Action Programme on Intermodal Freight Transport in Java, Indonesia

Technical Design Study (Summary)

Ministry of Transportation
Republic of Indonesia

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of:

Federal Ministry
for the Environment, Nature Cons
and Nuclear Safety

of the Federal Republic of Germany

1. Introduction

1.1 Background

Indonesia is the fourth most populous country in the world and the largest member state of the Association of Southeast Asian Nations (ASEAN). The transport and warehousing sector has been a source of considerable economic success, with its contribution to GDP increasing from 4.4% in 2014 to 5.2% in 2018 (Worldbank, 2020) – one of the fastest growing sectors in Indonesia.

Indonesia's ranking in the global Logistics Performance Index (LPI) is still below that of neighboring countries such as Vietnam, Thailand, or Malaysia. **Logistics costs in Indonesia, expressed as a percentage of manufacturing sales, are at 25% still significantly larger than in e.g. Thailand (15%) and Malaysia (13%)** (Worldbank, 2020). The Ministry of Transport's (MoT) Strategic Plan (RENSTRA 2015-2019) addresses some of the root causes of high logistics costs, including the lack of adequate infrastructure.

The transport sector was responsible for 136 MT of carbon dioxide (CO_2) emissions in 2016 (up from 71 MT in 2006), 90% of which is caused by land transport. **The transport sector's fuel consumption has been green growing at an average rate of 5% over the past decade.** The freight transport sector plays a significant role in this trend, as **a major consumer of total energy consumption – and therefore emitter of greenhouse gas (GHG) emissions.** In 2015, carbon emissions from road freight transport on Java have been estimated to be 11.5 MT which is approximately 8.12% of the total emissions of the transport sector. **Therefore, green freight policies are needed.**

One of the factors behind the comparatively high emissions from freight transport is the **dominance of road freight in the modal split** which more than 90% (RIPNAS, 2018) and estimated will grow at about 2% annually on Java. Unlike road freight, rail freight is largely underdeveloped, despite significant investment programmes in road and rail transport infrastructure along the main corridors on Java. This is mainly because of a general **lack of prioritization for the development of the rail freight sector compared to passenger rail.** This has led to a **limited availability of rail transport capacity and equipment that can accommodate freight transport demand.**

Road transport as the dominant mode has many flaws as well: large parts of the fleet are outdated and are not equipped with fuel efficient engines; vehicles are generally small, maximizing their flexibility but limiting their efficiency and economy of scale; illegal over dimensioning and overloading (ODOL) is very common leading to road damage and accidents; road congestion causes delays and significant time losses.

Modal shift from road to rail freight transport can be **highly effective in reducing externalities of freight transport, including CO_2 and other emissions**, accidents and congestion. Improving the competitiveness of rail freight transport in terms of cost, time, reliability and general service level is of great importance to realize a higher modal share for rail.

1.2 Objective and scope

The purpose of this report is to **formulate an intermodal action programme for the context of Java, Indonesia, that is implementable and capable of promoting modal shift from road to railway** to help reduce GHG (Green House Gas)/CO_2 emission.

The focus of the action programme development is on a) reducing the imbalances currently observed between intermodal and road (notably through institutional, fiscal and pricing interventions); and b) policies and actions designed to increase the productivity and efficiency of the intermodal sector (notably through infrastructural enhancements that connect the rail network with industrial production and consumption areas, as well as major transport hubs such as sea ports). While the scope of this project is extensive, we do not study the potential of expanding railway network. We rather **focus on the improvement of existing network capacity and the access to the network.**

1.3 Sector overview

Economic contribution of the transport sector

Transport and storage industry (passenger and goods) accounted for 5.6 % of Indonesia's GDP (Figure 1). The sector officially employs 5-6 million people across Indonesia, which is 4% of Indonesia's formal labour market (60% of these transport jobs are on Java). Road transport accounted for 44% of the transport sectors GDP contribution, whereas rail for only 1.4%.

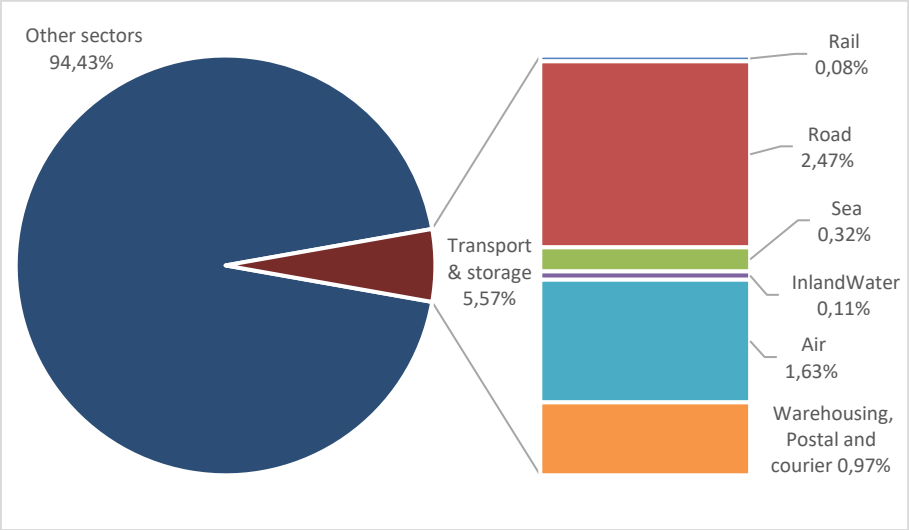

Figure 1: Transport contribution to Indonesia's GDP Market development of the rail freight sector

Source: Chart based on BPS statistical yearbook 2020

Indonesia's rail freight sector is historically dominated by coal transport which accounts for about two thirds of the volume and mainly happening on Southern Sumatra. The volumes of cement, containers and fuel products transported by rail have also grown significantly at a lower level (Figure 2).

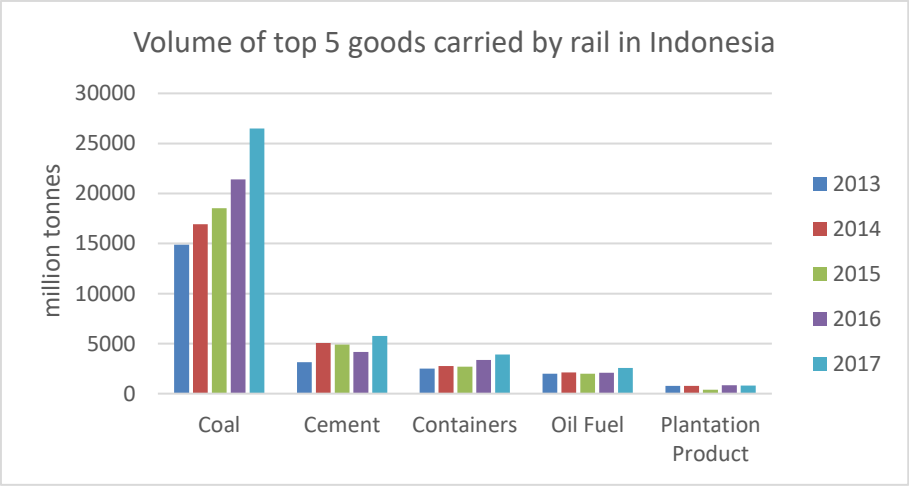

Figure 2: Volume of top 5 goods carried by rail in Indonesia

Source: Directorate of Railway Traffic and Transport, Directorate General of Railway

In terms of regional distribution, **Sumatra accounts for about two-thirds of the rail freight transport volume, and Java for the remaining one third** (MoT Land Transport Statistics, 2018) (Figure 3).

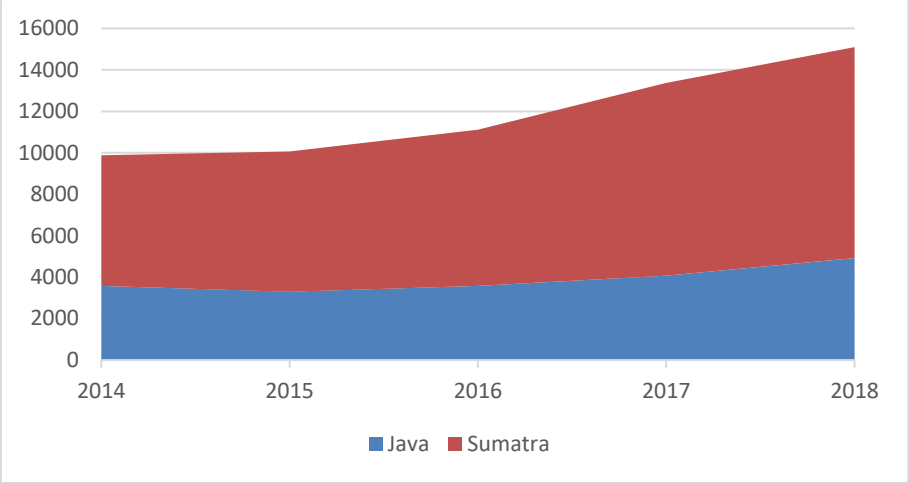

Figure 3: Rail freight growth by region, in million tkm

Nationally, rail freight had a market share of less than 1% (in tonnes) in 2011 (RIPNAS, 2018), but the number varies by origin/destination and by commodity type.

Existing infrastructure capacity

Figure 4: Transport networks on Java (Source: Wikipedia)

Railroads on Java were around 3783 km long in 2017 (Figure 4). **Its technical capacity in terms of axle load is relatively small (9-18 tonnes, compared to 22.5-30 tonnes in Europe)**, which removes one of its main competitive advantages versus road transport, particularly when accounting for ODOL in road freight transport. Programs for railway infrastructure expansion and improvement (e.g. double tracks) are ongoing, using a corridor approach (North Java first, then South Java).

The average distance of rail transports on Java are in the range of 330-450 kilometres (DG Rail, 2018) which is generally perceived as a length where a shift to rail can be economic. The entire length of the northern Java corridor from Jakarta to Surabaya is about 720 km and is fully double tracked since 2016.

With Japanese development aid, t**he entire route will be modernised by 2025, including an additional track between Jakarta and Semarang in Central Java, which is the busiest section for both passenger and freight**. This network expansion could help to create additional capacity for freight on the rail network, on which generally passenger transport is prioritized. PT KALOG provides additional freight services on the South Java Corridor (via Bandung and Yogjakarta), yet with limited volumes. In terms of scheduling, **rail freight capacity is restricted because of the competition with rail passenger transport, which is prioritised by the infrastructure manager.**

Governance, relevant stakeholders

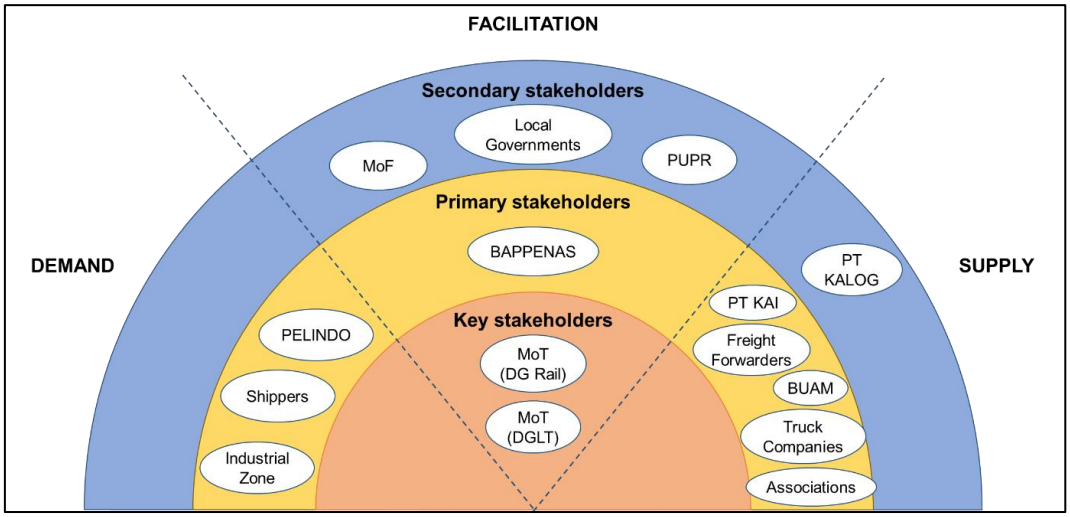

Figure 5: Stakeholder map of intermodal freight transport

Figure 5 presents a map showing the stakeholders that are relevant to the intermodal freight transport action plan. **The Ministry of Transportation** (MoT) is responsible for governance and regulation of transport both for roads and rails. Within the MoT, there are two directorate general that responsible for each of mode of transport: **Directorate General (DG) of Land Transport** and **Directorate General (DG) of Rails**. Under each DG, there are also dedicated **Sub-Directorate of AMM** (*Angkutan Multimoda dan Antarmoda*) under Directorate of Road Transport, DG of Land Transport, **responsible for multimodal connectivity for passengers and freight modes**, and **Sub-Directorate Transport** under Directorate of Railways Traffic and Transportation, DG of Rails, responsible for **rail passengers and rail freight transportation**.

BAPPENAS is critical ministry to help with the action plan in scrutinizing the budget planning before submitting to **Ministry of Finance** (MoF) for financial approval. **Local government and PUPR** are main players to ensure that there is connectivity and road access to and from nearest station. Moreover, local government is also important in supporting land lease for building new rail infrastructure connecting with the main line.

On the **supply side**, the state-owned **PT KAI** is served as rail operator and infrastructure manager. It has important role to decide whether the selected routes under this concept document could be implement and whether such action to improve rail freight services could be acceptable. The route's decision will also need considerations from shippers, port operators as well as the industrial zone/manufacturing industries where the freight transport will start/end its shipment.

PT KAI needs to work with **PT KALOG** (KAI's subsidiary company that is responsible for rail freight operations) to operate the freight trains on Java's public network and to offer door to door services. On the other hands, PT KALOG also relies its services via **third parties's trucking companies** for its first and last mile services, to and from its rail terminals.

Besides PT KALOG, PT KAI needs also to work with **BUAM and other freight forwarders** to ensure continuity of the services. BUAMs are freight forwarders or shipping lines that arrange door-to-door transport using multiple transport modes, including air, road, waterways. They got their multimodal business licence from Ministry of Transportation. Currently, BUAMs who offer intermodal rail transport services do so via KALOG, rather than through their own infrastructure or equipment.

Because the freight forwarding, trucking companies and manufacturing industries is fragmented in Indonesia, **industry organization like ALI, ALFI, APTRINDO, HKI, ORGANDA, Kadin Indonesia and EuroCham can facilitate the communication between the industry and policy makers.**

2. Barriers for intermodal rail freight transport

Service quality is considered the most **important factor to determine choice of a mode of transport**, followed closely by transport cost and by transport time (based on survey results). That indicates that these three factors need to be improved in parallel in order to make more market participants shift from road to rail. A similar sentiment came to the rate on **how obstructive certain rail freight barriers are in the context of Java.** Intermodal service issue (double handling risk) is the number one barrier, followed closely by the comparatively higher cost of rail and thirdly: infrastructure issues (Figure 6).

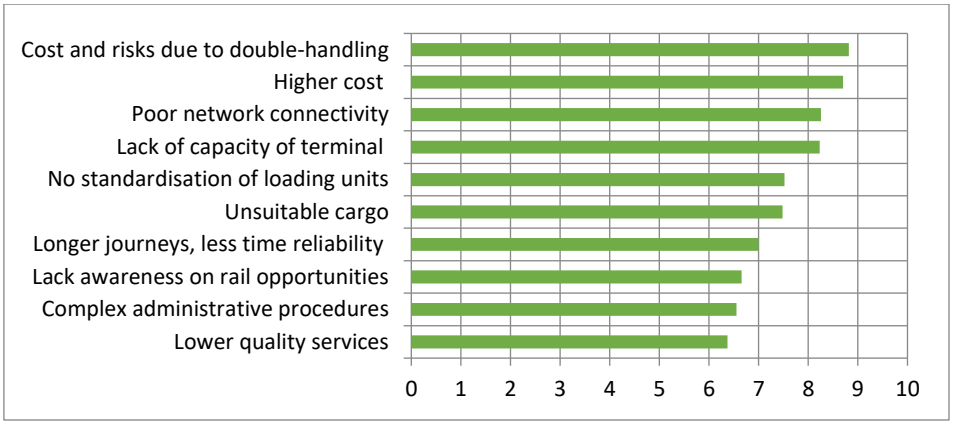

Figure 6: The biggest barriers for shippers & forwarders in Indonesia to use more multimodal rail transport

The causal factors ('root cause analysis') are illustrated (Figure 7) by looked beyond the high-level barriers, which shows the factors that were found behind **six key problem areas.** There are two levels of problem areas: the top level are the three issues, namely cost, time and service quality. These issues are caused by a set of three underlying issues, namely inadequate infrastructure, lack of policy and institutional support and lack of market competition of intermodal freight transport services.

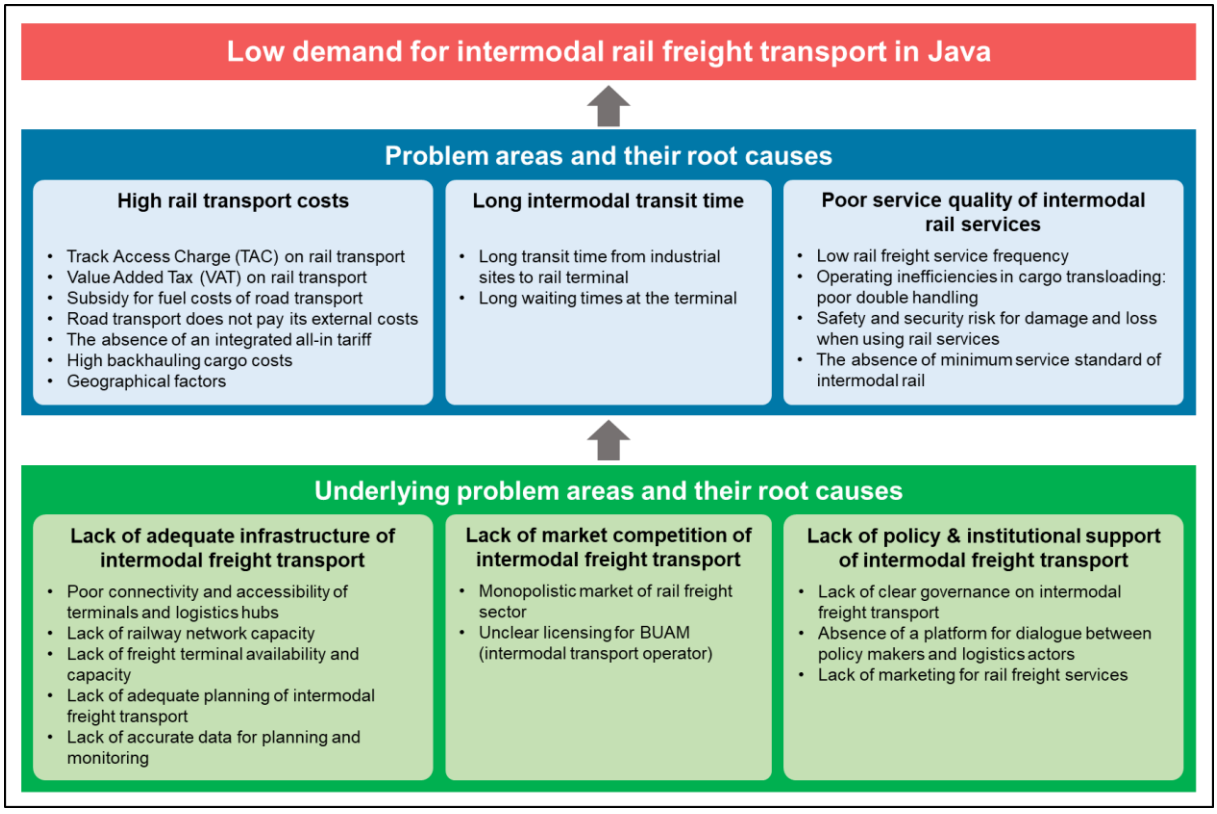

Figure 7: Specific factors cause the low demand for rail freight transport on Java

2.1 High rail transport costs

For long distance trip (e.g. Jakarta-Surabaya) rail transport cost is quite competitive to road cost, particularly when the destination of the cargoes is quite close to the terminal. For special case, the rail cost could be 54% lower than road cost. However, it is not the case for the shorter distance (less than 350 km).

Track Access Charge (TAC) on rail transport

TAC is charge imposed to any business entity operating a rail mode that uses state-owned railway infrastructure. The formula the TAC calculation includes maintenance costs, operating costs, and depreciation of infrastructure by considering the priority of the use of railway infrastructure. The magnitude of this factor ranging from 0.6 for a passenger train to 0.9 for a freight train. Currently, the TAC is approximately 35% of the total transport costs. The list of parameters included in the TAC calculation covers among others: frequency, length of service line, and weight of the train and the locomotive. Charges are determined per gross tonne-km.

The lack of transparency in the Indonesia railway's current pricing system is the main issue that impedes further involvement of the private sector in rail transport operation. Another cause is the **insufficient knowledge about actual maintenance and investment cost** that leads to underfinancing of the infrastructure manager and thus a lower service level for users.

Value Added Tax (VAT) on rail transport

The users of rail freight services are charged with a 10% Value Added Tax (VAT) (Ministry of Finance Regulation No. 80/2012), while there is not such VAT payment for road freight services. **This unequal burden of taxation contributes to the price difference between rail and road transport.** Actually, this VAT is a cost factor that could be reduced or removed to increase the attractiveness of rail freight transport.

Subsidy for fuel costs of road transport

According to Presidential decree (PP) No. 43/2018, heavy-duty trucks whose vehicle registration number is with yellow background and black letters (it is for public freight vehicles) are eligible for subsidized diesel fuel. The subsidy for diesel fuel is at 1,000 IDR/liter or 0.071 USD/liter. There has been a plan of the government to repeal this subsidy, but it has been cancelled due to the objection from the industries. **This subsidy has made the other modes more difficult to compete with road transport.**

Road transport does not pay its external cost

The costs caused by externalities such as accidents, environmental and infrastructure damage due to road transport activities are currently not taken into account in setting policies for infrastructure development, including in the current toll fare pricing concept in Indonesia which is based on both investment and operation costs in respond to the toll user willingness to pay value, regardless externalities. It is worth noting that this condition places a significant financial burden on the national budget. **These externalities costs are not charged to the road transport users although they place a significant financial burden on the national budget.** Internalization of these costs would help to level the competitive playing field between road transport and other modes.

The absence of an integrated all-in tariff for intermodal services

Transport of the first and last mile is under the responsibility of the forwarder or shipper to manage. With such service, tariffs for different segments of intermodal transport are determined independently by each involved operator. Consequently, **intermodal transport costs tend to be high due to the fragmented tariffs and inefficient revenue system.** In a particular case, this fragmented tariff has made a situation where in an effort to reduce the rail tariff made by rail operator is taken advantage by the truck operators to increase their tariff, so that the reduction on the total tariff for the intermodal services could not be reached. This also indicates **the lack of number of intermodal services providers which offer an all-in tariff for the whole services.**

High backhauling cargo cost

Imbalance of trade flows is a frequent problem in freight transport, and Java is no exception. The container traffic remains dominated by one-way service from the production centres carrying outbound export products, with almost no return traffic, so that the cost of freight charged by the rail operator to the cargo owners is extremely high compared with the trucking service. While this occurs for all transport modes, rail transport is at a disadvantage since **freight trains usually only carry a single commodity owned by a single customer, and no cooperation leading to freight consolidation occurs**. In contrast, road transport is much more flexible to compensate for the imbalance at least partly in cargo flows.

Geographical pattern of freight movements

Many of the regions in Java where freight volumes are generated and consumed are situated close to the coastlines where port cities are located such as Jakarta, and Surabaya. This, combined with geographical shape of the island has **caused transport distance between origins and destinations within Java to be rather short for rail transport with a few exceptions for freight traffic between western Java (such as Jakarta) to eastern Java (Surabaya)**. In terms of cost, this implies that transport volumes need to be very high to recover the transhipment costs.

2.2 Long intermodal transit time

Long transit time from industrial sites to rail terminal

In particular cases where the customer's sites are located relatively near to the rail terminal, the door-to-door transit time of intermodal rail freight trip is shorter compared to that of road transport. Rail does not encounter congestion on their trips, while trucks suffer from road congestion and additional time due to uncertain driver's behaviour. However, **in cases where the location of the origin or final destination is far away from the rail terminals, rail transport needs considerable additional time for its first and last mile trips by truck**. This additional time makes rail service unattractive to cargo owners. In road transport, trucks can reach the final destination directly without a detour. This situation occurs due to **the limited number of rail terminals, and they have not covered remote areas yet.**

Long waiting times at the terminal

In rail freight service, besides the journey time, there are additional delays, i.e. waiting time to get cargo transhipment service (to/from the train) and the loading/unloading time. Waiting time is affected by the frequency and punctuality of train schedules, while the loading/unloading time is affected by the speed and availability of cargo handling equipment. Currently, **the frequency of freight rail service is still limited.**

The arrival times of truck and train are often not synchronized causing the cargo to be stored first into the container yard (CY) in the terminal before being loaded to the train, so that increased the dwelling time of cargo at the terminal. In addition, rail service operator is still **needing more time to control container positioning due to the limited number and capacity of handling equipment (such as gantry cranes), and also due to damage of the handling equipment.**

The absence of Minimum Service Standards has led to unreliable terminal handling services that shippers find too risky. Those conditions do not occur in truck services. Trucks can leave the cargo origin point almost any time, provided the cargoes are ready to depart. **Truck handling time is also relatively shorter because the volume transported is much lower than the rail freight volume.**

2.3 Poor service quality of intermodal rail services

Low Rail Freight Service Frequency

Currently, **rail freight services are only provided in limited time windows**, i.e. at night, when there is less or no interaction with passenger services and when cargo delivery via road is less impacted by congestion. Consequently, **its service frequency is also limited, and prioritized to customers who already have contract with rail service operators**. Prospecting customers consider **the low rail service frequency and lack of certainty in train schedules as factors that negatively affects service quality**. This is because they have caused high cargo dwell time in the terminals, which in turn, also increases time and inventory costs.

Operational inefficiencies in cargo transloading: poor double handling

The handling service at the rail terminal produces an extra cost for cargo owners which doesn't exist for road transport. PT KALOG has been reported to charge customers IDR 500,000 (USD 35) per container lift (i.e. a total of IDR 1 million (USD 70) for putting a container on a train and off again). **The double handling also produces extra time in the transport chain** due the transloading at the terminal (depends on various factors including the operational efficiency, the spatial design, and the technical equipment of the terminal as well as the type of loading units).

On Java, **the containers have not been used extensively in rail freight system even in the intermodal services, so cargo is still transported using wagons rather than standardized loading units**. An operational efficiency problem is that some **terminals aren't technically equipped to transload cargoes or containers from trucks directly to the train,** which results in additional time and cost to the rail users.

In addition, **a weak connectivity between the seaports and the rail terminal creates additional transloading needs**. Moreover, the handling equipment at the port loading dock is not designed to load and unload cargo from and to the train. Double handling process is also caused by **the inappropriate implementation of intermodal service contract.** The single contract concept of intermodal transport is not implemented yet.

Safety and security risk for damage and loss when using rail services

When the contract with a customer is for a door-to-door service, **the liability for cargo lies with the forwarder, and it cannot be transferred to the rail freight service operator.** On the other hand, **the cargo owner often distrusts the rail operator in terms of safety and security, as well as quality of services in handling the goods.** This is worsened with the fact that **there is no guarantee for damage or loss of the shipment,** which made forwarders reluctant to use rail transport. Additionally, when a forwarder has to partner with other companies to fulfil the capacity of containers/wagons, it is **difficult to ensure the quality of the service throughout the intermodal transport chain.** For road transport, it is easier to ensure the safety and quality of the cargoes as they are transported from origin to destination by a single forwarder.

The absence of Minimum Service Standard of Intermodal Rail

Even though service quality (includes timeliness, reliability, flexibility, and safety (loss and damage)) is an important aspect, currently **there is no minimum service standard** for freight transport except standards for transport safety.

2.4 Lack of adequate infrastructure for intermodal services

Poor connectivity and accessibility of terminals and logistics hubs

Poor connectivity is indicated by **the disconnection of the railways to the logistics hubs**. **Connectivity is often constrained by sector specific-policies or regulations, spatial issues as well as technical issues.** Development of railways that are connected directly to seaports in dense areas is often hampered by limited space in the port and surrounding areas, while the freight train generally requires a substantial amount of space for the emplacement. Moreover, this situation is also worsened by the fact that the seaport authority and rail operator operate individually with their own operational targets which might not be aligned with the intermodal rail freight target.

Another issue related to the lack of connectivity is **the difficulty to access certain areas with trucks as feeder mode, due to road access restrictions.** In many cases, large container carrying vehicles are not permitted to access certain roads. As a result, logistic service providers must use smaller trucks, leading to increases in lead time and costs due to lack of economy of scale and additional transhipment processes.

Lack of railway network capacity

The capacity of the current railway network is still limited. It is indicated by the **limited service frequency or time slots that can be offered by rail freight service operator to the customers**, due to the shared use of railways with passenger transport. The lack of capacity is also caused by **the limited freight carrying capacity**, **in terms of the number of available freight locomotives, rolling stocks, wagons, and axle capacity.** The current track still uses narrow gauge that is designed for low speed train. The axle capacity of narrow-gauge railways does not allow for high loads and it hampers the utilization of economy of scale.

Lack of freight terminal availability and capacity

In terms of infrastructure, **the number of rail terminals and the capacity of some terminals (emplacements) is still limited, and the network does not cover remote areas yet. Many of the terminals are operated exclusively for a single type of commodity or a single customer.** It often leads to inefficient utilization of terminals, particularly as the demand fluctuates dynamically.

Lack of adequate planning of intermodal freight transport

Currently, p**lanning in the Indonesian transportation system is still sector oriented.** Each sector (e.g. land, sea, air and rail transport) has its own master plan along with its respective targets. Meanwhile, **the comprehensive freight transport planning which integrates all modes in a multi-mode master plan does not exist yet**. **Indonesia's railway masterplan is still oriented to the development of the railway system itself, while the planning has not yet focused on the development of intermodal rail services** that take into account the operational needs, as well as policies that address the intermodal system. This is among the lead causes for the lack of adequate infrastructure for intermodal rail services.

Lack of accurate data for planning and monitoring

One of barriers in freight demand planning is **the availability and reliability of data, for example OD (origin and destination) data**. A reliable data could produce more accurate forecast for demand which could minimize ineffective infrastructure developments. **Currently, the quality of OD data is still poor**. For example, the latest national OD survey data (OD survey 2016) does not register the volume of freight transport on Java. Furthermore, the 2011 National OD survey data does not distinguish different commodities. Moreover**, there is often a lack of harmonisation in the available data.** However, difficulties in analysing the data could occur if data from one institution does not match with data from other relevant institutions.

2.5 Lack of market competition

Monopolistic market of rail freight sector

Currently, **the number of rail service providers from the private sector is very limited,** which practically makes the rail transport market monopolistic. Among the main causes is **the long list of requirements for a company to be able to operate rail transport services**. Furthermore, **the lack of capacity of rail freight** also contributes to **the limited number of services offered to the customers.** In terms of business opportunities, if the operation of rail transport can be opened to the private sector, the intermodal rail has a great potential to improve.

Unclear Licensing for BUAM (Intermodal Transport Operator)

According to Government Regulation PP.No.8 of 2011, a BUAM (*Badan Usaha Angkutan Multimoda* or Multimodal Transport Operator) is a legal entity acting in its own name or through other legal entities to represent it, to complete intermodal transport which is characterized by the notion of single operator, single tariff, and single contract document. A BUAM license is needed for a logistic service provider to be able to offer intermodal transport services. Besides BUAM, there is JPT (*Jasa Pengurusan Transportasi* or Transportation Management Service) license (regulated by PM No.49 Tahun 2017) –it is a license for entity that handles freight forwarding, and it also allows multimodal system in its operation. However, it does not enable companies to offer a "single contract document" for its intermodal transport service. While BUAM licence is issued by MoT, JPT licence is issued by the provincial government. **BUAM and JPT have quite different scope of works, technical, and administration requirements, obligation to customers, insurance system, and tariff stipulation.**

There is a difficulty for JPT license holders to transform into BUAM, because **BUAM license has a higher requirement in terms of human resources, skills, and vehicle specifications.** It creates additional cost burdens for JPT license holders, and financially it is not viable for their business, especially for UMKM (Small Micro Medium Enterprises). Additionally, the lack of communication and information regarding the benefits of BUAM license are also an issue for JPT to consider shifting their business into BUAM. **There are only 12 companies registered as BUAM in 2020, which indicates there are still problems in BUAM licensing which has been introduced since 2011.** In fact, JPT should be preserved since UU No. 23/2014 about Local Government (as a higher-level regulation than PP No. 8 Year 2011) states that JPT licences are under the authority of provincial government.

2.6 Lack of policy and institutional support

Lack of clear governance on intermodal freight transport

There are several ministries involved in intermodal transport services, and they are under the coordination of two coordinating ministries, i.e. the Coordinating Ministry of Economic Affairs and the Coordinating Ministry of Maritime Affairs. Currently, **there is still a great lack of coordination among these ministries.**

Moreover, **there are many institutions with different authorities and responsibility structure, which need to work together to produce a synchronized policy for intermodal rail transport.** There is a fact in Indonesia that Intermodal and Multimodal Transport Unit (AMM) is under the authority of the DG Land of MoT at echelon three level. **Due to the inadequate level of authority,** it makes difficult for AMM to manage and coordinate the other modes, i.e. air, sea and rail transport, though it is within the MOT.

In addition, the rail transport operators (i.e. PT KAI) is under the authority of Ministry of State-Owned Enterprises, while the regulation and operation are controlled by the Directorate General of Railway of MOT. This situation has led to stagnation in the development of intermodal rail transport. **The lack of clear and centralized governance for these institutions** has caused lack of clear targets and complicated decision-making process for developing intermodal rail transport.

Moreover, **the absence of a constitution that mandates the establishment of a masterplan for intermodal transport in Indonesia has led to the absence of such an important masterplan.** Specifically, it is difficult to have a clear pathway and strategic prioritization to improve and further develop intermodal transport infrastructure without a masterplan.

The legislation should show the government's commitment in improving the intermodal freight transport as part of Indonesia logistic systems. Moreover, it should involve multiple relevant stakeholders within the logistic sector, and it should clearly show the vision in supporting intermodal transport system in Indonesia. It is important to specify the responsibility and performance targets for each policy maker in view of developing intermodal transport system.

Absence of a platform for dialogue between policy makers and logistics actors

There is no dedicated platform for dialogue between policy makers, shippers, and operators on rail freight, or for networking and coordination among the relevant industry players at national and local levels. Thus, there are no opportunities for champions to lobby and engage in agenda setting and to push for reforms in the rail sector. Currently, there has been a good communication among the stakeholders, but it is still incidental and too limited in market coverage. Therefore, **the existing dialogue does not give enough influence and input on the decision-making process.**

Lack of marketing for rail freight services

Rail freight services are historically depicted as poor and inefficient services according to logistics service providers or shippers, and this image contributes to the low attractiveness of rail among shippers. This problem is essentially caused by **a severe lack of knowledge on rail freight services**. It is also worsened by **the insufficient marketing initiatives from rail infrastructure and rail service providers** such as PT.KAI and PT. KALOG to logistics players.

3. Policies and measures to overcome the barriers for intermodal freight transport

The 6 strategies that address each barrier group are formulated based on review of best practices in intermodal transport and expert consultation (Table 1).

Table 1: Strategies to overcome barriers for intermodal freight transport

No.	Barriers	Strategies
1	Higher rail transport costs	Reduce rail transport costs
2	Long intermodal transit time	Reduce rail transit time
3	Poor service quality of intermodal rail services	Improve quality, safety, reliability & efficiency of cargo shipment
4	Lack of adequate infrastructure for intermodal services	Increase capacity of intermodal services
5	Lack of market competition	Create competitive market
6	Lack of policy and institutional support on intermodal rail	Establish strong institutional support on intermodal rail

Based on these strategies, we formulate **different action plans which together constitute the proposed action program, which aimed to address each of the barriers**. Figure 8 provides an overview of the barriers, the objective for overcoming the barriers and the proposed intervention actions.

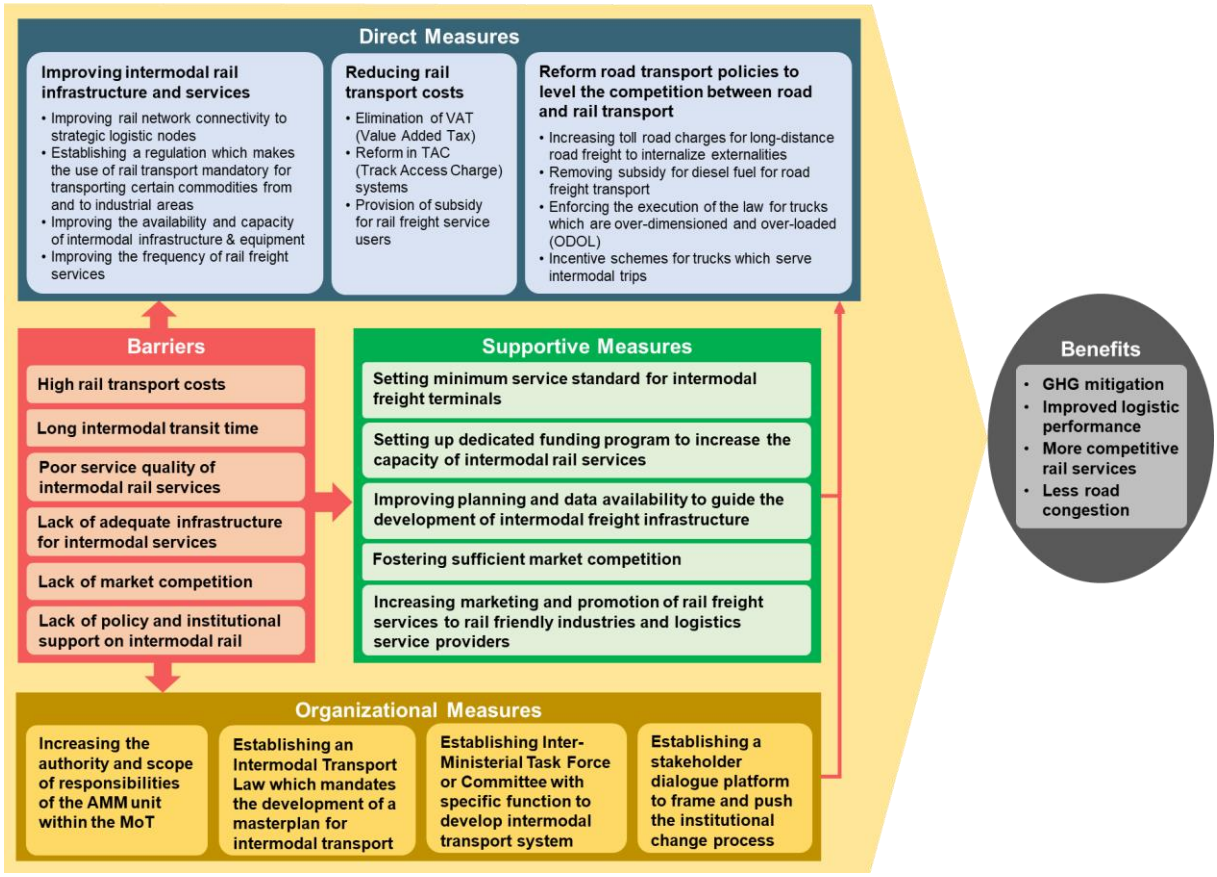

Figure 8: Proposed programme of actions to boost intermodal rail freight in Java

3.1 Direct measures

Table 2: Proposed direct measures

Action Measure	Sub Action Measure	Next Steps	Timeline	Responsible Parties
1. Improving intermodal rail infrastructure and services	**Improving rail network connectivity to strategic logistic nodes such as ports and industrial estates, warehousing facilities, and locations for natural resources**	▪ Develop a masterplan for intermodal transport system development where priority corridors and relevant terminals are identified. ▪ Perform feasibility studies that provide detailed information on local circumstances (connectivity, land ownership, transloading equipment, storage area) and offer solutions to resolve bottlenecks. ▪ Implementation: develop the infrastructure.	short term (less than 6 months)	Ministry of Transportation, particularly the DG Railways
	Establishing a regulation which makes the use of rail transport mandatory for transporting certain commodities from and to industrial areas	▪ Market assessment to identify conditions for mandatory shift to rail. ▪ Enactment of legislation needed to support this action. ▪ Review the legal framework needed for establishing regulations for masterplan and mandatory shift to rail. ▪ Coordinate and collaborate with the relevant agencies to issue a regulation needed to commence the development of the infrastructure.	short-medium term (1-2 years)	Ministry of Transportation (DG Railways), Ministry of Trade, Ministry of Finance
	Improving the availability and capacity of intermodal infrastructure & equipment.	▪ Demand analysis as a basis for gradual investment in transport equipment ▪ Review of state-of-the-art for technological requirements of equipment ▪ Tender procedure for the procurement (purchase or lease) of the equipment	annual basis	PT. KAI
	Improving the frequency of rail freight services	▪ Demand analysis to project transport frequency need	medium term (1-2 years)	PT.KAI

Action Measure	Sub Action Measure	Next Steps	Timeline	Responsible Parties
		▪ Establishment of time schedule for freight trains, integrated in overall schedule, with clear identification of contingencies (e.g. priority rules/rerouting schedules in case of blockages on the network)		
2. Reducing rail transport costs	**Elimination of VAT (Value Added Tax)**	▪ Continue the discussion with Ministry of Finance to remove VAT using the evidence provided by cost-benefit analysis of improving the modal share of rail transport ▪ Establish budget plan (compensation/transfer of funds), then Implementation	short term (less than 1 year).	Ministry of Finance in coordination with Ministry of Transportation (DG Railways)
	Reform in TAC (Track Access Charge) systems	▪ Conduct a full financial feasibility analysis based on the results of impact assessment to implement TAC reform. ▪ Coordinate with ministry of finance to establish budget plan. ▪ Implementation	short term (less than 6 months).	Ministry of Transportation (DG of Railways)
	Provision of subsidy for rail freight service users	▪ As part of the demand analysis for terminal development, a parallel trajectory to identify cargo flows (existing or potential) that could benefit from a subsidy at the start (e.g. in areas with industrial development that could generate extra future demand for rail) should be established ▪ Assess the projected financial requirements to achieve results (i.e. regular rail services that meet beneficiaries' needs) ▪ Secure funding ▪ Establish administrative procedure for selection of beneficiaries (business plan with commitment to results, including timing of funding need) ▪ Establish intermediate/final evaluation procedure for subsidy program	short-medium term (less than 1 year).	Ministry of Transportation (DG of Railways)

Action Measure	Sub Action Measure	Next Steps	Timeline	Responsible Parties
3. Reform road transport policies to level the competition between road and rail transport	**Increasing toll road charges for long-distance road freight to internalize externalities**	▪ Conduct a full analysis on externalities from road freight together with Ministry of PUPR to reform structure of toll road charges and to gain support to develop rail freight infrastructure. ▪ Establish legal base for implementation ▪ Establish financial plan for resource collection and allocation	medium term (2-3 years).	Ministry of Transportation (DG Land Transportation), together with the Ministry of Public Works
	Removing subsidy for diesel fuel for road freight transport	▪ Establish legal base for implementation ▪ Establish financial plan for resource collection and allocation	short term (less than 1 year)	Ministry of Transportation (DG Land Transport), Ministry of Finance
	Enforcing the execution of the law for trucks which are overloaded and over dimensioned (ODOL)	▪ Enter dialogue with road users and road enforcement agencies (national/local highway police) to assess priorities and feasibility ▪ Establish realistic and fair penalty system ▪ Develop a roadmap to enforce the regulation for overloaded and over dimensioned trucks	implemented in phases (within 1 year)	Ministry of Transportation, particularly DG Land Transportation
	Incentive schemes for trucks which serve intermodal trips	▪ Establish legal base for implementation ▪ Set up (simple) administrative procedure for freight forwarders to claim tax benefits	short-medium term (1-2 year),	Ministry of Transportation (collaboration between DG Land Transportation and DG Railways)

3.2 Supportive measures

Table 3: Proposed supportive measures

Action Measure	Next Steps	Timeline	Responsible Parties
1. Setting minimum service standard	▪ Establish service standards based on international best practice and needs of domestic rail customers ▪ Translate service standards into operational requirements ▪ Secure funding to meet these operational requirements ▪ Develop contingency plans	short (less than 2 years).	Ministry of Transportation (DG Railways)
2. Setting up dedicated funding program to increase the capacity of intermodal rail services	▪ Set up short, medium and long-term goals for the program based on the findings of the present study ▪ Secure financial support for the funding program	immediately (less than a year)	Ministry of Transportation (DG Railways & DG Land Transportation)
3. Improving planning and data availability to guide the development of intermodal freight infrastructure	▪ Mobilise the R&D division to adopt a more regular data collection program that incorporates the needs for the planning of the intermodal action program ▪ Secure funding for the increased frequency of the data collection ▪ Secure the support of the data providers (shippers, hauliers, freight transport operators) and enter a dialogue with them to come to a streamlined process	the next national OD survey which is scheduled to take place in 2021	Ministry of Transportation (Research and Development division/Puslitbanghub and AMM unit within Directorate of Road Transport)
4. Fostering sufficient market competition	▪ Review and analysis of current procedure and requirements to attain BUAM license. ▪ Conduct a study to simplify and synchronize BUAM and JPT license. ▪ Develop a regulatory roadmap which allows a joint investment that allows foreign company to own shares in BUAM. ▪ Study the cost and benefit of tax incentives targeting companies that operate as BUAM	these measures should be started in short term (less than 1 year) where full implementation to be realized within 2-3 years.	Ministry of Transportation (DG Land Transport and Multimodal Transportation Unit (*Subdit. Angkutan Antarmoda dan Multimoda/ AMM.),* Indonesian investment coordinating board (BKPM), Ministry of Finance
5. Increasing marketing and promotion of rail freight services	▪ Find a partner (marketing agency) with the right connections in the logistics sector.	short term (less than one year).	PT. KALOG, PT.KAI

Action Measure	Next Steps	Timeline	Responsible Parties
to rail friendly industries and logistics service providers			

3.3 Organisational measures

Table 4: Proposed organisational measures

Action Measure	Next Steps	Timeline	Responsible Parties
Increasing the authority and scope of responsibilities of the AMM unit within the MoT to increase the effectiveness of the unit in developing intermodal transport system	▪ Draft a mission statement for the AMM's extended scope.	short term (less than 1 year).	Ministry of Transportation
Establishing an Intermodal Transport Law which mandates the development of a masterplan for intermodal transport	▪ President together with Coordinating Ministry for Maritime Affairs and Investments could draft the law and propose this to the DPR.	short-medium term (within less than 1-2 year).	President, People's Representative Council of Indonesia (*Dewan Perwakilan Rakyat/DPR*), Coordinating Ministry for Maritime Affairs
Establishing InterMinisterial Task Force or Committee with specific function to develop intermodal transport system	▪ Initiate dialogue between relevant ministries and establish the mission statement of the task force	short term (less than 1 year).	Coordinating Ministry for Maritime Affairs and Investments or the President. The following ministries can be important members of the task force: Ministry of Transport, Ministry of Industry, Ministry of Trade, and Ministry of Finance.
Establishing a stakeholder dialogue platform to frame and push the institutional change process	▪ Identify relevant stakeholders ▪ Organize consultation to determine first objectives of the platform	This can be considered as ongoing or ready to implement in a matter of weeks.	Ministry of Transportation Subdit. AMM, Directorate of Road Transport, DG Land Transpportation with support from GIZ.

3.4 Summary

Table 5 provides a recapitulation of the **direct mitigation measures** and **a measure to foster sufficient market competition**.

Table 5: Recapitulation Matrix for direct mitigation measures and their implementation strategy

Action Measure	Sub Action Measure	Next Step	Timeline	Relevant Agencies and Organizations	Coordinator
1. Improving intermodal rail infrastructure and services	Improving rail network connectivity to strategic logistic nodes such as ports and industrial estates, warehousing facilities, and locations for natural resources.	1. Develop a masterplan for intermodal transport system development where priority corridors and relevant terminals are identified. 2. Perform a full feasibility study for: a) infrastructure development projects such as new terminals, additional transloading equipment, and railway connections (private sidings) b) improvement in frequency of rail freight. The feasibility study should include cost benefit and financial analysis for the investments needed. 3. Review the legal framework needed for establishing regulations for masterplan and mandatory shift to rail. 4. Coordinate and collaborate with the relevant agencies to issue a regulation needed to commence the development of the infrastructure	Short-term (the study should ideally be commenced in less than 6 months and finished within 1 year)	1. Multimodal transport division (*Unit Angkutan Multi Moda*) of DG Land transport. 2. DG Railways (Infrastructure and Equipment Directorate) 3. BPJT - Ministry of Public Work and Public Housing 4. PT. KAI 5. PT. Lookman Djaja 6. Ministry of National Development Planning of Indonesia (BAPPENAS), Transport directorate 7. Ministry of Industry	Multimodal transport division of DG land transport
	Establishing a regulation which makes the use of rail transport mandatory for transporting certain commodities from and to industrial areas				
	Improving the availability and capacity of intermodal infrastructure (new terminals) & equipment (reach stackers, gantry crane).				
	Improving the frequency of rail freight services				
2. Reducing rail transport costs	Elimination of VAT (Value Added Tax)	Continue the discussion with Ministry of Finance to remove VAT using the evidence provided by cost-benefit analysis of improving the modal share of rail transport.	Short-term (<6 month)	1. DG Railways 2. Expert Staff of MoT for Logistics, Multimodal, and Transport Safety	DG Railways

Action Measure	Sub Action Measure	Next Step	Timeline	Relevant Agencies and Organizations	Coordinator
	Reform in TAC (Track Access Charge) systems	Conduct a full financial feasibility analysis based on the results of impact assessment to implement TAC reform. Coordinate with ministry of finance to establish budget plan.	Short-term (<6 month)	3. Ministry of Finance	
	Provision of subsidy for rail freight service users	Expand the impact assessment to include other rail freight corridors on Java, other types of commodities, and other areas with industrial developments. Coordinate with ministry of finance to establish subsidy regulation (selection of beneficiaries, evaluation procedure)	Short-term (<1 year)		
3. Reform road transport policies to level the competition between road and rail transport	Increasing toll road charges for long-distance road freight to internalize externalities	1. Conduct a full analysis on externalities from road freight together with Ministry of PUPR to reform structure of toll road charges and to gain support to develop rail freight infrastructure. 2. Enter dialogue with road users and road enforcement agencies to assess priorities and feasibilities. 3. Develop a roadmap to enforce the regulation for overloaded and over dimensioned trucks 4. Establish legal base for implementation of the measures 5. Collaborate with ministry of finance to develop a financial plan and its administrative procedure.	Medium-term (1-2 years)	1. DG Land Transport, Road traffic directorate 2. Multimodal transport division of DG land transport 3. Expert Staff of MoT for Logistics, Multimodal, and Transport Safety 4. Ministry of Public Works and Public Housing 5. Ministry of Finance	DG Land Transport
	Removing subsidy for diesel fuel for road freight transport				
	Enforcing the execution of the law for trucks which are overloaded and over dimensioned (ODOL)				
	Incentive schemes for trucks which serve intermodal trips				

Action Measure	Sub Action Measure	Next Step	Timeline	Relevant Agencies and Organizations	Coordinator
4. Fostering sufficient market competition	Synchronizing regulations that might complicate the licensing of BUAM. Focus: synchronization of regulations regarding JPT and BUAM.	1. Simplify the requirements for attaining BUAM. Study the possibility of synchronizing JPT and BUAM licenses.	Medium term (2-3 years)	1. Multimodal transport division (Unit Angkutan Multi Moda) of DG Land transport. 2. Financial Services Authority (Otoritas Jasa Keuangan) Indonesian investment coordinating board (BKPM) 3. PT. KAI 4. Ministry of Finance	Multimodal transport division of DG land transport
	Increasing the attractiveness of intermodal transport industry for private foreign investments.	2. Develop a regulatory roadmap which allows a joint investment that allows foreign company to own shares in BUAM.			
	Provide tax incentives for companies that operate as BUAM.	3. Study the cost and benefit of tax incentives targeting companies that operate as BUAM.			

4. Potential Action Programme

The action programmes are formulated with **three different ambition levels**: (1) basic, (2) moderate, (3) strong, which are aimed at increasing the competitiveness of intermodal rail freight transport. The action program consists of combination of measures that impact the performance of specific aspects of intermodal rail transport system**.** Policy makers can use the analysis results as an input in adopting the action program.

The main focus of the programme is on the Northern (Jakarta-Surabaya) corridor and the Southern (Bandung-Jombang) corridor. This is because this corridor represents the majority of the demand for rail freight and it already has necessary basic infrastructure that enables intermodal rail transport at a sufficient scale such as container depots, rail freight terminals with transloading equipment such as reach stackers. Within Jakarta-Surabaya, we assess the impact of implementing the direct mitigation measures on the following freight infrastructure:

- **Establish connection between Tanjung Priok Port (JICT) and Pasoso rail terminal,**
- **Establish connection between Telok Lamong Port (Surabaya) – Northern Java rail network,**
- **Improve the accessibility of currently established dry ports and stations from and to freight origins and destinations. Specifically, the impact of action program on dry ports such as Cikarang, Gede Bage, Rambi Pudji, and Solo Jebres and rail stations such as Klari.**

We do not include assessment of new railway connections between:

- Patimban port – Karawang
- Tanjung Mas port – Northern Java rail network

This is because both routes mostly serve cargo import and export from and to Java (both from domestic and international trade) which data is hardly available.

4.1 Three ambition levels and their implications

- **Basic**: describe**s a minimum level of intervention** measures focused on tackling primary problems that have caused an imbalanced playing field between intermodal rail transport and road transport. The measures pose the minimum political or financial barriers and hence are designed to be implementable within the short term. The basic intervention focuses on reducing additional costs, time, and risk aspects of intermodal rail transport so that it can be on a level competition with road transport.
- **Moderate:** represents **a higher degree of commitment** in reforming the intermodal transport sector. In this scenario, stronger financial aid, investments and service quality management are deployed to deliver improvements in cost, time, and risk and safety of intermodal transport. Apart from all the improvements that are covered in basic intervention, this ambition level also takes into account the development of rail connection to Jakarta International Container Terminal (JICT) and an elimination of Value Added Tax (VAT) which amounts to 10% of the total rail transport cost.
- **Strong: includes all measures that are specified in the basic and moderate measures at a more advanced level**. The distinct intervention scale in this scenario, is in the development of a rail connection to the new freight terminal Teluk Lamong in Surabaya which is developed as a new alternative port to the congested Tanjung Perak Port in Surabaya. Additionally, it also features a risk and safety rating that is improved to a high level (99%) – higher than that of road transport at 95%. This is reflecting the strong commitment to maintaining high service quality for intermodal rail transport such that the risk of cargo damage and loss is minimized.

Table 6: Action programme with three different ambition levels

No	Intervention Measure	Baseline	Basic	Moderate	Strong
Cost					
1	Reducing transloading costs	Transloading cost (cargo lift-off /cargo lift-on) is based on average cost of 550,000/lift	-30% (IDR 165,000/TEU)	-40% (IDR 220,000/TEU)	-50% (IDR 275,000/TEU)
2	Tax benefit for trucking companies that serve intermodal trips	No improvements	-5% (IDR/TKM)	-7.5% (IDR/TKM)	-10% (IDR/TKM)
3	Eliminating VAT	VAT is 10% of rail transport costs	No elimination of VAT	-100% (complete elimination of VAT)	-100% (complete elimination of VAT)
4	Reducing TAC	TAC is 55% of the total rail costs	-10%	-20%	-30%
Time					
5	Improving existing road connections to rail stations and dry ports	No improvements	Reduction in travel time to dry ports by 30%	Reduction in travel time to dry ports by 30% Connecting JICT to rail network: -20% in rail total travel time from and to JICT	Reduction in travel time to dry ports by 30%. Connecting JICT and Teluk Lamong to rail network: reduced rail total travel time: • from and to JICT (-20%) • from and to Teluk Lamong (-30%)
6	Reducing transshipment time in terminal	1 hour/TEU	0.75 hour (25% reduction)	0.6 hour (40% reduction)	0.5 hour (50% reduction)
7	Reducing waiting time in terminal	1 hour/TEU (Truck)	0.75 hour (25% reduction)	0.6 hour (40% reduction)	0.5 hour (50% reduction)
Service Quality					
8	Improving service quality of rail transport in terms of risk and safety	75% of cargoes arrive on time, without damage and loss	85% (10% improvement)	95% (20% improvement)	99% (24% improvement)

These **three ambition levels are designed to improve the performance of different aspects of intermodal transport system** (in terms of infrastructure quality, service quality, and pricing**) and also to increase the modal share of rail transport**, which will also lead to other benefits. We assess the impact of three ambition levels of the action programme in terms of **four areas**:

1) **Business use case:** Represents the financial feasibility from the perspective of freight forwarders and logistics service providers as the main potential clients to shift to rail freight transport.
2) **Rail transport demand and GHG mitigation potential:** Represent the changes in volume of rail freight due to modal shift from road freight to rail freight.
3) **Cost-benefit for governments:** Represents the ratio between the total benefits and cost of implementing the action programme, particularly for the government as the policy maker as well as the major source of funding of the action programme.
4) **Likelihood of successful implementation:** Represents all the other factors that are not possible to be analysed quantitatively, which could determine the successfulness in implementing the action programme.

Table 7 summarizes **the results of the impact assessment based on the four aspects mentioned above.** As can be seen in the table, stronger the ambition level will result in higher benefits.

Table 7: Summary of the impact of the intermodal action programme

Criteria	Baseline	Basic	Moderate	Strong
Business case				
Reduction in rail transport costs (%)	-	12	20	26
Reduction in rail transport time (%)	-	10	19	29
Rail transport demand and GHG mitigation potential				
Modal share of rail (%)	1.74	7.12	14.87	19.59
CO_2 reduction by 2030 (MTonne)	-	1.2	2.75	3.56
Cummulated CO_2 reduction 2020-2030 (MTonne)	-	7.92	18.1	23.4
Costs & benefit for government				
Cost: Revenue for the government (Billion IDR)	101.8	263.2 (+258.4%)	-949 (-931.6)	-1,703 (-1672%)
Cost: Revenue for PT.KAI (Billion IDR)	2,050	8,665 (+422%)	17,531 (+855%)	21,200 (+1,034%)
Benefit: Reduction in total transport costs (Billion IDR)	165,442	163,124 (-1.4%)	157,761(-4.64%)	152,899 (-7.58%)
Cost and benefit ratio (%)	-	NA	731	695
Likelihood of successful implementation				
Strengths*)	-	High	High	Medium
Weaknesses*)	-	High	Medium	Medium
Opportunities*)	-	High	Medium	Medium
Threats*)	-	Medium	Low	Low

*) Assessment of low implies a low likelihood of successful implementation for the relevant ambition level based on the SWOT category

4.2 Impact Assessment

Business Use Case

The likelihood of freight logistics companies to shift their activities from truck mode to intermodal rail is analysed by the benefits they will gain over their current operations. In this analysis, **the benefit is obtained in the form of potential cost savings due to the shift from truck to intermodal rail.** The indicators are divided into cost-benefit and time-benefit indicators (Tabel 8). The result of the Cost Benefit Analysis is shown in Table 9.

Table 8: Cost and Time Indicators for the Three Ambition Levels

Company	Components		Baseline	Ambition Levels		
				Basic	Moderate	Strong
1	Truck	Cost (Rp.)	6,500,000	6,500,000	6,500,000	6,500,000
		Time (Hours)	48	58	58	58
	Intermodal Rail	Cost (Rp.)	7,350,000	6,445,750	5,824,773	5,433,864
		Time (Hours)	29	27	25	23
2	Truck	Cost (Rp.)	10,000,000	10,000,000	10,000,000	10,000,000
		Time (Hours)	24	29	29	29
	Intermodal Rail	Cost (Rp.)	7,850,000	6,920,750	6,287,273	5.883,864
		Time (Hours)	63	53	44	35
3	Truck	Cost (Rp.)	7,000,000	7,000,000	7,000,000	7,000,000
		Time (Hours)	24	29	29	29
	Intermodal Rail	Cost (Rp.)	7.350.000	6.445.750	5.824.773	5.433.864
		Time (Hours)	29	27	25	23

Table 9: Cost Benefit Analysis

Companies	Indicators	Baseline	Ambition Levels		
			Basic	Moderate	Strong
1	% to cost baseline (for intermodal rail)	100%	88%	79%	74%
	% cost of truck to intermodal rail	**88%**	**101%**	**112%**	**120%**
	% to time baseline (for intermodal rail)	100%	93%	86%	79%
	% time of truck to intermodal rail	**166%**	**213%**	**230%**	**250%**
2	% to cost baseline (for intermodal rail)	100%	88%	80%	75%
	% cost of truck to intermodal rail	**127%**	**144%**	**159%**	**170%**
	% to time baseline (for intermodal rail)	100%	85%	70%	56%
	% time of truck to intermodal rail	**38%**	**54%**	**65%**	**83%**
3	% to cost baseline (for intermodal rail)	100%	88%	79%	74%
	% cost of truck to intermodal rail	**95%**	**109%**	**120%**	**129%**
	% to time baseline (for intermodal rail)	100%	93%	86%	79%
	% time of truck to intermodal rail	**83%**	**107%**	**115%**	**125%**

Companies	Indicators	Baseline	Ambition Levels		
			Basic	Moderate	Strong
Average	% to cost baseline (for intermodal rail)	100%	88%	80%	74%
	% cost of truck to intermodal rail	**104%**	**118%**	**130%**	**139%**
	% to time baseline (for intermodal rail)	100%	90%	81%	71%
	% time of truck to intermodal rail	**96%**	**125%**	**137%**	**153%**

Indicating that cost or time required to conduct logistics activities using truck mode is relatively LOWER than intermodal rail, implying intermodal rail is LESS PREFERABLE

Indicating that cost or time required to conduct logistics activities using truck mode is relatively HIGHER than intermodal rail, implying intermodal rail is MORE PREFERABLE

For Company 1, who serves predominantly fast-moving consumer goods, the decision to shift to intermodal rail is a challenge because currently the industrial zones and rail terminals are still far apart. **They will be interested in using rail transport as long as it is cost-effective, and the location of the rail terminal is near to the industrial hub since the current first/last mile transport cost is still quite significant relative to total transport cost.** The analysis shows that policy intervention is required, at least with the basic ambition level, to create a cost saving which could help company to shift from truck to intermodal rail. This shift would directly provide a significant reduction in lead time for Company 1.

For Company 2, intermodal rail becomes a more interesting option when it is implemented with a strong ambition level. Currently, the share of rail transport used by this company is 10%. With the moderate and strong interventions, the share for intermodal rail is predicted to increase at around 15% and 20%, respectively. For Company 2, shift from truck to intermodal rail system will generate a high potential to reduce cost than other companies. I**t requires a more "radical" policy intervention as modal shift from truck to intermodal rail does not create the expected time efficiency. Currently, their extremely high lead time is mainly caused by the requirement of the container-based cargo to stay overnight in the terminal beyond the office hour of the terminal**.

For Company 3, **c**urrently, the modal share of rail is below 5%. Company 3 estimates that their customers will shift to rail mode on the moderate and strong scenarios with the expected share at 10%-15%. For the basic scenario, the cost and time improvements are not attractive enough compared to truck mode. However, **for their customers which corporate incentives aimed to reduce carbon emissions, the basic intervention would still be considered.** The analysis shows that policy intervention is required, at least for the basic ambition level, to achieve the expected costs and time efficiency.

In summary, the current intermodal rail cost and lead time tend to be worse than road transport. The cost and time efficiency gained from basic interventions could already attract some companies to shift to rail. However, the proposed measures of **moderate and strong ambition level would increase their willingness to shift to intermodal rail significantly, with projected shares of up to 20%.** This underlines the need for an action program with high ambition and strong intervention, which generate a more significant cost and time reduction for intermodal rail freight. The companies confirmed that **there is still ample opportunity to improve the time and cost efficiency through the following measures**:

- Better handling/transloading system in the rail terminal by referring to handling management system of the more established terminal (i.e. seaport).
- Better connectivity between rail terminals, ports, dry ports and industrial areas, and establishing rail terminals as consolidation centers.
- A more strategic alliance between rail operator, and first mile and last mile transport companies for an equal opportunity to enter intermodal freight transport market.
- A full range of services at intermodal terminals which integrate the container depots, customs, quarantine is needed.
- The integration of scheduling of trains, trucks and warehousing so that synchronized schedules can be obtained and waiting times at terminals can be reduced.

Rail transport demand and GHG mitigation potential

Table 11 provides an overview of rail freight volumes across different intervention measures. Compared to the baseline, **a basic level of ambition increases rail modal share to 7.12% by 2030, while moderate and strong intervention increase rail share to 14.87 % and 19.59% respectively**. In terms of **rail freight volume**, compared to the current circumstances, **rail transport demand will increase up to 378% (basic intervention), 898% with moderate measure and 1214% by strong measure by 2030**.

Table 10: Impact of intervention measures on rail freight volume on Java

Policy intervention scenario	2020 (MTonne)	2025 (MTonne)	2030 (MTonne)	Rail Modal share (%)	Volume difference with 2020 (%)
Baseline	8.49	9.23	9.86	1.74	
Basic	8.49	38.03	40.56	7.12	378
Moderate	8.49	79.37	84.69	14.87	898
Strong	8.49	104.52	111.53	19.59	1214

In terms of GHG mitigation potential, increased rail modal share may reduce CO_2 emissions considerably with emission reduction ranging from 1.2-3.56 MTonne in 2030 compared to baseline. Specifically, **CO_2 emissions in the year 2030 may be reduced by 1.2 MTonne (basic ambition), 2.75 MTonne (moderate ambition), and 3.56 MTonne (strong ambition)** (Figure 9).

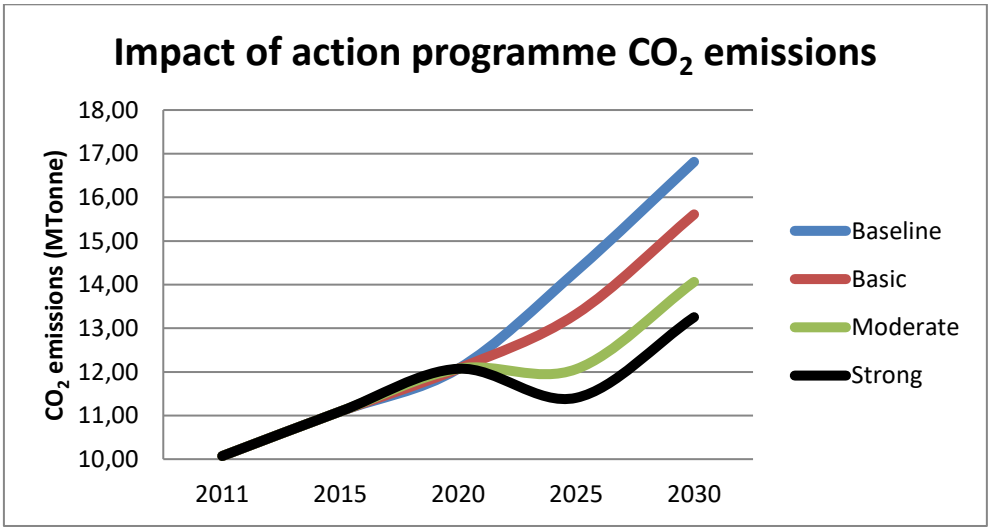

Figure 9: Impact of intervention measures on CO_2 emissions from freight transport on Java

Table 12 provides a summary for **the cumulative CO_2 mitigation potential** of each intervention measure. While **basic intervention measure reduces around 7.9 MTonne CO_2, the strong measure is expected to mitigate around 23.4 MTonne CO_2 between 2020-2030 periods**.

Table 11: Cumulative CO_2 emissions due to modal shift to rail transport on Java

Policy intervention scenario	2025 (MTonne)	2030 (MTonne)	Reduction by 2030 (MTonne)	change (%)	Cumulative reduction 2020-2030 (MTonne)	Avg. Annual GHG mitigation (MTonne)
Baseline	14.30	16.81				
Basic	13.32	15.61	1.2	4.8	7.92	1.2
Moderate	12.06	14.06	2.75	10.8	18.09	2.75
Strong	11.40	13.25	3.56	14	23.39	3.56

Cost-benefit to government

At any ambition level, **the government (national, provincial and/or local level) will be required to invest in infrastructure, namely intermodal terminals that connect the shippers via the regional roads to the rail network for long distance transport**. The investment in intermodal terminals may involve the purchase of real estate, the building of road to connect the existing network to the new terminal, as well as the expansion of the rail network to the terminal, in addition to the necessary buildings and equipment to operate the terminal. This presents a significant upfront investment. Ideally, both public and private funds are used to spread the risk for both parties. The operation of the terminal can be done by private partner or by semi-public entity. Depending on the nature of the contract, maintenance costs for the terminals could be borne by the government or taken on by the private party that operates the terminal.

After the initial investment, **the main economic benefits for the government** that are generated come from the **reduction of external costs as a result of modal shift.** These external costs include lower emissions, lower air pollutions, lower road congestion levels, lower damage to road infrastructure, and lower accident costs.

Revenues for the government

The total revenue from the government is computed based on:

- the reduction in tax income due to tax benefit provided for intermodal truck companies
- the changes in rail transport demand across the three ambition levels
- the VAT charged for each rail freight transport

Table 13 provides a summary of the changes in government revenues across the three ambition levels.

Table 12: Revenues for the government

Intervention policy	Total govt. revenue from VAT and reduction in tax for intermodal trucks by 2030 (Billion IDR)	Changes in total revenue by 2030 (Billion IDR)
Baseline	101.85	
Basic	263.18	161.33
Moderate	-948.89	-1,050.74
Strong	-1,703.34	-1,805.19

Revenues for PT.KAI

The revenue for PT.KAI is estimated based on:

- the tariffs and handling costs charged to customers of intermodal rail, and
- the changes in rail transport demand across the three different ambition levels

Table 13: Costs for PT.KAI by 2030

Intervention policy	Total revenue from tariff (Billion IDR)	Change (%)	Total revenue from handling costs (Billion IDR)	Change (%)	Total revenue by 2030	Change (%)	Total revenue by 2030
Baseline	1,120.35		930.10		2,050.46		
Basic	5,169.21	461.4	3,496.71	275.95	8,665.93	6,615.47	422
Moderate	10,850.73	968.5	6,680.20	618.22	17,530.93	15,480.47	855
Strong	13,705.71	1223.3	7,494.71	705.79	21,200.42	19,149.96	1034

In general, there is a potential for a sharp increase in the total revenue of PT.KAI from 6,615 Billion IDR (USD 463 Million) (422% -basic ambition) to 19,150 Billion IDR (USD 1,340 Million) (1,034% -strong ambition). **It is interesting to see that the reduction in the handling costs** (i.e. basic 30%, moderate 40%, and strong 50%) do not cause loss in income. Instead, it **resulted in a net increase in the total revenue of PT.KAI.** Nevertheless, the total revenue for PT.KAI is estimated to grow rapidly as a consequence of significantly higher demand for rail transport in 2030 based on the three ambition levels.

Benefits for the society

Aside from the benefits to the government, there are also **significant benefits to society, namely the reduction in total transport costs.** Lower transport costs, in the long run**, may lead to growth in trade volume and GDP, lower amount of subsidy needed for diesel fuel as a result of modal shift and potentially increased income from tax from the intermodal transport sector.** Table 15 provides a summary of the economic impacts.

Table 14: Impact of policy interventions on the total transport costs by 2030

Intervention policy	Total transport cost paid by shippers (Billion IDR)	Reduction in total transport cost (Billion IDR)	Reduction (%)
Baseline	165,442.51		
Basic	163,124.53	2,317.97	1.40
Moderate	157,761.86	7,680.65	4.64
Strong	152,899.32	12,543.19	7.58

It is estimated that basic intervention would result in **a reduction of 2,318 Billion IDR (USD 162 Million) of transport costs (1.40 %), while moderate and strong measures would result in reduction of 7,680 Billion IDR (USD 538 Million) (4.6%) and 12,543 Billion IDR (USD 878 Million) (7.6%) respectively.** These potential reductions are quite high considering the amount of savings that can be attained by society.

Cost benefit analysis

For basic ambition level, there are no additional costs incurred apart from infrastructure investment costs. This is because the government still receives revenues from VAT while the costs of subsidy for intermodal trucks are still considerably low. In addition, the sharp increase in the volume of rail freight would result in a net increase of the government revenues from the VAT. In moderate and strong ambition level the government may suffer a loss of 1,051 Billion IDR (USD 74 Million) (moderate ambition), and 1,805 Billion IDR (USD 126 Million) (strong ambition) respectively.

The benefits are based on the reduction in total transport costs paid by the society. Our analysis shows that basic ambition would only bring benefits, while moderate and strong ambition have a benefit-cost ratio of 731%, and 695% respectively. Table 16 presents an overview of the cost and benefit for each ambition level.

Table 15: Cost Benefit analysis of the action programme

Intervention policy	Loss of income from elimination of VAT and reduction in tax for intermodal trucks (Billion IDR)	Total benefits (Billion IDR)	Benefit/Cost ration (%)
Basic	0	2,479	NA
Moderate	1,051	7,681	731
Strong	1,805	12,543	695

In general, the costs to the government and PT.KAI are considerably small in comparison to the benefits. These transport cost reductions are also **strongly correlated with reduction in fuel consumption from road freight as well as maintenance and operations of truck fleets.** Hence, there is a good incentive to provide a financial aid to implement moderate and strong ambition levels. This government spending, in turn, could lead to savings from reductions of overall diesel fuel consumptions for road freight transport. It is also noteworthy that the full economic impacts that come from such a reduction –i.e. growth in GDP, has not been fully considered in this study. This potential regional GDP growth could deliver the highest economic benefits from the reduction in logistics costs on Java.

Likelihood of successful implementation

The likelihood for successful implementation of the action programme can be analysed based on the following aspects:

Strength:

- Part of Trans-Java rail corridor with a good connection with national arterial road/toll road.
- Government support (including financial support) towards expanding transport infrastructure to increase industrial activities.

Weaknesses:

- Complicated regulations concerning railway logistic and land use activities.
- Lack of required technologies and infrastructure.
- Competition with other transport modes operators (especially truck operators).
- Lack of political backing and progressive decisions towards creation of rail freight transport.

Opportunities:

- Development of semi-fast train connecting Jakarta and Surabaya; and Jakarta and Bandung.
- Improving market share of rail freight.
- Obtaining the newest technology, products, and know-how by adopting successful intermodal freight system.
- Promotion and the use of alternative fuels, reduction of carbon footprint by using biofuels, electric trucks for short distance deliveries.

Threats:

- No financial incentives because lack of funded projects.
- Economic depreciation of infrastructure investments.
- Negative attitude of private investors and operators, due to lack of knowledge.

The summary of the assessment on the likelihood for successful implementation of the action programme rail is shown in Table 9.

5. Conclusions

This research work has identified the root problems of the low market share for intermodal rail freight and formulated potential action programme to increase the share of rail freight.

The root problems are categorized into the following groups of barriers: (1) the uncompetitive intermodal rail transport cost, (2) long intermodal rail transit time, (3) poor quality of intermodal rail services, (4) lack of capacity of intermodal services, (5) lack of market competition, and (6) lack of policy as well as institutional support.

Based on those barriers, **an action programme is proposed, consisting of 3 groups of measures,** which are direct measures, supportive measures and organizational measures. **(1) Direct measures** deal with the improvement of intermodal infrastructure, cost reductions of rail services using the instruments of VAT (Value Added Tax), TAC (Track Access Charges), and subsidies to the users of rail freight service based on certain criteria (i.e. tax benefit program for trucks serving intermodal trips), and reformation of road transport policies to level the competition between road and rail transport. **(2) Supportive measures** deal with the establishment of minimum service standards, dedicated funding for infrastructure investment, improvement in freight planning and data, fostering sufficient market competition, and increasing marketing and promotion of rail freight services. Lastly, **(3) the organizational measures** deal with the upgrading of the authority of Multimodal and Intermodal Transport Division (AMM) in the Ministry of Transportation, the establishment of an inter-ministerial task force to develop the intermodal transport system, and establishing a stakeholder dialogue platform to frame and push the institutional change process.

Through a selection of these measures, **an action program with a choice of ambition levels was designed. (1) At the basic ambition level,** the focus is on reducing additional costs, time, and risk aspects of intermodal rail transport, so that it can be on a level competition with road transport, without necessarily changing much to the organizational framework at the government level and with relatively low infrastructure investment levels. **(2) At the moderate ambition level,** there is more government investment in connecting the rail network to the main logistic hubs (at Tanjung Priok primarily), in addition to an elimination of rail freight VAT, a reduction in TAC and a tax benefit program for trucks serving intermodal trips to further reduce the cost gap between rail and road. **(3) The strong ambition level** mainly aims to improve the quality of rail freight service to the highest possible level by investing in the operational conditions on intermodal terminals, reducing waiting times, damage and congestion. In addition to the connections in Jakarta, where most international cargo enters Java, the strong ambition level also foresees in the development of an intermodal hub near Surabaya, Java's second biggest economic center on the North corridor. This will also require a more direct follow up of intermodal developments by reinforcing the position of AMM as the responsible agency.

Each level of the action program would result in lower emissions due to modal shift from road to rail. The ex-ante impact assessment shows that an increased modal share of intermodal rail may reduce annual CO_2 emissions with emission reduction ranging from 1.2-3.56 MTonne in 2030 (5-14%) compared to baseline. Compared to the baseline scenario in 2030. The total cumulated CO_2 emission reduction between 2020-2030 period is: 7.92 MTonne (Basic), 18.09 MTonne (Moderate) and 23.4 MTonne (Strong).

Furthermore, an important economic benefit is the reduction in transport cost which contributes to the reduction in the national logistics costs. Our analysis shows a stronger action program may lead to a higher reduction in the total transport costs (from 1.4% to 7.58%) on Java which is equivalent to 2.3 -12.5 Trillion IDR (USD 161-875 Million) savings respectively. On the other hand, the government may gain or loss their income from VAT depending on the measures implemented. Basic ambition level, may result in a net increase in government revenue from VAT to 263.2 Billion IDR (USD 18.5 Million) while moderate and strong ambition level may require government to set up an additional budget for financial aid measures as much as 949 Billion IDR (USD 66.4 Million) (moderate) and 1,703 Billion IDR (USD 119.2 Million) (Strong). **Weighting the benefit against the cost, basic ambition would provide economic benefits (increased revenue from tax, and reduction in total national transport costs) without extra financial aid measures/costs to government (apart from infrastructure investment costs)**. Furthermore, moderate and strong ambitions have benefit-cost ratio of 731% and 695% respectively. However, it is noteworthy that this estimate has not included the potential agglomeration effect caused by lower transport costs between western and eastern Java. This lower

transport costs could lead to a higher GDP growth due to the growing trade volume between these regions or between Java and eastern Indonesia.

PT. KAI, as a rail network manager, potentially sees a sharp increase in their revenue across all ambition levels due to the rise in rail freight demand. Specifically, basic, moderate and strong ambition might deliver additional 6,615 Billion IDR (USD 463 Million) (322%), 15,480 Billion IDR (USD 1,083 Million) (755%), and 19,150 Billion IDR (USD 1,340 Million) (934%) of revenue compared to baseline.

Other benefits also include improved conditions of roads (both in terms of congestion and road safety) and a more competitive transport sector that is capable of moving high freight volumes under better conditions, which in turn will lead to a boost for the Indonesian economy as a whole.

In order to better assess the benefits of the programme, additional modelling and policy assessment is needed to obtain more accurate values for the marginal costs and benefits, such as air pollution costs, damage to infrastructure costs, accident costs, and congestion costs. While every tonne of cargo shifted from road to rail will lead to a net reduction of these externalities, a proper social cost-benefit assessment of the investment cannot be done without good insight in actual cost levels.

From the business use case perspective, the current intermodal rail cost and lead time tend to be less competitive compared to road transport. The analysis shows that improving both the lead time and the cost situation of rail transport are important to increase its market share and attract logistic service providers to shift to intermodal rail. **The greatest discrepancy currently lies in the time difference. The cost and time improvements gained from the basic ambition level are already able to attract companies to shift to rail.** Nevertheless, companies also confirmed that a higher shift to intermodal rail would take place along with further reduction in intermodal rail transport costs and time. T**his underlines the need for strong policy measures which could lead to a more significant cost and time reduction for intermodal rail freight.** The companies confirmed that there is still ample opportunity to improve the time and cost efficiency through the better handling/transloading system, better connectivity between rail terminal, port, dry port and industrial area, and establishing rail terminals as consolidation centers. Equally important, a healthy competition for first and last mile transport needs to be established so that there can be equal opportunities for logistics service providers to enter the intermodal freight transport market. In this context, rail terminal operators may form a partnership with the first and last mile transport companies to avoid distortion in market prices and unfair competition.

Based on the findings in this study, **specific policy recommendations** can be provided:

1. **Establish a complete, and reliable database for national freight transport flows.** The availability of reliable data is indispensable to guide the development of efficient intermodal transport infrastructure and transport infrastructure in general. In the context of the intermodal transport network, a complete origin and destination data, (ideally for different modes and commodities) will be invaluable to analyze the selection of rail terminal locations that will require a large amount of investment.
2. "Kaizen"[1] – **continuously improve and innovate with evidence-based policy making**. As impact assessment expertise and data collection methods continue to improve, policymakers are encouraged to leverage expertise available (both by academics and business experts) to plan the development of efficient intermodal freight transport infrastructure. An independent and comprehensive impact assessment should ideally, be done prior to the implementation of any intermodal transport policies involving major investments.
3. Set up **a dedicated funding program for developing intermodal rail infrastructure** as part of the government commitment which has been lacking. Impact assessment and financial viability study can help provide justification and opportunity for acquiring such funding.
4. **Focus on operational excellence and service quality**: new terminals should be able to provide streamlined, efficient services. The negative image of rail freight is one of the main causes for its low market share. A high service standard set by the government will help improve the image and the competitiveness of rail freight.

[1] Kaizen is the Japanese term for continuous improvement

5. Establish **a fair competition for the first and last mile transport market**. A level playing field for road freight service providers to enter intermodal freight transport market would help establish collaboration between road freight and rail transport instead of competition.
6. **Incentivize the establishment and the functioning of BUAMs**. They are the parties who can assume a full door-to-door responsibility for the intermodal transport chain on behalf of the shipper, simplifying the administrative process and improving the accessibility of rail freight transport. Hence, the growth of BUAMs would help drive competition for a better service quality and efficiency for intermodal rail transport.
7. **Commit for a strong ambition level** which could lead to a more significant improvement for intermodal rail transport and economic benefits for PT.KAI and society. The impact assessment and the business use case results confirmed that a strong intervention measure would lead to a higher share for intermodal rail mode as well as higher socio-economic benefits: considerable reduction in GHG emissions and total transport costs paid by the society.

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