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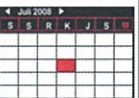
How Much Do People Value Clean Air? – A Case Study From Jakarta

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Poor air quality in Indonesia's capital city is having a significant impact on residents' health and there is an urgent need to introduce new initiatives to deal with the problem. To help justify investment in such new strategies, a recent EEPSEA study has looked at the value that citizens in the Jakarta Metropolitan Area (JMA) place on pollution reduction policies for the transportation sector. The study is the work of Mia Amalia from the →

Block 1 Card 4	Policies	Current condition	Improved public transport facilities	Restriction of vehicle numbers in busy areas	Reduction of old cars and motorcycles
	Code	1	2	3	4
Health problems		4 days per month	3 days per month	1 day per month	3 days per month
Visibility		10 kilometres	50 kilometres	30 kilometres	50 kilometres
Smell from cars and motorcycle smoke		Very disturbing	Slightly disturbing	Disturbing	Disturbing
Cost per year		Rp 0	Rp 500.000	Rp 900.000	Rp 500.000

Sample of show cards presenting a choice set

Air pollution in the JMA damages human health and the environment. For instance, in Jakarta Province approximately 46% of diseases are air-pollution-related. These diseases include respiratory diseases, eye irritations and allergic conditions such as asthma. In 2004 there were about 6,400 premature deaths related to air pollution in the JMA. During that year, each working age person lost, on average, about 24 productive work days due to pollution-related health problems. As well as having an impact on people's health, air pollution in the JMA also impairs visibility and can cause offensive smells.

➡ Environmental Management and Development Program at the Australian National University. It shows that, although many residents are mistrustful of the government's ability to clean up the city's air, they do place a significant value on clean air.

Households in the JMA are, on average, willing to pay up to USD 66.51 per annum over three-year period for the implementation of three new environmentally-beneficial transportation policies. These policies would make a significant positive improvement to both Jakarta's air quality and to the health of its citizens. The study uses the choice modelling approach in its assessment. The researcher carefully crafted the questionnaire to suit local conditions (a population with low literacy and have high dependency on oral than written communication) which are typical in developing countries.

Jakarta's Pollution Problem

Compared with other big cities, the levels of many air-borne pollutants in the JMA are amongst the highest in the world. For example, levels of total suspended particle (TSP) pollution in the JMA are second highest globally after New Delhi. NO_2 concentrations are approximately $10\mu g/m^3$ higher than the World Health Organisation's standard. The main sources of air pollutants in the Jakarta Metropolitan Area (JMA) are domestic activity, industry, municipal solid waste burning and the transport sector. The transport sector is the main source of many pollutants, including CO and NOx and TSP. Indeed, levels of NOx, PM_{10} and CO in the city show sharp concentration peaks in the morning and afternoon when traffic congestion is at its highest.

Do People Value Clean Air?

To assess the value that people in the JMA place on cleaner air, the study examines how much JMA citizens would be willing to pay for three key results of pollution clean-up: 1) lowering the number of restricted activity days due to illnesses related to air pollution; 2) better visibility; 3) a reduction in odours disturbance. Better health, better visibility and lower odour disturbance are not things that are bought and sold in markets. Therefore, specific non-market valuation techniques were used to estimate their value. To do this, the study used a choice modelling technique. The researcher developed the questionnaire using a number of focus group discussions. Amalia also drew upon the findings of previous studies she had carried out; these studies looked at issues such as dispersion of

a significant value on clean air"

particulate matter and the impact that particulate matter has on human health.

To choose the people who would take part in the survey, 13 subdistricts were randomly selected from the 166 subdistricts in the JMA. Five villages were then randomly selected within every subdistrict and two sub-villages from every village. Sub-villages were used to create primary sampling units (PSU) consisting of 50 households each. Five households per PSU were interviewed. In the survey, 1,170 households were contacted and 647 households agreed to be interviewed.

Choosing Pollution Clean-up Strategies

The people involved in the study were first given details of the pollution problem facing the JMA. Proposed solutions were then outlined and it was explained that these policies would improve air quality but that they would be expensive to implement. It was made clear that the money to pay for the policies could come from the JMA's citizens in the form of increased land and property taxes, higher vehicle taxes and entry fees to busy areas, as well as through higher parking fees in busier areas.

The three pollution clean-up policies outlined in this research were: (1) the improvement of public transport facilities through the construction of bus corridors, monorails, light rails, pedestrian walking paths and bike lanes; (2) the restriction of vehicle number in busy areas; (3) the reduction of old vehicle numbers.

Assessing How Much People Might Be Willing To Pay

Respondents were presented with a number of choice card sets. These described the three proposed pollution clean-up policies. They also outlined a range of impacts that these policies might have on the number of restricted activity days, on visibility and on smells. The choice cards also listed the amount of money that the policy options would cost a respondent's household. A range of potential impacts and costs was used and each respondent was given a specific combination of these variables. Respondents were asked to choose which options they would prefer. They were also given the option to say that they would like no action to be taken.

The research also gathered information on the citizens' socio-economic status; for example, data was gathered on average income, education and age. Information was also gathered on the respondents' history of respiratory illnesses, the number of restricted activity days they had suffered during the past month and their perception of air pollution in Jakarta.

The sample was divided into two groups. One group of respondents were told that the choice of air pollution improvement strategy would depend on the most popular programme chosen by JMA citizens. They were also told that the choices made by JMA citizens would determine the amount of money that each household would pay. This 'provision rule' was worded to make respondents feel that their responses would actually influence policy.

1	NPV in million USD			NPV in trillion Rp		
Discount rate (%)	6.75	9.51	12.75	6.75	9.51	12.75
Policies	2	3	4	5	6	7
TS	498	474	448	4,373	4,161	3,934
RD	507	483	456	4,459	4,242	4,010
RO	524	499	472	4,608	4,384	4,144

Present value of total benefit for three new transport policies for a three-year period

Getting the Choice-Modelling Questionnaire Right

Many lessons were learned during the development and implementation stage of this study's choice modelling questionnaire. The households interviewed generally had a low education level. Because of this, an oral rather than a written approach was developed for the questionnaire interviews. Show cards were used to describe the pollution issues facing people in the JMA. They were also used to outline proposed solutions to the issues and to present choice sets.

To further help people's understanding, a 'story-like' questionnaire was developed so that surveyors could easily guide the respondents through the whole questionnaire. Surveyors were carefully trained so that they were capable of delivering the questionnaire using show cards and, at the same time, able to tell the 'story' so that respondents could understand the links between problems, alternative solutions and choice exercises. It is clear that, in communities with low literacy and high dependency on oral communication, such an approach will deliver better results than a more conventional survey.

How Much is Clean-up Worth?

It is clear that the respondents in the JMA placed a significant non-market value on cleaner air. This was especially true for any reductions in the level of illnesses caused by air pollution and for any improvements in odour. However, most of the respondents were reluctant to choose any of the three proposed air pollution clean-up policies. The probable reason for this was that they may not believe that their contributions would be used to reduce air pollution from the transport sector. This was probably because, historically, most of the relevant policies implemented in the JMA have failed to remedy the air pollution problem. Another possible cause is that the costs of each of the projects listed in the choice-modelling questionnaire were relatively high (the lowest was Rp 100,000 per year).

Nonetheless, on average, respondents in the JMA were willing to pay Rp 584,333 (USD 66.51), Rp 558,000 (USD 63.51) and Rp 579,333 (USD 65.94) per household per annum over a three-year period for the implementation of the improved public transport policy (TS), the vehicle restriction policy (RD), and the old-vehicle reduction strategy (RO), respectively. The total number of households in the whole of the JMA was approximately 6,310,790 in 2008. This means that the total value of the TS, RD and RO policies would be about USD 230 million, USD 219 million and USD 228 million, respectively.

The values produced by this study will be very useful to future studies. They could be used in cost benefit analysis to help estimate the total net benefit of the implementation of any new transport or air pollution policies. The results should also assist local government in the JMA area: they provide a more precise understanding of the JMA citizens' preferences towards transport policies. They also give a good indication of the potential total net benefit that such policies could deliver.