

INITIAL ASSESSMENT OF RUNOFF QUALITY FROM A ROAD AND HIGHWAY IN KLANG VALLEY

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Abstract

Primary data is being collected to study the quality of storm runoff produced from the road surfaces in Klang Valley. Seven locations at various tolled highways and one location at IIUM are selected for the collection of primary data on storm runoff quality. As many as 20 various relevant water quality parameters, consisting the major groups of pollutants, are chosen to be tested for runoff quality from the selected road and highways. Event Mean Concentration (EMC) is being calculated to compare the runoff quality from various roads. However, not all pollutants are tested yet. This paper presents results of runoff quality from a road selected at IIUM and nearby MTD toll on Kuantan highway. According to the initial evaluation, EMC value for COD of the highway runoff (73 mg/L) is higher than that of local road runoff (44 mg/L). On the other hand, the TSS of the road runoff (273.5 mg/L) is higher than that of highway (215 mg/L). When compared to Class II of the National Water Quality Standard (NWQS), it was observed that the runoff from the roads and highways are inferior with respect to BOD, COD, TSS and Turbidity, indicating road runoff must be treated before discharged into the river system. It is expected that completion of the study would provide some baseline EMC values for the highways in the Klang Valley.

Keywords: Highway, Rainfall, Road, Runoff Quality, Storm Event.

1. Introduction

Water pollution sources can be categorized into point sources (PS) and nonpoint sources (NPS). A point source of pollution discharges to the environment from an identifiable location, whereas a nonpoint source of pollution enters the environment from a widespread area. Nonpoint source pollution does not result from one specific traceable source. Generally, it results from land runoff, precipitation, atmospheric deposition, drainage, hydrologic modification and seepage. Nonpoint source pollutants include nutrients, sediment, heavy metals, petroleum products, bacteria, organics and toxic substances (Field et al., 2000).

Roads and highways constitute a significant portion of the urban landscape. Runoff from highways and surrounding development may contain contaminants such as oil, dirt, grease, and metals that can significantly impact the quality of receiving waters (L'Altrella, 2007). Various types of pollutants are deposited, built-up and wash-off from the road surfaces (Edogawatta, 2007; Pitt et al., 1993). Areas located in the tropical region are more susceptible to high NPS pollution due to high amount of annual rainfall. Therefore, it is very essential to conduct detail study to determine the storm runoff from various landuses. This study is intended to determine the runoff quality from selected roads and highways

located in the Klang Valley. However, this paper presents the initial findings based on the limited data collected for one road and one highway.

2. Materials and Methods

The study will be conducted at one local road and seven highways as listed below:

1. Road at IIUM Gombak
2. Gombak Toll Plaza of MTD Prime
3. Bangi Toll Plaza of PLUS
4. Sg. Besi Toll Plaza of PLUS
5. Sg. Buloh Toll Plaza of PLUS
6. Bukit Raja Toll Plaza of PLUS
7. Dato' Keramat Toll Plaza of AKLEH
8. Pasar Sentul Toll Plaza of DUKE

However, this paper will present the initial findings based on the sampling done at one IIUM Road and MTD toll at Gombak.

Runoff samples were collected during the rain storm only. It was made sure that the selected roadside drains were dry during the non-rainy periods. Samples were collected at 5 minutes interval. However, the first samples were collected in glass bottles to study the concentration of oil and grease (O&G). International practices were followed for the sampling, preserving and testing of the water samples (APHA, 1998).

Flow-weighted samples were prepared and tested for the following parameters:

1. pH;
2. Dissolved Oxygen (DO);
3. Turbidity;
4. Total Dissolved Solids (TDS);
5. Total Suspended Solids (TSS);
6. Oil and Grease (O&G);
7. Biochemical Oxygen Demand (BOD);
8. Chemical Oxygen Demand (COD);

9. Volatile Organic Compound (VOC);
10. Total Nitrogen (TN);
11. Total Phosphorus (TP);
12. Lead (Pb);
13. Zinc (Zn); and
14. Copper (Cu).

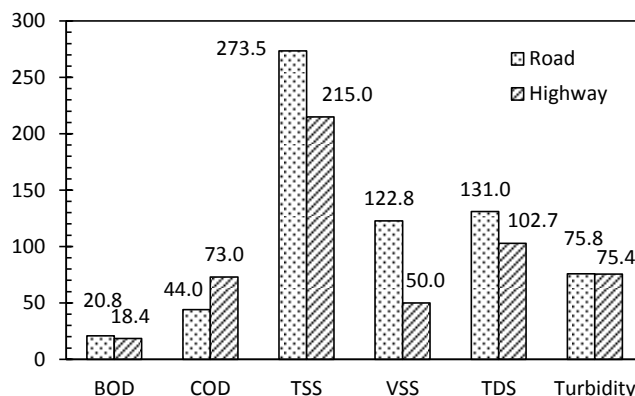
3. Results and Discussion

Four rain events were sampled at the IIUM road and three events for the site at MTD Gombak Toll Plaza along Kuantan highway. The event mean concentration (EMC) values were calculated and a few selected values are given in Table 1.

Table 1: Water Quality Data after Ablution

Parameter	Unit	EMC		NWQS (Class II)
		Road	Highway	
BOD	mg/L	20.8	18.4	1 - 3
COD	mg/L	44.0	73.0	10 - 25
TSS	mg/L	273.5	215.0	25 - 50
Turbidity	mg/L	75.8	75.4	5 - 50
Pb	mg/L	0.023	0.038	-
Zn	mg/L	0.220	0.064	-
Cu	mg/L	0.011	0.006	-
O & G	mg/L	2	4.3	-

The EMC values were also plotted to compare between two sources, which are shown in Figure 1.



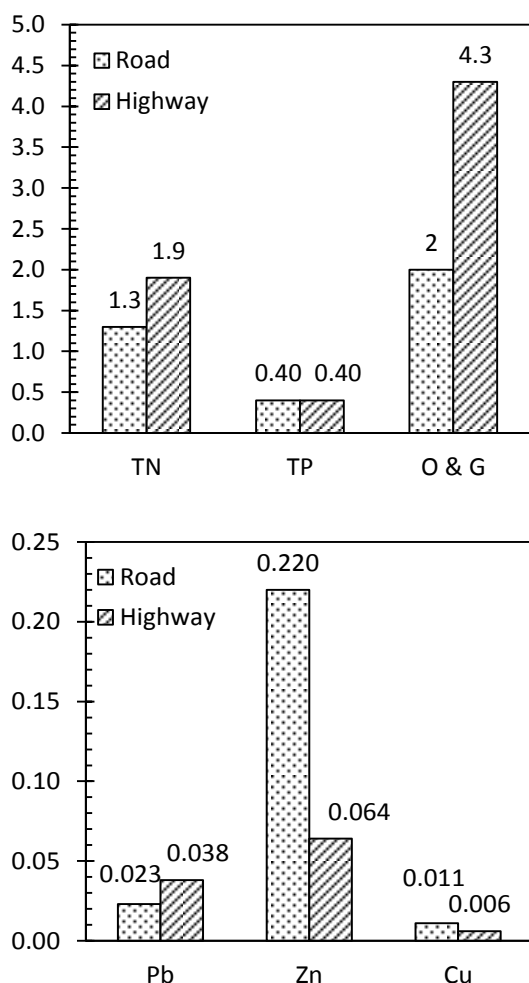


Figure 1: Comparison of EMC values

4. Conclusions

Study conducted in other countries indicated that runoff from roads and highways have potential to pollute water resources. Despite having huge amount of road and highway network, no detail study is conducted yet in Malaysia. Therefore, this study was intended to determine the runoff quality (in terms of EMCs) from selected roads and highways located in the Klang Valley. The initial sampling and findings revealed that, in relation to selected common but important water quality parameters, runoff from the roads and highways are inferior to the Class II of the National Water Quality Standard (NWQS), with respect to BOD, COD, TSS and Turbidity. This indicates that, in

order to maintain good quality water in the rivers, the road runoff must be treated (similar to runoff from other landuses) before allowing to flow into the rivers.

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