Scaling Up the Implementation of Nature-based Solutions for Climate Change Adaptation through Sustainable Peatland Management

Niken Andika Putri

Forest Carbon Sink Business Department

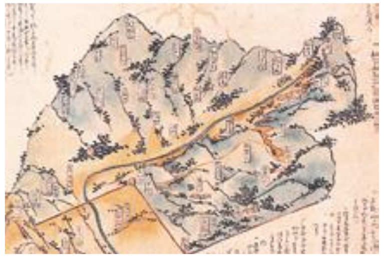
Sumitomo Forestry Co., Ltd.

December 8th, 2023

History of sustainable forest management (upstream to downstream)

1691
Establishment of Sumitomo Forestry

It begins managing the "Copper Mine Forest," to supply fuel for smelting and timber for the mine shafts.



Besshi Copper Mine Forest

1881
Forest devastation crisis

1894

"The Great Reforestation Plan" was launched. This became the starting point of the management philosophy.

Teigo Iba
(1847 – 1926)

1955
Became Sumitomo Forestry Co.

Forest restoration from severely degraded land (Copper Mine Forest)

(before reforestation)

(after reforestation)

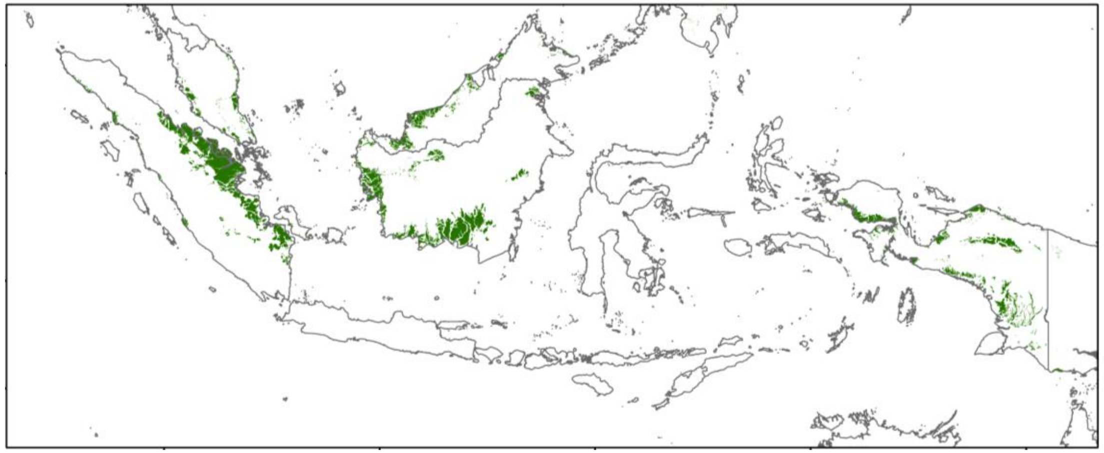
2010～
Peatland management project in degraded forest in West Kalimantan, Indonesia

2011
Papua New Guinea

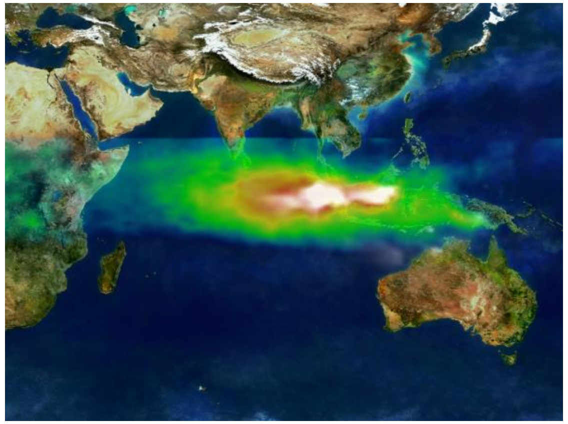
2016
New Zealand

Tropical peatlands: important ecosystem yet challenging to manage

Tropical peatland distribution map in Indonesia



Source: Xu *et al.* (2018)



(Courtesy of NASA)

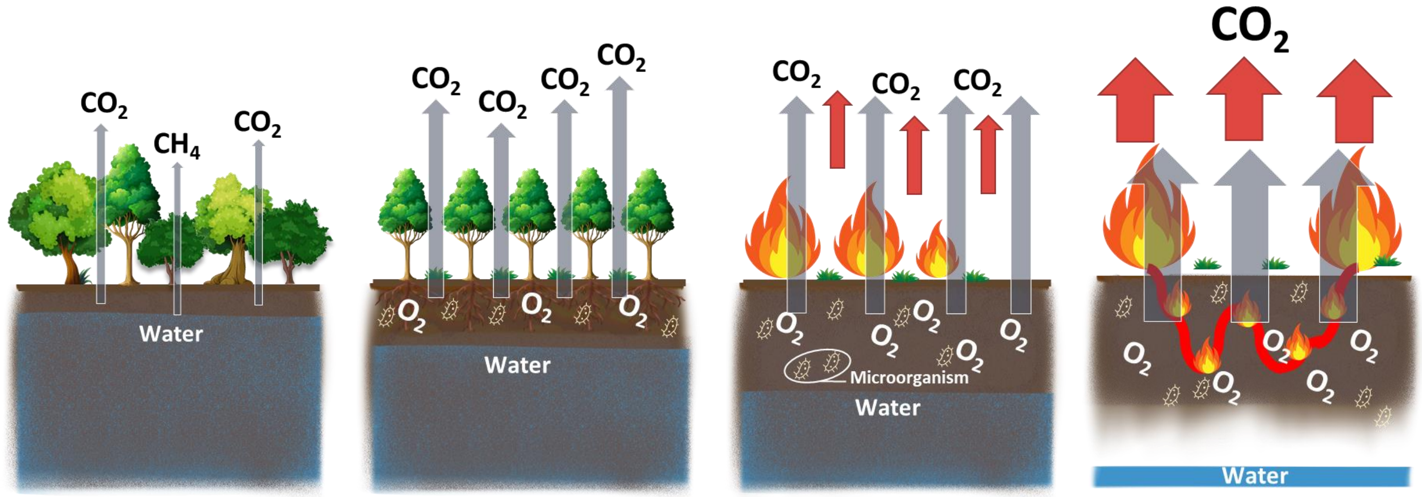
Peat fires → huge CO_2 emission, air pollution, economic loss, health impact, and biodiversity loss

- Tropical peatlands cover areas of approx. 90-170 Mha or 14% of the total peatland area, yet play a major role in global carbon and water cycle
  - It contains up to **20 times more carbon per ha** than tropical forest → one of Earth's most efficient terrestrial carbon stores
  - Peat in a good condition contains around **90% water**

- Inappropriate peatland management could lead to huge consequences, for example peat fire in Indonesia in 2015:
  - Economic loss: approx. USD 16.1 billion
  - CO_2 emission: 1.8 million ton CO_2
  - Land burned: 2.6 million ha
  - >100,000 people died from smoke exposure in Indonesia, Malaysia and Singapore

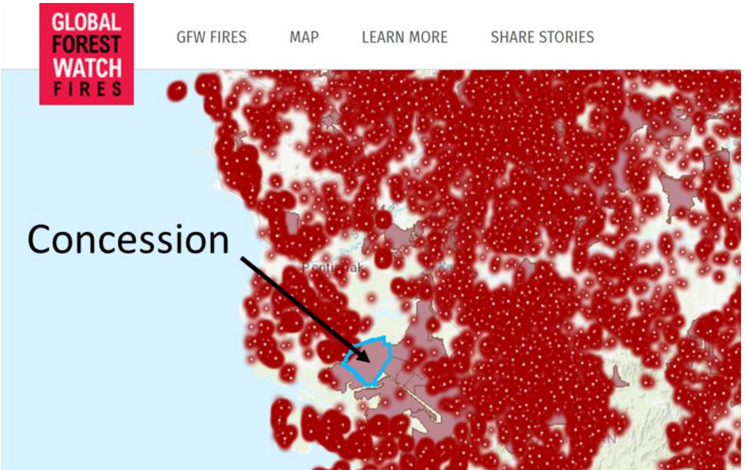
Source: World bank (2016); Koplitz et al. (2016)

Linkage between peatland water management and peat fire



- Fire risk is increasing with the lower groundwater level
- The condition worsens during the prolonged dry season or El Niño

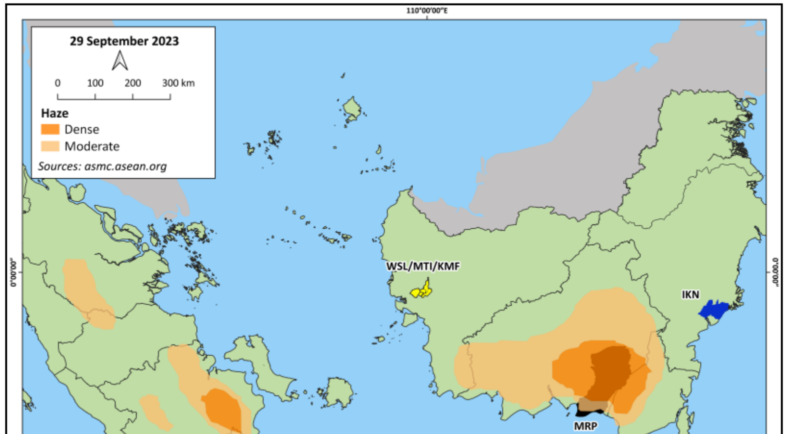
A few hotspots observed in Sumitomo Forestry's concession areas



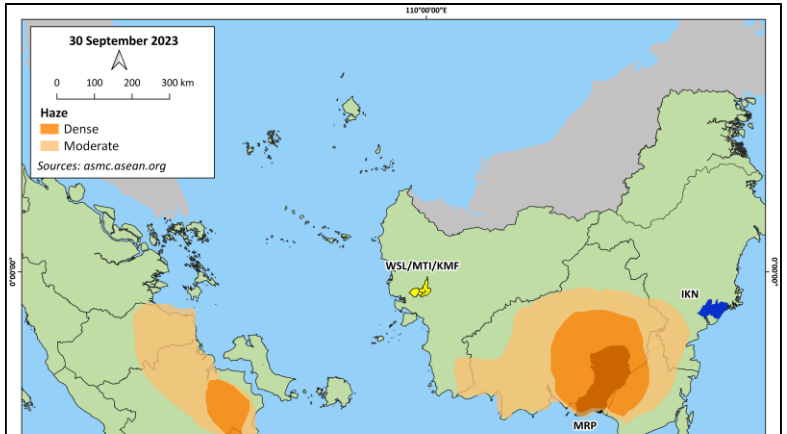
Hotspots in West Kalimantan Indonesia (1st July – 26th September 2019)

Credit: Global Forest Watch

Hotspots and smoke haze were observed in parts of Sumatra in Kalimantan



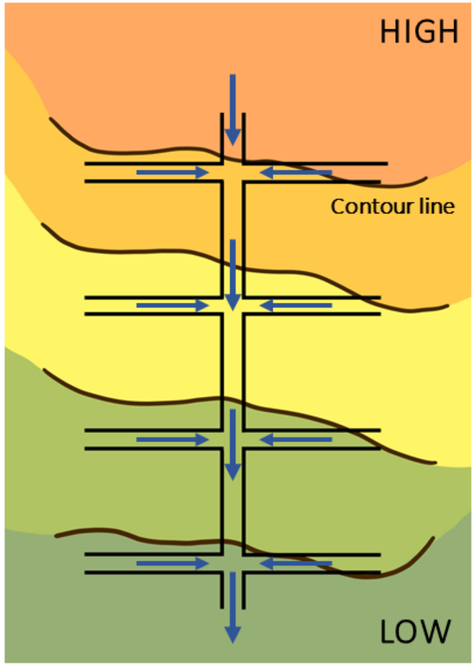
Haze distribution map (29 September 2023)

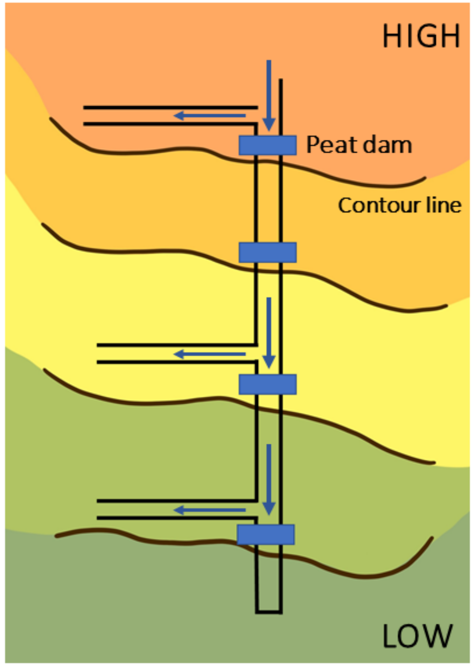


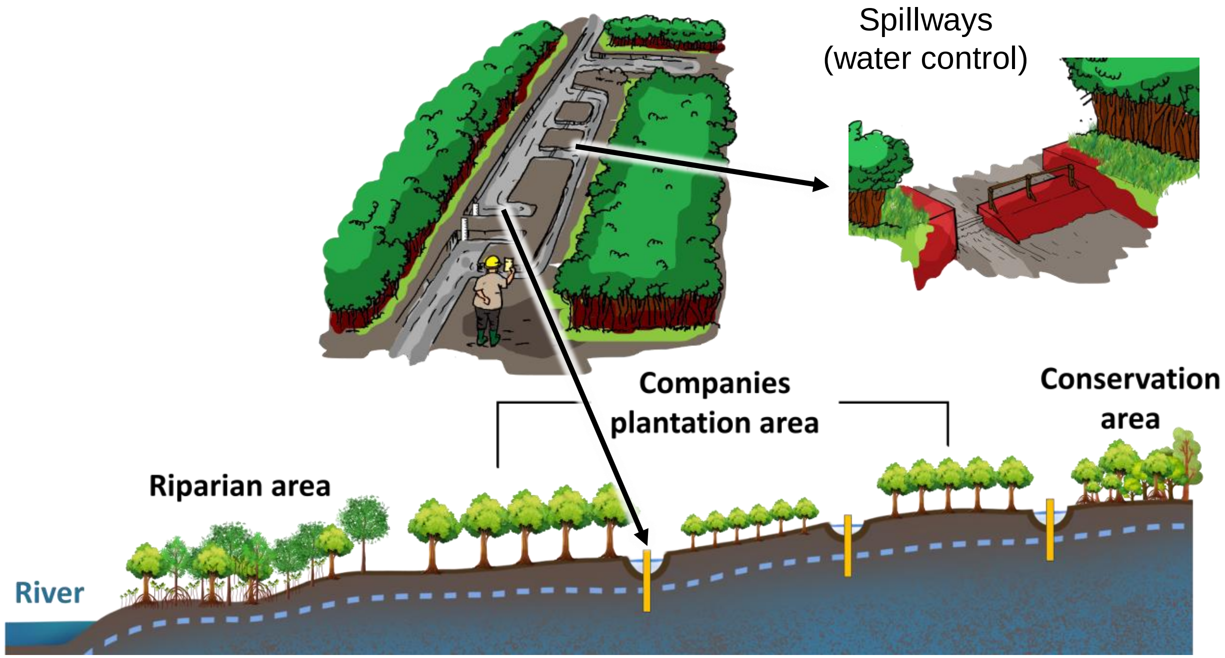
Haze distribution map (30 September 2023)

Credit: asmc.asean.org

Stock-based water management is crucial for climate adaptation in peatlands







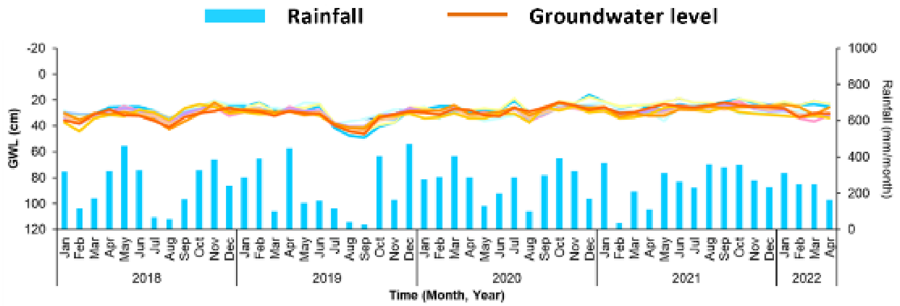
Drainage-based WM **Stock-based WM**

Source: Kato et al. (2018)

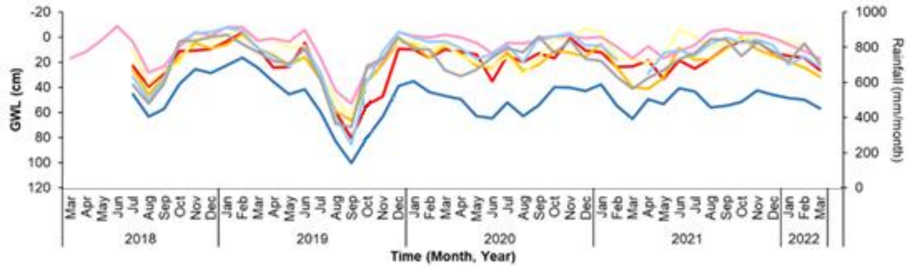
- In contrast to drainage-based WM, stock-based WM is designed based on a detailed topographic map (50 cm contour intervals)
  - Main canal: align across contours
  - Branch canal: align along contours
- Climate change has disrupted rainfall pattern, making peatland areas becoming more prone to drought and wildfire → stock-based water management on peatland can be effective to keep the peat wet, lowering the risk of fires.

Integration of climate adaptation and water management

Fluctuations of groundwater levels (SFC managed area)



Fluctuations of groundwater levels (unmanaged areas)



Peatland Management Method	CO_2 emissions (ton CO_2/ha/yr)
Drainage-based	36 – 222※ (median: 128)
Stock-based	**28※※**

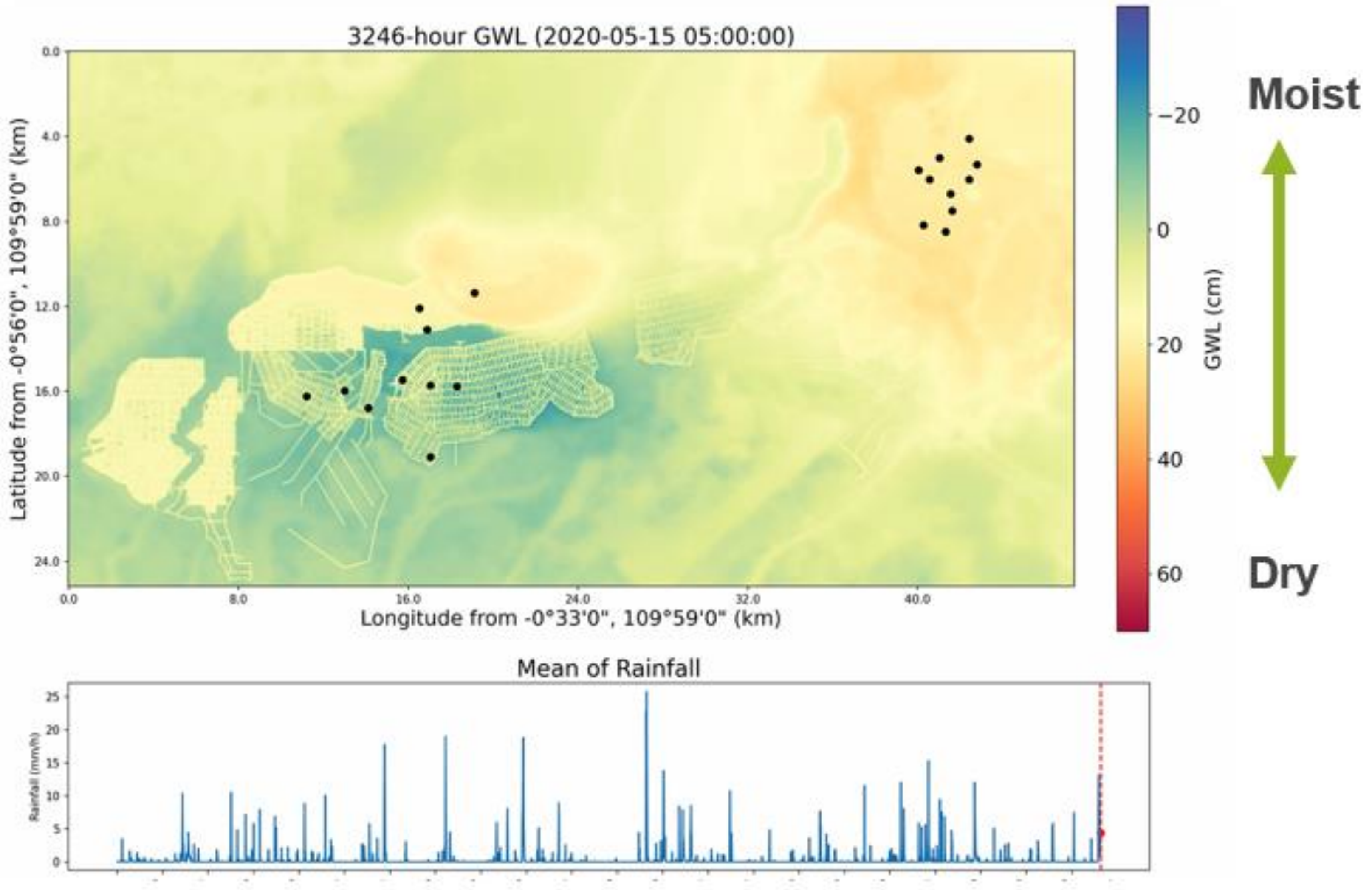
※Based on various studies of the Ex-Mega Rice Project
※※Based on SFC's field data

- Stock-based WM can maintain high and constant groundwater levels throughout the year even during a severe dry season or El Niño
- High and constant groundwater levels:
  → Increase moisture content, thus prevent the occurrence of fire
  → Limit microbial oxidation, thus lower peat subsidence and CO_2 emission
  → Provide water stock for the lower area during dry season
- Furthermore, constant groundwater levels in managed area → promote tree growth

Advancing the stock-based water management on peatland using AI

- We have developed a model for a groundwater level estimation by utilizing data collected in our area for over 10 years and AI
- Predicting groundwater levels enables early identification of potential fire-prone conditions, allowing for timely interventions and fire prevention strategies

AI groundwater level simulation



Sustainable peatland management for climate adaptation solutions

- A sustainable tropical peatland management not only can provide actual climate adaption solutions, but also of empower and foster community resilience.

Water structures technologies used by local communities

Creation of employment opportunities

Developing and sharing knowledge on peatland utilization for agriculture activities

- By leveraging advanced technology on peatlands, climate adaptation strategies can become more effective in addressing the threat posed by changing climate.
- However, challenges remain:
  - Lack of funding for scaling up a pilot project in other places
  - Diverse regulatory environment