

Land Subsidence



Land subsidence is a phenomenon of sudden sinking or gradual downward settling of the ground's surface towards the reference point. This condition commonly occurs in coastal cities, coastal peat areas and coastal oil and gas exploitation areas. In Indonesia, at least 21 provinces and 132 districts / cities are now indicated to have land subsidence, even for several locations on the North Coast of Java and East Sumatra Coast, have been recorded for having experience on land subsidence and are exposed to its impact, i.e. Tidal flood. The rough calculation of losses that measured only from the adaptation costs for repairing roads, bridges and settlements in northern coast of Java shows that the potential losses caused by land subsidence for each year is IDR 619 Trillion. Meanwhile, for the potential loss of residential buildings in the subsided peat area is reaching around IDR 158 trillion, this figure has not yet included other economic losses parameters.



The average rate of land subsidence in Indonesia's coastal lowlands varies from 1-20 cm / year. In some locations, such as Rangsang island, Riau, subsidence is also followed by coastal erosion at rates 30 meters / year. ITB monitoring results show that in the north coast of Java, at least 16 cities / districts experienced subsidence with impacted total area is reaching 11,500 hectares, while indications of subsidence in the peat ecosystem is reached 2.6 million hectares. High rates of subsidence have hampered conservation and rehabilitation efforts in the Coastal Zone and have the potential to eliminate Strategic Economic Zones, such as the Java North Coast Region, and eliminate tropical peat ecosystems such as the East Coast of Sumatra. For border and outer islands areas, such as Meranti Islands, Riau, this condition creates a weak point in the nation and state defence effort.



To avoid greater losses in the future, efforts to stop or reduce the rate of subsidence, as well as to prevent and handle disasters caused by subsidence are very urgent. For this reason, the Coordinating Ministry of Maritime Affairs, together with Yayasan Lahan Basah (Wetlands International Indonesia), the Bandung Institute of Technology (ITB), and the Working Group for Land subsidence roadmap development jointly develop The Mitigation and Adaptation Road Map of Land Subsidence in the Coastal Lowlands of Indonesia. The Road Map has been prepared to be used as a reference and guideline for implementing the mitigation and adaptation program that involves all relevant stakeholders.



Summary

Mitigation and Adaptation Road Map of Land Subsidence in Lowland Coastal Areas in Indonesia



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Potential Losses caused by Land Subsidence in peat or non-peat coastal areas



Physical Aspect

1. Loss of coastal areas;
2. Loss of land resources;
3. Damage to infrastructure;
4. Increased depth and frequency of floods;
5. Sea water intrusion;
6. Increased exposure to extreme waves and / or tsunamis;
7. Damage to peatland ecosystems that are integrated with freshwater ecosystems, the function of peat regulation in flowing fresh water naturally into the surrounding river or swamp ecosystem will be disturbed / damaged;
8. Declining Quality of the Environment;
9. Greenhouse gas (GHG) emissions increase due to loss of mangrove and/ or coastal peat ecosystems.



Social Aspect

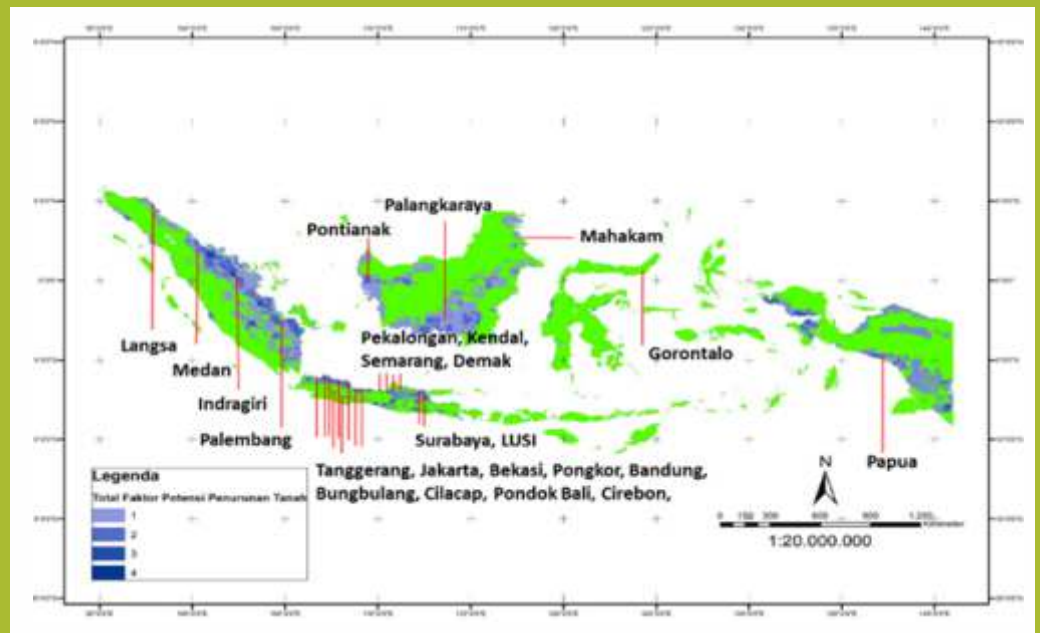
Communities lose coastal land and or peatlands based livelihoods.



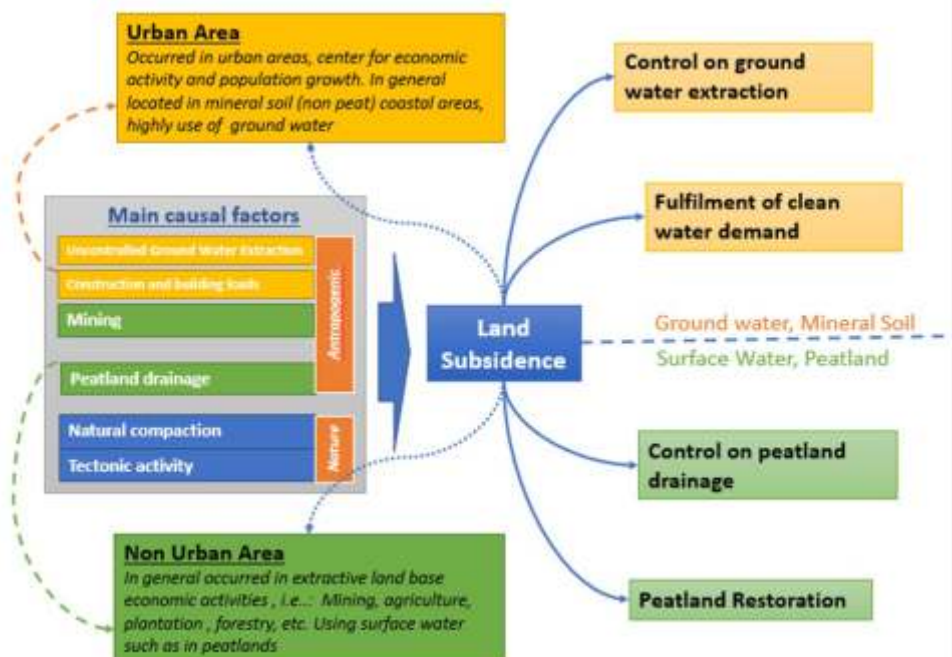
Economic Aspect

1. Increase of Land management cost;
2. Increase of water consumption cost;
3. Costs incurred by disasters including economic losses such as losses from low productivity, adaptation costs and relocation costs.

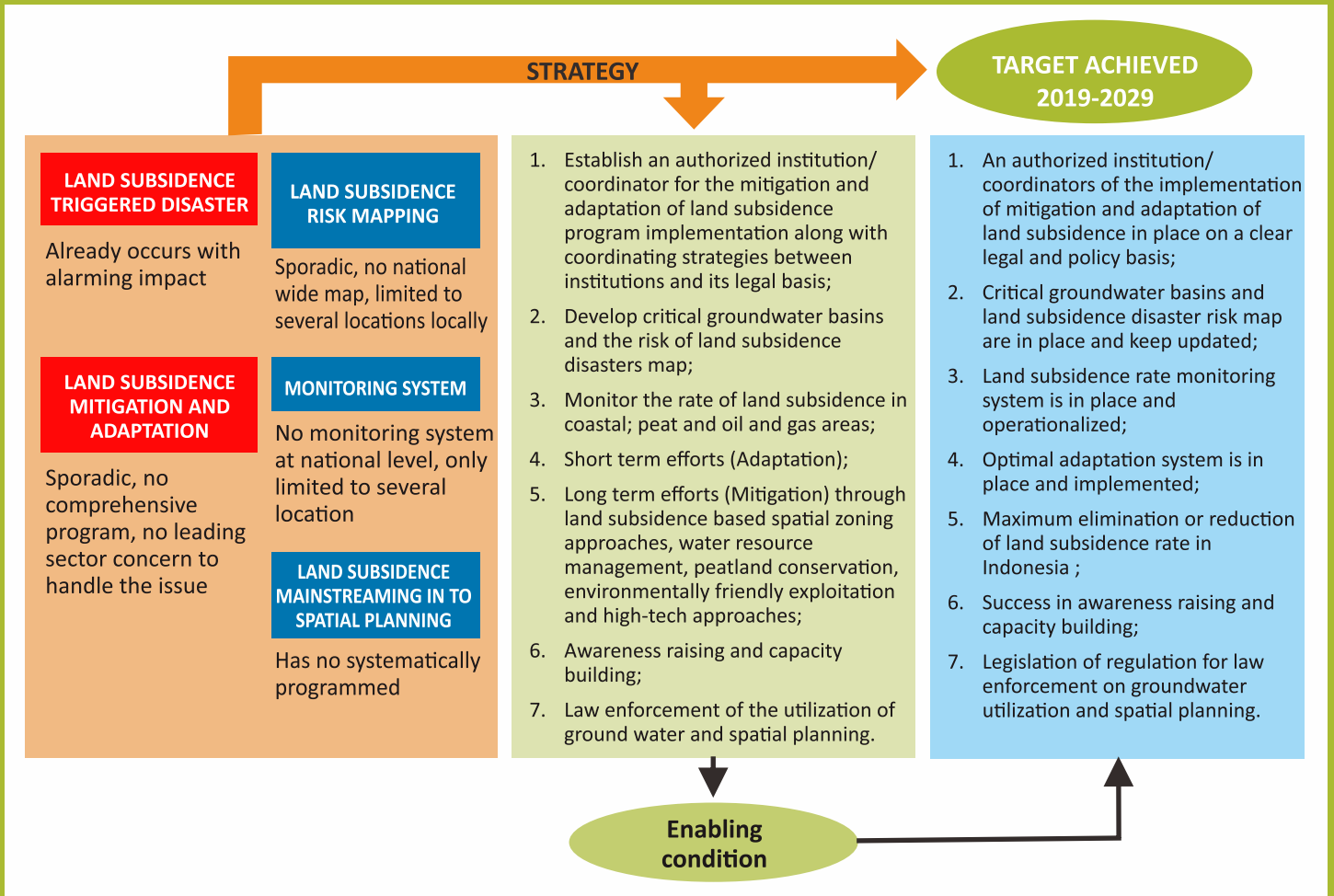
Map of potential land subsidence area in Indonesia (Andreas et al. 2019)



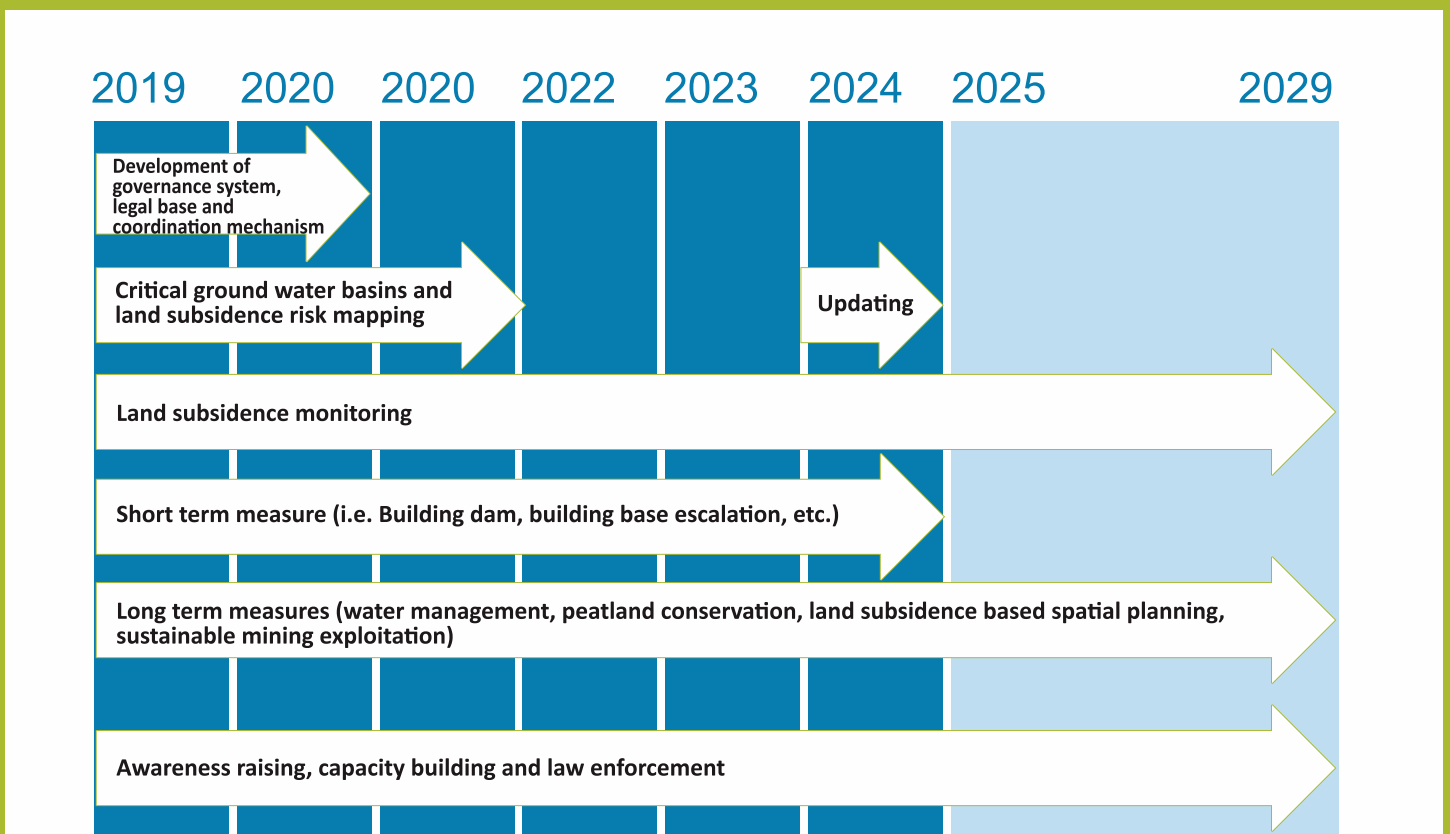
Problem of land subsidence in Indonesia



General framework of mitigation and adaptation roadmap of land subsidence in coastal lowland of Indonesia



Time Frame of The Roadmap





Strategies

Strategy 1. Establish an Authorized Cross Sectoral Institution / Coordinator for the Implementation of the Mitigation and Adaptation Program for Land Subsidence and Related Disasters (2019-2020)

- 1.1 Coordinating mechanism between the relevant sector ministries for mitigation and adaptation to land subsidence is in place;
- 1.2 Technical institutional forms for implementing mitigation and adaptation of land subsidence is agreed;
- 1.3 Legal basis documents/ institutional policies for implementing mitigation and adaptation of land subsidence is developed;
- 1.4 Technical institutions for the mitigation and adaptation of land subsidence is established and operationalized.

Strategy 2. Develop the Critical Groundwater Basin Map and Map of Land Subsidence Risks in the Coastal Lowlands (2019-2021) -2024

- 2.1 Land subsidence in coastal lowlands in Indonesia risk's map is developed;
- 2.2 Land subsidence in coastal lowlands in Indonesia risk map is regularly updated.

Strategy 3. Monitor and Evaluate Critical Groundwater Basins, and Soil Subsidence Rates in Coastal Lowland Cities, Coastal Peat Areas and Coastal Oil and Gas Exploitation Areas (2019-2029)

- 3.1. Groundwater basin monitoring programs, and land subsidence monitoring in coastal cities are in place by involving the central government, regional governments and CSR;
- 3.2. Land Subsidence monitoring in priority coastal city locations is implemented;
- 3.3. Land subsidence monitoring in indicated coastal city locations is implemented;
- 3.4. Land subsidence monitoring programs in coastal peat areas is in place by involving the central government, regional governments, and CSR systems from private parties (HTI companies, oil palm plantations, etc.);
- 3.5 Land subsidence monitoring in priority peat areas is implemented;
- 3.6. Land Subsidence monitoring in indicated coastal peat is implemented;
- 3.7. Land subsidence monitoring programs in the oil and gas exploitation area is in place by involving the K3S team through SKK-Migas and or other scenarios such as CSR from the private sector;
- 3.8. Land Subsidence monitoring program in the priority oil and gas exploitation area is implemented.

Strategy 4. Develop Concepts, Standard Operating Procedures (SOPs) and Implement Short-Term Solutions / Adaptations for Disaster of Land Subsidence that have Occurred (2019-2024)

- 4.1. The concept and SOP of short-term solutions / adaptations of land subsidence disasters are developed and socialized;
- 4.2 Short-term solutions/ adaptations are implemented;
- 4.3. The implementation of short-term solutions/ adaptations are monitored.

Strategy 5. Develop and Implement the Concept of Land Subsidence Prevention (Mitigation) through Spatial Planning Approach, Water Management, Peat Conservation and High-tech Environmentally Friendly Oil and Gas Exploitation Activities (2010-2029)

- 5,1 Guidelines for the integration of land subsidence into Spatial Planning is developed;
- 5.2. Priority areas for integration of land subsidence into Spatial Planning are identified;
- 5.3 Land subsidence is mainstreamed into spatial planning;
- 5.4 Water management based mitigation program plan is developed;
- 5.5 Priority areas for water management based mitigation programs are identified;
- 5.6 Water management based mitigation program is implemented;
- 5.7. Plan for mitigation of land subsidence based on peatland conservation is developed;
- 5.8. Priority areas for peatland conservation-based land subsidence mitigation programs are identified;
- 5.9. Land subsidence mitigation programs based on peatland conservation is implemented;
- 5.10. Land subsidence mitigation program plans through environmentally friendly and high-tech oil and gas exploitation programs is developed;
- 5.11. Priority areas for oil and gas exploitation programs that are environmentally friendly and high-tech are identified;
- 5.12. Oil and gas exploitation programs that are environmentally friendly and high-tech is implemented

Strategy 6. Conduct Awareness Raising and Capacity Building in Mitigation and Adaptation of Land Subsidence (2019-2029)

- 6.1. The awareness raising and capacity building programs in dealing with land subsidies are arranged and implemented.

Strategy 7. Carry out Law Enforcement of Groundwater Extraction and Spatial Planning (2019-2029)

- 7.1. Regulations and institutions for Law Enforcement related to the Utilization of Groundwater and Spatial Planning are in place;
- 7.2. Policies and regulations and institutions for Law Enforcement related to the Utilization of Groundwater and Spatial Planning are implemented and operationalized.

Yayasn Lahan Basah (YLBA) is part of the Wetlands International global network that is registered with the Ministry of Law and Human Rights No. AHU-0004332.AH.01.04.2018.



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