Damage Scanner Jakarta

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Overview of presentation

• Flood risk in general and the use of risk assessment
• Flood risk model: damage scanner
• Current flood risk
• Future flood risk
• Adaptation options
• Conclusion
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Flood risk in previous talk

- **Risk** is a function of Hazard, Exposure and Vulnerability (Kron, 2007)
- **Hazard** is driven by precipitation, stream capacity, sea level change, and land subsidence
- **Exposure** relates to assets or population at risk
- **Vulnerability** is the low, medium and high susceptibility (*kerentanan*) of assets. For example, to move assets to the second floor reduces the vulnerability.
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Damage scanner: overlaying maps

- Modeled inundation using 1D/2D SOBEK hydrology suite
- Land use map 2002 and Land use plan 2030
- Functions according to depth of inundation

Damage scanner
GIS presentation
Damage scanner

Note:
in this study, damage scanner only focuses on the direct damage
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Current flood risk

Flood risk map for Jakarta under the conditions of 2013 for a hypothetical 50 year return period event (Budiyono et al., 2014)
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Flood risk in the future

- Change of precipitation
  - 5 global climate models
  - 4 official radiative forcing from IPCC
  - Projection on 2030 by the GCMs

- Sea level rise
  - Low sea level rise in 2030 (3cm) (CSIRO, 2012)
  - High sea level rise in 2030 (11cm) (CSIRO, 2012)

- Change of land use
  - City plan 2030

- Land subsidence
  - Land subsidence 2025 (Deltares, 2013 based on Abidin et al., 2011)
Change of intense precipitation 2010-2030 for greater Jakarta

Change of precipitation ranges from -65% to +140% compared to present day precipitation depending on climate model used and climate scenarios
Land use change

Land use 2002

Agriculture & Open Space
Commercial & Business
Education & Public Facility
Forestry
Government Facility
High Density Urban Kampung
Industry & Warehouse
Low Density Urban Kampung
Park & Cemetery
Planned House
Swamp, River & Pond
Transportation Facility

Land use plan 2030

Kawasan peruntukan fungsi ibukota negara
Kawasan peruntukan fungsi lindung
Kawasan peruntukan industri dan pergudangan
Kawasan peruntukan perkantoran, perdagangan, dan jasa
Kawasan peruntukan permukiman
Kawasan peruntukan permukiman taman
Kawasan peruntukan pertanian
Kawasan peruntukan ruang terbuka biru
Kawasan peruntukan ruang terbuka hijau budidaya
Rencana pulau reklamasi kawasan peruntukan industri dan pergudangan
Rencana pulau reklamasi kawasan peruntukan perkantoran, perdagangan dan jasa
Rencana pulau reklamasi kawasan peruntukan permukiman

Source: Office of city planning, Jakarta
Land subsidence in Jakarta between 2012 and 2025 (meter)
## Annual expected damage values in Jakarta
Baseline in 2012 and the future scenarios for 2030*

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Flood risk (IDR trillion)</th>
<th>Flood risk (USD million)</th>
<th>Percent change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>1.67</td>
<td>143</td>
<td>0%</td>
</tr>
<tr>
<td>Baseline + change of land use</td>
<td>1.90</td>
<td>163</td>
<td>+14%</td>
</tr>
<tr>
<td>Baseline + sea level rise</td>
<td>2.01</td>
<td>172</td>
<td>+21%</td>
</tr>
<tr>
<td>Baseline + land subsidence</td>
<td>4.56</td>
<td>391</td>
<td>+173%</td>
</tr>
<tr>
<td>Baseline + change of precipitation</td>
<td>1.38 (median)</td>
<td>118 (median)</td>
<td>-17%</td>
</tr>
<tr>
<td></td>
<td>0.83-3.63 (range)</td>
<td>71-311 (range)</td>
<td>-50%-117%</td>
</tr>
<tr>
<td>Baseline + all future changes combined</td>
<td>5.82 (median)</td>
<td>498 (median)</td>
<td>248%</td>
</tr>
<tr>
<td></td>
<td>5.31-7.68 (range)</td>
<td>455-658 (range)</td>
<td>218%-360%</td>
</tr>
</tbody>
</table>

*as compared to the baseline
Annual expected damage per land use class in Jakarta based on land use 2002 and land use plan 2030 (without precipitation change, sea level rise, and land subsidence)
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Map showing villages (Kelurahan) with reported inundation in 2007 (left) and 2013 (right): impact of the eastern canal.

2007/50 year return period

2013/30 year return period
Example of change in flood risk due to implementation of Eastern Flood Canal (BKT)

Note that the map of 2007 does not include the BKT.

2007/50 year return period

2013/50 year return period
Conclusion

• Flood risk model for Jakarta has been created and is available for use
• The study confirms that the main driver of the increase in flood risk is land subsidence
• There is large uncertainty on the impact of precipitation
• Flood risk assessment can be used to prioritize future measures for reducing the risk of flooding
  – Early warning system
  – Dikes, polders and pumping system
  – Green metropolis
JCAT works for Jakarta

Photos: left to right
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