Climate Change Agent:

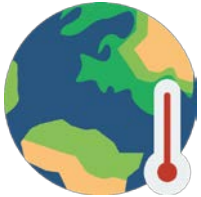
An Evidence From Deforestation Model In Indonesia

A Susandi, A R Wijaya, M Tamamadin, A Pratama, A F Pratama, I Faisal, O P Pandini, and D A Widiawan

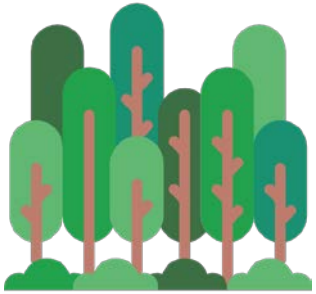
Institut Teknologi Bandung

The Backgrounds

From 2001 to 2015, 89% of tree cover loss occurred in Indonesia.



The climate change agent will be assessed and proved through deforestation model.



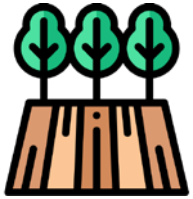
Indonesia has around **10%** of the world's **remaining tropical forest**.

It will use population and economic growth as the driving forces of deforestation

The Deforestation Model

Deforestation

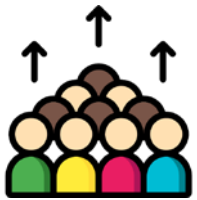
The rate of deforestation is expressed as a function of the direct causes



Direct Cause

Pressure for forest products and alternative land uses (cropland) .

Direct causes are expressed as a function of the indirect causes.

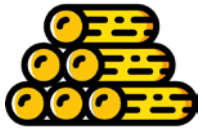


Indirect Cause

Population, gross domestic product, external debt and government policies

The Deforestation Model

To simplify, the direct causes of deforestation in Indonesia that is used by the model are:



Roundwood consumption

Export of forest products

Change in cropland and forest fire

The model calculated the elasticity (e) of deforestation (D) with respect to the population (P) as function of $e = \left(\frac{\delta D}{D}\right)\left(\frac{\delta P}{P}\right)^{-1}$ and GDP growth (Y_G) also as function of $e = \left(\frac{\delta D}{D}\right)\left(\frac{\delta Y_G}{Y_G}\right)^{-1}$ for Indonesia, based on deforestation data.

The Deforestation Model

P_t the total population of Indonesia in year t
Y_t^W total GDP of the rest of the world in year t
Y_t GDP of Indonesia in year t

Hence, the total deforestation model is:

$$D_t = D_t^{roundwood} + D_t^{export} + D_t^{cropland} + D_t^{fire}$$

$$D_t^{roundwood} = \left(\frac{P_t}{P_{t-1}}\right)^{0.6509} D_{t-1}^{roundwood}$$

deforestation of round wood consumption in year t

$$D_t^{cropland} = \left(\frac{Y_t}{Y_{t-1}} - 1\right)^{0.6171} D_{t-1}^{cropland}$$

deforestation of cropland in year t

$$D_t^{export} = \left(\frac{Y_t^W}{Y_{t-1}^W} - 1\right)^{0.0668} D_{t-1}^{exp\ ort}$$

deforestation of forest products export in year t

$$D_t^{fire} = \left(\frac{P_t}{P_{t-1}}\right)^{0.0434} D_{t-1}^{fire}$$

deforestation of a forest fire in year t

Deforestation Model: The assumptions

Population Assumption

1. **Population and economic growth** are the driving forces of deforestation
2. The model **uses historical and projected population data from UN**
3. These data are **an expression of population data projection** from 2000 to 2050 **with three different variants**: low, medium, and high

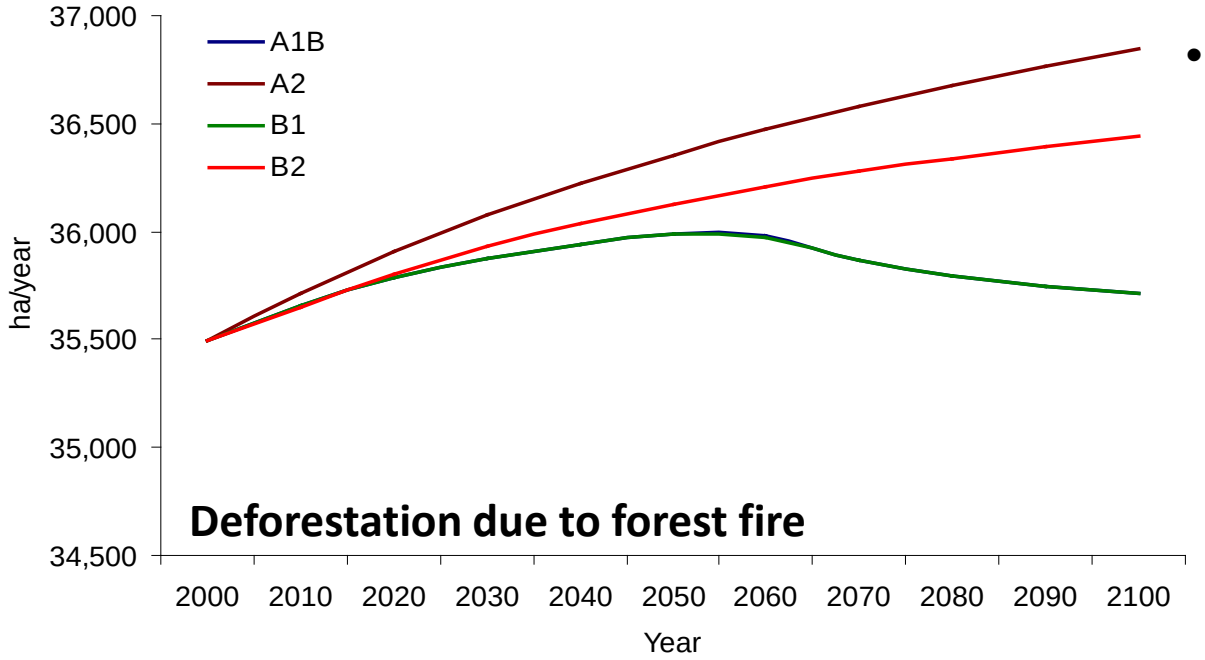
GDP Assumption

1. GDP data for Indonesia are **taken from the AIM model**
2. The **AIM model extrapolates the population and GDP data projection** for the next year to 2100 **based on the growth rate of the previous data**

Table of Total growth of population and GDP between 2000 and 2100 (resume for Indonesia)

Set of Scenarios	A1B	A2	B1	B2
Population growth (% per year)	0.14	0.87	0.14	**0.59**
GDP growth (% per year)	4.08	3.03	3.63	**3.07**
Per capita GDP growth (% per year)	**3.93**	**2.15**	**3.48**	**2.46**

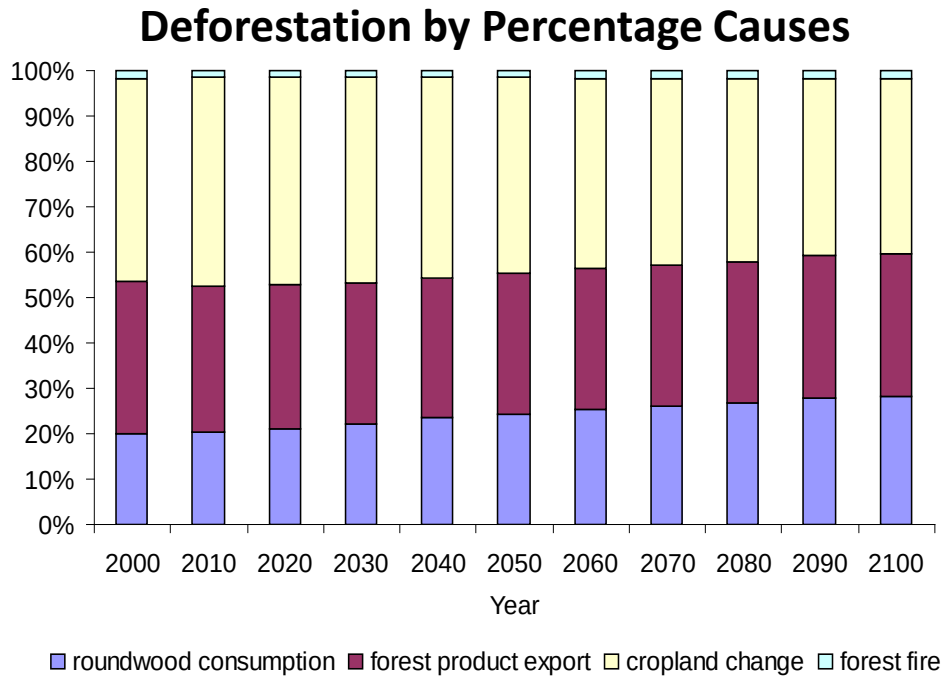
Result and Discussion (1)



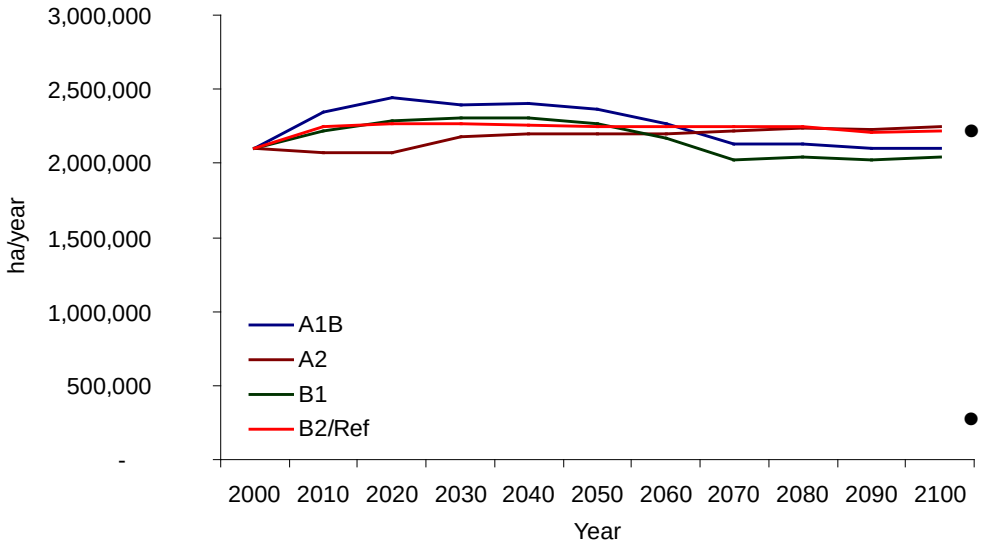
- In the **A1B** and the **B1** scenarios, **as population to increase**, the **forest fire deforestation** was **rose** in 2000 to **35,900 ha per year in 2050**, then **decreasing 35,700 ha per year in 2100 gradually**.

Result and Discussion (2)

- The **B2** as **reference scenario with the medium population** and **economy development projection**.
- the **cropland is the main contributor** of the total rate of deforestation which corresponding to **1 million ha per year**.



Result and Discussion (3)



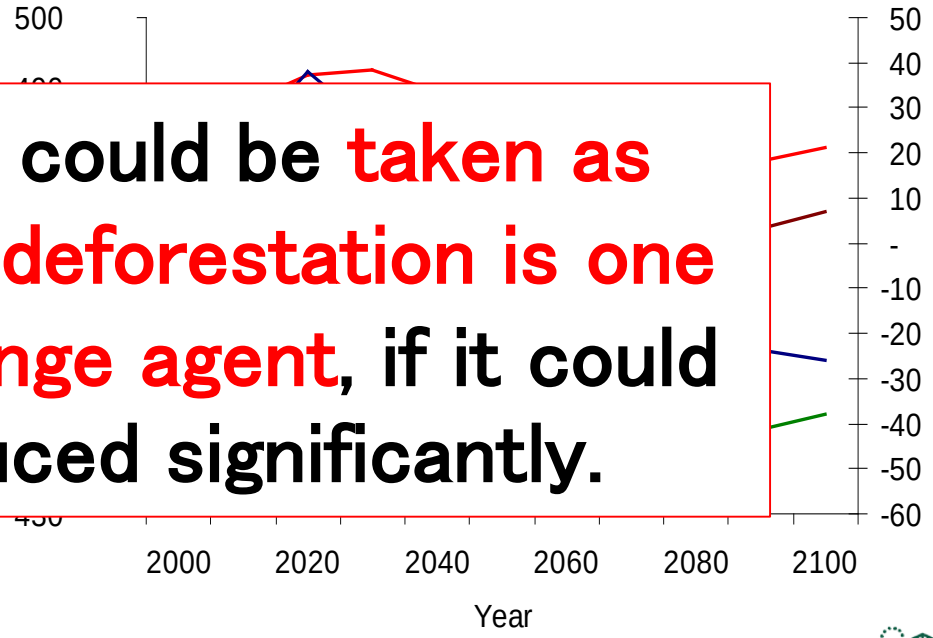
- In the A1B and the B1 scenarios, the rate of deforestation **looks similar**, **except the rate of deforestation by cropland**.
- Even the population growth in the A2 scenario is **highest** but **economic development** is **the lowest growth as driven to cropland deforestation**.
- Hence, the **rate of deforestation is slightly decreasing** in million tonnes of C **in the first half of century**, **later increases to the end of the century as implication of population development**

Result and Discussion (4)

- it could be taken **relation that the carbon emission by using each scenario shown that defore** **effect emissi**

- with a unit of store a carbon emission, **the loss by deforestation as projected in 2100 equivalent with 82 million tonnes carbon per year**.

Therefore, it could be taken as premises that deforestation is one of climate change agent, if it could not be reduced significantly.



Conclusions

Model for deforestation in Indonesia as the implication of future demographic and socio-economic development has been developed

Economic development would be the main contributor to cropland deforestation

Indonesia potentially become a big supplier of projects under clean development mechanism (CDM)

THANK YOU

A Susandi, A R Wijaya, M Tamamadin, A Pratama, A F Pratama, I Faisal, O P Pandini, and D A Widiawan