Co-benefits and trade-offs in Thailand's net zero emissions 2050

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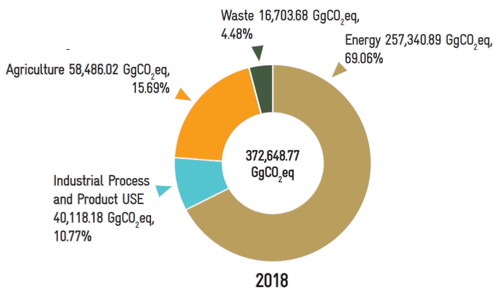
INTRODUCTION

Reducing the greenhouse gases bring not only climate benefits but also a number of co-benefits such as health, environment, land use improvement and energy security. However, the co-benefits of GHG mitigation are often overlooked in policy analyses. Thailand submitted its NDC and pledged to achieve carbon neutrality by 2050 and net zero GHG emissions by 2065. Co-benefits associated with reducing GHG emissions are not included. The co-benefits should be taken into consideration such as air pollutants, energy security and trade off in land use. The reduction of air pollutants reduces human respiratory health problems. There are economic benefits in reducing air pollutants. The analysis of co-benefits in a low carbon development strategy, makes it more economically attractive. It is recommended that the co-benefits of GHG mitigations should not be ignored in the policy analysis. Incorporating co-benefits in the assessment of GHG mitigation would produce higher positive impacts on the overall outcomes.



Thailand is considered a developing country highly vulnerable to the impacts of climate change. Thailand has been experiencing more severe and intensified impacts nationwide. Thailand was ranked the 9th most affected country – both in terms of human impacts and direct economic losses from weather related loss events.

The main source of GHG emissions was the energy sector, it accounted for 69% of total emission sources in 2018. The share of emissions from the agriculture sector decreased to 16% in 2018, while the share of emissions from the IPPU and waste sectors slightly increased to 4.48%.

METHODOLOGY

This study uses AIM/Hub, formerly known as AIM/CGE (Asia-Pacific Integrated Model/Computable General Equilibrium), for the analysis. The model is a one-year step recursive dynamic general equilibrium model. It is an efficient tool for the economic policy assessment and energy related to GHG emissions reduction at global, regional and national levels. The AIM/Hub model of Thailand examines 41 industrial classifications.

The reduction in air pollutants, improvement in energy security and trade-offs in land use has been analyzed under three scenarios. They are current policy (CurPol), nationally determined contributions (NDC) and net zero GHG emissions (NZE) scenarios.

Classification of Industries (Based on AIM/Hub-Thailand model)

Agricultural Sectors

- Rice
- Wheat
- Other grains
- Oil seed crops
- Sugar crops
- Other crops
- Ruminant livestock
- Raw milk
- Other livestock and fishery
- Forestry

Energy Supply Sectors

- Coal mining
- Oil production
- Gas production
- Petroleum refinery
- Coal transformation
- Biomass transformation (1st generation)
- Biomass transformation (2nd generation w/energy crop)
- Biomass transformation (2nd generation w/residue)
- Gas manufacture distribution
- Coal-fired power
- Oil-fired power
- Gas-fired power
- Nuclear power
- Hydroelectric power
- Geothermal power
- Photovoltaic power
- Wind power
- Waste biomass power

Other Production Sectors

- Mineral mining and other quarrying
- Food products
- Textiles, apparel, and leather
- Wood products
- Paper, paper products and pulp
- Chemical, plastic, and rubber products
- Iron and steel
- Nonferrous products
- Other manufacturing
- Construction
- Transport and communications
- Other service sectors
- Carbon capture service

OBJECTIVES & SCOPES

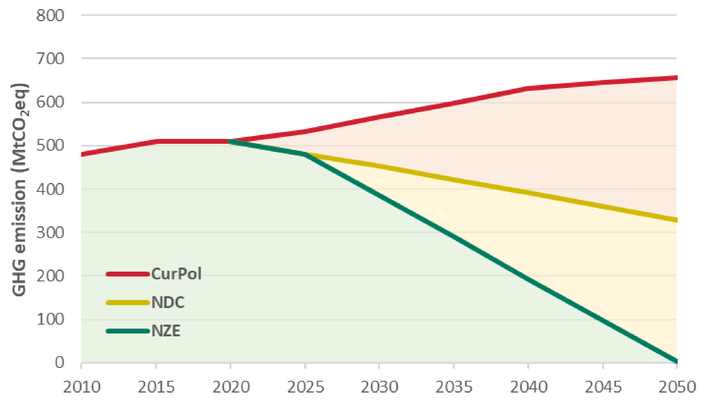
The purpose of this study is to assess the co-benefits of GHG emission reduction in Thailand to achieve NDC and net zero emission targets. In addition, this study considers both the energy and the non-energy related GHG emissions. GHG emissions from the non-energy sectors are from the agriculture, industrial processes and product use (IPPU), land use, land use change, and forestry (LULUCF) and waste sectors. The analysis provides co-benefit insights for Thailand on how to achieve its carbon neutrality target and ambitious GHG reduction targets in 2050 to align with the 1.5°C targets of the Paris Agreement.

CONCLUSION

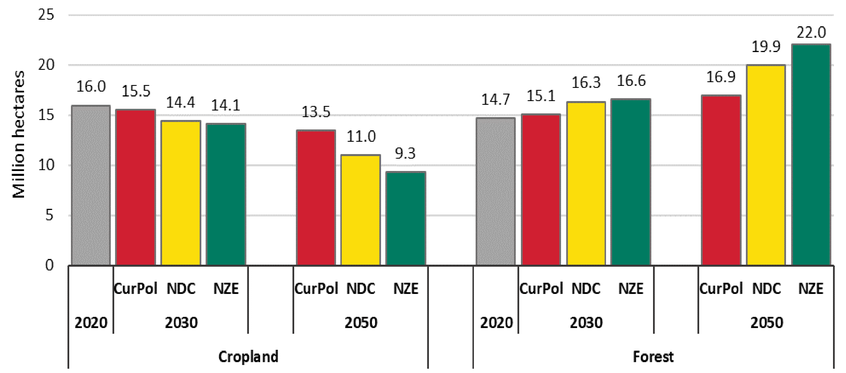
Thailand's emission reduction strategies focus mainly on a GHG emissions reduction. The co-benefits, avoided impacts and trade-offs have not been discussed in the climate policy documents. Considering co-benefits aspects in the assessment of the emissions reduction will give the holistic insights on the positive impacts of implementation of such strategies. It is highly recommended that policy makers take into consideration the co-benefits of GHG emissions reduction while assessing any issues or activities related to low carbon development. Health benefits from the lowering of local air pollutants will definitely make GHG emissions reduction more impactful to the society. Moreover, net zero emission pathway will require effective usage of land area and utilization of domestic energy resources, thereby making the country raise an energy security. Therefore, achieving net zero emission should be analyzed in holistic approach to cover all benefits related to it.

RESULTS & DISCUSSION

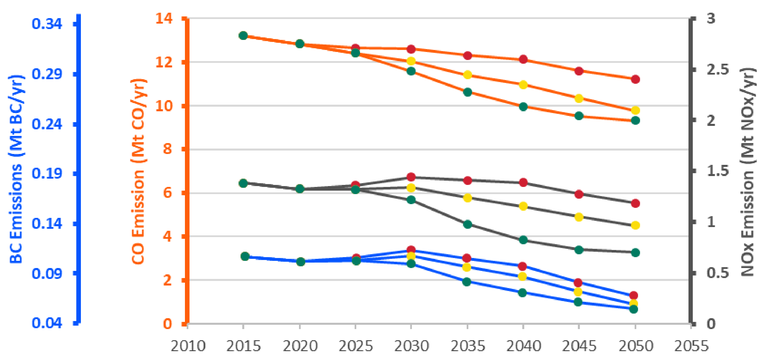
The NDC and NZE scenarios require higher area of land use for sustainable biomass production than those in the CurPol scenario. This implies better utilization of land for producing biomass and higher productivity in the agricultural production as there is a trade-off between the land use for non-energy crops, energy crops and forests. The cropland area would decrease in both the NDC and the NZE scenarios, whereas there would be increase in the forests area. The carbon sequestration from forestry sector plays a significant role in offsetting the emissions to achieve net zero GHG emissions.

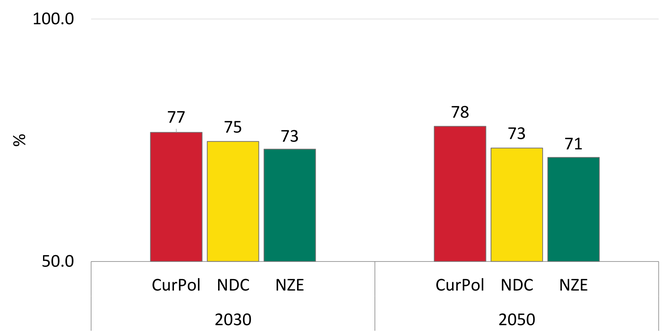


Thailand's current energy system is highly dependent on imported natural gas and oil. The net energy import dependency (NEID) was 69.8% in 2020. In the CurPol scenario, NEID would increase to 78% by 2050. NEID would be lowered in the NDC and NZE scenarios in 2050, dropping to 73% in the NDC and 71% in the NZE scenarios. Utilization of the domestic biomass and non-biomass renewable resources would be optimized in both the NDC and NZE scenarios. However, the energy system would depend on imported biomass energy in both the NDC and NZE scenarios. The NEID could be further reduced to 66% in NDC and 48% in NZE scenarios in 2050 if biomass could be produced domestically.



The emissions of all local pollutants would decrease in the CurPol scenario. This is mainly due to a shift to electricity from coal, oil and gas in the demand sector. In the energy supply side, the technological improvement would aid in the overall reduction of the local pollutants. Black carbon (BC) would be lowered by 20% in 2050 if net zero GHG emission is achieved. The high dependance on biomass would make the reduction of air pollutant not so significant in the NZE scenario. Likewise, carbon monoxide (CO) and nitrogen oxide (NOx) emissions would be lowered by 17% and 41%, respectively.





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