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The Rainy Leachate and Saprobic Category Impact Distribution Index to Reach Furthest [Wolinsky 2005] and Plankton Diversity in Landfill SBBL

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ABSTRACT

Influenced waste composition, operational methods and climate, leachate concentration increased with varied components in pairs of morning, afternoon, evening and downs, but DO morning at [0.21 mg / l] , DO afternoon [0.15 mg / l] , DO afternoon [0.15 mg / l] and downs [0.18 mg / l] below the minimum under PP 82 of 2001 amounted to 6 mg / l. The impact on plankton diversity, groups of organisms are able to adapt will thrive in certain pollution conditions. The distance range is based on the movement of currents affect the distribution of impacts following the tidal patterns in the form of matter and plankton drifting dependent biota saprobity durability. This study aims to assess the status of the rainy season leachate from the aspects of SI , diversity and distribution of impact farthest reach a formula Wolinsky, 2005, when the tidal occurred. Leachate samples were tested by the method Spectrophotometer, AAS, Conductivitymeter, Gravimeterik, Winkler Azide da Closed Reflux

SI results in leachate pairs of 1.6 to 1.85 and 0.66, 1.33 and downs, categorized Oligosaprobic and β - mesosaprobic. Pressure levels of pollutants and adaptability of microbial planktonic evidenced species reliable namely *Nitzchia palaea [27 sp], Nitzchia curvula [26 sp], Gyrosygma acuminata [7 sp], Skeletonema costatum [60 sp], Synedra acus [12 species], Cylotella bodanica [6 sp], Schroederia setigera [8 sp], Raphidium polymorphun [7 sp], Hemiaulus sp [6 sp], Helosira sp [3 sp], Luciana analysts, Canthocampthus sp, and Gonatozygon monotenium [2 sp]*, with the value of diversity 1.904, 1.828, 1.274, 1.578. Where the distribution of impact reaches 132 840 m and 38880 m. TPA on the coast can be developed using aspects of the SI as a specific category with a pollution level where lindinya the tidal ecosystem .

KEYWORDS: Leachate; Diversity; Tidal; SI; reach

INTRODUCTION

The absence of a Wastewater Installation [wastewater], as well as the influence of the landfill operation technique that is open dumping is a weakness in pollution control on the landfill SBBL against partisanship neighbourhood for 16 years. Management of open dumping pose a major problem in landfills, the necessary improvments in the engineering field, especially for reducing landfill leachate. Told as a landfill that does not comply standards, their impact is produces leachate [50]. During operation the leachate, gas produced and leachate[4] and disease-carrying organisms [49]. Therefore, placement of the waste must be planned because it has a primary role in the processing of leachate [5]

Leachate rainy season has varied quality [24]. Change in the concentration of the leachate is highly influenced by rainfall. In the process transport of contaminants will occur chemical reactions such scorpsi desorption, ion exchange and oxide reduction. Where such reactions affect the compounds in groundwater flow and the effect of inhibiting further movement speed is decreased [3]. Therefore, the components of the leachate is highly dependent on the redox conditions in the landfill [12], [38], Leachate from landfills results indicate the growth of microorganisms in a landfill environment [17], Leachaentration will be increased by the amount of dissolved organic material and is suspected of oxidation process will in increase heavy metal[22]. Effect of changes in redox conditions, from time to time on the organic materials and heavy metals in landfill. But system open dumping with the identification of the location of polutan distance of 1-25 m, 125-250 m relatively heavy

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pollution that can contaminate groun water [6], With the sanitary landfill system is still producing leachate with heavy pollution, ecological risk and potentially lead to public health and ecosystem [42]and [22] led to an increase in long-term and potentially harmful to the environment and human health [8].

The quantity and quality of leachate is affected by the seasons. The temperature of the wet lower than the dry season, this is due to differences in the intensity of solar heat [7],[26], displacement flushing and migration of contaminants piles of garbage, affect the biological components, determine the diversity or extinction of populations of organisms when the ups and downs into the landfill.

Tidal patterns lead to changes in physico-chemical factors, determine the species diversity of plankton, and resistance to environmental conditions. Four times the sampling showed similar results with the value of [1904], [1,828] [1,274], [1.578] were moderate [1 < H ' < 3] in the presence of *Nitzchia palaea* [27 sp], *Nitzchia curvula* [26 sp], *Gyrosygma acuminata* [7 sp], *Skeletonema costatum* [60 sp], *Synedra acus* [12 species], *Cylotella bodanica* [6 sp], *Schroederia setigera* [8 sp], *Raphidium polymorphun* [7 sp], *Hemiaulus sp* [6 sp], *Helosira sp* [3 sp], *Luciana analysts, Canthocampthus sp, and Gonatozygon monotenium* [2 sp]

E saprobitas group of freshwater and marine plankton follow the pattern obtained value pairs [1,6 morning], [1.85 during the day], [0.66 afternoons], and [0.357 dawn dawn] included in the category of lightly polluted [Oligosaprobic] to moderate [β - mesosaprobic] The research objective of the status of leachate rainy season from the aspects of saprobic index, diversity and range of distribution impacts the farthest using the formula Wolinsky, 2005, when tides occur explained that the leachate when influenced by the tides, would follow the pattern ekostem waters with the distribution of plankton on the location of leachate followed by resistance plankton species and form the basis for the use of saprobic index for regions to develop landfill in coastal areas .

MATERIAL AND METHOD

Study area

TPA Sui Bakau Besar Laut [SBBL], District Sui. Pinyuh West Kalimantan Province, Indonesia was chosen as a test site [Figure 1], has a kind of tidal waters with a single daily [diural tides] that happened one time and one time ebb tide in one day. Sampling is done on two points, namely on the latitude 0.302764 / 00, 18'9,95 "N, longitude 109.041622 / 1090 2'29,84 " E and latitude 0.302858 / 00, 18'10,29 "N, longitude 109.041637 / 1090 2.29,89 " E. Determination of the main point as a reference to determine the extent of the spread of the effects farthest distance range when the ups and downs in the rainy season .

Water Analysis

Samples of physics, chemistry leach tested in a testing laboratory Profinsi West Kalimantan Health Office of Health Laboratory Unit. While the analysis of biological samples to obtain a species of planktonic done on laboratory management Aquatic Resources Faculty of Fisheries and Marine Resources, Diponegoro University, Indonesia.

Analysis saprobic Index.

Conducted to determine the level of pollution in the study site. The formula used to use formulas *Persoone and De Pauw, namely: saprobic Index Analysis: of formula Persoone and De Pauw:*

$$SI = \frac{1C + 3D + 1B - 3A}{1A + 1B + 1C + 1D}$$

Specification:
SI = Saprobic Index
A = Total species of Polysaprobic organism
B = Total species of α- Mesosaprobik organism
C = Total species of β- Mesosaprobik organism
D = Total species of Oligosaprobik organism

The forecast distribution of impacts based on tides and currents by the formula:

D = C.Q. z (Wolinsky,2005).

Noted:

D	=	Impact the farthest distance range distribution
C	=	The maximum current speed [M/sec]
Q	=	Multiplier factor single tide periode = 12 x 3600, double = 6 x 3600, mix = 8 x 3600
Z	=	The coefficient of drift material [0,025, 0,50, 0,75,1]

Diversity Indek [H'] Shannon & Wiener:

$$H' = - \sum_{i=1}^{s}(pi\ Ln\ pi)$$

Specification:
H' = Index of species diversity
ni = Total individual species to - i
N = The total number of individuals in the community
Criteria:

H' < 1	Diversity, low productivity, an overview indication of severe pressure and unstable ecosystems
1 < H' < 3	Diversity was, quite moderate Productivity
H'> 3	High biodiversity, ecosystem steady, high productivity, resistant to ecological pressures

The procedure for applying the method

Sampling of physics and chemistry at each sampling point with three retrieval when high tide and one low tide. Samples were stored at a temperature of 40c, the analysis using method *Spectrophotometer, AAS, Conductivitymeter, Gravimeterik, Winkler Azide da Closed Reflux*. The sampling technique of physics and chemistry carried grap samples for the purpose of showing the characteristics at the time the sample was taken[25]. A biological sample taken 100 l filtering to 50 ml with planktonet 0,054 , preserved with Lugol as much as 0.5 % , add 1 ml preservative , pour in *Sedwich Rafter*, Then, it was observed under microscope and name of plankton species was identified [32], [47]

RESULTS

Parameters measured were TSS, TDS, NH4, Fe, COD, BOD and DO [Table 3]. The results of the test parameters generally show above the specified maximum . While the lowest value is 0.21 mg / l [DO plug the morning] , 0.15 mg / l [DO post lunch] , 0.15 mg / l [DO plug the afternoon] , and 0.18 mg / l in the [DO low tide at dawn] .Diversity index [H '] in the morning tide [1904], during the [1828] afternoon [1274] and downs dawn [1578] being categorized diversity [1 < H ' < 3] [Table 2]. The other side *saprobic index* values in tidal conditions [1.6], [1.85], [0.66 indicated *oligosaprobic*], receding [1.33 / β - *mesosaprobic*] and [Table 1]. The existence of these differences is influenced by physical and chemical in leachate and follow the pattern of tidal ecosystem. Distribution of impacts based on pairs of rain in the form of material drifting get 132 840 m, while the receding rain distribution conditions impact the farthest reaches 38880 m.

Table 1. Saprobic Value Index on tidal conditions rainy

No	Condition	Saprobik Indek	Category
1	Tide Mornings	1,60	Oligosaprobic
2	Pairs daytime	1,85	Oligosaprobic
3	Tide afternoons	0,66	β -mesosaprobic
4	Receding dawn	1,33	β -mesosaprobic

Table 2. Diversity Index [H '] tidal rainy season

No	Condition	Diversity Index Values [H']	Category
1	Tide Mornings	1.904	moderate
2	Pairs daytime	1.828	moderate
3	Tide afternoons	1.274	moderate
4	Receding dawn	1.578	moderate

Table 3. Value station I wet tidal concentration

Parameter	Tide Mornings [06.30]	Pairs aytime [12.00]	Tide fternoons [16.00]	Receding dawn [03.00]	*} Maximum allowable
TDS	16.345	63.653	57.523	35.212	1.000
TSS	14.123	22.022	20.012	16.723	50
BOD_5	88	745	847	658	2
COD	135	1.145	1.303	1.012	10
DO	0,21	0,15	0,15	0,18	6**
NH3	35	55	43	37	0,5
pH	6	8	7	7	
Besi	7,5	15,45	8,25	7,02	0,3

Specification:
*] Class 1 Quality Standars Based Regulation No. 82 of 2001 on Water Quality Management and Control Water Pollution
**] The minimum value allowed

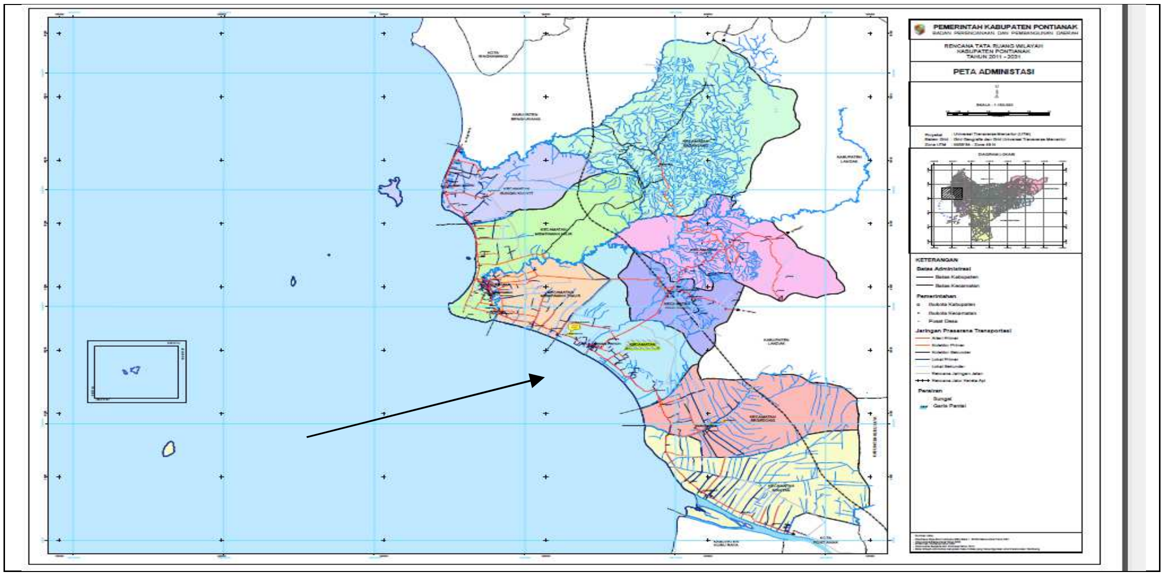

Figure 1. Location Research

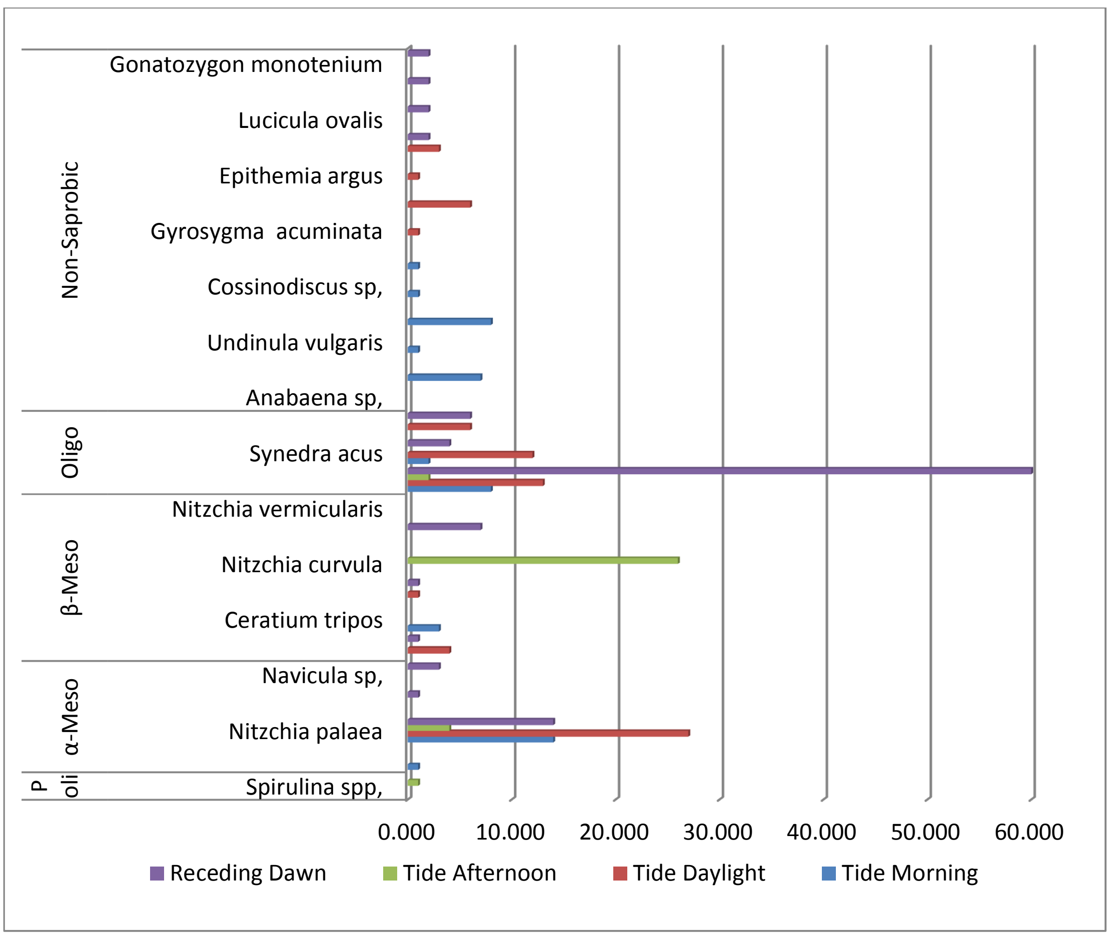

Figure 2. Plankton species rainy season

DISCUSSION

Open dumping is a problem for District Government of Mempawah. Leachate Untreated causing pollution damage to the soil [43], [44], the water surface [30], ground water and surface water [39], quality of ground water [19], Factor for the decomposition of wastes is strongly influenced by the state of water[11]. Leachate effluent concentration generally decreases over time [35]. The result of this analysis in contrast to other studies, where the leachate concentrations higher with age old landfill. The absence of Wastewater Treatment plants, landfill regarded as uncontrolled dumping [2].Biological and chemical processes that occcur in the landfill throught the decomposition phase, phase of early metanogens and metanogens stable phase.This will increase the risk of health [13]comes from leachate and gas factor [18], including residents living near waste disposal due to the migration of landfill sites [49]. Governance functions of Local Government [local governments] do not have the legal regulations, environmental monitoring is half done damage to be higher, due to weak oversight and a factor of integration of the various fields of the sector.

The key parameter BOD pollution pairs show different values between morning, afternoon, evening and downs. The highest concentration of 847 mg / l and 745 mg / l measured in the evening and during the day. However, the parameters survive in the presence of leachate Fe for 16 years. This is because the tren of contaminants in the leachate varied conditions of time [20]. Similarly, COD, and other parameters showed a high concentration of leachate can be identified not fresh, there are factors that affect the composition of leachates such as, type of waste and the physical, chemical and biological[1], except DO plug the morning , afternoon, evening and early morning low tide showing different values in the range of values of 0.21 mg / l , 0.15 mg / l, 0.15 mg / l and 0.18 mg / l. Change in concentrations leachate is higly influenced by rainfall. Process of transport contaminant chemical reaction will accur among scorpsi desporsi, ion exchange of oxidation-reduction. Where reactions affect the coumpound in grounwater flow and the effect is inhibiting, furter deacrease the speed of movement[3].

The value of the rainy season concentrations higher than the dry season, the essential components that influence is rainfall. Two core factors that waste generated comes from leachate and the entry -level waste to landfill sites is the main source of leachate [51]. The main source of the formation of leachate is an infiltration of rainwater, therefore, the chemical composition of the leachate and pollutant organic material produced is very different in each landfill [50]. Waste composition is very important and has great influence in determining the characteristics of the physical, chemical and biological [51], Change in the composition of the waste and leachate due to the release of various chemical components [29].

Characteristics of leachate in the landfill SBBL containing organic materials [BOD 88 mg / l, 745 mg / l, 847 mg / l and 658 mg / l], inorganic [ammonia 35 mg / l, 55 mg / l, 43 mg / l, and 37 mg / l] as well as heavy metals. Increased concentration leachate have the effect on the processing leachate with coagulation-photooxidation [56] high. But there are many variations, different parameters in the landfill the same, the disposal of waste differ between parameters, specifications and several cases of metal in other locations with a suspended and dissolved materials from the trash degeneration[15], The composition of leachate in landfill have a relationship with the parameters and in some cases associated with metal [24]. The concentration of heavy metals increases, allegedly the oxidation process and the amount of dissolved organic material [21], however, heavy metals in the rainy seasons is very different in as many ups and downs. In landfills leachate have the heavy metal with a concentration range of very large and varied [33], by bringing the suspended and dissolved materials from the garbage degradation. The composition is influenced by the type of organic and inorganic waste , ease of decomposition, the condition of a pile of garbage seen from temperature, pH, moisture, age of the landfill, the quantity and quality of water that affected the climate and hydrogeology, the composition of the ground cover, the availability of nutrients and microbes, and the presence of inhibitor / substance that inhibit or decrease the rate of a chemical reaction .

The flow of water in the composition of the leachate ever [8], The conditions between the landfill has a difference related to the waste material to be made to the conditions of the flow of the flat rate and show thatthe quality and quantity of leachate througt the dump needs to be taken into account and will increase in the long run [52]. The results analysis of the leachate has a a high concentration of biological oxygent demand [BOD], chemical oxygent demand [COD], suspended solids, total dissolved solid, NH_3, and Fe. But a decline contamination of the water bodies, so it has an impact on public health such as malaria, intestinal worms, infection of the upper respiratory, typhoid fever, dysentry, salmonellosis, cholera and gastroentritis [53]. that the water in the landfill is very diverse, containing a collection of water, little availability solids. Decomposes waste generation is characterized by physical, biological and chemical, and cause the odour. Componen leachate from landfills in the water pose a potential risk genotoksic of organisme[41], the rainy season contamination is above the specified limits, is expected to affect on grounwater quality [27],The concentration contains organic and inorganic materials in high effect to the composition of the leachate[9],Changes in the quality of landfill leachates from recent and aged municipal solid waste[37], During operation the leachate, gas produced and leachate[4], [28]look into the matter that the process of development from time to time changes from degradation to the composition of leachate almost in various parts of the TPA, water balance modeling is done TPA. [16], Relationship quality of landfill leachate in place and the subyect does modeling ever done[14], [54], [10], Leachate the resulting increased concentration between season this is related to the toxicity that depends in leachate[23],Martin *et al*., 1999]. Decomposition is affected by compaction, moisture, presence of inhibitors of the material, the rate of water flow, temperature, availability of the population of microorganisms that affected the state of the soil cover, water type synthesis, properties heterogenization gerbage, physical properties of the chemical, and biological [23]

For Inorganic Wastes inorganic the solubility of various components plays a role in determining the composition of the leachate. The components of the leachate and then changed as of solutes or as gas in landfill. Change composition of waste and leachate due to release of various chemical components [29]. The composition of leachate at the landfill is a landfill age, the nature of the waste [solid or liquid], the sources of waste and rainfall[55], Beside it contains pollutants that can be categorized into groups dissolved organic material, inorganic macrocomponen, heavy metals and xenobiotic organic compounds [36],The high chemical oxygen demand [COD], the levels of ammonium, heavy metal compounds biologically necessary processing to suppress of leachate to be low [34], but the results are different from the age of the landfill, where concentrations of leachate is still high of the conditions set [Table 3]. TPA SBBL very specific cases where lindinya the tidal ecosystem, and diversity of plankton is largely determined by the condition of the tides and low tides. Ecosystem leachate during the rainy season there are biota group E Saprobix Index [Figure 2] [*Raphidium polymorphun, Undinula vulgaris, Schroederia setigera, Cossinodiscus sp, Gyrosgyma acuminata, Hemialus sp, Epithemia argus, Helosira sp, Lucicula ovalis, Canthocamthus sp,* and *Gonatozygon monotenium*] that does not exist in the sea is in the leachate, otherwise there is in fresh water and then die because of intolerance to environmental conditions. The results of this study differentiates with other studies, where the leachate on tidal ecosystem and concept saprobitas used as a water pollution index parameter. under these conditions there are species that live in group E of freshwater and related to the adaptability of microbes. Rain pairs have large numbers of plankton more than low tide, sea water intrusion into a factor of many species of plankton are found among *Nitchia curvula* [26 sp], because they have the tolerance to high salinity and can live in extreme situations. Skeletonema species is tolerant power plankton with a high organic materials [31], whereas the Nitzchia of life clustered in any season[46].

Diversity index of plankton [H '] rainy classified as moderate [moderately] with a value of 1,904.,1,828., 1,274., 1,578. Odum [1993] Planktonic organisms are able to tolerate and breed are moderate influenced physico-chemical conditions, and tidal patterns that enters the landfill. Therefore the pollution is able to change the structure of the ecosystem as well as reducing the number of species in the community of plankton organisms. Changes in water quality responded by plankton as a marker of instability environmental factors and population. Change in water quality responded by plankton as a marker of instability factors of the environment and population [48]

Anggoro [1988] saprobic levels indicate the degree of pollution embodied many microorganisms indicators of pollution. Saprobix Index rainy pairs including lightly polluted category [Oligosaprobic} to moderate [β - mesosaprobic] in the morning, afternoon and dawn. The influence of the tidal patterns that affect the physical-chemical properties in leachate in the landfill. This ecosystem confirms that Saprobitas can be used as indicators of environmental pollution in the leachate. The adaptability of plankton assessed using a formula Wolinsky, 2005 was a method that examines the impact spreads farthest distance range. The working principle of this method is to measure the flow velocity when the ups and downs SBBL entering landfill sites. Distribution material impact farthest bring drifting sediment, plankton, etc when the tide as far as 132 840 m, 38880 m at low tide.

Conclusion

The conclusion from these results that leachate rainy season has very bad quality it isinfluenced by the durabbility of plankton populations that occupy the zone. Thedurability of the distribution of plankton furthest follow the tidal patterns in use formula wolinsky, 2005 as a references resistence adaptation to the flow entering the landfill as far as 132840 m and 38880 m. Changes that caused the tidal influence of physics, chemistry and biology leachate, where the spread of the diversity of the plankton under a mild condition, but saprobic index significantly different patterns of oligosaprobic to β-mesosaprobic. One of the solutions needed is the manufacture WWTP and use of saprobic Index to use as a determinant of the level of contamination so it looks diversity of species present in the leachate during the rainy season on the pattern of ups and downs in which the distribution of impact farthest detected by using a plankton species Wolinsky, 2005.

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