

ASSESSING PM_{2.5} FOR STUDY ON HEALTH IMPACT OF TRANS-BOUNDARY HAZE FROM PEAT FOREST FIRES IN INDONESIA

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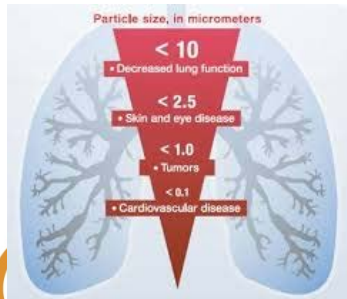
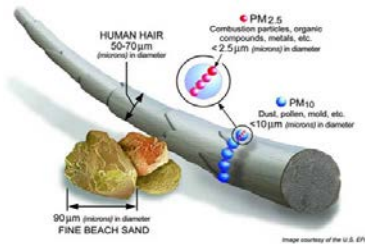
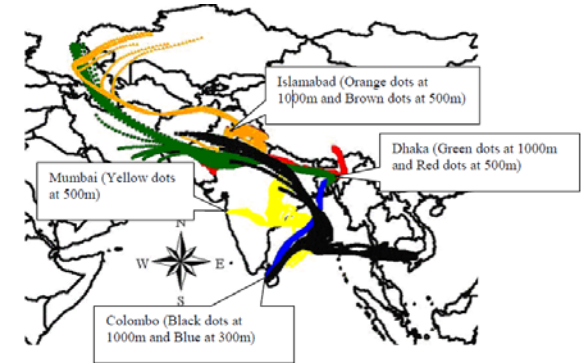


Bogor, 3 November 2017

Regional Problems



Jakarta has probably the worst traffic jams in the world



- ❖ Economic activities; etc cause air pollution
- ❖ Impact on human health
- ❖ Transboundary air pollution
- ❖ Air pollution is a regional problem



Regional cooperative framework is needed

Air Pollution Problem in Indonesia

- Increased economic development in the Indonesian region has often led to rapid and unplanned urbanization.
- Urban air pollution is a major problem in this region and growing recognition of the health effect problems resulting from airborne particles.
- Air pollution is a global phenomenon with air transport taking place across countries in a few days and around the globe in a few weeks.



**February 14, 2014
Indonesia's Mount Kelud Erupts**



**September-October 2015
Smoke and Fires in Sumatra
and Borneo**



Figure courtesy of NASA



Forest Fires in Indonesia



Indonesia has struggled for years to contain forest fires, especially in the islands of Sumatera and Borneo.



The fires are caused by firms and farmers engaging in illegal slash-and-burn practices to clear their land of unwanted vegetation and peat. Sumatra and Kalimantan possess large areas of peatland, which is highly combustible during dry season. Peat contributed heavily to carbon emissions because of the substance's high density and carbon content. The haze was particularly severe in 2015 due to the El Niño phenomenon, which caused drier conditions, causing the fires to spread more.



Some of actions government taken to control the fires

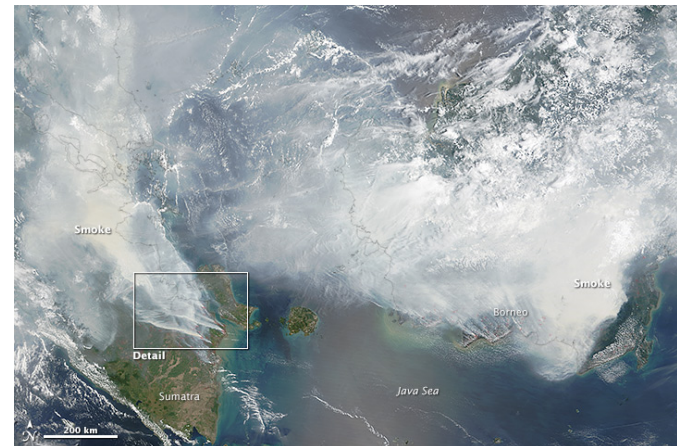
Outline of Collaborative Research

- ✓ Indonesia, forest fires from uncontrolled burning of large areas of lands are major problem for air quality. Tropical peat/forest fires in Indonesia are generally caused by illegal human activities including land clearing, converting to agricultural lands through heavy logging and slash and burn techniques, and accidental fire. Most of these fires particularly occurred in Kalimantan and Sumatra islands, which have the world largest areas of tropical peat lands.



Outline of Collaborative Research

- ✓ In particular, peat fires could become an even worse air pollution source due to its underground fires and also its impact to other region nearby as trans-boundary haze pollution.
- ✓ Neighboring country such as Malaysia and Singapore experienced severe air pollution exceeding the typical air quality standards due to the peat fires in Kalimantan, and the impact of it also beared by Brunei and even Southern Thailand.
- ✓ In order to reduce trans-boundary haze pollution from vegetation fires, information on their impacts on air quality and human health need a thorough investigation.



Outline of Collaborative Research

- ✓ In this study, the observation of air quality especially during peat fires episode in Palangka Raya/Pekanbaru will be carried out with focused on the fine particulate ($PM_{2.5}$) to investigate the mass concentration and its chemical characteristics of particulate emissions in peat fires and its dispersion to show the influence to the neighboring countries, as well as the correlation with the health impact of this disaster.

Fine-Particulate Air Pollution and Life Expectancy in the United States

C. Arden Pope III, Ph.D., Majid Ezzati, Ph.D., and Douglas W. Dockery, Sc.D.

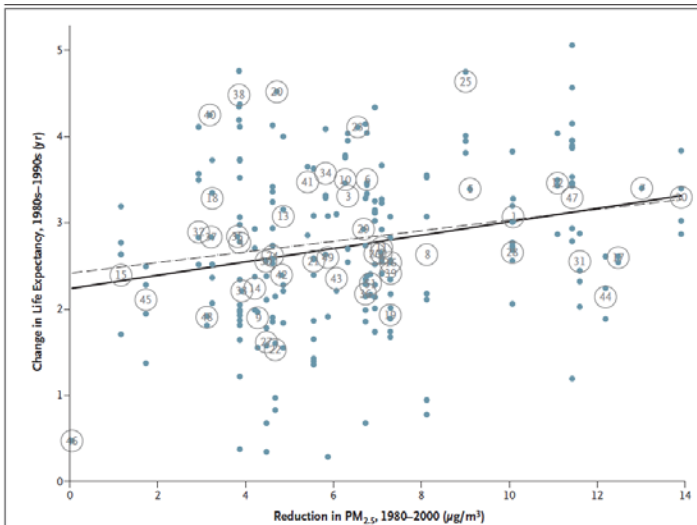


Figure 4. Changes in Life Expectancy for the 1980s–1990s, Plotted against Reductions in $PM_{2.5}$ Concentrations for 1980–2000.

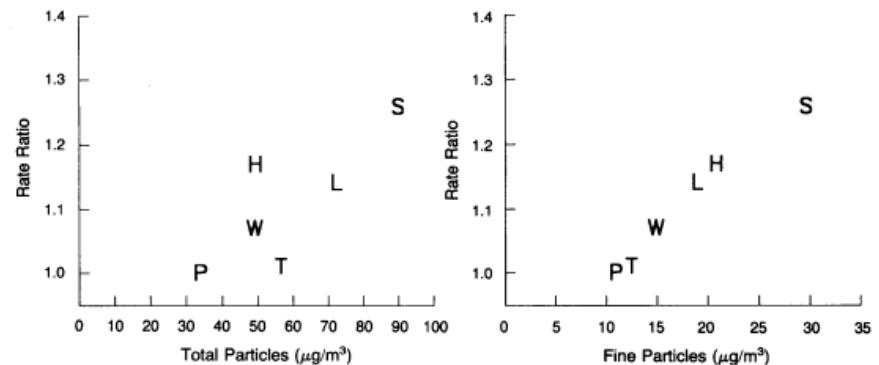
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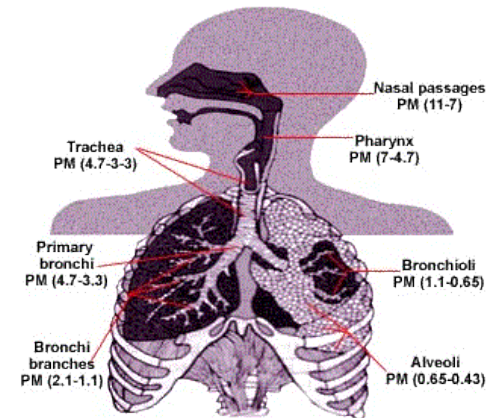
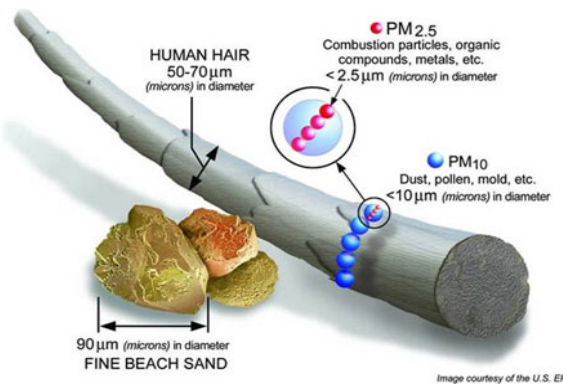
AN ASSOCIATION BETWEEN AIR POLLUTION AND MORTALITY IN SIX U.S. CITIES

DOUGLAS W. DOCKERY, Sc.D., C. ARDEN POPE III, Ph.D., XIPING XU, M.D., Ph.D.,
JOHN D. SPENGLER, Ph.D., JAMES H. WARE, Ph.D., MARTHA E. FAY, M.P.H.,
BENJAMIN G. FERRIS, JR., M.D., AND FRANK E. SPEIZER, M.D.



Why we need Airborne Particles Analysis?

- Only few existing data for “coarse” PM₁₀ particles in Indonesia
- Data on fine PM_{2.5} particles are relatively scarce, but are needed more because of the health effects
- Identifying pollution sources is the first critical step towards developing strategies for its management



Disposition of Particulate Matter (PM)
in the Respiratory system
(Richard Wilson, Harvard Press, 1996)

Elemental analysis in
airborne particulate matter
is crucial to identify the
pollution sources



Nuclear Analytical Techniques

NATs Technology for Particulate Matter Analysis



Figure courtesy of ANSTO

IBA facility in Australia

Advantages :

- Simultaneous multi elemental
- Non destructive, selective and sensitive
- Small weight samples
- Cost and time effective



Synchrotron facility in Italy



NAA and XRF, Indonesia

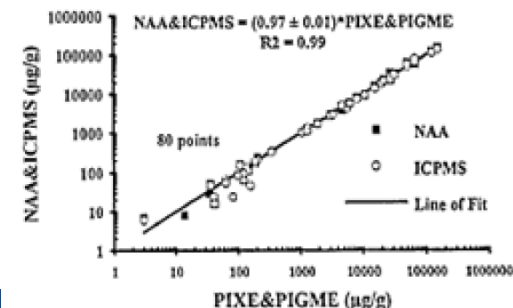
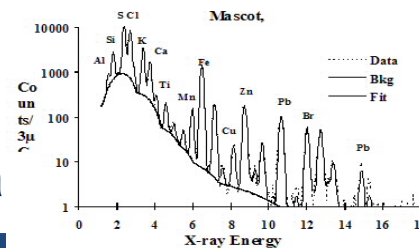
Air pollution is a regional problem



Regional cooperative framework



Regional Cooperative Modalities



A Plan of Collaborative Research

- ✓ Through this collaborative research, we will exploit developments applied with Japan Disaster Prevention joint laboratory to apply state of the science techniques to derive transboundary haze forest fires impact on human health.
- ✓ We will provide the monitoring data of $PM_{2.5}$ and chemical composition with existing health datasets in Palangka Raya and Pekanbaru for establishing the quantitative correlation of $PM_{2.5}$ from forest fires haze with human health impact.
- ✓ The exchange of knowledge and sharing of expertise will directly lead to improved local capability to evaluate air pollution gradients, conduct exposure assessments for viable health impact evaluations and will provide the policy/regulation maker to make decisions relating to optimal control methodologies to mitigate against the impacts.



This will both protect and enhance the value of future investments

A Plan of Collaborative Research

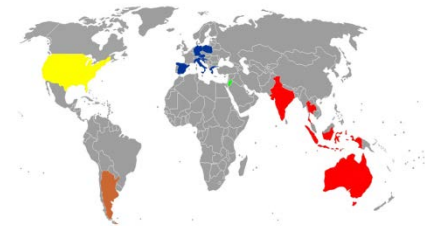
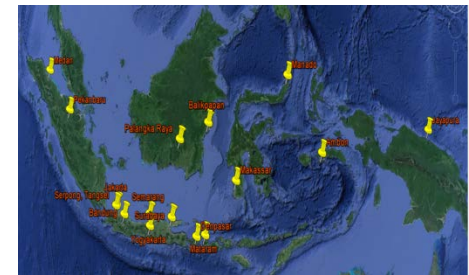
- ✓ Specifically, the project will directly provide:
 - an assessment of impact of transboundary haze forest fires event on air quality with monitoring data on forest fires episodes, and long term monitoring on normal condition. The data will comprise of PM_{2.5} concentrations, black carbon, and chemical composition analyzed using NAA and XRF. We have experience on this activity and involve in regional project under IAEA coordination in air quality monitoring.
 - improve understanding of potential haze impact on human health including the impact on dispersion of haze. Estimating the health impact for further distance from the main source location. Through this collaborative research, we hope we could improve knowledge and capability in utilization of data monitoring for disaster prevention especially related with the human health impact, and dispersion of the haze.

A Plan of Collaborative Research

- ✓ Monitoring of fine particulate ($PM_{2.5}$) is carried out in cooperation with the minister of environment and forestry of Indonesia and local EPA of Palangka Raya city/Central Borneo Province and Pekanbaru city/Riau Province.
- ✓ Chemical composition will be carried out using BATAN laboratory which have been accredited by implementing the ISO17025.
- ✓ Health impact study will be carried out in cooperation with Faculty of public health, University of Indonesia
- ✓ The expenses for this research will be covering for travel expense for samplings, and meeting, chemical and laboratory goods

Related Researchs on Air Quality Monitoring

- ❖ Nuclear Techniques for Improved Management of Trans-boundary Air Pollution in the RCA Region (RAS/7/013) 2003 – 2006
- ❖ Characterization and Source Identification of Particulate Air Pollution in the Asian Region (RAS/7/015) 2007 – 2010
- ❖ Supporting Sustainable Air Pollution Monitoring Using Nuclear Analytical Technology (RAS/7023) 2011 – 2014
- ❖ Assessing Air Quality in Indonesia (TC-INS 7007) 2012-2015
- ❖ Assessing the Impact of Urban Air Particulate Matter on Air Quality (RCA) (RAS7029) 2015-2018
- ❖ Optimization of Nuclear Instrumentation for Modern Environmental and Industrial Applications (CRP G42005) 2014-2018



Significance of This Collaborative Research

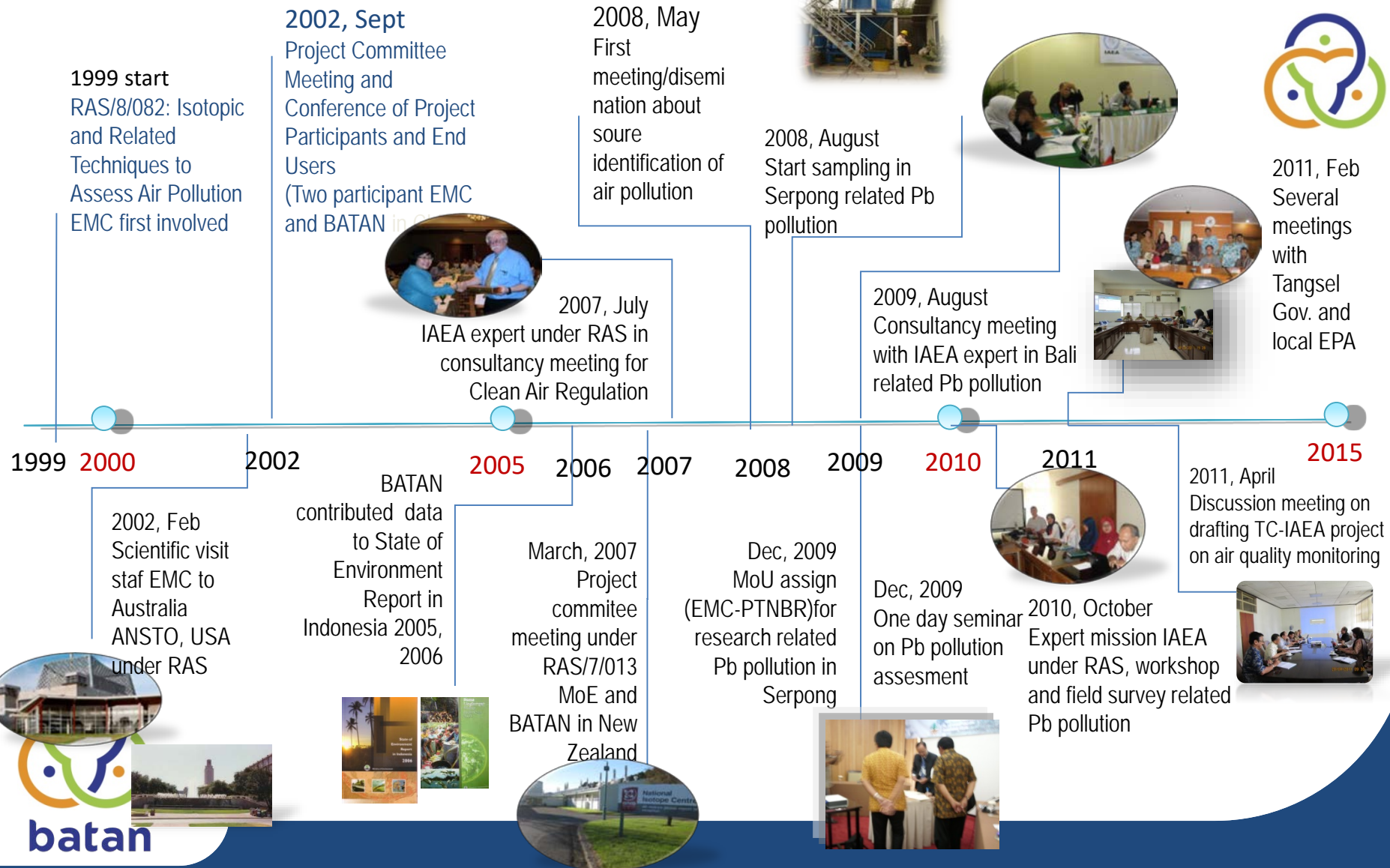
- ✓ This collaborative research will develop and promote collaboration more extensively, and it is essential to conduct the research as a bilateral Japan-Indonesia collaboration project to accelerate the goals and achievements.
- ✓ Fires on peat burn longer and produce more smoke than other fires, and it is associated with an increased risk of respiratory illness and heart attacks. Therefore, the study on health impact of trans-boundary haze from peat forest fires in Indonesia, estimate and evaluate the correlation of air quality data and health dataset requires joint collaboration and coordination of efforts from both partner countries, and hopefully the results from this collaboration will provide valuable information that will accelerate its outcome to environmental improvement and minimize the impact to human health in order to achieve the Sustainable Development Goals (SDGs).
- ✓ By this collaborative research, we hope we could get a scientific support in utilization of monitoring data obtained by local researcher to get better understanding in correlation with human health and disaster prevention for global scale (by modeling, statistical approach etc)

Expected Results

- ✓ PM_{2.5} data from actual monitoring site (at forest fires episodes and long term data at normal conditions), black carbon, and other chemical composition data.
- ✓ Correlation of air quality data (PM_{2.5}) with human health impact based on utilization of health datasets obtained from local health institutions. This assessment will provide recommendations for government policies and strategy in reducing the future fires.
- ✓ Expanding the correlation by estimation from existing data for further to global dispersion of the haze caused by forest fires episodes.
- ✓ Improving capability building in human resources (local EPA, researchers and academic involved in this research) in utilization of monitoring data for mitigation and prevention of disaster.
- ✓ Strengthening the networking and open the bridge between BATAN and Kyoto University especially in environmental disaster study and further future collaboration

THANK YOU

Air Quality Monitoring BATAN-MoE



Collaboration with MoE

MoU between minister of Environment and
Head of BATAN in Serpong,
4 August 2011



MoU between Deputy of MoE and Deputy of
BATAN in Serpong,
4 August 2011



Collaboration for application nuclear analytical techniques in
environmental was officially signed between BATAN and MoE

Laboratory

Maintenance of Accredited Laboratory on implementing ISO/IEC 17025:2005 for scope of airborne particulate matter characterization (LP-311-IDN from 31 March 2011 – 31 March 2015)

