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in Southeast Asia (Tropical BEST-SEA)

Source of Organic Matters to Support Mine Rehabilitation in Indonesia

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Mining in Indonesia

Mining industry is important for the economy of Indonesian. Through corporate social responsibity, Mining industry has also significantly contribution to the development of local infrastructure, education, and economy.

Most of mining in Indonesia is open pit mining involving removal of vegetation and soil to reach the ore or coal. After mining is completed, the soil would be returned and revegetation would be conducted.

Tropical soil, especially those outside Java Island in Indonesia, has relatively thin fertile, organic matter rich top soil (10-20 cm) and thicker partly mineralised sub-soil with very little organic matters and nutrients

Coal (left) and nickel (right) mining has to be rehabilitated after mining operation is completed. Soil quality is important to ensure the success of rehabilitation programmes.

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- During soil excavation and removal, top soil and sub-soil are unavoidably mixed. Sub-soil would dominate the mixture makes the soil become unfertile and mostly acidic.
- Soil fertility improvement is needed to support rehabilitation of ex-mine sites → application of compost/organic matters, lime, and inorganic fertilizer
- Large amount organic matters is needed to improve soil conditions:
  - Source of essential nutrients for plants
  - Improve structure → soil aggregate, aeration, water infiltration, and more resistant to erosion
  - Improve water and nutrient holding capacity
  - pH buffer for soil
  - Habitat and nutrient for microorganisms
  - Big fraction of organic matters on the soil surface → protect erosion, soil moisture, water infiltration

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	Seedlings Height Growth (cm) Weeks After Planting							Total Height 18 Months
	2	4	7	9	11	13	Total	
K0	1.6	1.6	1.4	2.5	2.5	4.2	13.8	160.5
K1	1.8	2.1	4.5	4.0	3.9	3.5	19.8	189.6
K2	1.4	1.5	4.3	4.4	3.1	3.7	18.4	129.5
K3	2.4	1.5	3.6	3.1	2.6	3.1	16.3	123.8
K4	2.3	2.1	4.4	3.7	3.9	5.1	21.5	196.6

Notes:

1. K0 = No compost
2. K1 = Compost (7 weeks) 3 kg/seedling
3. K2 = Compost (7 weeks) 5 kg/seedling
4. K3 = Compost (14 weeks) 3 kg/seedling

K4 = Compost (14 weeks) 5 kg/seedling

Anthocephalus macrophyllus (from left no compost, + compost 5 kg, 13 weeks; 18 months) on ex-mine site

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Anthocephalus macrophyllus
1 year old, no-compost vs 5 kg compost

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Potential Source of Organic Matters

- Biomass from land clearing → huge amount of biomass from land clearing is commonly disposed (leaves, stems, and roots), 50 to 100 ton per ha
  - Available on site → low transportation cost
  - Free of charge
  - Need processing → chipping/grinding
- Empty fruit bunch of oil palm → huge amount that could be use as alternative source of organic matters
  - Mining operation close to palm oil factory
  - Low price
  - Need transportation
  - Applied directly or composted before application

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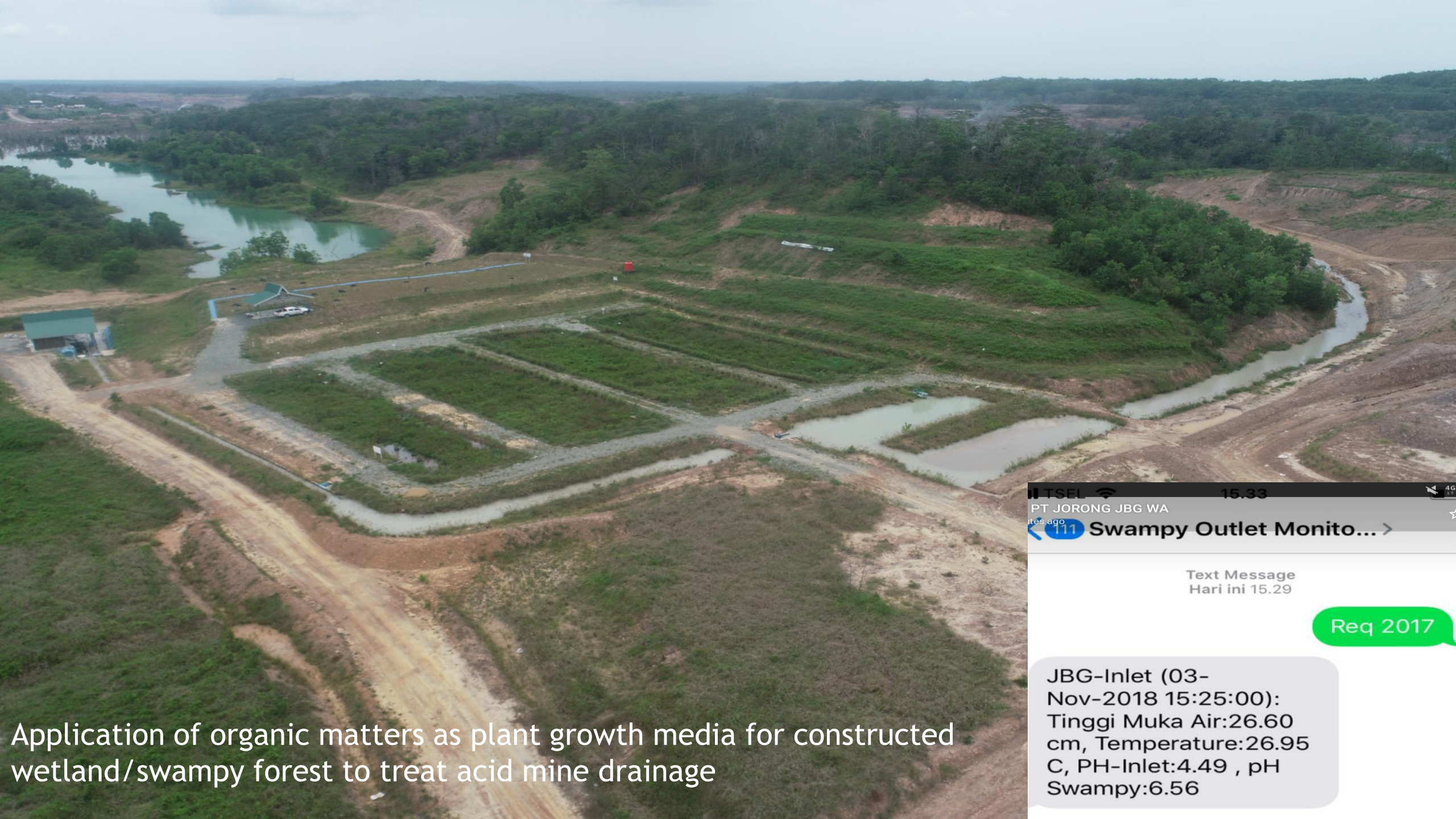
Shorea spp. and *Dryobalanops* sp., 14 years old planted on coal ex-mine site in East Kalimantan

Organic Matters for Acid Mine Water Treatment

- Organic matters could be use to treat acid mine drainage → chemistry reaction and as the habitate for the sulphate reducing bacteria (SRB)
- Organic matter could be used to construct wetland to treat acid mine drainage



Application of organic matters as plant growth media for constructed wetland/swampy forest to treat acid mine drainage

Need Further Research

- Large scale on-site composting technique and its feasibility
- Optimum dosages of compost for sustainable growth of seedlings
- Technique of application → spreading on the surface with and without mixing, or placing in the planting whole
- Population and diversity of microorganisms, and micro and macro fauna
- The use of organic matters for acid mine water treatments

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