The Effectiveness of Urban Forest in Absorbing CO₂ Emission at Rajekwesi Type A Terminal

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ABSTRACT

The terminal in Bojonegoro District is Rajekwesi Type A Terminal. It is located close to the CBD that has resulted in a decrease in environmental quality, due to gas emissions released by motor vehicles. The decrease in environmental quality can be overcome with an ecological approach, for example by creating or expanding green open spaces (urban forest). This study aimed to provide information about the capability of urban forest of the terminal to absorb CO₂ emissions. This study began with a survey counting the number of motor vehicles at the gateway of the terminal on Sunday, Monday, Wednesday, Friday and Saturday for 24 hours. Then, the measurement of tree biomass was carried out using the nondestructive method. After the data was collected, the amount of CO₂ emissions from motor vehicles was calculated by adding up CO₂ emissions in a stationary (idle) position when it was moving. The total CO₂ emissions of motor vehicles at Rajekwesi Type A Terminal was 292.058,087 kgCO₂/year. The amount of carbon sink (Wtc) of a tree was calculated by multiplying the total biomass (Wt) by the carbon concentration. The amount of Wtc at the urban forest of Rajekwesi Type A Terminal was 4.366,059 kg/year. After the amount of Wtc was found out, the amount of CO₂ absorbed by the tree could be found out by multiplying Wtc by the conversion constant of the carbon (C) element to CO₂ (3,67). The amount of CO₂ absorbed by the trees at the urban forest of Rajekwesi Type A Terminal was 16.023,44 kgCO₂/year. If they were compared, the absorption of CO₂ was still much smaller than the emission rate. Thus, the function of the urban forest of terminal as an absorber of CO₂ emissions was still not optimal.

Keywords: Urban forest, CO₂ emissions, Terminals, Motor vehicles, Trees

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1. Introduction

When viewed from the regional transportation network, Bojonegoro District is a crossing area for transportation from various areas, such as Tuban District, Lamongan District, Nganjuk District, Madiun District, Ngawi District and Blora District. This position is also supported by the region’s potential as an agricultural, tourism and mining area. Therefore, what needs attention is the transportation network, especially land transportation facilities and terminals, so that it can support all the activities of its districts.

The terminal in Bojonegoro District is Rajekwesi Type A Terminal. As the node of the transportation network, the terminal is a major source of air pollution. The location of the terminal, which is close to office, trade, services, education and health sites, has caused environmental degradation in the surrounding area, due to gas emissions released by motor vehicles. Based on Informasi Kinerja Pengelolaan Lingkungan Hidup Daerah (IKPLHD) Provinsi Jawa Timur in 2016, fuel use from the transportation sector in 2016 was dominated by gasoline, amounting to 14,46 million kiloliters, and diesel, amounting to 6.723,01 kiloliters. By using the IPCC GL 2006 method, from the 2016 fuel use, the greenhouse gas emission was 33.891,51 Gg CO₂e.

The environmental quality degradation can be overcome with an ecological approach. The ecological approach emphasizes the relationship between humans and their environmental activities, so that humans and their various activities continue to be the focus in relation to their abiotic, biotic, social, economic and cultural environments. An example of the effort to overcome environmental degradation, with an ecological approach, is the creation or expansion of urban forests. Urban forest is a form of green open space, which is useful for controlling the microclimate. It serves to absorb solar radiation, lower air temperature, increase air humidity, reduce wind speed and absorb pollutants from transportation activities (Fandeli et al., 2004; Hamdaningsih et al., 2010).

Based on the identification of the problem, this study aims to provide information on the capacity of urban forest to absorb CO₂ emissions at the terminal. The scope of the area in this study is Rajekwesi Type A Terminal, which is located on Veteran Street, Sukorejo Village, Bojonegoro District. For the scope of the material, the measurement of CO₂ levels was limited to the calculation of CO₂ emissions from motor vehicles. This measurement was a measurement of node 1 (observations made on emission sources),
which may produce more accurate pollutant data, because it is directly related to the intensity of the emitter’s activities (Soedomo, 2001; Kosegeran et al., 2013). Meanwhile, biomass measurements were only carried out on trees. Measurements of understory biomass were not carried out because of their very low absorption of CO₂. According to Birdsey (1992) and Boyce (1995), the percentage of carbon content in each tree stand was around 30.6 %, while in understory it was around 15 % (Fandeli et al., 2004; Hairiah and Rahayu, 2007; Ludang et al., 2017).

2. Research Methods

2.1. Data Collection Method

Data collection in this study was carried out through a survey of counting the number of motor vehicles and a survey of tree biomass measurements. The survey to count the number of motor vehicles was conducted on Sunday, Monday, Wednesday, Friday and Saturday, for 24 hours, with 15 minute intervals. This survey was conducted at the terminal entrance by counting the number of motor vehicles entering the terminal.

For the survey, the measurement of tree biomass was carried out by means of nondestructive technique (not cutting down trees) (Hairiah and Rahayu, 2007; Ihsan et al., 2015), by recording the names, ages and diameter of the trunk at breast height (1.3 m from the ground) of all trees. Consequently, the specific gravity (SG) of wood from each tree species was calculated by cutting the wood from one of the branches, then by measuring its length and diameter. The wood samples were put in an oven at 100°C for 48 hours and then weighed for their dry weights. The wood SG could be calculated by dividing its dry weight by its volume.

2.2. Data Analysis Method

Data analysis in this study included the analysis of calculating CO₂ emissions and the analysis of calculating the carbon sink in trees. The CO₂ emission of each type of motor vehicle can be obtained by adding up the CO₂ emission of a motor vehicle when it was in a stationary (idle) position and when it moved, based on the following equations.

\[
ECO_2 = t_{\text{stationary}} \times \text{confuel} \times \text{convfuel}
\]

where:

- \( ECO_2(s) \): CO₂ emission of motor vehicle in stationary position (kgCO₂)
- \( t_{\text{stationary}} \): duration of the vehicle engine run in stationary position (minutes)
- \( \text{confuel} \): total fuel consumption at stationary position per minute (l/minute)
- \( \text{convfuel} \): fuel conversion factor to CO₂ (kgCO₂/l)

\[
ECO_2(g) = l_{\text{travel}} \times \text{convfuel}
\]

First, the amount of CO₂ emission for each type of motor vehicle was calculated; then it was multiplied by the number of units for each type of motor vehicle in the terminal on Sunday, Monday, Wednesday, Friday and Saturday. Next, it was averaged for each day’s character, so that the average daily CO₂ emissions were obtained. Finally, it was multiplied by 365 to find the total annual CO₂ emission.

The analysis of the carbon sink in trees was preceded by the processing of biomass data. The method of processing tree biomass data (Hairiah and Rahayu, 2007; Ihsan et al., 2015) is to use allometric equations that have been developed by previous researchers, whose measurements begin with felling and weighing several trees.

\[
Y = 0.11p d^{2.62}
\]

where:

- \( Y \): tree biomass (kg/tree)
- \( d \): stem diameter at breast height/ dbh (cm)
- \( p \): wood SG (g/cm³)

Then, the tree biomass was divided by the age of the tree to obtain the tree biomass per year. The total biomass of all trees at the terminal were added up, whether they were small, medium or large, to obtain the total tree biomass (Wt).

The carbon concentration in biomass was about 46 %. Therefore, the estimated amount of carbon sink (Wtc) can be calculated by multiplying the total tree biomass (Wt) by the carbon concentration (Hairiah and Rahayu, 2007; Fitrand et al., 2020). After the amount of carbon sink (Wtc) was known, the amount of CO₂ absorbed by trees could be calculated by multiplying the amount of carbon sink by the constant for the conversion from carbon (C) to CO₂ (3.67) (Fandeli and Muhammad, 2009; Anonymous, 2012).

3. Results and Discussion

3.1. Motor Vehicles and CO₂ Emissions at Rajekwesi Type A Terminal

The routes and mileages of motor vehicles at Rajekwesi Type A Terminal were different. The closer the distance a motor vehicle traveled, the less was its CO₂ emissions. Conversely, the farther the distance it traveled, the more was its CO₂ emissions. The routes and mileages of motor vehicles at Rajekwesi Type A Terminal can be seen in Table 1.
Table 1. Types, Routes and Mileages of Motor Vehicles at Rajekwesi Type A Terminal

| No. | Motor Vehicle Type          | Routes Taken within the Terminal                            | Distance Travelled (km) |
|-----|----------------------------|--------------------------------------------------------------|-------------------------|
| 1.  | Motorcycle (small, medium, big) | Entrance gate – private vehicle parking lot – exit           | 0.213                   |
| 2.  | Sedan/ Jeep                 | Entrance gate – private vehicle parking lot – exit           | 0.213                   |
| 3.  | Family car/ MPV             | Entrance gate – private vehicle parking lot – exit           | 0.213                   |
| 4.  | Pick-up                     | Entrance gate – private vehicle parking lot – exit           | 0.213                   |
| 5.  | Microbus                    | Entrance gate – rural transport arrival route – rural transport | 0.297                   |
| 6.  | Bus                         | Entrance gate – inter province/ within province transport arrival route – inter province/ within province transport vehicle waiting area – inter province/ within province transport departure route – exit | 0.442                   |

Source: Primary survey, 2020

In addition to the distance traveled, the amount of CO₂ emissions released by motor vehicles was also influenced by the number of motor vehicles (Saadah, 2002; Tim Penulis Pedoman Penyelenggaraan Inventarisasi GRK Nasional, 2012). The highest number of motor vehicles occurred on Friday (a normal day before the weekend). On Fridays, the number of prospective passengers, especially workers, was higher compared to those of other days, and thus the number of private vehicles used and public vehicles operated were also greater. The number of motor vehicles in Rajekwesi Type A Terminal can be seen in Table 2.

Table 2. Number of Motor Vehicles at Rajekwesi Type A Terminal

| Day          | Motorcycle (unit) | Sedan/ Jeep (unit) | Family car/ MPV (unit) | Pick-up (unit) | Microbus (unit) | Bus (unit) | Total (unit) |
|--------------|-------------------|--------------------|------------------------|----------------|-----------------|------------|-------------|
| Sunday       | 0                 | 474                | 20                     | 8              | 17              | 5          | 14          | 114          | 652          |
| Monday       | 2                 | 731                | 61                     | 10             | 26              | 8          | 12          | 135          | 983          |
| Wednesday    | 1                 | 806                | 93                     | 8              | 23              | 7          | 14          | 135          | 1,087        |
| Friday       | 4                 | 909                | 69                     | 5              | 27              | 6          | 14          | 135          | 1,169        |
| Saturday     | 1                 | 717                | 50                     | 7              | 11              | 9          | 16          | 136          | 947          |

Source: Primary survey, 2020

The amount of CO₂ emissions contained in the Rajekwesi Type A Terminal can be calculated by adding up the CO₂ emissions of each type of motor vehicle in stationary (idle) and moving positions. The CO₂ emissions of each type of motor vehicle in stationary (idle) position can be seen in Table 3, while the CO₂ emissions of each type of motor vehicle in moving position can be seen in Table 4.

Table 3. CO₂ Emission for Each Type of Motor Vehicle in Stationary (Idle) Position

| No. | Motor Vehicle Type | Running Machine Duration in Stationary Position (minute) | Fuel Consumption (l/minute) | Conversion Factor Oil Fuel to CO₂ (kgCO₂/l) | CO₂ Emission of Motor Vehicle in Stationary Position (kgCO₂) |
|-----|--------------------|-----------------------------------------------------------|-----------------------------|---------------------------------------------|-------------------------------------------------------------|
| 1.  | Motorcycle         | Small 0.1                                                | 0.014                       | 2.10                                        | 2.10 × 0.014 = 0.003                                       |
| 2.  | Motorcycle         | Medium 0.1                                               | 0.017                       | 2.10                                        | 2.10 × 0.017 = 0.004                                       |
| 3.  | Motorcycle         | Big 0.1                                                  | 0.024                       | 2.10                                        | 2.10 × 0.024 = 0.005                                       |
| 4.  | Sedan/ Jeep        | Small 0.1                                                | 0.127                       | 2.10                                        | 2.10 × 0.127 = 0.027                                       |
| 5.  | Sedan/ Jeep        | Medium 0.1                                               | 0.148                       | 2.10                                        | 2.10 × 0.148 = 0.031                                       |
| 6.  | Sedan/ Jeep        | Big 0.1                                                  | 0.083                       | 2.58                                        | 2.58 × 0.083 = 0.043                                       |
| 7.  | Family car/ MPV    | Small 10.0                                               | 0.105                       | 2.58                                        | 2.58 × 0.105 = 0.270                                       |
| 8.  | Family car/ MPV    | Medium 10.0                                              | 0.144                       | 2.58                                        | 2.58 × 0.144 = 0.373                                       |
| 9.  | Family car/ MPV    | Big 15.0                                                 | 0.144                       | 2.58                                        | 2.58 × 0.144 = 0.373                                       |

Source: Primary survey and analysis results, 2020

Table 4. CO₂ Emission of Each Type of Motor Vehicle When Moving

| No. | Motor Vehicle Type | Mileage Average (km) | Conversion Factor Oil Fuel to CO₂ (kgCO₂/km) | CO₂ Emission of Motor Vehicle in Moving Position (kgCO₂) |
|-----|--------------------|-----------------------|-----------------------------------------------|-----------------------------------------------------------|
| 1.  | Motorcycle         | 0.213                 | 0.08                                           | 0.017                                                      |
| 2.  | Motorcycle         | 0.213                 | 0.10                                           | 0.021                                                      |
| 3.  | Motorcycle         | 0.213                 | 0.14                                           | 0.030                                                      |
| 4.  | Sedan/ Jeep        | 0.213                 | 0.18                                           | 0.020                                                      |
| 5.  | Sedan/ Jeep        | 0.213                 | 0.21                                           | 0.023                                                      |
| 6.  | Sedan/ Jeep        | 0.213                 | 0.15                                           | 0.017                                                      |
| 7.  | Family car/ MPV    | 0.297                 | 0.19                                           | 0.014                                                      |
| 8.  | Family car/ MPV    | 0.442                 | 0.26                                           | 0.031                                                      |

Source: Primary survey and analysis results, 2020

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To find out the amount of CO$_2$ emission for each type of motor vehicle, the CO$_2$ emissions of motor vehicles in stationary position and moving position were added up. The amount of CO$_2$ emission for each type of motor vehicle can be seen in Table 5. Based on Table 5, it can be seen that the CO$_2$ emission of each type of motor vehicle (except motorcycle) was dominated by CO$_2$ emission in stationary position. This happens because the amount of fuel that a vehicle burns in a stationary position is greater than the fuel it spends when it moves. The more fuel is burned, the more CO$_2$ emission is released. The stationary position occurs when the vehicle is loading and unloading passengers and goods.

Table 5. CO$_2$ Emission of Each Type of Motor Vehicle at Rajekwesi Type A Terminal

| No. | Motor Vehicle Type | CO$_2$ Emission of Motor Vehicle in Stationary/Idle Position (kgCO$_2$) | CO$_2$ Emission of Motor Vehicle in Moving Position (kgCO$_2$) | CO$_2$ Emission of Motor Vehicle (kgCO$_2$) |
|-----|--------------------|-------------------------------------------------|-------------------------------------------------|-------------------------|
| 1.  | Motor cycle        | Small 0,003                                     | 0,017                                          | 0,020                   |
| 2.  | Sedan/jeep         | Medium 0,004                                    | 0,021                                          | 0,025                   |
| 3.  | Family car/MPV     | Big 0,005                                       | 0,030                                          | 0,035                   |
| 4.  | Microbus           | 0,027                                           | 0,020                                          | 0,047                   |
| 5.  | Pick-up            | 0,031                                           | 0,023                                          | 0,054                   |
| 6.  | Bus                | 2,709                                           | 0,017                                          | 2,723                   |

Source: Analysis results, 2020

After obtaining the amount of CO$_2$ emissions for each type of motor vehicle, the CO$_2$ emissions of motor vehicles in the Rajekwesi Type A Terminal are obtained by multiplying the number of units for each type of motor vehicle. The CO$_2$ emissions of motor vehicles at Rajekwesi Type A Terminal can be seen in Table 6.

Table 6. Total Motor Vehicle CO$_2$ Emissions at Rajekwesi Type A Terminal

| Day     | Motorcycle Type | Motor Vehicle Type | Small (kgCO$_2$) | Medium (kgCO$_2$) | Big (kgCO$_2$) | Sedan/Jeep (kgCO$_2$) | Family Car/MPV (kgCO$_2$) | Pick-up (kgCO$_2$) | Microbus (kgCO$_2$) | Bus (kgCO$_2$) | Total (kgCO$_2$) |
|---------|-----------------|--------------------|------------------|------------------|---------------|-----------------------|--------------------------|------------------|-------------------|---------------|------------------|
| Sunday  | 0,000           | 11,950             | 0,700            | 0,376            | 0,918         | 0,300                 | 38,122                   | 0,420            | 38,122            | 0,540         | 180,195         |
| Monday  | 0,040           | 18,275             | 2,135            | 0,470            | 1,404         | 0,480                 | 32,676                   | 0,540            | 32,676            | 0,540         | 180,195         |
| Wednesday | 0,020         | 20,150             | 3,255            | 0,376            | 1,242         | 0,420                 | 38,122                   | 0,540            | 38,122            | 0,540         | 180,195         |
| Friday  | 0,080           | 22,725             | 2,415            | 0,235            | 1,458         | 0,360                 | 38,122                   | 0,540            | 38,122            | 0,540         | 180,195         |
| Saturday| 0,020           | 17,925             | 1,750            | 0,329            | 0,594         | 0,540                 | 43,568                   | 0,540            | 43,568            | 0,540         | 180,195         |

Note: dbh (diameter at breast height)

| Total CO$_2$ emission (kgCO$_2$/day) | 800,159 |
| Yearly CO$_2$ emission (kgCO$_2$/year) | 292,058,087 |

Source: Analysis results, 2020

3.2. Biomass and Carbon Sink in Rajekwesi Type A Terminal

The urban forest in Rajekwesi Type A Terminal was in the form of an area of 0,5 ha. Based on the growth rate, the trees in the urban forest at Rajekwesi Type A Terminal included:

1. Small trees/ seedling (dbh 5 - 20 cm)
   a. Tanjung (Mimusops elengi) : 250 trees
   b. Mahogany (Swietenia mahagoni) : 71 trees
   c. Trembesi (Samanea saman) : 2 trees
   d. Glodokan (Polyalthia longifolia) : 102 trees
   e. Sawo kecik (Manilkara kauki) : 95 trees
   f. Kiarapayung (Artocarpus heterophyllus) : 2 trees
   g. Mango (Mangifera indica) : 1 tree
   h. Bintaro (Cerbera manghas) : 1 tree

2. Medium sized trees/ poles (dbh 20 - 35 cm)
   a. Tanjung (Mimusops elengi) : 3 trees
   b. Mahogany (Swietenia mahagoni) : 25 trees
   c. Trembesi (Samanea saman) : 2 trees
   d. Sengon (Albizia chinensis) : 2 trees
   e. Glodokan (Polyalthia longifolia) : 10 trees
   f. Sawo kecik (Manilkara kauki) : 2 trees

3. Large trees / trees (dbh > 35 cm)
   a. Mahogany (Swietenia mahagoni) : 1 tree
   b. Trembesi (Samanea saman) : 8 trees
   c. Sengon (Albizia chinensis) : 2 trees
   d. Acacia (Acacia pycnantha) : 1 tree

   Note: dbh (diameter at breast height)

   The specific gravity of tree wood / timber found in the urban forest at Rajekwesi Type A Terminal can be seen in Table 7, while the tree biomass in the urban forest at Rajekwesi Type A Terminal can be seen in Table 8.

   The carbon concentration in biomass was around 46 %. Therefore, the estimated amount of carbon sink (Wtc) contained in the urban forest of Rajekwesi Type A Terminal could be calculated by multiplying the total biomass (Wt) in the urban forest at Rajekwesi Type A Terminal by its carbon concentration (Hairiah and Rahayu, 2007; Fitrada et al., 2020).

Without the figures, we can't provide the exact calculation. However, the general formula for calculating the total carbon sink (Wtc) is:

\[ Wtc = Wt \times 0,46 \]

After the amount of carbon sink (Wtc) was known, the amount of CO$_2$ absorbed by trees in the urban forest at Rajekwesi Type A Terminal could be calculated through the following equation (Fandeli and Muhammad, 2009; Anonymous, 2012):

\[ WCO_2 = Wtc \times 3,67 \]
The total CO₂ emission of motor vehicles in Rajekwesi Type A Terminal was 292,058,087 kgCO₂/year, while the amount of CO₂ absorbed by trees in the terminal’s urban forest was 16,023,44 kgCO₂/year. If the amount of CO₂ absorbed by the trees was compared to the amount of CO₂ emission from the motor vehicles, the absorption capacity for CO₂ was still much smaller than the emission rate. The percentage of CO₂ balance in Rajekwesi Type A Terminal can be seen in Table 9.

### 3.3. Comparison between CO₂ Emission with the Trees Capacity to Absorb CO₂

From Table 9, it can be learnt that the trees in the urban forest at Rajekwesi Type A Terminal could only absorb 16,023,44 kgCO₂/year (5.486%) of the total motor vehicle CO₂ emissions of 292,058,087 kgCO₂/year. Therefore, the function of the terminal urban forest as an absorber of CO₂ emission is still not optimal.

| Table 7. Timber Specific Gravity (ρ) of the Trees in the Urban Forest at Rajekwesi Type A Terminal |
|---|---|---|---|---|
| No. | Tree Name | Botanical name | Monocot/ Dicot | Wood Sample | Timber Specific Gravity ρ (g/cm³) |
| 1. | Tanjung | Minusops elengi | Dicot | 1.94 | 0.81 |
| 2. | Mahogany | Swietenia mahagoni | Dicot | 1.52 | 0.64 |
| 3. | Trembesi | Samanea saman | Dicot | 1.35 | 0.64 |
| 4. | Ketapang | Terminalia catappa | Dicot | 1.38 | 0.66 |
| 5. | Sengon | Albizia chinensis | Dicot | 1.43 | 0.41 |
| 6. | Acacia | Acacia auriculiformis | Dicot | 1.27 | 0.74 |
| 7. | Glodokan | Polyalthia longifolia | Dicot | 0.98 | 0.68 |
| 8. | Sawo kecil | Manilkara kauki | Dicot | 0.79 | 1.06 |
| 9. | Kiarapayung | Felicium decipiens | Dicot | 1.21 | 0.98 |
| 10. | Jackfruit | Artocarpus heterophyllus | Dicot | 1.47 | 0.62 |
| 11. | Mango | Mangifera indica | Dicot | 1.12 | 0.68 |
| 12. | Bintaro | Cerbera manghas | Dicot | 1.07 | 0.40 |

Source: Analysis results, 2020

| Table 8. Tree Biomass in the Urban Forest at Rajekwesi Type A Terminal |
|---|---|---|---|---|
| No. | Local Name | Tree Biomass (kg/tree) | Tree Age (year) | Tree Biomass per Year (kg/year) |
| 1. | Tanjung | 10,066,492 | 6-8 | 1,646,370 |
| 2. | Mahogany | 12,403,758 | 6-14 | 1,706,114 |
| 3. | Trembesi | 54,436,134 | 6-17 | 3,245,903 |
| 4. | Ketapang | 156,309 | 2-8 | 20,217 |
| 5. | Sengon | 3.537,730 | 6-17 | 20,034 |
| 6. | Acacia | 8.627,777 | 17 | 507,516 |
| 7. | Glodokan | 7.416,387 | 6-12 | 1,092,508 |
| 8. | Sawo kecil | 5.651,651 | 6 | 941,942 |
| 9. | Kiarapayung | 550,570 | 6-15 | 38,927 |
| 10. | Jackfruit | 51,527 | 6 | 8,588 |
| 11. | Mango | 89,635 | 6 | 14,939 |
| 12. | Bintaro | 26,243 | 6 | 4,374 |

Total (kg/year) 9,491,430

Source: Analysis results, 2020

| Table 9. CO₂ Balance at Rajekwesi Type A Terminal |
|---|---|---|---|---|
| No. | CO₂ Balance Component | Motor Vehicle Type | Total (kgCO₂/year) | Percentage (%) |
| 1. | CO₂ Emission | Small | 1,042 | 0.004 |
| | | Medium | 6,842,446 | 2.343 |
| | | Big | 874,175 | 0.299 |
| | | Sedan/ jeep | 132,339 | 0.045 |
| | | Family car/ MPV | 422,357 | 0.145 |
| | | Pick-up | 153,300 | 0.052 |
| | | Microbus | 13,914,530 | 4.764 |
| | | Bus | 269,708,511 | 92.348 |
| | | Total | 292,058,087 | 100 |
| 2. | CO₂ Sequestration | Trees and seedlings | 16,023,440 | 5.486 |
| 3. | CO₂ Emission not absorbed by trees | | 276,034,650 | 94.514 |

Source: Analysis results, 2020
4. Conclusion

Based on the results of the research and discussion that have been carried out, several conclusions are obtained. First, when compared to other days, the highest CO\textsubscript{2} emission of motor vehicles at Type A Rajekwesi Terminal was on Saturdays (weekends) and it amounted to 826,870 kg\textsubscript{CO\textsubscript{2}}, of which 92.17\% was from bus emission (762,144 kg\textsubscript{CO\textsubscript{2}}).

Second, the amount of CO\textsubscript{2} absorbed by the trees in the urban forest at Rajekwesi Type A Terminal was 16,023,44 kg\textsubscript{CO\textsubscript{2}}/year, where the tree with the highest biomass was Trembesi (Samanea saman), which had 54,436,134 kg/tree.

Third, if the amount of CO\textsubscript{2} absorbed by trees (16,023,440 kg\textsubscript{CO\textsubscript{2}}/year) was compared to the total CO\textsubscript{2} emissions of motor vehicles (292,058,087 kg\textsubscript{CO\textsubscript{2}}/year), the CO\textsubscript{2} absorption was still smaller than the emission rate. Therefore, the function of the terminal urban forest as an absorber of CO\textsubscript{2} emission was still not optimal.

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