Bachelor Thesis

Impact of Toll Road Construction to Travel Time, Travel Costs and Job Accessibility Changes in Jakarta – Bandung Region

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Preface

In Front of you lies the thesis “Impact of Toll Road Construction to Travel Time, Travel Costs and Job Accessibility Changes in Jakarta – Bandung Region”. It has been written to fulfil the requirements for a bachelor degree in Civil Engineering at the University of Twente.

This research contributes to the Centre of Transport Studies at the University of Twente and will also furtherly help Ms. I.G.A. Andani and will be a part of her research about the ex-post evaluation of the spatial and social equity impacts of the Cipularang toll road in Indonesia.

I would like to thank my supervisors Ms. I.G.A. Andani and Prof. Dr. Ing. K.T. Geurs for their guidance and feedback during this thesis.

Sammie van Berlo

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Abstract

In the early 2000's numerous developments have occurred in the area between Jakarta and Bandung, this has led to an urban belt from Jakarta city to Bandung city to arise. In 2005 the construction of the Cipularang toll road was finished and it created a continuously route of toll roads from Jakarta to Bandung. But the exact effects from this toll road are on accessibility are unknown.

The objective of this research is to examine the effects from the Cipularang toll road on travel time, generalised travel costs and as a result of these effects how the job accessibility has changed in the Jakarta – Bandung region. This has to be done with limited data. To achieve this objective the following research question is stated: What are the effects of the Cipularang toll road on travel time, generalised travel costs and job accessibility in the Jakarta-Bandung region?

After a literature review, it has been determined that in order to answer the research question the average travel time changes, the average generalised travel costs changes and the job accessibility changes need to be calculated. *Firstly* with help of ArcGIS a road network is created to generate a cost origin-destination matrix. *Secondly*, two different accessibility measures are used: The contour accessibility measure and the potential accessibility measure. For both these measures the generalised travel costs and the travel times are used as an impedance. For the job accessibility measures with the generalised travel costs as an impedance, there is made a distinction between different income groups. The potential accessibility measures seemed to have a larger effect for districts further away from the toll road then the contour accessibility measures.

Based on the results it is concluded that according to the different accessibility measures the Cipularang toll road has the largest effect in the districts in and around the Bandung municipality. The individual districts where the Cipularang toll road has the largest effects on average generalised travel costs, travel time and job accessibility are the Cimahi Tengah, Ketapang, Margahayu, Bojongsoang, Bandung Kidul and Cimahi Selatan districts.

For further research it is recommended to collect more data for parameters, the estimation of the impedance functions and for the estimation of the travel flows. This way a better representation of reality will be achieved.

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3 List of abbreviations

- AGC = Average generalised travel costs
- ATC = Average travel costs
- ATT = Average travel time
- CCA = Contour generalised travel costs accessibility
- CTA = Contour travel time accessibility
- FC = Fuel costs
- GC = Generalised travel costs
- IDR = Indonesian Rupiah
- OD = Origin Destination
- PCA = Potential generalised travel costs accessibility
- PTA = Potential travel time accessibility
- TC = Travel costs
- TD = Travel distance
- TFC = Toll fee costs
- TS = Travel speed
- TD = Travel distance
- VOT = Value of time
- VTTS = Value of travel time savings

4 Introduction

This research will primarily focus on the impact of the Cipularang toll road on the average generalised travel costs, the average travel time and the job accessibility in the Jakarta – Bandung region in Indonesia. The past years numerous developments have occurred in the area between Jakarta and Bandung, this has led to an urban belt from Jakarta city to Bandung city to arise. These developments have caused an increase in the number of trips in the region. In 2005 the Cipularang toll road was constructed to accomplish a non-stop toll road network between Jakarta city and Bandung city. The toll road shortened the travel time between Jakarta and Bandung from 4 hours to 2,5 hours (Dorodjatoen, 2009). It is very probable that the effects of the toll road between Jakarta and Bandung are positive, but what are the effects for the districts that are further away from the toll road gates? This study aims to calculate the effects of the Cipularang toll road on generalised travel costs, travel time and job accessibility. In order to do so the following questions will be answered:1) What is a good selection of accessibility measures given the limited data available? 2) How did the average travel time and average generalised travel costs change in the Jakarta-Bandung region due to the Cipularang toll road? 3) Which districts in the Jakarta-Bandung region have had the most changes in job accessibility with generalised travel costs as an impedance due to the Cipularang toll road and is there a difference for different income groups? 4) Which districts in the Jakarta-Bandung region have had the most changes in job accessibility with travel time as an impedance due to the Cipularang toll road? *Firstly*, a network dataset will be created. *Secondly,* the Origin-Destination cost matrix between the districts in the Jakarta – Bandung region will be generated. *Thirdly,* the changes in travel time and travel costs will be calculated and *finally,* two methods will be used to calculate the job accessibility per district while making distinction between different income groups.

5 Problem description

The construction of a toll road can have several direct effects, for instance travel time and travel costs changes. The problem is that it is unknown what the exact effects of the arrival of the new Cipularang toll road on generalised travel costs, travel time and accessibility in the Jakarta-Bandung region are. There is some information about the travel time changes of the Cipularang toll road, but this information is based on surveys and does not really give specific information of the travel time and costs between districts. Therefore it is also not possible to determine the travel costs between the various districts with the current information. It seems obvious that there are a lot of positive effects for the transport between Jakarta and Bandung, but what does it mean for the other districts around the toll road gates. The amount of data available to study those effects is limited; one of the challenges of displaying the effects is to make a proper model with the limited data available. Right now it is unclear what the direct effects of the toll road on the transport system are. There are no studies about it yet and the challenge is to perform this research with the limited data available.

6 Research objectives

The main goal of this research is to examine the effects of the Cipularang toll road on travel time, generalised travel costs and as a result of these effects how the job accessibility has changed after the construction of the Cipularang toll road in the Jakarta – Bandung region. This objective can be accomplished by analysing the changes in travel time and generalised travel costs for a situation with and a situation without the Cipularang toll road. Another objective is to complete this analysis with limited data. There isn't much data available for the study area so the challenge will be to perform the study with the limited data available for the study area. The following main and sub questions have been established:

The main question:

- What are the effects of the Cipularang toll road on travel time, generalised travel costs and job accessibility in the Jakarta-Bandung region?

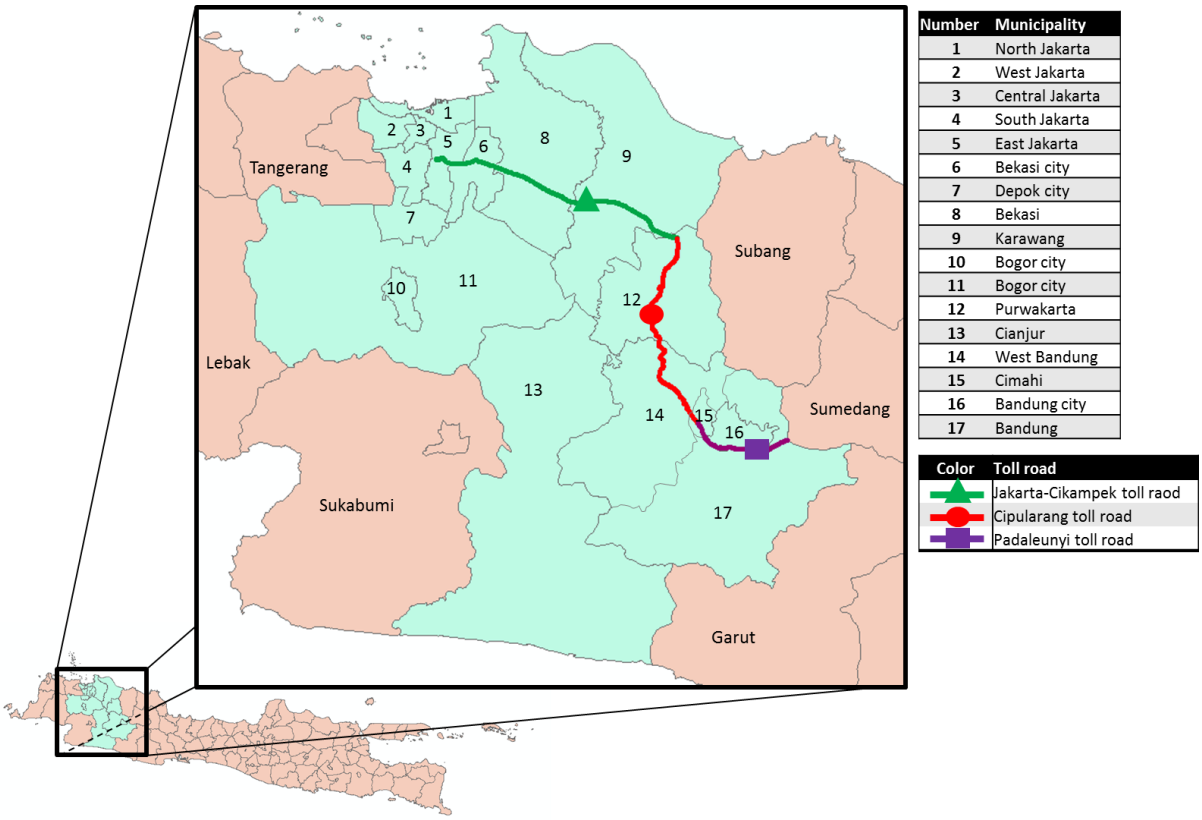
The main question is divided in several sub questions:

1. What is a good selection of accessibility measures given the limited data available?
2. How did the average travel time and average generalised travel costs change in the Jakarta-Bandung region due to the Cipularang toll road?
3. Which districts in the Jakarta-Bandung region have had the most changes in job accessibility with generalised travel costs as an impedance due to the Cipularang toll road and is there a difference for different income groups?
4. Which districts in the Jakarta-Bandung region have had the most changes in job accessibility with travel time as an impedance due to the Cipularang toll road?

Firstly, there will be a research to which accessibility measures should be used. *Secondly*, there will be investigated what the biggest effects on travel time and generalised travel costs are in the study area due to the Cipularang toll road. And at last it will be investigated what the effects are on job accessibility with generalised travel costs as an impedance, and with travel time as an impedance.

7 Case study description

After the economic crisis in the early 2000s there have been a lot of developments in Indonesia and especially in the Jakarta – Bandung region. Not only did this have influence on the region itself, it also had a big part in the development of the national economy. The influence of the Jakarta – Bandung region on the national economy is big because is contributes more than 20% of the total gross domestic product of Indonesia (Dorodjatoen, 2009). The Jakarta – Bandung region consists of certain municipalities within the province of West-Java and the special Capital Region of Jakarta. In Figure 1 the municipalities from the case study of the Jakarta – Bandung region can be seen. In this study the Jakarta – Bandung region consists of 17 municipalities.



Number	Municipality
1	North Jakarta
2	West Jakarta
3	Central Jakarta
4	South Jakarta
5	East Jakarta
6	Bekasi city
7	Depok city
8	Bekasi
9	Karawang
10	Bogor city
11	Bogor city
12	Purwakarta
13	Cianjur
14	West Bandung
15	Cimahi
16	Bandung city
17	Bandung

Color	Toll road
	Jakarta-Cikampek toll raod
	Cipularang toll road
	Padaleunyi toll road

Figure 1: The municipalities and toll roads from the case-study of the Jakarta – Bandung region.

Lots of physical development has occurred in this area for the past 20 years and this shaped an urban belt of about 200 km from Jakarta-city to Bandung city. In the early 2000s the number of industrial developments and the construction of settlements has been growing fast while the rural area's has decreased. The development of large scale housing and new town, infrastructure and industrial estate was increasing as well (Firman, 2009). In Table 1 it is possible to observe the changes in land-use in the Jakarta – Bandung region. There are some major reductions in the forest areas and increases in industrial areas, mixed gardens, dry land and settlements. Because of those increases in these areas there are a lot more activities which lead to an increase in the traffic network. The areas highlighted in the table are the Bopunjur area and the Bandung

Metropolitan Area. These areas do not cover the complete part of the Jakarta-Bandung region but it shows the development in two parts of the region.

Landuse	Bopunjur*			BMA		
	1994	2001	Change %	1994	2001	Change %
Primary forest	12166,2	5449,4	-55%	57294,4	55748,7	-3%
Secondary forest	1205,6	14	-99%	39349,3	5541,9	-86%
Mining areas	640,8	705,6	10%	-	-	-
Industrial areas	459,2	647,4	41%	2356,2	2478,8	5%
Mixed garden	20499,8	24809,1	21%	42638,6	85889,8	101%
Dry land	6425	10685	66%	34655,6	37030,7	7%
Grass land	2973,6	2973,6	0%	6427,8	6427,8	0%
Estates	10145,3	10755,5	6%	57680,8	55946,6	-3%
Settlements	9705,5	12234,5	26%	29914,9	33025,1	10%
Paddy fields	30328,2	25939,8	-14%	65626,1	53147,4	-19%
Shrubs	3127,9	3553	14%	2516,5	3138,5	25%
River/lagoon/reservoir	1016,1	1016,1	0%	6767,1	6776,6	0%
Unused land/open land	593,1	593,1	0%	1611,7	1611,7	0%
Total area	**99286,3**	**99376,1**		**346839**	**346763,6**	

*Bopunjur is an abbreviation for Bog, Puncak, and Cianjur combined, which is part of the Jakarta Metropolitan Area.

Table 1: Land-use conversion in the area of Bogor–Puncak–Cianjur (Bopunjur) and Bandung Metropolitan Area (BMA), 1994–2001 (in ha) (Firman, 2009)

In addition, the tourism, recreation and employment have increased in that period and with this growth in also came a growth in population. After the economic crisis there has been an enormous increase in migrants. In 5 years there has been an increase of about 1,35 million immigrants in the Jakarta Metropolitan Area (Central Board of Statistics, 2001) & (Julianery, Widyastuti, & Santoso, 2006) and about 0,52 million immigrants in the Bandung Metropolitan Area (West Java Office of Central Board of Statistics, 2001) & (Kompas, 2006). All these immigrants mainly originate from other parts of Java and this implicates the attractiveness of the Jakarta – Bandung area for people who search for jobs. By incorporating land-use types (As seen in Table 1) and population density the changes of urban characteristics in the Jakarta Metropolitan Area and the Bandung Metropolitan Area can be observed. These changes are shown in Table 2 and it indicates a strong increase in the number of urbanized villages and neighbourhoods, and a small decrease in the number of rural villages and neighbourhoods which are still showing rural characteristics.

Cities and district	1999			2005			Change		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Jabodetabek (JMA)	730	1099	**1829**	1035	812	**1847**	41,78%	-26,11%	**0,98%**
Jakarta city	265	0	**265**	267	0	**267**	0,75%	-	**0,75%**
Bodetabek*	465	1099	**1564**	768	812	**1580**	65,16%	-26,11%	**1,02%**
Bandung Raya	266	593	**859**	412	451	**863**	54,89%	-23,95%	**0,47%**
Bandung city	133	6	**139**	154	0	**154**	15,79%	-100,00%	**10,79%**
Bandung and Sumedang	133	587	**720**	258	451	**709**	93,98%	-23,17%	**-1,53%**

*Bodetabek is an abbreviation for Bogor, Depok, Tangerang and Bekasi combined, which is part of the Jakarta Metropolitan Area.

Table 2: Number of urban and rural localities in Jakarta and Bandung Metropolitan Areas (Gardiner & Gardinier, 2006)

A growth in population and number of activities also causes an increase of traffic and use of the road network, thus there is a growth in the total number of trips in the Jakarta – Bandung Area. There are three toll roads that connect Jakarta and Bandung. The first one is the Jakarta-Cikampek toll road and is built in 1988. The second one is built in 1991 and is called the Padaleunyi toll road, it leads from Padalarang to Cileunyi. The third and final section is built in 2005 and is called the Cipularang toll road. When this toll road was finished there has been a continuous toll road route established between Jakarta and Bandung. This toll road was built to be able to handle the increasing amount of trips in the Jakarta – Bandung region. An overview of these toll roads can be seen in figure 1.

The construction of the Cipularang toll road made it easier to travel from Jakarta to Bandung for all kinds of activities such as tourism, recreation and commuters. The construction of the Cipularang toll road reduced the travel time from the centre of Jakarta to the centre of Bandung from 4 hours to 2,5 hours (Dorodjatoen, 2009).The toll road has direct effects on the changes of travel costs and travel time between Jakarta and Bandung. Besides the direct effects there are also indirect effects caused by the toll road. For example in the long run it will stimulate land-use changes and economic activities. Due to the rapid traffic between Jakarta and Bandung several economic activities such as shopping areas, restaurants, hotels and food stores also developed not only in the big cities but also along the toll road.

This study will focus on the effects on accessibility caused by the construction of the Cipularang toll road. To be able to perform this research and to answer the research questions (which are stated in chapter 6), the data in Table 3 is available for analysis.

Data	Year	scource
Road network (Jakarta, Bogor, Bekasi, Karawang, Purwakarta, Bandung)	2013	Satelite images
Road network (Cianjur)	2013	Satelite images
Population (per district)	2013	Region in Figure, BPS (Statistics Agency)
VTTS (Indonesia)	1998	Road Research Development Project, IRE, Bandung
GDP (Indonesia)	1966-2015	Trading Economics
Labour force (per municipality)	2013	INDO-DAPOER (Indonesia Database for Policy and Economic Research)
Employement (per municipality)	2013	INDO-DAPOER (Indonesia Database for Policy and Economic Research)
Expenditure (per municipality)	2012	INDO-DAPOER (Indonesia Database for Policy and Economic Research)
Labour force travel survey (Study Area)	2015	JUTPI/JUPITRAPIS Study
Indonesian travel survey	2015	Indonesian statistics agency

Table 3: Data availability

8 Methodology

8.1 What is a good selection of accessibility measures given the limited data available?

In order answer this question a literature study is performed about different accessibility measures and based on the available data (Table 3) the accessibility measures which are used in this research are chosen.

8.2 How did the average travel time and average generalised travel costs change in the Jakarta-Bandung region due to the Cipularang toll road?

In order to analyse the differences in travel time and generalised travel costs and job accessibility, the travel time and travel costs need to be calculated. The program ArcGIS (Esri) will be used to retrieve this data. ArcGIS is a geographic information system which can be used to work with and analyse geographical information. The tools that will mainly be used in this research are the Network analyst tools. The Network analyst tools are tools which are specifically designed to analyse road networks.

In order to use the ArcGIS Network analyst tools, first a road network of the study area has to be created. There is data of the road network for two different parts of the study area in 2013 (see data availability table). These road networks have to be merged to get one road network of the complete study area using the merge tool from ArcGIS.

After the merge some roads still had to be connected manually because they didn't connect automatically. This has only been done for all the roads except for the local roads because there are too many local roads to connect manually.

After the main roads where connected properly, there still appeared to be some tiny missing parts in the road network and as a result no routes could be calculated. After trial and error, 5 meters was the right value to solve this problem. To solve this problem the integration tool was used to connect all the points within 5 meters from each other. With a value lower than 5 meters the result was that there was no route available between Jakarta and Bandung. With a minimum of 5 meters a route was available between Jakarta and Bandung. The higher this value gets, the less accurate the road network will become so 5 meters was used for the integration tool.

Because a comparison is needed for a situation with and a situation without the Cipularang toll road, two road networks will be created. The final result of the road network can be seen in appendix 13.5.

When the road networks are created, certain characteristics have to be allocated to the different road segments in the road network.

The first characteristic to add to the road network was the travel time. To calculate the travel time for each line-segment in the road network, the travel speed and travel distance for each line-segment in needed. The following formula is used for the calculation of the travel time:

$$TT = \left(\frac{TD * \frac{1}{1000}}{TS} \right) * 60$$

$$TT = Travel\ Time\ (minutes)$$

$$TD = Travel\ Distance\ (meters)$$

$$TS = Travel\ Speed\ (kilometer/hour)$$

The travel distance is calculated with help of the "calculate geometry" tool in ArcGIS, this is used for all of the line-segments in the shapefile. Different travel speeds where used in the road network depending on the municipalities traffic condition, urban characteristics and the type of road. The road types which are being distinguished are toll roads, artery roads, collector roads and local roads. A detailed overview of the different speeds used for particular roads can be seen in appendix 13.1. The second characteristic are the costs, they need to be added to the road network. The costs which are taken into account to calculate the costs for each line segment in the road network are the fuel costs and the toll costs. The following formula is used for the calculation of the travel costs:

$$TC = FC * \frac{TD}{1000} + TFC * \frac{TD_{tr}}{1000}$$

$$TC = Travel\ Costs\ (IDR)$$

$$FC = Fuel\ Costs\ (IDR/kilometre)$$

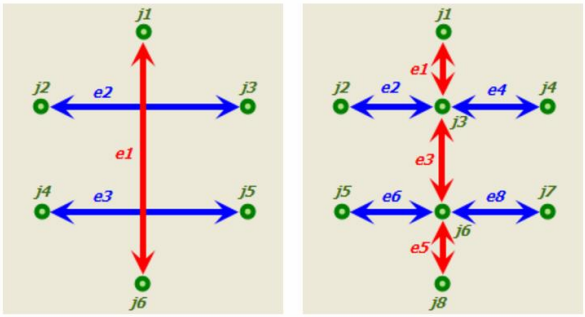
$$TFC = Toll\ Fee\ Costs\ (IDR/kilometre)$$

$$TD = Travel\ Distance\ (metre)$$

$$TD_{tr} = Travel\ Distance\ if\ road\ segment\ is\ a\ tollroad\ (metre)$$

The average fuel costs contain 6,450 IDR (Indonesian rupiah) per litre and with an average of 12,5 km of travel distance per litre the costs for each trip per kilometer can be calculated. This means an average fuel cost of 516 IDR per kilometer. Also the toll fee for toll roads has to be taken into account. A 155 kilometer drive from Jakarta IC to Cileunyi costs 53500 IDR (appendix 13.2), that means 345 IDR per kilometer. So for the toll roads these costs per kilometer will be added.

After the road networks are created and they have the right characteristics, a network dataset can be created. A network dataset is necessary to be able to perform analysis on the road network. To create the network dataset there are two connectivity options: "End-to-end" or "Any vertex". The "End-to-end" option connects only the endings of the line-segments and the "Any vertex option" always connects if one line-segment crosses another line-segment. The difference is displayed in Figure 2.



End-to-end Any vertex

Figure 2: Connectivity groups in ArcGIS

If the road network is 'perfect', then the end-to-end option is the best option because it takes differences in heights (for example: bridges) into account. The current road network does not work for the end-to-end option because not all the roads are properly connected with the end of the lines. Also the any vertex option does not work for the current road network because that way it may appear that what in reality would be a bridge would be a single level crossing in the model. This is very important for the modelling of the toll road in particular because Cars can only enter at certain tollgates and not by 'driving of the bridge'.

This problem can be solved by creating two separate road networks: One that consists of only the toll roads, and one that consists of all the roads except for the toll road. After that the entrances of the toll road had to be inserted manually so these two layers of road networks can be connected.

This means there are other parts on the road network where height levels are not be taken into account and in the model cars will see bridges as single level crossings. It is almost impossible to check and correct all those errors in the network manually, but because this research is about the Cipularang toll road it is only corrected for the toll road.

When the network datasets are ready, it is possible to create an OD-cost matrix (Origin Destination-cost matrix) with help of the Network analyst tool from ArcGIS. The outcome is an overview of the travel time in minutes and travel costs in IDR, based on the shortest possible route, for each possible OD-pair. The origins and destinations that will be used are the centroids for each district in the study area and these districts can be seen in appendix 13.3. This OD-cost matrix will be created for both road networks and with the results of both matrices the value of travel time savings (VTTS) can be taken into account to create a generalised cost function.

When analysing the effects of new infrastructure and using costs as an impedance, the value of time (VOT) (Tillema et al. 2010) also called the value of travel time savings (VTTS) (Department for International Development, 2002) has to be taken into account. This value shows what value people give to a shorter travel time. Due to a toll road the travel costs could go up, but the travel time could go down and the value of this travel time saving could weigh up against the increase of the costs. The following two generalised cost functions have been created.

$$GC_{0\,ij} = FC * \frac{TD_{ij}}{1000} + TFC * \frac{TD_{tr\,ij}}{1000}$$

$$GC_{1\,ij} = FC * \frac{TD_{ij}}{1000} + TFC * \frac{TD_{tr\,ij}}{1000} - \frac{(TT_{0\,ij} - TT_{1\,ij})}{60} * VTTS$$

$$GC_{ij} = Generalised\ costs\ between\ origin\ i\ and\ destination\ j\ (IDR)$$

$$FC = Fuel\ Costs\ (IDR/kilometre)$$

$$TFC = Toll\ Fee\ Costs\ (IDR/kilometre)$$

$$TD = Travel\ Distance\ (metre)$$

$$TD_{tr} = Travel\ Distance\ if\ road\ segment\ is\ a\ tollroad\ (metre)$$

$$TT = Travel\ Time\ (minutes)$$

$$VTTS = Value\ of\ travel\ time\ savings\ (\frac{IDR}{hour})$$

For this formula and also for other formulas, a 0 represents the situation without the toll road and a 1 represents the situation with the toll road.

In 1998 the VTTS was 5391 IDR per hour (Department for International Development, 2002). Based on the GDP growth (Trading Economics, 2013)the VTTS in 2013 is 51593 IDR per hour.

Now that the generalized costs have been generated, the next step is to examine how much the average travel time and average generalised travel costs have changed in the whole area and between Jakarta and Bandung.

The average travel time accessibility (ATT) is calculated by summing up the travel time of all the trips from one origin of the situation without the toll road from the OD-cost matrix and then divide it by the total amount of trips possible from that origin.

$$ATT_i = \frac{\sum TT_i}{n_{TT_i}}$$

Then the same is done for the situation with the toll road and then it is possible to measure the difference in average travel time for each district.

$$change\ in\ average\ travel\ time\ for\ each\ district = \frac{ATT_{1\,i} - ATT_{0\,i}}{ATT_{0\,i}} * 100\%$$

To see the total change for the whole study area the following formula is used.

$$change\ in\ average\ travel\ time\ for\ whole\ study\ area = \frac{ATT_1 - ATT_0}{ATT_0} * 100\%$$

For the average generalised travel costs accessibility (AGC) the same step has to be repeated but it is necessary to analyse the generalised costs instead of the travel time. This gives the following formulas

$$AGC_i = \frac{\sum GC_i}{n_{GC_i}}$$

$$change\ in\ average\ generalised\ travel\ time\ for\ each\ district = \frac{AGC_{1\,i} - AGC_{0\,i}}{AGC_{0\,i}} * 100$$

$$change\ in\ average\ generalised\ travel\ time\ for\ whole\ study\ area = \frac{AGC_1 - AGC_0}{AGC_0} * 100\%$$

After this is done the same analysis will be done, but without taking in to account the VTTS. This way it is possible to see what the actual "out of your pocket" cost changes are. This gives the following formulas

$$averag\ travel\ costs\ in\ district\ i = \frac{\sum TC_i}{n_{TC_i}}$$

$$change\ in\ average\ travel\ costs\ for\ each\ district = \frac{AGC_{1\,i} - AGC_{0\,i}}{AGC_{0\,i}} * 100$$

$$change\ in\ average\ travel\ costs\ for\ whole\ study\ area = \frac{AGC_1 - AGC_0}{AGC_0} * 100\%$$

8.3 Which districts in the Jakarta-Bandung region have had the most changes in job accessibility with generalised travel costs as an impedance due to the Cipularang toll road and is there a difference for different income groups?

Contour generalised travel costs job accessibility (CCA) measure:

In order to calculate the job accessibility the number of potential employees who can reach a district must be divided by the number of jobs in that district.

$$CCA_j = \frac{\sum_i P_i GC_{ij}(T)}{J_j}$$

$$CCA_j = Contour\ Cost\ Job\ accessibility\ at\ zone\ j$$

$$P_i = Potentail\ employees\ at\ zone\ i$$

$$GC_{ij}(T) = Generalised\ travel\ costs\ threshold$$

$$J_j = Number\ of\ jobs\ at\ zone\ j$$

Firstly there must be determined how many potential employees and how many jobs there are in each district. There is data available about population in all of the districts (Table 3) but those include people who are not capable of working like children and elderly. To exclude these people the data of the amount of people in the labour force is used. This data is on municipality level, so to estimate the labour force per district the same ratio is used as the population ratio. The data of the people in labour force for all of the districts can be found in appendix 13.4. *Secondly* the amount of available jobs for each district is needed. There is not any data available which indicates the exact number of jobs available, but there is data about the employment for each municipality, so it is assumed the number of jobs is equal to the number of employment. Since that data is only available per municipality, the number of jobs is divided with the same ratio as the population is divided over the districts within the municipalities.

The next step is to determine a travel budget, this will be the generalised cost threshold. A distinction will be made between ten equal income groups. There is data about the expenditure (The World Bank, 2013) per municipality, but now the question arises what percentage of the expenditures is caused by what percentages of the different income groups.

It is assumed the expenditure distribution is equal to the income distribution. In order to determine the income distribution, the Lorenz curve is used. The Lorenz curve indicates

what cumulative portion of the population has a cumulative portion of the income (Figure 3). The Gini coefficient is based on the Lorenz curve and it is a number from 0 to 1 which indicates how evenly the income in a country is distributed.

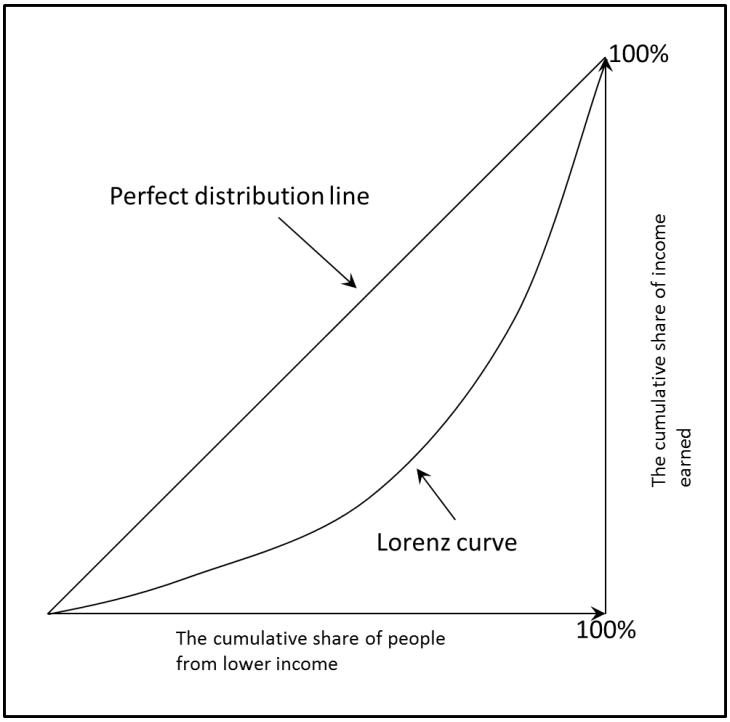


Figure 3: The Lorenz curve

The Gini coefficient can be calculated by dividing the area beneath the perfect distribution line by the area between the perfect distribution line and the Lorenz curve. When the Gini coefficient is 0 the Lorenz curve will be equal to the perfect distribution line, this means the income is perfectly evenly divided to the population. When the Gini coefficient is 1 it means that one person has all the income of the country.

The Gini coefficient for Indonesia is 0,3947 in 2013 (FRED, 2013), so a Lorenz curve formula must be created which take this Gini coefficient value into account. Figure 4 helps explaining how to calculate the Gini coefficient.

$$\text{Gini coefficient} = \frac{Area\ A}{Area\ A+B}$$

$$Area\ A + B = 0{,}5$$

$$0{,}3947 = \frac{Area\ A}{0{,}5}$$

$$Area\ A = 0{,}1973$$

$$Area\ B = 0{,}3027$$

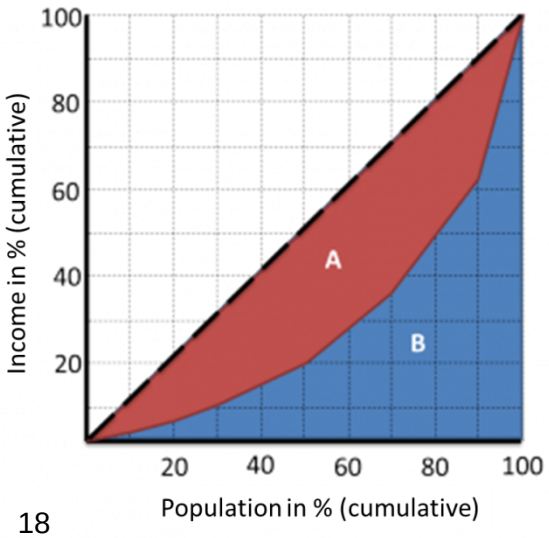


Figure 4: Calculation Gini coefficient

Because of the lack of data it is assumed that the formula for the Lorenz curve is a power function. For the estimation of the Lorenz curve this means:

$$\int_0^1 x^r dx = 0{,}3027$$

$$r = 2{,}3040$$

This means the formula for the Lorenz curve is: $f(x) = x^{2,3040}$

Using the estimated formula of the Lorenz curve, the income distribution in Table 4 is applicable.

Income group	x	f (x)	Part of income (%)
Group 1	0,1	0,004966	0,50%
Group 2	0,2	0,024525	2,00%
Group 3	0,3	0,062418	3,80%
Group 4	0,4	0,121105	5,90%
Group 5	0,5	0,202506	8,10%
Group 6	0,6	0,308226	10,60%
Group 7	0,7	0,439655	13,10%
Group 8	0,8	0,59803	15,80%
Group 9	0,9	0,78447	18,60%
Group 10	1	1	21,60%

Table 4: Income distribution

The next step is looking at the expenditure. Using the data about the expenditure per month for each municipality, and assuming the expenditure distribution is equal to the income distribution, an average expenditure per day per person per income group can be derived.

Now a travel budget needs to be estimated. But not every income group spends the same percentage of their expenditure on traveling. It is assumed that the lower income group has a higher percentage of their expenditure for a traveling budget then the higher income group. It is estimated that this travel budget allocation is a square root function with an average travel budget of 30% (BeritaTRANS, 2016)and the poorest group having a travel budget of 50%. When these conditions are taken into account, the following function can be derived:

$$travelbudget\ \% = \sqrt{(1073 * part\ of\ population)} + 50$$

Taking this estimated function into consideration, it gives the travel budget percentages which are shown in Table 5 as a result.

income group	Travel budget percentage
Group 1	50,00%
Group 2	39,60%
Group 3	35,40%
Group 4	32,10%
Group 5	29,30%
Group 6	26,80%
Group 7	24,60%
Group 8	22,60%
Group 9	20,70%
Group 10	18,90%

Table 5: Travel budget distribution

With the data about expenditure and population and with the income and travel budgets, a travel budget per person per district per income group can be calculated. The results of these travel budgets can be found in appendix 13.4.

Now the potential employees in each zone (P_i), the jobs in each zone (J_j) and travel budgets ($GC_{ij}(T)$) have been estimated, so it is possible to calculate the job accessibility the CCA formula. This has to be rewritten when taken into account the different income groups, where g stands for the different income groups:

$$CCA_j = \frac{\sum_{i\ g} P_{i\ g} GC_{ij}(T_g)}{J_j}$$

To calculate the job accessibility chance the following formula is used:

$$Job\ accessibility\ change\ by\ contour\ cost\ measure = \frac{CCA_{j\ 1} - CCA_{j\ 0}}{CCA_{j\ 0}} * 100\%$$

Potential generalised travel costs job accessibility (PCA) measure:

In order to calculate the job accessibility the number of potential employees who can reach a certain district must be divided by the number of jobs in that district, but this time with using an impedance function.

$$PCA_j = \frac{\sum_i P_i e^{-\beta GC_{ij}}}{J_j}$$

$$PCA_j = \ Job\ accessibility\ at\ zone\ j$$

$$P_i = \ Potentail\ employees\ at\ zone\ i$$

$$e^{-\beta GC_{ij}} = impedance\ function\ based\ on\ Generalised\ Costs$$

$$J_j = Number\ of\ jobs\ at\ zone\ j$$

The first step of estimating the working population and the number of jobs for each districts is the same as the first measure, but the second step is different. Instead of determine travel budgets, impedance functions need to be determined.

For the impedance function a negative exponential function will be used:

$$F(d_{ij}) = e^{-\beta GC_{ij}}$$

F = the probability of the trip taking place

β = the impedance parameter

GC_{ij} = the generalised costs from a trip (IDR)

Before the probability can be calculated first the impedance parameter must be calculated. This will be estimated with a help of the labour force travel survey (Table 3) which has been taken in a part of the study area. The results of this survey are displayed in Table 6.

Distance	amount of trips	%
< 10 km	308	19,67%
10 - 29 km	834	53,26%
> 30 km	424	27,08%
	1566	100,00%

Table 6: Results labour force travel survey

These results can be rewritten and are shown in Table 7.

Distance	amount of trips	%
> 0 km	1566	100,00%
> 10 km	1258	80,00%
> 30 km	424	27,00%

Table 7: Rewritten results labour force travel survey

Now the kilometers have to be converted to costs using the average cost per kilometer which is derived from the generalised cost function:

$$average\ cost\ per\ kilometre = \frac{\sum GC}{\sum TD/1000}$$

The outcome of the calculation is 547 IDR/km. These results can be rewritten and are shown in Table 8.

Costs	amount of trips	%
> 0 IDR	1566	100,00%
> 5620 IDR	1258	80,00%
> 16298 IDR	424	27,00%

Table 8: Rewritten results labour force travel survey with cost per kilometer

With these points and by using exponential regression it is possible to estimate the parameter for the impedance function. The impedance function is a negative exponential function, chapter 9.1 gives arguments for the choice of the impedance function. Figure 5 shows the results of the regression.

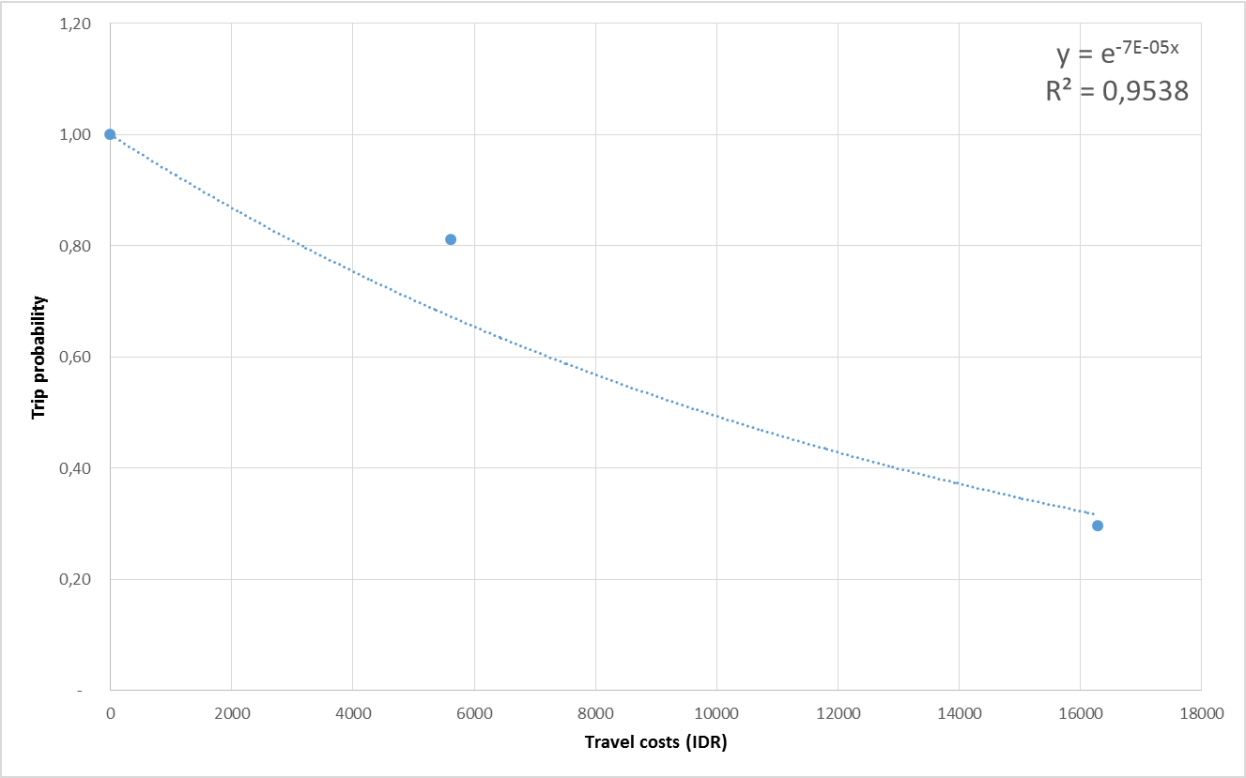


Figure 5: Results exponential regression

Figure 5 shows that the impedance parameter is 0,00007

From the survey it is calculated that the impedance factor for the study area is 0,00007. This gives the following function:

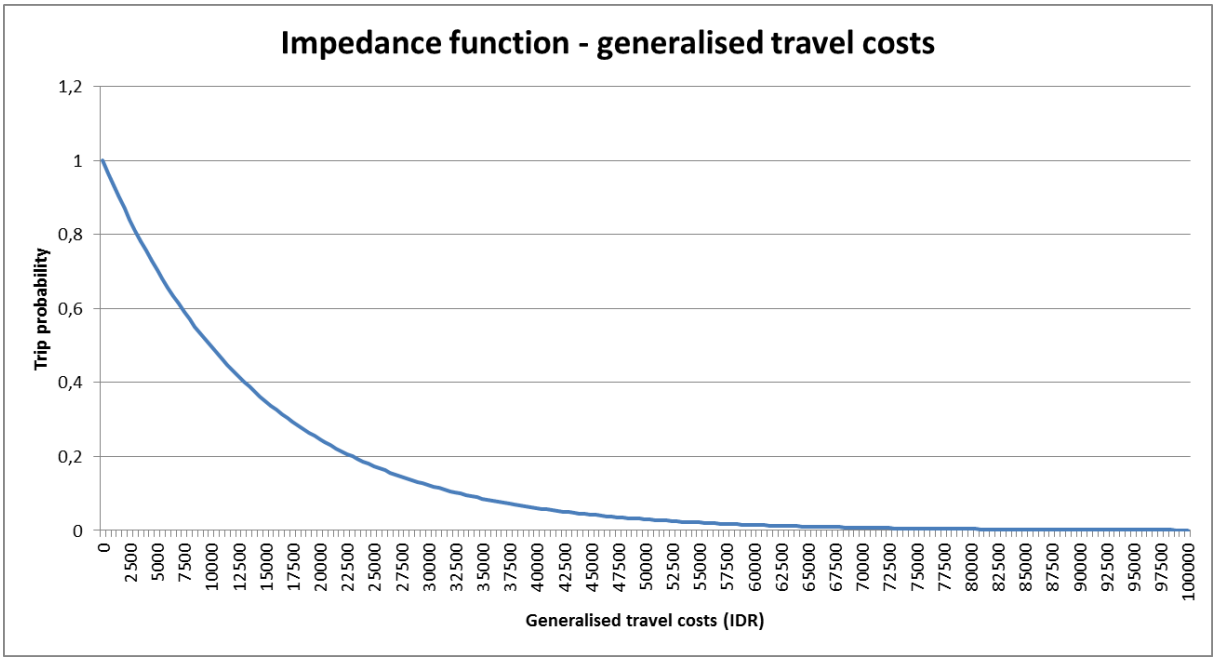


Figure 6: Impedance function based on generalised travel costs for the study area

Figure 6 shows the more costs a taking trip takes, the less probable a trip will become. But since this thesis is looking at different income groups, different impedance parameters are estimated. To be able to compare these results with the travel budget measure properly the same ratio is used for the impedance parameters as the travel budget distribution ratio, while still maintaining an average impedance parameter of 0,00007. This gives impedance parameters which are shown in Table 9.

Income group	Impedance function parameter
Group 1	0,0001167
Group 2	0,0000924
Group 3	0,0000826
Group 4	0,0000749
Group 5	0,0000684
Group 6	0,0000625
Group 7	0,0000574
Group 8	0,0000527
Group 9	0,0000483
Group 10	0,0000441

Table 9: Impedance parameters

These parameters give the following functions:

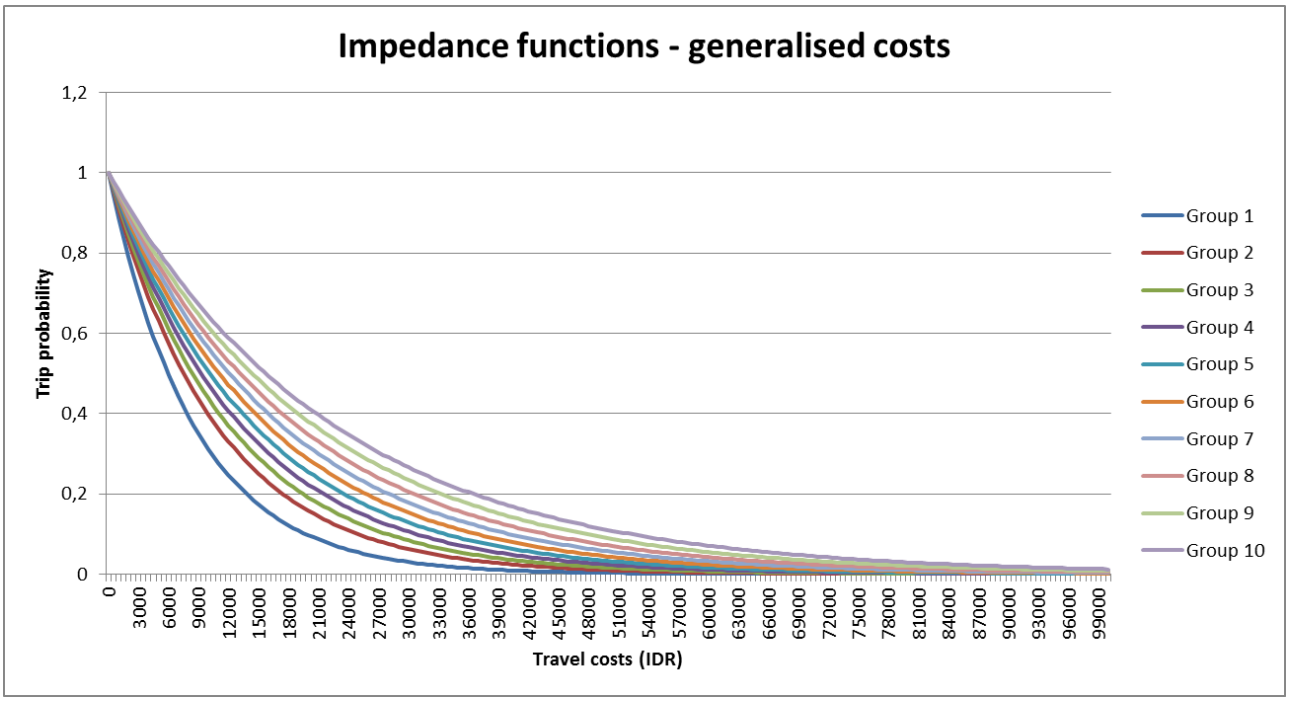


Figure 7: Impedance functions per income group

As figure 7 shows, the richer groups have a higher trip probability than the poorer groups.

Now the potential employees in each zone (P_i), the jobs in each zone (J_j) and an impedance function ($e^{-\beta GC_{ij}}$) has been estimated, it is possible to calculate the job accessibility with of the PCA formula. This has to be rewritten when taken into account the different income groups, where g stands for the different income groups:

$$PCA_j = \frac{\sum_{i\,g} P_{i\,g} e^{-\beta_g GC_{ij}}}{J_j}$$

To calculate the job accessibility change the following formula is used:

$$Job\ accessibility\ change\ by\ potential\ cost\ measure = \frac{PCA_{j\,1} - PCA_{j\,0}}{PCA_{j\,0}} * 100\%$$

8.4 Which districts in the Jakarta-Bandung region have had the most changes in job accessibility with travel time as an impedance due to the Cipularang toll road?

Contour travel time accessibility (CTA) measure:

In order to calculate the job accessibility the number of potential employees who can reach a district must be divided by the number of jobs in that district.

$$CTA_j = \frac{\sum_i P_i TT_{ij}(T)}{J_j}$$

$$CTA_j = \ Job\ accessibility\ at\ zone\ j$$

$$P_i = \ Potentail\ employees\ at\ zone\ i$$

$$TT_{ij}(T) = Travel\ time\ threshold$$

$$J_j = Number\ of\ jobs\ at\ zone\ j$$

The potential employees in each zone and the number of jobs in each zone have already been estimated. So now a travel time threshold needs to be established. Two threshold are chosen. *Firstly*, a threshold of 3 hours is chosen (CTA 180) because that is the average travel time from the OD-cost matrix and that is the time it takes to at least get from Jakarta to Bandung. *Secondly,* a threshold of 40 minutes is chosen (CTA 40) because that is the average travel time based on the Indonesian travel survey. (Table 3)

To calculate the job accessibility change the following formula is used:

$$Job\ accessibility\ change\ by\ contour\ time\ measure = \frac{CTA_{j\,1} - CTA_{j\,0}}{CTA_{j\,0}} * 100\%$$

potential travel time accessibility (PTA) measure:

In order to calculate the job accessibility the number of potential employees who can reach a district must be divided by the number of jobs in that district, but now with using an impedance function.

$$PTA_j = \frac{\sum_i P_i e^{-\beta TT_{ij}}}{J_j}$$

$$PTA_j = \ Job\ accessibility\ at\ zone\ j$$

$$P_i = \ Potentail\ employees\ at\ zone\ i$$

$$e^{-\beta TT_{ij}} = impedance\ function\ based\ on\ Travel\ Time$$

$$J_j = Number\ of\ jobs\ at\ zone\ j$$

The first step of estimating the working population and the number of jobs for each districts is the same as the first measure, but the second step is different. Instead of determine travel budgets, an impedance function needs to be determined.

For the impedance function a negative exponential function will be used:

$$F(d_{ij}) = e^{-\beta TT_{ij}}$$

F = the probability of the trip taking place

β = the impedance parameter

TT_{ij} = the travel time from a trip (IDR)

Before the probability can be calculated, first the impedance parameter must be calculated. This will be estimated with a help of the labour force travel survey (Table 3) which has been taken in a part of the study area. The results of this survey are displayed in Table 10.

Minutes	amount of trips	%
<= 30 Minutes	300	18,50%
31 - 60 minutes	799	49,26%
61 - 120 minutes	454	27,99%
> 120 minutes	69	4,25%
	1622	100,00%

Table 10: Results labour force travel survey 2

These results can be rewritten into results which are shown in Table 11

Minutes	amount of trips	%
> 0 minutes	1622	100,00%
> 30 minutes	1322	82,00%
> 60 minutes	523	32,00%
> 120 minutes	69	4,00%

Table 11: Rewritten results labour force travel survey 2

With these points and by using the exponential regression it is possible to estimate the parameter for the impedance function. The impedance function is a negative exponential function, chapter 9.1 gives arguments for the choice of the impedance function. Figure 8 shows the results of this regression.

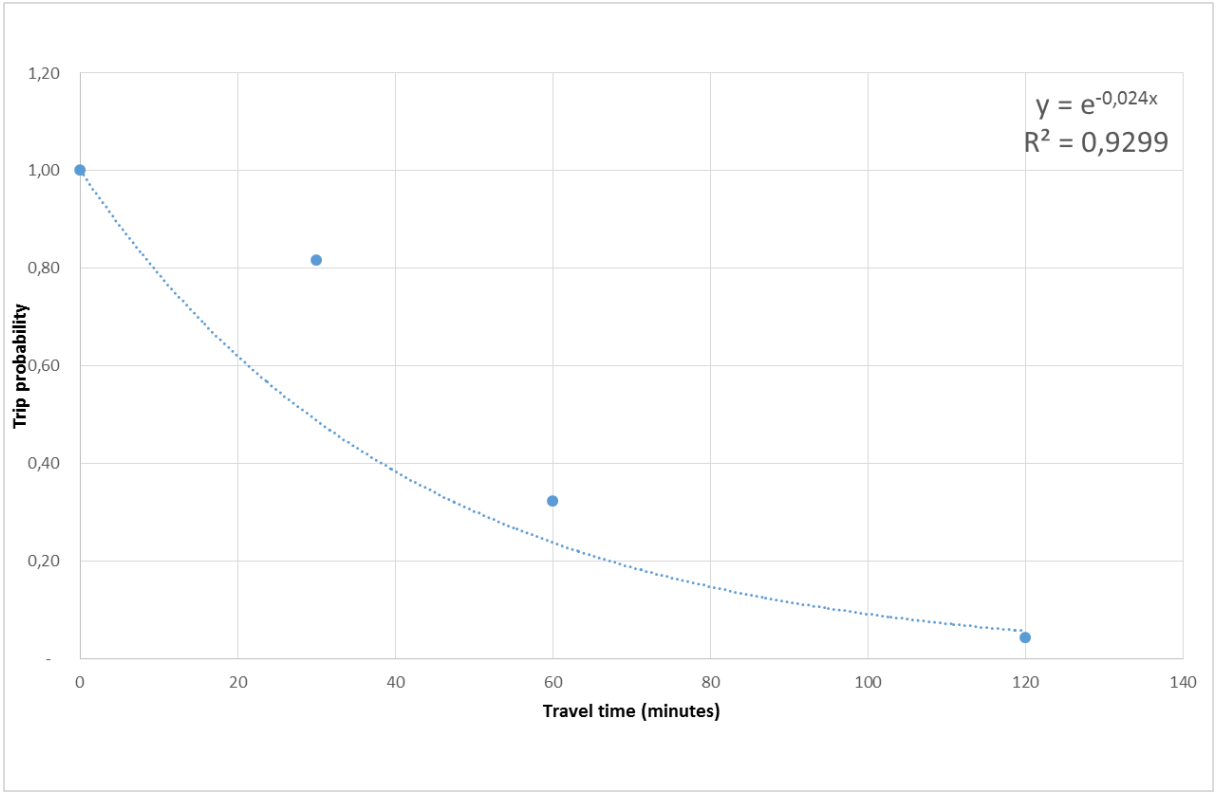


Figure 8: Results exponential regression 2

Figure 8 shows that the impedance parameter is 0,024.

From the survey it is calculated the impedance factor for the study area is 0,024. This gives the following function.

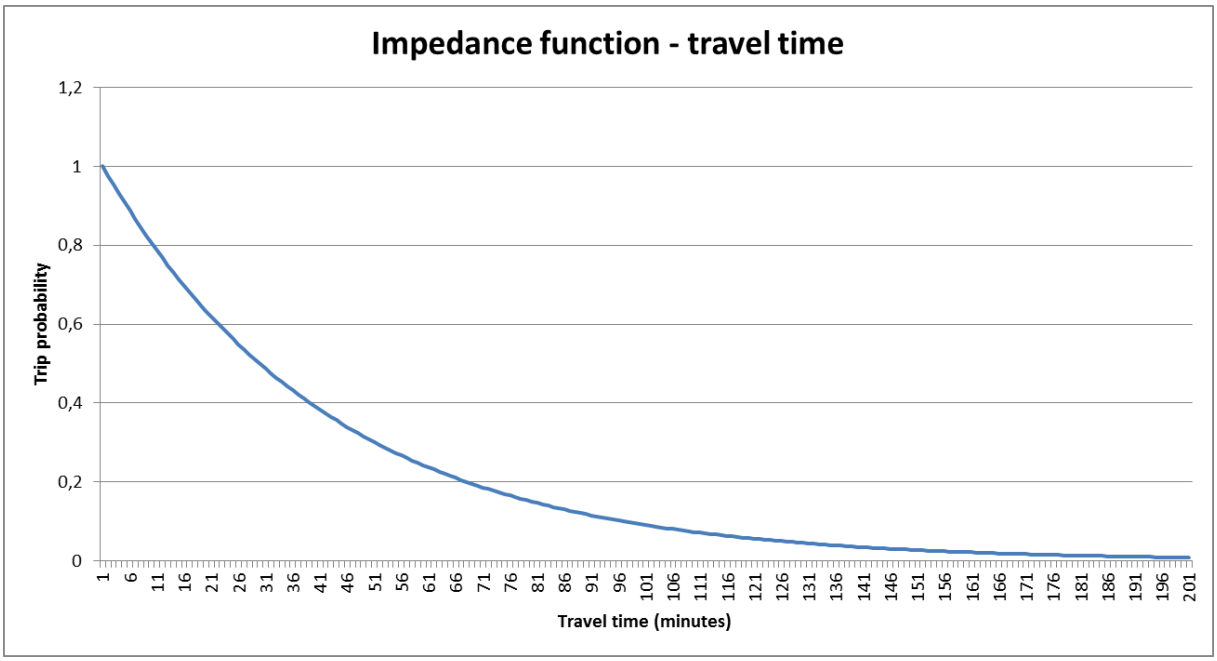


Figure 9: Impedance function study area

Figure 9 shows the more time a trip takes, the less probable a trip will become. Now the potential employees in each zone (P_i), the jobs in each zone (J_j) and impedance function ($e^{-\beta TT_{ij}}$) have been estimated, it is possible to calculate the job accessibility.

To calculate the job accessibility change the following formula is used:

$$Job\ accessibility\ change\ by\ potential\ cost\ measure\ = \frac{PTA_{j\,1} - PTA_{j\,0}}{PTA_{j\,0}} * 100\%$$

9 Results

9.1 What is a good selection of accessibility measures given the limited data available?

Accessibility is foremost a place-specific concept which has been defined as the ease with which some land-use activity can be reached from a certain location using a particular mode of transportation (Dalvi, 1978). Although different views on how to measure accessibility have been given, the two elements; impedance and attractiveness are consistently found in these different views and they all imply actual or potential interactions between different locations.

The first question that arises is: what are the different components on how to measure accessibility? Geurs & van Wee (2004) have reviewed how to do an accessibility evaluation of land-use and transport strategies. They came up with four different components of accessibility which could be identified:

1) The land-use component. It takes into account the amount, quality and spatial distribution opportunities, the demand for these opportunities and the confrontation of supply of and demand for these opportunities.
2) The transportation component. It takes into account the transport system including the amount of time, costs and effort and it includes its location and characteristics.
3) The temporal component. It takes into account the temporal constraints like the availability of opportunities during different parts of the day.
4) The individual component. It takes into account the needs, abilities and opportunities of individuals.

Several accessibility measures haven been selected for application by Geurs & Ritsema van Eck (2001)

1. A contour measure

   The contour measure, sometimes called the cumulative measure, indicates the number of opportunities or locations reachable within a certain travel time or travel distance. The accessibility increases if the number of opportunities or locations increases. The measure is described by the following formula and is used by Thill & Kim (2003) and Tillema et al. (2010):

$$A_i = \sum_j D_j f(d_{ij})$$

$A_i = measure\ of\ accessibility\ at\ zone\ i$

$D_j = oppertunities/attractiveness\ at\ zone\ j$

$f(d_{ij}) = 1$ if $d_{ij} = T$ and $f(d_{ij}) = 0\ if\ otherwise$

T is a non-negative spatial separation threshold. In the case of a contour measure $f(d_{ij})$ acts like a rectangular impedance function.

2. A potential accessibility measure

   The potential accessibility measure, also known as the gravity measure, describes accessibility as the potential of opportunities for interaction and is was first used by Hansen (1959). The measure is described by the following formula and is used by Thill & Kim (2003) and Tillema et al. (2010):

$$A_i = \sum_j D_j f(d_{ij})$$

   $A_i = measure\ of\ accessibility\ at\ zone\ i$

   $D_j = oppertunities/attractiveness\ at\ zone\ j$

   $f(d_{ij}) = impedance\ function$

   The $f(d_{ij})$ impedance function indicates the spatial separation from the origin location based which can be based on a measure like time and costs.

3. The inverse balancing factor of the doubly-constrained spatial interaction model

   The doubly-constrained model is a gravity model which explains the level of spatial interaction between locations. The model can be described by the following formula (Wilson, 1971):

$$T_{ij} = a_i b_j O_i D_j F(d_{ij})$$

$T_{ij} = the\ magnitude\ of\ flow\ between\ zones\ i\ and\ j$

$a_i b_j = balancing\ factors\ that\ transform\ the\ activity\ units\ into\ the\ flow\ units$

$O_i D_j = the\ number\ of\ activities\ in\ zone\ i\ and\ zone\ j$

$F(d_{ij}) = impedance\ function$

The balancing factors of the doubly-constrained spatial interaction model can be considered as accessibility measures. (Wilson, 1971)

4. A utility-based accessibility measure

   The utility-based accessibility measure states that accessibility should be measured at the individual level and the computation of individual accessibility, like income, should account for user characteristics in addition to trip characteristics, like travel speed and travel costs.

An impedance function is reflecting the friction from the infrastructure connecting two zones (i & j). There are four different forms of impedance functions described by Geurs & Ritsema van Eck (2001):

- Negative power function: $F(D_{ij}) = d^{-\alpha}$
- Negative exponential function: $F(D_{ij}) = e^{-\beta d}$
- Normal or Gaussian function: $F(D_{ij}) = 100 * e^{-d2/u}$
- Logistic function: $F(D_{ij}) = 1 + e^{a+b*\ln d}$

The negative exponential function is the most popular function and has dominated scientific literature (Reggiani et al. 2010). Cheng & Bertollini (2013) did research about how to measure job accessibility using an impedance function and for their research they used a negative exponential function. According to Östh et al. (2016), whom examined the differences in using different impedance functions for a case study in Sweden, the logistic function showed the best correlation results. According to Reggiani et al. (2010), whom did a similar research but for a case study in Germany, the power decay function fits the best for short distance trips and like Östh et al. (2010), the logistic function fits the best for long distance trips. According to de Vries et al. (2006), whom also did a similar research but for a case study in Denmark, both the exponential and the power functions are not the correct functional forms. They stated that the exponential function is a poor function because it wrongly imposes strongly increasing elasticities, but it can be useful for short distances. The power function who has a stable elasticity, would be a too simple representation of reality. For the best solution they came up with a power-spline function. It is a continues ln function, but with different slopes for different intervals.

Looking at the available data the land-use component and the transportation component can be taken into account in the accessibility measures. The only measures which can be used are the contour measures and the potential accessibility measures. The inverse balancing factor of the doubly-constrained spatial interaction mode needs data about the traffic flow in the study area, but that data is not available for the complete study area. And for the utility-based accessibility measure there is more data needed on an individual level. Based on the available data good options to measure accessibility are to calculate the average travel time, the average generalised travel costs and the job accessibility in the study area, based on the contour measure and based on the potential accessibility measure.

But which impedance function to use? The results of the accessibility measures is highly influenced by the choice of the impedance function. Given the lack of data about the study area, the negative exponential impedance function is the best option. Currently there is not enough data to estimate a complex curve although the logistic function or the power-spline function seems more ideal.

9.2 How did the average travel time and average generalised travel costs change in the Jakarta-Bandung region due to the Cipularang toll road?

The average travel times for each district for of all the possible trips have been calculated for the situation with the toll road and without the toll road (ATT). The percentage change in average travel time due to the Cipularang toll road can be seen in Figure 10 together with the fifteen districts where the average travel time has decreased the most in Table 12.

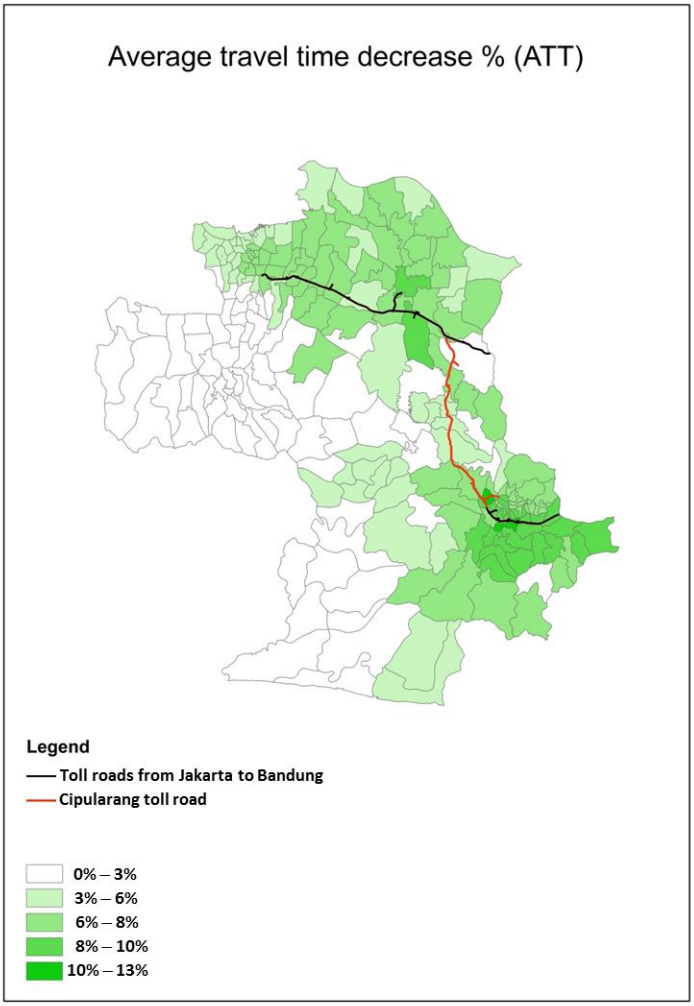


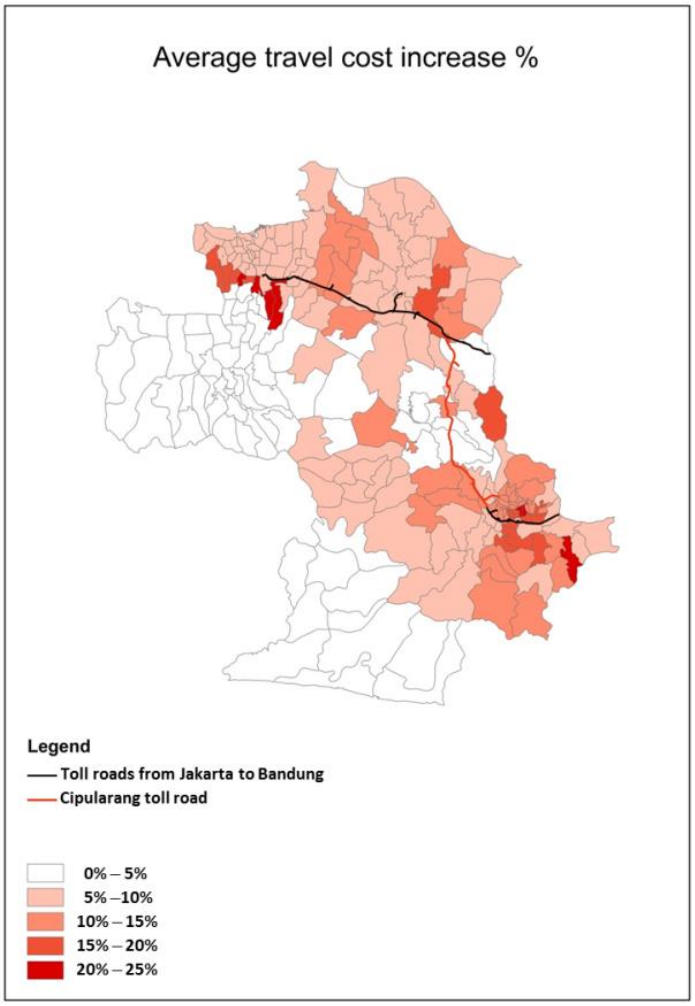
Figure 10: ATT difference results

DISTRICT	Average travel time with toll road (minutes)	Average travel time without toll road (minutes)	Average travel time decrease (%)
CIMAHI TENGAH	133,42	153,4	13,02%
BANDUNG KIDUL	144,77	162,49	10,91%
DAYEUHKOLOT	146,28	163,8	10,70%
MARGAHAYU	147,53	165,13	10,65%
MARGACINTA	150,86	168,32	10,37%
BABAKAN CIPARAY	139,51	155,55	10,31%
CIMAHI SELATAN	140,9	157,08	10,30%
CILEUNYI	156,11	173,82	10,19%
KETAPANG	158,7	176,22	9,94%
BOJONGSOANG	162,09	179,81	9,86%
BALEENDAH	160,49	177,96	9,81%
PAMEUNGPEUK	163,78	181,15	9,59%
RANCAEKEK	170,98	188,7	9,39%
CICALENGKA	171,51	189,23	9,36%
SOREANG	171	188,47	9,27%
STUDY AREA	**188,41**	**197,92**	**4,80%**

Table 12: ATT results peaks

It appears in the Bandung region, south-east in the study area, the Cipularang toll road has the biggest impact on the average travel time. Also in the districts in the Bekasi and Karawang municipalities, north in the study area, seems to be a big impact due to the Cipularang toll road on average travel time. (An overview of the municipalities can be seen in Figure 1)

Next is the change is average generalised costs (AGC). The average generalised costs of all possible trips have been calculated for the situation with the toll road and without the toll road. These results of this are shown in Figure 11. Next to the result of the average generalised costs are the results for the average travel costs. The difference between the generalised costs and the travel costs is that in the generalised costs the VTTS is included. This influences the accessibility, but not what people actually spent. To get an idea in which region the “out-of-your-pocket-costs” are actually increasing due to the Cipularang toll road, the average travel cost increase is added in Figure 11. These results are shown together with the 15 districts where the changes are the highest for the average generalised costs and the average travel costs in Table 13.



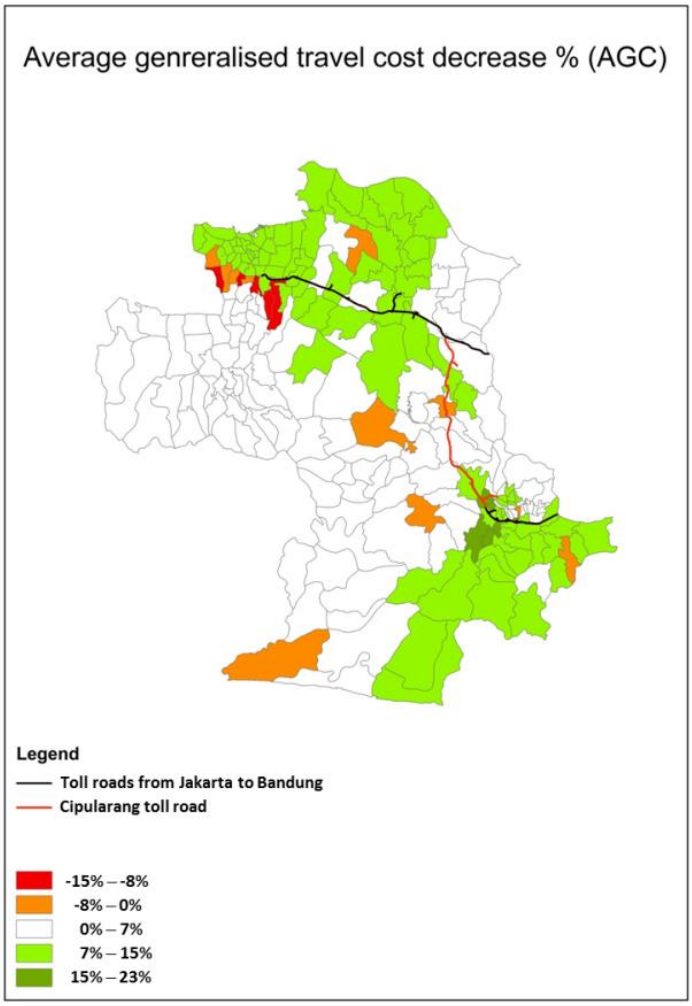


Figure 11: ATC difference results & AGC difference results

DISTRICT	Average generalised travel costs with toll road (IDR)	Average generalised travel costs without toll road (IDR)	Average travel costs decrease including VTTS (%)
CIMAHI TENGAH	41830,32	53705,55	22,11%
MARGAHAYU	49074,1	58357,02	15,91%
KETAPANG	50815,99	60122,47	15,48%
BANDUNG KIDUL	52053,13	61349,67	15,15%
SOREANG	52878,15	62211,1	15,00%
CIMAHI SELATAN	45994,69	54097,1	14,98%
BOJONGSOANG	54450,02	63758,34	14,60%
KARAWANG	49571,25	57163,12	13,28%
CIKARANG	47638,55	54776,59	13,03%
CILEUNYI	62532,5	71873,42	13,00%
CIAMPEL	51718,74	59399,35	12,93%
TELUKJAMBE	49851,36	57038,52	12,60%
LEMAHABANG	49562,89	56678,05	12,55%
RANCAEKEK	65084,45	74392,77	12,51%
PASIRJAMBU	64826,68	74067,99	12,48%
STUDY AREA	**55335,47**	**58594,92**	**5,56%**

Table 13: AGC results peaks

When looking at the average travel cost increase, it appears that in a small part of Jakarta, North-west in the study area, the Cipularang toll road has the biggest impact on the average travel costs. Also in the Bandung, Bekasi, Cianjur and Karawang municipalities there seems to be a noticeable increase in average travel costs. But when looking at the generalised costs, and taking into account the VTTS, most districts seem to gain a positive effect on accessibility from the toll road. There are a few districts which mostly lie in Jakarta, Bandung and Cianjur which do have a negative improved accessibility according to the measure.

9.3 Which districts in the Jakarta-Bandung region have had the most changes in job accessibility with generalised travel costs as an impedance due to the Cipularang toll road and is there a difference for different income groups?

The results of how much the job accessibility has changed in which districts calculated for the CCA measure and the PCA measure are shown in Figure 12. To compare the results from the different measures, the upward peaks of both measures are shown in Table 14 and Table 15. This shows the fifteen highest changes in job accessibility for each measure.

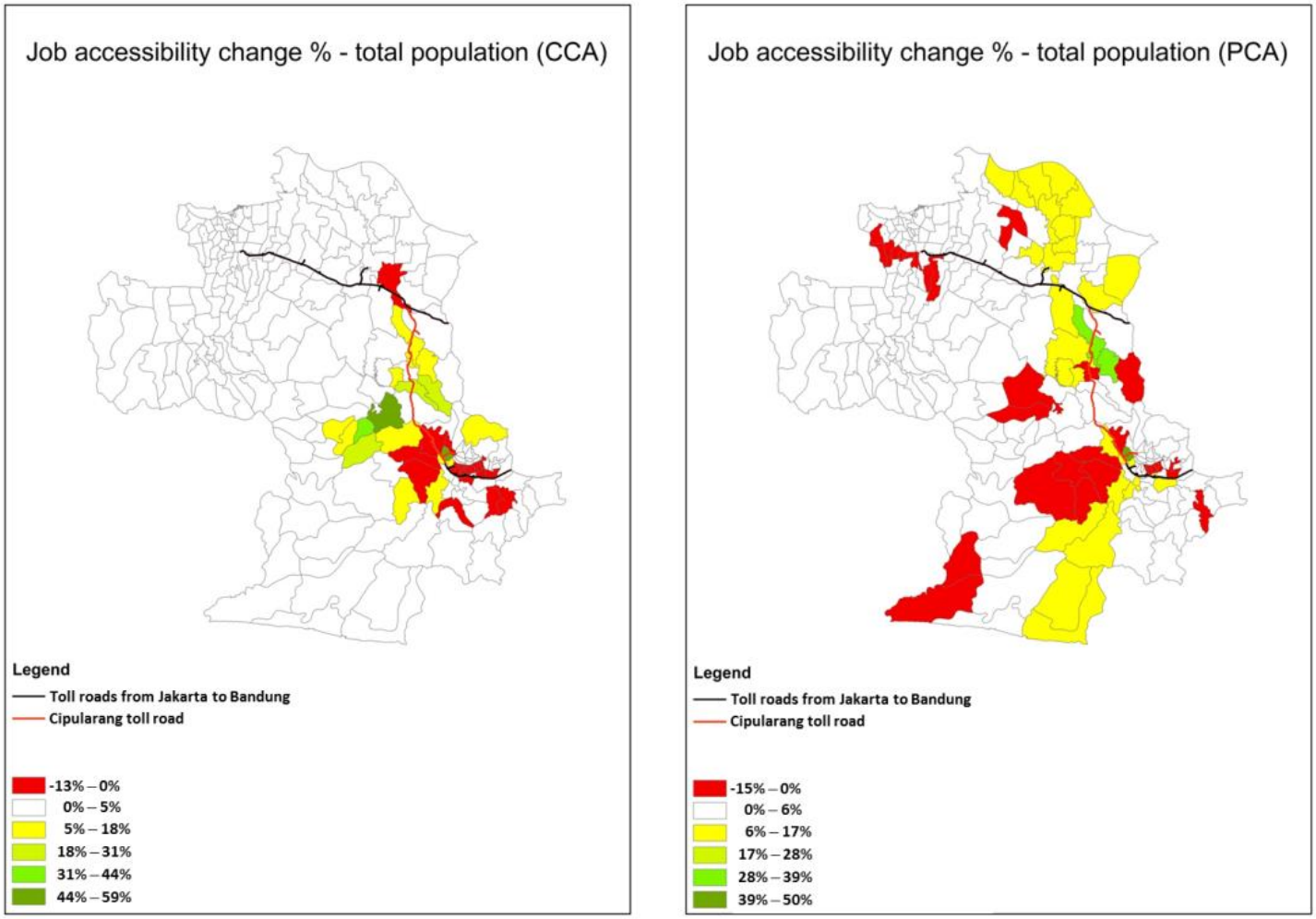


Figure 12: CCA difference results & PCA difference results

DISTRICT	Job accessibility with toll road	Job accessibility without toll road	Job accessibility increase (%)
CIMAHI TENGAH	30,85	19,43	58,76%
CIPEUNDEUY	6,23	3,98	56,54%
CIRANJANG	8,73	6,07	43,78%
BOJONGPICUNG	2,19	1,68	30,49%
DARANGDAN	10,57	8,35	26,50%
BOJONG	11,01	8,97	22,82%
SINDANGKERTA	5,18	4,55	13,94%
KARANGTENGAH	3,79	3,48	9,09%
SOREANG	12,62	11,76	7,33%
PASAWAHAN	7,42	6,93	7,06%
CIMAHI SELATAN	13,87	13,05	6,32%
SUKALUYU	5,33	5,02	6,03%
CIPATAT	8,64	8,15	6,03%
PLERED	8,09	7,64	5,84%
PURWAKARTA	3,53	3,34	5,77%
STUDY AREA	**28,97**	**28,9**	**0,27%**

Table 14: CCA results peaks

DISTRICT	Job accessibility with toll road	Job accessibility without toll road	Job accessibility increase (%)
CIMAHI TENGAH	45,47	30,48	49,16%
PASAWAHAN	35,01	26,29	33,18%
PURWAKARTA	15,07	11,48	31,27%
CAMPAKA	28,02	22,56	24,20%
CIAMPEL	68,65	59,94	14,52%
CIMAHI SELATAN	22,97	20,55	11,80%
MARGAHAYU	45,27	40,71	11,20%
SOREANG	22,71	20,48	10,87%
KARAWANG	12,22	11,03	10,76%
KETAPANG	43,39	39,26	10,52%
PASIRJAMBU	27,85	25,37	9,78%
RAWAMERTA	58,09	52,94	9,72%
BANDUNG KIDUL	85,34	78,14	9,22%
CIWIDEY	16,32	14,96	9,11%
BOJONGSOANG	42,69	39,16	9,00%
STUDY AREA	**34,63**	**34,14**	**1,44%**

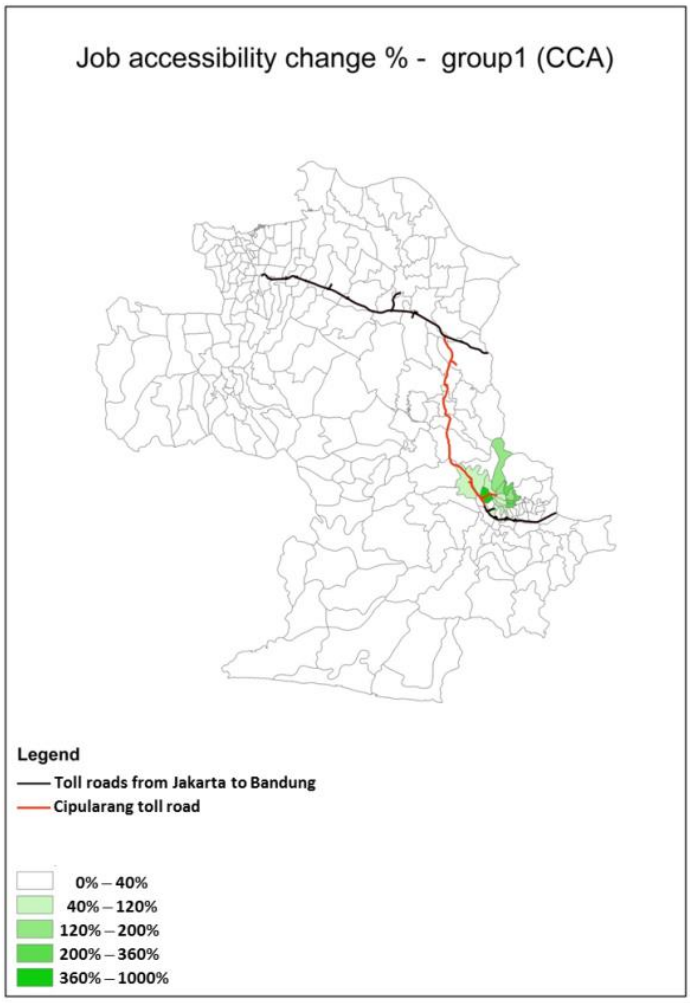
Table 15: PCA results peaks

When analysing tables 14 and 15 there are five districts which stand out and are on both of the measures top 15. These are Cimahi Tengah, Pasawahan, Cimahi Selatan, Soreang and Purwakarta.

According to the CCA measure it seems that the impact from the Cipularang toll road on the job accessibility has the most effect in the West Bandung and Cimahi municipalities and in a small part of the Purwakarta municipality. According to the PCA measure the Cipularang toll road also has an impact on the Karawang and part of the Cianjur region. It does not seem to have a big impact on the Jakarta region.

The next question is if there is a difference in job accessibility for different income groups. *Firstly,* the group with the lowest income (group 1) will be examined and s*econdly,* the group with the highest income (group 10) will be examined. This can be seen in Figure 13 for group 1 and Figure 14 for group 10 .

To compare the results from both measures for the groups with the lowest income (group 1), the upward peaks from the CCA measure are shown in Table 16 and the upward peaks from the PCA measure are shown in Table 17. To compare the results from both measures for the highest income groups (group 10), the upward peaks are shown. the upward peaks from the CCA measure are shown in Table 18 and the upward peaks from the PCA measure are shown in Table 19.



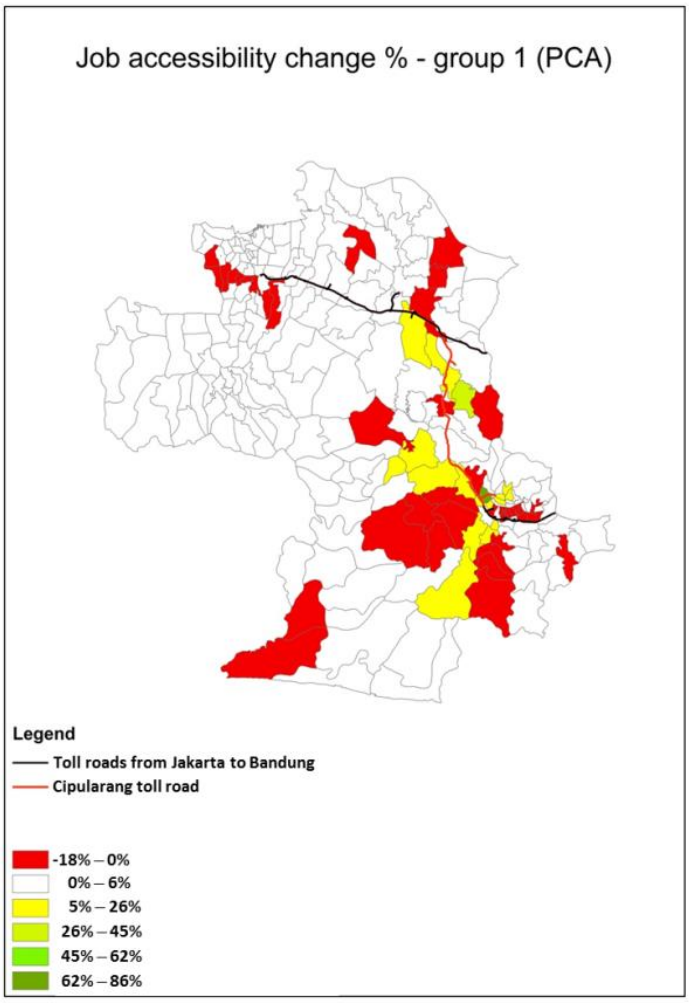


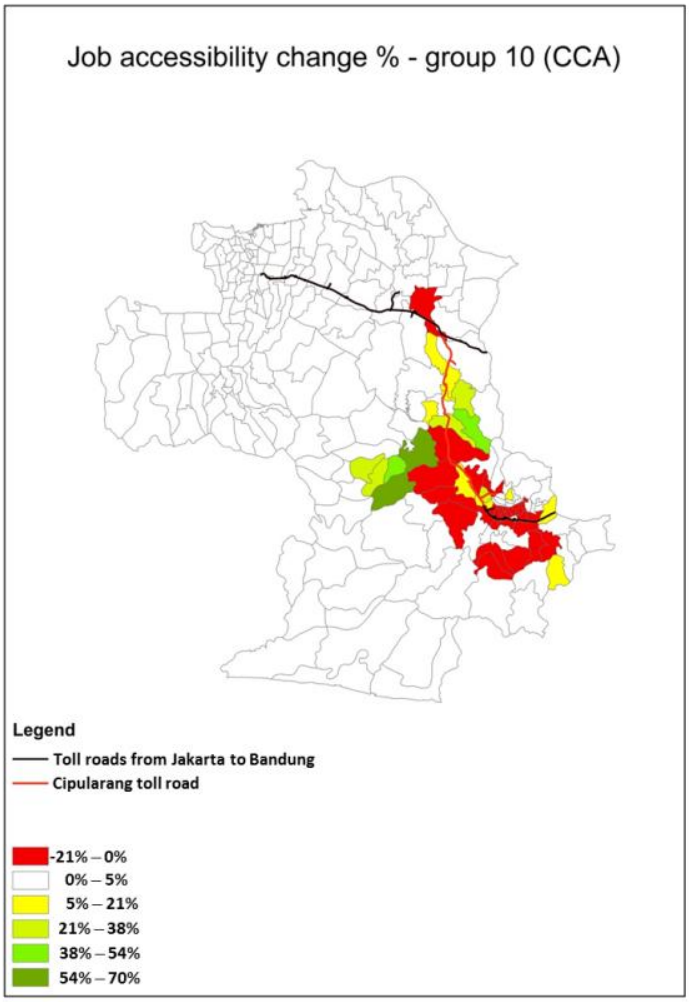
Figure 13: CCA difference results group 1 & PCA difference results group 1

DISTRICT	Job accessibility with toll road	Job accessibility without toll road	Job accessibility increase (%)
CIMAHI TENGAH	1,19	0,11	953,43%
CIDADAP	0,42	0,11	275,30%
SUMUR BANDUNG	0,7	0,21	238,58%
BANDUNG WETAN	0,83	0,24	238,58%
CIBEUNYING KALER	0,37	0,11	227,75%
SUKASARI	0,33	0,11	197,20%
PARONGPONG	0,29	0,11	164,21%
COBLONG	0,25	0,11	122,81%
BANDUNG KULON	0,24	0,11	113,42%
CIMAHI UTARA	0,23	0,11	107,66%
NGAMPRAH	0,23	0,11	103,82%
PADALARANG	0,22	0,11	103,01%
BOJONG LOA KALER	0,33	0,18	85,36%
ANDIR	0,41	0,23	81,87%
SUKAJADI	0,38	0,22	77,61%
STUDY AREA	**0,19**	**0,18**	**6,59%**

Table 16: CCA results group 1 peaks

DISTRICT	Job accessibility with toll road	Job accessibility without toll road	Job accessibility increase (%)
CIMAHI TENGAH	3,34	1,8	85,72%
PASAWAHAN	0,98	0,75	31,33%
PURWAKARTA	0,46	0,36	25,91%
CAMPAKA	0,74	0,64	16,99%
PADALARANG	1,56	1,38	13,23%
CIPATAT	1,12	1,01	10,60%
MARGAHAYU	2,58	2,36	9,38%
CIMAHI SELATAN	1,31	1,2	9,33%
SOREANG	1,13	1,04	8,28%
KETAPANG	2,34	2,16	7,96%
CIAMPEL	1,7	1,58	7,59%
SUKAJADI	3,44	3,2	7,44%
CICENDO	3,8	3,54	7,37%
CIDADAP	5,38	5,03	6,92%
COBLONG	2,75	2,59	6,33%
STUDY AREA	**1,79**	**1,78**	**0,96%**

Table 17: PCA results group 1 peaks



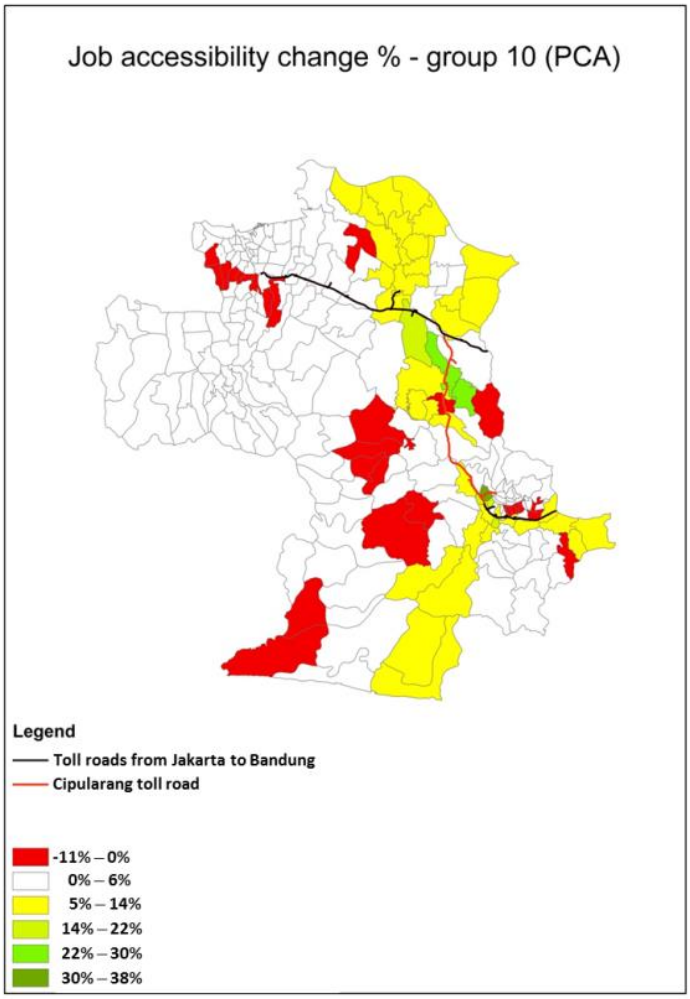


Figure 14: CCA difference results group 10 & PCA difference results group 10

DISTRICT	Job accessibility with toll road	Job accessibility without toll road	Job accessibility increase (%)
CIPEUNDEUY	1,42	0,83	70,88%
BOJONGPICUNG	0,45	0,28	61,30%
BOJONG	2,65	1,73	53,21%
CIRANJANG	2,04	1,34	52,06%
DARANGDAN	2,56	1,87	36,76%
CIMAHI TENGAH	4,09	3,03	35,21%
KARANGTENGAH	0,77	0,61	25,84%
SUKALUYU	1,5	1,2	25,28%
PASAWAHAN	1,34	1,09	22,44%
CIMAHI SELATAN	2,37	2,01	17,79%
PLERED	1,53	1,3	17,12%
PURWAKARTA	0,7	0,6	16,04%
IBUN	3,75	3,49	7,35%
PACET	1,82	1,72	5,69%
PADALARANG	3,12	2,96	5,37%
STUDY AREA	**4,76**	**4,76**	**0,01%**

Table 18: CCA results group 01 peaks

DISTRICT	Job accessibility with toll road	Job accessibility without toll road	Job accessibility increase (%)
CIMAHI TENGAH	5,9	4,3	37,26%
PASAWAHAN	6,66	5,18	28,49%
PURWAKARTA	2,82	2,21	27,56%
CAMPAKA	5,47	4,47	22,26%
CIAMPEL	13,57	11,83	14,66%
CIMAHI SELATAN	3,31	2,91	13,94%
MARGAHAYU	6,53	5,74	13,68%
SOREANG	3,44	3,04	13,30%
KETAPANG	6,37	5,63	13,13%
BANDUNG KIDUL	11,96	10,66	12,24%
PASIRJAMBU	5,14	4,59	12,06%
BOJONGSOANG	6,17	5,51	11,97%
KARAWANG	2,25	2,01	11,81%
CIWIDEY	3,08	2,76	11,51%
RAWAMERTA	11,01	9,91	11,16%
STUDY AREA	**5,14**	**5,04**	**2,02%**

Table 19: PCA results group 10 peaks

When analysing Tables 16 and 17 for group 1, there are five districts who stand out and are on both of the measures top 15. These are Cimahi Tengah, Cidadap, Coblong, Padalarang and Sukajadi. The CCA measure seems to have a bigger impact in the Cimahi and West Bandung municipality, while the PCA measure also seem so have more impact in the Bandung, Purwakarta and Karawang municipalities.

When analysing Tables 18 and 19 for group 10 there are four districts who stand out and are on both of the measures top 15. These are Cimahi Tengah, Pasawahan, Purwakarta and Cimahi Selatan. In both measures they have a high job accessibility change. The CCA measure seem to have a big impact west from the toll road in Cianjur, while the effects from the PCA measure are more spread out from north to south of the study area, from the Karawang to the Cianjur municipality.

For both CCA measures the impact from the Cipularang toll road on job accessibility is closer to the toll road than for both PCA measures.

9.4 Which districts in the Jakarta-Bandung region have had the most changes in job accessibility with travel time as an impedance due to the Cipularang toll road?

The results of how much and in which districts the job accessibility has changed calculated for the CTA measures and the PTA measure are shown in Figure 15, Figure 16 and Figure 17. To compare the results from the different measures, the upward peaks of the measures are shown in Table 20, Table 21 and Table 22. This shows the fifteen highest changes in job accessibility for each measure.

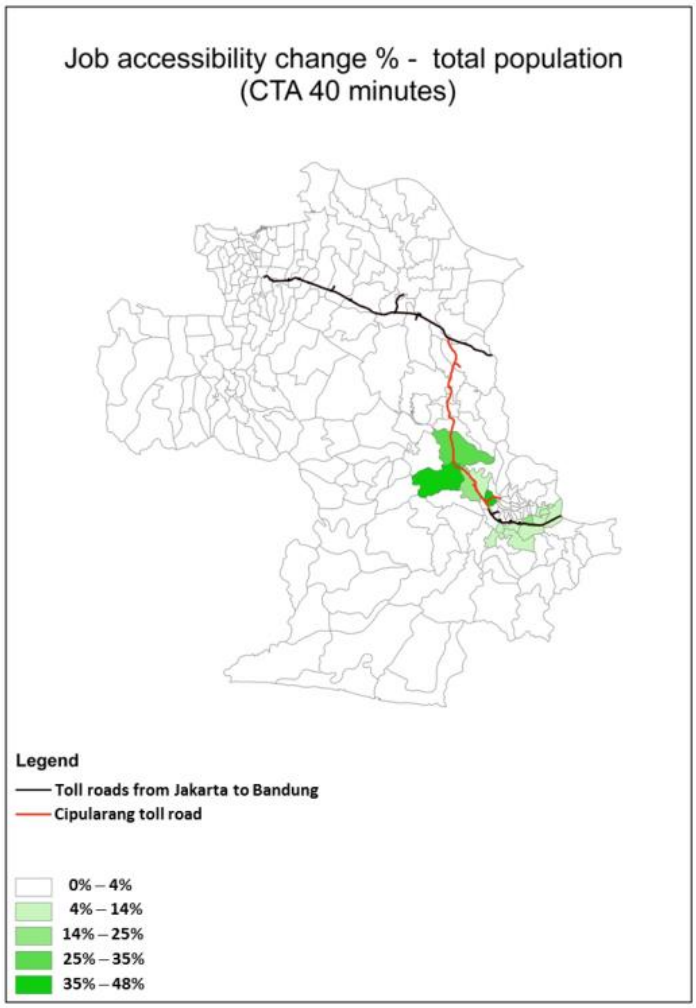


Figure 15: CTA 40 difference results

DISTRICT	Job accessibility with toll road	Job accessibility without toll road	Job accessibility increase (%)
CIPATAT	4,68	3,18	47,21%
CIMAHI TENGAH	30,64	22,56	35,80%
CIKALONG WETAN	7,34	5,71	28,56%
MARGACINTA	47,26	40,85	15,69%
PADALARANG	23,37	20,27	15,27%
KETAPANG	18,39	16,71	10,03%
NGAMPRAH	15,46	14,46	6,90%
BOJONGSOANG	26,88	25,15	6,87%
BALEENDAH	14,36	13,54	6,04%
RANCASARI	33,84	32,25	4,94%
CIBIRU	34,66	33,04	4,89%
UJUNG BERUNG	38,1	36,32	4,89%
MARGAHAYU	35,47	33,88	4,68%
CILEUNYI	24,23	23,16	4,63%
DAYEUHKOLOT	44,35	42,64	4,01%
STUDY AREA	**9,27**	**9,13**	**1,56%**

Table 20: CTA 40 results peaks

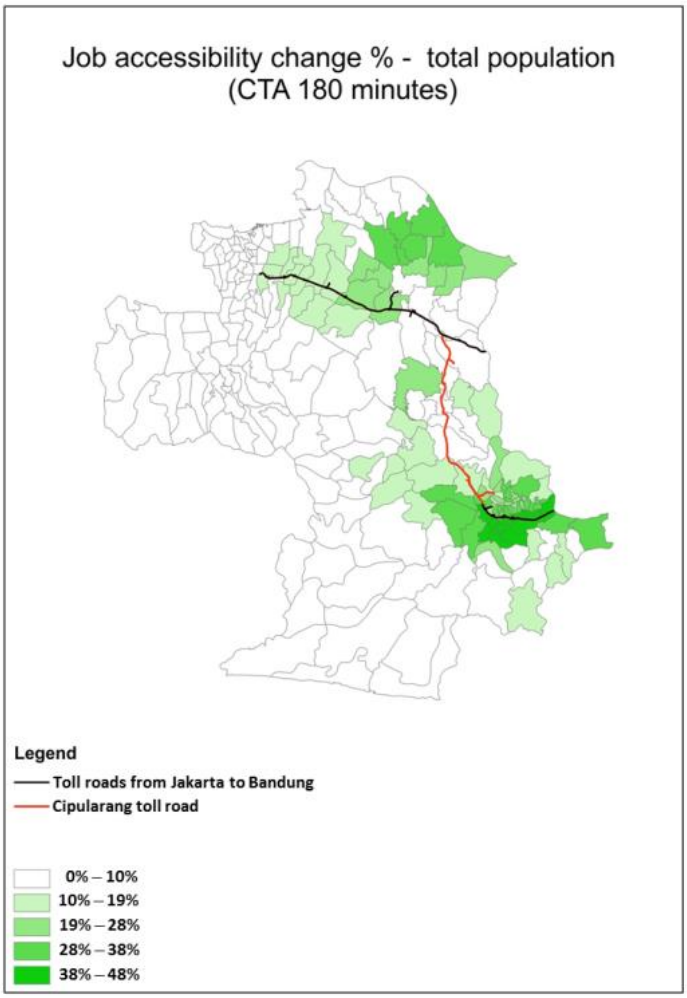


Figure 16: CTA 180 difference results

DISTRICT	Job accessibility with toll road	Job accessibility without toll road	Job accessibility increase (%)
BALEENDAH	83,33	56,6	47,22%
BOJONGSOANG	176,18	119,67	47,22%
CILEUNYI	112,02	76,85	45,76%
MARGACINTA	216,26	148,79	45,34%
KETAPANG	171,34	118,98	44,01%
BANDUNG KIDUL	381,8	267,96	42,48%
RANCASARI	162,22	114,17	42,08%
MARGAHAYU	200,91	141,46	42,02%
DAYEUHKOLOT	216,77	152,64	42,02%
PAMEUNGPEUK	265,61	192,39	38,06%
CISARUA	142,97	103,71	37,86%
MARGAASIH	133,55	96,9	37,82%
CICALENGKA	111,73	81,86	36,49%
RANCAEKEK	104,84	76,81	36,49%
REGOL	276,3	203	36,11%
STUDY AREA	**128,42**	**116,46**	**10,27%**

Table 21: CTA 180 results peaks

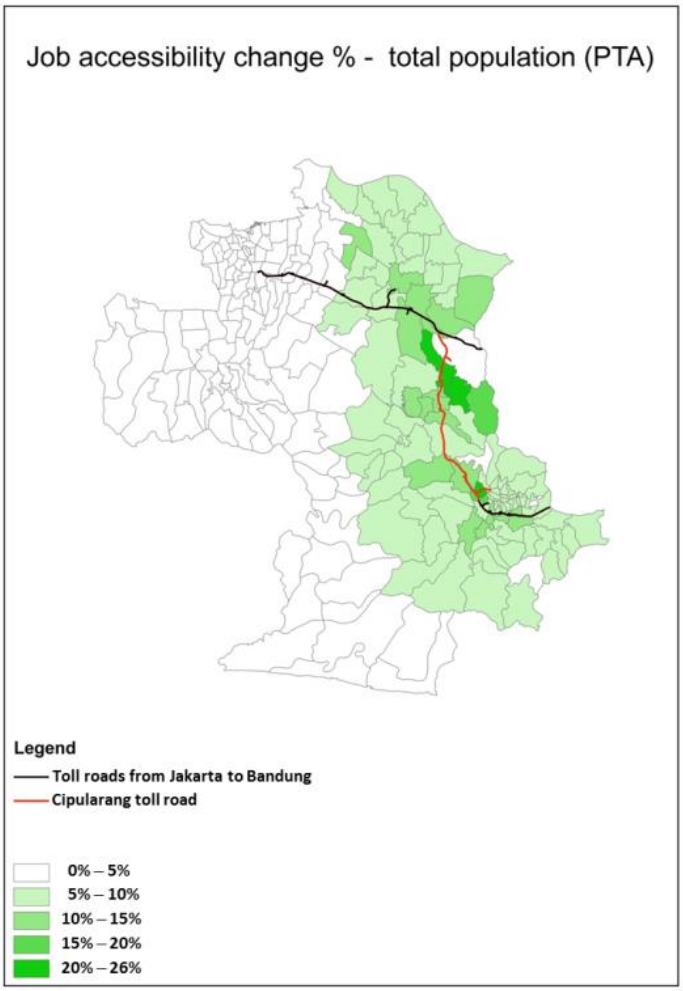


Figure 17: PTA difference results

DISTRICT	Job accessibility with toll road	Job accessibility without toll road	Job accessibility increase (%)
CIMAHI TENGAH	33,3	26,5	25,65%
PASAWAHAN	37,07	29,64	25,06%
CAMPAKA	32,82	26,55	23,60%
PURWAKARTA	15,77	12,82	22,99%
WANAYASA	19,83	16,5	20,17%
CIMAHI SELATAN	19,61	16,98	15,49%
PADALARANG	29,62	25,71	15,18%
CIAMPEL	68,39	60,4	13,22%
MARGAHAYU	38,29	33,98	12,68%
JATISARI	18,54	16,5	12,35%
CIPATAT	28,64	25,52	12,23%
KETAPANG	31,49	28,2	11,66%
SUKATANI	40,6	36,39	11,59%
DAYEUHKOLOT	44,84	40,24	11,43%
BANDUNG KIDUL	82,21	73,84	11,33%
STUDY AREA	**18,85**	**17,99**	**4,80%**

Table 22: PTA results peaks

Firstly, when comparing the results of the two CTA measure they have eight districts in common: Ketapang, Margahayu, Dayeuhkolot, Baleendah, Bojongsoang, Cileunyi, Margacint and Rancasari. *Secondly*, when comparing the results of the CTA 40 measure with the PTA measure they have six districts in common: Ketapang, Margahayu, Dayeuhkolot, Cipatat, Cimahi Tengah and Padalarang. Lastly, when comparing the results of the CTA 180 measure with the PTA measure they have four districts in common: Ketapang, Margahayu, Dayeuhkolot and Bandung Kidul. When analysing these three tables together there are three districts who stand out and are on all three of the measures top 15. These are Ketapang, Margahayu and Dayeuhkolot.

The effect of the CTA 40 measure have a small reach compared to the other measures. It only seems to have a noticeable effect in the Cimahi and West Bandung Municipalities, and a small part of the Bandung municipality. The CTA 180 measure seems to have two central point on which there are noticeable effects. *Firstly* the Bandung city municipality and the area around it, mainly reaching to the West Bandung, Bandung and Cimahi municipality. *Secondly* the Karawang and Bekasi municipality. The PTA measure seems to have a more evenly spread out effect around the Cipularang toll road and seems to have the biggest effect in the Purwakarta municipality.

9.5 Overview of the results

To show the different result for the different measures, Table 23 shows the accessibility improvements for the whole study area for the different measures.

Measure	With toll road	Without toll road	Accessibility improvement (%)
AGC	55335,47	58594,92	5,56%
ATT	188,41	197,92	4,80%
CCA	28,97	28,90	0,27%
PCA	34,63	34,14	1,44%
CTA 40	9,27	9,13	1,56%
CTA 180	128,42	116,46	10,27%
PTA	18,85	17,99	4,80%

Table 23: Overview of the accessibility measure changes for the complete study areas

The average generalised travel cost and the average travel time measure both give about the same accessibility improvement. The CCA and the PCA measures both have a smaller job accessibility improvement then the CTA and the PTA measures. In Table 24 the 15 most in accessibility changed districts for each measure are presented next to each other. The results from Table 24 can be seen in Figure 18. Figure 18 shows the frequency of a district appearing in the 15 most in accessibility changed districts. Figure 19 shows the same but it makes a distinction between the different impedances.

AGC	ATT	CCA	PCA	CTA 40	CTA 180	PTA
PASEH	CIMAHI TENGAH	CIMAHI TENGAH	CIMAHI TENGAH	CIPATAT	BALEENDAH	CIMAHI TENGAH
CIPAYUNG	MARGAHAYU	CIPEUNDEUY	PASAWAHAN	CIMAHI TENGAH	BOJONGSOANG	PASAWAHAN
PONDOKGEDE	KETAPANG	CIRANJANG	PURWAKARTA	CIKALONG WETAN	CILEUNYI	CAMPAKA
BATUNUNGGAL	BANDUNG KIDUL	BOJONGPICUNG	CAMPAKA	MARGACINTA	MARGACINTA	PURWAKARTA
KIARACONDONG	SOREANG	DARANGDAN	CIAMPEL	PADALARANG	KETAPANG	WANAYASA
MAMPANG PRAPATAN	CIMAHI SELATAN	BOJONG	CIMAHI SELATAN	KETAPANG	BANDUNG KIDUL	CIMAHI SELATAN
KRAMAT JATI	BOJONGSOANG	SINDANGKERTA	MARGAHAYU	NGAMPRAH	RANCASARI	PADALARANG
PESANGGRAHAN	KARAWANG	KARANGTENGAH	SOREANG	BOJONGSOANG	MARGAHAYU	CIAMPEL
KEBAYORAN BARU	CIKARANG	SOREANG	KARAWANG	BALEENDAH	DAYEUHKOLOT	MARGAHAYU
PANCORAN	CILEUNYI	PASAWAHAN	KETAPANG	RANCASARI	PAMEUNGPEUK	JATISARI
KEBAYORAN LAMA	CIAMPEL	CIMAHI SELATAN	PASIRJAMBU	CIBIRU	CISARUA	CIPATAT
LENGKONG	TELUKJAMBE	SUKALUYU	RAWAMERTA	UJUNG BERUNG	MARGAASIH	KETAPANG
ASTANA ANYAR	LEMAHABANG	CIPATAT	BANDUNG KIDUL	MARGAHAYU	CICALENGKA	SUKATANI
UJUNG BERUNG	RANCAEKEK	PLERED	CIWIDEY	CILEUNYI	RANCAEKEK	DAYEUHKOLOT
RANCASARI	PASIRJAMBU	PURWAKARTA	BOJONGSOANG	DAYEUHKOLOT	REGOL	BANDUNG KIDUL

Table 24: Districts from all the peaks

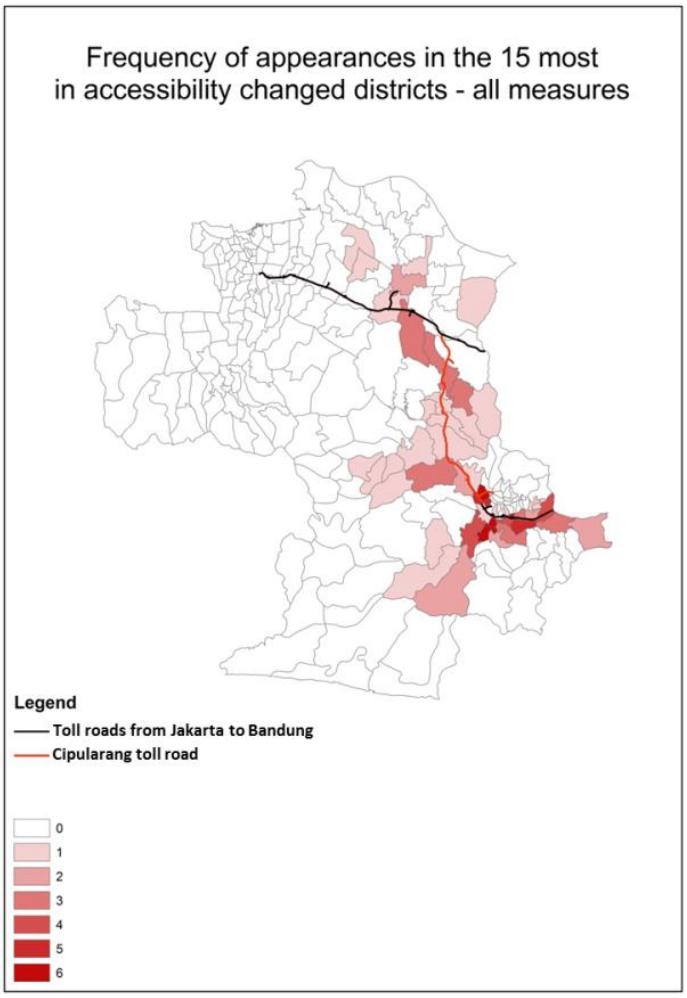


Figure 18: Frequency district appearances in all peaks

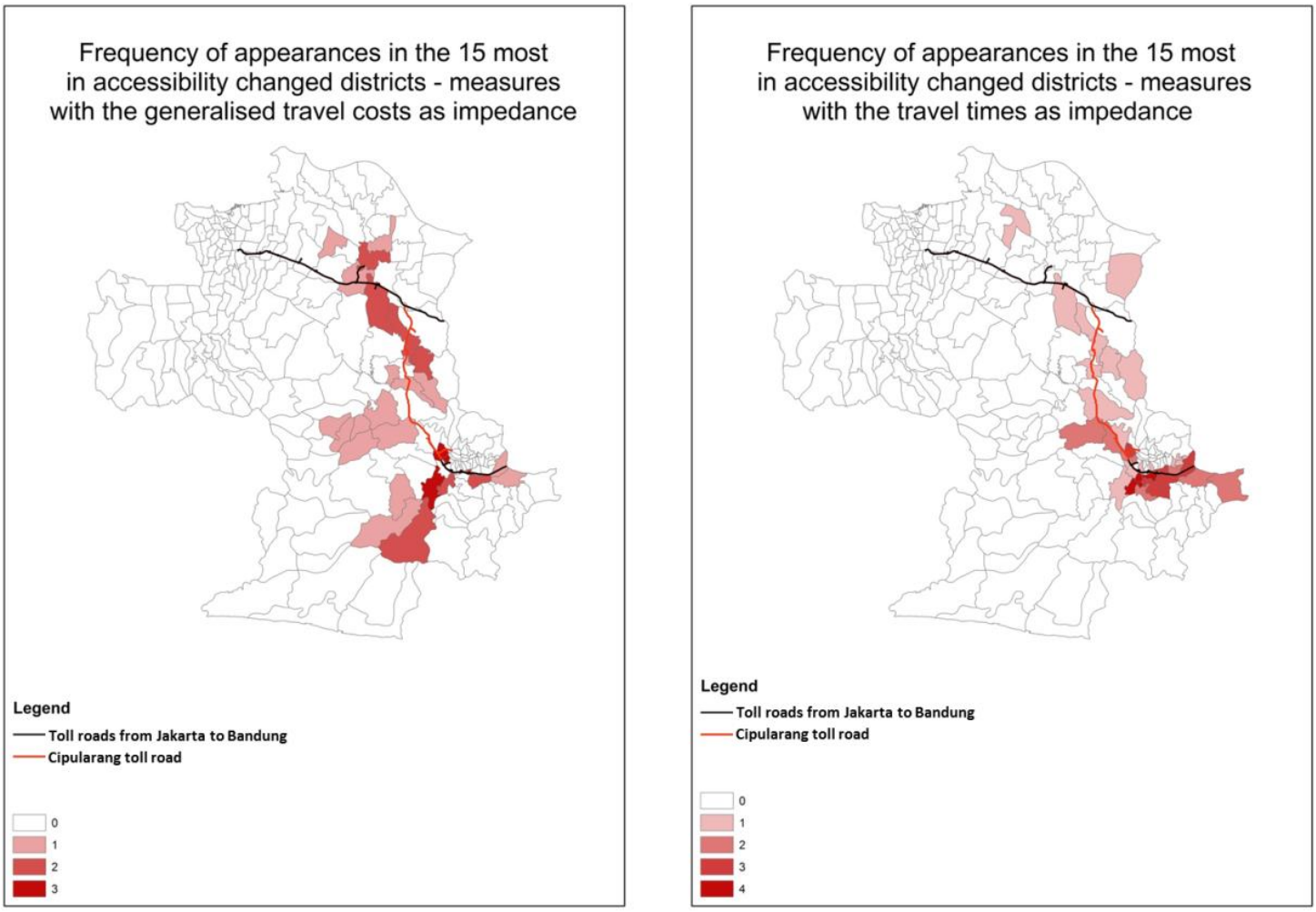


Figure 19: Frequency district appearances in peaks for generalised travel cost as an impedance & frequency district appearances in peaks for travel time as an impedance

From Figure 18 it can be concluded that the most accessibility changes take place in the Bandung, West Bandung, Bandung city and Cimahi municipalities. Also the Karawang and Purwakarta municipalities have areas which are highly influenced on accessibility by the toll road, and to less extent the Cianjur and Bekasi municipality. The difference between the frequency with travel time as an impedance (ATT, CTA 40, CTA 18 and PTA) and the frequency with generalised travel costs (AGC, CCA, and PCA) as an impedance due the toll road is not significantly notable. There are some individual districts that only have a big effect from the toll road for one of the two impedances, but the overall the effects take place in the same municipalities. Table 25 shows the districts which appear at least three times in the 15 most in accessibility changed districts.

District	Frequency generalised costs as impedance	Frequency time as impedance	Frequency total
KETAPANG	2	4	6
MARGAHAYU	2	4	6
CIMAHI TENGAH	3	3	6
BOJONGSOANG	2	3	5
BANDUNG KIDUL	2	3	5
CIMAHI SELATAN	3	2	5
DAYEUHKOLOT	0	4	4
CILEUNYI	1	3	4
SOREANG	3	1	4
BALEENDAH	0	3	3
MARGACINTA	0	3	3
RANCAEKEK	1	2	3
CIPATAT	1	2	3
PASAWAHAN	2	1	3
PURWAKARTA	2	1	3
CIAMPEL	2	1	3

Table 25: Most appeared districts in the peaks of the results

The same frequency analysis is done for the different income groups in the CCA and the PCA measures. The results of this can be found in Table 26 and Figure 20.

CCA 1	CCA 10	PCA 1	PCA 10
CIMAHI TENGAH	CIPEUNDEUY	CIMAHI TENGAH	CIMAHI TENGAH
CIDADAP	BOJONGPICUNG	PASAWAHAN	PASAWAHAN
SUMUR BANDUNG	BOJONG	PURWAKARTA	PURWAKARTA
BANDUNG WETAN	CIRANJANG	CAMPAKA	CAMPAKA
CIBEUNYING KALER	DARANGDAN	PADALARANG	CIAMPEL
SUKASARI	CIMAHI TENGAH	CIPATAT	CIMAHI SELATAN
PARONGPONG	KARANGTENGAH	MARGAHAYU	MARGAHAYU
COBLONG	SUKALUYU	CIMAHI SELATAN	SOREANG
BANDUNG KULON	PASAWAHAN	SOREANG	KETAPANG
CIMAHI UTARA	CIMAHI SELATAN	KETAPANG	BANDUNG KIDUL
NGAMPRAH	PLERED	CIAMPEL	PASIRJAMBU
PADALARANG	PURWAKARTA	SUKAJADI	BOJONGSOANG
BOJONG LOA KALER	IBUN	CICENDO	KARAWANG
ANDIR	PACET	CIDADAP	CIWIDEY
SUKAJADI	PADALARANG	COBLONG	RAWAMERTA

Table 26: Districts from the income group peaks

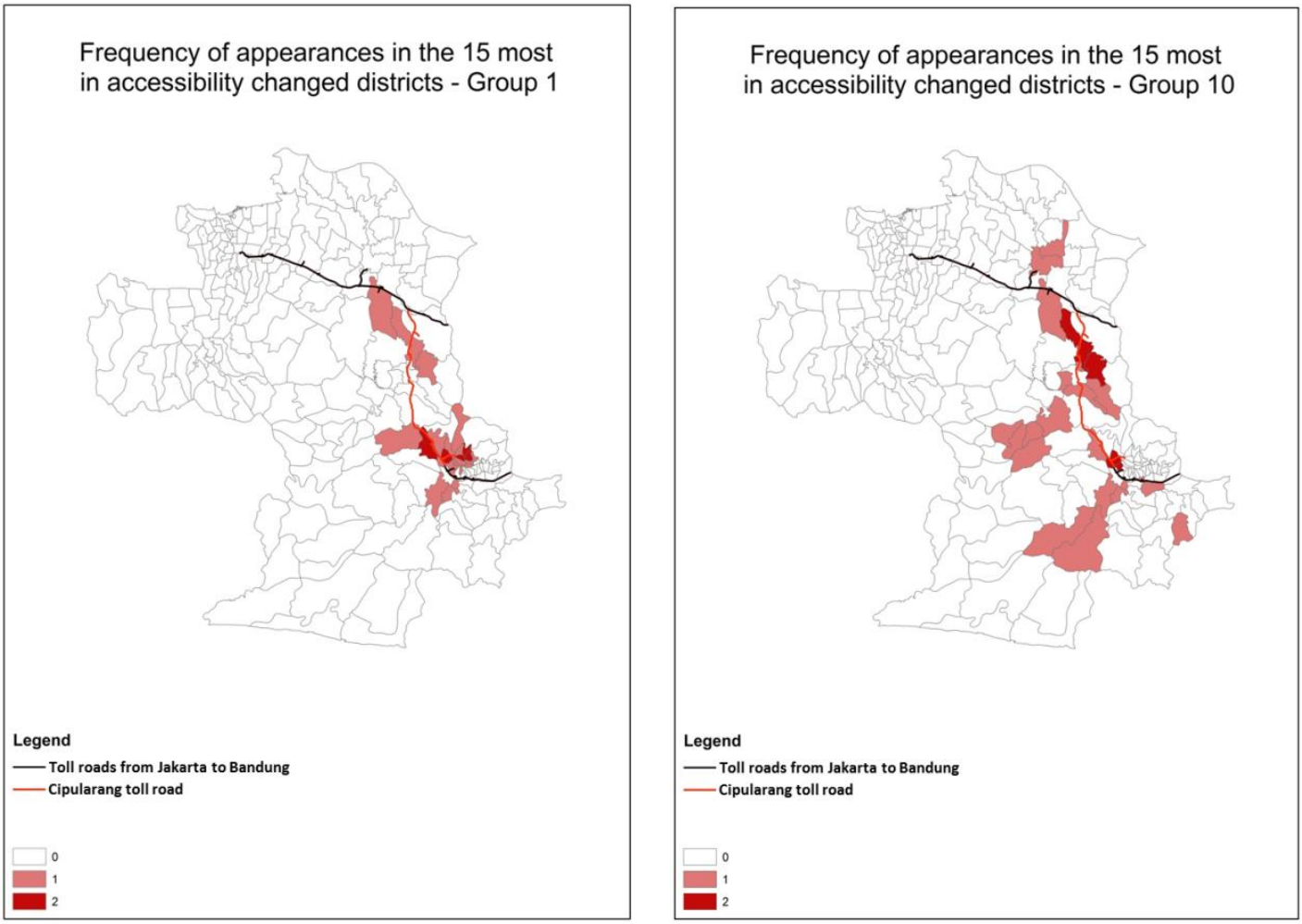


Figure 20: Frequency district appearances in peaks for group 1 & frequency district appearances in peaks for group 10

It can be concluded that the most changes in accessibility regarding the lowest income group appear in the West Bandung and Cimahi municipalities and some parts of the Bandung, Purwakarta and Karawang municipalities. For the highest income group it can be concluded that the most accessibility changes take place in the Bandung, West Bandung, Purwakarta and Cimahi municipalities and some parts of the Cianjur and Karawang municipalities. Table 27 shows the districts which appear at least two times in the 15 most in accessibility changed districts for the different income group measures. An overview of the results for all the districts can be found in appendix 13.6.

District	Frequency group 1	Frequency group 10	Frequency total
CIMAHI TENGAH	2	2	4
PADALARANG	2	1	3
CIMAHI SELATAN	1	2	3
PASAWAHAN	1	2	3
PURWAKARTA	1	2	3
KETAPANG	1	1	2
SOREANG	1	1	2
MARGAHAYU	1	1	2
CAMPAKA	1	1	2
CIAMPEL	1	1	2
COBLONG	2	0	2
SUKAJADI	2	0	2
CIDADAP	2	0	2

Table 27: Most appeared districts in the peaks of the results for the income groups

Looking at Table 25 and Table 27, Cimahi Tengah is on top of both lists. This means that the Cipularang toll road has a high overall effect on accessibility in Cimahi Tengah and also specifically for the low income group and the high income group. Also Ketapang and Margahayu are on top of Table 25 and also have appeared in the 15 most in accessibility changed districts for the low and high income group in Table 27. Bojongsoang and Bandung Kidul appear high on Table 25 with a score of 5, but they don't appear in Table 27. Cimahi Selatan also apears with a score of 5 in Table 25 and the Cipularang toll road also seems to have a noticable effect on the high income group of Cimahi Selatan.

10 Discussion

There is more focus in the changes from the accessibility measures than the absolute values. Using travel time as an impedance will result in a higher accessibility change for the study area than using the generalised travel costs as an impedance. That is due to the fact that all trip are based on the shortest routes possible. So it is possible that the generalised travel costs go up in the situation with the Cipularang toll road, in reality someone would take a route with lower costs, but not in this model. That is also the reason why the accessibility measure with the generalised travel costs as an impedance show districts with a negative accessibility change. This is due to the fact that the VTTS for a trip is lower than the increase of the actual costs.

In the results it appears that the effects of the PCA measure are spread out further away from the toll road then the effects from the CCA measure . That is the case because of the different approaches. In the CCA measure, a trip either takes place or it does not takes place based on a threshold, so for the population it is either possible for everyone to make a trip or for no one. The PCA measure uses an impedance function to calculate a trip probability. So it is not just a one or a zero, but a certain part of the population who can make the trip. Also the PTA measure is more spread out then the CTA measures. That is the case because of the same reason the PCA and the CCA measure results are different. The CTA measure uses a threshold and the PTA measure uses an impedance function to calculate the trip probability.

There are certain aspects which could make this research a better representation of reality. *The travel budget* is based on a lot of assumptions. First there is assumed the expenditure distribution is the same as the income distribution. Then there is assumed that the travel budget of the group with the lowest income is 50% of the total expenditure. And with an average travel budget of 30% of the total expenditure it is assumed that the travel budget distribution is a square root function. *The road network* is not perfect. All the main roads are connected properly, but there are a lot of local roads who are not. It would take too much time to fix that manually. Also not all the height levels of the roads are taken into account correctly. As a result the road network indicates at some points same-level-crossing while in reality there is a bridge. *The toll fee* costs are not a 100% accurate. In reality there isn't a fixed amount of toll fee per kilometer. To be able to implement this into the model an assumption is made about the costs per kilometer based on the longest trip possible. The assumption has been made that *the impedance parameters* are distributed the same way as the travel budgets over the different income groups because there had to be made a distinction between the income groups. For *an impedance function* a negative exponential function is not the best representative function to use according to the literature. But due to a lack of data a more representative function could not be chosen.

The aim was to investigate the effects for the road network situation in 2013. But as shown in Table 3, not all data was available for the year 2013.

For further research it is interesting to collect more data to achieve a more accurate representation of reality in performing this research. For the ATT and AGC measure it is assumed that there is one trip between each OD pair. It would be interesting to have more data about the exact travel times and travel distances of the traffic flows in the study area, or to model the traffic flow in the study area in future research. It would also be interesting to make a distinction between the different income groups when using a measure with time as an impedance. For the contour measure, different time thresholds for different income groups could be estimated based on different average travel times. For the potential, measures different impedance parameters could be estimated for the different income groups. Also a regression analysis could be performed for the results of the different measures to see if there is a relation in the results different measures.

11 Conclusion

To measure the accessibility changes in the Jakarta-Bandung region given the limited data, it is most suitable to calculate the job accessibility using contour accessibility measures and potential accessibility measures. Although still many assumption had to be made for costs, budgets and impedance parameters, the accessibility measures could be calculated.

When looking at the change in average travel time in the study area there seems to be a big influence by the Cipularang toll road in and around Bandung city, and in the North part of the study area around the toll road. When looking at the change in the average travel costs about the same areas seems to be influenced and have higher average travel costs. But when looking at the generalised costs (and taking into account the VTTS) there are only a few districts left on which the toll road has a negative influence.

Overall the Cipularang toll road has the biggest impact on districts in and around the Bandung municipality. Travel time, travel cost and job accessibility all show notable changes in the Bandung, West Bandung and Cimahi municipality. The Cipularang toll road also has a big influence on the Bekasi and Karawang region when looking at the changes in travel time and generalised travel costs. The individual districts in which the effect appear the most according to the different measures are Cimahi Tengah, Ketapang, Margahayu, Bojongsoang, Bandung Kidul and Cimahi Selatan.

The difference in the results with travel time as an impedance and with the generalised travel costs as an impedance are not significantly notable. The effect from the Cipularang toll road on job accessibility for the lower income groups is most noticeable in the districts very close to the toll road. For the high income groups the job accessibility changes are more noticeable in the districts further away from the toll road.

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13 Appendix

13.1 Traffic speeds

These are the traffic speeds used in ArcGIS for the different municipalities in km/h.

	Municipality	Arteri	Kolektor	Local	Toll-road
1	West Bandung	51,00	23,00	15,00	66,82
2	Purwakarta	51,00	23,00	15,00	66,82
3	Bandung City	33,03	25,67	20,20	56,16
4	Bandung Regency	51,00	23,00	15,00	56,16
5	Bekasi City	18,00	18,00	18,00	57,30
6	Karawang	51,00	23,00	20,00	57,30
7	Jakarta	12,00	12,00	12,00	12,00
8	Bekasi Regency	18,00	18,00	18,00	57,30
9	Cimahi	38,21	34,74	33,55	66,82
10	Bogor City	11,70	10,74	7,59	60,00
11	Bogor Regency	51,00	23,00	15,00	60,00
12	Depok	21,14	8,00	14,00	61,50
13	Cianjur	51,00	23,00	15,00	-

13.2 Toll fee

TARIF TOL ASAL TUJUAN RUAS JAKARTA-CIKAMPEK s.d. PURBALEUNYI
JAKARTA-CIKAMPEK

ASAL	TUJUAN	BESARNYA TARIF TOL (Rp.)				
		GOL I	GOL II	GOL III	GOL IV	GOL V
Jakarta IC	Cikunir	4,000	6,000	8,000	10,000	12,000
	Bekasi Barat	4,000	6,000	8,000	10,000	12,000
	Bekasi Timur	4,000	6,000	8,000	10,000	12,000
	Tambun	4,000	6,000	8,000	10,000	12,000
	Cibitung	4,000	6,000	8,000	10,000	12,000
	Cikarang Barat	4,000	6,000	8,000	10,000	12,000
	Cibatu	5,500	7,500	9,500	12,000	14,500
	Cikarang Timur	6,500	8,500	10,500	13,000	15,500
	Karawang Barat	7,500	12,000	15,000	19,000	23,000
	Karawang Timur	9,000	14,500	17,500	22,000	26,500
	Dawuan IC	11,500	19,000	23,500	29,000	35,000
	Kalihurip	13,500	21,500	27,000	34,000	41,000
	Cikampek	13,500	21,500	27,000	34,000	41,000
	Sadang	17,500	28,000	35,500	44,000	53,000
	Jatiluhur	22,500	35,500	45,500	56,500	68,000
	SS Padalarang	45,500	70,000	91,000	113,500	136,500
	Padalarang	46,000	70,500	92,000	114,500	137,500
	Baros	47,500	72,500	94,500	118,000	142,000
	Pasteur	48,500	74,500	96,500	120,500	145,000
	Pasir Koja	49,000	75,500	98,500	123,000	147,500
	Kopo	49,500	75,500	98,500	123,000	148,000
	Moh. Toha	49,500	76,000	98,500	123,000	148,000
	Buah Batu	50,500	78,500	100,500	125,500	151,000
	Cileunyi	53,500	82,500	105,500	132,000	158,500
Cikunir	Jakarta IC	4,000	6,000	8,000	10,000	12,000
	Bekasi Barat	4,000	6,000	8,000	10,000	12,000
	Bekasi Timur	4,000	6,000	8,000	10,000	12,000
	Tambun	4,000	6,000	8,000	10,000	12,000
	Cibitung	4,000	6,000	8,000	10,000	12,000
	Cikarang Barat	4,000	6,000	8,000	10,000	12,000
	Cibatu	5,500	7,500	9,500	12,000	14,500
	Cikarang Timur	6,500	8,500	10,500	13,000	15,500
	Karawang Barat	7,500	12,000	15,000	19,000	23,000
	Karawang Timur	9,000	14,500	17,500	22,000	26,500
	Dawuan IC	11,500	19,000	23,500	29,000	35,000
	Kalihurip	13,500	21,500	27,000	34,000	41,000
	Cikampek	13,500	21,500	27,000	34,000	41,000
	Sadang	17,500	28,000	35,500	44,000	53,000
	Jatiluhur	22,500	35,500	45,500	56,500	68,000
	SS Padalarang	45,500	70,000	91,000	113,500	136,500
	Padalarang	46,000	70,500	92,000	114,500	137,500
	Baros	47,500	72,500	94,500	118,000	142,000
	Pasteur	48,500	74,500	96,500	120,500	145,000
	Pasir Koja	49,000	75,500	98,500	123,000	147,500
	Kopo	49,500	75,500	98,500	123,000	148,000
	Moh. Toha	49,500	76,000	98,500	123,000	148,000
	Buah Batu	50,500	78,500	100,500	125,500	151,000
	Cileunyi	53,500	82,500	105,500	132,000	158,500
Bekasi Barat	Jakarta IC	4,000	6,000	8,000	10,000	12,000
	Cikunir	4,000	6,000	8,000	10,000	12,000
	Bekasi Timur	4,000	6,000	8,000	10,000	12,000
	Tambun	4,000	6,000	8,000	10,000	12,000
	Cibitung	4,000	6,000	8,000	10,000	12,000
	Cikarang Barat	4,000	6,000	8,000	10,000	12,000
	Cibatu	5,500	7,500	9,500	12,000	14,500
	Cikarang Timur	6,500	8,500	10,500	13,000	15,500
	Karawang Barat	7,500	12,000	15,000	19,000	23,000
	Karawang Timur	9,000	14,500	17,500	22,000	26,500
	Dawuan IC	11,500	19,000	23,500	29,000	35,000
	Kalihurip	13,500	21,500	27,000	34,000	41,000
	Cikampek	13,500	21,500	27,000	34,000	41,000
	Sadang	17,500	28,000	35,500	44,000	53,000
	Jatiluhur	22,500	35,500	45,500	56,500	68,000
	SS Padalarang	45,500	70,000	91,000	113,500	136,500
	Padalarang	46,000	70,500	92,000	114,500	137,500
	Baros	47,500	72,500	94,500	118,000	142,000
	Pasteur	48,500	74,500	96,500	120,500	145,000
	Pasir Koja	49,000	75,500	98,500	123,000	147,500
	Kopo	49,500	75,500	98,500	123,000	148,000
	Moh. Toha	49,500	76,000	98,500	123,000	148,000
	Buah Batu	50,500	78,500	100,500	125,500	151,000
	Cileunyi	53,500	82,500	105,500	132,000	158,500

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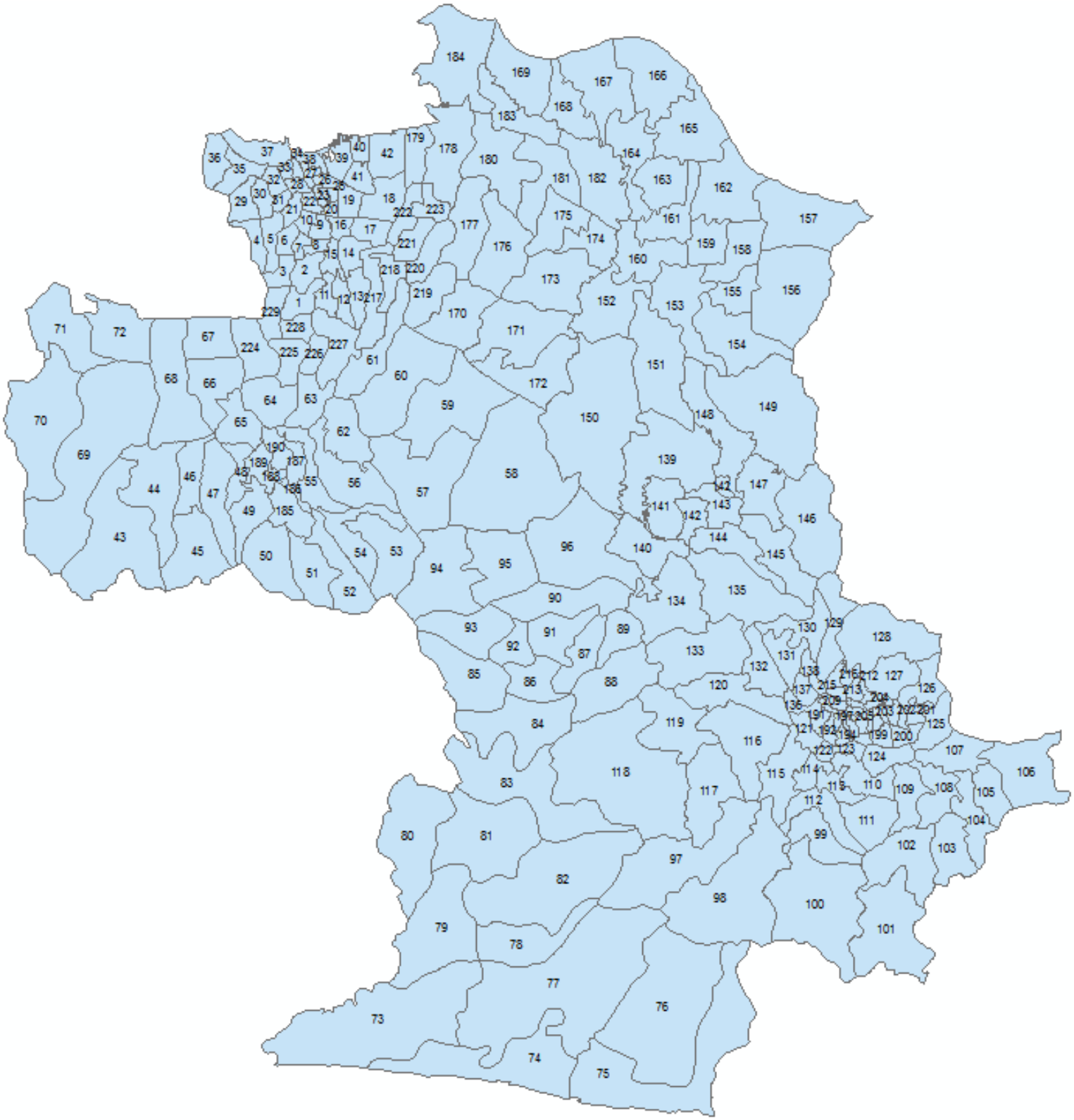
13.3 Map of districts



Number	District
1	JAGAKARSA
2	PASAR MINGGU
3	CILANDAK
4	PESANGGRAHAN
5	KEBAYORAN LAN
6	KEBAYORAN BAR
7	MAMPANG PRAPATAN
8	PANCORAN
9	TEBET
10	SETIA BUDI
11	PASAR REBO
12	CIRACAS
13	CIPAYUNG
14	MAKASAR
15	KRAMAT JATI
16	JATINEGARA
17	DUREN SAWIT
18	CAKUNG
19	PULO GADUNG
20	MATRAMAN
21	TANAH ABANG
22	MENTENG
23	SENEN
24	JOHAR BARU
25	CEMPAKA PUTIH
26	KEMAYORAN
27	SAWAH BESAR
28	GAMBIR
29	KEMBANGAN
30	KEBON JERUK
31	PALMERAH
32	GROGOL PETAMBURAN
33	TAMBORA
34	TAMAN SARI
35	CENGKARENG
36	KALI DERES
37	PENJARINGAN
38	PADEMANGAN
39	TANJUNG PRIOK
40	KOJA
41	KELAPA GADING
42	CILINCING
43	NANGGUNG
44	LEUWILIANG
45	PAMIJAHAN
46	CIBUNGBULANG
47	CIAMPEA
48	DRAMAGA
49	CIOMAS
50	CIJERUK
51	CARINGIN
52	CIAWI
53	CISARUA
54	MEGAMENDUNG
55	SUKARAJA
56	BABAKAN MADA
57	SUKAMAKMUR
58	CARIU
59	JONGGOL
60	CILEUNGSI
61	GUNUNG PUTRI
62	CITEUREUP
63	CIBINONG
64	BOJONGGEDE
65	KEMANG
66	PARUNG
67	GUNUNG SINDUI
68	RUMPIN
69	CIGUDEG
70	JASINGA
71	TENJO
72	PARUNG PANJAN
73	AGRABINTA
74	SINDANGBARAN
75	CIDAUN
76	NARINGGUL
77	CIBINONG
78	TANGGEUNG
79	KADUPANDAK
80	TAKOKAK
81	SUKANAGARA
82	PAGELARAN
83	CAMPAKA
84	CIBEBER
85	WARUNGKONDA
86	CILAKU
87	SUKALUYU
88	BOJONGPICUNG
89	CIRANJANG
90	MANDE
91	KARANGTENGAH
92	CIANJUR
93	CUGENANG
94	PACET
95	SUKARESMI
96	CIKALONG KULO
97	CIWIDEY
98	PASIRJAMBU
99	CIMAUNG
100	PANGALENGAN
101	KERTASARI
102	PACET
103	IBUN
104	PASEH
105	CIKANCUNG
106	CICALENGKA
107	RANCAEKEK
108	MAJALAYA
109	CIPARAY
110	BALEENDAH
111	ARJASARI
112	BANJARAN
113	PAMEUNGPEUK
114	KETAPANG
115	SOREANG
116	CILILIN
117	SINDANGKERTA
118	GUNUNGHALU
119	CIPONGKOR
120	BATUJAJAR
121	MARGAASIH
122	MARGAHAYU
123	DAYEUHKOLOT
124	BOJONGSOANG
125	CILEUNYI
126	CILEUNGKRANG
127	CIMENYAN
128	LEMBANG
129	PARONGPONG
130	CISARUA
131	NGAMPRAH
132	PADALARANG
133	CIPATAT
134	CIPEUNDEUY
135	CIKALONG WETA
136	CIMAHI SELATAN
137	CIMAHI TENGAH
138	CIMAHI UTARA
139	JATILUHUR
140	MANIIS
141	TEGAL WARU
142	PLERED
143	SUKATANI
144	DARANGDAN
145	BOJONG
146	WANAYASA
147	PASAWAHAN
148	PURWAKARTA
149	CAMPAKA
150	PANGKALAN
151	CIAMPEL
152	TELUKJAMBE
153	KLARI
154	CIKAMPEK
155	TIRTAMULYA
156	JATISARI
157	CILAMAYA
158	LEMAHABANG
159	TALAGASARI
160	KARAWANG
161	RAWAMERTA
162	TEMPURAN
163	KUTAWALUYA
164	RENGASDENGKL
165	PEDES
166	CIBUAYA
167	TIRTAJAYA
168	BATUJAYA
169	PAKISJAYA
170	SETU
171	SERANG
172	CIBARUSAH
173	LEMAHABANG
174	KEDUNGWARING
175	CIKARANG
176	CIBITUNG
177	TAMBUN
178	BABELAN
179	TARUMAJAYA
180	TEMBELANG
181	SUKATANI
182	PEBAYURAN
183	CABANGBUNGIN
184	MUARA GEMBOI
185	KOTA BOGOR SELATAN
186	KOTA BOGOR TIMUR
187	KOTA BOGOR UTARA
188	KOTA BOGOR TENGAH
189	KOTA BOGOR BARAT
190	TANAH SEREAL
191	BANDUNG KULON
192	BABAKAN CIPARAY
193	BOJONG LOA KALER
194	BOJONG LOA KIDUL
195	ASTANA ANYAR
196	REGOL
197	LENGKONG
198	BANDUNG KIDUL
199	MARGACINTA
200	RANCASARI
201	CIBIRU
202	UJUNG BERUNG
203	ARCAMANIK
204	CICADAS
205	KIARACONDONG
206	BATUNUNGGAL
207	SUMUR BANDUNG
208	ANDIR
209	CICENDO
210	BANDUNG WETAN
211	CIBEUNYING KIDUL
212	CIBEUNYING KALER
213	COBLONG
214	SUKAJADI
215	SUKASARI
216	CIDADAP
217	PONDOKGEDE
218	JATIASIH
219	BANTAR GEBANG
220	BEKASI TIMUR
221	BEKASI SELATAN
222	BEKASI BARAT
223	BEKASI UTARA
224	SAWANGAN
225	PANCORAN MAS
226	SUKMA JAYA
227	CIMANGGIS
228	BEJI
229	LIMO

13.4 Population data and travel budgets used

OBJECTID	DISTRICT	POP	LABOUR FORCE	EXPENDITURE	EMPLOYMENT	Group 1 (IDR) per day	Group 2 (IDR) per day	Group 3 (IDR) per day	Group 4 (IDR) per day	Group 5 (IDR) per day	Group 6 (IDR) per day	Group 7 (IDR) per day	Group 8 (IDR) per day	Group 9 (IDR) per day	Group 10 (IDR) per day
1	JAGAKARSA	345176	173875,0327	1,31413E+13	159527,4341	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
2	PASAR MINGGU	298099	150161,0001	1,1349E+13	137770,2059	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
3	CILANDAK	195947	98704,11336	7,45996E+12	90559,37301	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
4	PESANGGRAHAN	217864	109744,3337	8,29437E+12	100688,5905	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
5	KEBAYORAN LAMA	301757	152003,6394	1,14883E+13	139460,7966	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
6	KEBAYORAN BARU	142834	71949,57477	5,43788E+12	66012,53137	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
7	MAMPANG PRAPATAN	144189	72632,12706	5,48947E+12	66638,76168	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
8	PANCORAN	151097	76111,88442	5,75246E+12	69831,38085	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
9	TEBET	210042	105804,1684	7,99658E+12	97073,55471	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
10	SETIA BUDI	134936	67971,12607	5,13719E+12	62362,37123	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
11	PASAR REBO	201166	97305,39776	7,65866E+12	88553,35289	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
12	CIRACAS	263918	127658,978	1,00477E+13	116176,8081	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
13	CIPAYUNG	252822	122291,7654	9,62527E+12	111292,3445	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
14	MAKASAR	193590	93640,8337	7,37023E+12	85218,39468	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
15	KRAMAT JATI	283254	137011,9361	1,07839E+13	124688,523	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
16	JATINEGARA	270208	130701,4949	1,02872E+13	118945,6686	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
17	DUREN SAWIT	392961	190077,9774	1,49605E+13	172981,5879	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
18	CAKUNG	519352	251214,186	1,97724E+13	228618,9561	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
19	PULO GADUNG	264023	127709,7672	1,00517E+13	116223,0292	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
20	MATRAMAN	149778	72448,66362	5,70225E+12	65932,33493	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
21	TANAH ABANG	144815	86420,08488	5,5133E+12	79367,82898	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
22	MENTENG	67989	40573,24967	2,58843E+12	37262,29551	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
23	SENEN	95061	56728,78976	3,6191E+12	52099,47306	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
24	JOHAR BARU	116899	69760,87769	4,4505E+12	64068,08577	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
25	CEMPAKA PUTIH	84677	50532,01345	3,22377E+12	46408,38073	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
26	KEMAYORAN	218780	130559,5841	8,32924E+12	119905,3525	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
27	SAWAH BESAR	100329	59872,53182	3,81966E+12	54986,67206	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
28	GAMBIR	78051	46577,86863	2,9715E+12	42776,91137	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
29	KEMBANGAN	294025	156407,655	1,11939E+13	143348,0835	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
30	KEBON JERUK	352288	187400,8671	1,34121E+13	171753,4551	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
31	PALMERAH	201537	107208,3311	7,67278E+12	98256,75605	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
32	GROGOL PETAMBURAN	230551	122642,4327	8,77738E+12	112402,1562	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
33	TAMBORA	238936	127102,8635	9,09661E+12	116490,1545	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
34	TAMAN SARI	109932	58478,72231	4,18526E+12	53595,92385	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
35	CENGKARENG	546381	290649,3357	2,08014E+13	266380,9853	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
36	KALI DERES	422935	224981,7926	1,61017E+13	206196,4856	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
37	PENJARINGAN	323156	161327,9418	1,2303E+13	146387,5323	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
38	PADEMANGAN	156425	78091,4583	5,95531E+12	70859,49121	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
39	TANJUNG PRIOK	384169	191787,23	1,46258E+13	174026,0181	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
40	KOJA	299543	149539,7136	1,1404E+13	135690,9994	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
41	KELAPA GADING	156199	77978,63318	5,9467E+12	70757,1147	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
42	CILINCING	391544	195469,0232	1,49066E+13	177366,8443	2607,624886	8260,955639	14031,10799	19754,32309	24754,70457	29630,96311	33613,32783	37245,22777	40159,50935	42581,47134
43	NANGGUNG	91584	40731,51498	7,76178E+11	37525,11365	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
44	LEUWILIANG	200712	89265,63412	1,70104E+12	82238,6073	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
45	PAMIJAHAN	145937	64904,73338	1,23682E+12	59795,40652	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
46	CIBUNGBULANG	136457	60688,55193	1,15648E+12	55911,12458	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
47	CIAMPEA	220224	97943,4962	1,86641E+12	90233,34457	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
48	DRAMAGA	109764	48816,97688	9,30254E+11	44974,08472	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
49	CIOMAS	262888	116918,0917	2,22799E+12	107714,2522	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
50	CIJERUK	181983	80936,00729	1,54231E+12	74564,69206	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
51	CARINGIN	124524	55381,41129	1,05535E+12	51021,7642	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
52	CIAWI	112272	49932,39704	9,51509E+11	46001,69855	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
53	CISARUA	122803	54616,00536	1,04076E+12	50316,61133	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
54	MEGAMENDUNG	105609	46969,06191	8,9504E+11	43271,63836	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
55	SUKARAJA	188864	83996,2968	1,60063E+12	77384,07434	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
56	BABAKAN MADANG	112334	49959,97122	9,52035E+11	46027,10208	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
57	SUKAMAKMUR	81298	36156,86916	6,89004E+11	33310,5858	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
58	CARIU	104880	46644,84289	8,88862E+11	42972,942	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
59	JONGGOL	133763	59490,40923	1,13365E+12	54807,30015	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
60	CILEUNGSI	372184	165526,928	3,15427E+12	152496,5813	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
61	GUNUNG PUTRI	337920	150288,1895	2,86388E+12	138457,4424	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
62	CITEUREUP	216267	96183,64071	1,83287E+12	88612,02562	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
63	CIBINONG	355970	158315,8345	3,01686E+12	145853,148	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
64	BOJONGGEDE	363832	161812,4188	3,08349E+12	149074,4797	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
65	KEMANG	155292	69065,32173	1,31611E+12	63628,47167	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
66	PARUNG	229745	102177,9122	1,9471E+12	94134,42562	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
67	GUNUNG SINDUR	112282	49936,84449	9,51594E+11	46005,79589	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
68	RUMPIN	140781	62611,62879	1,19312E+12	57682,81605	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
69	CIGUDEG	188519	83842,85981	1,59771E+12	77242,71598	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
70	JASINGA	101464	45125,59439	8,59911E+11	41573,28935	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
71	TENJO	72031	32035,41837	6,10465E+11	29513,57728	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
72	PARUNG PANJANG	119914	53331,1374	1,01628E+12	49132,8887	580,4820009	1838,966979	3123,45755	4397,499446	5510,631731	6596,133072	7482,645184	8291,140515	8939,887199	9479,038881
73	AGRABINTA	69696	28759,41047	6,63557E+11	24681,03297	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
74	SINDANGBARANG	53121	21919,88986	5,05751E+11	18811,42608	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
75	CIDAUN	65802	27152,58735	6,26483E+11	23302,07374	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
76	NARINGGUL	45473	18764,01332	4,32936E+11	16103,085	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
77	CIBINONG	355970	146887,7317	3,38909E+12	126057,5543	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
78	TANGGEUNG	79999	33010,84823	7,61649E+11	28329,57352	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
79	KADUPANDAK	82973	34238,04186	7,89964E+11	29382,73858	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
80	TAKOKAK	51797	21373,55349	4,93145E+11	18342,56578	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
81	SUKANAGARA	49990	20627,91164	4,75941E+11	17702,66354	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
82	PAGELARAN	69218	28562,16819	6,59006E+11	24511,76165	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
83	CAMPAKA	88857	36666,0201	8,45983E+11	31466,40476	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
84	CIBEBER	118461	48881,83718	1,12784E+12	41949,89449	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
85	WARUNGKONDANG	119145	49164,08346	1,13435E+12	42192,11537	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
86	CILAKU	100256	41369,71213	9,5451E+11	35503,06533	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
87	SUKALUYU	71852	29649,06396	6,84083E+11	25444,52452	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
88	BOJONGPICUNG	127731	52707,01704	1,21609E+12	45232,62486	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
89	CIRANJANG	76786	31685,03347	7,31059E+11	27191,77281	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
90	MANDE	71385	29456,36072	6,79637E+11	25279,14856	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
91	KARANGTENGAH	137744	56838,78898	1,31142E+12	48778,46942	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
92	CIANJUR	162474	67043,39499	1,54687E+12	57535,95831	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
93	CUGENANG	102523	42305,16873	9,76094E+11	36305,86465	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
94	PACET	206972	85405,08357	1,97052E+12	73293,77232	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
95	SUKARESMI	82002	33837,36768	7,80719E+11	29038,88409	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
96	CIKALONG KULON	96791	39939,91189	9,21521E+11	34276,02534	652,1047886	2065,86797	3508,845447	4940,085037	6190,561179	7409,997134	8405,891567	9314,143117	10042,93543	10648,61036
97	CIWIDEY	124544	52670,65298	1,15029E+12	47339,87491	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
98	PASIRJAMBU	82565	34917,39838	7,62571E+11	31383,42089	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
99	CIMAUNG	76217	32232,77844	7,03941E+11	28970,51039	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
100	PANGALENGAN	143729	60784,14281	1,32748E+12	54632,20132	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
101	KERTASARI	67390	28499,7696	6,22414E+11	25615,31804	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
102	PACET	206972	87530,11297	1,91159E+12	78671,22133	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
103	IBUN	79092	33448,63892	7,30494E+11	30063,31406	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
104	PASEH	125410	53036,8913	1,15829E+12	47669,04638	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
105	CIKANCUNG	87540	37021,36564	8,0852E+11	33274,44638	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
106	CICALENGKA	164389	69521,42193	1,5183E+12	62485,18352	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
107	RANCAEKEK	175193	74090,51988	1,61808E+12	66591,84469	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
108	MAJALAYA	237167	100299,8198	2,19048E+12	90148,51066	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
109	CIPARAY	157564	66635,07489	1,45526E+12	59890,96263	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
110	BALEENDAH	248024	104891,3319	2,29075E+12	94275,31743	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
111	ARJASARI	95012	40181,33416	8,77531E+11	36114,5956	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
112	BANJARAN	191735	81086,26389	1,77087E+12	72879,55193	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
113	PAMEUNGPEUK	73508	31087,12069	6,7892E+11	27940,80425	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
114	KETAPANG	121035	51186,66884	1,11788E+12	46006,08427	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
115	SOREANG	206582	87365,17885	1,90799E+12	78522,98014	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
116	CILILIN	196320	87910,93192	2,38813E+12	79523,85443	833,1818222	2639,520013	4483,184749	6311,852212	7909,561674	9467,611682	10740,04696	11900,5026	12831,66661	13605,52588
117	SINDANGKERTA	65449	29307,67412	7,96151E+11	26511,59713	833,1818222	2639,520013	4483,184749	6311,852212	7909,561674	9467,611682	10740,04696	11900,5026	12831,66661	13605,52588
118	GUNUNGHALU	126705	56737,7477	1,5413E+12	51324,72481	833,1818222	2639,520013	4483,184749	6311,852212	7909,561674	9467,611682	10740,04696	11900,5026	12831,66661	13605,52588
119	CIPONGKOR	87004	38959,87531	1,05836E+12	35242,9372	833,1818222	2639,520013	4483,184749	6311,852212	7909,561674	9467,611682	10740,04696	11900,5026	12831,66661	13605,52588
120	BATUJAJAR	122005	54633,11557	1,48412E+12	49420,88355	833,1818222	2639,520013	4483,184749	6311,852212	7909,561674	9467,611682	10740,04696	11900,5026	12831,66661	13605,52588
121	MARGAASIH	145639	61591,89708	1,34512E+12	55358,20306	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
122	MARGAHAYU	124132	52496,41489	1,14648E+12	47183,27139	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
123	DAYEUHKOLOT	115047	48654,29578	1,06257E+12	43730,01179	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
124	BOJONGSOANG	117309	49610,91366	1,08347E+12	44589,81071	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
125	CILEUNYI	189281	80048,44768	1,7482E+12	71946,77273	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
126	CILEUNGKRANG	50765	21468,92423	4,68866E+11	19296,06203	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
127	CIMENYAN	111927	47334,82285	1,03376E+12	42544,08224	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
128	LEMBANG	185158	78304,79802	1,71012E+12	70379,59724	632,603067	2004,086516	3403,910583	4792,347795	6005,427436	7188,395171	8154,506575	9035,596127	9742,593315	10330,15504
129	PARONGPONG	104838	46945,83476	1,2753E+12	42467,00209	833,1818222	2639,520013	4483,184749	6311,852212	7909,561674	9467,611682	10740,04696	11900,5026	12831,66661	13605,52588
130	CISARUA	122803	54990,45524	1,49383E+12	49744,13149	833,1818222	2639,520013	4483,184749	6311,852212	7909,561674	9467,611682	10740,04696	11900,5026	12831,66661	13605,52588
131	NGAMPRAH	165822	74254,10835	2,01713E+12	67169,95002	833,1818222	2639,520013	4483,184749	6311,852212	7909,561674	9467,611682	10740,04696	11900,5026	12831,66661	13605,52588
132	PADALARANG	167126	74838,03182	2,033E+12	67698,1647	833,1818222	2639,520013	4483,184749	6311,852212	7909,561674	9467,611682	10740,04696	11900,5026	12831,66661	13605,52588
133	CIPATAT	126772	56767,7499	1,54211E+12	51351,86468	833,1818222	2639,520013	4483,184749	6311,852212	7909,561674	9467,611682	10740,04696	11900,5026	12831,66661	13605,52588
134	CIPEUNDEUY	79387	35549,02787	9,657E+11	32157,49914	833,1818222	2639,520013	4483,184749	6311,852212	7909,561674	9467,611682	10740,04696	11900,5026	12831,66661	13605,52588
135	CIKALONG WETAN	116664	52241,44744	1,41915E+12	47257,39075	833,1818222	2639,520013	4483,184749	6311,852212	7909,561674	9467,611682	10740,04696	11900,5026	12831,66661	13605,52588
136	CIMAHI SELATAN	245989	112542,8184	4,30851E+12	99680,53582	1199,661929	3800,52899	6455,140906	9088,158908	11388,63062	13631,99843	15464,12213	17135,01126	18475,75343	19589,99943
137	CIMAHI TENGAH	168494	77087,95776	2,95118E+12	68277,73682	1199,661929	3800,52899	6455,140906	9088,158908	11388,63062	13631,99843	15464,12213	17135,01126	18475,75343	19589,99943
138	CIMAHI UTARA	156508	71604,22385	2,74125E+12	63420,72735	1199,661929	3800,52899	6455,140906	9088,158908	11388,63062	13631,99843	15464,12213	17135,01126	18475,75343	19589,99943

139	JATILUHUR	79349	37118,65008	1,2738E+12	33612,11482	1099,532771	3483,319817	5916,365932	8329,620458	10438,0845	12494,21078	14173,41723	15704,84647	16933,68429	17954,93033
140	MANIS	36934	17277,34719	5,92908E+11	15645,18581	1099,532771	3483,319817	5916,365932	8329,620458	10438,0845	12494,21078	14173,41723	15704,84647	16933,68429	17954,93033
141	TEGAL WARU	48653	22759,37545	7,81035E+11	20609,33625	1099,532771	3483,319817	5916,365932	8329,620458	10438,0845	12494,21078	14173,41723	15704,84647	16933,68429	17954,93033
142	PLERED	81500	38124,86586	1,30833E+12	34523,27513	1099,532771	3483,319817	5916,365932	8329,620458	10438,0845	12494,21078	14173,41723	15704,84647	16933,68429	17954,93033
143	SUKATANI	70472	32966,08033	1,1313E+12	29851,83122	1099,532771	3483,319817	5916,365932	8329,620458	10438,0845	12494,21078	14173,41723	15704,84647	16933,68429	17954,93033
144	DARANGDAN	65106	30455,92045	1,04516E+12	27578,80184	1099,532771	3483,319817	5916,365932	8329,620458	10438,0845	12494,21078	14173,41723	15704,84647	16933,68429	17954,93033
145	BOJONG	48552	22712,12868	7,79414E+11	20566,55281	1099,532771	3483,319817	5916,365932	8329,620458	10438,0845	12494,21078	14173,41723	15704,84647	16933,68429	17954,93033
146	WANAYASA	67961	31791,46023	1,09099E+12	28788,17547	1099,532771	3483,319817	5916,365932	8329,620458	10438,0845	12494,21078	14173,41723	15704,84647	16933,68429	17954,93033
147	PASAWAHAN	74348	34779,23346	1,19352E+12	31493,69888	1099,532771	3483,319817	5916,365932	8329,620458	10438,0845	12494,21078	14173,41723	15704,84647	16933,68429	17954,93033
148	PURWAKARTA	189069	88444,54311	3,03516E+12	80089,33871	1099,532771	3483,319817	5916,365932	8329,620458	10438,0845	12494,21078	14173,41723	15704,84647	16933,68429	17954,93033
149	CAMPAKA	88857	41566,39516	1,42644E+12	37639,68905	1099,532771	3483,319817	5916,365932	8329,620458	10438,0845	12494,21078	14173,41723	15704,84647	16933,68429	17954,93033
150	PANGKALAN	70923	32079,01295	9,44113E+11	28934,01424	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
151	CIAMPEL	41488	18765,33832	5,5228E+11	16925,60076	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
152	TELUKJAMBE	192978	87285,41885	2,56889E+12	78728,0318	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
153	KLARI	167244	75645,7347	2,22632E+12	68229,49222	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
154	CIKAMPEK	311387	140842,7112	4,14512E+12	127034,6135	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
155	TIRTAMULYA	44882	20300,47036	5,9746E+11	18310,22978	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
156	JATISARI	126409	57175,75326	1,68273E+12	51570,2918	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
157	CILAMAYA	136898	61920,00783	1,82236E+12	55849,42375	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
158	LEMAHABANG	61531	27830,93983	8,19089E+11	25102,41854	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
159	TALAGASARI	61219	27689,81986	8,14935E+11	24975,13384	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
160	KARAWANG	290976	131610,6605	3,87342E+12	118707,665	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
161	RAWAMERTA	49620	22443,50384	6,60532E+11	20243,16211	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
162	TEMPURAN	59033	26701,07541	7,85836E+11	24083,32505	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
163	KUTAWALUYA	54656	24721,32498	7,2757E+11	22297,66764	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
164	RENGASDENGKLOK	170551	77141,51598	2,27034E+12	69578,6284	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
165	PEDES	111186	50290,27444	1,48009E+12	45359,85938	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
166	CIBUAYA	49324	22309,62078	6,56591E+11	20122,40484	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
167	TIRTAJAYA	62775	28393,61051	8,35649E+11	25609,92546	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
168	BATUJAYA	77529	35066,95705	1,03205E+12	31629,02288	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
169	PAKISJAYA	37506	16964,24939	4,99273E+11	15301,08904	911,7674941	2888,479421	4906,038532	6907,185828	8655,591175	10360,59639	11753,04771	13022,95747	14041,94882	14888,79847
170	SETU	128816	83340,31534	1,93129E+12	77368,53903	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
171	SERANG	127747	82648,70252	1,91527E+12	76726,48394	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
172	CIBARUSAH	109502	70844,7026	1,64172E+12	65768,30332	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
173	LEMAHABANG	61531	39808,81989	9,22512E+11	36956,30647	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
174	KEDUNGWARINGIN	58400	37783,15128	8,7557E+11	35075,78778	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
175	CIKARANG	96952	62725,20691	1,45357E+12	58230,61262	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
176	CIBITUNG	231335	149667,2141	3,46832E+12	138942,7631	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
177	TAMBUN	636298	411666,8424	9,53979E+12	382168,7263	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
178	BABELAN	248270	160623,681	3,72222E+12	149114,141	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
179	TARUMAJAYA	128866	83372,66393	1,93204E+12	77398,56967	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
180	TEMBELANG	35523	22982,37814	5,32584E+11	21335,56865	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
181	SUKATANI	70472	45593,39447	1,05656E+12	42326,38556	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
182	PEBAYURAN	95167	61570,3623	1,4268E+12	57158,51877	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
183	CABANGBUNGIN	47336	30625,05564	7,09692E+11	28430,60771	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
184	MUARA GEMBONG	36041	23317,50951	5,4035E+11	21646,68609	1026,893378	3253,198221	5525,507888	7779,333474	9748,504215	11668,79483	13237,0664	14667,3235	15814,97953	16768,7581
185	KOTA BOGOR SELATAN	191468	84577,7488	2,84918E+12	76288,64405	1019,227858	3228,913855	5484,26126	7721,262564	9675,733905	11581,69	13138,25479	14557,83535	15696,9244	16643,58324
186	KOTA BOGOR TIMUR	100517	44401,68371	1,49577E+12	40050,06389	1019,227858	3228,913855	5484,26126	7721,262564	9675,733905	11581,69	13138,25479	14557,83535	15696,9244	16643,58324
187	KOTA BOGOR UTARA	182615	80667,08587	2,71744E+12	72761,24853	1019,227858	3228,913855	5484,26126	7721,262564	9675,733905	11581,69	13138,25479	14557,83535	15696,9244	16643,58324
188	KOTA BOGOR TENGAH	103719	45816,11302	1,54341E+12	41325,87102	1019,227858	3228,913855	5484,26126	7721,262564	9675,733905	11581,69	13138,25479	14557,83535	15696,9244	16643,58324
189	KOTA BOGOR BARAT	224963	99373,59822	3,34761E+12	89634,41531	1019,227858	3228,913855	5484,26126	7721,262564	9675,733905	11581,69	13138,25479	14557,83535	15696,9244	16643,58324
190	TANAH SEREAL	209737	92647,77039	3,12104E+12	83567,7572	1019,227858	3228,913855	5484,26126	7721,262564	9675,733905	11581,69	13138,25479	14557,83535	15696,9244	16643,58324
191	BANDUNG KULON	142411	67965,41909	2,40109E+12	60509,29716	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
192	BABAKAN CIPARAY	147096	70201,32775	2,48008E+12	62499,91627	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
193	BOJONG LOA KALER	120405	57463,09123	2,03006E+12	51159,12342	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
194	BOJONG LOA KIDUL	85668	40884,91425	1,44438E+12	36399,64939	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
195	ASTANA ANYAR	68830	32849,00602	1,16049E+12	29245,31759	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
196	REGOL	81467	38879,9938	1,37355E+12	34614,67802	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
197	LENGKONG	71187	33973,88045	1,20023E+12	30246,78808	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
198	BANDUNG KIDUL	58957	28137,13276	9,9403E+11	25050,3587	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
199	MARGACINTA	95108	45390,13896	1,60354E+12	40410,63004	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
200	RANCASARI	113977	54395,33864	1,92168E+12	48427,91753	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
201	CIBIRU	112264	53577,81217	1,8928E+12	47700,0775	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
202	UJUNG BERUNG	102133	48742,80883	1,72199E+12	43395,49647	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
203	ARCAMANIK	143774	68615,90863	2,42407E+12	61088,42498	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
204	CICADAS	63578	30342,49752	1,07194E+12	27013,78472	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
205	KIARACONDONG	131972	62983,42325	2,22508E+12	56073,84939	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
206	BATUNUNGGAL	120927	57712,21489	2,03886E+12	51380,91705	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
207	SUMUR BANDUNG	36579	17457,2685	6,16731E+11	15542,12512	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
208	ANDIR	97553	46557,01125	1,64477E+12	41449,49102	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
209	CICENDO	99752	47606,48043	1,68184E+12	42383,82857	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
210	BANDUNG WETAN	31124	14853,87859	5,24759E+11	13224,33917	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
211	CIBEUNYING KIDUL	107806	51450,23889	1,81764E+12	45805,90888	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
212	CIBEUNYING KALER	70924	33848,36413	1,1958E+12	30135,04148	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
213	COBLONG	131530	62772,47946	2,21763E+12	55886,04712	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
214	SUKAJADI	108375	51721,79322	1,82723E+12	46047,67244	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
215	SUKASARI	81908	39090,46034	1,38099E+12	34802,0554	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
216	CIDADAP	58672	28001,11697	9,98225E+11	24929,26448	1154,811831	3658,44388	6213,8115	8748,392507	10962,85967	13122,3578	14885,98643	16494,40834	17785,02605	18857,61527
217	PONDOKGEDE	430125	228509,8786	5,83159E+12	206792,7311	928,6222884	2941,87541	4996,73081	7034,871008	8815,597109	10552,12079	11970,31275	13263,69787	14301,52614	15164,03052
218	JATIASIH	194554	103359,5139	2,63774E+12	93536,42081	928,6222884	2941,87541	4996,73081	7034,871008	8815,597109	10552,12079	11970,31275	13263,69787	14301,52614	15164,03052
219	BANTAR GEBANG	237400	126122,0463	3,21864E+12	114135,6451	928,6222884	2941,87541	4996,73081	7034,871008	8815,597109	10552,12079	11970,31275	13263,69787	14301,52614	15164,03052
220	BEKASI TIMUR	449775	238949,2139	6,098E+12	216239,9317	928,6222884	2941,87541	4996,73081	7034,871008	8815,597109	10552,12079	11970,31275	13263,69787	14301,52614	15164,03052
221	BEKASI SELATAN	190403	101154,2375	2,58146E+12	91540,72973	928,6222884	2941,87541	4996,73081	7034,871008	8815,597109	10552,12079	11970,31275	13263,69787	14301,52614	15164,03052
222	BEKASI BARAT	407921	216713,6953	5,53055E+12	196117,6348	928,6222884	2941,87541	4996,73081	7034,871008	8815,597109	10552,12079	11970,31275	13263,69787	14301,52614	15164,03052
223	BEKASI UTARA	302167	160530,4144	4,09675E+12	145273,9068	928,6222884	2941,87541	4996,73081	7034,871008	8815,597109	10552,12079	11970,31275	13263,69787	14301,52614	15164,03052
224	SAWANGAN	252076	116442,6783	2,11424E+12	107488,1581	574,4745377	1819,935335	3091,132592	4351,989308	5453,601681	6527,869067	7405,206581	8205,334717	8847,36746	9380,939411
225	PANCORAN MAS	381935	176429,0703	3,20341E+12	162861,5563	574,4745377	1819,935335	3091,132592	4351,989308	5453,601681	6527,869067	7405,206581	8205,334717	8847,36746	9380,939411
226	SUKMA JAYA	403251	186275,6727	3,3822E+12	171950,9483	574,4745377	1819,935335	3091,132592	4351,989308	5453,601681	6527,869067	7405,206581	8205,334717	8847,36746	9380,939411
227	CIMANGGIS	517024	238831,3814	4,33645E+12	220465,0877	574,4745377	1819,935335	3091,132592	4351,989308	5453,601681	6527,869067	7405,206581	8205,334717	8847,36746	9380,939411
228	BEJI	187227	86486,66802	1,57033E+12	79835,78514	574,4745377	1819,935335	3091,132592	4351,989308	5453,601681	6527,869067	7405,206581	8205,334717	8847,36746	9380,939411
229	LIMO	220647	101924,5293	1,85064E+12	94086,46448	574,4745377	1819,935335	3091,132592	4351,989308	5453,601681	6527,869067	7405,206581	8205,334717	8847,36746	9380,939411

13.5 Road network

Road network used in ArcGIS

The red strip is the Cipularang toll road and the yellow strips the other toll roads which connect Jakarta and Bandung. The black stripes are the rest of the road network in the study area. One road network is used with the Cipularang toll road, and one road network without the Cipularang toll road.

13.6 District appearances in top 15 for each measure

	District	AGC	ATT	CCA	PCA	CTA 40	CTA 180	PTA	Frequency costs	Frequency time	Frequency total
1	JAGAKARSA	0	0	0	0	0	0	0	0	0	0
2	PASAR MINGGU	0	0	0	0	0	0	0	0	0	0
3	CILANDAK	0	0	0	0	0	0	0	0	0	0
4	PESANGGRAHAN	0	0	0	0	0	0	0	0	0	0
5	KEBAYORAN LAMA	0	0	0	0	0	0	0	0	0	0
6	KEBAYORAN BARU	0	0	0	0	0	0	0	0	0	0
7	MAMPANG PRAPATAN	0	0	0	0	0	0	0	0	0	0
8	PANCORAN	0	0	0	0	0	0	0	0	0	0
9	TEBET	0	0	0	0	0	0	0	0	0	0
10	SETIA BUDI	0	0	0	0	0	0	0	0	0	0
11	PASAR REBO	0	0	0	0	0	0	0	0	0	0
12	CIRACAS	0	0	0	0	0	0	0	0	0	0
13	CIPAYUNG	0	0	0	0	0	0	0	0	0	0
14	MAKASAR	0	0	0	0	0	0	0	0	0	0
15	KRAMAT JATI	0	0	0	0	0	0	0	0	0	0
16	JATINEGARA	0	0	0	0	0	0	0	0	0	0
17	DUREN SAWIT	0	0	0	0	0	0	0	0	0	0
18	CAKUNG	0	0	0	0	0	0	0	0	0	0
19	PULO GADUNG	0	0	0	0	0	0	0	0	0	0
20	MATRAMAN	0	0	0	0	0	0	0	0	0	0
21	TANAH ABANG	0	0	0	0	0	0	0	0	0	0
22	MENTENG	0	0	0	0	0	0	0	0	0	0
23	SENEN	0	0	0	0	0	0	0	0	0	0
24	JOHAR BARU	0	0	0	0	0	0	0	0	0	0
25	CEMPAKA PUTIH	0	0	0	0	0	0	0	0	0	0
26	KEMAYORAN	0	0	0	0	0	0	0	0	0	0
27	SAWAH BESAR	0	0	0	0	0	0	0	0	0	0
28	GAMBIR	0	0	0	0	0	0	0	0	0	0
29	KEMBANGAN	0	0	0	0	0	0	0	0	0	0
30	KEBON JERUK	0	0	0	0	0	0	0	0	0	0
31	PALMERAH	0	0	0	0	0	0	0	0	0	0
32	GROGOL PETAMBURAN	0	0	0	0	0	0	0	0	0	0
33	TAMBORA	0	0	0	0	0	0	0	0	0	0
34	TAMAN SARI	0	0	0	0	0	0	0	0	0	0
35	CENGKARENG	0	0	0	0	0	0	0	0	0	0
36	KALI DERES	0	0	0	0	0	0	0	0	0	0
37	PENJARINGAN	0	0	0	0	0	0	0	0	0	0
38	PADEMANGAN	0	0	0	0	0	0	0	0	0	0
39	TANJUNG PRIOK	0	0	0	0	0	0	0	0	0	0
40	KOJA	0	0	0	0	0	0	0	0	0	0
41	KELAPA GADING	0	0	0	0	0	0	0	0	0	0
42	CILINCING	0	0	0	0	0	0	0	0	0	0
43	NANGGUNG	0	0	0	0	0	0	0	0	0	0
44	LEUWILIANG	0	0	0	0	0	0	0	0	0	0
45	PAMIJAHAN	0	0	0	0	0	0	0	0	0	0
46	CIBUNGBULANG	0	0	0	0	0	0	0	0	0	0
47	CIAMPEA	0	0	0	0	0	0	0	0	0	0
48	DRAMAGA	0	0	0	0	0	0	0	0	0	0
49	CIOMAS	0	0	0	0	0	0	0	0	0	0
50	CIJERUK	0	0	0	0	0	0	0	0	0	0
51	CARINGIN	0	0	0	0	0	0	0	0	0	0
52	CIAWI	0	0	0	0	0	0	0	0	0	0
53	CISARUA	0	0	0	0	0	0	0	0	0	0
54	MEGAMENDUNG	0	0	0	0	0	0	0	0	0	0
55	SUKARAJA	0	0	0	0	0	0	0	0	0	0
56	BABAKAN MADANG	0	0	0	0	0	0	0	0	0	0
57	SUKAMAKMUR	0	0	0	0	0	0	0	0	0	0
58	CARIU	0	0	0	0	0	0	0	0	0	0
59	JONGGOL	0	0	0	0	0	0	0	0	0	0
60	CILEUNGSI	0	0	0	0	0	0	0	0	0	0
61	GUNUNG PUTRI	0	0	0	0	0	0	0	0	0	0
62	CITEUREUP	0	0	0	0	0	0	0	0	0	0
63	CIBINONG	0	0	0	0	0	0	0	0	0	0
64	BOJONGGEDE	0	0	0	0	0	0	0	0	0	0
65	KEMANG	0	0	0	0	0	0	0	0	0	0
66	PARUNG	0	0	0	0	0	0	0	0	0	0
67	GUNUNG SINDUR	0	0	0	0	0	0	0	0	0	0
68	RUMPIN	0	0	0	0	0	0	0	0	0	0
69	CIGUDEG	0	0	0	0	0	0	0	0	0	0
70	JASINGA	0	0	0	0	0	0	0	0	0	0
71	TENJO	0	0	0	0	0	0	0	0	0	0
72	PARUNG PANJANG	0	0	0	0	0	0	0	0	0	0
73	AGRABINTA	0	0	0	0	0	0	0	0	0	0
74	SINDANGBARANG	0	0	0	0	0	0	0	0	0	0
75	CIDAUN	0	0	0	0	0	0	0	0	0	0
76	NARINGGUL	0	0	0	0	0	0	0	0	0	0
77	CIBINONG	0	0	0	0	0	0	0	0	0	0
78	TANGGEUNG	0	0	0	0	0	0	0	0	0	0
79	KADUPANDAK	0	0	0	0	0	0	0	0	0	0
80	TAKOKAK	0	0	0	0	0	0	0	0	0	0
81	SUKANAGARA	0	0	0	0	0	0	0	0	0	0
82	PAGELARAN	0	0	0	0	0	0	0	0	0	0
83	CAMPAKA	0	0	0	0	0	0	0	0	0	0
84	CIBEBER	0	0	0	0	0	0	0	0	0	0
85	WARUNGKONDANG	0	0	0	0	0	0	0	0	0	0
86	CILAKU	0	0	0	0	0	0	0	0	0	0
87	SUKALUYU ◆	0	0	1	0	0	0	0	1	0	1
88	BOJONGPICUNG ◆	0	0	1	0	0	0	0	1	0	1
89	CIRANJANG ◆	0	0	1	0	0	0	0	1	0	1
90	MANDE	0	0	0	0	0	0	0	0	0	0
91	KARANGTENGAH ◆	0	0	1	0	0	0	0	1	0	1
92	CIANJUR	0	0	0	0	0	0	0	0	0	0
93	CUGENANG	0	0	0	0	0	0	0	0	0	0
94	PACET	0	0	0	0	0	0	0	0	0	0
95	SUKARESMI	0	0	0	0	0	0	0	0	0	0
96	CIKALONG KULON	0	0	0	0	0	0	0	0	0	0
97	CIWIDEY ◆	0	0	0	1	0	0	0	1	0	1
98	PASIRJAMBU ◆	1	0	0	1	0	0	0	2	0	2
99	CIMAUNG	0	0	0	0	0	0	0	0	0	0
100	PANGALENGAN	0	0	0	0	0	0	0	0	0	0
101	KERTASARI	0	0	0	0	0	0	0	0	0	0
102	PACET ◆	0	0	0	0	0	0	0	0	0	0
103	IBUN ◆	0	0	0	0	0	0	0	0	0	0
104	PASEH	0	0	0	0	0	0	0	0	0	0
105	CIKANCUNG	0	0	0	0	0	0	0	0	0	0
106	CICALENGKA	0	1	0	0	0	1	0	0	2	2
107	RANCAEKEK	1	1	0	0	0	1	0	1	2	3
108	MAJALAYA	0	0	0	0	0	0	0	0	0	0
109	CIPARAY	0	0	0	0	0	0	0	0	0	0
110	BALEENDAH	0	1	0	0	1	1	0	0	3	3
111	ARJASARI	0	0	0	0	0	0	0	0	0	0
112	BANJARAN	0	0	0	0	0	0	0	0	0	0
113	PAMEUNGPEUK	0	1	0	0	0	1	0	0	2	2
114	KETAPANG ◆ ◆	1	1	0	1	1	1	1	2	4	6

	District	AGC	ATT	CCA	PCA	CTA 40	CTA 180	PTA	Frequency costs	Frequency time	Frequency total
115	SOREANG ◆ ◆	1	1	1	1	0	0	0	3	1	4
116	CILILIN	0	0	0	0	0	0	0	0	0	0
117	SINDANGKERTA	0	0	1	0	0	0	0	1	0	1
118	GUNUNGHALU	0	0	0	0	0	0	0	0	0	0
119	CIPONGKOR	0	0	0	0	0	0	0	0	0	0
120	BATUJAJAR	0	0	0	0	0	0	0	0	0	0
121	MARGAASIH	0	0	0	0	0	1	0	1	0	1
122	MARGAHAYU ◆ ◆	1	1	0	1	1	1	1	2	4	6
123	DAYEUHKOLOT	0	1	0	0	1	1	1	0	4	4
124	BOJONGSOANG ◆	1	1	0	1	1	1	0	2	3	5
125	CILEUNYI	1	1	0	0	1	1	0	1	3	4
126	CILEUNGKRANG	0	0	0	0	0	0	0	0	0	0
127	CIMENYAN	0	0	0	0	0	0	0	0	0	0
128	LEMBANG	0	0	0	0	0	0	0	0	0	0
129	PARONGPONG ◆	0	0	0	0	0	0	0	0	0	0
130	CISARUA	0	0	0	0	0	1	0	0	1	1
131	NGAMPRAH ◆	0	0	0	0	1	0	0	0	1	1
132	PADALARANG ◆ ◆	0	0	0	0	1	0	1	0	2	2
133	CIPATAT ◆	0	0	1	0	1	0	1	1	2	3
134	CIPEUNDEUY ◆	0	0	1	0	0	0	0	1	0	1
135	CIKALONG WETAN	0	0	0	0	1	0	0	0	1	1
136	CIMAHI SELATAN ◆ ◆	1	1	1	1	0	0	1	3	2	5
137	CIMAHI TENGAH ◆ ◆	1	1	1	1	1	0	1	1	3	6
138	CIMAHI UTARA ◆	0	0	0	0	0	0	0	0	0	0
139	JATILUHUR	0	0	0	0	0	0	0	0	0	0
140	MANIIS	0	0	0	0	0	0	0	0	0	0
141	TEGAL WARU	0	0	0	0	0	0	0	0	0	0
142	PLERED ◆	0	0	1	0	0	0	0	1	0	1
143	SUKATANI	0	0	0	0	0	0	1	0	1	1
144	DARANGDAN ◆	0	0	1	0	0	0	0	1	0	1
145	BOJONG ◆	0	0	1	0	0	0	0	1	0	1
146	WANAYASA	0	0	0	0	0	0	1	0	1	1
147	PASAWAHAN ◆ ◆	0	0	1	1	0	0	1	2	1	3
148	PURWAKARTA ◆ ◆	0	0	1	1	0	0	1	2	1	3
149	CAMPAKA ◆ ◆	0	0	0	1	0	0	1	1	1	2
150	PANGKALAN	0	0	0	0	0	0	0	0	0	0
151	CIAMPEL ◆ ◆	1	0	0	1	0	0	1	2	1	3
152	TELUKJAMBE	1	0	0	0	0	0	0	1	0	1
153	KLARI	0	0	0	0	0	0	0	0	0	0
154	CIKAMPEK	0	0	0	0	0	0	0	0	0	0
155	TIRTAMULYA	0	0	0	0	0	0	0	0	0	0
156	JATISARI	0	0	0	0	0	0	1	0	1	1
157	CILAMAYA	0	0	0	0	0	0	0	0	0	0
158	LEMAHABANG	0	0	0	0	0	0	0	0	0	0
159	TALAGASARI	0	0	0	0	0	0	0	0	0	0
160	KARAWANG ◆	1	0	0	1	0	0	0	2	0	2
161	RAWAMERTA ◆	0	0	0	1	0	0	0	1	0	1
162	TEMPURAN	0	0	0	0	0	0	0	0	0	0
163	KUTAWALUYA	0	0	0	0	0	0	0	0	0	0
164	RENGASDENGKLOK	0	0	0	0	0	0	0	0	0	0
165	PEDES	0	0	0	0	0	0	0	0	0	0
166	CIBUAYA	0	0	0	0	0	0	0	0	0	0
167	TIRTAJAYA	0	0	0	0	0	0	0	0	0	0
168	BATUJAYA	0	0	0	0	0	0	0	0	0	0
169	PAKISJAYA	0	0	0	0	0	0	0	0	0	0
170	SETU	0	0	0	0	0	0	0	0	0	0
171	SERANG	0	0	0	0	0	0	0	0	0	0
172	CIBARUSAH	0	0	0	0	0	0	0	0	0	0
173	LEMAHABANG	1	0	0	0	0	0	0	1	0	1
174	KEDUNGWARINGIN	0	0	0	0	0	0	0	0	0	0
175	CIKARANG	1	0	0	0	0	0	0	1	0	1
176	CIBITUNG	0	0	0	0	0	0	0	0	0	0
177	TAMBUN	0	0	0	0	0	0	0	0	0	0
178	BABELAN	0	0	0	0	0	0	0	0	0	0
179	TARUMAJAYA	0	0	0	0	0	0	0	0	0	0
180	TEMBELANG	0	0	0	0	0	0	0	0	0	0
181	SUKATANI	0	0	0	0	0	0	0	0	0	0
182	PEBAYURAN	0	0	0	0	0	0	0	0	0	0
183	CABANGBUNGIN	0	0	0	0	0	0	0	0	0	0
184	MUARA GEMBONG	0	0	0	0	0	0	0	0	0	0
185	KOTA BOGOR SELATAN	0	0	0	0	0	0	0	0	0	0
186	KOTA BOGOR TIMUR	0	0	0	0	0	0	0	0	0	0
187	KOTA BOGOR UTARA	0	0	0	0	0	0	0	0	0	0
188	KOTA BOGOR TENGAH	0	0	0	0	0	0	0	0	0	0
189	KOTA BOGOR BARAT	0	0	0	0	0	0	0	0	0	0
190	TANAH SEREAL	0	0	0	0	0	0	0	0	0	0
191	BANDUNG KULON ◆	0	0	0	0	0	0	0	0	0	0
192	BABAKAN CIPARAY	0	1	0	0	0	0	0	0	1	1
193	BOJONG LOA KALER ◆	0	0	0	0	0	0	0	0	0	0
194	BOJONG LOA KIDUL	0	0	0	0	0	0	0	0	0	0
195	ASTANA ANYAR	0	0	0	0	0	0	0	0	0	0
196	REGOL	0	0	0	0	0	1	0	0	1	1
197	LENGKONG	0	0	0	0	0	0	0	0	0	0
198	BANDUNG KIDUL ◆	1	1	0	1	0	1	1	2	3	5
199	MARGACINTA	0	1	0	0	1	1	0	0	3	3
200	RANCASARI	0	0	0	0	1	1	0	0	2	2
201	CIBIRU	0	0	0	0	1	0	0	0	1	1
202	UJUNG BERUNG	0	0	0	0	1	0	0	0	1	1
203	ARCAMANIK	0	0	0	0	0	0	0	0	0	0
204	CICADAS	0	0	0	0	0	0	0	0	0	0
205	KIARACONDONG	0	0	0	0	0	0	0	0	0	0
206	BATUNUNGGAL	0	0	0	0	0	0	0	0	0	0
207	SUMUR BANDUNG ◆	0	0	0	0	0	0	0	0	0	0
208	ANDIR ◆	0	0	0	0	0	0	0	0	0	0
209	CICENDO ◆	0	0	0	0	0	0	0	0	0	0
210	BANDUNG WETAN ◆	0	0	0	0	0	0	0	0	0	0
211	CIBEUNYING KIDUL	0	0	0	0	0	0	0	0	0	0
212	CIBEUNYING KALER ◆	0	0	0	0	0	0	0	0	0	0
213	COBLONG ◆	0	0	0	0	0	0	0	0	0	0
214	SUKAJADI ◆	0	0	0	0	0	0	0	0	0	0
215	SUKASARI ◆	0	0	0	0	0	0	0	0	0	0
216	CIDADAP ◆	0	0	0	0	0	0	0	0	0	0
217	PONDOKGEDE	0	0	0	0	0	0	0	0	0	0
218	JATIASIH	0	0	0	0	0	0	0	0	0	0
219	BANTAR GEBANG	0	0	0	0	0	0	0	0	0	0
220	BEKASI TIMUR	0	0	0	0	0	0	0	0	0	0
221	BEKASI SELATAN	0	0	0	0	0	0	0	0	0	0
222	BEKASI BARAT	0	0	0	0	0	0	0	0	0	0
223	BEKASI UTARA	0	0	0	0	0	0	0	0	0	0
224	SAWANGAN	0	0	0	0	0	0	0	0	0	0
225	PANCORAN MAS	0	0	0	0	0	0	0	0	0	0
226	SUKMA JAYA	0	0	0	0	0	0	0	0	0	0
227	CIMANGGIS	0	0	0	0	0	0	0	0	0	0
228	BEJI	0	0	0	0	0	0	0	0	0	0
229	LIMO	0	0	0	0	0	0	0	0	0	0

◆ = Appearance in top 15 lowest income group

◆ = Appearance in top 15 highest income group