Worsening and Health Effects of Greater Jakarta Air Pollution

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**Air Pollution and Health: Evidence to Catalyze Local Action**
Better Air Quality 2018
Kuching, Sarawak, Malaysia, 12 – 16 November 2018
Outline

1. Industrialization and motorization
2. Air Pollution Exposure in the Greater Jakarta
3. Health Effect
5. Conclusion and recommendation
Industrialization and Motorization
Motor Vehicle Growth

Total Sales (2017): 1.1 million units of car and 7 units million of motor cycle p.a.
Traffic
Waste
Air pollutants

- Lead (Pb)

Lead smelter @ KPBB

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Air Pollution Exposure in the Greater Jakarta
Air Pollution in Various Cities and Its Effect to Public Health

Health Effect - Jakarta Case 2016
58.3% of the Jakarta population (>10 millions) were suffered by various related-air pollution diseases/illness, and paid the direct medical cost IDR 51.2 trillions ~ USD 3.9 billions

<table>
<thead>
<tr>
<th>Sakit/Penyakit</th>
<th>2010</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthmatic bronchial</td>
<td>1,210,581.00</td>
<td>1,489,014.63</td>
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<tr>
<td>COPD</td>
<td>153,724.00</td>
<td>172,632.05</td>
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<tr>
<td>ISPA</td>
<td>2,449,986.00</td>
<td>2,731,734.39</td>
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<tr>
<td>Pneumonia</td>
<td>336,273.00</td>
<td>373,935.58</td>
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<tr>
<td>Coronary artery disease</td>
<td>1,246,130.00</td>
<td>1,386,319.63</td>
</tr>
</tbody>
</table>
AAQM in Jakarta 2012-2017, declining slightly

PM$_{2.5}$, PM$_{10}$, NOx, SOx, CO, O$_3$
Currently Air Quality in Jakarta

Source: AirNow, analysis by KPBB
Emission Inventory Results

base year = 2012
projected to 2030

Source: Breathe Easy Jakarta, 2013
Spreading of High Risk Lead Smelters in Jakarta and its Surrounding areas
Health Effect
Air Quality, and Health Effect in Jakarta

- WHO released the report that in 2016 PM contributed to 79,700 premature mortality, and O3 contributed 900 mortality, and defined that 8% total mortality was caused by air pollution exposure in Indonesia.
- Increasing of people in Jakarta who suffered by cancer.

**Health Effect - Jakarta Case 2016**
- 58.3% of the Jakarta population (>10 millions) were suffered by various related-air pollution diseases/illness, and paid the direct medical cost
  - Rp 51.2 trillions ~ USD 3.9 billions

**Hazardous Air Pollutant (HAP).** High risk people who stay in surrounding areas of lead smelter is founded such as the children born, and or growing up with having disabilities, down syndrome, mental disorder, abnormal body, acute anemia, tremor, autism, decreasing of intellectuality, learning difficulties, wrist drop, foot drop, mortality, and others.
  - Many adults are suffered high blood pressure, tremor, stomach cram, infertility, kidney failure, male dysfunction, mortality, etc.
### BLL Values by Location

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>SITE</th>
<th>n</th>
<th>med</th>
<th>min</th>
<th>max</th>
<th>n</th>
<th>med</th>
<th>n</th>
<th>med</th>
<th>n</th>
<th>med</th>
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<tbody>
<tr>
<td>Kelapa Dua</td>
<td>Site 1</td>
<td>41</td>
<td>8.3</td>
<td>2.2</td>
<td>14.7</td>
<td>34</td>
<td>1,289</td>
<td>68</td>
<td>32</td>
<td>68</td>
<td>971</td>
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<tr>
<td>Dadap</td>
<td>Site 2</td>
<td>37</td>
<td>8.7</td>
<td>2.3</td>
<td>14.9</td>
<td>45</td>
<td>1,201</td>
<td>90</td>
<td>35</td>
<td>90</td>
<td>853</td>
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<tr>
<td>Rawa Buaya</td>
<td>Site 3</td>
<td>45</td>
<td>7.9</td>
<td>2.9</td>
<td>13.9</td>
<td>42</td>
<td>8,149</td>
<td>84</td>
<td>47</td>
<td>84</td>
<td>423</td>
</tr>
<tr>
<td>Cipondoh</td>
<td>Ste 4</td>
<td>36</td>
<td>9.8</td>
<td>3.2</td>
<td>15.2</td>
<td>44</td>
<td>6,501</td>
<td>88</td>
<td>44</td>
<td>88</td>
<td>546</td>
</tr>
<tr>
<td>Cinangka</td>
<td>Site 5</td>
<td>39</td>
<td>14.2</td>
<td>3.8</td>
<td>33.7</td>
<td>41</td>
<td>182,678</td>
<td>82</td>
<td>621</td>
<td>82</td>
<td>6387</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>198</td>
<td></td>
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<td></td>
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</tbody>
</table>

**Chart:** BLL (Blood Lead Level) school-children in 8 cities/regencies: the mostly above threshold level, 2016

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**Correlation Soil, Window, Floor, and BLL**
Control Strategy
Integrated Emission Reduction Strategy

**EMISSIONS**
- PM, HC, CO, NOx, SOx: Local Air Pollution
- CO2: Global Green House Gas

**CLEAN ENERGY**
- Lower Emission Vehicle:
  - Euro Standard
  - New Type/Current Production
  - Soot-free Buses
  - Scrapping Car
- Low Carbon Emission Vehicle:
  - Down Sizing
  - Technology Improvement
  - EV as alt Low Carbon Tech
  - Eco-mode application
  - Automatic turn-off at the idling
  - Scrapping Car
  - Appropriate Car Fuel Filling System
- Power Plant with clean fuel and technology:
  - CNG, LPG, LNG
  - No Diesel Fuel, No Coal
- Electric Vehicle:
  - Bus
  - Motor cycle
- Clean Smelter Technology
- Eco-industrial technology.

**CLEAN TECHNOLOGY**
- MOI, MOT, MOEF, AUTO-INDUSTRY, City Government
- MOI, MOT, MOEF, Pertamina, PGN, PLN, City Government
- MOE, MOI, MO Energy, City Government
- MOE, MOT, MO Energy, Traffic Police, City Government

**LAND USE, INDUSTRY, TRAFFIC AND TRANSPORT MANAGEMENT**
- MOI, MOT, MOEF, City Government
- MOI, MOT, MOEF, City Government
- MOI, MOT, MOEF, City Government
- MOI, MOT, MOEF, City Government

**EMISSION STANDARD**
- MOI, MOT, MOEF, City Government
- MOI, MOT, MOEF, City Government
- MOI, MOT, MOEF, City Government
- MOI, MOT, MOEF, City Government

**LAW ENFORCEMENT**
- MOI, MOT, MOEF, Traffic Police, City Government

**TRANSPORTATION**
- MOI, MOT, MOEF, City Government
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**TRANSPORTATION:**
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  - Bus
  - Motor cycle
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- Eco-industrial technology.

**INCENTIVE/disincentive:**
- Fiscal:
  - Low Emission Vehicle
  - Vehicle Carbon Tax
  - Fuel Carbon Tax
- Non Fiscal:
  - Market Driven:
    - Low Emission Disclosure
    - Fuel Economy/Low Carbon Vehicle Disclosure and or Fuel Economy Labeling

**IN-USED VEHICLE:**
- I/M
- Regularly Inspection
- Self Monitoring.
- E-law enforcement for traffic

**INDUSTRY:**
- Industrial Zone/eco-industrial
- Clean Smelter Management
- Eco-office.
## Cost Benefit Analysis

### Vehicle Emission Standard

#### 20015-2030

<table>
<thead>
<tr>
<th>Cost Benefit</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
<th>Option 4</th>
<th>Option 5</th>
<th>Option 6</th>
<th>Option 7</th>
<th>Option 8</th>
<th>Option 9</th>
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<tbody>
<tr>
<td>Cost Refinery Production</td>
<td>467,416</td>
<td>428,932</td>
<td>431,091</td>
<td>467,416</td>
<td>338,794</td>
<td>464,669</td>
<td>458,053</td>
<td>421,638</td>
<td>466,745</td>
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<tr>
<td>Technology Utilization</td>
<td>493,312</td>
<td>664,566</td>
<td>15,863</td>
<td>643,108</td>
<td>784,586</td>
<td>30,911</td>
<td>342,032</td>
<td>117,541</td>
<td>493,312</td>
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<tr>
<td>Total Cost</td>
<td>960,728</td>
<td>1,093,497</td>
<td>446,954</td>
<td>1,110,523</td>
<td>1,123,380</td>
<td>495,580</td>
<td>800,086</td>
<td>539,179</td>
<td>960,057</td>
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<tr>
<td>Benefit Health Improvement</td>
<td>1,656,264</td>
<td>2,646,587</td>
<td>1,532,923</td>
<td>2,012,137</td>
<td>2,854,542</td>
<td>1,667,728</td>
<td>1,667,729</td>
<td>1,649,883</td>
<td>1,648,305</td>
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<tr>
<td>Production Saving</td>
<td>27,712</td>
<td>157,826</td>
<td>52,277</td>
<td>27,712</td>
<td>448,399</td>
<td>36,237</td>
<td>57,138</td>
<td>169,923</td>
<td>31,387</td>
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<tr>
<td>Subsidy Saving</td>
<td>286,392</td>
<td>1,640,422</td>
<td>539,615</td>
<td>286,392</td>
<td>4,601,071</td>
<td>373,975</td>
<td>589,473</td>
<td>1,746,763</td>
<td>324,084</td>
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<tr>
<td>Total Benefit</td>
<td>1,970,368</td>
<td>4,444,835</td>
<td>2,124,816</td>
<td>2,326,241</td>
<td>7,904,005</td>
<td>2,077,940</td>
<td>2,314,340</td>
<td>3,566,569</td>
<td>2,003,776</td>
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<tr>
<td><strong>FY 2005-2030</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Net Benefit</td>
<td>1,009,640</td>
<td>3,351,338</td>
<td>1,677,862</td>
<td>1,215,717</td>
<td>6,780,625</td>
<td>1,582,360</td>
<td>1,514,255</td>
<td>3,027,390</td>
<td>1,043,719</td>
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<tr>
<td>NPV; SDR 8 %</td>
<td>38,963</td>
<td>803,680</td>
<td>310,516</td>
<td>374,486</td>
<td>1,563,678</td>
<td>290,778</td>
<td>275,887</td>
<td>599,926</td>
<td>47,736</td>
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<tr>
<td>Net Benefit Average</td>
<td>38,382</td>
<td>128,898</td>
<td>64,533</td>
<td>46,758</td>
<td>260,793</td>
<td>60,860</td>
<td>58,241</td>
<td>116,438</td>
<td>40,143</td>
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<tr>
<td><strong>FY 2009-2030</strong></td>
<td></td>
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<td></td>
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</tr>
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<td>Fuel Saving</td>
<td>286,392</td>
<td>1,640,422</td>
<td>539,615</td>
<td>286,392</td>
<td>4,601,071</td>
<td>373,975</td>
<td>589,473</td>
<td>1,746,763</td>
<td>324,084</td>
</tr>
<tr>
<td>NPV; SDR 8 %</td>
<td>71,395</td>
<td>469,465</td>
<td>127,900</td>
<td>71,395</td>
<td>1,098,827</td>
<td>91,202</td>
<td>144,873</td>
<td>388,089</td>
<td>84,727</td>
</tr>
<tr>
<td>Net Benefit Average</td>
<td>13,018</td>
<td>74,565</td>
<td>24,528</td>
<td>13,018</td>
<td>209,140</td>
<td>16,999</td>
<td>26,794</td>
<td>79,398</td>
<td>14,731</td>
</tr>
</tbody>
</table>

### Policy Options on Transportation:

1. Emission Standard
2. Fuel Efficiency + Option 1
3. CNG + Option 1
4. Catalytic Converter + Option 1
5. Hybrid Technology + Option 1
6. Scrapped + Option 1
7. Biofuel + Option 1
8. Public Transport + Option 1
9. Leapfrog Emission Standard + Option 1

### Economic Benefit:
- health cost,
- productivity,
- and fuel saving

Control strategy could be reduce health effect and its impact on medical cost as well as social cost

Source: CBA Fuel Economy and Fuel Quality Initiative in Indonesia, UNEP, USEPA, MOEF, KPBB2012
Conclusion and Recommendation

1. Industrialization and motorization tends to increase the intensity of air pollution in Indonesia especially in the large cities such the Greater Jakarta.
2. Air pollution, include Hazardous Air Pollutant exposed the environment in the Greater Jakarta, and cause people are suffered by illness/dieses related to their respiratory.
3. Needs to conduct health and social recovery for the victims of air pollution.
5. Needs to improve nurturing -environmental friendly process- at all level of industrialization and motorization, and **needs to enforce strictly to the polluters.**
Terimakasih

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