Application of gravity theory on the inter-regional zones activity build upon generating inland fisheries product result in Central Java

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Abstract. The inland fisheries goods producing zones with their products have limited characteristics within the limited distribution capability due to limited availability of infrastructure conditions. Equation study method with multiple factor by transportation infrastructure shape build upon service standard and capacity is be appointed as model variable formed. The modelling result with multiple regression method gradually yielded from the modelling of transportation movement production on the commodity frights fisheries land based on infrastructure condition and production zones that is Ln Oi = 3,3 + 0,94 Ln C1 + 0,12 Ln C2 + 0,02 Ln C3 + 0,04 Ln C4 + 0,01 Ln C5 + 0,1 Ln C6 + 0,02 Ln C7 - 0,05 Ln C8 + 0,03 Ln C9 - 0,02 Ln C10 - 0,11 Ln C13 with the model significance of the determination test R² = 0.86. The dominant factor of infrastructure affecting the movement generating is the need for long-term capacity of roads in production zones to improve the accessibility and service of road pavement in good condition to support rising in the movement of land fisheries commodities and the results.

1. Introduction
The development of demand for land fisheries commodity consumption become the dominant potential to support the adequacy of non-animal protein requirement. The production of terrestrial fisheries commodities and their products develop according to the characteristics of the region's potential or the scope of the corresponding zone. With the development of terrestrial commodity production and the results leading to increased movement activity requires estimation and movement prediction to determine the infrastructure requirements supporting the movement accessibility.

The movement generating magnitude in the Central Java zone is a 'mass' that requires identification to be facilitated according to its size. The movements generating magnitude from the terrestrial commodities productivity and the results in the transport infrastructure provision must be in accordance with the level of service and feasibility. The movement generating that resultant from land fisheries commodity production zones has limited transportation infrastructure conditions to encourage the potential movement of freight transport.

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So that the mass appeal of a distance defined between zones in the Central Java zone will be influenced by the condition of its transport infrastructure. By amount of highway length and highway damage shapes identification build upon the service level within a zone will affect the rate of movement generating that resultant from the zone. To fulfil the goods transport infrastructure needs build upon volume of trip generated need the proper modelling trip generating as the defines of a mass in newton law.

The trips generation is a modelling stage that estimates the number of movements coming from a zone or land use and the number of moves that are attracted to a land use or zone. The trips generation is shown diagrammatically at Figure 1. The trip generation model be used forecasting the quantity of travel generate on behalf a known region characteristic shape. The trips generating the quantity of travel with an origin region \(O_i\) and the quantity of travel so as to attracted in every region destination \(D_d\) limited study area. Therefore, amount of travel from the origin zone is also called trip production [1-7].

![Figure 1. Generation and Attraction Movement Gravity Model (GR)](image)

That model take the concept of gravity acquaint by Newton in 1686 extend as of gravity theorem

\[
F_{id} = G \frac{m_i m_d}{d_{id}^2}
\]

with G a gravitational fixity

Within geography, strength can be measured as a travel among two zone, although mass be able to exchange, by means of variables such as residents or travel generating and attraction, in addition to range, time, or cost as a calculate mobility. Therefore, transportation objective, the GR representation is articulated as

\[
T_{id} = k \cdot \frac{O_i D_d}{d_{id}^2}
\]

with k a fixity

Therefore, at mathematical format, the representation GR be able to articulated as:

\[
T_{id} = O_i D_d A_i B_d f(C_{id})
\]

2. Methods
Approach to the ‘mass’ estimation study of the movement generating a vast region that is heavily influenced by region used factors at every region need lots of numbers and in sequence for exactness need to approach the determinant factor at this study with the purpose of examination equation - zone-build upon correlations.

Definition of variable equation generation

Dependent variables
\(O_i =\) Trip Generation of inland fisheries goods

Independent variables
\(C_1 =\) variable number residents
\(C_2 =\) variable number PRDB of Central Java
$C_3$ = variable of goods build upon Input - Output inland fishery goods in Central Java

$C_4$ = variable measurement lengthwise of national roads in the district or city in central java,

$C_5$ = variable measurement lengthwise of provincial highways at the urban in Central Java,

$C_6$ = variable measurement lengthwise of local highways at the region and the urban in Central Java,

$C_7$ = variable highway shapes steady at the region and the urban in Central Java,

$C_8$ = variable highway shapes moderate at the region and the urban in Central Java

$C_9$ = variable highways shapes broken at the region and the urban in Central Java

$C_{10}$ = variable highways shapes, heavily damaged at the region and the urban in Central Java

$C_{11}$ = variable quantity of goods transport at the region and the urban in Central Java

$C_{12}$ = variable quantity of goods transport by private ownership,

$C_{13}$ = variable quantity of goods transport by corporation ownership

[1,3,6]
3. Results and Discussion

3.1. Correlation test of land fisheries commodities

The output by the relationship test is articulated by correlation coefficient, be able to identify the stage of relationship among the bound variable and the free variable to analyze the relationship level. The C 11 and C 12 variable happen multicollinearity for the reason that an upper coefficient rate among the free variables with the result that the C 11 and C 12 variables are erased. So, in the regression analysis the next stage of the variable is not included.

3.2. Validation test of trips generating model and the results of inland fisheries goods

Multicollinearity test analysis to test whether the regression model found the correlation between independent variables. Multiple regression requirements with good models of VIF (Variance Inflation Factor) and T (Tolerant) values should not exceed 10. The resulting model of data analysis can be called a good model if it meets the following requirements: The influence of predictors is significant, marked by P value <0.05. - R² value is quite high (>50%).

Build upon the output by first stage regression analysis of X 11 and X 12 variables are not included in the regression analysis at second stage. The result of second stage regression evidenced by the normality test. The normality test used in this research is the One Sample Kolmogorov–Smirnov Test with observations through scatterplot charts shown in the figure 3.

![Probability Plot of RES12](image)

Source: Data Analyze, 2017

**Figure 3.** Results of normality test inland fisheries goods

The likelihood of necessary is little than 0.05, after that the regression equation can to forecast for the Trip generating (Oi). For casting of equation indicator by the regression output with the least square estimation method. The output estimation by statistical program computation is equation expressed with logarithm natural (Ln) (4)

\[
\text{Ln } O_i = 3.3 + 0.94 \text{ Ln } C_1 + 0.12 \text{ Ln } C_2 + 0.02 \text{ Ln } C_3 + 0.04 \text{ Ln } C_4 + 0.01 \text{ Ln } C_5 - 0.1 \text{ Ln } C_6 + 0.02 \text{ Ln } C_7 - 0.05 \text{ Ln } C_8 + 0.03 \text{ Ln } C_9 - 0.02 \text{ Ln } C_{10} - 0.11 \text{ Ln } C_{13}
\]  

(4)

The condition of road infrastructure services based on the road length from the road management status, roads in the zone or district road area requires an increase in road length to support better accessibility. The condition of road infrastructure services based on the level of road damage, roads with good considents have a greater coefficient to encourage the level of movement in the zone. So that on
the condition of the heavily damaged roads in the zone requires a significant increase to encourage the movement generating in zones. The goods movement estimated model of inland fisheries and other terrestrial waters results are then calculate build upon every region. The output estimation of trip generating rate from inland fisheries goods with other results in the manner of calculate programming model from inland fisheries goods trip with another terrestrial water products are shown in the figure 4 [1-7]

**Figure 4.** Trip Generating of inland fisheries goods

Based on the computational programming simulation output shown in figure 4. Regency that has land fisheries commodity movement area and other result of big land waters dominated by Demak Regency, Boyolali Regency and Klaten Regency. District with the rise of medium movement are Sragen regency, Banyumas regency, Purbalingga regency, Banjarnegara regency and Cilacap town. District groups with small generations are Wonogiri regency, Wonosobo regency, Semarang regency and Cilacap city. The rise of land commodity movement of land fisheries and other groundwater products from the generating zones is the commodity productivity result of the sector. estimation of gravity model between the zones that occurs is shown by the magnitude of the desire line. The magnitude of gravity is shown in the data sample of banyumas city and boyolali city which has more large style on a particular city according to the distance between the zones that occurred. Gravity force shows at closer distance has bigger quantity according to magnitude of land fisheries commodity movement generating in that zone. [1-7]

**Figure 5.** Desire line from gravity force movement generating zone of land fishery commodity.

4. Conclusion

Based on the results of data analysis, trip transportation modelling studies of land-fisheries commodity goods based on the infrastructure condition by domestic provincial production region area in Central
Java as follows. *First*, the trip generating of inland fisheries goods is greatly influenced by the regional commodity production sector in the commodity producer zones. Second, land-based fisheries commodities based on movement generation have a strong correlation with GRDP and the number of inhabitants of every region in domestic provincial by Central Java to input-output commodities in the area. *Third*, trips generation model with a high enough significance at the value of $R^2 = 0.86$. The dominant highways infrastructure variables affecting the trip generation rate of goods transport is the roads long capacity in the producer zones of land fisheries commodities production with good road pavement condition which is quite high.

5. References

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