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Myanmar LULCC and Emission Challenges

Zaw Naing

Thin Nwe Htwe

Mar Lar Yu Aung

Win Myint Oo



Myanmar

at a glance

Capital: Naypyitaw

Major cities: Yangon (Pop-7 m) and Mandalay (Pop-1 m)

Area: 676,578 km²

(About **2 times larger than Vietnam** _331,210 km²)

Main Export: Natural gas, beans, pulses, teak, minerals, gems and jewelries

GDP - per capita (PPP): \$1,800 (2015 est.)

Population: 54 millions



Myanmar Topography

Beautiful Country

- Coastline
- Mountains
- Rivers
- Plain Areas
- Delta Areas



Shwe Dagon Pagoda in Myanmar



Bagan in Myanmar



Inlay Lake



Mandalay



Content

- Air Pollution in Myanmar
- Urbanization
- Land Utilization
- Land Use and Land Cover Change
- Deforestation
- Agriculture and Greenhouse Gas Emission
- Outdoor / Indoor Air Pollution
- Challenges



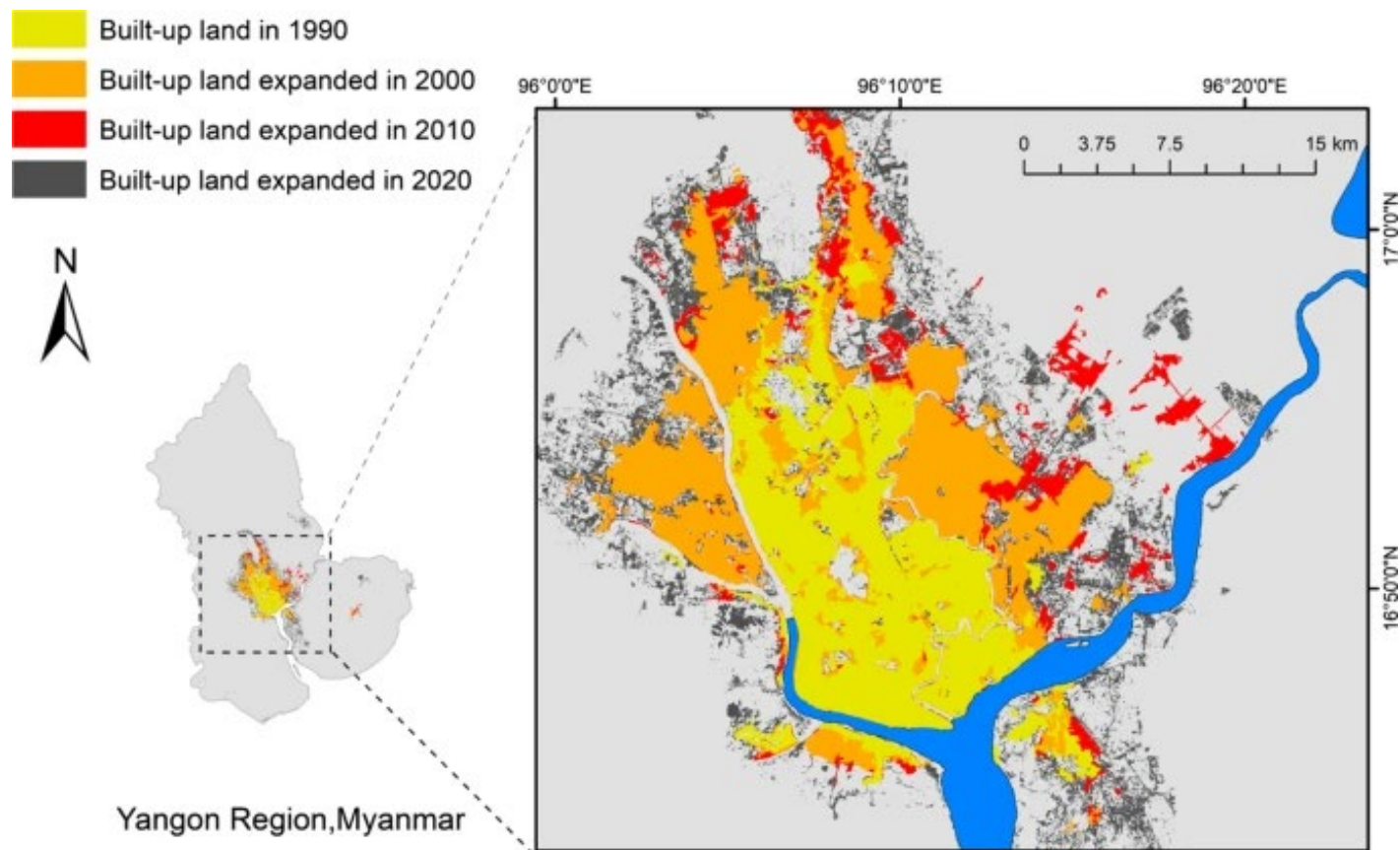
Air Pollution in Myanmar



- Acute environmental health issues are on the rise, caused by rapid **urbanization** and **industrialization**.
- 2017, over 45,000 deaths in Myanmar were attributed to air pollution.
- A higher mortality risk factor than in other countries in the region, at almost twice the average for Southeast Asia (GBD 2017).
- Yangon and Mandalay have the highest PM concentration, PM10, among the cities in Southeast Asia (Raitzer, Samson, and Nam 2015).



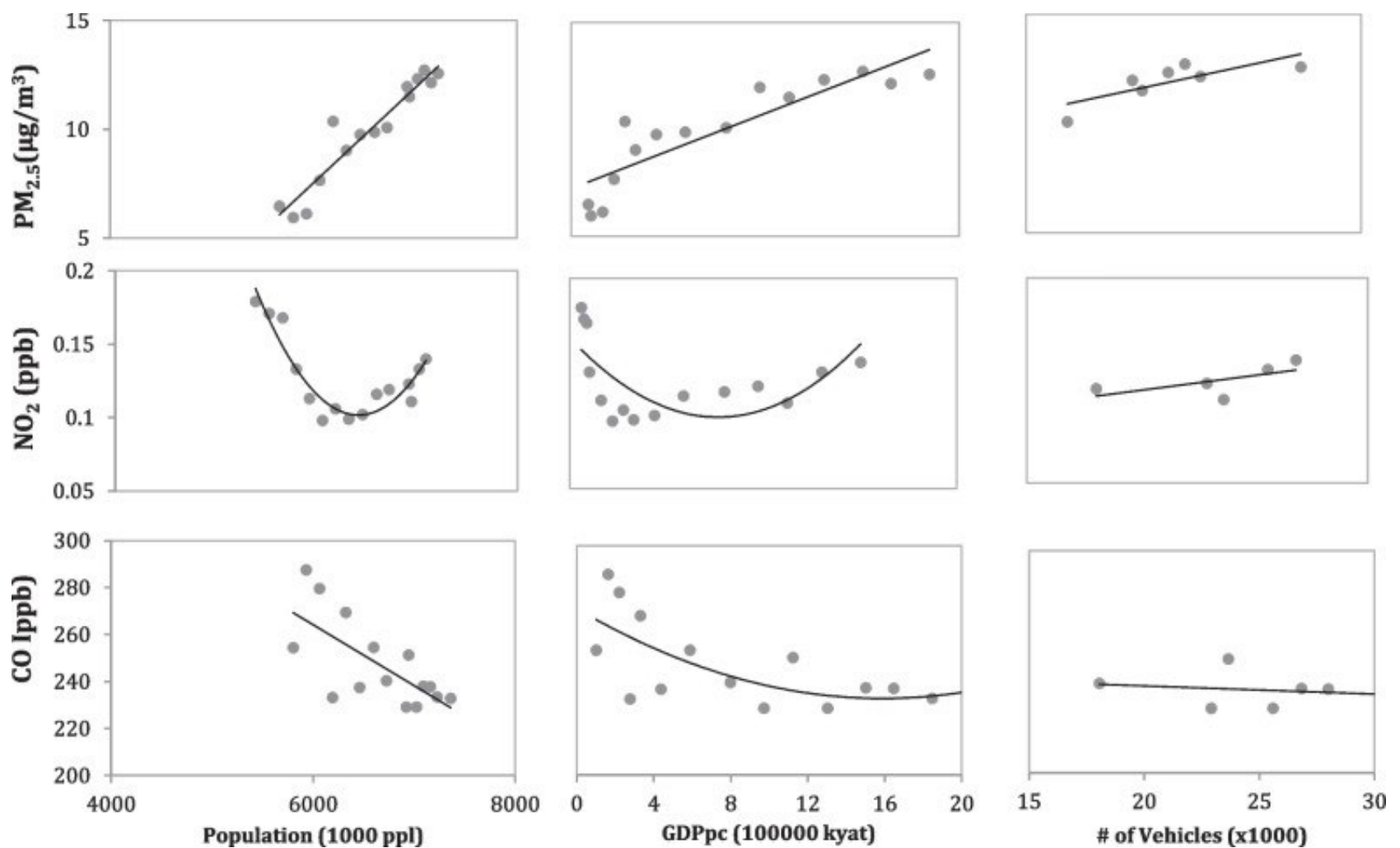
Yangon: Urban Expansion and Urban Transformation



The urban built-up area increased by

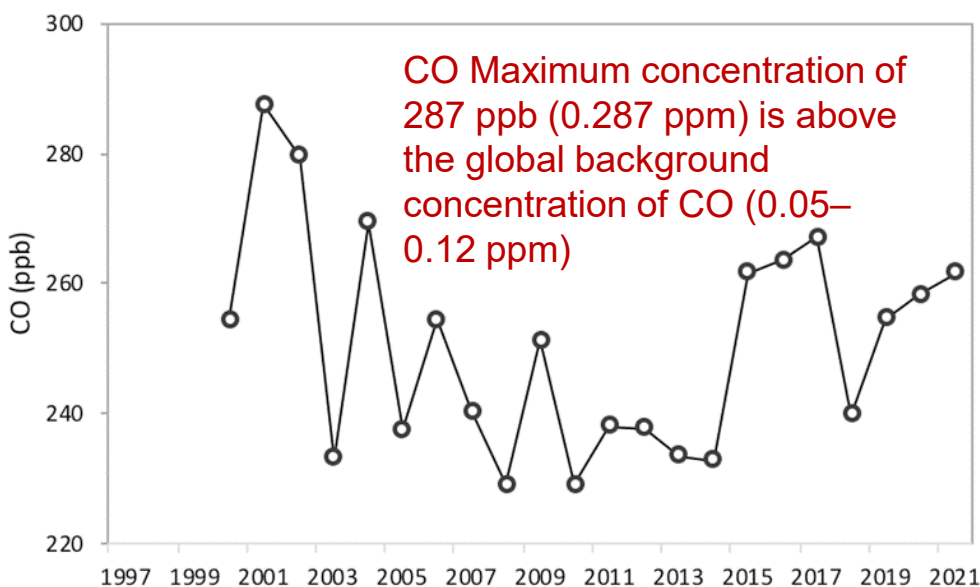
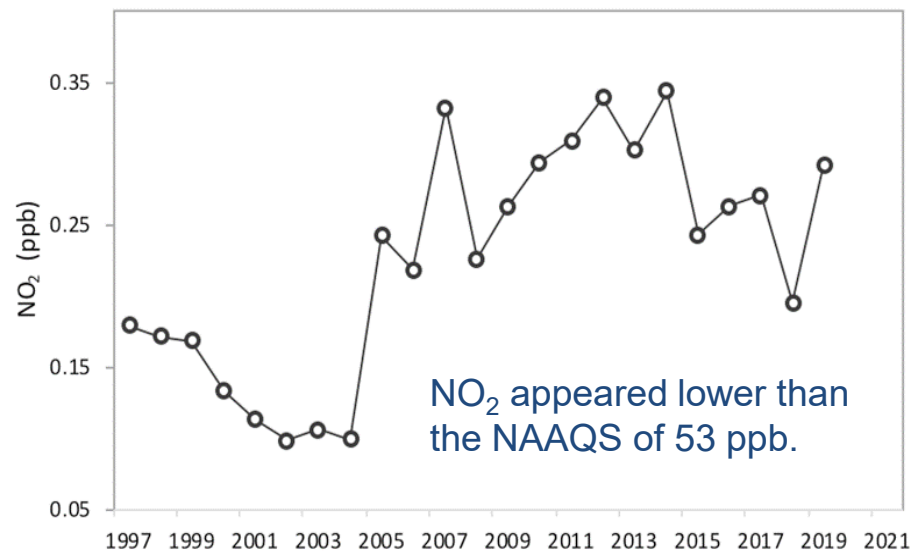
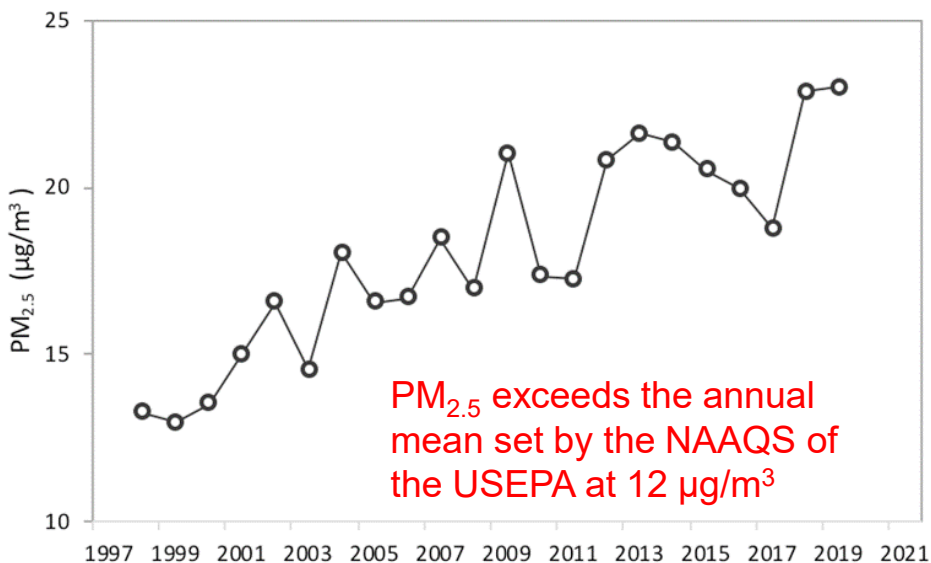
- 79% (161 km² in 1990 to 289 km² in 2000)
- 104% to 329 km² in 2010, and
- 225% to 739 km² in 2020.
- Mostly converted from farmlands and green land

460%
in 30 years



- PM_{2.5} was positively associated with all three socioeconomic variables (population, GDPpc, and # of vehicles)
- NO₂ decreased and increased with population and GDPpc,
- CO declined with population and GDPpc

Air pollutant concentrations in Yangon



Ref:

Fan, P., Chen, J., Fung, C. *et al.* Urbanization, economic development, and environmental changes in transitional economies in the global south: a case of Yangon. *Ecol Process* **11**, 65 (2022).

<https://doi.org/10.1186/s13717-022-00409-6>

Dry Zone Area Expansion

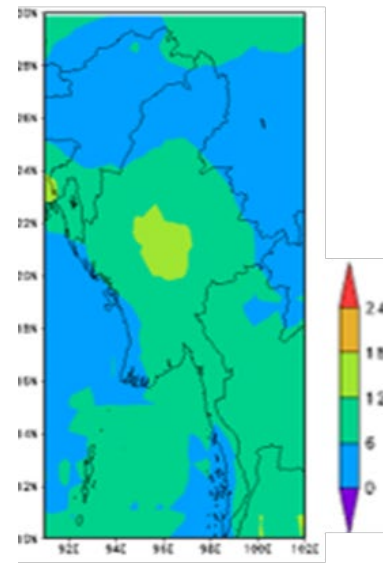
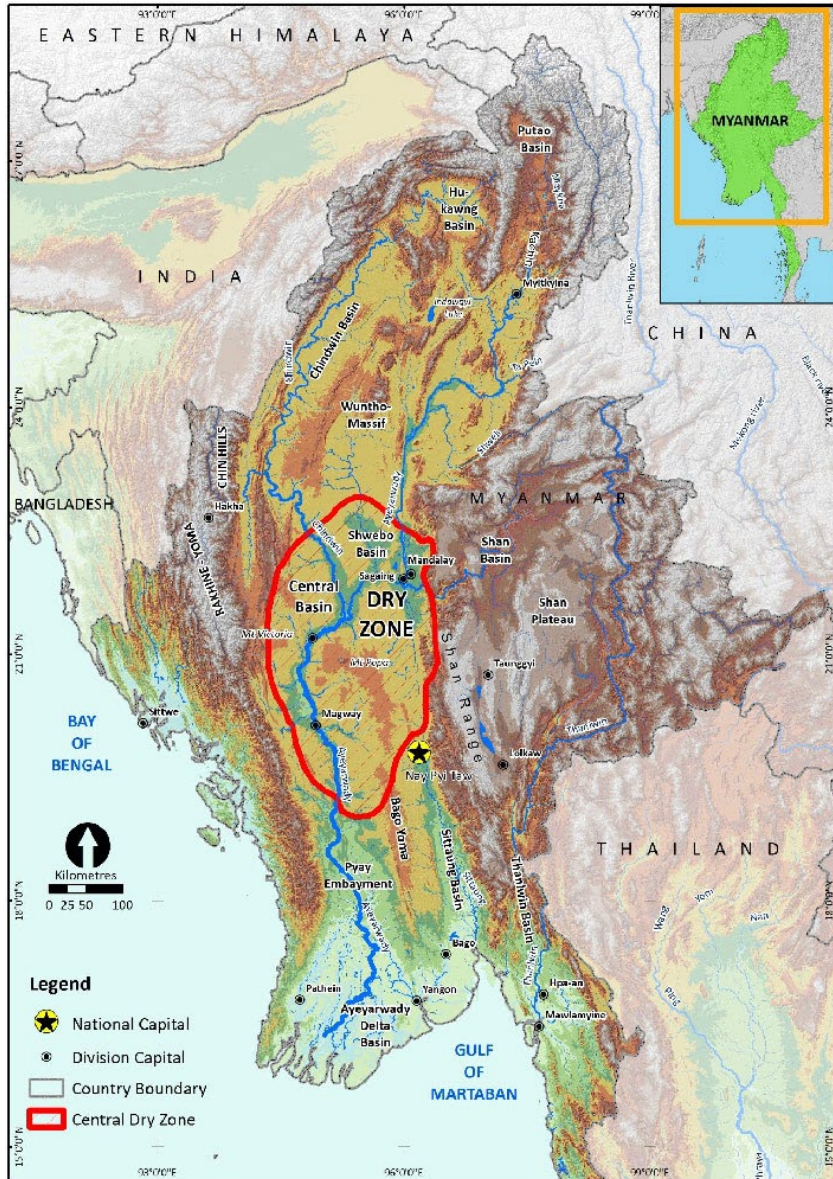


Figure (5) Annual Rainfall For 2021_2050(RCP_4.5)

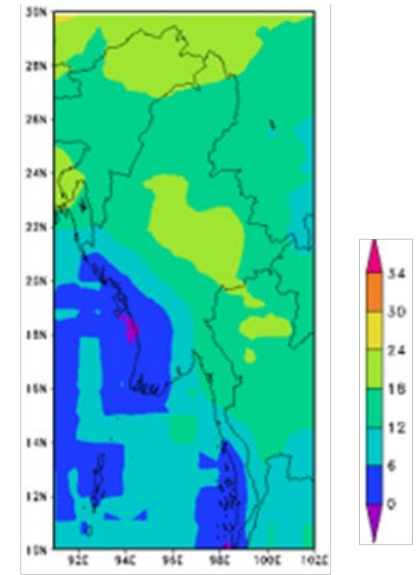


Figure (6) Annual Rainfall For 2070_2099(RCP_4.5)

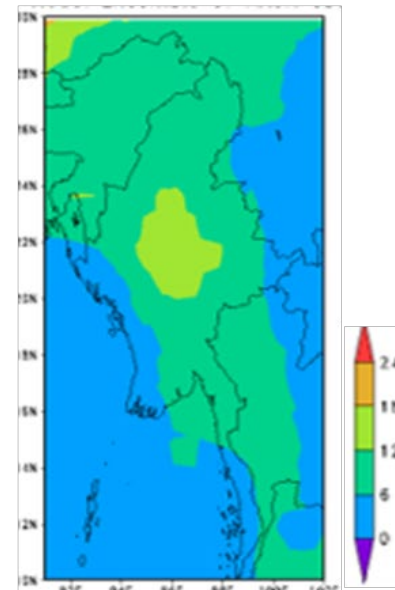


Figure (7) Annual Rainfall For 2021_2050(RCP_8.5)

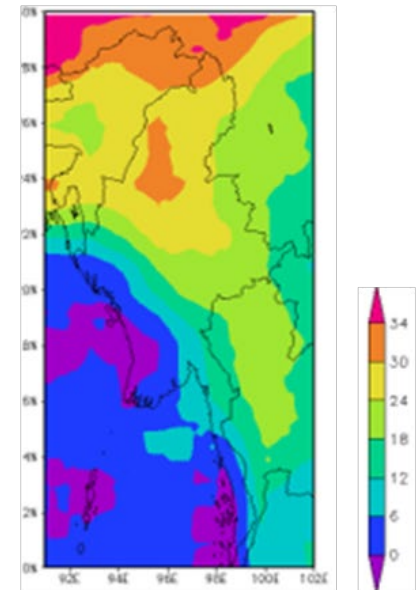
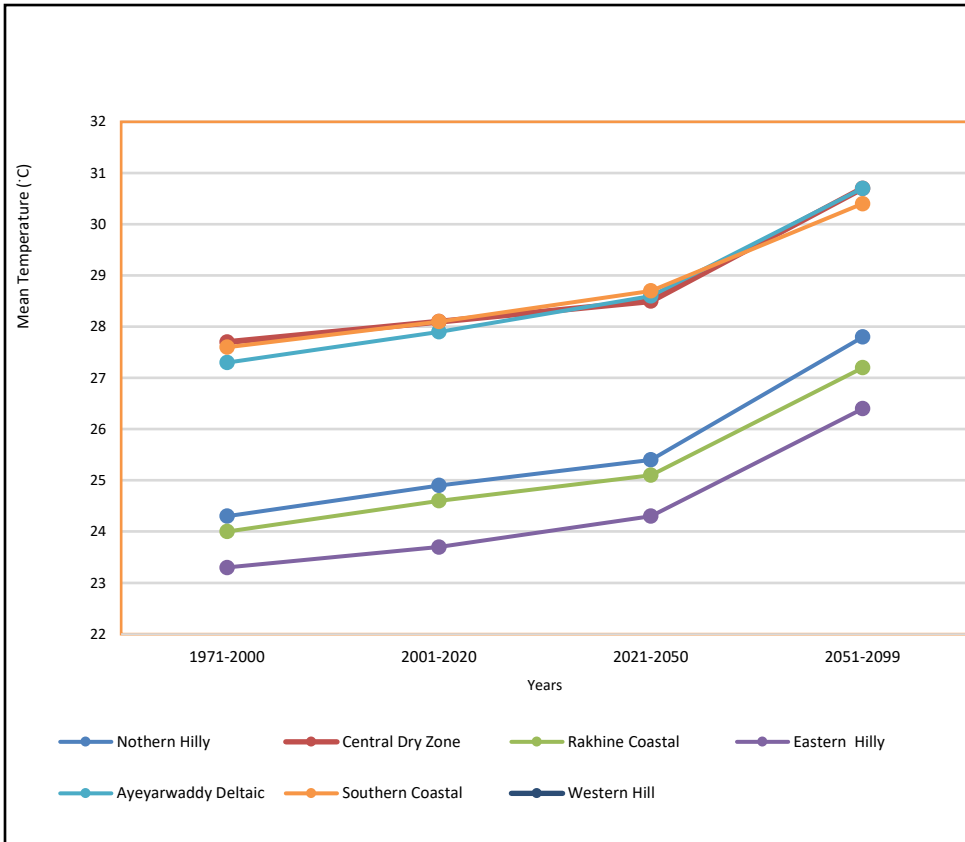
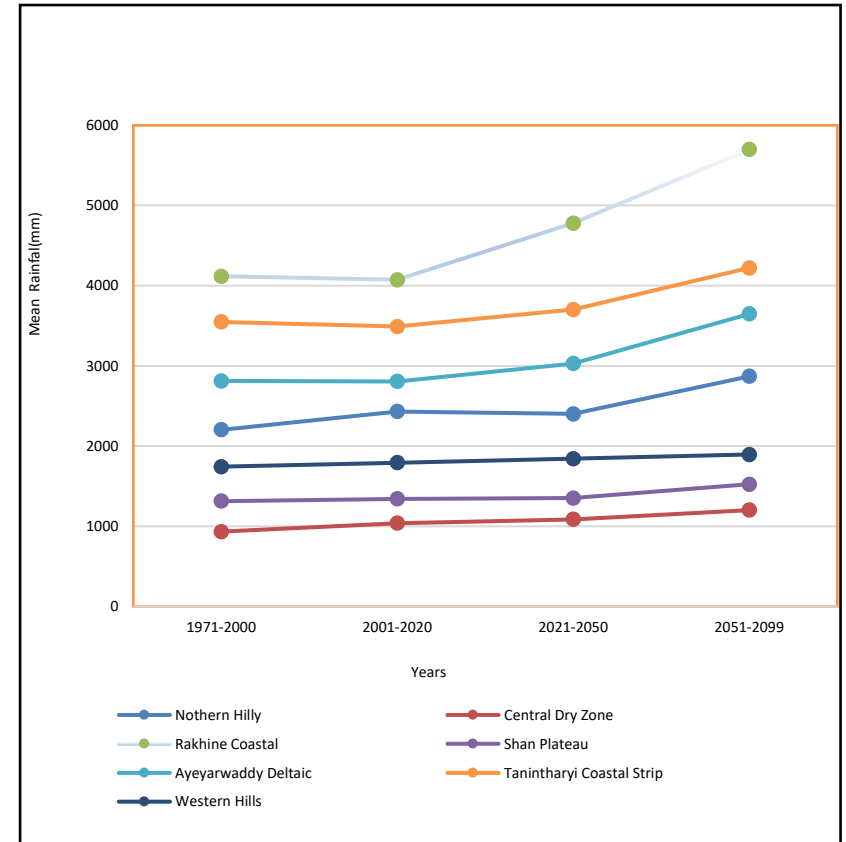


Figure (8) Annual Rainfall For 2070_2099(RCP_8.5)

PREDICTED Temperature and Rainfall Trends for the 7 Physiographic Regions in Myanmar (1971-2099)



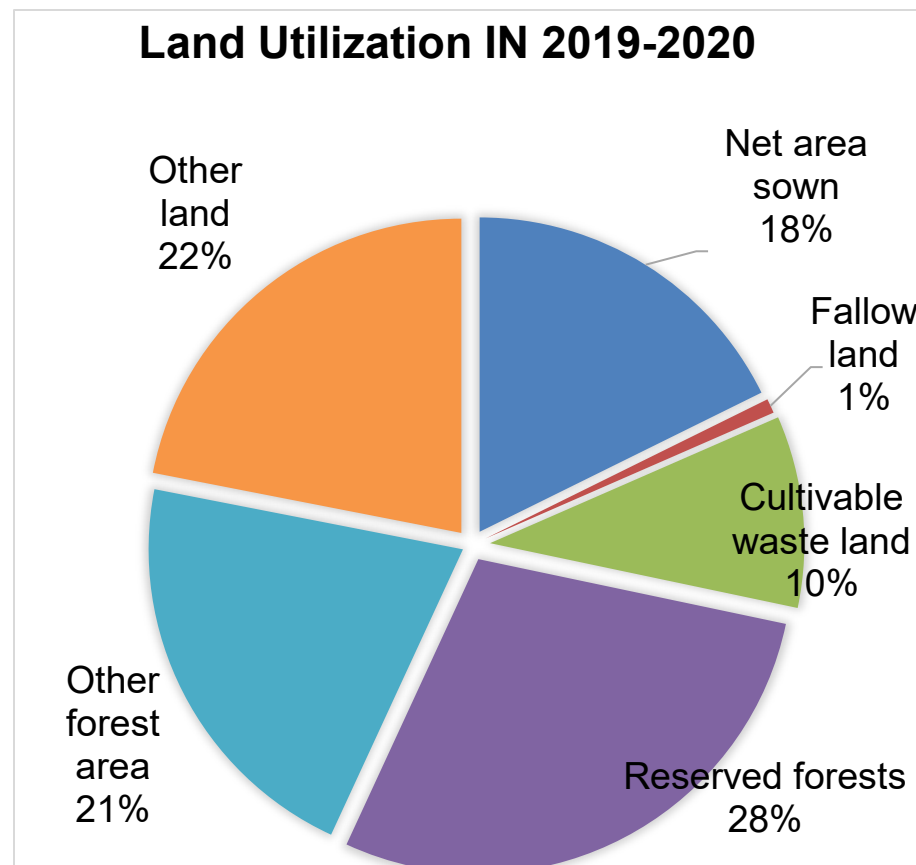
PREDICTED TEMPERATURE TRENDS FOR THE SEVEN PHYSIOGRAPHIC REGIONS IN MYANMAR (1971-2099)



PREDICTED RAINFALL TRENDS FOR THE SEVEN PHYSIOGRAPHIC REGIONS IN MYANMAR (1971-2099)

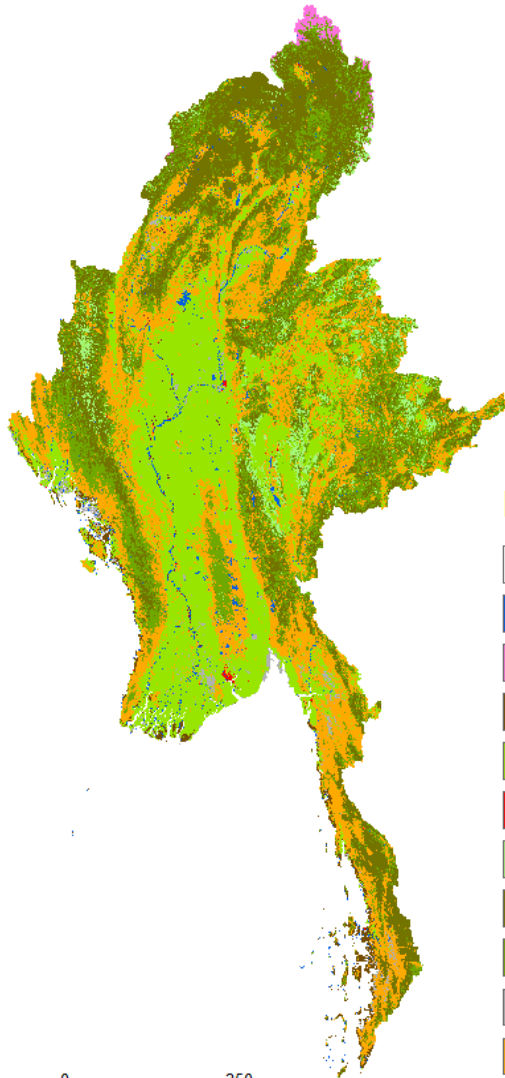
Land Utilization in Myanmar (2019-2020)

Particulars	Area (000 ha)
Net area sown	11976
Fallow land	502
Cultivable waste land	6673
Reserved forests	19340
Other forest area	14328
Other land	14839
Total	67659

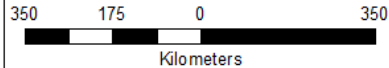
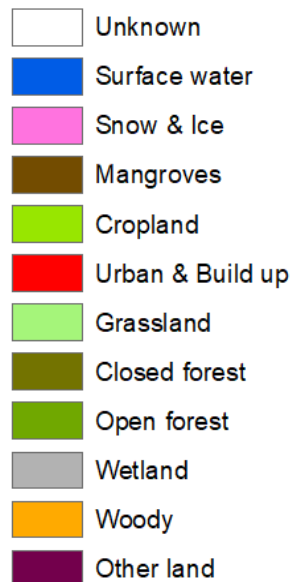


Source: Annual Report, 2019-2020, DALMS

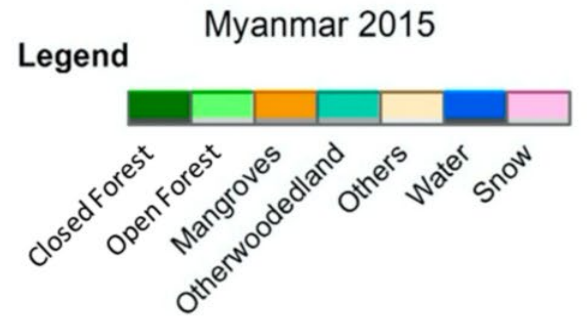
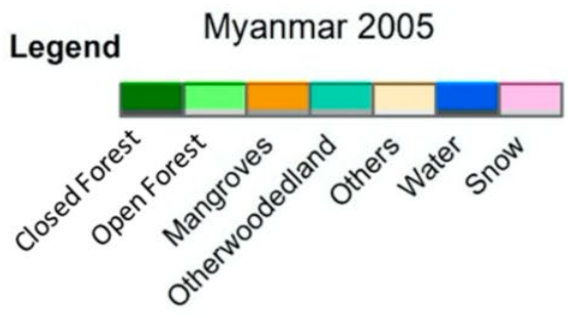
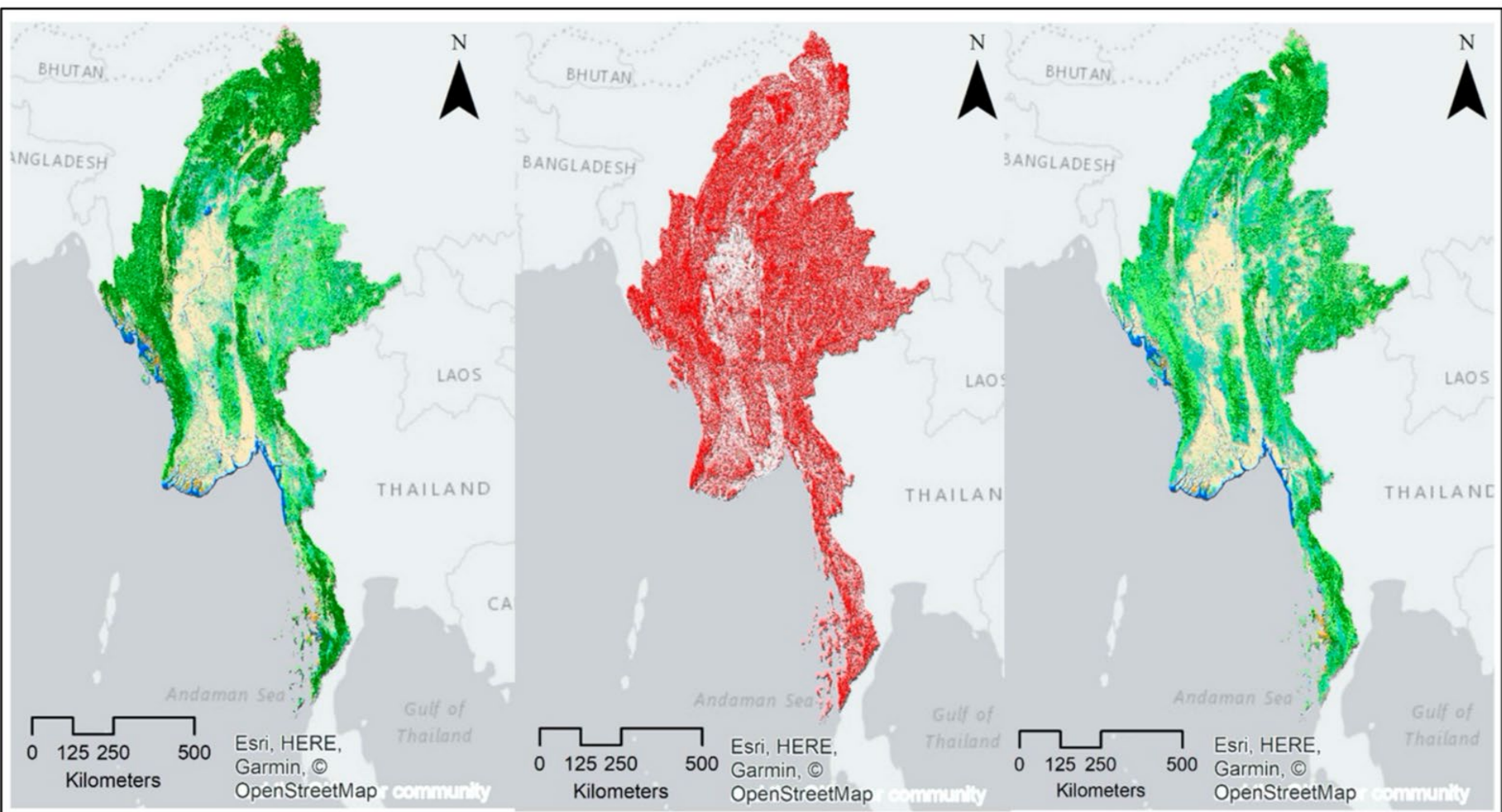
Land Cover Map_2017



Land Cover

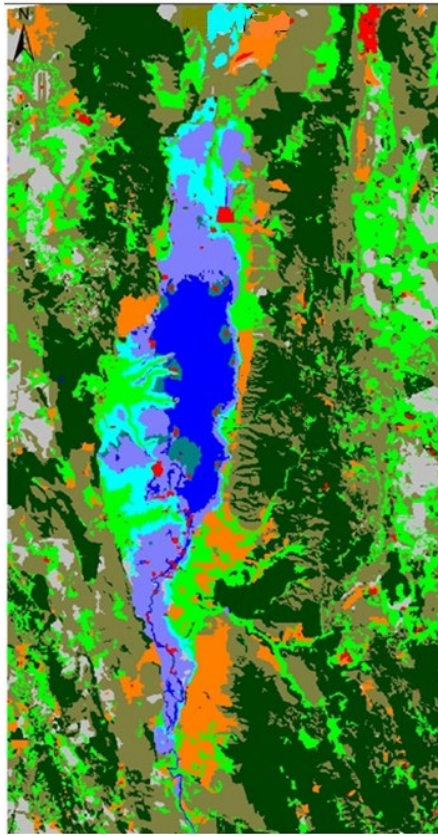


- Forest cover
 - 58% in 1990
 - 42% in 2020
 - Overall annual rate of forest cover loss
 - ❖ 2.58% (bet: 2005 and 2010)
 - ❖ 0.97% (bet: 2010 and 2015)
- (Zaw Naing Tun, 2021)

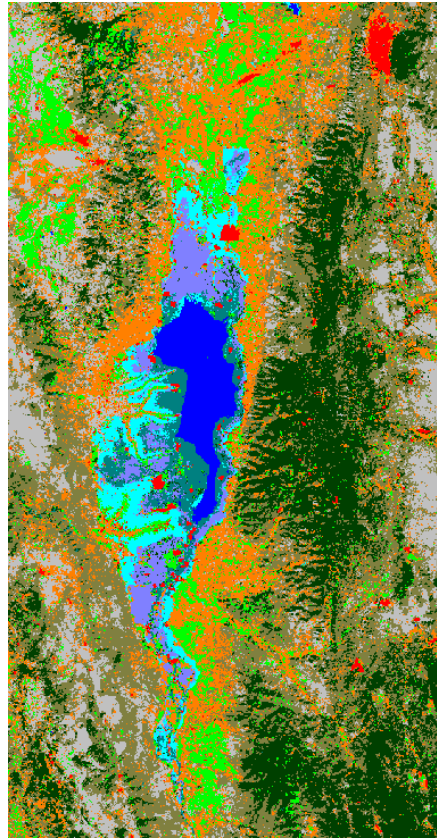


Land cover and land use changes in Inle lake Region

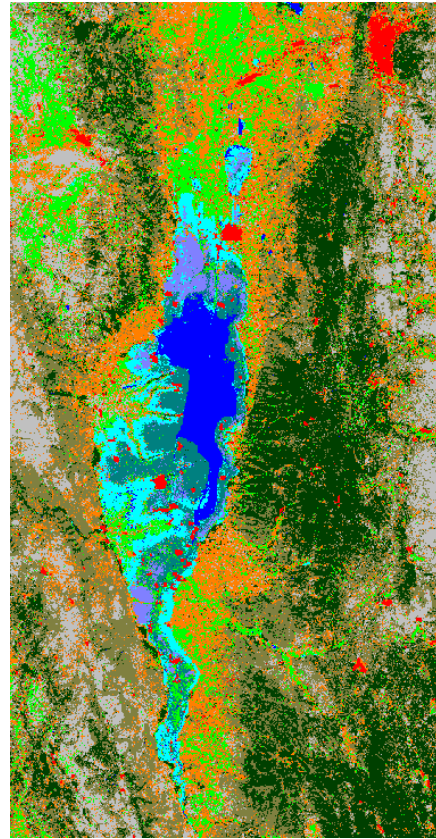
Feb 1968



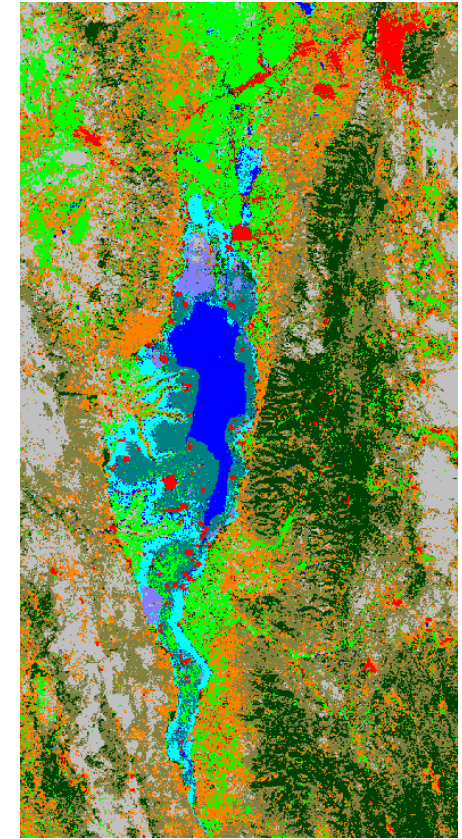
Feb 1989



Feb 2000



Feb 2009



N
WGS 1984
UTM 47N

Agroforest
Barren land
Crops / Fallow land

Floating garden
Forest
Marshland

Paddy field
Shrubland
Urban
Water

0 2.5 5 10 15
km

Htwe, T. H., et. al., 2014. Transformation processes in farming systems and surrounding areas of Inle Lake, Myanmar, during the last 40 year, DOI:10.1080/1747423X.2013.878764

Deforestation

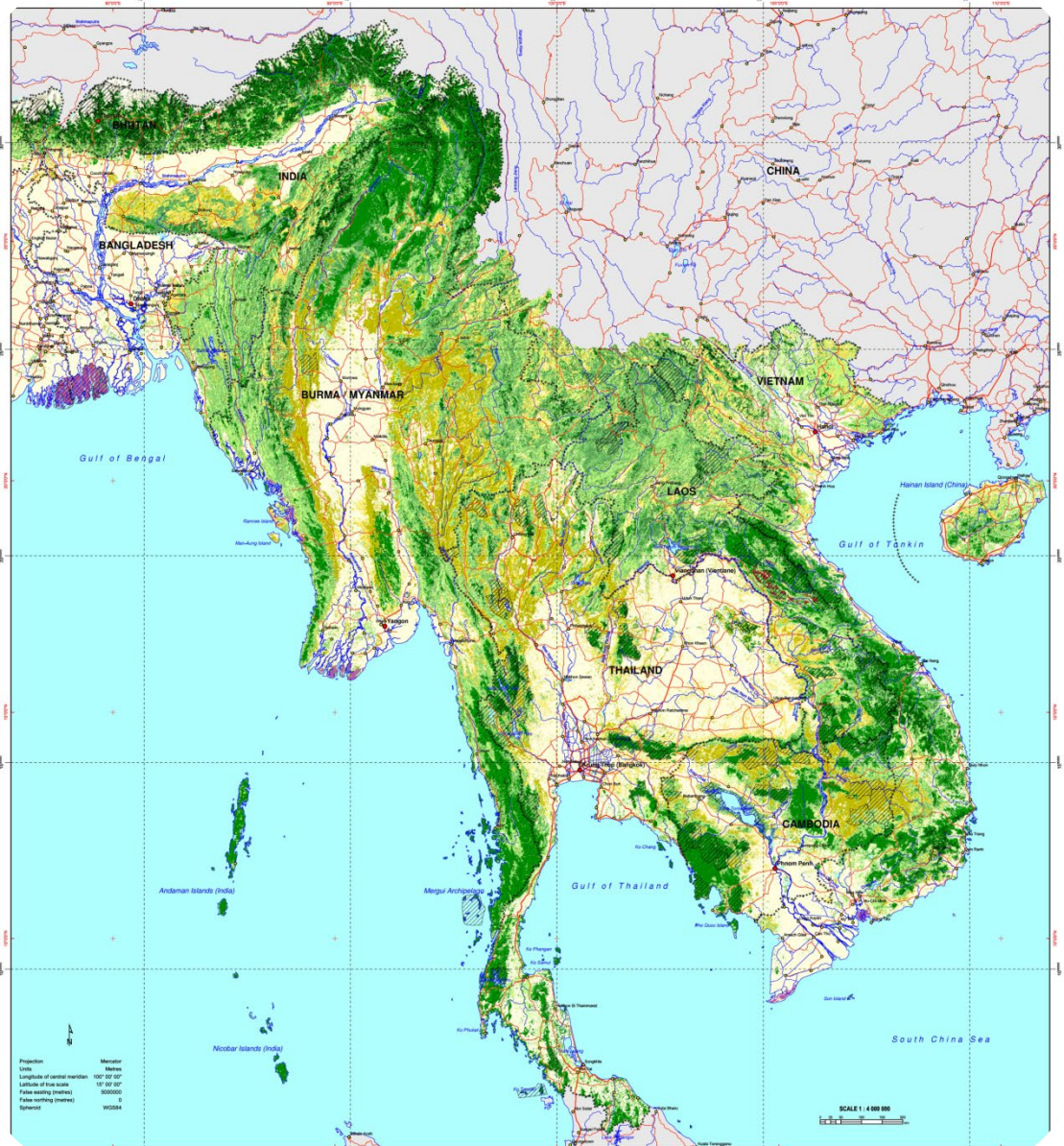


Causes

- Legal and illegal logging
- Agricultural expansion
- Fuelwood and charcoal consumption
- Road construction
- Mining and Oil Exploration
- Dam construction

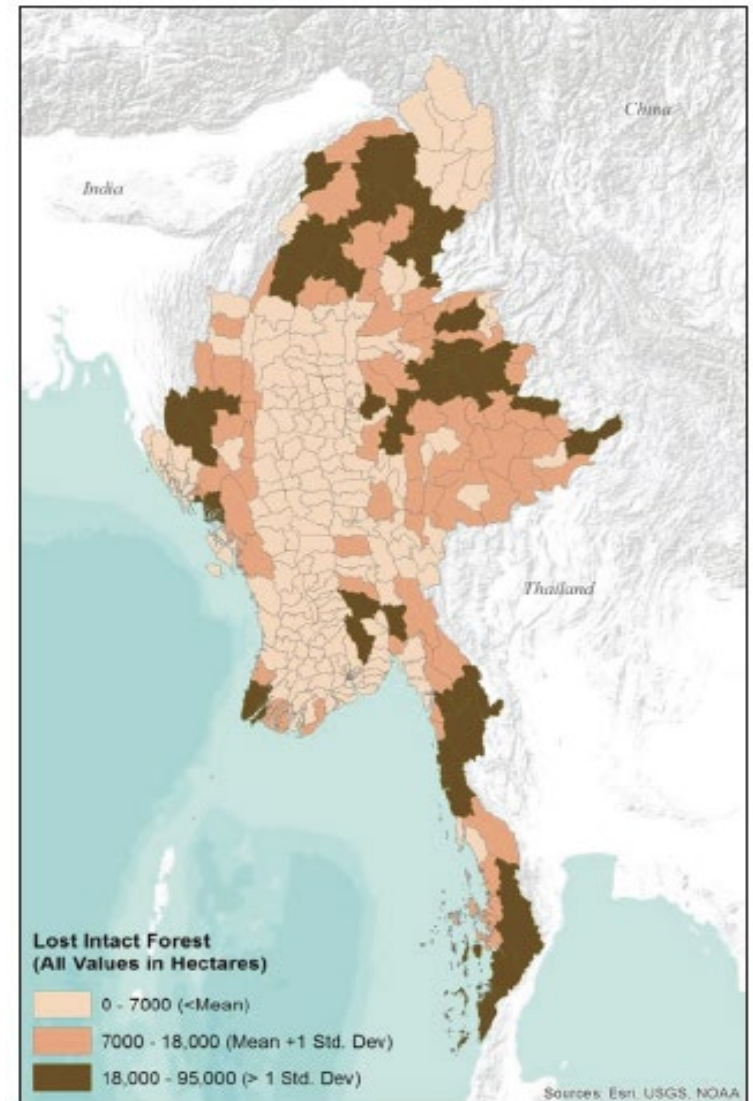
Remedy

- Conservation (Myanmar Selection System (MSS))
- Replantation



Deforestation

- Timber is estimated to account for a small proportion of the total volume of forest products.
- Over 80 percent of woody biomass extracted in 2017 was for wood fuels (based on FAO 2018a).



Intact forests (ha) lost between 2002 and 2014;
Source: Bhagwat et al. 2017

Agriculture

37% of GDP

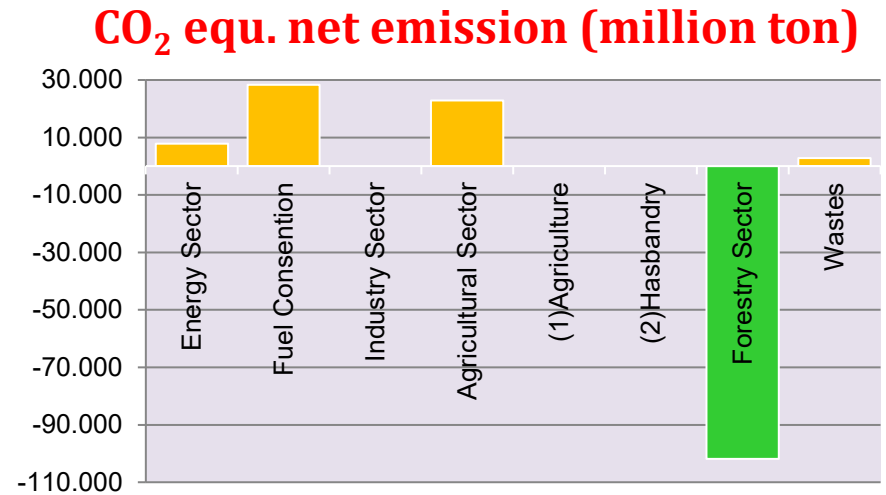
Employing 65% of
Population

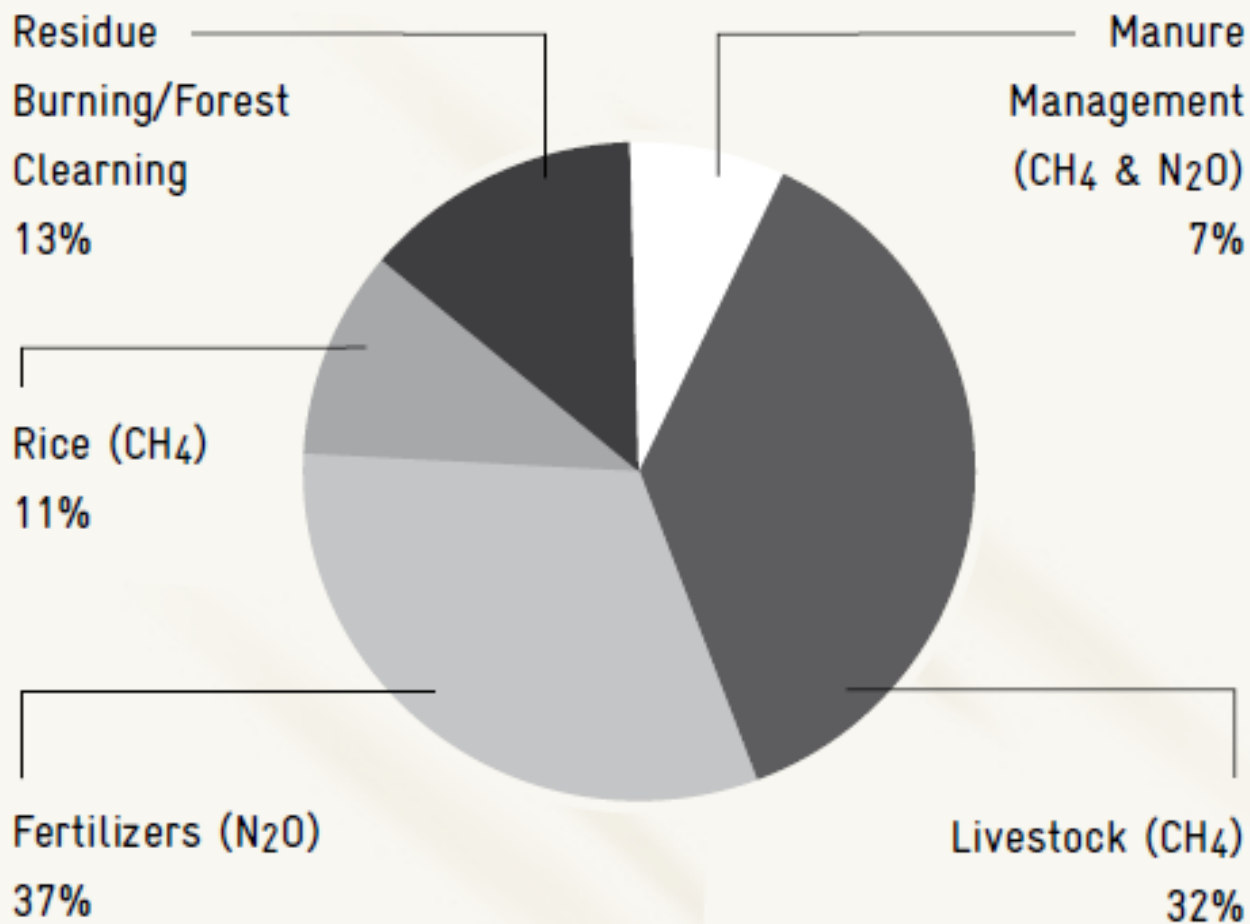
- Rice still the most crucial agricultural commodity
- Smallholdings are largest and most abundant in some of Myanmar's most productive areas.



GHG emission and removals in Myanmar for year 2000

Source/ Sink	CO ₂ equ. net emission (million ton)
Energy Sector	7.863
Fuel Consumption	28.298
Industry Sector	0.463
Agricultural Sector	22.843
-Agriculture	
-Hasbandry	
Forestry Sector	- 101.816
Wastes	2.826
Total	- 67.820

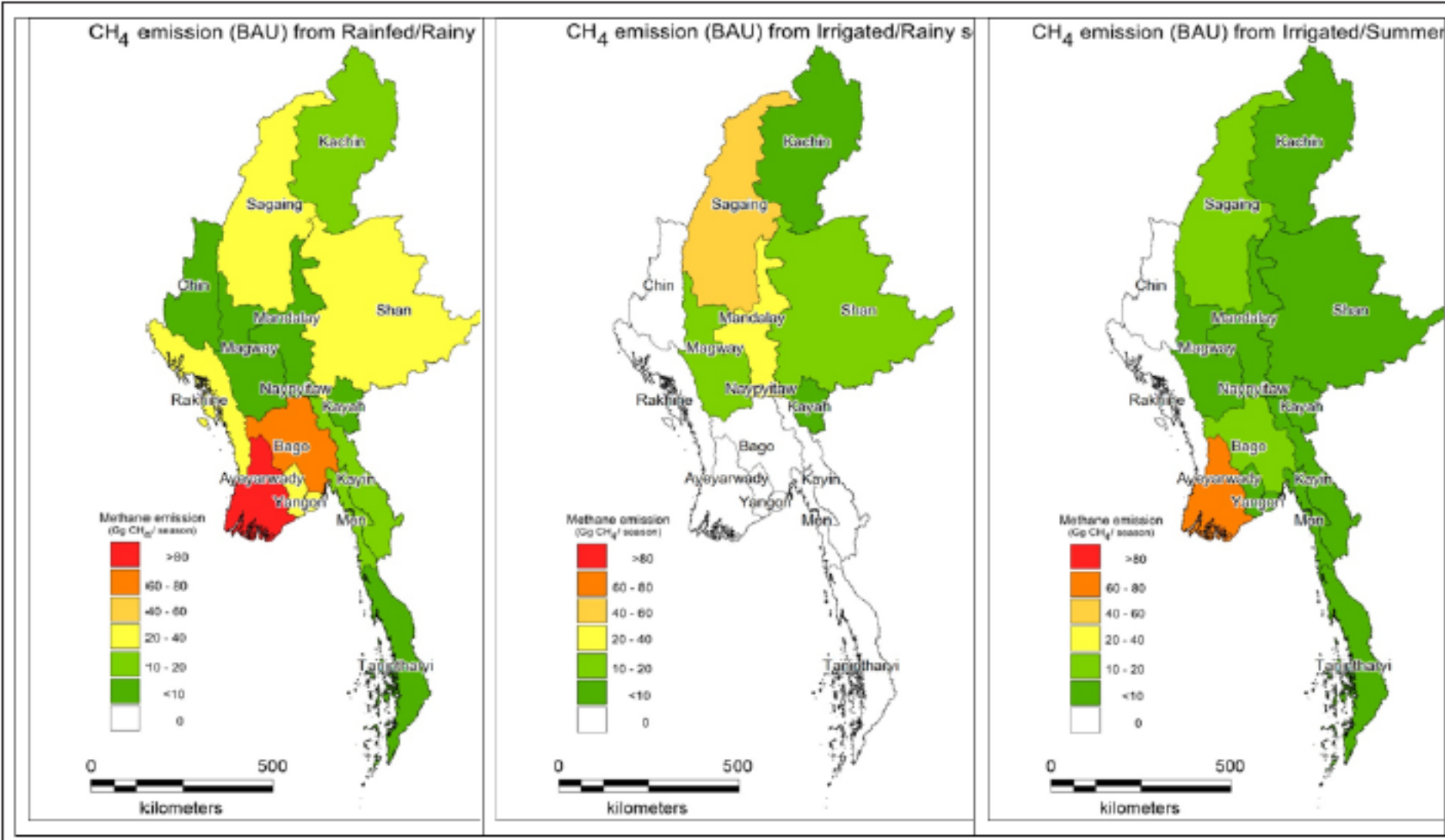




Sources of emissions from the agricultural sector (2000)

Source: Drawn from data presented in USEPA (2006)

Methane Emission from Rice Plantation in Myanmar (Lai Lai, 2021)



GHG Emission

- GHG budget dominated by CH₄ from flooded paddy fields
- Depend on cultivation practices and postharvest technologies
- Two thirds of the 'on-field' emissions
- Half of the total emissions throughout the entire value chain including resource inputs



Air Pollution: Outdoor

- Combustion processes from motor vehicles, solid fuel burning and industry, heating appliances, and tobacco smoke
- Smoke from bushfires, windblown dust, and biogenic emissions from vegetation (pollen and mould spores)
- Burning of traditional biomass (wood, crop waste and dung) as the major source in Myanmar



Air Pollution: Indoor

- Outside the home, such as emissions from transport or smoke from neighbouring wood heaters
- Within homes
- Wood fuel is used as the main energy source by 60–80 percent of the rural population (WB, 2019).



Source: World Bank, 2019. Myanmar Country Environmental analysis

Challenges

- Lack of sustainable land use planning
- Limited efficient technologies and fuel substitution
- Limited monitoring network on air quality assessment
- Limited research tools and capacity building programme
- Weak of control and enforcement of emission guidelines as well as air quality management

An aerial photograph of a lush green hillside with terraced rice fields. The terraces are arranged in a series of curved, horizontal steps that follow the contour of the land. The rice plants are in various stages of growth, appearing as vibrant green. The background shows more terraced fields extending up the hill, and the foreground is partially obscured by dark green foliage. The overall scene is a beautiful example of traditional agricultural terracing.

Thank you so much for your kind attention!