

**POLLUTION ASSESSMENT OF SELECTED HEAVY METALS IN  
SOIL SURROUNDING BIOMASS POWER PLANT**

**NURUL DIANA BINTI MAT AIL**

**Final Year Project Report Submitted in  
Partial Fulfillment of the Requirements for the  
Degree of Bachelor of Science (Hons.) Chemistry  
In Faculty of Applied Sciences  
Universiti Teknologi MARA**

**JANUARY 2017**

## **ABSTRACT**

### **POLLUTION ASSESSMENT OF SELECTED HEAVY METALS IN SOIL SURROUNDING BIOMASS POWER PLANT**

Problem of heavy metals pollution is becoming more serious with increasing industrialization and disturbance of natural biogeochemical cycles. Heavy metals can give adverse health effect to human and environment. The objectives of this study were to determine the content of the selected heavy metals in topsoil surrounding Biomass Power Plant and to assess the pollution levels based on contamination factor, enrichment factor and geo-accumulation index. Heavy metal that were analyzed included copper (Cu), zinc (Zn) and manganese (Mn). In this study, the soil samples had been air-dried and sieved through 2.12  $\mu\text{m}$  in size and then, the soil samples were analyzed by using Quantexpress (Fast Screening) XRF S8 Tiger. The mean concentrations (mg/kg) for Cu, Zn and Mn were found as 36.4, 17.2 and 66.4 respectively. The analysis of contamination factor showed that the contamination degree of heavy metal in the soil samples is in the class of low contamination degree to moderate contamination degree. Analysis of the Igeo indexes indicates that heavy metal content in soil samples are mostly in the levels of unpolluted. Based on the data of EF, it can be concluded that the soils surrounding Biomass Power Plant is not significantly contaminated with the studied heavy metals.

## TABLE OF CONTENTS

	<b>Page</b>
<b>ACKNOWLEDGEMENTS</b>	iii
<b>TABLE OF CONTENTS</b>	iv
<b>LIST OF TABLES</b>	vi
<b>LIST OF FIGURES</b>	vii
<b>LIST OF ABBREVIATIONS</b>	viii
<b>ABSTRACT</b>	ix
<b>ABSTRAK</b>	x
<b>CHAPTER 1 INTRODUCTION</b>	
1.1 Background	1
1.2 Problem statement	3
1.3 Significance of study	4
1.4 Objectives of study	5
1.5 Scope and limitation	5
<b>CHAPTER 2 LITERATURE REVIEW</b>	
2.1 Agricultural soil	6
2.2 Heavy metal	8
2.3 Heavy metal in soil	10
2.4 Threats for humans	13
2.5 Threats for environmental health	14
2.6 Ecological risk assessment	15
<b>CHAPTER 3 METHODOLOGY</b>	
3.1 Materials	18
3.1.1 Raw materials	18
3.1.2 Apparatus	18
3.2 Methods	19
3.2.1 Study area	19
3.2.2 Soil collection	20
3.2.3 Sample preparation	20
3.2.4 Determination of heavy metal content	20
3.3 Assessment of the pollution level	21
3.3.1 Contamination factor	22
3.3.2 Enrichment factor	23
3.3.3 Geo-accumulation index	24

<b>CHAPTER 4 RESULTS AND DISCUSSION</b>	
4.1 Concentration of control soil	26
4.2 Concentration of heavy metal in soil samples	27
4.3 Distribution pattern of heavy metals	28
4.4 Contamination factor	31
4.5 Enrichment factor	34
4.6 Geo-accumulation index	36
<b>CHAPTER 5 CONCLUSION AND RECOMMENDATIONS</b>	38
<b>CITED REFERENCES</b>	40
<b>APPENDICES</b>	47
<b>CURRICULUM VITAE</b>	49

## LIST OF TABLES

<b>Table</b>	<b>Caption</b>	<b>Page</b>
3.1	Distance from Biomass Power Plant	20
3.2	Classes of contamination factor	22
3.3	Classes of contamination degree	22
3.4	Classes of enrichment factor	23
3.5	Classes of geo-accumulation index	24
3.6	Background concentration of heavy metals	25
4.1	The average concentration % of heavy metal in control soil	26
4.2	The average concentration % of heavy metal in studied area	27
4.3	Descriptive statistical data of heavy metal in soil samples	27
4.4	Contamination factor in each sampling site	31
4.5	Class of contamination factor in each sampling site	32
4.6	Degree of contamination and its classes in each sampling site	32
4.7	Enrichment factor in each site surrounding Biomass Power Plant	34
4.8	Classification indication for each sampling site	35
4.9	Geo-accumulation index surrounding Biomass Power Plant	36
4.10	The classification of the soil quality based on the geo- accumulation index	36