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Quality of leachate and soil in the dry season in the temporary transit system at the lanfill in environmentally frienly trash cans for the environmental sampel settlements, District of Koja North Jakarta

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Abstract

The quality of leachate, soil in the dry season reaching to 240 m3/day/88 tons/day, Dipo due to limited land, so use the operating system after rhythm by scavengers. That is accordance with DKI Jakarta Regional Regulation No.1 of 2012 concerning Regional Spatial Planning to improve integrated solid waste system. But it still has not equipped with waste treatment facilities, taking and of land availability, for buffer zones. This research was aimed analysis the physics concentration, chemistry on leachate, while on the soil tested based on chemical parameters. The research design used a descriptive quantitative approach. Leachate sampling using the *grab sample* technique. Test soil using TCLP government regulation No.85/1999, standard reference using USEPA D1311/1992 and Standard Method 23RD Edition:3111B,3112 B and 3113B 2017. The result of the study in the dry season showed that the concentration of heavy metals in the soil was below the specified limit <0,032mg/l from 1,0mg/l. Lead <0,059mg/l than specified 5,0mg/l, Arsen <0,001mg/l. While leachate is classified as bad at being at a high threshold value referring to government regulation No.82 of 2001.That is on BOD_5 up to 568,58mg/l, COD 5544mg/l, H2S 0,832mg/l. The findings in this study are a transit system, there is a high concentration of leachate in certain parameters, soil quality is still safe. The government needs to conduct a review of the availability of land to accommodate temporary waste that meets environmental and aesthetic aspects so that it does not pose potential risks to human and the environment by taking into account the health impacts on the surrounding environment and preventing leakage or seepage into environmental media.

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Introduction

Leachate can be considered as very dangerous liquid. It contains high organic, inorganic compounds including Zn, and Hg. In addition, it contains a variety of high toxic pollutants resulting from the extraction of dissolved and suspended matter (Purwanti, Heny 2014), contamination of surface water and underground water in the surrounding area, containing BOD, COD around 2.000-30.000mgt & 3.000-60.000mg/l (Sembiring, 2011), (Herison, 2009) well pollution in the last trash can of Bantar Gebang area (Buana, 2018) endangers the health of community around the Satpel Dipo settlement due to groundwater flow due to rainwater that falling through piles of garbage then heading to residential areas and contamination of the soil (Ramadhan and friends, 2019), shrimps farms failed to harvest in Cilinang area (Usman, 2014). The risk of impact due to leachate is chemical pollution of water, air, gas explosions formed in the landfill, groundwater noise disturbance and social impact (Antoniua *et al.*, 12). The high amount of waste generated has an impact on the risk of existing leachate in Koja Temporary trash can with concentrations above predetermined values such as research (Nurasanah 2007, Bhalla, Shaini, Jha (2012), Wartiniyati (2016). The high concentration of organic material BOD and COD in leachate ever did by Bhalla, Shaini, Jha (2012), have similarity which did in District of Koja, where BOD reaching to 568,58mg/l, COD about 5544mg/l and DO in about 0,0mg/l. That results have similarity in research.

TPA SBBD with system *Open dumping* during 12 years (Wartiniyati, 2016). The result of sulfur research as H_2S also reaching to 0,832mg/l, from the conditions required 0,002mg/l for class I, II, dan III, based on Government Regulations No.82 of 2001. The importance of this case to research because leachate will be cause problem in the environment and health (Yantrapalli, 2018). Temporary transit system which in North Jakarta area still have not found, Garbage carried by using car from the specific area then bring, bring down from car in Dipo as temporary transit, sorted out (taken the garbage which still have economic values), then lift the residue back to the car and throw to the last trash can. The thing likes in this research still cause the environmental pollution based on the test result in the laboratory. This research was aimed analysis physics concentration, Chemistry on leachate although on soil tested based on Chemical parameter, The importance problem of this research taken that the polluted soil leachate contained many contaminant (Sulistyoningrum *et al.*, 2018). Based on that explanation above so that the descriptive of this research must be did and tested so that become the base to continually on the waste transit system in the future.

Material and methods

Environmentakky friendly waste disposal site for environmental Satpel is located in Koja District, Nort Jakarta. Geographically, TPS Koja is at the coordinate of Lattitude–6,10298 Longitude:106,90438 S 6”6’10,7424”

Water and Soil Analysis

Phyical and chemical Samples were taken from leachate and soil in TPS, Koja District. The samples were analyzed at the Center for Environmental Health Engineering & Diseases Control, Jakarta, Ministry of Health of the Republik Indonesia, Directorate General of Disease Prevention and Control.

Methods

Test on leachate used the APHA 5210 B-2012.For BOD_5, APHA 522 0.C-2012 (COD), APHA 4500 0.C-2012 (Do), and on Sulfur a H2S with the SNI-6989,70:2009.While testing on the soil at point 1 using the Standar Method 23 rd Edition 2017,Methode 3111B (Lead) and Standar Method 23 rd Edition 2017, Methode 3113B (Arsenic).Point II TPS oil with parameters Cadmium, Copper, Lead, Selenium, Zinc, Arsenic, and Crom testing using Standar Methode 21 st Edition 2012, Methode 3111B.

Result and discussion

The result analysis on leachate in dry season showed on table 1. Based on that result at Temporary trash can Satpel in Koja, North Jakarta. Character *open dumping* though have land limited the capacity reaching to 22,71 ton/day.

The temperature showed 32° C, with humidity reaching to 48%, with wind direction from North-Northeast 3 and the pressure 1008 hPa. The Analysis result leachate sample like BOD and sulfur as H2S showed above the specified limit guided by Government regulations PP No. 82 T of 2001 (Table 1). The result similar which done Arbain *et al.* (2011), Yatim Muklis (2013), Sari Afdal (2017), Zubair dkk (2012). BOD is the parameter to determine organic pollution on air water waste. The high of that organic like BOD, and sulfur as H2S caused the microbe be active and decomposed from that organic biologically become organic acid compounds. Inspection needed on BOD as determination of pollution load because of waste water in the area, and can design the processing system biologically (G.Alerts & SS santika,1987). The great of this leachate's problem and soil in temporary trash can Dipo from BOD, which above the determined (class 1-4) PP No. 82 Of 2001 using test mode APHA 5210 B-2012, cause the bad smell, so that cause the low of dissolved oxygen (Kurnianti *et al.*, 2020) with average 952,54kg/day. The high of BOD values so that make worst water quality and lower DO value. Proven by the content of DO reaching to 0,0mg/l. DO is lower make animal or water plant can not to growing well and even died. While COD is below the specified limit (5,544mg/l).

The low value of dissolved oxygen indicates an increased pollution load, because the coagulants that work to precipitate colloids must first react with the pollutants in the water causing increased consumption. In addition, leachate that enters the soil and water sources has an impact on the environment, ecosystem, and leachate continues to flow even though it is up to 30 years where the landfill is then closed but the impact will continue for up to 30 years. several years.

Widyasari, 2013 agrees that the TPA controlled landfill has the potential to pollute the soil due to waste disposed of in the TPA, because it will decompose along with rainwater so that it will produce leachate. In addition, the Pb content in the soil is around 7.174ppm/BML 50ppm, with an average 0.141ppm/< BML 1ppm in leachate. Average Pb content of water s age 0.152ppm (> 0.05ppm BML). Meanwhile, the Pb level in the monitoring well water exceeds the BML, and the water is used by the community for daily activities. Vaverkov, 2017 suggested that TPA poses a threat to groundwater and soil resources by using mustard greens / *Synapsis alba* L and barley / *Hordeum vulgare* L. Kasasi, 2008, suggested that samples from landfill soil were covered with a depth of 2.5-17m indicates for Cd around 0.50-18.75mg/kg, 3.88-171.88mg/kg for Cr, 8.13-356.25mg/kg in Cu,5.63-63.75mg/kg for Ni, 2.50-92.50mg/kg for Pb and 6.38-343.75mg/kg for Zn. Where there are three points showing the highest value at a depth of 2.5m.

Table 1. Leachate Concentration Values are based on water Quality criteria based on class.

No	Parameter	Unit	PP No. 82 Of 2001				Test Methode	Test result
			Kelas 1	Kelas II	Kelas III	Kelas IV		
1	BOD	mg/l	2	3	6	12	APHA 5210 B-2012	568.58
2	COD	mg/l	10	25	50	100	APHA 5220.C-2012	5.544
3	DO	mg/l	6	4	3	0	APHA 45000.C-2012	0.0
4	Sulfur/as H_2S	mg/l	0,002	0,002	0,002	(-)	SNI-6989.70:2009	0.832

Table 2. The value of the concentration in the soil with the Extraction Method using the EPHA Method 1992, EPHA Methode 1311 Dry Season.

No	Parameter	Unit	TCLP Quality PP No. 85 Of 1999	Test Methode	Test result
1	Cadmium/Cd	mg/l	1,0	Standart Methode 23 rd Edition 2017, Methode 3111B	< 0,032
2	Lead/Pb	mg/l	5,0	Standart Methode 23 rd Edition 2017, Methode 3111B	< 0,059
3	Arsenic	mg/l	5,0	Standart Methode 23 rd Edition 2017, Methode 3111B	< 0,001

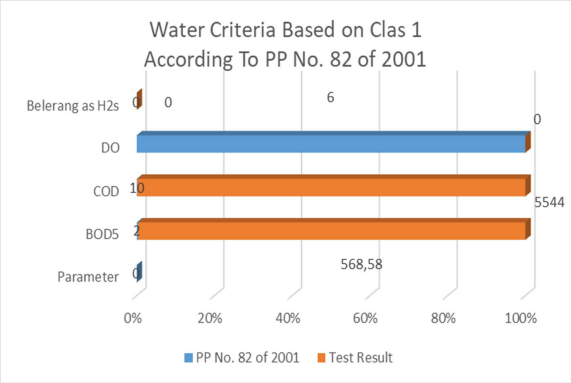

Fig. 1. Water criteria Based on Class I According to PP No.82 of 2001.

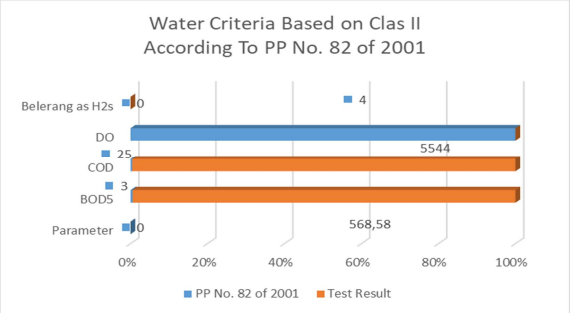

Fig. 2. Water criteria Based on Clas II According to PP No.82 of 2001.

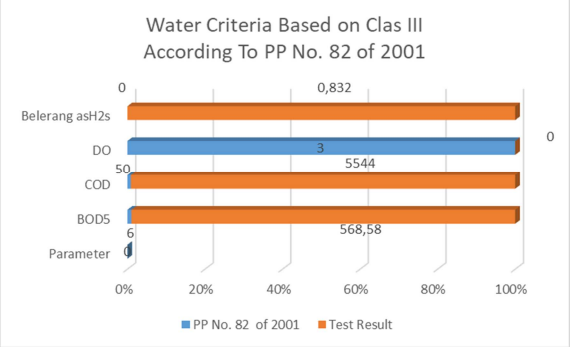

Fig. 3. Water criteria Based on Clas III According to PP No.82 of 2001.

The results of soil tests on cadmium, lead and arsenic in the dry season showed that <0.032mg/l, <0.059mg/l, and <0.001mg/l were still below the limits determined from the test results where the soil depth was about 3 m. The low levels are because some of the soil in the Dipo area is covered with cement plaster. The low parameters of Cd, Pb and Arsenic which are toxic/non-essential heavy metals can cause health problems if they are bound in the body (Said, 2010). Several studies on soil and landfill including Anjelina *et al.*, 2020, stated that the soil in the landfill area of Batu Layang sub-district, Pontianak City was polluted with Pb 0.005mg/l, and Cd should have reached > 0.003mg/l in the soil. Adnan *et al.*, 2013, Soil contaminated with Arsenic, Pb, Fe, copper/Cu, and aluminum/Al. Where As and Pb are at high limits of 5.90mg/kg, and 31.00mg/kg using the provincial sediment quality guidelines for metals and temporary sediment quality values. However, Cu decreased at a depth of 30m. The finding of contamination at this location with clay soil texture was based on cluster I and cluster II analysis methods. Bartkowiak *et al.,* 2018. The results on sandy soil in the landfill at a depth of 0-20cm showed a significant effect on changes in soil organic carbon content, phosphorus, potassium, magnesium, copper and zinc with positive macro and micro quantities.

Sulfur as Hydrogen Sulfide shows 0.832mg/l, which means it has a value that exceeds the maximum limit specified. This impact poses a risk to adjacent communities. The high H2S arises as a result of biological activity where bacteria decompose organic matter in the absence of oxygen/anaerobic. Husein *et al.*, 2020, redox conditions, anoxic environment, pH, metal oxidation state and microbial activity are metal content found in the landfill and continues to increase, due to the nature of metal leaching from waste and in the original soil in the landfill. Eremin, 2017 *et al.*, Potential sources of pollutant dispersion are solid particles originating from aerosol emissions from surrounding landfills containing heavy metals Zn, Cd, Ni, Cu, Cr and Pb, where these heavy metals show concentrations at the minimum limit required. determined, however Zc showed an increase in the soil around the Balakovo landfill. Morta *et al.,* 2021, parameters for groundwater, as well as soil samples such as coliforms, biochemical oxygen demand, dissolved oxygen, phosphorus, lead, coliform, iron for groundwater, copper, cadmium, lead and zinc for soil are at levels that exceed the limit, resulting in public health and ecological risk impacts. El Fadili *et al.*, 2022, stated that soil Around the landfill, Zn, Cd, Fe, Cu, Ni, Pb, and Cr are at moderate and high levels of pollution.

Priatna *et al.*, 2019. Stated that the lack of landfill land and the impact on environmental pollution, the emergence of methane gas, contamination of ground water by leachate. The description shows that the method is principally just disposing of waste without any further closure and management. There are differences in the location of Dipo, North Jakarta, but it still causes pollution and some parameters show high values such as BOD and H2S. Efforts made to handle leachate in the transit system at Dipo temporary trash cans are strategic land patterns to improve an integrated solid waste system according to the regional spatial plan (Article 6 paragraph (3) letter b), DKI Jakarta Regional Regulation No. Regional Spatial Planning which states to improve an integrated solid waste system. However, it has not been equipped with waste processing facilities, taking into account the adequacy of land availability, including for buffer zones. The government needs to review the availability of land to accommodate temporary waste that meets environmental and aesthetic aspects so as not to cause potential risks to humans and the environment by taking into account the health impacts on the surrounding environment, and preventing leakage or seepage into the environmental media.

Conclusion

Physical concentration in leachate during the dry season at the Environmentally Friendly Garbage Depot, Environmental Satpel Settlement, Koja District, North Jakarta, although the transit system is temporary, it causes pollution and several parameters show concentration values that exceed the threshold value. While the soil is tested based on chemical parameters that are used as a place to accumulate garbage when it is lowered for a moment to take waste that still has economic value, then raised again and disposed of to the landfill showing that it is below the standard value that has been determined using the Standard Method 23rd Edition 2017, Method 3111B, this is because some of the land uses a cement plaster base. So, it needs to be strategically rearranged to improve an integrated waste system according to spatial plans.

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