

UNIVERSITI TEKNOLOGI MARA

**ASSESSMENT OF HEAVY METALS
POLLUTANTS IN TREE BARK OF
Tectona grandis sp. FROM PERLIS,
MALAYSIA**

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ABSTRACT

Perlis, Malaysia currently develop with various types of industrial and agricultural activities which resulted atmospheric and soil pollutants problems. Tree bark is an example of biomonitoring technique which suitable and effective to evaluate the air pollution levels in targeted area. Tree barks (*Tectona grandis sp.*) and nearby topsoil samples were used to evaluate the selected heavy metals (As, Fe, Cd, Co, Cr, Cu, Mn, Ni, Pb and Zn) in Perlis area. Eighteen samples of tree bark and topsoil each were collected from same station at Perlis area. Both samples were analysed using energy dispersive X-Ray fluorescence (EDXRF) spectrometer and evaluated with inductively coupled plasma mass spectrometer (ICPMS). The results concentration of elements shows that As, Fe, Cr, Pb and Zn recorded above the natural level. In addition, the heavy metal pollution level in atmospheric was evaluated using assessment through the calculation of enrichment factor (EF), geoaccumulation index (I_{geo}) and pollution index (PI). Average EF values was used to evaluate tree bark samples that indicates all location had polluted. Meanwhile, I_{geo} evaluation shows only Fe, Co, Cr, Cu, Mn, Ni and Zn were categorised in uncontaminated soil. While overall pollution by pollution index (PI) calculated heavy metal in tree bark and topsoil sample were originated from natural sources except station 18 of topsoil sample. Besides that, principle component analysis (PCA) and cluster analysis (CA) were used to determine possible sources of heavy metal in atmosphere and topsoil. Analysis of tree bark and topsoil shows the heavy metal pollutants sources were possibly from transportation, agriculture, industrial and natural sources. The overall results obtained clearly shows tree bark (*Tectona grandis sp.*) is suitable to be used as biomonitoring for monitoring atmospheric pollutants.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

Deeper understanding of environmental problems and the necessity to protect the planet has become one of the most crucial and timely tasks facing mankind. Ecological mistakes may develop into a global crisis phenomenon such as climate change, ozone layer depletion, soil pollution, poor air quality and water pollution. Human social and economic systems may carry the planet into a crisis of no return. The improvement of the technologies without worried of impacts to the environment would disturb natural processes such as carbon cycle and nitrogen cycle and also human itself.

Population growth, changing social structures, enhancement of living standards and improvement of technology for natural resource utilization, may, directly or indirectly, lead to rapid deterioration of the environment. Most used resources return in the form of waste that can be, in the worst case scenario, hazardous to the environment and all living organisms. Hazardous anthropogenic activities are increasing the pollutant load on the Earth. Large urban areas and megacities, which are constantly growing all over the world, are principally responsible for the enormous release of toxic and hazardous substances into the environment, in particular, heavy metals/metalloids (Shekhter, 2012). As more countries have become industrialized and urbanized, heavy metal pollution is reaching disturbing levels. The affected areas are holistic include air, soil and water.

Heavy metal pollution pollutes the atmosphere at troposphere region where human live in and also the initial formation of anthropogenic and natural sources of the pollution (Vallero, 2008). Air pollution is best defined as the presence of pollutant substances in the atmosphere that interferes human life or produces other harmful environmental effects (Bhatia, 2007). The air pollution involve of pollutant into the atmosphere in size of particulate matter or airborne which toxic that emitted from the naturally or anthropogenic sources (Wuana and Okieimen, 2011). Air pollution starts from two major sources, which are anthropogenic and natural sources. Anthropogenic sources are the emission of pollutants by human activities such as industrial, agriculture