speed With Delay (SWD)

$685.00
$680.00
$675.00
$670.00
$665.00
$660.00
$655.00
$650.00
$645.00
$640.00
$635.00
$630.00

$32.34

$649.63

■ Activities Cost (US$/500km)

■ Vehicle Operating Cost (US$/500km)
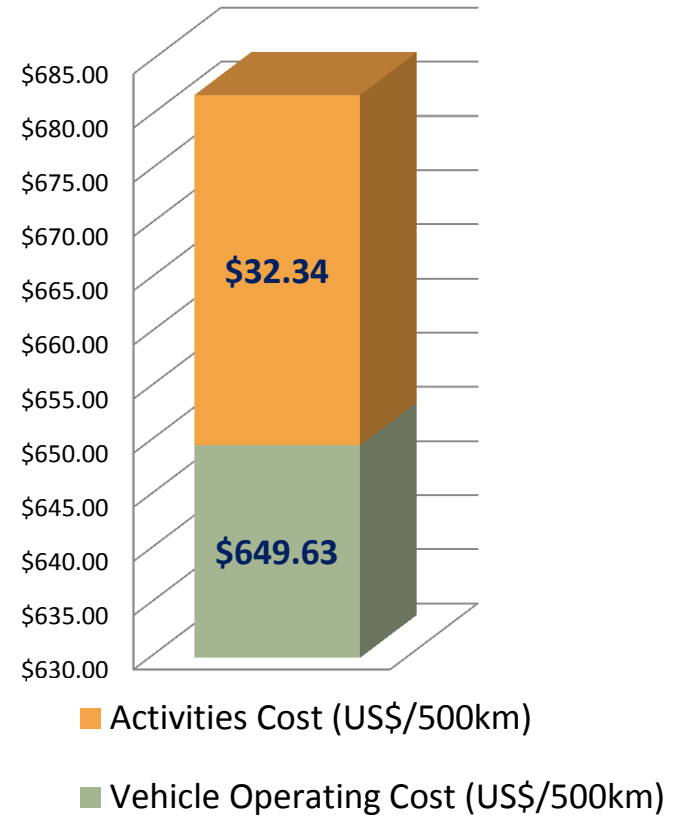
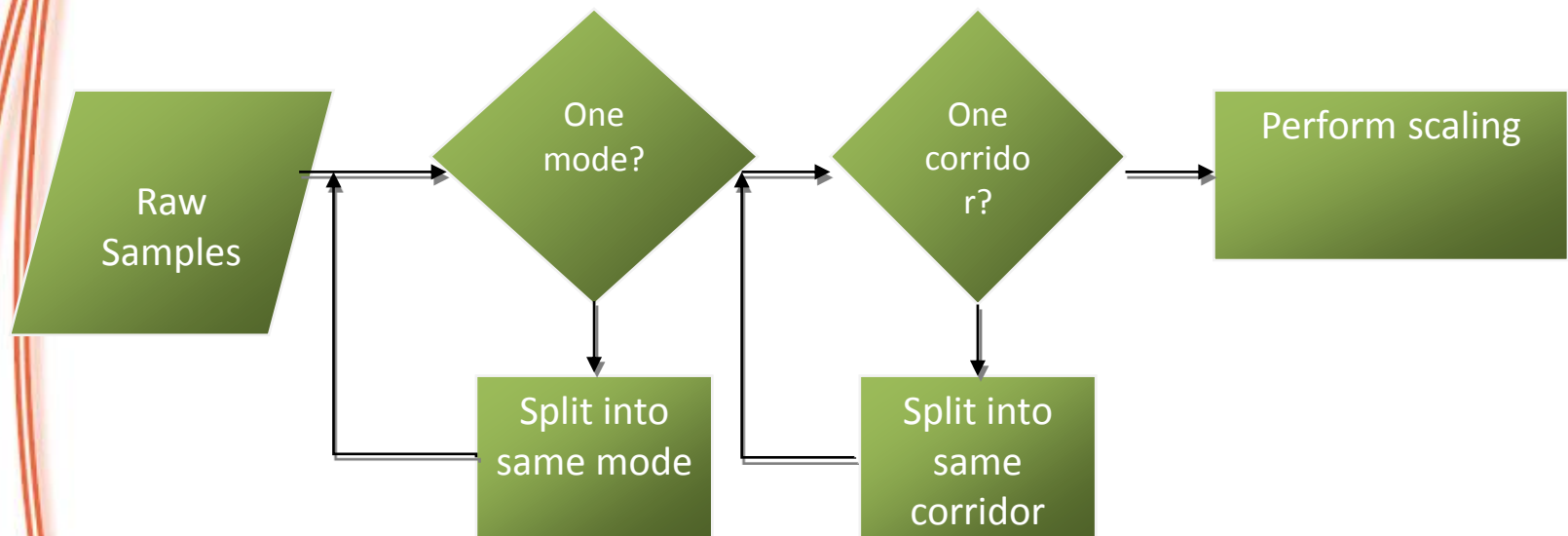**Chart 3 : Cost Analysis**

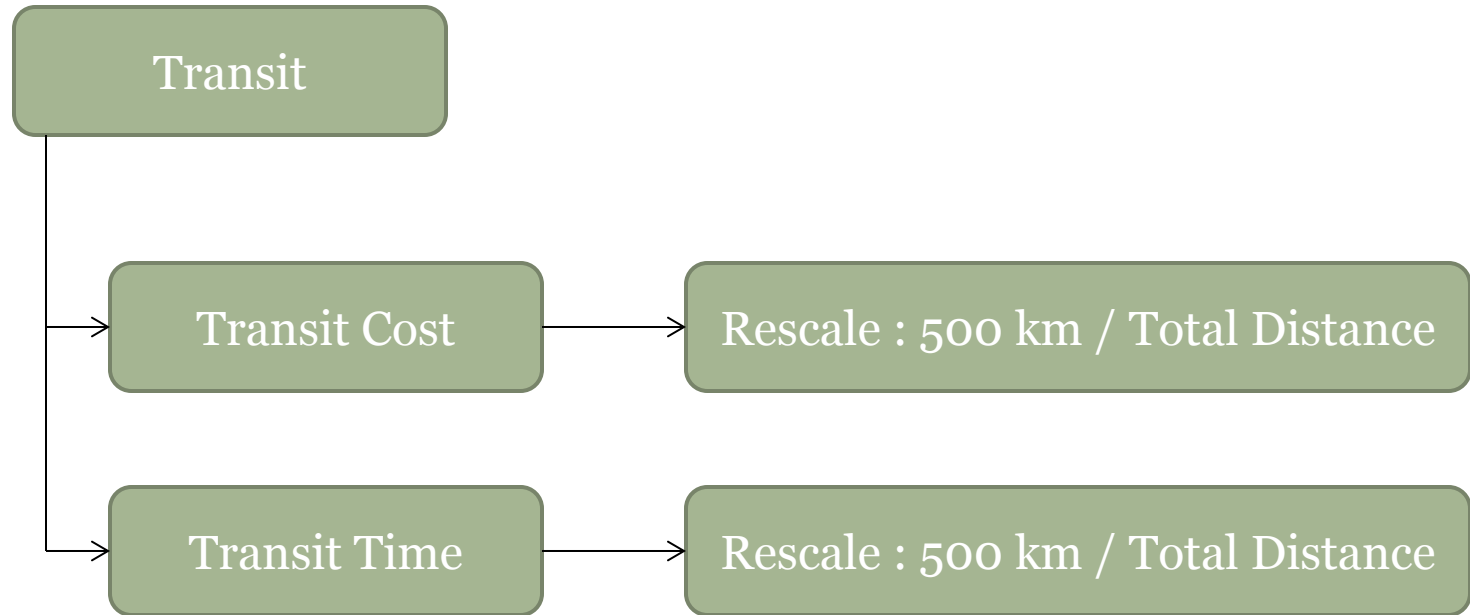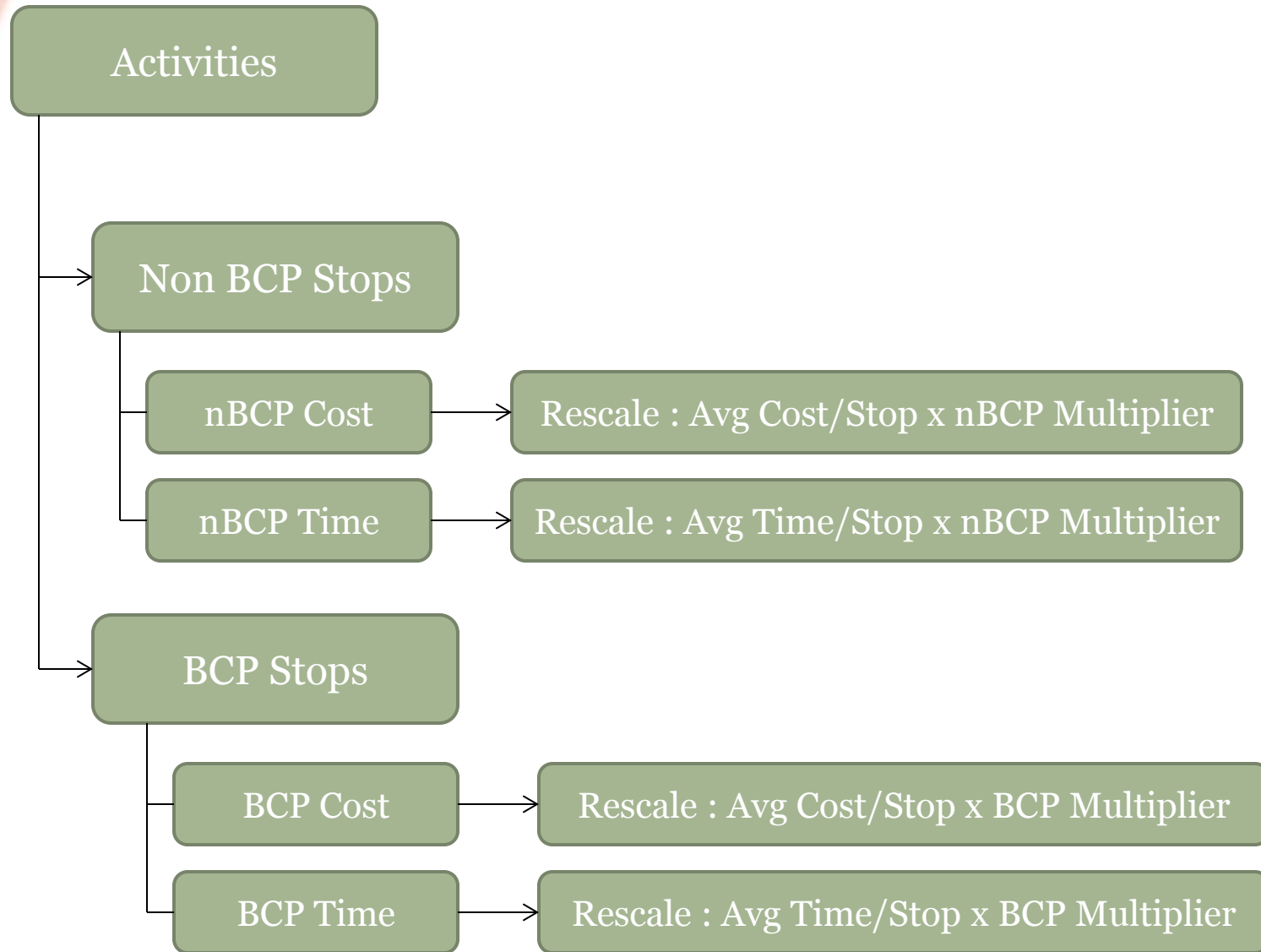| 1 | Data Collection and Entries |
2	CPMM Excel Template
3	Visual Dashboard
4	Data Elements
5	Statistical Analysis

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All the CPMM samples are first categorized into groups of the **same transport mode** and **same corridor.** This is because road and rail have very different transport economics. Each corridor also has different characteristics.

Transit

Transit Cost → Rescale : 500 km / Total Distance
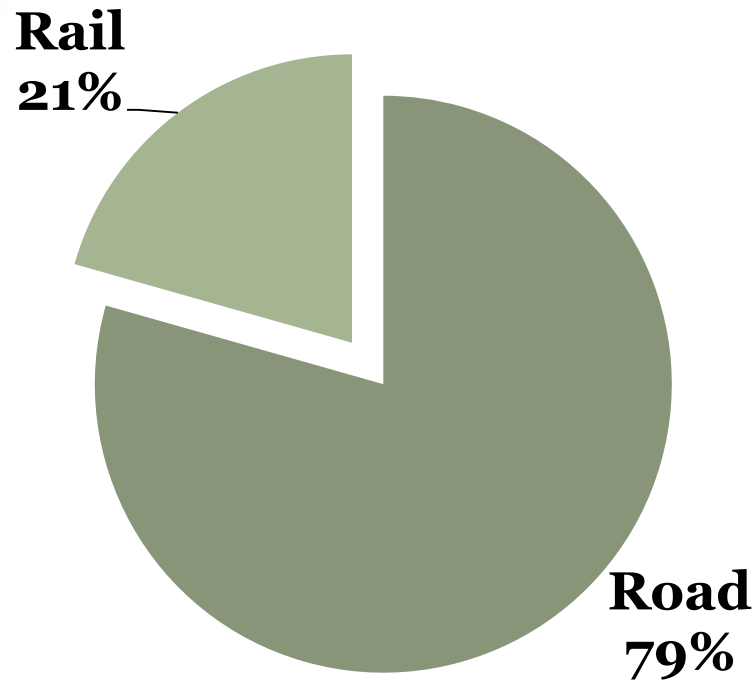
Transit Time → Rescale : 500 km / Total Distance

Transit time refers to the total time the vehicle is moving on the road. Transit cost refers to the vehicle operating cost. These two parameters depend on the total distance travelled. Since each corridor has different distances, they are converted to 500 km for easier comparisons.

Activities

→ Non BCP Stops

  nBCP Cost → Rescale : Avg Cost/Stop x nBCP Multiplier

  nBCP Time → Rescale : Avg Time/Stop x nBCP Multiplier

→ BCP Stops

  BCP Cost → Rescale : Avg Cost/Stop x BCP Multiplier

  BCP Time → Rescale : Avg Time/Stop x BCP Multiplier

Data Profile – Mode of Transportation

Mode of Transport, 2014

Rail 21%

Road 79%

Mode of Transport, 2015

Rail 25%

Road 75%
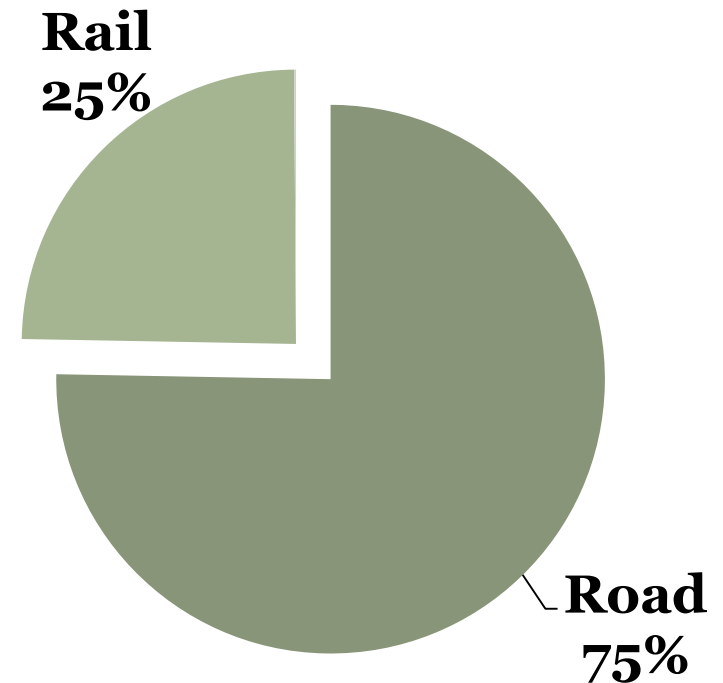
Mode of Transport was little changed. **Road transport** remains as the dominant transport in CPMM samples.

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Data Profile - Perishables

Perishables, 2014

Peris hable 20%

Non- peris habl e 80%

Perishables, 2015

Peris hable 22%

Non- peris hable 78%
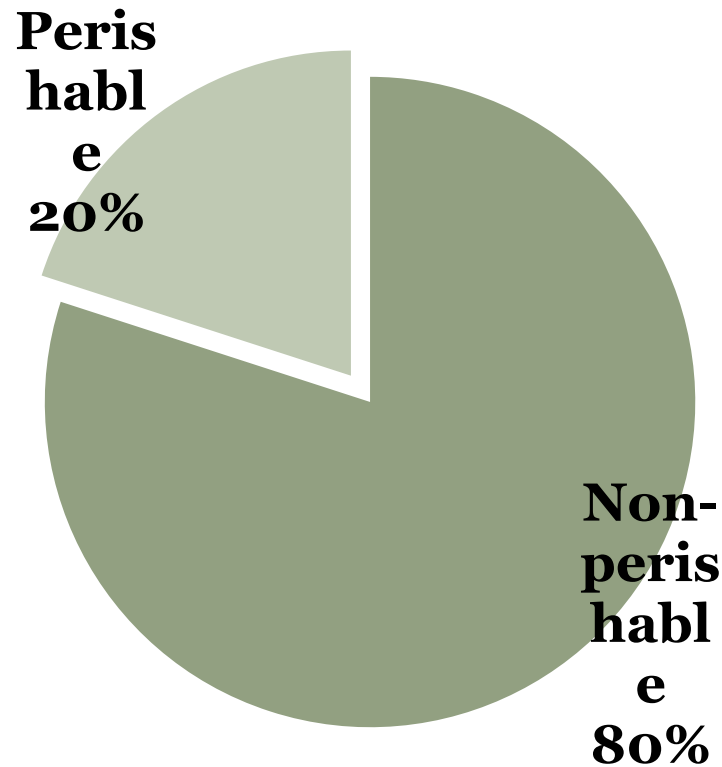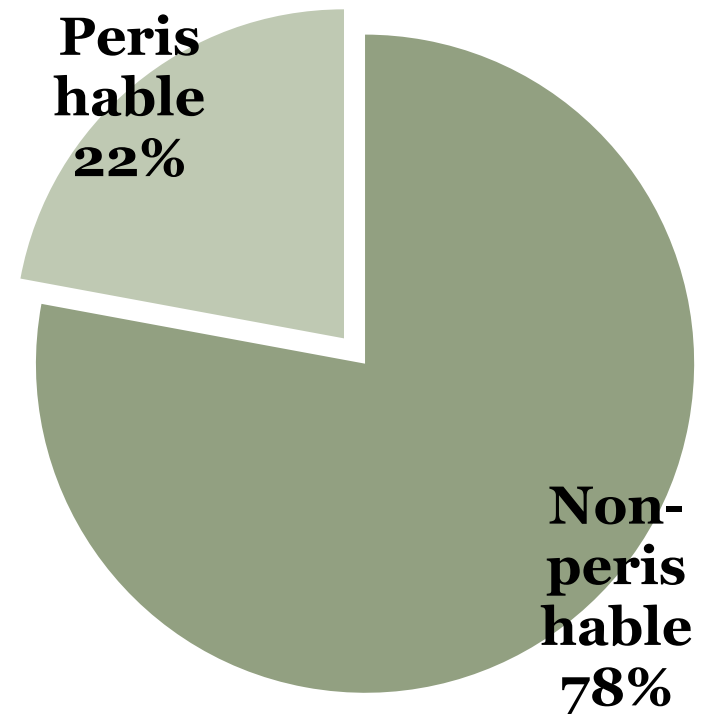
The proportion of shipments carrying perishables increased slightly in 2015. The movement of **fruits and vegetables** accounted for this behaviour.

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TIR, 2014

TIR 38%

Non-TIR 62%

TIR, 2015

TIR 35%

Non-TIR 65%

TIR accounted for **35%** of all road shipments, but the percentage has decreased over the years.

Profile – Goods Classifications

2015

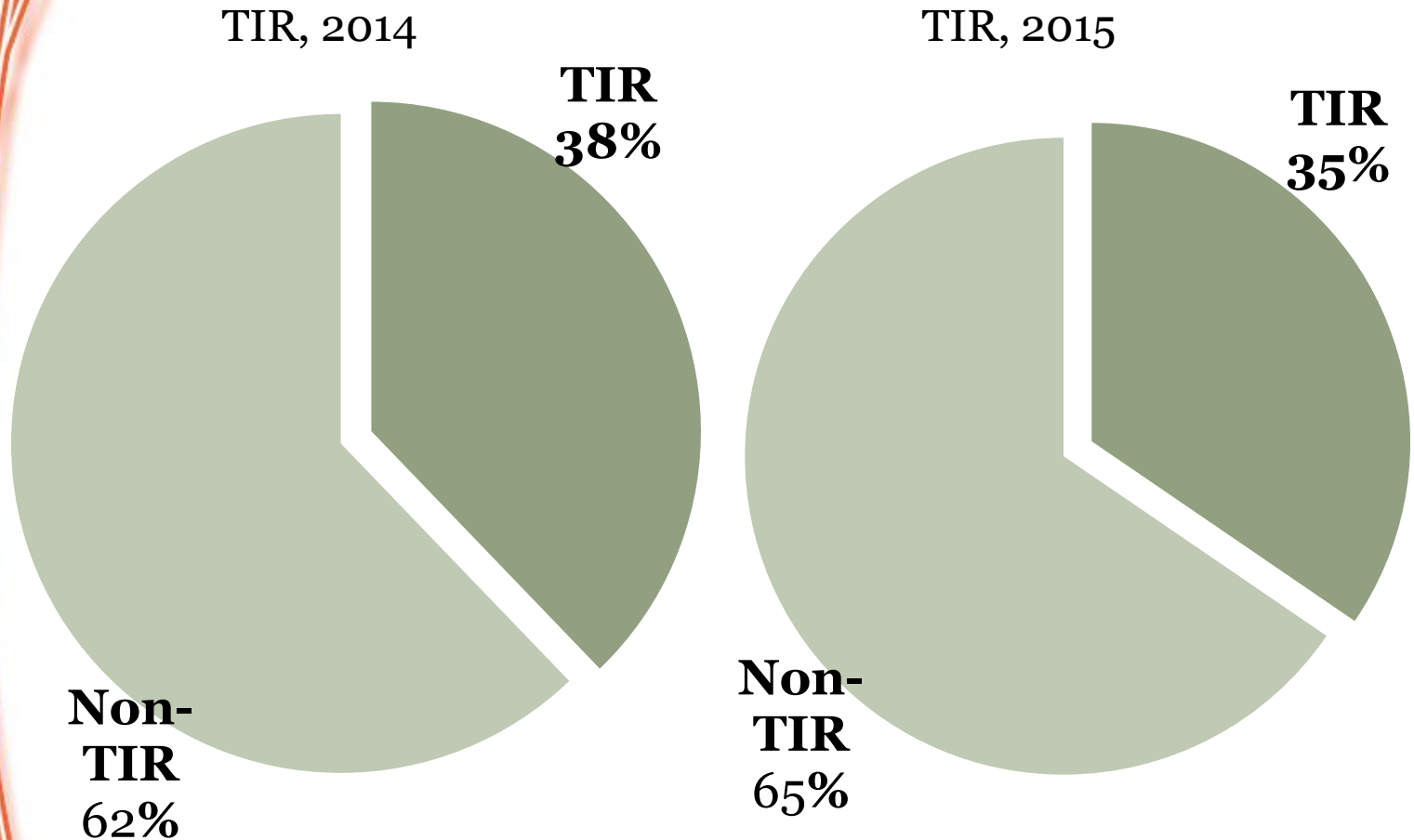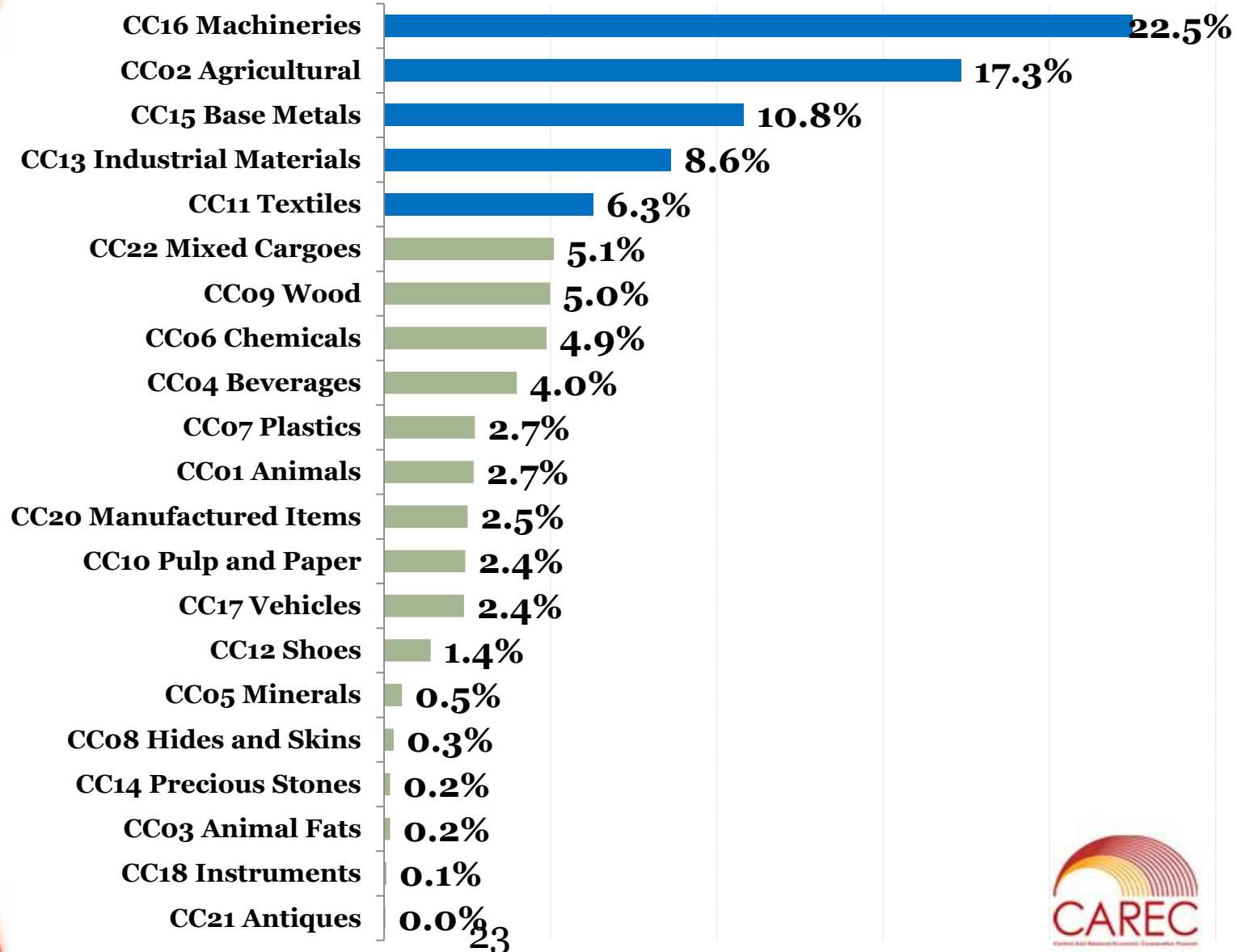| Classification	Percentage
CC16 Machineries	22.5%
CC02 Agricultural	17.3%
CC15 Base Metals	10.8%
CC13 Industrial Materials	8.6%
CC11 Textiles	6.3%
CC22 Mixed Cargoes	5.1%
CC09 Wood	5.0%
CC06 Chemicals	4.9%
CC04 Beverages	4.0%
CC07 Plastics	2.7%
CC01 Animals	2.7%
CC20 Manufactured Items	2.5%
CC10 Pulp and Paper	2.4%
CC17 Vehicles	2.4%
CC12 Shoes	1.4%
CC05 Minerals	0.5%
CC08 Hides and Skins	0.3%
CC14 Precious Stones	0.2%
CC03 Animal Fats	0.2%
CC18 Instruments	0.1%
CC21 Antiques	0.0%

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Contents

TFI Trend for Road (2010-2015)

To insert Road TFI trend charts

TFI1

Time to Clear a BCP

TFI2

Cost Incurred at BCP

TFI3

Cost Incurred to Travel a Corridor Section

TFI4

Speed to Travel on CAREC Corridors (SWD)

Source : CPMM Annual Report 2015

Batken-Gulistan (KGZ-TAJ)

Yierkeshitan-Irkeshtan (PRC-KGZ)
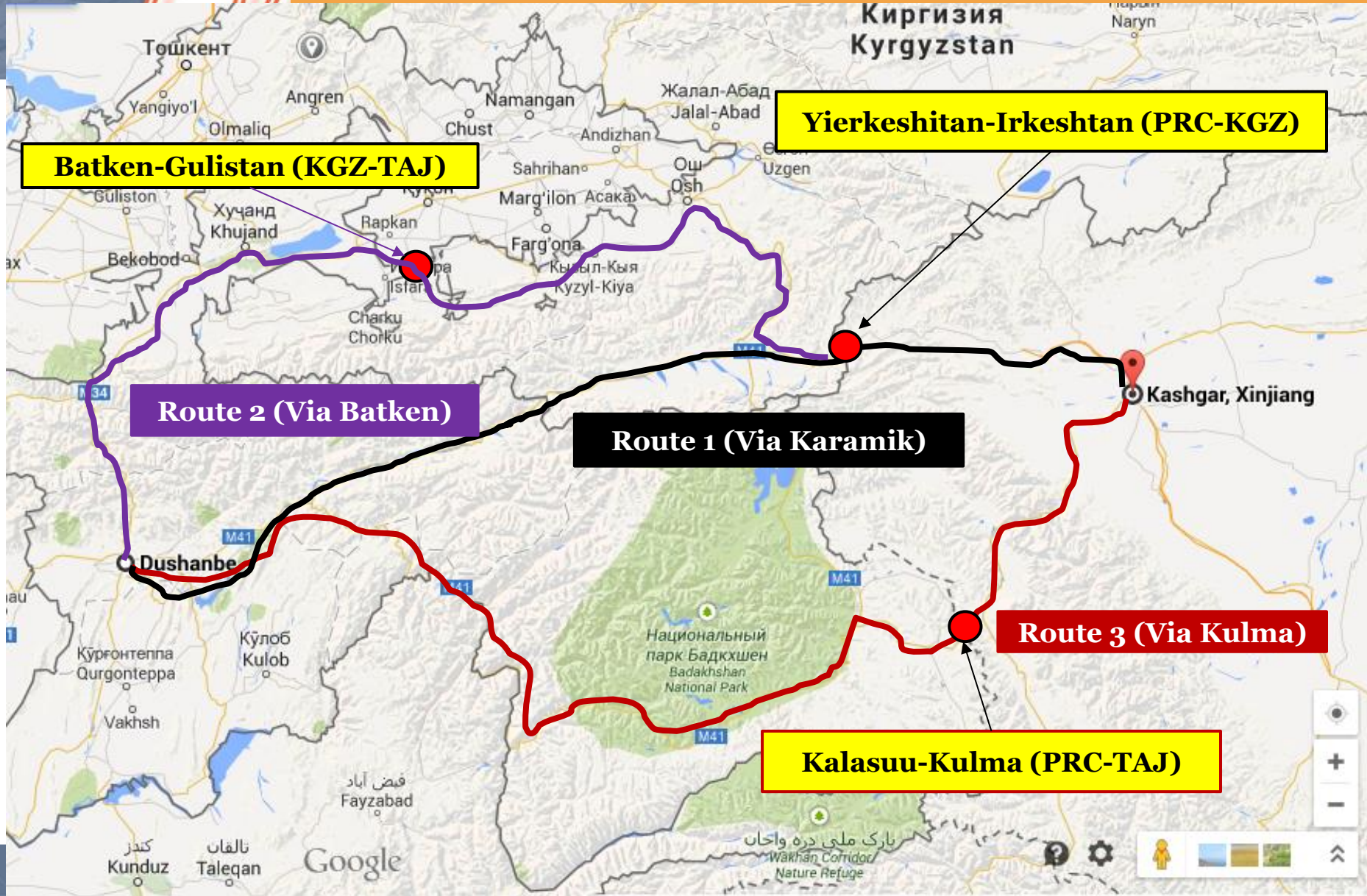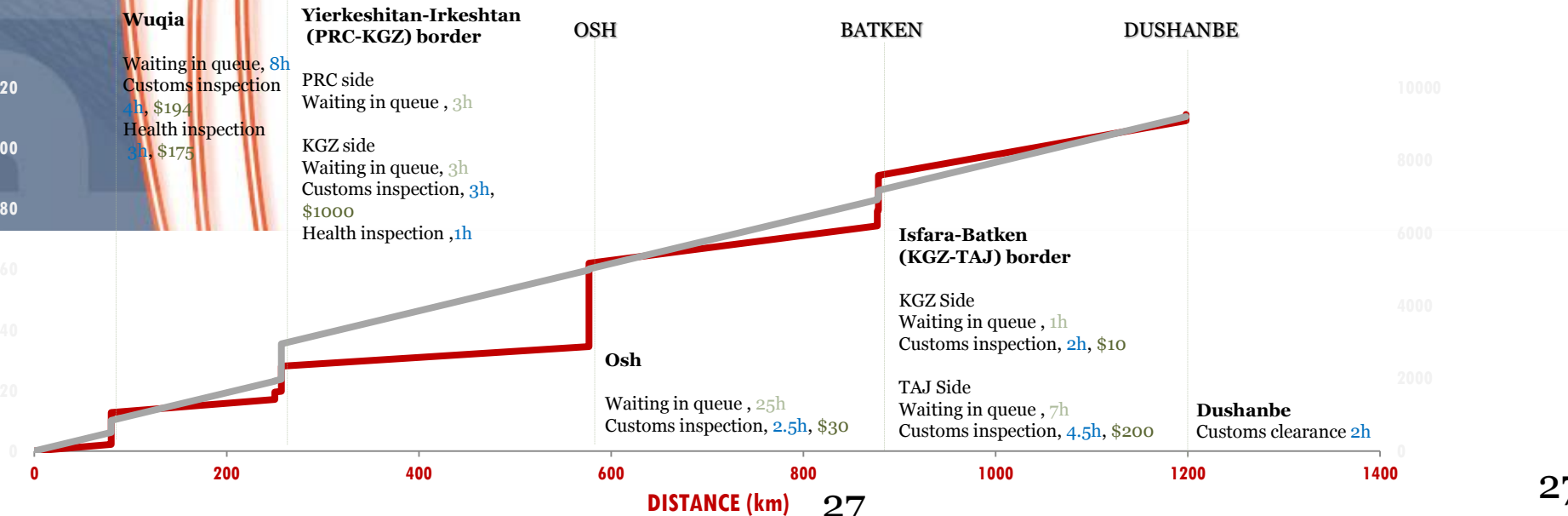
Route 2 (Via Batken)

Route 1 (Via Karamik)

Route 3 (Via Kulma)

Kalasuu-Kulma (PRC-TAJ)

Sample TCD: Kashi (PRC) – Dushanbe (TAJ)

WUQIA   IRKESHTAN   KARAMYK   DUSHANBE

	Via Karamyk	Via Batken-Isfara
	877 km	1,198 km
	75 hr	111 hr
	$ 7,333	$ 9,212

Karamyk (KGZ-TAJ) border
KGZ side
Waiting in queue , 4h
Customs inspection, 1h
TAJ side
Customs inspection, 3h, $200

Dushanbe
Waiting in queue, 8h

Wuqia
Waiting in queue, 8h
Customs inspection 4h, $194
Health inspection 3h, $175

Yierkeshitan-Irkeshtan (PRC-KGZ) border

PRC side
Waiting in queue , 3h

KGZ side
Waiting in queue, 3h
Customs inspection, 3h, $1000
Health inspection ,1h

OSH   BATKEN   DUSHANBE

Isfara-Batken (KGZ-TAJ) border

KGZ Side
Waiting in queue , 1h
Customs inspection, 2h, $10

TAJ Side
Waiting in queue , 7h
Customs inspection, 4.5h, $200

Osh
Waiting in queue , 25h
Customs inspection, 2.5h, $30

Dushanbe
Customs clearance 2h

DISTANCE (km)

27

Causes of Delays for Road BCPs

Average duration of delays at BCPs

2015, Road transport, in hours

Activity	Hours
Border Security / Control	0.4
Customs Inspection	6.4
Health / Quarantine	0.4
Phytosanitary	0.3
Veterinary Inspection	0.3
Visa/Immigration	0.2
GAI/Traffic Inspection	0.2
Police Checkpoint / Stop	0.2
Transport Inspection	0.4
Weight/Standard Inspection	0.4
Vehicle Registration	0.4
Emergency Repair	1.3
Escort / Convoy	1.0
Loading / Unloading	2.2
Road Toll	0.4
Waiting/ Queue	5.0

Among activities with high duration, **customs inspection** stands out. In 2015, the average delay for customs inspection rose to 6.4 due to lengthy procedures at PAK-AFG BCPs for northbound shipments.

Waiting in queues and loading/unloading are very time-consuming, and are frequently experienced during shipments, specifically in these BCPs, when entering neighboring countries

Peshawar (PAK), 12 hrs
Chaman (PAK), 12 hrs
Irkeshtan (PRC), 14 hrs

28
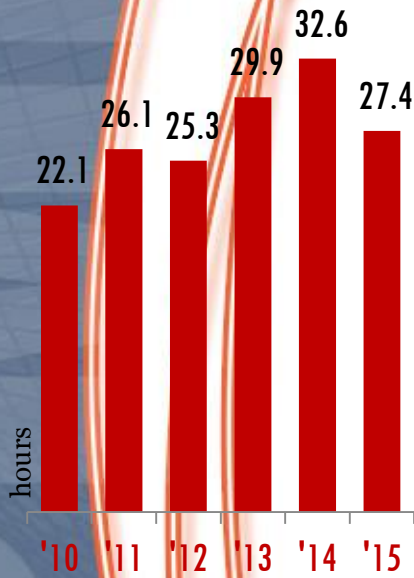
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Identifying Time-Consuming Road BCP

OUTBOUND TRAFFIC

Chaman	PAK	5,6	36.0
Peshawar	PAK	5,6	31.8
Irkeshtan	PRC	2,5	16.8
Khorgos	PRC	1	10.6
Tazhen	KAZ	2,6	7.2
Dautota	UZB	2,6	6.8
Yallama	UZB	3,6	6.4
Alat	UZB	2,3	6.2
Merke	KAZ	1,3	5.9
Sarasiya	UZB	3	5.6
Farap	TKM	2,3	5.6
Karamyk	KGZ	2,3,5	4.8
Nizhni Pianj	TAJ	2,5,6	4.4

INBOUND TRAFFIC

Spin Buldak	AFG	5,6	60.0
Torkham	AFG	5,6	32.6
Sherkhan Bandar	AFG	2,5,6	9.7
Tazhen	KAZ	2,6	7.8
Konysbayeva	KAZ	3,6	7.5
Farap	TKM	2,3	7.1
Fotehobod	TAJ	2,3,6	7.1
Chaldovar	KGZ	1,3	6.5
Sarahs	TKM	3	6.1
Dautota	UZB	2,6	5.9
Dusti	TAJ	3	5.8
Khorgos	KAZ	1	5.8
Alat	UZB	2,3	5.4

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TFI Trend for Rail (2010-2015)

TFI1
Time to Clear a BCP
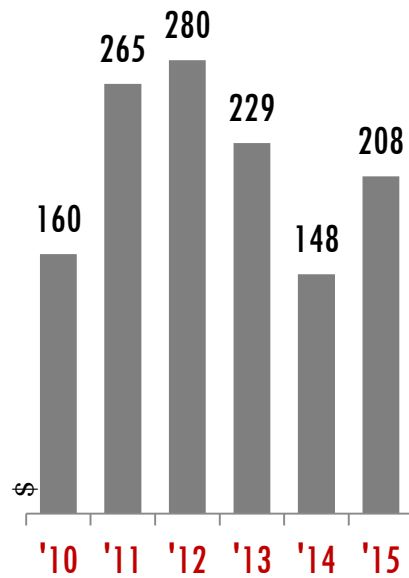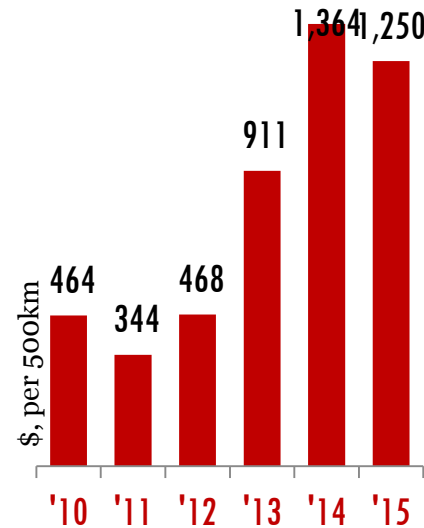
Year	hours
'10	22.1
'11	26.1
'12	25.3
'13	29.9
'14	32.6
'15	27.4

TFI2
Cost Incurred at BCP

Year	$
'10	160
'11	265
'12	280
'13	229
'14	148
'15	208

TFI3
Cost Incurred to Travel a Corridor Section

Year	$, per 500km
'10	464
'11	344
'12	468
'13	911
'14	1,364
'15	1,250

TFI4
Speed to Travel on CAREC Corridors (SWD)

Year	kph (total)	(red)
'10	27	22
'11	30	15
'12	34	15
'13	32	13
'14	32	11
'15	38	14
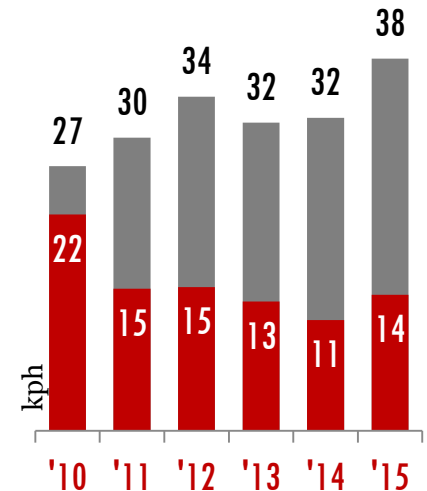
Source : CPMM Annual Report 2015
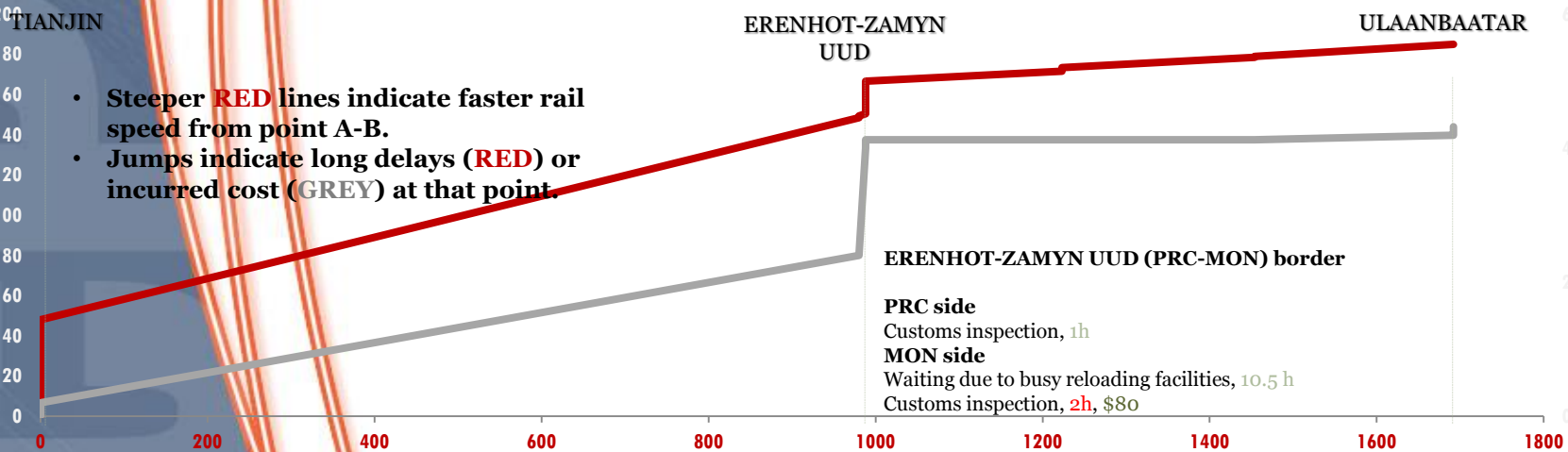
Comparing Corridors 1 and 4 (Rail)

Sample TCD: Urumqi (PRC)-Almaty (KAZ) (above), Tianjin (PRC)-Ulaanbaatar (MON) (below)
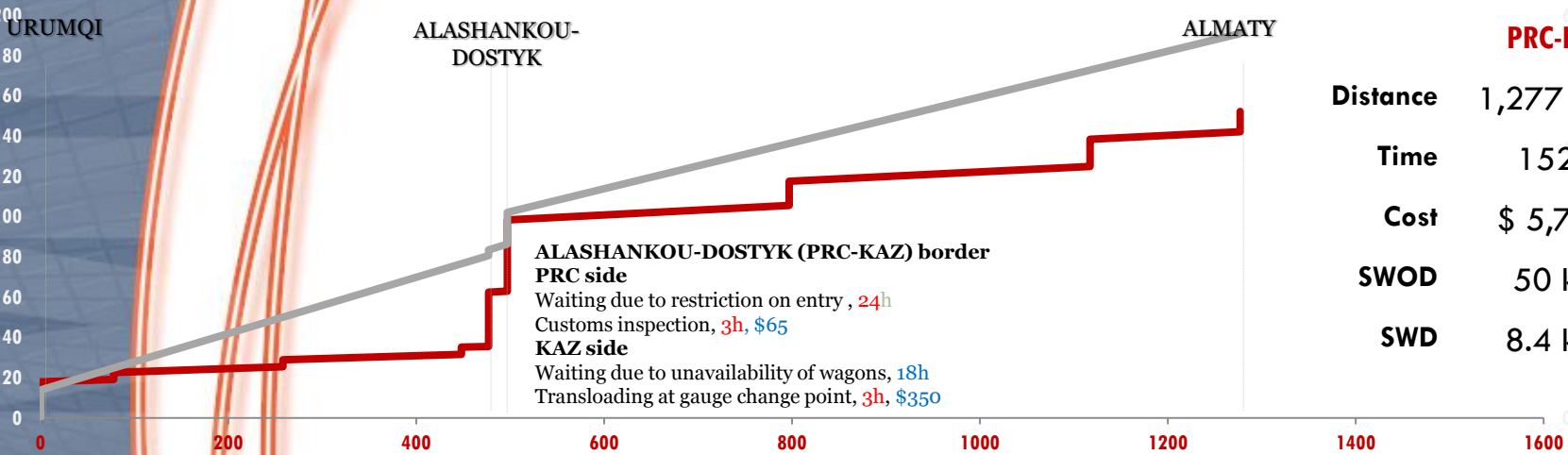
	PRC-KAZ	PRC-MON
Distance	1,277 km	1,692 km
Time	152 hr	185 hr
Cost	$ 5,733	$ 4,915
SWOD	50 kph	14 kph
SWD	8.4 kph	9.2 kph

URUMQI — ALASHANKOU-DOSTYK — ALMATY

ALASHANKOU-DOSTYK (PRC-KAZ) border
PRC side
Waiting due to restriction on entry , 24h
Customs inspection, 3h, $65
KAZ side
Waiting due to unavailability of wagons, 18h
Transloading at gauge change point, 3h, $350

TIANJIN — ERENHOT-ZAMYN UUD — ULAANBAATAR

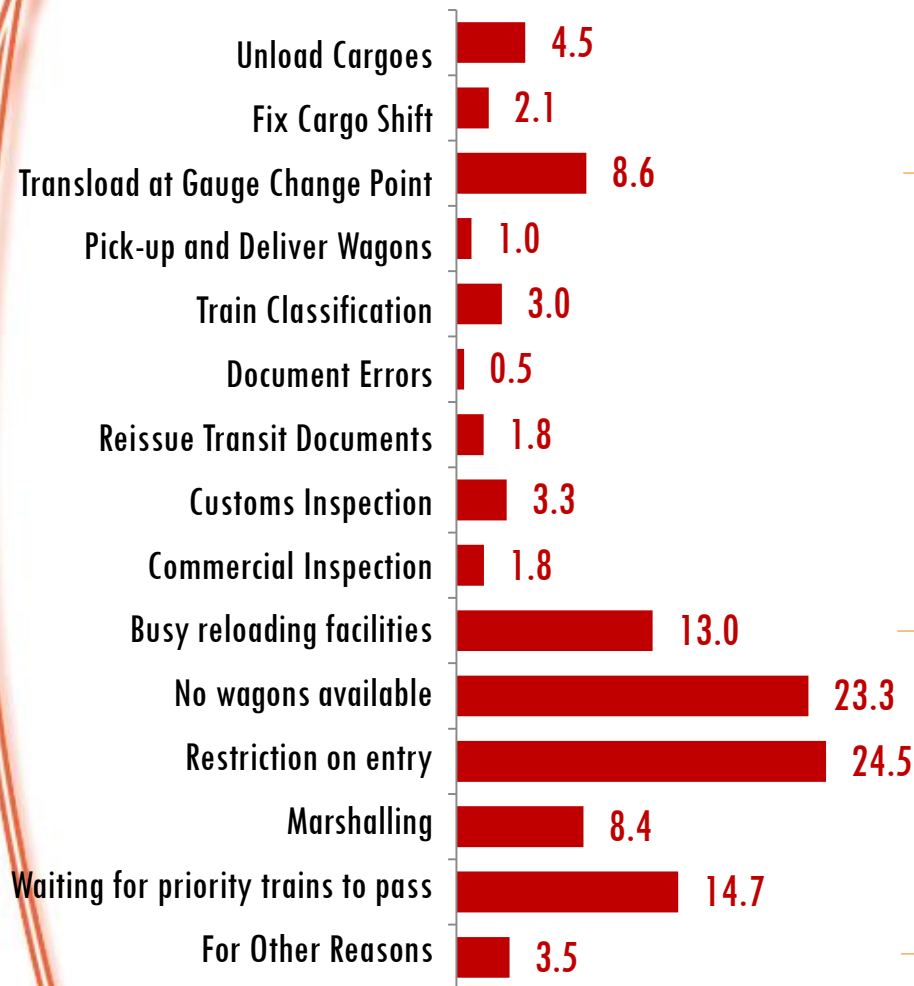- Steeper **RED** lines indicate faster rail speed from point A-B.
- Jumps indicate long delays (**RED**) or incurred cost (**GREY**) at that point.

ERENHOT-ZAMYN UUD (PRC-MON) border

PRC side
Customs inspection, 1h
MON side
Waiting due to busy reloading facilities, 10.5 h
Customs inspection, 2h, $80

DISTANCE (km)

31

Causes of Delays for Rail BCPs

Average duration of delays at BCPs

2015, rail transport, in hours

Cause	Hours
Unload Cargoes	4.5
Fix Cargo Shift	2.1
Transload at Gauge Change Point	8.6
Pick-up and Deliver Wagons	1.0
Train Classification	3.0
Document Errors	0.5
Reissue Transit Documents	1.8
Customs Inspection	3.3
Commercial Inspection	1.8
Busy reloading facilities	13.0
No wagons available	23.3
Restriction on entry	24.5
Marshalling	8.4
Waiting for priority trains to pass	14.7
For Other Reasons	3.5

Aside from waiting in queue, delays due to **transloading at the break in gauge** are commonly encountered at BCPs during inbound border crossing.

- Erenhot (PRC), 33.6 hrs
- Dostyk (KAZ), 4.8 hrs
- Zamyn-Uud (MON), 1.3 hrs

Waiting in queue for rail transport is divided into several categories. In 2015, trains are delayed due to restriction on entry (24.5 hours) and unavailability of wagons (23.3 hours).

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Rail		Alataw Shankou		Dostyk		Total	
		Time*	Cost**	Time	Cost	Time	Cost
Containerized, 40 ft., Express	2015	n.a	n.a	46.0	293	46.0	293
	2014	n.a	n.a	44.3	122	44.3	122
Containerized, 40 ft., conventional		33.6	113	45.4	404	79.0	517
		42.0	138	60.4	232	102.4	370
Bulk chemicals		64.3	199	83.8	359	148.1	558
		94.0	246	102.0	215	196	461
Industrial materials		30.0	84	41.0	395	71.0	479
		45.8	149	67.0	246	112.8	395

Road		Korgas		Khorgos		Total	
	2015	10.6	633	5.8	332	16.4	965
	2014	19.3	644	6.8	308	26.1	952

- CPMM has three main stages. They are (1) Data Collection, (2) Data Aggregation and (3) Data Analysis.
- A standard MS Excel Template is used to collect all samples data.
- Aggregation is done with validation rules to detect problems. Validated data are then aggregated.
- Analysis is typically done at modal and corridor level to produce insights on the transport time and cost.

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