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DOI Number: 10.5958/0976-5506.2019.02518.X Conjecture of TSP Concentration and PM.10 through Measurement Dust Fall (Study of Dust Dispersion from Special Roads for Coal Transport) Junaidi1, Rahmawati1, Muhammad Pahruddin1, Agnes T Diana Nerawati2 1Department of Environmental Health, Health Polytechnic Ministry of Health Banjarmasin; 2Department of Environmental Health, Health Polytechnic Ministry of Health Surabaya ABSTRACT The naming of pollutants in the form of particles refers to their physical characteristics or relative size. Dustfall describes large particles that can settle (fall) because it is influenced by its gravitational force. TSP or dust are smaller particles that can float in the air and follow the movement of the wind. PM10 or PM2,5 are very small particles (equivalent diameter of 10 microns and 2.5 microns) that can enter the human respiratory tract. The existence of these particles is interrelated because they originate from the same source, which is a solid which is mechanically destroyed. Because it comes from the same source and process, the presence of one type of particle under natural conditions will also be followed by the presence of other particles. This makes it possible to estimate the existence of other particles by measuring one of the selected types of particles. This study aims to obtain an estimation model of PM10 and TSP levels through the measurement of dustfall concentration. Dustfall, TSP and PM10 measurements were carried out simultaneously at one coal haul roadside location for 24 hours divided per hour in each measurement set, air temperature humidity measurement, and observation of coal transport volume were also carried out in each measurement set. The results of the study show that; air temperatures ranged from 26 - 35OC and air humidity ranged from 42 - 76%, dustfall levels ranged from 676.95 - 4,041.14 tons/km2. Month, TSP levels ranged from 153.2 - 9457.8 µg/m3 and levels PM10 ranges from 145.0 - 7,603.4 µg/m3. The particulate matter in the air has a positive correlation with air temperature and has a negative correlation with air humidity. The model of TSP relationship with PM10 was TSP = 0.077 + 1.251 (PM10), the relationship between dustfall and TSP was dustfall = 935,702 + 305,333 (TSP), the relationship between dustfall and PM10 was dustfall = 938,719 + 393,762 (PM10). It was concluded that there was a relationship between dustfall with the levels of TSP and PM10 individually, and the estimation model PM10 and TSP by the dustfall was a dustfall filled with 60% by TSP and PM10 and TSP filled with 77.8% PM10. Keywords: pollutants, dustfall, TSP, PM10 Introduction The naming of pollutants in the form of particles refers to their physical characteristics or relative size. Dust fall describes large particles that can settle (fall) Corresponding Author: because they are influenced by their gravitational force. Junaidi TSP or dust are smaller particles that can float in the air Health Polytechnic Ministry of Health Banjarmasin and follow the movement of the wind. PM10 or PM2,5 are Email: jun_aidi1204@yahoo.co.id very small particles (equivalent diameter of 10 microns 716 Indian Journal of Public Health Research & Development, September 2019, Vol.10, No. 9 and 2.5 microns) that can enter the human respiratory tract. The existence of these particles is interrelated because they originate from the same source, which is a solid which is mechanically destroyed. Because it comes from the same source and process, the presence of one type of particle under natural conditions will also be followed by the presence of other particles. This makes it possible to estimate the existence of other particles by measuring one of the selected types of particles.2 Method The coal transportation traffic disperses the Total Particles into ambient air in a certain amount. The total scattered particles consist of various sizes, ranging from large to small. In this study measurements were carried out on dustfall, TSP and PM10 simultaneously on one spot on the side of the road that was considered safe, which is 5 meters away on the edge of the coal haul road. Measurements were carried out for 24 hours divided per hour of observation, besides that, measurements were also made on the air temperature, air humidity and the volume of traffic passing by coal. The measurement data are analyzed statistically and see the third particle fraction of the type of dust. Results and Discussion The concentration of dust from direct measurements in the field is as follows: Table 1: Concentration of dust fall, TSP and PM.10 at the Research Site No. Days to Dust Fall (ton/km2.bulan) TSP (µg/m3) PM.10 (µg/m3) 1. 12.00 – 13.00 4.041,14 9.457,8 7.603,4 2. 13.00 – 14.00 3.972,35 8.336,5 6.826,7 3. 14.00 – 15.00 812,34 3.918,8 2.480,1 4. 15.00 – 16.00 2.663,72 4.152,6 3.468.3 5. 16.00 – 17.00 2.554,47 5.016,4 3.275,6 6. 17.00 – 18.00 1.188,05 869,0 716,0 7. 18.00 – 19.00 852,96 618,2 486,3 8. 19.00 – 20.00 1.218,51 788,2 584,0 9. 20.00 – 21.00 1.329,28 582,3 447,3 10. 21.00 – 22.00 1.396,21 362,0 298,6 11. 22.00 – 23.00 676,95 267,6 185,6 12. 23.00 – 00.00 888,80 356,1 280,5 13. 00.00 – 01.00 1.035,73 362,1 261,0 14. 01.00 – 02.00 1.090,25 311,5 245,8 15. 02.00 – 03.00 1.343,49 215,6 192,4 16. 03.00 – 04.00 893,57 153,2 145,0 17. 04.00 – 05.00 1.613,70 1.062,5 812,7 18. 05.00 – 06.00 1.462,21 838,9 566,1 19. 06.00 – 07.00 1.847,85 2.643,4 1.891,2 20. 07.00 – 08.00 1.399,99 3.465,8 3.092,6 Indian Journal of Public Health Research & Development, September 2019, Vol.10, No. 9 717 Conted... 21. 08.00 – 09.00 1.190,17 2.865,1 2.072,3 22. 09.00 – 10.00 1.787,15 2.783,6 2.129,4 23. 10.00 – 11.00 1.367,11 2.971,6 2.179,4 24. 11.00 – 12.00 2.172,13 1.120,7 1.076,2 Average 1.616,59 2.229,98 1.721,5 Description: Quality standards According to PPRI No. 41 of 1999 Dust Fall: 20 tons/km2. Month TSP: 230 µg/m3 PM10: 150 µg/m3 The concentration of dust fall in Total Suspended Particulate

(TSP) and Particulate Matter 10 micron (PM .10) is very high and has exceeded the maximum quality standard set by PP 41 of 1999. The high concentration of the three dust parameters is caused by: •z The first factor, is the density or volume of coal transportation traffic, recorded the volume of coal truck traffic passing a total of 5,283 units or an average of 220 units per hour. The high level of dust around the road, especially the special road for coal transportation, corresponds to several previous studies, such as;3-4,7 •z The second factor, is that the road conditions are less compact, so that when there is friction between the wheels of the vehicle and the road body and air turbulence due to vehicle speed (reaching 60 km/h) it triggers the dispersion of particles into the air around the road. •z The third factor, is air temperature and air humidity, these two factors are related to the nature of dust (Patty, 1976); During the day the air temperature can reach 35OC, with a low humidity of 42% and a correlation of air temperature with positive particle content, that is, the higher the air temperature the more the particle content, while the air humidity is negatively related, or the smaller the air humidity high particle content. The percentage of PM10 from TSP ranges from 63.3% 96.0% with an average of 77.8% (± 8.4%), while the dustfall content is filled by 60% of the concentration of TSP + PM10 obtained from the average measurement results of dustfall in the field = 1,616.59 tons/km2. Month deducted by 970,638 tons/km2. Month (Dustfall constant = 970,638 - 414,735 (TSP) + 912,450 (PM10)), to 645.95 tons/km2. Month or 40%, it can be concluded that the remaining 60% of dustfall is TSP concentration and PM10. Conclusions and Recommendations Conclusion: 1. Measured Particulate Matter 10 micron (PM10) concentration ranged from 145.0 - 7.603.4 µg/m3, Total Suspended Particulate (TSP) ranged from 153.2 - 9,457.8 µg/m3 and dust fall ranged from between 676.95 - 4,041.14 tons/km2. month. 2. The air temperature at the study site ranged from 26OC to 35OC and air humidity ranged from 42 - 76%. 3. The model for estimating TSP and PM10 by dust fall is a. PM10 and TSP fill 60% of dustfall b. PM10 fills 77.8% of TSP Recommendation: 1. Determination of TSP and PM10 concentrations can be done by measuring the level of dustfall using a dustfall collector and the estimator using the model results of this study. 2. Further research on PM2.5 dust fraction by PM10 and TSP, because these three particulate parameters have the same unit Conflict of Interest: None Ethical Clearance: From ethical committee at Health Polytechnic Ministry of Health Banjarmasin & Surabaya Source of Funding: Self 718 Indian Journal of Public Health Research & Development, September 2019, Vol.10, No. 9 REFERENCES

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