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# Economic Contribution of Regional Feeder Ports to Indonesian Local Economy

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## Abstract

*Indonesia regional feeder ports' main function is to serve marine transport activities between regencies or cities in a province in limited quantities. The intention of the government to make marine transportations as the backbone of national logistic transportation system puts these ports to an important position. They act as suppliers for the main and/or collector ports and as goods distribution centers for the region from the bigger ports. Not only as a provider of accessibility between regions, regional feeder ports should be seen as an infestation to boost regional economy. This study aims to explain the influences of regional feeder ports on regency/city economy, based on two types of port: (1) cargo and (2) cargo & passengers port. Results show that both types of ports have positive influences on the regency/city economy, although it is not related to region's economic base sector. Cargo ports which are mainly located on west area of Indonesia support the region's economy more than cargo & passenger ports which are mainly located on the east one.*

***Keywords:*** *regional feeder port; cargo port; passenger port; regional economy*

## Abstrak

***[Judul: Kontribusi Ekonomi Pelabuhan Feeder Regional Terhadap Ekonomi Lokal Indonesia]*** *Pelabuhan Feeder Regional Indonesia memiliki fungsi utama untuk melayani aktivitas tranportasi laut antar kabupaten atau kota di provinsi dalam jumlah terbatas. Pemerintah bermaksud untuk membuat tranportasi laut sebagai tulang punggung sistem transportasi logistik nasional dan menempatkan pelabuhan ini dalam posisi yang penting, yakni sebagai pemasok untuk pelabuhan utama dan/atau pelabuhan collector dan juga sebagai pusat distribusi barang untuk daerah dari pelabuhan yang lebih besar. Tidak hanya membantu aksesibilitas antar daerah, pelabuhan feeder regional seharusnya juga perlu dilihat sebagai bentuk investasi untuk memajukan ekonomi daerah. Kajian ini bertujuan untuk menjelaskan pengaruh pelabuhan feeder regional terhadap ekonomi daerah/kota berdasarkan dua tipe pelabuhan: (1) pelabuhan peti kemas dan (2) pelabuhan peti kemas dan pelabuhan penumpang. Hasil penelitian menunjukkan bahwa meskipun tidak terkait dengan sektor ekonomi dasar daerah tersebut kedua jenis pelabuhan memiliki pengaruh positif kepada ekonomi kabupaten/kota. Pelabuhan peti kemas yang sebagian besar berlokasi di wilayah barat Indonesia memberikan dukungan yang lebih besar pada ekonomi daerah dibandingkan pelabuhan peti kemas dan penumpang yang banyak ditemukan di bagian timur wilayah Indonesia.*

***Kata kunci:*** *pelabuhan feeder regional; pelabuhan peti kemas; pelabuhan penumpang; ekonomi regional*

## 1. Introduction

There are two different views on the relationship between economic activities of ports and local economic development. Traditional view is that ports are the accelerators of economic development. This view was suggested by Fugita and Mori (1996) that the relationship emphasizes economic pull effect of ports emphasizing mutually beneficial circle between ports and relevant local economies. They assert that ports provide comparative advantage to the cities where they are located. While, another pessimistic group of scholars assert that ports simply respond to demand through the physical transfer of commodity flows. The latter think that port is a derived demand, economic growth generates demand for port development, but the reverse relationship, does not hold.

Indonesian hierarchy of ports, as written in Law No. 17 of 2008 on Shipping (Shipping Act) and Government Regulation No. 61 of 2009 on Ports, consists of 3 ports level: (1) main ports, serving international and domestic marine transport activities in

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large quantities; (2) collector ports, serving domestic marine transport activities in medium quantities; and (3) feeder ports, serving domestic marine transport activities in a province in limited quantities and as a feeder for main and collector ports. Regional feeder ports itself focused on inter-regency or city transport activities in a province, and its existence is a part of national maritime development strategies, including the government's intention to make maritime transportation as the backbone of national logistic transportation system, as written in Presidential Decree No. 26 of 2012 on National Logistic System Blueprint, or widely known as '*Tol Laut'* ('Maritime Highway'). This concept emphasizes the development of high-capacity main ports. But in providing main ports supply, regional feeder ports needed for collecting cargos from production locations, that cannot be reached by a particular vessel size or located away from the main port. This works in reverse for the goods distribution from bigger ports to the destined region. Regarding to its important position, however, the existence of this regional feeder port will have an impact on the economy of its region, with the creation of inter-regional accessibility. This impact on the economy and employment occurs in a form of a direct impact, indirect impact, and induced impacts (Rodrigue, 2013).

According to Ferrari (2011), port impact on regional economy is specific and depends on the hinterland's characteristics. In this case, in addition to economic improvement strategies through port investment, there is also a division of Indonesia's zone into 6 economic corridors, as stipulated in Presidential Decree No. 32 of 2011 on Master plan of Acceleration and Expansion of Indonesia Economic Development 2011-2025: (1) Sumatra; (2) Java; (3) Kalimantan; (4) Sulawesi; (5) Bali – Nusa Tenggara; and (6) Papua – Maluku. Each of them has different development themes which could affect regencies' or cities' characteristics in each particular corridor. Moreover, in general there are two types of regional feeder ports, divided by availability of transport services at one time at the port: cargo ports, which serve transport services of unspecified goods (either general cargo, dry bulk, or liquid bulk); and cargo & passenger ports, which serve transport services of unspecified goods and passengers at the same time. Cargo ports are mostly located in western part of Indonesia, which is widely used for expansion of markets and trade, considering the advantages of marine transportation that can handle the movement of goods in large quantities and long distances (Hein, 2011). Meanwhile, cargo & passenger ports are mostly located in eastern part of Indonesia that the majority of its territory consists of small islands, where the movement of passengers and goods between islands are based on basic needs than the needs of trade or market extension, and can only be done through sea transport.

The aim of this paper is to explore the economic contribution of regional feeder ports on local economy of regencies or municipalities. These include identifying regional economic conditions and regional feeder ports activities in each economic corridor; and identifying the relationships and comparing the effects between two types of regional feeder port on the condition of regional economy. Issues facing different investment options on pots are discussed, particularly with regard to feeder ports. The paper then shifts to economic experiences in all feeder ports which are reviewed in this regard. The paper is closed with commentary on the institutional challenges of advancing the sustainable maritime connectivity agenda

## 2. Research Method

This research used quantitative approach, based on the data type and analysis, and the flow of deductive reasoning. This study is classified as a descriptive study, which aimed to describe the condition of a phenomenon, which is the influence of regional feeder ports on regional economy, using regency/city as the unit of analysis. The dataset used in this study consists of Indonesia's 74 regional feeder ports, consists of 32 cargo ports in 30 regions and 42 cargo & passenger ports in 34 regions. Data about regional feeder port activities are collected from Directorate General of Sea Transportation, Ministry of Transportation; and data about regional economy are collected from Indonesia Central Bureau of Statistics. Ports and regions selection are based on purposive sampling using the completeness of data on observed variables as main consideration, with 30 samples for each port types and regions as minimum benchmark considering the results of other empirical studies, where in general the normal distribution most likely have been obtained with the number of 30 samples (Kachigan, 1986). Such consideration is made based on data collection process; the author found that in regency/city, there's only major port-related data available, especially the import & export outlets.

In this study, instead of observing the regional feeder port as a transit port, this study is using an assumption that the unloaded goods and arrived passengers are destined to the region where the port located, as well as the loaded goods and departed passengers are originally from the region. If there's more than one port located in one regency/city, then the data of port activities are accumulated, as far as the existence of more than one port in one region is due to small islands-shaped regional characteristics, or the distance between each ports are still within 50 miles (85 kilometers) as specified in Minister of Transportation Ministerial Decree No. KP 414 of 2013 on the Establishment of the National Ports Master Plan. Based on the dataset, Papua was excluded from observed corridor because there are no

data about region which have regional feeder ports, as listed in Table 1.

**Table 1**. Number of Ports Studied in Each Economic Corridor

| Corridor | Cargo Ports | Cargo & Passenger Ports |
|---|---|---|
| Sumatra | 9 ports in 8 regions | 12 ports in 8 regions |
| Java | 8 ports in 8 regions | 4 ports in 3 regions |
| Bali - Nusa Tenggara | 2 ports in 2 regions | 9 ports in 9 regions |
| Kalimantan | 5 ports in 4 regions | - |
| Sulawesi | 8 ports in 7 regions | 6 ports in 6 regions |
| Maluku | 1 ports in 1 regions | 11 ports in 8 regions |

Methods of analysis used in this research consist of content, descriptive statistical, and path analysis. The first method is used to conclude theories and previous researches in order to determine research aspects and variables. The second one is used to classify regional economy variables and regional feeder port activities variables into four categories through quartile methods, e.g. Very High, High, Low, and Very Low; and to identify regional economic conditions and regional feeder ports activities in each economic corridor. The third method is used to identify correlations and effects of each types of port on the condition of regional economy.

In studying the impact of port on the regional economy, from the port side, there has been an indication of importance of transportation infrastructures to stimulate economic development, including quay line length and number of berths (Deng, Lu and Xiao, 2013). Furthermore, research shows the quantity of infrastructure is related to port productivity in 5 American ports (De Neufville and Tsunokawa, 1981). Cargo output, in the form of the volume of loaded and unloaded goods, is one of the main sea transport services. Movements of goods which made possible by the existence of ports, will expand the market, stabilize prices of goods, and stimulate region to increase its production (Adisasmita, 2011).

Unloaded goods, or can be regarded as imported goods are meant to meet the needs of consumption or raw material needs while loaded goods or exported goods are produced goods from particular region. In terms of passenger flow, passengers using transport services may include labor, tourists, or moving residents. The passenger flow is also expected to provide positive benefits to the region, i.e. carry out productive activities, increase production and productivity. In this case, passengers and goods movement is accommodated by the means of transport such as ships. This is a reason that the flow of ships also need to be taken into account as part of port activities in the region. Ideally, the port capacity should be included as research variables; however, due to limited data on regional feeder port capacity, in this study port capacity are excluded and not observed. Research aspects and variables are listed in Table 2.

**Table 2**. Research Aspects and Variables

| Aspect | Variables | Unit |
|---|---|---|
| Regional Feeder Port Activities | • No. of Ship Calls<br>• Vol. of unloaded goods<br>• Vol. of loaded goods<br>• No. of arrived passengers<br>• No. of departed passengers | • Unit<br>• Ton<br>• Ton<br>• Person<br>• Person |
| Conditions of Regional Economy | • Total GDRP (constant market price)<br>• Base sector | • Million IDR<br>• - |
| Other Determinant Factors of Regional Economy | • Number of labor in region<br>• GDRP of region's base sector (constant market price)<br>• GDRP of Communication and Transportation Sector (constant market price) | • Person<br>• Million IDR<br>• Million IDR |

In terms of the region's economy, total GDRP is used as an indicator of regional economy. GDRP is defined as the total value added generated by all business units within a certain area (Central Bureau of Statistics, 2013). Then, the base or leading sector of the region used as a reflection of regional growth based on export base theory, and previous research shows there's a correlation between port output and its region's base sector. Other than these 2 variables, other determinant factors which will observed as intervening variables need to be studied. From the employment side, both economic theories (classical and neoclassical economics) includes labor workforce as part of income function. Moreover, regional revenue from transport sector is a sector whose income is directly related to maritime transport. Besides the regional economy, the geographical condition of corridors and regions is also observed in general.

## 3. Results and Discussion

Based on the descriptive statistics shown in Table 3, wide range of Total GDRP of all regions with regional feeder ports shows that regional feeder ports found on both low and high-productivity regions. In both categories of regions, the volume of unloaded goods is higher than the loaded ones, but the difference is higher in regions with cargo & passenger port. This means that there are more imported goods are not fully used as raw materials to be exported. In addition, Total GDRP of regions with cargo port are generally higher than the regions with cargo & passenger ports, indicates that regions with cargo port are more productive and might use the port to improve the regions productivity. Number of ship calls is higher in regions with cargo & passenger ports, and

number of arrived and departed passengers are mostly equal, which signifies the passenger transport services are mostly used for round-trips.

**Table 3.** Descriptive Statistics of Variables used in the model

| Aspect | Category | Variable | N | Minimum | Maximum | Mean | Std. Dev. |
|---|---|---|---|---|---|---|---|
| Condition of Regional Economy | All Regions with Regional Feeder Port | Total GDRP | 64 | 119.686,4 | 15.815.462,9 | 2.469.403,2 | 2.917.972,3 |
| | Regions with Cargo Port | Total GDRP | 30 | 360.177,4 | 15.815.462,9 | 3.662.795,0 | 3.452.763,6 |
| | Regions with Cargo & Passenger Port | Total GDRP | 34 | 119.686,4 | 7.953.885,0 | 1.416.410,4 | 1.827.957,8 |
| Regional Feeder Port Activities | Regions with Cargo Port | No. of Ship Calls | 30 | 27 | 9.185 | 992,07 | 1.876,8 |
| | | Vol. of Unloaded Goods | 30 | 792 | 9.634.092 | 683.665,47 | 1.805.044,5 |
| | | Vol. of Loaded Goods | 30 | 341 | 5.387.377 | 673.287,97 | 1.359.664,5 |
| | Regions with Cargo & Passenger Port | No. of Ship Calls | 34 | 198 | 4.478 | 1.195,88 | 1.107,2 |
| | | Vol. of Unloaded Goods | 34 | 399 | 6.980.811 | 344.984,65 | 1.245.890,9 |
| | | Vol. of Loaded Goods | 34 | 233 | 1.150.246 | 107.355,76 | 239.937,8 |
| | | No. of Arrived Passengers | 34 | 161 | 181.297 | 36.162,41 | 46.161,8 |
| | | No. of Departed Passengers | 34 | 172 | 182.777 | 34.689,18 | 45.808,4 |

3.1 Conditions of Regional Economy and Regional Feeder Port Activities in Each Economic Corridors

As shown in Table 4, at the category of regions that have regional feeder ports (without considering the ports type), in general, it was found that most regencies/cities in Java and Sumatra have a High or Very High total GDRP class, and there are more regions with cargo regional feeder port rather than regions with cargo & passenger port. In addition to the geographical conditions of the corridor, which is consists of 1 main island and surrounded by small islands, the comparison between the number of regions with cargo port and regions with cargo & passenger port can also show the advantage of sea transportation that can drive industrial productivity in the region, as it has been described by Rodrigue, Notteboom, and Slack (2013).

In line with this, it was also found that most regencies/cities in Bali–Nusa Tenggara corridor and Maluku corridor has a Very Low total GDRP class, and there are far more regions with cargo & passenger port. Low total GDRP indicates low amount of region's end products, and the existence of the port which provides cargo & passenger services at a time, shows that the movement is based on the necessity of meeting the basic needs than for market expansion of goods or service procurements produced by the region.

**Table 4**. Dominant Conditions of Regional Economy and Regional Feeder Ports Activity based on Economic Corridors

| Category | Variable | Sumatra | Java | Bali - Nusa Tenggara | Kalimantan | Sulawesi | Maluku |
|---|---|---|---|---|---|---|---|
| All Regions with Regional Feeder Ports | *Total GDRP* | H | VH | VL | L | L | VL |
| | *Sector Base* | Agriculture | Agriculture | Agriculture | Agriculture | Agriculture | Manufacturing |
| | *Number of Ports*** | F = F&P | F > F&P | F < F&P | F > F&P | F > F&P | F < F&P |
| Regions with Cargo Regional Feeder Ports-type | *Total GDRP* | L | VH | H | VL | H | VL |
| | *Sector Base* | Mining | Agriculture | Manufacturing, services* | Agriculture | Distributed in 7 sectors* | Manufacturing |
| | *No. of Ship Calls* | VH/H/L/ VL* | H/L* | H/VL* | L | VH/H/ VL* | VL |
| | *Vol. of Unloaded Goods* | H/VL* | H | L | VH | VL | L |
| | *Vol. of Loaded Goods* | L | H | L/VL* | VH | H | VL |
| Regions with Cargo & Passenger Regional Feeder Ports-type | *Total GDRP* | VH | VH | L | - | L | VL |
| | *Sector Base* | Agriculture | Agriculture, mining, finance* | Agriculture | - | Agriculture | Manufacturing |
| | *No. of Ship Calls* | VH | VH | L | - | L | H |
| | *Vol. of Unloaded Goods* | VH/H* | H | L | - | VL | L |
| | *Vol. of Loaded Goods* | H | VH | H | - | VL | VH/L* |
| | *No. of arrived passengers* | VH/L* | VH | H/VL* | - | H/L* | H |
| | *No. of departed passengers* | VH | VH | L/VL* | - | L | H |

*VH = Very High, H = High, L = Low, VL = Very Low*

**More than 1 classification in 1 cell indicates an equal distribution between the classes*

***F = number of regions that have cargo ports; F&P = number of regions that have cargo & passenger ports*

In the category of regions with cargo ports, port activity is considered very high in Kalimantan corridor, high in Java, between high and low in Sumatra, between low and very low in Bali – Nusa Tenggara, and very low in Maluku corridor. In Java corridor, where the cargo ports activity is high and most regions have a high GDRP, imported and exported goods (considered as unloaded and loaded goods at ports) considered as production stimulator, and able to raise the productivity of other sectors to create high-end products, indicated by the high total GDRP. As with the corridor of Kalimantan and Sumatra, the cargo ports activity is considered high, but the imported and exported goods have not been able to support the region's whole productivity, resulting in a low total GDRP. In Bali – Nusa Tenggara and Sulawesi corridor, high regional productivity can be derived from other sectors that are not much related to regional feeder ports, because of the diversity of region's sector base in each corridor and the low cargo ports acitivity. In Maluku corridor, it was found that regional import, export, and production process are low, indicated by the low total GDRP and port activity, although its base is manufacture industry sector.

In the category of regions with cargo & passenger ports, port activity is very high in Java, high in Sumatra, between high and low in Maluku, low in Bali – Nusa Tenggara, and between low an dvery low in Sulawesi. Given the high activity of the port in corridor with both high and low GDRP, it shows that the need for movement of passengers by sea transportation still occur whether on regions with high GDRP or low GDRP. However, in Java and Sumatra corridors, flow of passengers are based on services such as tourism, whereas in Maluku corridor it is constituted by a basic necessity, given the dominant level of total GDRP of the corridors respectively. In addition, in Maluku the services of passengers transport are more required than the goods, because the high number of ship calls is only followed by high flow of passengers, not by a high flow of goods

### 3.2 Comparison of Correlation and Effects of Port Activities on Regional Economy between Cargo Port and Cargo & Passenger Port

Correlations and effects examined using 95% confidence level. Correlation analysis (Cramer's V and Kendall-Tau) is used to determine the correlations between each port activity variables and each conditions of regional economy variables, while path analysis is used to determine the path and amount of effect, because economic impact of port, as described by Rodrigue (2013), can occur directly or indirectly.

As shown in Table 5, correlation between port type in regions and level of Total GDRP is quite strong, where the higher the level of Total GDRP, the higher the number of regions with cargo port fall into that category, in contrast to the number of regions with cargo & passenger port. This condition aligns with the main advantage of sea transport as a mode of transport with the lowest cost per unit compared to other modes, making it profitable for economic sectors. Correlation between the number of ship calls and unloaded goods at the cargo ports indicates imported goods, as raw materials or as consumer goods, will increase the production of the region; likewise the number of ship calls as conveyances that carry both loaded and unloaded goods from and to the region. Meanwhile, loaded goods as exported end-products from the region, not found to be correlated with Total GDRP, which indicates the exports does not affect the productivity of region as a whole. Inexistence of correlation between cargo & passenger ports activity variables and regional economy may signify that ports activity is not supporting the productivity of the region. There is no activity of both types of ports that have a correlation with regional base sector, indicating the potential export sector in the region does not determine the volume of import or exported goods or ship calls carrying goods, and vice versa.

**Table 5**. Results of Correlation Tests between Regional Feeder Port Activities and Regional Economy

| Conditions of Regional Economy / Variables Port-related Variables | | Level of Total GDRP | | Base Sector | |
|---|---|---|---|---|---|
| | | *Correlation Coef.* | *Sig.* | *Correlation Coef.* | *Sig.* |
| Port type in region | | 0,550 | 0,000* | 0,466 | 0,085 |
| Cargo port activities | Level of No. of Ship Calls | 0,297 | 0,034* | 0,520 | 0,279 |
| | Level of Vol. of Unloaded Goods | 0,291 | 0,026* | 0,556 | 0,114 |
| | Level of Vol. of Loaded Goods | 0,261 | 0,136 | 0,411 | 0,812 |
| Cargo & Passenger port activities | Level of No. of Ship Calls | 0,065 | 0,694 | 0,407 | 0,529 |
| | Level of Vol. of Unloaded Goods | 0,219 | 0,083 | 0,392 | 0,613 |
| | Level of Vol. of Loaded Goods | 0,206 | 0,173 | 0,458 | 0,259 |
| | Level of No. of Arrived Passengers | 0,062 | 0,700 | 0,498 | 0,118 |
| | Level of No. of Departed Passengers | 0,099 | 0,535 | 0,461 | 0,248 |

*) Significant at 95% confidence level

On the calculation of effect through path analysis this research observed 2 out of 3 impact types of port investment on the economy as described by Rodrigue earlier. As shown in Table 6, direct impact such as harbor revenue is observed as indirect effect on GDRP of Transportation & Communication Sector, and induced impact that felt by supporting economic sectors is observed as direct effect on Total GDRP and specifically through indirect effect on GDRP of Base Sector. Induced impact could not be observed through this study because it requires primary observation to each ports direct users.

**Table 6**. Effect of Port Activities on Total GDRP

| Type of Port in Region | Port Activity Variables | Direct Effect (on Total GDRP) | Indirect Effects | | | | Total Effect |
|---|---|---|---|---|---|---|---|
| | | | Number of Labor in Region | GDRP of Base Sector | GDRP of Transportation & Comm. Sector | Total of Indirect Effect | |
| Cargo Port | *No. of Ship Calls* | - | - | - | - | - | - |
| | *Vol. of Unloaded Goods* | 0,643 | 0,066 | 0,339 | 0,111 | 1,107 | 1,750 |
| | *Vol. of Loaded Goods* | - | - | - | - | - | - |
| | **Total Effect** | **0,643** | **0,066** | **0,339** | **0,111** | **1,107** | **1,750** |
| Cargo & Passenger Port | *No. of Ship Calls* | - | * | - | - | - | - |
| | *Vol. of Unloaded Goods* | - | * | - | 0,301 | 0,301 | 0,301 |
| | *Vol. of Loaded Goods* | 0,420 | * | 0,158 | - | 0,158 | 0,578 |
| | *No. of Arrived Passengers* | - | * | - | - | - | - |
| | *No. of Departed Passengers* | - | * | - | - | - | - |
| | **Total Effect** | **0,420** | ***** | **0,158** | **0,301** | **0,459** | **0,879** |

*) on the category of regions with cargo & passenger ports, there is no correlation between No. of Labor and Total GDRP found.

The effect of cargo ports on regional economy comes from volume of unloaded goods, which affects Total GDRP directly and indirectly through all of 3 intervening variables. This condition means unloaded goods as imported raw materials or goods to be consumed to fulfill population needs, are really support the regional production as a whole, thus providing a good influence on transportation sector, base sector, and employment. Meanwhile the effect of cargo & passenger ports comes from volume of loaded and unloaded goods. Loaded goods affects the Total GDRP directly and indirectly through GDRP of Base Sector, means the exported goods as region's products increases regional production as a whole. Unloaded goods affect Total GDRP indirectly through GDRP of Transportation and Communication sector, indicates there are commodities procurement from other regions which increase port revenue, but does not yet support the region's production.

On the cargo port category, the indirect effect through GDRP of Base Sector or induced impact of ports investment, is greater than the indirect effect through GDRP of Transportation and Communication sector, or in other words, direct impact; but it is contrary on the cargo & passenger ports category. This indicates cargo ports relatively supports the regions' economic sectors productivity more than regions' revenue on port. Total effect of cargo port activities on Total GDRP is higher than the effect of cargo & passenger port activities also indicates that cargo ports has more impact on regional economy than the cargo & passenger ports.

## 4. Conclusion

Both types of regional feeder ports have a positive influence on regency/city economy. This means the existence of theses ports in a region can significantly improve regional economy. The total effect of cargo ports activity variables on Total GDRP is greater than cargo & passenger ports. This condition signifies that the cargo port, as a means to fulfill the needs of goods movement between regions, supports more than the cargo & passenger ports, which further will increase regional economy.

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