DISCUSSION PAPER

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Transforming Logistics Performance in BBIN Countries

Towards creating a lasting legacy

Joining Dots • Connecting People • Shared Prosperity

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End to end analysis of a corridor using objective data is rare in South Asia, in general, and in the Bangladesh, Bhutan, India, Nepal (BBIN) sub-region, in particular. The overall focus largely remains on examining the border effect. The border effect captures the quality of trade facilitation which is only one aspect of the quality of the overall logistics of a corridor.

For an objective analysis of any region, such as BBIN and the corridors, that provide intra-regional connectivity, one has to therefore move away from the traditional approach of using either survey-based perception studies or in-depth analysis of the border effect.

Given current technology sophistication made available to transport assets and operations, it is possible to assess corridor specific logistics quality in any region. In this context, the Discussion Paper attempts to analyse the concept of freight fluidity and the fluidity of a specific corridor that should be adopted for future research in this area.

It makes practical recommendations on the means to apply this methodology including by underlining the performance indicators to measure logistics as well as methods for improving the eco-system of logistics services which is under-developed across corridors in the BBIN sub-region.

Implementation of recommendation put forth in this paper can help both policymakers and businesses prioritise their efforts, and this, in turn, would lead to significant gains in logistics quality.

Introduction

A lot of literature has been generated around the theme of logistics performance of countries or regions. The most well-known among them is the World Bank's Logistics Performance Index (LPI).

While LPI has served an important role in bringing the attention of policy-makers to logistics and supply chain efficiency and providing a standardised metric of cross-country comparison, it suffers from intrinsic short-comings.

One obvious shortcoming is that the quality of a logistics performance for a large region or a country taken as a whole is sometimes not very meaningful. The level of connectivity and quality of logistics services between Delhi and Mumbai is completely different from that between Delhi and Gangtok, the capital city of the Indian state of Sikkim nestled between Nepal and Bhutan in the Himalayas.

To apply an Indian average to make sense of either the Delhi-Mumbai case or the Delhi-Gangtok case can be quite meaningless.

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The second shortcoming is that any perception-based survey has in-built biases, which can be accentuated if a large number of respondents tend to represent a specific set of stakeholders.

To elaborate, an operations manager at the ground level in India might have a very different view from the manager sitting at the regional HQ of a logistics MNC, but the number of respondents from HQ might outnumber the respondents from the ground.

The surveyor would have no way of knowing whether the HQ manager did their due diligence and got in-country on the ground inputs and if he got them, interpreted that feedback correctly.

An obvious shortcoming of analysing logistics quality is the paucity of actual operational data which can be obtained directly from the field without recourse to survey. This short-coming still impedes researchers.[1]

Ubiquitous technology available all around us has made it very easy to capture large scale operational data which would enable objective measurement and benchmarking of logistics quality.

Instead of making another addition to the exhaustive list of papers and reports that have tried to use surveys or field studies to try and assess logistics quality, this paper attempts to provide an alternative methodology that should be adopted for future research in this area and makes practical recommendations on the means to apply this methodology.

The paper also applies the performance indicators to measure logistics quality that emerges from this discussion of this alternative methodology to provide a meta-analysis of logistics quality in the BBIN region to further underline the fact that the quality of the overall logistics being poor in this region is well-known.

What needs to be known is the micro-level details of this poor performance based on objective data.

Measuring Specifics: Objective Analysis of Logistics Quality

While survey-based instruments that try to put a number on the overall perception of logistics quality in a country or region, the more interesting question is the actual quality of connectivity and the associated logistics services available to service this connectivity between a set of specific origin-destination (OD) pairs in a large country or region (such as BBIN).

In other words, a meaningful analysis of the quality of logistics services can only be done for a particular corridor or a set of corridors. This means assessing the overall logistic quality of the entire corridor between the origin(s) and destination(s). End to end analysis of a corridor using objective data is rare in South Asia or the BBIN context. Typically, it is the border effect that has been exhaustively studied.[2]

The border effect captures the quality of trade facilitation which is only one aspect of the quality of the overall logistics of a corridor. For an objective analysis of any region like BBIN and the corridors that provide intra-regional connectivity, one has to therefore move away from the traditional approach of using either survey-based perception studies or in-depth analysis of the border effect.

While the literature on logistics quality has identified an expansive list of parameters by which to measure the quality of the logistics (see Fugate, Mentzer, and Stank (2010), Caplice and Sheffi (1995) for examples), these different elements identified in this literature can be summarised into four broad fundamentals of transit time, costs, reliability, and resilience.

Transit time refers to the total time taken to move a consignment between origin and destination. Reliability has two elements. The first element refers to the logistician keeping his transit time commitment to the consignee/consignor, i.e. the percentage where the consignments were delivered by or before the committed transit time.

The second element refers to the percentage of cargo damage or loss in transit. Resilience refers to both the ability to respond to operational disruptions and adopt alternatives and the extent of redundancy available in the corridor, i.e. the availability of alternative routes or modal options.

Costs are somewhat of an odd one out in this list. All the other elements are essentially related to logistics operations and management subject to infrastructure constraints. Costs, on the other hand, are dependent on a large number of factors including some which could be considered to be exogenous to logistic operations *per se*.

For example, the extent and volume of trade between an OD pair are as dependent on the economic geography as it is on connectivity. But the volume of trade, especially economies of scale is a key driver of logistics costs.

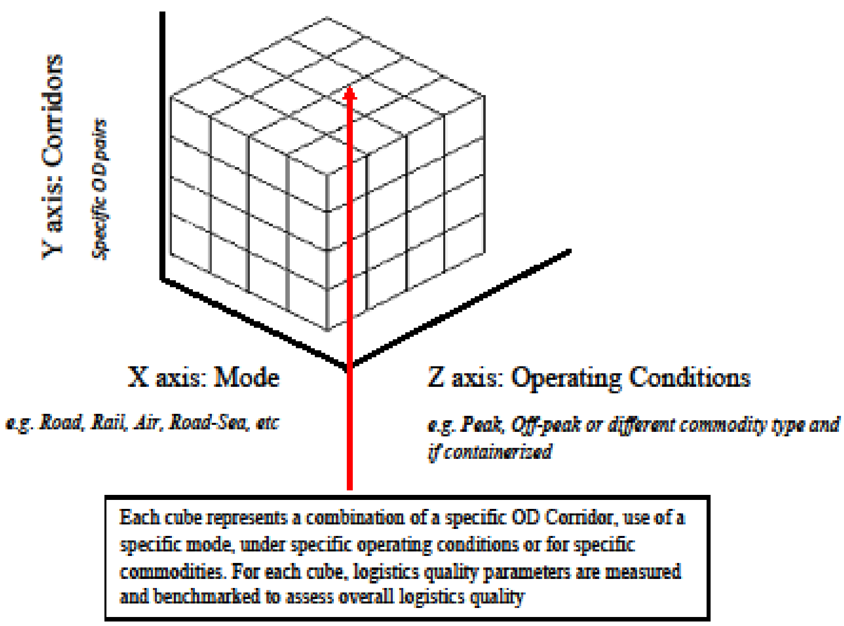
There has been an increasing trend towards using the large amounts of data made available due to the digital enablement of logistics assets such as trucks, vessels, containers, toll-plazas, and border-crossing points, etc. to assess the quality of logistics between specific OD pairs or within a region. This has given rise to the concept of freight fluidity and the fluidity of specific corridors.

The Fluidity of a Corridor:[3] Assessing Logistic Quality of Corridors

Fluidity is a broad term referring to the characteristics of a multi-modal freight network in a geographic area of interest, where any number of specific data elements and performance measures are used to describe the network performance (Eisele and Villa 2015)

More specifically the concept of fluidity analyses specific geography by objective measurement of logistics quality parameters for every corridor (or OD pair) in that geography, using different modes, and under different operational conditions. A visual representation would help clarify this concept.

Figure 1: Corridor Fluidity Conceptualisation



Source: Adopted and modified by the author from Eisele and Villa (2015)

In Figure 1 the Y-axis elements represent different corridors (or origin-destination pairs) in a specific geography. In the context of BBIN, examples of this could include Kolkata to Nepal, or the corridor connecting Eastern India with North-East India (NER) through Bangladesh.

The X-axis elements represent the specific mode being used, e.g. in the case of Kolkata to Nepal, this could represent rail-road or just road. In the case of Eastern India to NER available modes could include road, rail-road, inland water, sea-road, and rail-sea.

Z-axis could represent different things. It could capture the diversity of operating conditions, e.g. whether goods are moving during peak seasons, or differentiate by specific commodity types, or whether the goods are moving on containers (or other standardised unit-loading systems that allow greater inter-operability). The Z-axis can also be used to differentiate by average consignment size of goods since quantity in itself can become an operational differentiator.

Each cube in Figure 1, therefore, represents the movement of goods using a certain corridor in a specific region, using a certain mode (or mode combinations), and specific operating conditions and constraints imposed by choice of the time of movement, type of commodity, the use (or not) of standard load units, or any other such variation. For example, in the BBIN context, the cube marked by the red arrow in Figure 1 could represent Eastern India to NER via Bangladesh corridor, using a road-sea modal combination, for the movement of containerised general cargo.

To assess fluidity, objective measurement of logistics quality-related fundamentals, i.e. transit time, costs, reliability, and resilience would have to be undertaken using precise performance indicators for each of these fundamentals.

Table 1 captures some of the commonly used performance indicators. The table draws from the literature on logistics corridor quality assessment including Eisele et al. (2011), papers in the edited report of Transportation Research Board of the National Academies (2014), OECD/ITF (2016), and Fugate, Mentzer, and Stank (2010).

One can develop an index or a score based on assigning weights to these performance indicators according to their importance from the perspective of that particular study. The modeling methodology, choice of indicators, or the choice of developing indexes or scores from such indicators is not the focus of the discussion in this paper.

The exposition in this section was primarily to draw attention to the fact that given current levels of technology integral to transport assets and operations, it is possible to assess corridor specific logistics quality in a region based on real data instead of depending on perception-based surveys which are subjective.

And that such an analysis can be a comprehensive one and not depend purely on the border effect (dwell time/release time) as compiled by Customs administrations from time to time.

As has been highlighted for the list of 26 performance indicators in Table 1, almost all the data related to connectivity transit time, and reliability is available directly, or in cooperation with transport asset operators (i.e. obtaining the GPS data from the mobile-based conveyance tracking applications that are in common use).

The customs clearance related data can easily be obtained from the EDI record of customs administration, and augmented with time-release studies in core gateways. Only resilience and cost-related indicators need targeted logistician survey.

The concept of fluidity analyses specific geography by objective measurement of logistics quality parameters for every corridor

Table 1: Performance Indicators to Measure Logistics Quality Fundamentals

CONNECTIVITY AND TRANSIT TIME		
Quality of connectivity and mobility	• Existence of effective physical infrastructure to support connectivity using that mode (or a model combination) for OD pair • Existence of a regular logistics service to support that mode (or a model combination) for OD pair • Point to point transit time for OD • Average time per km • Variability in average time per km for every 20/50/100 km stretch	• Already available Geospatial mapping of infrastructure • Readily available information • Easy to obtain from GPS applications in mobile for road and in-built vessel systems for rail/ship/aircraft
Physical bottlenecks	• Average waiting time per trip due to congestion (including at tolls etc.) • Average Time to enter/exit gateways (land-border//port/airport), and standard deviation • Turnaround time for transport asset at port/airport/land port, and standard deviation • Dwell time for cargo at port/airport/land port, and standard deviation • Average time for transshipment and standard deviation	• Easy to obtain from GPS applications in mobile for road and in-built vessel systems for rail/ship/aircraft • Customs Time Release studies
Regulatory bottlenecks	• Average time for transport asset to complete entry/exit procedures at port/airport/land port, and standard deviation • The average time is taken for customs and associated agencies to release cargo and standard deviation	• Easy to obtain from GPS applications in mobile for road and in-built vessel systems for rail/ship/aircraft • Custom Time Release studies
RELIABILITY		
Transit time commitment	• Standard deviation in travel time • % of shipments arriving within committed travel time • % of shipments arriving significantly late (definition of significantly late would depend on mode and expectation)	• Easy to obtain from GPS applications in mobile for road and in-built vessel systems for rail/ship/aircraft
Damage and loss	• % of shipments reporting loss, theft, or damage	• Logistician Survey
RESILIENCE		
Robustness	• % of the time the logistician can respond to disruption and provide alternative	• Logistician Survey
Rapidity	• Speed of responsiveness: the amount of time taken (in hrs) to operationalise alternative (commencement of journey using alternative means, for example, different route, mode, or modal mix)	• Logistician Survey
Redundancy	• Availability of effective alternative route for OD	• Already available through Geospatial mapping of infrastructure
COSTS		
Overall costs	• Cost per Kg or Unit, and standard deviation • Cost as % Unit Value of goods (Cost per Kg/Value per Kg or Unit), and standard deviation	• Logistician Survey
Benchmark	• Cost per Kg or Unit, and standard deviation vis-à-vis an established benchmark • Cost as % Unit Value of goods (Cost per Kg/Value per Kg or Unit), and standard deviation vis-à-vis an established benchmark	• Logistician Survey
Economies of scale and accessibility to services	• Cost elasticity due to volume • The minimum parcel size requirement • The difference in cost per Kg between LCL/LTL cargo and FCL/FTL cargo	• Logistician Survey

Source: Author's compilation

In other words, a comprehensive logistics quality assessment using real data can be implemented in the BBIN sub-region with the existing level of technology sophistication, with as much or lesser effort than survey-based methodologies.

A Meta-Analysis of Logistics Quality

While actual real-time data is not available, the anecdotal experience gathered from operators[4], findings of some previous studies[5], and infrastructure assessments undertaken on specific corridors[6] can be used to provide a basic qualitative overview of some of the more fundamental indicators of logistics quality in the BBIN sub-region.

While this assessment is incomplete and suffers from not having been informed by robust real-time operational data as a proper assessment should, it provides what can be described as a meta-analysis.

Quality of Connectivity and Mobility

Multiple road connections are crisscrossing the region that allows cross-border road freight. However, the quality of the physical infrastructure of roads is poor in many stretches and often goes through congested urban spaces, and average speed is between 20 km/hr to 40 km/hr, about half of average speeds typically seen in the more advanced corridors in South-East Asia. There is also a very high variability in average speeds across different stretches in every corridor.

Regular air connectivity exists between the main economic nodes. But air connectivity between secondary nodes (for e.g. say Comilla and Silchar) or between some secondary and primary nodes (for e.g. Comilla and Calcutta) is very poor.

Rail connectivity exists between India and Nepal but is impeded by poor rail network within Nepal itself, and there is no thorough rail services between India (or other BBIN member countries) and Nepal's primary economic node of Kathmandu. Bhutan has no rail cargo connectivity.

Rail cargo connectivity between India and Bangladesh exists in a rudimentary sense currently. However, container and other cargo services are expected to be operational soon with the completion

Multiple road connections are crisscrossing the region that allows cross-border road freight of the rail bridge over Padma[7] and connectivity between Akhaura and Agartala[8]. Once completed, this would also establish a direct link between Nepal's railhead of the Birgunj and Bangladeshi rail network.

The only effectively operational Inland water transport (IWT) infrastructure is the India-Bangladesh Protocol (IBP) route which connects Kolkata in West Bengal to Pandu in Assam via Bangladesh. Many others are works in progress but do not have regular services as yet. Coastal and short-sea shipping are possible between India and Bangladesh.

Given the rudimentary nature of rail and IWT infrastructure, cargo movement across different corridors essentially depend on the road, with some air freight and coastal shipping. This also means that there has been no serious investment to date by logisticians to develop multi-modal operations, i.e. rail-road, road-IWT, or road-air.

Evacuation of coastal cargo (i.e. sea-road) also remains under-developed. This means that the current eco-system of logistics services is under-developed across corridors in the BBIN sub-region.

Physical and Regulatory Bottlenecks

As already indicated, all road corridors that provide cross-border connectivity in the BBIN sub-region suffer from congestion due to both relatively poor road quality in many stretches, and due to having to negotiate urban areas without recourse to a by-pass. Four-laning or more exists in very few stretches overall.

In many cases, the key land-border crossings require negotiating through congested urban spaces. The approach road to Benapole-Petrapole the main land-border crossing between India and Bangladesh from either Kolkata or Dhaka is an illustrative example for all of the issues mentioned here.

Both dwell time of cargo and turnaround time for trucks in most land-borders in the BBIN sub-region remain sub-optimal, especially when adjusted for cargo throughput. Poor traffic management in and around land ports is one major factor. Physical infrastructure short-comings are aggravated by policies and regulations.

Not allowing trucks to cross-borders and not having developed the concept of inland border clearances that allow trucks and goods to cross border-points with minimal inspection means that there is inordinate pressure on the border infrastructure.

The need for trans-shipment between trucks of two countries adds a layer of delay and operational costs. The fact that policies are not aligned on both sides of the border, for example the number of truckloads of cargo to be cleared, leads to increased

dwell time as this mismatch in throughput leads to accumulation of cargo at land ports.

Anecdotal evidence suggests that the standard deviation in both dwell time and turnaround time is high, which seems to suggest that there are frequent spikes in both dwell time and turnaround time resulting in low levels of predictability for logisticians.

Handling infrastructure and quality of cargo terminal management in the key airports serving the region, i.e. Dhaka, Kathmandu, Kolkata, Guwahati, Chittagong, and Paro remain much below average compared to most airports in SE Asia and the rest of India (i.e. major hubs like Delhi, Bangalore or Hyderabad). Coupled with regulatory and procedural complications, this results in relatively poor dwell times for air-cargo.

As mentioned earlier connections to secondary cities and lack of robust service offerings often result in scheduling problems further increasing dwell time as intra-BBIN cargo often has to wait longer in terminals, or in transit airports to find appropriate connections.

Turnaround time and dwell time in the most important ports serving BBIN, i.e. Kolkata-Haldia, Vishakhapatnam, Dhaka-Pangaon, and Chittagong are significantly higher (double or more) compared to major ports in SE Asia.

Also, Chittagong port, the main deep seaport of Bangladesh, and potentially an outlet for NER suffers from severe congestion on both the land-side and quay-side, resulting in poor turnaround time.

Rail cargo handling facilities serving the BBIN corridor, primarily the ICD at Majerhat (near Kolkata) and the ICD in Birgunj, have high dwell times due to several operational issues, and suffers from congestion on approach roads. The efficacy of customs clearance is also below average when compared to similar facilities elsewhere in more developed parts of South East and East Asia.

Reliability and Resilience

Reliability and resilience of logistics services have not been studied or analysed seriously in BBIN corridors, but anecdotal evidence especially for road freight seems to suggest that there are higher than average challenges due to theft, loss, and damage.

As already discussed, physical and infrastructure bottlenecks and quality of infrastructure also present a challenge to transit time reliability, especially for road freight.

The ability to re-route shipments in case of emergencies in the case of rail/air/IWT is mostly non-existent due to the paucity of alternatives. Even in the case of a road, the fact that trucks cannot cross borders and travel to the end destination means much greater coordination is required at the border which impedes quick reaction time. Besides, regulatory restrictions and lack of inland clearances make re-routing very challenging.

Costs

There has been very little attempt to capture cost data for different types of transportation service offering systemically in terms of studies of reports for this region. Part of the challenge lies in the fact that no cross-border services are being offered for many of the modal combinations.

In some cases, certain modal combinations are not possible due to regulatory restrictions, in other cases, they are still not perceived as operationally or commercially feasible. In many cases, regular cross-border services do not exist.

There has been very little attempt to capture cost data for different types of transportation service offering systemically in terms of studies of reports for this region

The only mode for which there is some data is for the road transport sector. Typical costs in the BBIN sub-region depending on the season and sector ranges from Rs 3.25/per tonne-km to Rs 7/per tonne-km. Besides, the cross-border movement would include customs brokerage charges and informal payments. Road freight charges are low compared to SE Asian averages for similar distances.

Container rail movement between Kolkata port and Birgunj costs around Rs 130k to Rs 150k, including the costs of empty container repositioning, and this

is significantly higher than comparable global averages for similar distances. Lack of regular and well-established coastal or IWT services means that very little data exists for these modes.

Conclusion and Recommendations

The meta-analysis of logistics quality underlines that logistics quality remains extremely poor in the BBIN sub-region. The corridors that connect BBIN suffer from poor connectivity and transit time and are plagued by physical bottlenecks. Policymakers realise this problem and several connectivity initiatives in the road, rail and IWT are underway.

Once complete, this will result in a marked improvement in logistics quality and create greater confidence in logisticians to make more service offerings. But in many cases, the speed of implementation of these projects has been very slow. Regulations and procedures at the border, and in some cases behind the border add and exacerbate these problems.

While there has been some discussion on adoption of best practices such as allowing movement of trucks across borders and allowing inland clearances (under discussion under BBIN MVA), having integrated and coordinated customs operations, developing a common message exchange protocol between BBIN customs administrations, and looking at refining the risk management systems, especially at land borders, progress in this area is exceedingly slow. The negotiations around BBIN MVA for e.g. are continuing for 5 years without a final resolution.

Most of the problems that are discussed in section IV and summarised in the previous paragraphs have been analysed by many studies, and are well known. The generic and obvious recommendation is for expedited completion of the infrastructure projects. It is also well-known among policy-makers that the regulatory reforms represent low-hanging fruit.

Developing a Corridor Fluidity Measurement System

Perhaps the most important recommendation that can be made is the adoption of systemic data collection from transport assets, including containers and unit-load devices, and developing a corridor fluidity monitoring mechanism.

A partnership between logisticians in BBIN countries moderated by national or regional business associations could create the network required on the ground linking devices with transport assets. Public transport service providers such as Railways and IWT operators would also have to be included as partners.

A partnership between logisticians in BBIN countries moderated by national or regional business associations could create the network required on the ground linking devices with transport assets

Developing a data collection application (app) has become relatively inexpensive and simple. A basic app for such a purpose can be developed for as little as US$30,000. The data control tower can be managed by interested research NGOs with long working experience in the region such as CUTS in India, Unnayan Shamannay in Bangladesh, etc.

Once operational, the data control tower would be able to churn out a micro-level analysis of the different performance indicators of logistics quality based on real data. The same app can be used to conduct targeted surveys on baseline costs for different services periodically.

This would help policy-makers identify show stoppers in each corridor, as well as provide logisticians insights on how to tweak their service offerings, including adopting multi-modal solutions.

Such a system would also help track incremental improvements as the physical infrastructure being developed gets completed for use or as regulatory reforms are adopted, and thus help push further investments in infrastructure and increase the appetite for reforms.

In essence, it would help both policymakers and businesses prioritise their efforts, and this in turn would lead to significant gains in logistics quality.

The core recommendation of this discussion paper to policymakers, businesses, and research entities, therefore, is to redirect resources from another set of survey-based studies or overview analyses, and use it instead to develop even a rudimentary system to measure corridor fluidity based on real operational data from the ground.

Over time the system thus developed could be formalised and turn into a permanent institution between regional governments and businesses supported by research entities in the BBIN sub-region. In other words, this would create a lasting legacy.

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Endnotes

1 A good example is the relatively recent work by Kumar, Shepherd and Dime (2018), where authors use the available transit time data from Universal Postal Union (UPU) in their analysis of trade costs and supply chain reliability in South Asia simply because it is the only reliable database available. Parcels logistics are hardly representative trade, especially in the South Asian context. It is even less reliable proxy for across the land border movement.

2 The 'infamous' Benapole-Petrapole land-border between India and Bangladesh is arguably the most 'analysed' border in the world, being the subject of numerous studies over the last two decades.

3 The concept of freight fluidity of corridors was developed for Transport Canada's Gateways and Trade Corridors Initiative, the Directorate of Economic Analysis was interested in developing freight performance measurements for goods using Canada's international gateways and traveling along its freight transportation corridors. For a detailed discussion on this concept refer to Eisele et al. (2011).

4 The author in current capacity as Logistics Sector Specialist Consultant with ADB, and previously as a Senior Manager with Deutsche Post DHL Group has been part of many industry discussions/meetings on BBIN corridors.

5 These include Banerjee (2016), World Bank (2018), CUTS (2019), ADB (2020), and Kathuria and Mathur (2020) among others.

6 ADB (2020).

7 Existing rail-bridge on the Padma cannot support laded container operations. Direct cargo trains between Dhaka and Kolkata can only start operating once the Padma Bridge Rail link project is completed.

8 End to end seamless rail operations between Kolkata and Agartala via Bangladesh would also require double gauging of tracks in large sections of Bangladesh rail network, especially in the Dhaka-Chittagong stretch.

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