Living in the bottomless pit:
The land user’s perspective on land subsidence in Indonesia

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Introduction

- Land subsidence: gradual settling or sudden sinking of the earth’s surface due to movement of earth materials (Galloway et al., 1999)

- Triggers (Indonesia):
  - natural compaction of alluvial
  - Population/activities growth → groundwater extraction,
  - load of construction, and
  - intensive agricultural activities
  (Abidin et al., 2011; Marfai and King, 2007; Saputra et al., 2017)
Facts and problems:

- Impacts: damages to houses, infrastructure, and plantation, inundation (Saputra et al., 2017, Abidin et al., 2011, Marfai et al., 2008)
- LS causes economic losses of affected land users
- There is no enough evidence how much cost of LS and which strategies were actually taken by the land users

**Aim**: to investigate the cost of land subsidence for affected land users as well as how such land users respond to land subsidence and its relation to their economic capacity.
Case study areas

Considerations:
- Most rapid land subsidence
- Delta area (Jakarta and Semarang City), peatland (Indragiri Hilir)

Interviews of 330 land users in 12 sub-districts + surveys + FGDs
Semarang City


Jakarta

Source: Abidin et al, 2011

http://friends-international.org/blog/index.php/indonesia-blog-2-these-streets-are-made-for-walkin/
Surveys: Impacts of land subsidence

- Local street
- Damaged and Subsided
- Leaning
- Sea wall
- School
Damage to plantation

Oil palms

Daily tidal inundation

+/- 1.5 m
## Land subsidence cost to land users

<table>
<thead>
<tr>
<th>Location</th>
<th>Percentage of loss of income to total income in 2015 and 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jakarta</td>
<td>191.3 %</td>
</tr>
<tr>
<td>Semarang City</td>
<td>726.1 %</td>
</tr>
<tr>
<td>Indragiri Hilir</td>
<td>69.4 %</td>
</tr>
<tr>
<td>Total (N=110)</td>
<td>329.7 %</td>
</tr>
</tbody>
</table>

Source: questionnaire analyses (2017)

“As the mangrove was destroyed by land sinking and coastal erosion, we hardly found fish or crab near the damaged mangrove” (Respondent in Semarang City).

“Many of our oil palm and coconut trees are leaning. Even, some of them have already dead. Since the condition of the trees is not normal, the productivity is also scarce. Because of the damages, I was thinking to change the crop” (Respondent in Indragiri Hilir).
Land user’s responses to land subsidence

<table>
<thead>
<tr>
<th>Response type</th>
<th>Detailed response</th>
<th>Number of affected land users stated these responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fix the damages</td>
<td>Repair the damaged house</td>
<td>23</td>
</tr>
<tr>
<td>Reduce the impacts</td>
<td>Elevate or modify the house</td>
<td>127</td>
</tr>
<tr>
<td></td>
<td>Build gullies around the house and canals</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: questionnaire analyses (2017)

“I know that my house is leaning. That is not a big problem. I still can deal with it” (Respondent in Indragiri Hilir).

“The water came up from the ground into my floor through the cracks on my ceramic floor. To fix it, I patched the floor using cement, in some parts. If the water comes once more, I will do the same way” (Respondent in Semarang City).
“As our house wall has cracked badly, we did raise not only the floor but also the roof and wall. Besides that, because the house had been very low, we could not breathe comfortably” (Respondent in Semarang City).

“Although we rent this house, we keep elevated the house floor. We had no choice. If we did not lift it, we would suffer from inundation. We bought the sand. It is not too much” (Respondent in Jakarta).
## Economic capacity of LUs to respond to LS

<table>
<thead>
<tr>
<th>Response type</th>
<th>Income allocated</th>
<th>Savings allocated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fix the damages</td>
<td>10 %</td>
<td>77 %</td>
</tr>
<tr>
<td>Reduce the impacts</td>
<td>29 %</td>
<td>25 %</td>
</tr>
</tbody>
</table>

### Source: questionnaire analyses (2017)
LIVING IN THE BOTTOMLESS PIT?

- LS influences LUs in a long period
- LS cost LUs enormously
- The responses could not stop LS
- Income & savings of LUs are limited

VULNERABLE: YES

RESILIENCE ??
Incompletely Resilience
(in households level & short period; NOT in a long time)
Public authorities

Saputra et al., 2017

Total response to land subsidence

Indragiri Hilir
(Starting to be aware of land subsidence distribution and triggers)

Semarang City
(Recognized the status, adopted the issue for some areas but lacks zoning regulations, designed groundwater zoning, took limited actions)

Jakarta
(Recognized the status, designed policies and zoning regulations for detail spatial planning, but took limited actions)

Land users

Indragiri Hilir

| Term | 87.1 |
| Awareness | 62.9 |
| Speed | 62.9 |
| Urgency | 84.5 |
| Adaptation | 39.7 |
| Actions | 6.0 |

Semarang City

| Term | 84.7 |
| Awareness | 78.2 |
| Speed | 54.0 |
| Urgency | 83.9 |
| Adaptation | 45.2 |
| Actions | 0 |

Jakarta

| Term | 95.6 |
| Awareness | 73.3 |
| Speed | 43.3 |
| Urgency | 39.5 |
| Adaptation | 75.6 |
| Actions | 0 |
A proposed response: retreating from the affected area!

4 Reasons for staying on the affected areas:

**Economic source connection with the affected area**

“I am a fisherman. I cannot retreat from my only economic source” (Respondent in Semarang City).

**Social relationship with people in affected areas**

“I was just moved from Java (island) through transmigration program. The government provided me house and plantation. I have a new family here. I also grow my family here. I do not want to move again” (Respondent in Indragiri Hilir).

**The perceived on the level of damage and loss**

“I think the subsidence and its impacts here is not a big deal. I still can deal with it” (Respondent in Indragiri Hilir).

**The uncertainty of social and economic condition in a new area**

“I only know how to fish. It is my only skill. I do not have the skill to work in the factory. I am also no longer young” (Respondent in Semarang City).
Jakarta Coastal Region in 2050 (Abidin et.al., 2009)
References


