TRANSPORTATION MODEL
INTER ISLANDS CLUSTER TRANS MALUKU

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Abstract

Maluku province consists of 1340 islands, 92.4% of the total area (712,479.69 km²) is water, low inter-cluster connectivity Trans Maluku islands, with a population of 1,535,506 inhabitants (2011). The purpose of this study were 1) to explain the geo-economic conditions and transportation resources to support the development of the province of Maluku, and 2) to analyze the performance of transport services in cluster islands of Maluku Trans towards social, economic and environmental, and 3) to simulate the network model intermodal connectivity between road and line ferry as an integrated land transport, and 4) transport development strategy Trans Maluku island Clusters in supporting of the development of the region. The data used came from 494 questionnaires, with an error rate of 5%. Determination of cluster sampling and random to managers and users of transportation. Descriptive and quantitative analysis, using the formula Average Daily Traffic (ADT), with simulated equivalency service level crossing streets with traffic. In addition, the analysis of Strength Weakness Opportunity Threat by using the GAP and Important Performance Analysis (IPA). The results of the analysis describes 1) geo-economic conditions of the sea the seed sector to support the development of the province of Maluku, while transport services in cluster islands far from the minimum service standards. 2) the performance of transportation services is quite good and worth the four modes of transportation (sea, air, and highway crossings) have the same impact on the effectiveness of the development of the province Maluku. 3) empirical model of land transport connectivity synthesis between cluster islands are formed of functions and distance transport line ferry. 4) Development strategy for the development of transportation in cluster islands region can use the dimension of infrastructure condition and performance of transportation.

Keywords: Inter-Island, Transport, Road Capacity and Ferry Transport

INTRODUCTION

Maluku province consists of 1340 islands, 92.4% of the total area (712,479.69 km²) is water, low inter-cluster connectivity Trans Maluku islands, with a population of 1,535,506 inhabitants (2011). The condition of natural resources (fisheries / marine products, tourism, mining) and maritime services Maluku undeveloped and has not managed optimally. Limitations of infrastructure and transportation facilities are also less supportive, so that the area / village slowly growing and unproductive. This is evident in the poverty rate of 21.78%, is above the national poverty level of 11.96% (BPS, March 2012). Development of the road network should be integrated and integrated transport network inter-island ferry, thus forming a network of transportation infrastructure systems efficiently and effectively, lower transportation costs and to accelerate the economic growth of the community. Scenario connectivity archipelago desperately needs to be able to open the system connectivity isolated areas that are connected with the economic centers. The main objective is to reduce the disparity in strengthening connectivity prices and services, increasing competitiveness and accelerating poverty reduction, which in turn can improve the Accessibility of social and economic development.

The purpose of this study were 1) to explain the geo-economic conditions and transportation resources to support the development of Maluku province, and 2) to analyze the performance of transport services in cluster islands of Maluku Trans towards social, economic and environmental, and 3) to simulate the network model intermodal connectivity between road
and line ferriage as an integrated land transport, and 4) transport development strategy Trans-Maluku island cluster in support of the development of the region.

**STUDY OF THEORY**

Model development of the islands that can be applied: 1) Development Model fast-growing area, 2) model development Agropolitan Region, 3) Modeling Transito, 4) Ecotourism Area Development Model and Scientific Research, and 5) Sea Border Area Development Model (Koespramoedyo, 2003). Elements associated with the development of the area transportation system: 1) Nodal centers, 2) the area of effect or service areas, and 3) transportation network.

Transport is one of the elements forming the structure of space in support of regional development, both functional and inter-node orientation distribution services in the area and out of the territory and directly affect economic growth (Figure 1).

![Transportation System Development Diagram](http://www.irishspatialstrategy.ie/docs/pdf)

**Figure 1.** Transportation and economic development
(Source: [http://www.irishspatialstrategy.ie/docs/pdf](http://www.irishspatialstrategy.ie/docs/pdf))

Transport infrastructure investment can also increase the growth of the region's economy as it would improve the quality of transport services. That is, commodity transportation costs can be lowered, as well as travel time can be accelerated, thus increasing the competitiveness of commodities.

**METHOD AND DISCUSSION**

The data used for this analysis came from 494 questionnaires, with an error rate of 5%. Determination of cluster sampling and random to managers and users of transportation. Descriptive and quantitative analysis, using the formula average daily traffic (ADL), with simulated equivalency service level crossing streets with traffic. In addition, the SWOT analysis
with GAP and IPA. Analysis of the performance of transportation services using 14 indicators grouped into 3 categories: 1) social function, 2) economic, and 3) the environment (Figure 2).

**Notes:**
- A = Transport Social Functions
- B = Transport Economic Functions
- C = Environment Functions
- D = Economic and Benefit Social
- E = Quality of service
- F = Sustainable Transport
- G = Efficient Transportation Development Goals and Effective with triple output (Social, Economic and Environmental).

**Figure 2. Fungsi by Transport Performance Indicators**
**Sources:** National Transportation Systems (developed Jinca, 2002)

The study started from the assumption that the current condition of transportation services, a product of past policy. Transportation performance is input in the thought process of the SOM system (Subject, Object and Methods), is expected to produce an output strategy development, (Figures 3 and 4).

**Instrument Input:**
- Archipelago
- National Regulation
- Laws and Regulations Transportation
- Transportation System National / Regional
- Transportation level / rank Local Transportation
- National Spatial Plan and Regional

**Out put**
- Transportation Development
- Strategies of Cluster Trans Maluku island

**Figure 3. Macro Framework Concept Research**
DISCUSSION

Geo-Economic Conditions and Natural Resources as a Supporting Development of Regional Transportation Maluku Province.

Geo-economic conditions Maluku province consists of 93% of the sea, the island covers 1340. Productive age population (15-54 years) as much as 59.82%. PDRB growth of 5.21% in the last 6 years timeframe and the agriculture and fisheries sector as the largest contributor (31.75%).

Accessibility and mobility indices Maluku region is between 0.01 to 0.93 and from 0.006 to 0.458. Movement centered orientation to the city of Ambon (84.4% i.e. island group VII includes the islands of Ambon and Lease). The average daily traffic on the streets of Ambon 20500-33000 vehicles, the lowest in the Region XII island cluster, include Wetar Island (179 vehicles per day). Geo-economic conditions of the sea the seed sector to support the
development of the province of Maluku, while the transportation services island cluster is still far from the minimum service standards.

The movement of goods between the Cluster island following the movement of passengers, forming a triangular connection between Ambon, Piru and Bula. Masohi is the main node of the three. Interaction cluster towards the eastern North and South is still very weak, nor the interaction between the clusters in the East and South (Fig. 5).

![Map of Maluku Province](image)

**Figure 5. Passenger Movement Dicer line and Goods**

Performance Transportation Services Cluster Trans Maluku Islands Aspects of Social, Economic and Environmental. Trans Maluku conditions based on analysis of customer satisfaction index (CSI) on the performance of transport showed a reasonably good value and the four modes of transportation (sea, air, and highway crossings) have the same impact on the effectiveness of the development of the province of Maluku. Public discontent, especially indicators of maritime transport, port waters are polluted, not comfortable, not smooth and low to the safety of maritime transport (Fig. 6).

Road transport accident rate relative high average 455 events per year, with property losses, about 300 million per year in the period (2005-2010).

Ferry transportation service performance is still far from adequate, especially aspects of comfort, pollution, safety, accessibility, frequency and regularity.
Table 1. Transport Performance

<table>
<thead>
<tr>
<th>Performance Indicators</th>
<th>Transport Modes</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Road</td>
<td>Ferry</td>
</tr>
<tr>
<td>Social</td>
<td>3,37</td>
<td>3,44</td>
</tr>
<tr>
<td>Economic</td>
<td>3,61</td>
<td>3,59</td>
</tr>
<tr>
<td>Environment and Comfort</td>
<td>3,31</td>
<td>3,41</td>
</tr>
</tbody>
</table>

Source: Result Analysis, 2012

Intermodal Interagency Network Model of Road Network Connectivity and Line Ferry for Integrated Land Transport.

Model and crossing the road network can be built based on the theoretical synthesis of the theory of traffic flow, the average daily Traffic (ADL) vehicles on the road.

The average daily traffic should be equal to the capacity of the line ferry to occur over the unloading intermodal connectivity to the node (in the harbor crossing) and a ground transportation entity that serves as a bridge connecting roads for the transportation of passengers and their cargo and vehicles (Table 2).
Table 2. Capacity Model per Line

<table>
<thead>
<tr>
<th>Tual – Larat</th>
<th>Hunimua – Waipirit</th>
<th>Saumlaki - Tepa (S=120 mil)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Y_{800} = 662, 3 – 155,0 \ln(x)$</td>
<td>$Y_{1250} = 98,92 – 23,2 \ln(x)$</td>
<td>$Y_{300} = 584,4 – 137,0 \ln(x)$</td>
</tr>
<tr>
<td>$Y_{600} = 496,7 – 116,0 \ln(x)$</td>
<td>$Y_{1000} = 79,13 – 18,5 \ln(x)$</td>
<td>$Y_{600} = 438,3 – 103,0 \ln(x)$</td>
</tr>
<tr>
<td>$Y_{400} = 331,1 – 77,7 \ln(x)$</td>
<td>$Y_{750} = 59,35 – 13,9 \ln(x)$</td>
<td>$Y_{400} = 292,2 – 68,6 \ln(x)$</td>
</tr>
<tr>
<td>$Y_{200} = 165,5 – 38,8 \ln(x)$</td>
<td>$Y_{500} = 39,56 – 9,29 \ln(x)$</td>
<td>$Y_{200} = 146,1 – 34,3 \ln(x)$</td>
</tr>
</tbody>
</table>

Source: Result Analysis, 2012, R2 values of around 0.989

Transport Development Strategy Cluster Island Trans-Maluku in Supporting the Regional Development

Development Strategy of two characters of Maluku Region:

1. Regional dominance mainland (Buru and Seram, including cluster islands I-V), is a fast growing and developing region Agropolitan supported by the model of transito region. Connectivity gateway node that is, a) orientation to the west and north (in the Bay of Bara in Buru Island), b) orientation to the north and east (Bula and Seram Island in Northern), c) orientation to the East and South (Bula in the eastern of Seram island).

2. Regional dominance of land (including Cluster islands VI-XII) is a fast-growing region (the economic potential of the marine sector), supported the development of a model with a transit node gateway connectivity in Ambon, Tual, Dobo and Ilwaki (Figure 7).
Transportation development strategy model of Cluster Island Trans-Maluku planned according to Figure 8.

Four models of the development of the transport system in cluster islands in Maluku Province:

1. **The first model**, a strategy to develop a network of services, integration of inter-and intra modes of transportation in the development of the national economy in the Economic Corridor “Master Plan for Acceleration and Expansion of Indonesia (MP3EI)” in Maluku province.
3. The **Both models**, strategies to increase human resource capacity transport, coordination across sectors and between regions and the center, as well as developing a transportation management based on Information and Technology (IT).

4. The **third Models**, strategies to increase the participation of public and private, government funding synergies and increase Budget Revenues and Expenditure Region of transport.

5. The **fourth models**, strategies to increase the infrastructure capacity network as well as transportation safety, improve the transportation services and planning (Table 3).

| Table 3. Model Policy and Strategy Development Transport Cluster Islands Trans Maluku |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| **Transportation Performance of Cluster Island** | **Regional Application of Cluster Island** | **Transportation Policy Purpose** | **Transportation Development Strategies** | **Efforts and Action Plan** |
| MODEL 1: Conditions and Performance Transport Infrastructure Good (+) | Cl. I, Cl. V and Cl. VII | Island Cluster Development and Transport Network Improvement | Network development services and integration of transport modes | Increased Connectivity Regional Cluster Interaction between Island, level Implementation Regional Transportation / Transport and Local level, Kap. Human Resource financing, empowerment of local transportation. |
| MODEL 2: Infrastructure Condition Good (+), and Performance Transportation Less (-) | Cl. II, Cl. III and Cl. IV | Development of Human Resource and Transportation Management | Increased Kap. Human Resource, coordination across sectors and regions, Transportation Management Improvement | Improved Means of Transportation, integration planning, dissemination of rules / regulations (Statute) Transportation, and encourage private investment. |
| MODEL 3: Condition of Infrastructure and Transport Performance Less (-) | Cl. VI, Cl. XI and Cl. XII | Transportation Resources Development | Increased public and private participation in the development of Transport, funding synergies. | Consistent implementation of the rules or regulations, transportation stakeholder coordination, optimization of human resources and funding. |
| MODEL 4: Infrastructure Condition Minus (-) and Performance Transportation value Both (+) | Cl. VIII, Cl. IX and Cl. X | Development and Transport Infrastructure Development | Improve network infrastructure, security, transportation and planning services as well as transportation Benchmarking. | Efforts Covers; safety, supervision and utilization of ALKI II, funding and security policy of the condition. |

Source: Result Analysis, 2012

**CONCLUSION**

1. The condition of the geo-economic potential of the marine area leading sector to support the development of the province of Maluku, while transport services in cluster islands far from the minimum service standards.

2. The performance is quite good value transportation services and the four modes of transportation (sea, air, and highway crossings) have the same impact on the effectiveness of the development of the province of Maluku. Public discontent, especially from marine transport indicators, because there is polluted harbor waters, not comfortable, not smooth and low to the safety of passengers, as well as to the integration / connectivity.

3. Empirical model of land transport connectivity synthesis between cluster islands are formed from the function and range transport trajectory crossings.
4. Transport development strategy for regional development in cluster islands can take the dimensions of the infrastructure condition and performance of transportation.

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