

## Gross Pollutant Traps: Wet Load Assessment at Sungai Kerayong, Malaysia

M R Mohd Shah<sup>1</sup>, N M Zahari<sup>1</sup>, N. F Md Said<sup>1</sup>, L M Sidek<sup>1</sup>, H Basri<sup>1</sup>, M S F Md Noor<sup>1</sup>, M M Mohammad Husni<sup>1</sup>, Milad Jajarmizadeh<sup>1</sup>, ZA Roseli<sup>2</sup>, N Mohd. Dom<sup>2</sup>

<sup>1</sup> Centre for Sustainable Technology and Environment, Universiti Tenaga Nasional, Jalan IKRAM-UNITEN 43000 Kajang, Selangor, Malaysia.

<sup>2</sup> Humid Tropics Centre, Department of Irrigation and Drainage, Jalan Ledang, Off Jalan Duta, 50480 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur, Malaysia.

Email: rashidshah92@gmail.com

**Abstract.** The purpose of this project is to carry out assessment on the effectiveness and performance of Gross Pollutant Traps (GPTs) stormwater quality control in the urban areas. The study aims to provide a management and planning tool for effective management of the gross pollutants in the urban areas specifically in River of Life (ROL) project. ROL project is a Malaysian Government initiative under the Economic Transformation Program. One of the program in the greater Klang Valley is to transform Klang River into a vibrant and livable waterfront by the year 2020. The main river in ROL catchment is Sungai Klang (upper catchment), with main tributaries Sungai Gombak, Sungai Batu, Sungai Jinjang, Sungai Keroh, Sungai Bunus, Sungai Ampang and Sungai Kerayong. This paper objective is to study the gross pollutant wet load at Sungai Kerayong 1 and Sungai Kerayong 2 which is located at the downstream location of the ROL project. The result shows that Sungai Kerayong 2 produced higher gross pollutant wet load (8025.33 kg/ha/yr) than Sungai Kerayong 1 (4695.12 kg/ha/yr). This could be due to high contributions amounts of gross pollutant traps from residential area, the degree of develop area, and also the location of the river itself related to climate and rainfall.

### 1. Introduction

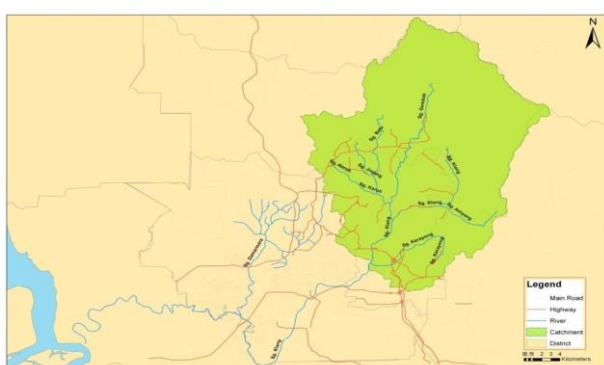
Urbanization often relates to deterioration of stormwater quality due to many factors such as uncontrolled pollution and waste disposal. It leads to improvement of socio economic life in one area, but also brings wide range of challenges to the environment. Therefore, management of water quality impacts in urban areas need to be address in order to protect our environment. Gross pollutants are defined as discarded materials larger than 5 mm and include litter and debris, and coarse sediments are particles with grain sizes greater than 0.5 mm [1]. Visible street waste such as anthropogenic litter and organic matter (sediments, leaves and grass clippings) are classed as gross pollutants and it can exhibit varying degrees of physical and material properties such as firmness, shape, size and density [2]. The main purpose of gross pollutant traps (GPTs) is to eliminate gross pollutants washed into the stormwater system before the stormwater enters the receiving waters [3]. In Malaysia, the use of GPT was suggested in Manual Saliran Mesra Alam (MSMA) where it located at the end of every drain to trap gross pollutants before entering main river system [6]. At the same time, it is important to



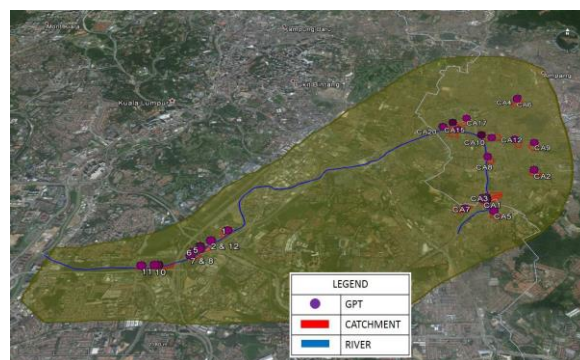
understand that tropical climate always related to situation where high rainfall intensity occurs in short duration which is cause the performance of GPT cannot be recognise properly [7].

## 2. Study Area

Figure 1 shows the locations of Sg Sungai Kerayong included within the locations of ROL project. It is located at the downstream of the project. Type of land use for Sungai Kerayong are residential, commercial and mix development. Sungai Kerayong catchment area with 61km<sup>2</sup> [4] is located in Wilayah Persekutuan Kuala Lumpur and has been one of the major tributaries of Klang River [5]. The residential area forms the largest fraction at which covering 50% of the total catchment. This location has a year-round warm tropical climate and sunny with heavy rainfall, especially during the Southwest Monsoon from April to September [4].



**Figure 1:** Location of ROL Project and Sungai Kerayong



**Figure 2:** Location of Proprietary GPTs for Sungai Kerayong

## 3. Type of GPT Used

In this study area, there are 2 types of GPT used at Sungai Kerayong which are Continuous Deflective System (CDS) and Cleans All (CA). CDS installed at Sungai Kerayong 1 (12 GPT) meanwhile CA installed at Sungai Kerayong 2 (20 GPT). For CDS, the gross pollutants and sediments are separated from stormwater by centrifugal forces, which also prevent the screen from becoming blocked by debris and other items such as plastic bags. Meanwhile, for CA type, the underground gross pollutant and sediment trap that utilise a screened basket to separate the gross pollutants followed by a deeper sump for silt retention.



**Figure 3:** Continuous Deflective Separation (CDS)



**Figure 4:** Cleans All (CA)

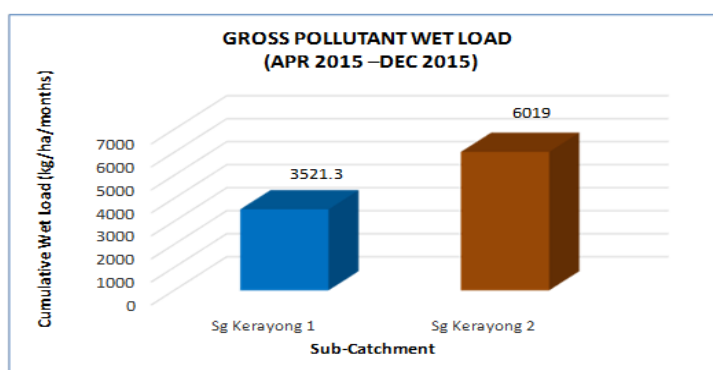
#### 4. Results and Discussion

In order to evaluate the performance of GPTs system in this study, the results obtained from data collection process was analysed. Gross pollutants wet load were obtained from GPTs maintenance data obtained from Pejabat Lembaga Sungai Klang (PLSK). The data was analysed based on catchment types of land use. The wet load data analysed for Sungai Kerayong 1 and Sungai Kerayong 2 were from April 2015 until December 2015 respectively.

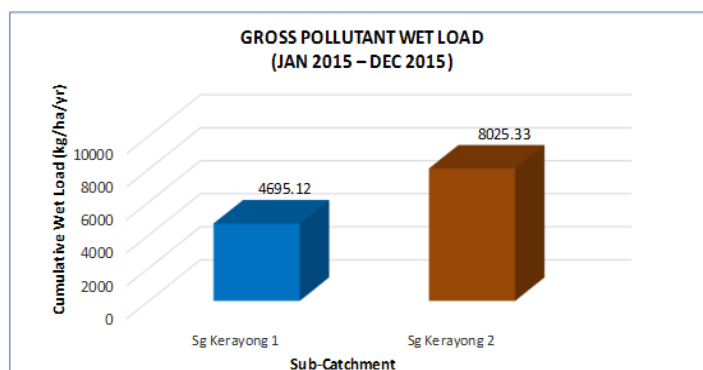
**Table 1:** Summary of Gross Pollutants Wet Load for Sungai Kerayong 1 & 2 (April – December 2015)

Catchment	Type of Land Use	Total No. of GPTs	Wet Load (kg/ha/months) (Land Use)	Wet Load (kg/ha/yr) (Land Use)	Wet Load (kg/ha/yr/GPT) (Land Use)	Total Wet Load (kg/ha/months) (Catchment)	Total Wet Load (kg/ha/yr) (Catchment)
Sg Kerayong 1	R	1	94.90	126.53	126.53	3521.34	4695.12
	C	8	2784.50	3712.67	464.08		
	M	3	641.94	855.91	285.30		
Sg Kerayong 2	R	13	4346.59	5795.45	445.80	6019.00	8025.33
	M	7	1672.41	2229.88	318.55		

R = Residential, C = Commercial, M = Mix Development



**Figure 4:** Gross Pollutants Wet Load for Sungai Kerayong 1 & Kerayong 2



**Figure 5:** Gross Pollutant Wet Load trapped in a year for Sungai Kerayong 1 & Kerayong 2

The result shows cumulative gross pollutant wet load for Sungai Kerayong 1 is 3521.34 kg/ha, with a total number of 12 GPTs installed in the catchment. Sungai Kerayong 2 with 20 GPTs resulted in 6019 kg/ha within 9 months. In terms of year, total wet load for Sg Kerayong 1 is 4695.12 kg/ha/yr and Sungai Kerayong 2 8025.33 kg/ha/yr. Figure 4 and 5 illustrate the gross pollutant wet load for the captured by 32 GPTs in Sungai Kerayong. Sungai Kerayong is a highly urbanized area with 74 % of imperviousness, which explained the amount of gross pollutant wet load captured in the GPTs [4]. From the result, the highest gross pollutant wet loads is in Sungai Kerayong 2. It occurred caused by high contributions amounts of gross pollutant traps from residential area and also the location of the river itself at which the conditions of climate and rainfall.

## 5. Conclusion

The wet load assessment at Sungai Kerayong 1 and Sungai Kerayong 2 have been conducted successfully. Result shows that Sungai Kerayong 2 produced higher gross pollutant wet loads than Sungai Kerayong 1 due to the degree of development area, climate and rainfall conditions. The assessment was conducted based on the catchment type of land used. It can be concluded that it is important to identify the amount of gross pollutant emanated from catchment in order to ensure optimum number of GPTs installed to trap gross pollutants before entering river system. This should be subjected to further discussion and deliberation.

## Acknowledgement

The authors are grateful to Humid Tropics Centre Kuala Lumpur, Department of Irrigation and Drainage, Malaysia for their financial and technical support.

## References

- [1] Allison RA, Chiew FH, McMahon TA. *Stormwater Gross Pollutants*. Report 97/11. Australia: Co-operative Research Centre for Catchment Hydrology, eWater CRC, University of Canberra; 1997.
- [2] Jehangir T. Madhani, R. J. (2014). *The Capture and Retention Evaluation of a Stormwater Gross Pollutant*. Ecological Engineering, 1-4.
- [3] Fitzgerald, B. and Bird, W. (2010). Literature Review: *Gross Pollutant Traps as a Stormwater Management Practice*. Auckland Council Technical Report 2011/006.
- [4] Norlida, M.D., Ismail, A. and Rozi, A. (2012) *Dissolved Organic Carbon Production and Runoff Quality of Sungai Kerayong*, International Journal of Engineering & Technology IJET-IJENS Vol: 12 No: 04 Kuala Lumpur, Malaysia.
- [5] Ismail Abustan, A. H. (2008). 11th International Conference on Urban Drainage, Edinburgh, Scotland, UK. *Determination of Rainfall-Runoff Characteristics in An Urban Area: Sungai Kerayong Catchment, Kuala Lumpur*, 10.
- [6] DID. (2012), Chapter 10, *Storm Water Management Manual For Malaysia 2nd Edition*, Department of Irrigation and Drainage (DID), Malaysia.
- [7] Lariyah, M., Nor, M., Khairudin, K., & K.H. Chua. (2006). *Development of Stormwater Gross Pollutant Traps (GPT's) Decision Support System for River Rehabilitation in National Conference on Water for Sustainable Development Towards a Developed Nation by 2020, Guoman Resort, Port Dickson*. 1-8.