



## 1.19 CURRENT STATUS OF RESEARCH AND RELATED ACTIVITIES IN NAA APPLICATION.

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### 1.0 INTRODUCTION

MINT's laboratory is equipped with various types of analytical chemistry equipment capable of determining trace level of elements and organic compound particularly chemical pollutants of environmental concern. Neutron Activation Analysis (NAA) is one of the system that has been used for elemental analysis. Another analytical chemistry technique available for the analysis is the ICP- MS, mainly used for determination of elements that are of environmental concern such as Pb, Cd, Hg and Ni. These elements are either not possible or not sensitive enough to be determined by NAA technique. Particular types of samples such as water which is not suitable to be determined by NAA is also assayed by ICP - MS technique.

Apart from the elemental analytical equipment, our laboratory is also equipped with systems for assessment of organic pollutants in environmental materials. Examples of organic pollutants that are being studied include Polynuclear Aromatic Hydrocarbon (PAH) and other persistent organic pollutants particularly the organochlorine compounds.

Quality of the analytical data is the aspect that we seriously take into consideration when performing the analytical procedures. Standard Reference Materials (SRM), sample splitting and other internal quality control measures are examples of action being applied for the quality assurance and quality control measure. Participation

in the IAEA's organized Interlaboratory Comparison Studies is one of the activity that we undertake regularly to ensure that our analytical system is fit for the purpose.

Major applications of the facilities include the following: Providing analytical chemistry services and undertaking various environmental studies particularly air pollution and marine environmental pollution.

## 2.0 ANALYTICAL CHEMISTRY SERVICES

The services are offered to all interested parties in the country particularly those organizations involved in environmental monitoring and control. Table 1 shows typical example of samples numbering about 900 to 1000 yearly that we normally receive from clients for analysis.

**Table 1 :** Types of samples that we normally receive from clients for analysis of the elemental contents.

Types of samples	Percentages
1. Air Particulate Matter ( on air filter )	40%
2. Soils/Sediments	20%
3. Water	10 %
4. Flora/ fauna	10 %
5. Oil sludge/ waste sludge	10 %
6. Tin tailing/ blasting slag and others	10 %

Most of the samples received for the chemical analysis (elemental analysis) are the air particulate matter (on filter paper) - mainly to determine level of certain toxic constituents of the air pollutants at work places. Soils and sediments are normally from areas where there is a possibility of being contaminated by chemicals that can cause hazardous effect to human or animals in the surrounding area.

### **3.0 AIR POLLUTION STUDY**

Air pollution has become a major issue since a few years back due mainly to the worsening of air quality particularly in big cities such as Kuala Lumpur, Johor Bharu and Penang. Almost every dry season, haze has become a normal occurrence affecting not only the big cities but also other parts of the country. The worst was the haze episode of August to December 1997. Even though the Department of Environment (DOE) carries out regular nationwide monitoring of the air quality, there has not been enough quality data available which can provide information on the origin of pollutants. No thorough study relating to the identification of source of pollutants which could be used as factual foundation in making decision to overcome air pollution problem, has been carried out to date.

In view of the is fact, we decided to participate in the UNDP/RCA/IAEA ( RAS /97/03/A/01/18) project on Better Management of the Environment, National Resources and Industrial Growth Through Isotopes and Radiation Technology; for sub - project on air pollution and its trends in the region. The expected output of the UNDP/RCA/IAEA sub- project such as:

- Establishment of capability to undertake accurate monitoring of air particulate pollution;
- Identification/quantification of sources through source apportionment of regional air pollution levels;

- Identification of the relative adverse effects of different sources of pollution to enable rational decision making on the most cost - effective means for mitigating air pollution in individual urban areas such as “ no burn “ or “ car - free “ days during episodes of high pollution;

complied with the national need as previously mentioned.

Even though the project activity officially commenced in 1998, but the activity of data collection has started earlier using the recommended sampler for the particulate matter collection. Fig. 1 and Fig.2 show level of Air Particulate Matter in Kuala Lumpur ( representing urban area) and Bangi ( representing the sub - urban area), respectively.

It is envisage that by acquiring enough quality data and expertise through the IAEA's program the main objective of the study; i.e. identification of sources emission, will be achieved.

#### **4.0 MARINE ENVIRONMENTAL STUDY**

The program for marine environmental study that we are currently involved is the UNDP/RCA/IAEA ( RAS /97/03/A/01/18) project on Better Management of the Environment, National Resources and Industrial Growth Through Isotopes and Radiation Technology; for sub - project entitled Marine Coastal Environment and Its Pollution. The project consists of four components, namely :

1. Establishment of a Regional Database on Marine Radioactivity.
2. Determination of the Levels, Behavior and Fate of Radioactive and Non - Radioactive Pollutants in the Environment Through Isotope or Nuclear Techniques
3. Application of Nuclear and Modeling Techniques to Sustainable Developemnet in the Coastal Zone.

4. Application of nuclear Techniques to Address Specific Red Tide ( Harmful Algal Bloom ) concern.

Our laboratory is only involved in the first three of the project components, whilst the last component was undertaken by a group of researchers from the National University of Malaysia.

The UNDP/RCA/IAEA project was formulated to continue the previous footnote of an RCA project which officially ended at the end of 1996. Previously our study was more toward establishment of national capability to address issues on the marine environmental pollution.

State of marine pollution at various coastal water area of Malaysia including part of Melaka Strait, Johor Strait and part of South China sea were studied. The previous study mainly focus on acquiring data on natural radioactivity and common non-radioactive pollutants such as elemental ( including the elemental species ) as well as organic pollutants in the marine environmental materials.

The project program was also funded by Malaysian Government.

## 5.0 FUTURE ACTIVITY

A feasibility Study on Remediation of Tin - Mined - Out Land, North of Kinta field, West Malaysia , will be the title of our future activities. This program will be undertaken in collaboration with other agencies , namely; Department of Environment, Geological Survey and the Perak State government. It is envisaged that the program will be funded by JICA.

The objective of the study are to :

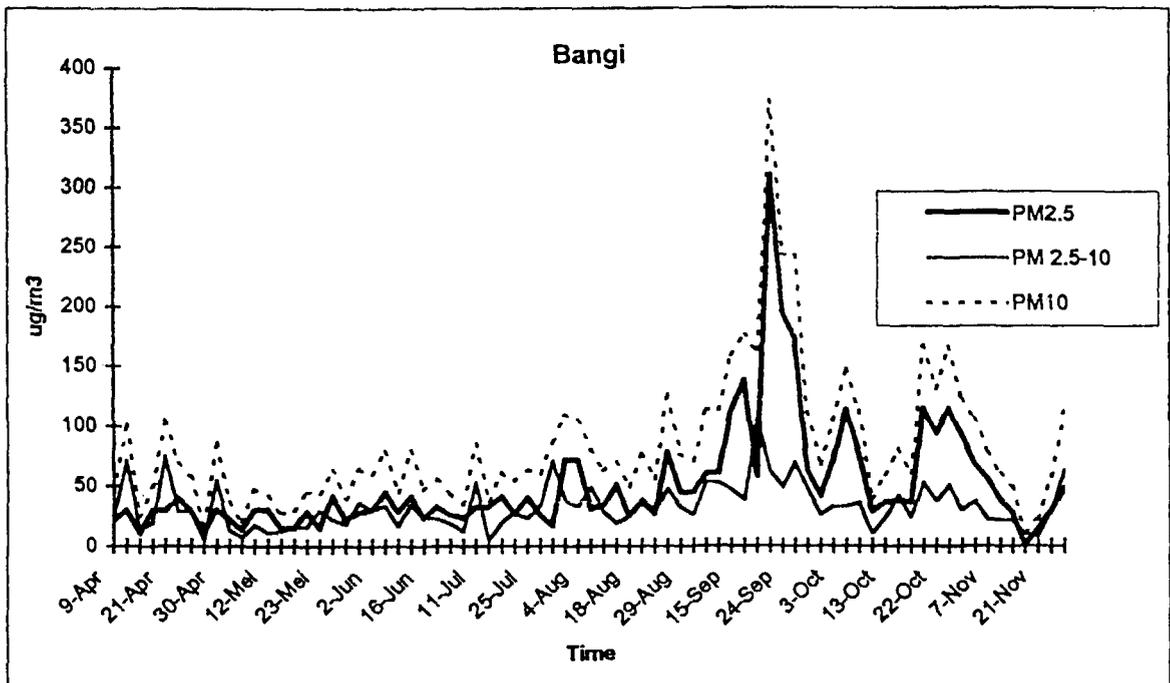
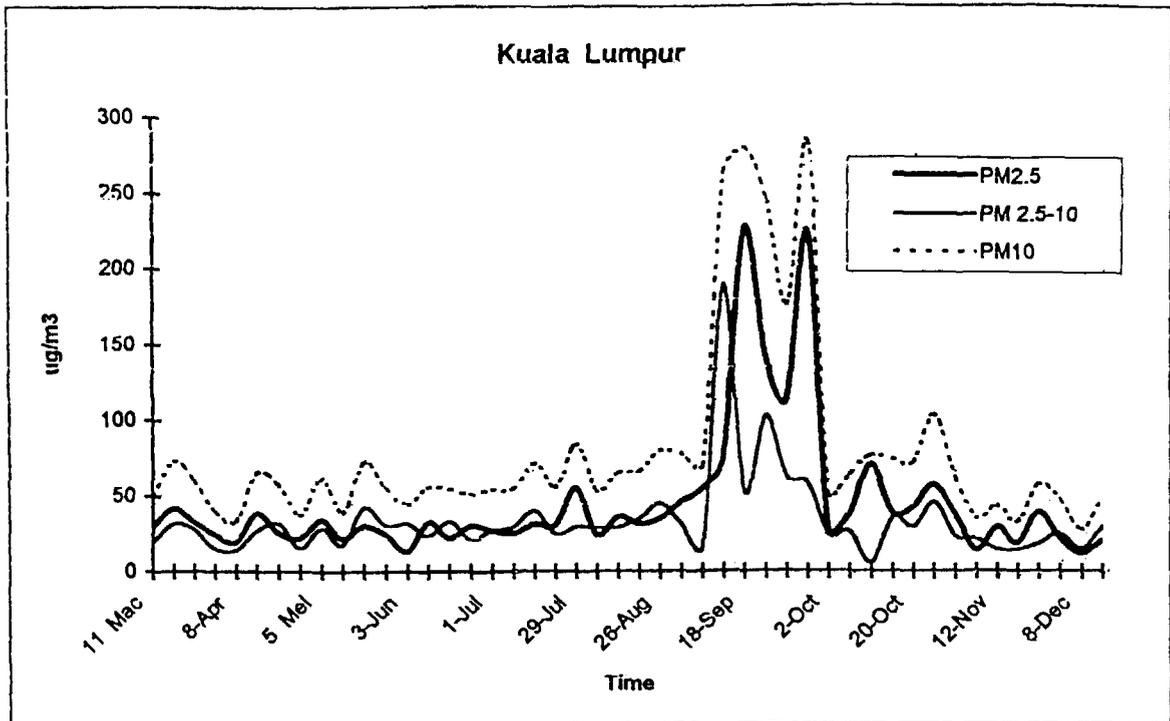
1. Compile thematic maps on the distribution of heavy metals, trace organic compounds and radioactivity;

2. Carry out a feasibility study on remediation of a selected contaminated area;
3. Establish environmental guidelines of region's development through the feasibility study to prevent future pollution problems and
4. Prepare database and propose a future monitoring system with remote sensing technology.

The elements and chemical to be determined in the study will include Hg, Cd, As, Pb, Cu, Mn, Ni, Sn, Zn, B, Ra, Th, U, and total external radioactive radiation. The determination of the chemicals in the collected samples such as slurry slime, water, sediment and soil; will be carried out mainly by NAA and ICP - MS.

## 6.0 CONCLUSION.

Almost all application of our analytical chemistry analysis systems are meant for environmental studies. In order to fulfil the need for the environmental studies, the NAA system alone is not enough due to its limitation especially in dealing with chemical/elements of environmental concern such as Pb, Cd or Ni. For this reason we equipped our laboratory with other analytical systems such as ICP-MS to compliment the elemental analysis and GC / GCMS for organic contaminants.



**Fig. 1 and 2: Concentration distribution PM 2.5 - 10 And PM 10 In Kuala Lumpur And Bangi**