

Rates and causes of mangrove deforestation in Southeast Asia from 2000 to 2012



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Mangroves lost at a huge rate

110 000 ha lost in Malaysia in 25 years⁴

All mangroves lost by 2100³

Mangrove loss > x2 rainforest loss⁷

1225.5 km² in Sabah wood chip export to Japan⁵

1-3% loss in SE Asia per year¹⁰

50% of mangrove loss due to shrimp aquaculture⁸

1.9 million ha lost in SE Asia from 1980 to 2005⁴

50 000 ha lost in Indonesia in 5 years⁴

24% of mangroves globally are degraded⁶

38% global mangrove loss by shrimp culture⁶

Vietnam loss from 4000 km² (1945) to 2130 km² (1998)⁹

SE Asia shows the highest mangrove loss globally⁶

Malaysia loss 17% 1965-85¹

2.1% global decline per year³

12% of Singapore's mangrove lost 1980-90⁴

Thailand 312700 ha \square 168683 ha between 1975 and 1993²

Philippines 70% loss 1920 to 1990¹

India loss 50% 1963-1977¹

75% of Asian mangroves lost in 20th century⁸

50% of global wetlands have been lost

Mangrove cover in Singapore from 13% to 0.5% of land area by 2002



How much mangrove have we lost?

Knowing accurately how much mangrove we have now, and how much we have lost is important:

- To assess conservation success
- To highlight areas to focus conservation
- To estimate carbon emissions
- To assess the success of Payments for Ecosystem Services (PES) such as REDD+

To date, we have used sometimes unreliable data with different methods and from different time periods

What is the current state of our mangroves in Southeast Asia?

Assessing mangrove loss in SE Asia

Hansen et al. 2013 Global Forest Change Product (2000-2012)

Geographic predictor variables

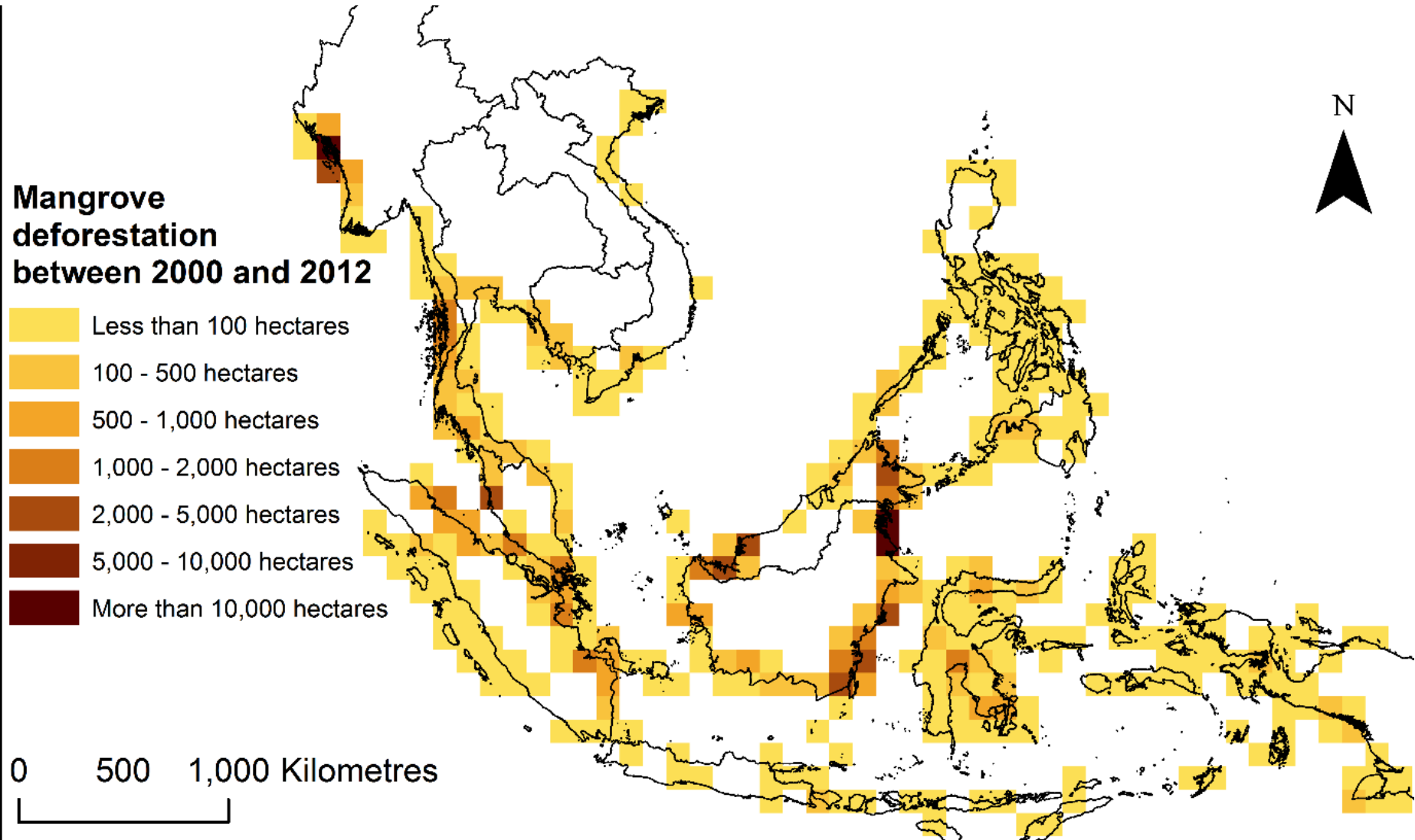
Giri et al. 2011 global mangrove layer (2000-01)

Identify deforested mangrove patches

Supervised classification on deforested patches >0.5 ha (45 540 patches)

Accuracy assessment

Mangrove loss in SE Asia



National scale loss

Table 1. Mangrove area and loss statistics for Southeast Asian countries between 2000 and 2012

Country	Total mangrove in 2000, ha	Mangrove habitat area lost, ha	Percentage mangrove loss 2000–2012, %
Indonesia	2,788,683	48,025	1.72
Myanmar	502,466	27,770	5.53
Malaysia	557,805	15,809	2.83
Thailand	245,179	3,344	1.36
Philippines	257,575	1,296	0.50
Cambodia	47,563	1,086	2.28
Vietnam	215,154	528	0.25
Brunei	11,054	41	0.37
Timor-Leste	1,066	2	0.19
Singapore	583	0	0
Southeast Asia	4,626,545	97,901	2.12

Countries are ordered by total mangrove lost. Mangrove habitat lost takes into account mangrove regrowth in d

Richards & Friess 2016. Rates and drivers of mangrove deforestation in Southeast Asia, 2000-2012. *Proceedings of the National Academy of Sciences* 113, 344-349.

Average deforestation of 0.18% per year – much lower than before

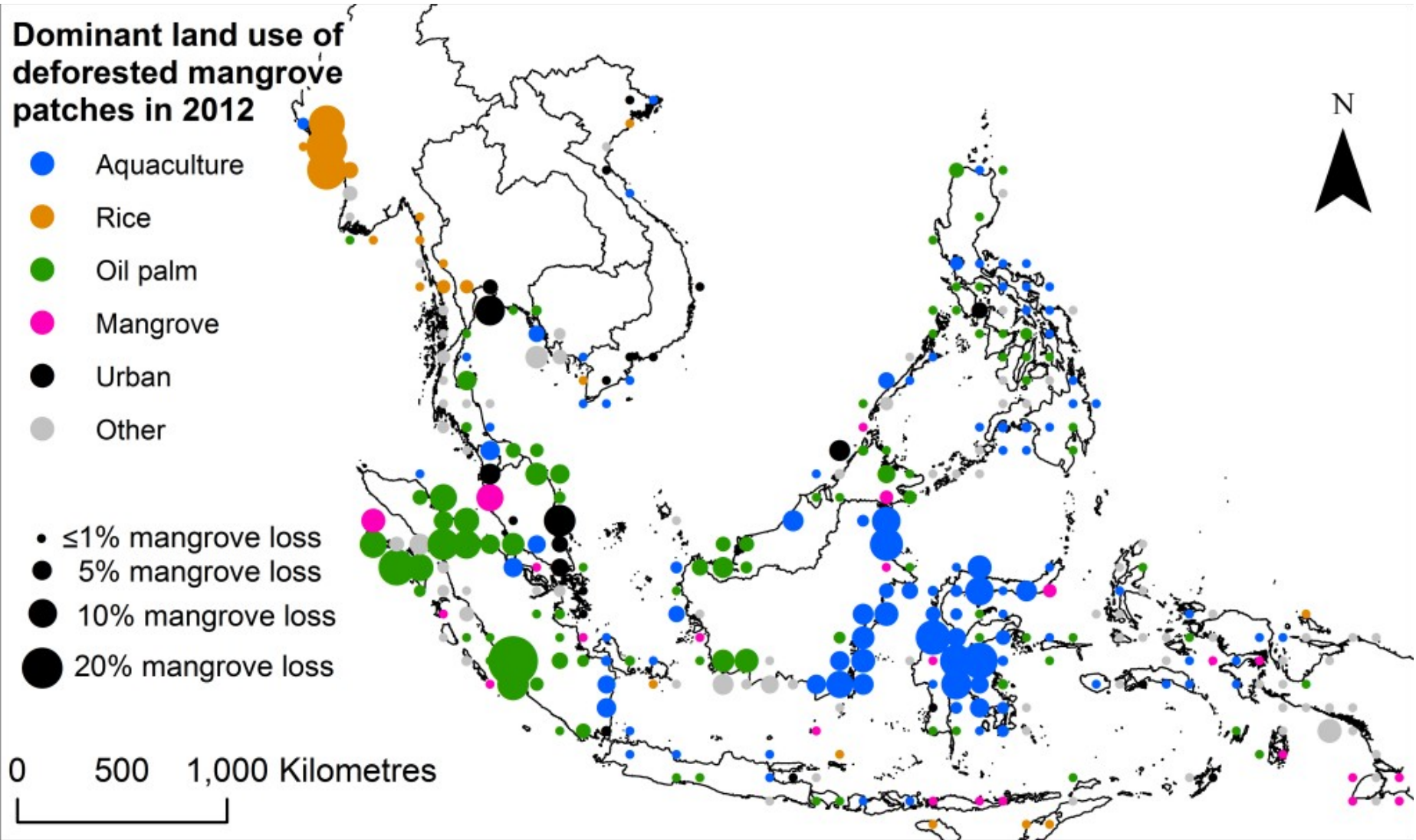
What's causing deforestation?

Dominant land use of deforested mangrove patches in 2012

- Aquaculture
- Rice
- Oil palm
- Mangrove
- Urban
- Other

- ≤1% mangrove loss
- 5% mangrove loss
- 10% mangrove loss
- 20% mangrove loss

0 500 1,000 Kilometres



What is causing the loss?

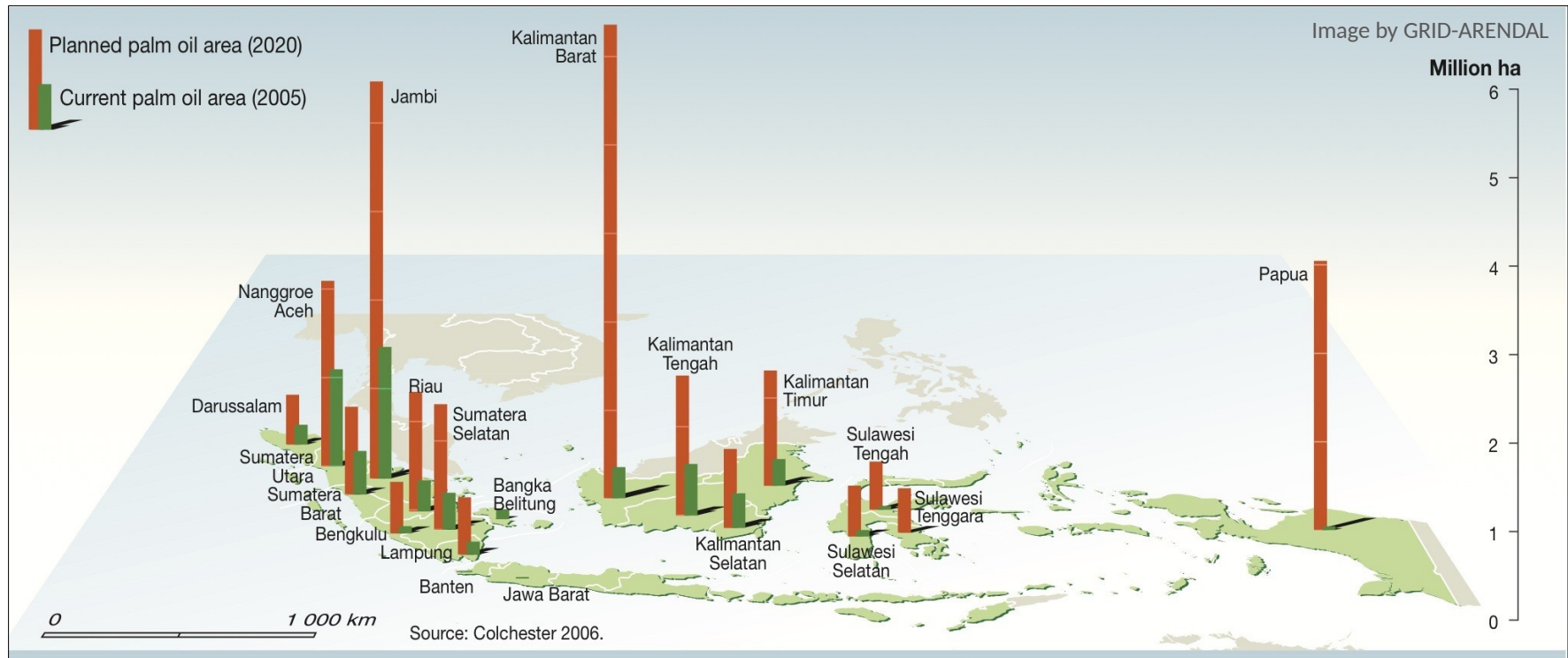
Table 2. Percentage of the total deforested mangrove (2000–2012) converted to different land uses

Country	Aquaculture	Rice	Oil palm	Mangrove forest	Urban	Other category
Indonesia	48.6	0.1	15.7	22.6	1.9	11.2
Myanmar	1.6	87.6	1.1	0.5	1.6	7.6
Malaysia	14.7	0.1	38.2	17.6	12.8	16.7
Thailand	10.8	5.6	40.0	5.1	14.4	24.1
Philippines	36.7	0.9	11.1	7.3	2.7	41.3
Cambodia	27.7	1.5	8.9	9.8	4.6	47.6
Vietnam	21.0	10.4	0.5	0.6	62.5	4.9
Brunei	29.2	0	27.7	12.5	15.9	14.8
Timor-Leste	0	26.1	0	0	0	73.9*
Singapore	0	0	0	0	0	0
Total	29.9	21.7	16.3	15.4	4.2	12.3

↑
Natural regrowth
or rehabilitation

Future trends

- Global annual demand for oil palm will grow by 256 million tonnes by 2050 – requiring 53 million ha more land



- Indonesia to increase production by further 30% between 2012 and 2019
- 118 000 ha of mangroves are proposed under oil palm concessions (Ilman et al. 2016)

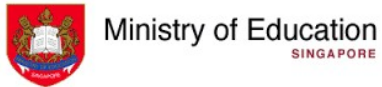


Summary

1. Mangrove is still being lost, but at a much lower rate (0.18%) than previously
2. Aquaculture is still the main cause of deforestation (30%), though rice and oil palm are also important
3. Oil palm may become a bigger threat in the future
4. We now have a transparent and repeatable method for monitoring deforestation in Southeast Asia, that can be used by all countries and organizations

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Richards & Friess. 2016. Rates and drivers of mangrove deforestation in Southeast Asia, 2000-2012. *Proceedings of the National Academy of Sciences* 113, 344-349.

For more info visit www.themangrovelab.com or email dan.friess@nus.edu.sg

Mangrove Macrobenthos and Management (MMM) meeting

MMM1	Kenya	2000
MMM2	Australia	2006
MMM3	Sri Lanka	2012
MMM4	USA	2016

MMM5 Singapore July 2019

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