# The 27th AIM International Workshop

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# THAILAND's updated NDC and Long-term strategy

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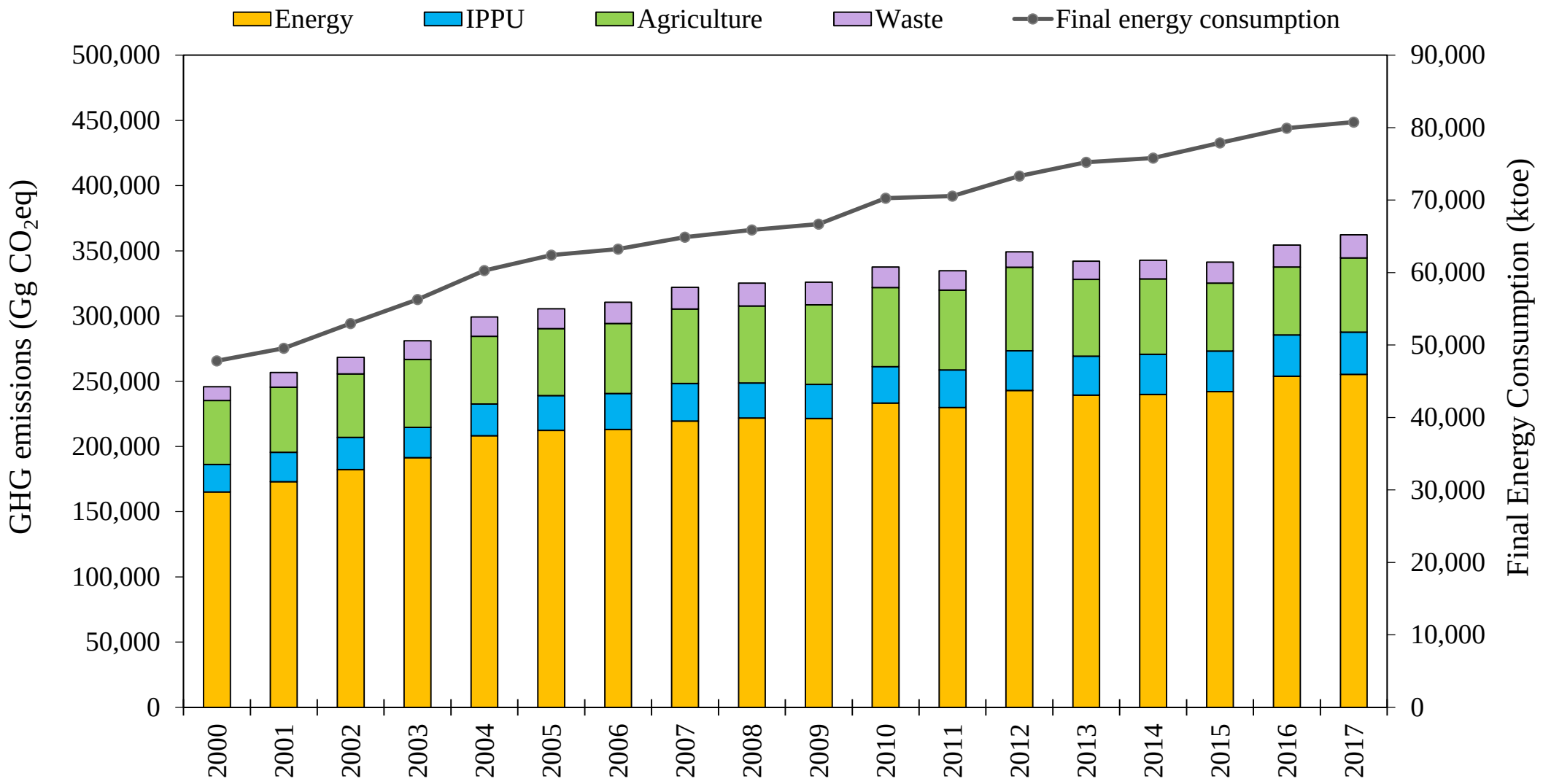
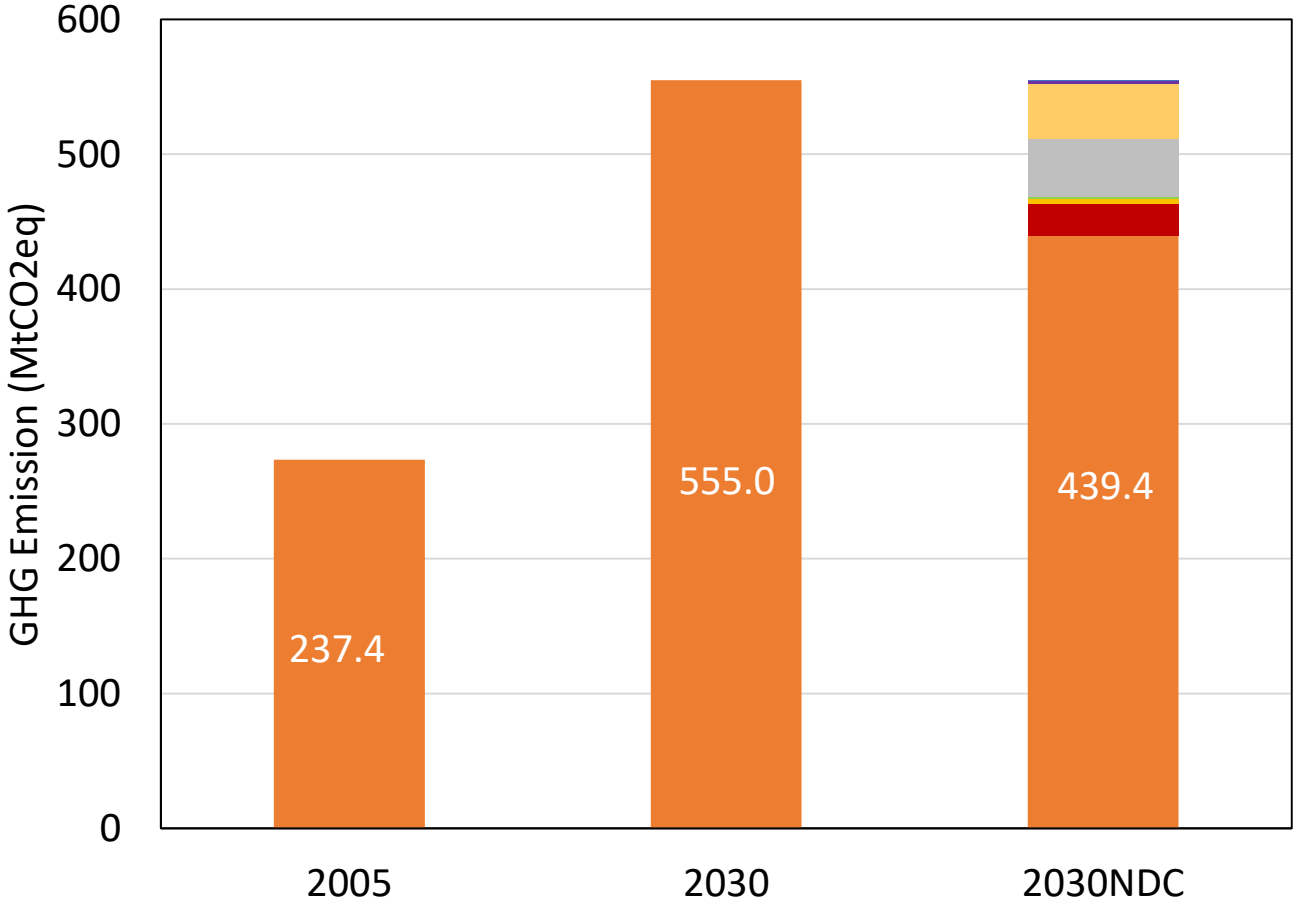
Sirindhorn International Institute of Technology, Thammasat University

# Trends of GHG Emissions and Total Final Energy Consumption 2000-2017




Source: BUR3 (ONEP, 2020)

# THAILAND'S GHG EMISSIONS & MITIGATION NDC 2030




**GHG mitigation 20%**

- Power 24 $MtCO_{2eq}$
- Industry 43 $MtCO_{2eq}$
- Transport 41 $MtCO_{2eq}$
- Residential 4 $MtCO_{2eq}$
- Commercial 1 $MtCO_{2eq}$
- IPPU 0.6 $MtCO_{2eq}$
- Waste 2 $MtCO_{2eq}$

**Total GHG mitigation**

115.6 $MtCO_{2eq}$

# COVID19 Effects
# MASS RAPID TRANSIT IN BANGKOK

## 2019 Bangkok area

## Monorail, Government Complex, 2021+

## Bangkok Area, 2025+

Source: Mass rapid transit authority of Thailand

No. 1007.2/13850

Office of Natural Resources and Environmental Policy and Planning
118/1 Tipco Tower 2, Rama VI Road, Phaya Thai, Bangkok 10400, THAILAND

20 October B.E. 2563 (2020)

Dear Executive Secretary,

Subject: Thailand's Updated Nationally Determined Contribution

In accordance with Decision 1/CP.21 of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), Thailand is pleased to communicate its updated nationally determined contribution, as attached.

Please accept the assurances of my highest consideration.

Yours sincerely,

Ms. Patricia Espinosa
Executive Secretary
UNFCCC secretariat
P.O. Box 260124
D-53153 Bonn
Germany

# Thailand's Updated Nationally Determined Contribution

## 1. Introduction

As a developing country highly vulnerable to the impacts of climate change, Thailand attaches great importance to the global efforts to address this common and pressing challenge. Pursuant to decision 1/CP.21, Thailand hereby communicates its updated nationally determined contribution (NDC) and the relevant information, described in the annex of the decision 4/CMA.1, as applicable.

## 2. Mitigation Component

Thailand intends to reduce its greenhouse gas emissions by 20 percent from the projected business-as-usual (BAU) level by 2030. The level of contribution could increase up to 25 percent, subject to adequate and enhanced access to technology development and transfer, financial resources and capacity building support. Thailand is formulating its Long-term Low Greenhouse Gas Emission Development Strategy (LT-LEDS) which will guide Thailand towards a climate-resilient and low greenhouse gas emissions development and serve as a basis for enhancing its subsequent NDCs.

LTS

### 2.1 Information to facilitate clarity, transparency and understanding of NDC

| | |
|---|---|
| **Baseline** | Business-as-usual projection from reference year 2005 in the absence of major climate change policies (BAU2030: approx. 555 $MtCO_2e$) |
| **Time frame** | 2021 – 2030 |
| **Scope and coverage** | **Target:**<br>Emission reduction relative to a Business-as-Usual baseline<br><br>**Sectors:**<br>Economy-wide (excluding land use, land-use change, and forestry) |

# Thailand's Accelerated NDC 2030 and 2-degree 2050 scenarios

| | |
|---|---|
| **Business-as-usual (BAU)** | ❿Without any climate policy |
| **Extended NDC 2-degree 2050** | ❿Two scenarios assuming GHG reductions of 20% & 25% in 2030, then declining to meet Thailand 2°C target in 2050. |
| **Accelerated NDC for 2-degree** | • Three scenarios assuming an accelerated GHG reduction targets of 30%, 40% and 50% in 2030, then declining to meet Thailand 2°C target in 2050. |

Note: This research was support by IGES in FY2020.

# SCOPE of Thailand LTS 2050

**NAMA**



Energy

Transport

**NDC**



Energy

Transport

IPPU

Waste

**LTS**

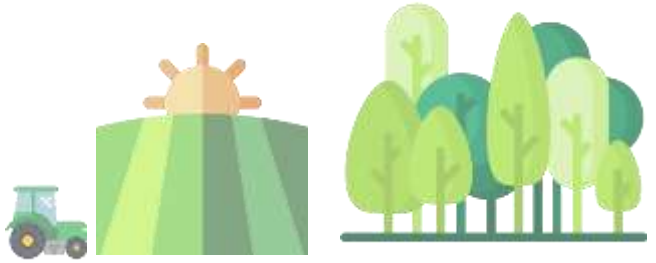


Energy

Transport

IPPU

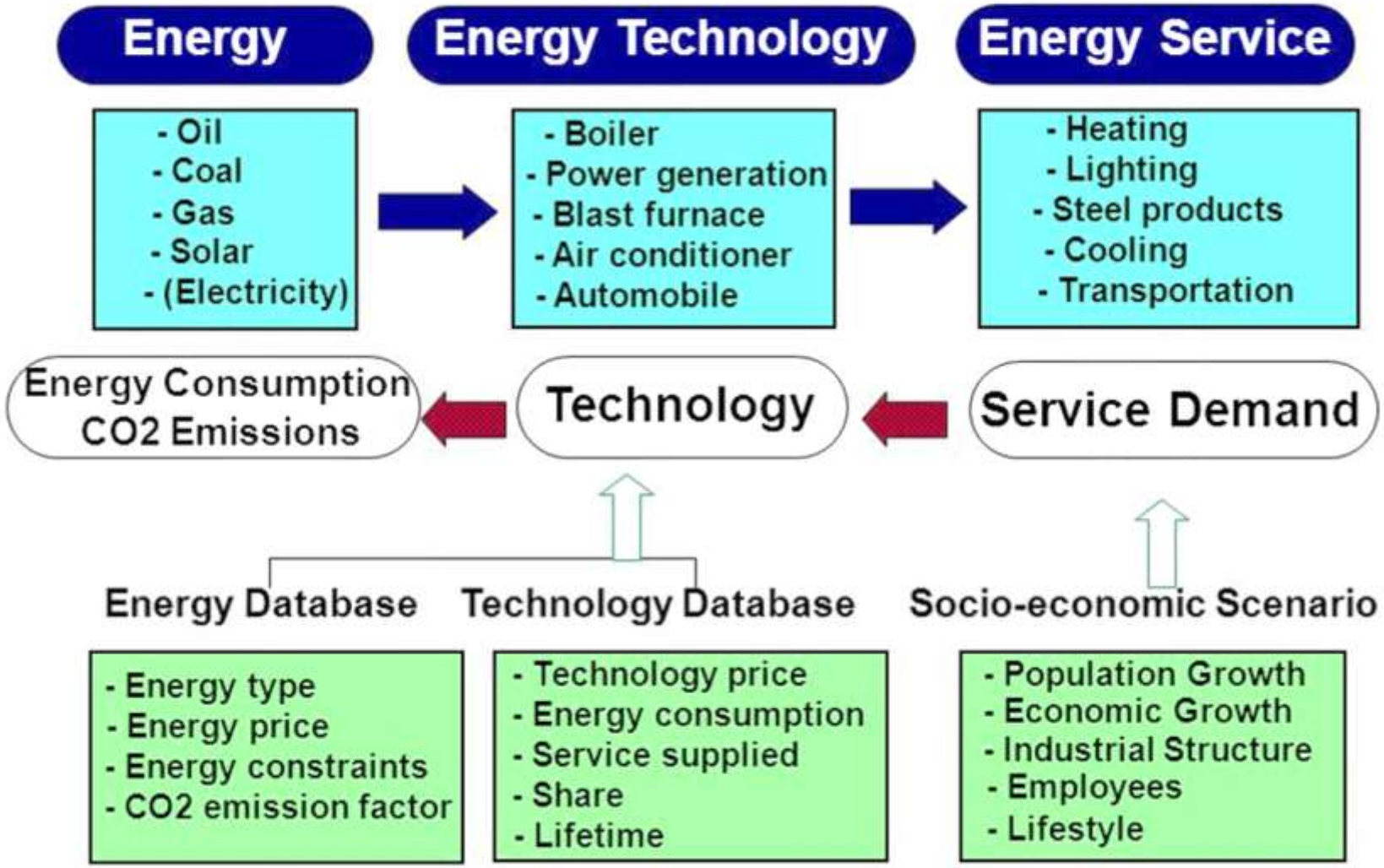
Waste



Agriculture LULUCF

AFOLU

# Structure of the AIM/End-Use Model



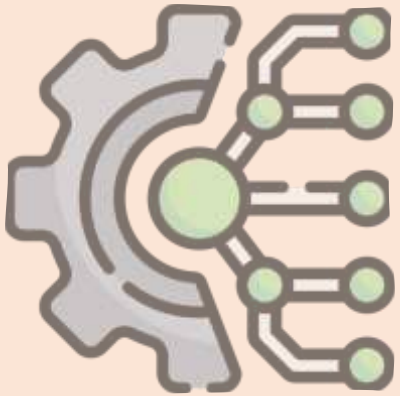

Note: National Institute for Environmental Studies (NIES), Japan

## Energy consumption in the power sector

- Natural gas
- Coal
- Hydro
- Biogas
- Biomass
- MSW
- Wind
- Solar

## Power Generating Technologies

**Existing technologies**



**Renewable energy technologies**

## Electricity demand

## Energy consumption in building sector

- Kerosene
- Charcoal
- Paddy husk
- Fuel wood
- LPG
- Electricity
- Solar

## Technologies in Buildings

**Lighting**

**Cooling**

**Heating**

**Cooking**

**Entertainment**

**Others**

## Service demand in building sector

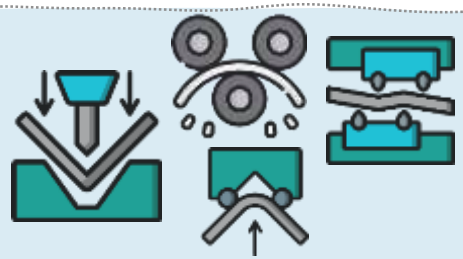
- Lighting
- Heating
- Cooling
- Cooking
- Others

# Manufacturing Industries

9 Sub-sectors:

(Food and beverage)

(Wood)



(Fabricated metal)

(Textile)

(Non-metallic)

(Paper and pulp)

(Basic metal)


(Chemical)

(Others)

## Energy consumption in the transport sector

- Gasoline
- Gasohol
- Diesel
- Fuel oil
- Jet fuel
- CNG
- LPG
- Biodiesel
- Electricity

# Road Transport Service Technologies

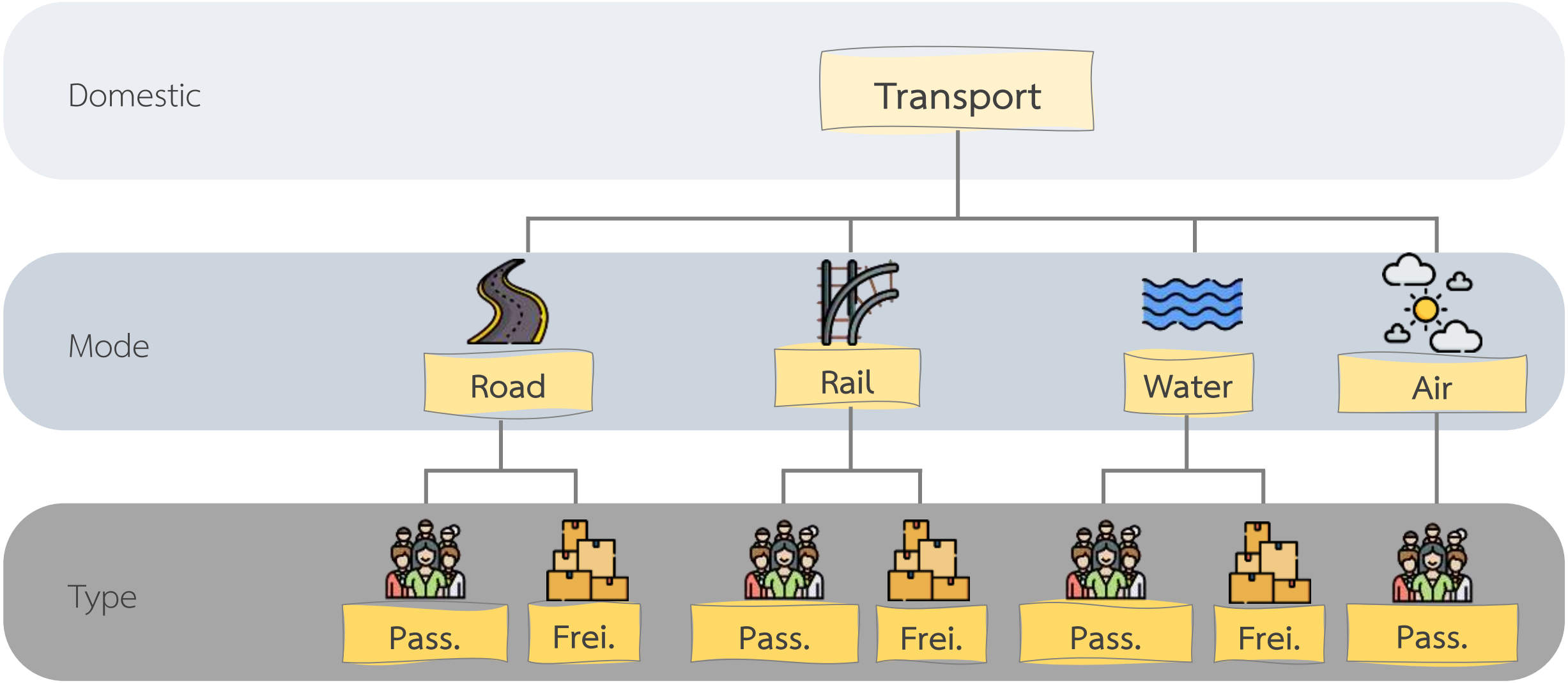
**Existing technologies by mode**

**Cleaner and efficient technologies**

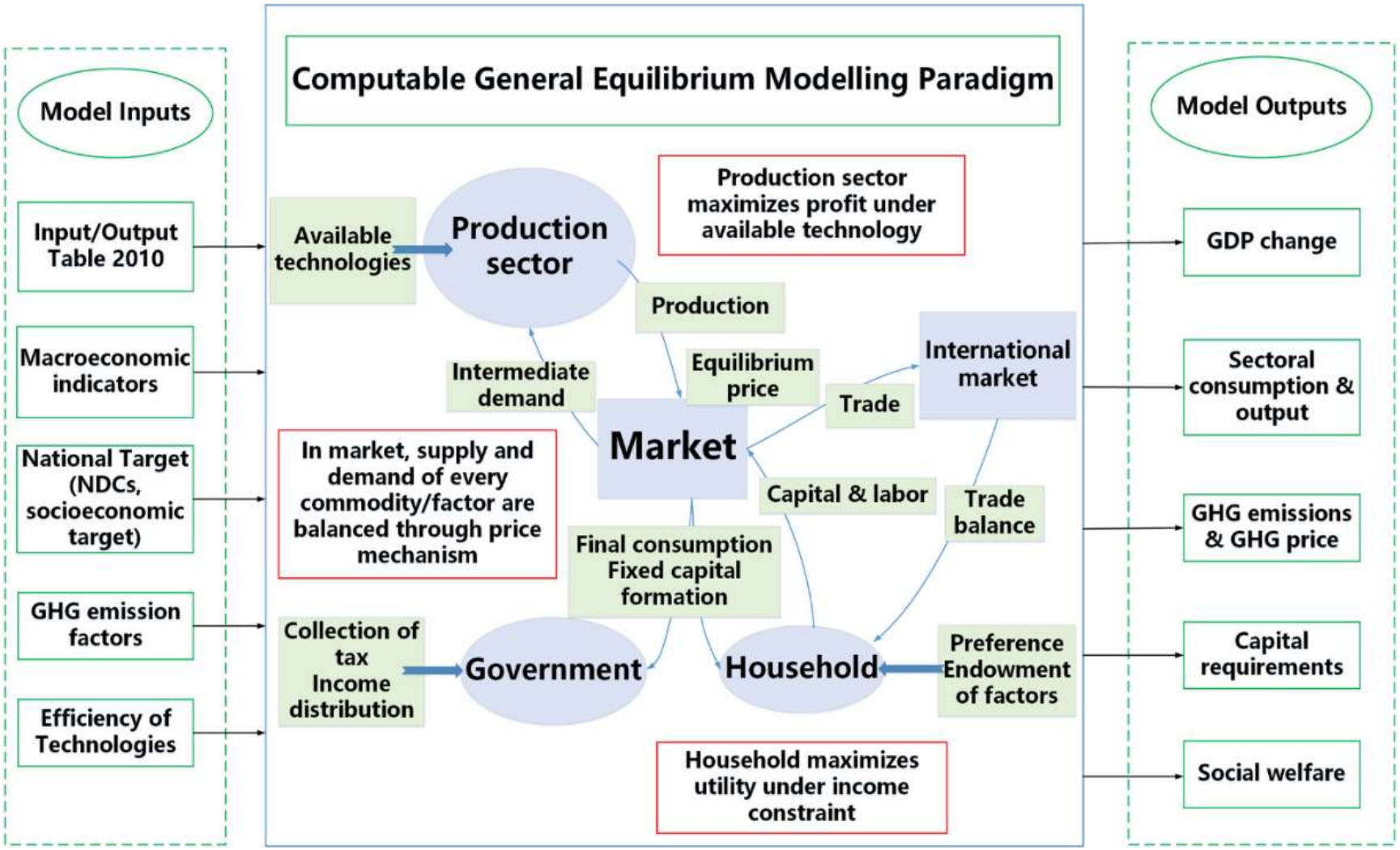
## Service demand in the transport sector

- Passenger kilometers
- Ton kilometers

# Transport Sector

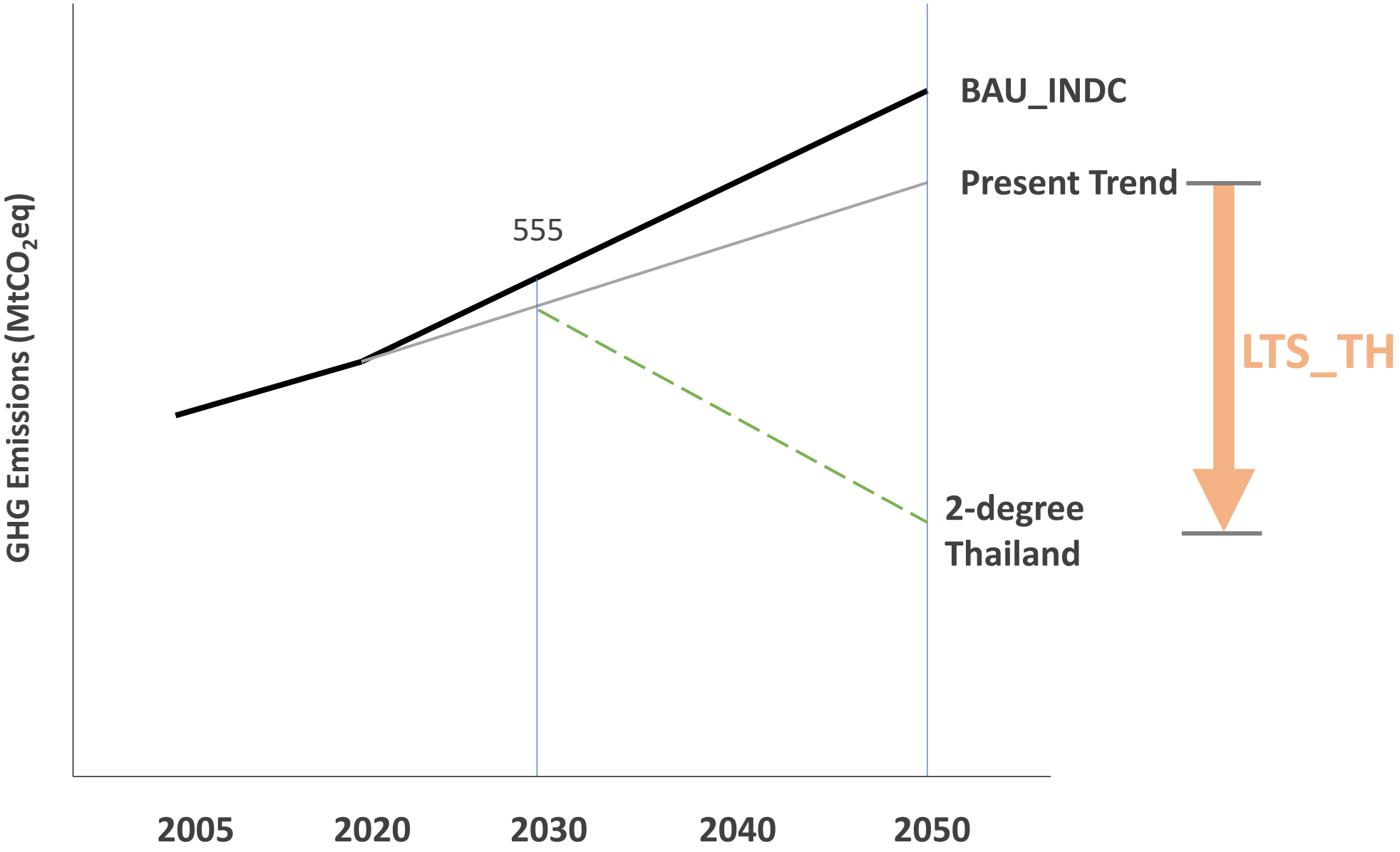


# Methodology Framework of AIM/CGE*

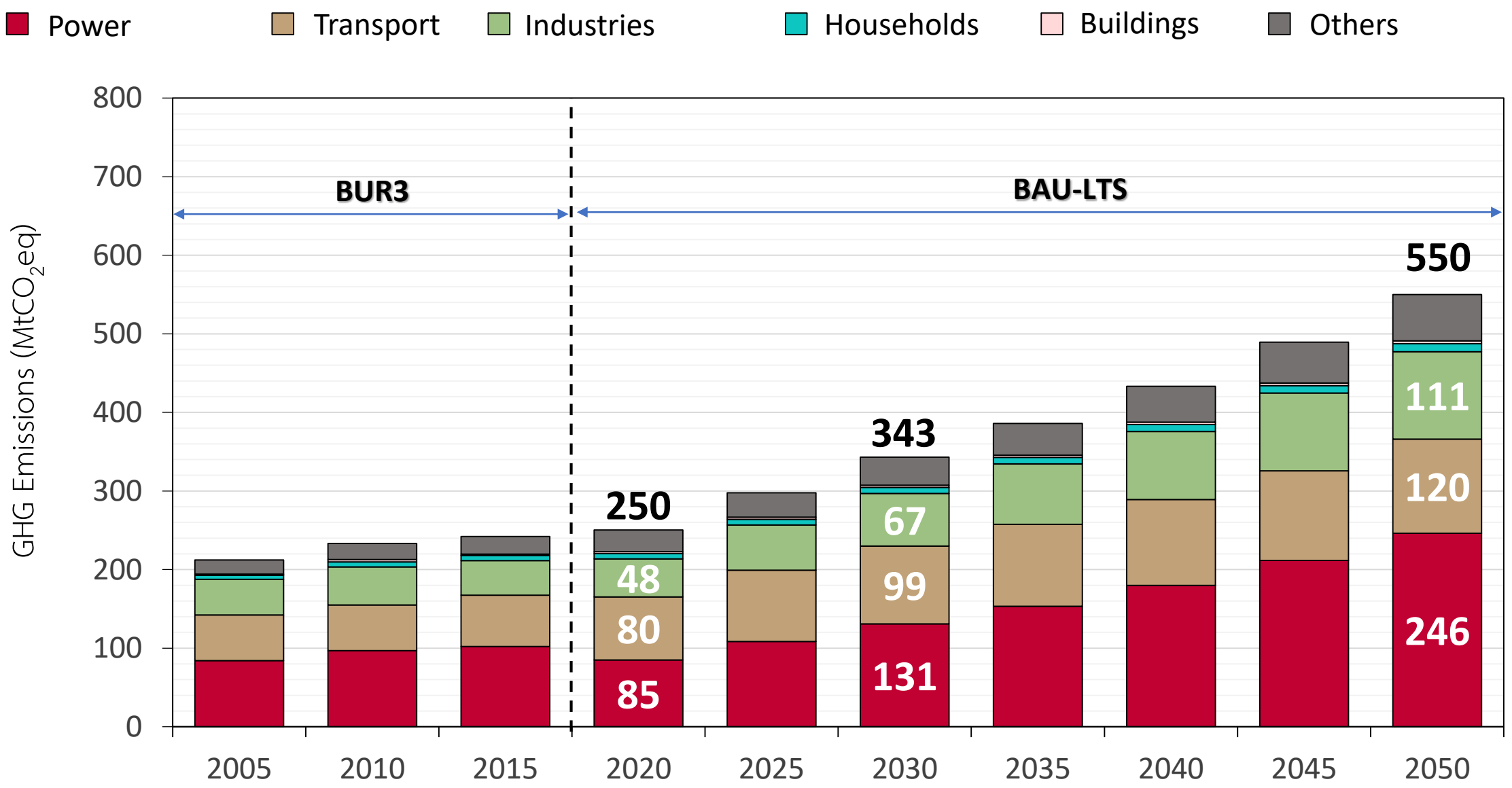



*Note: National Institute for Environmental Studies (NIES), Japan

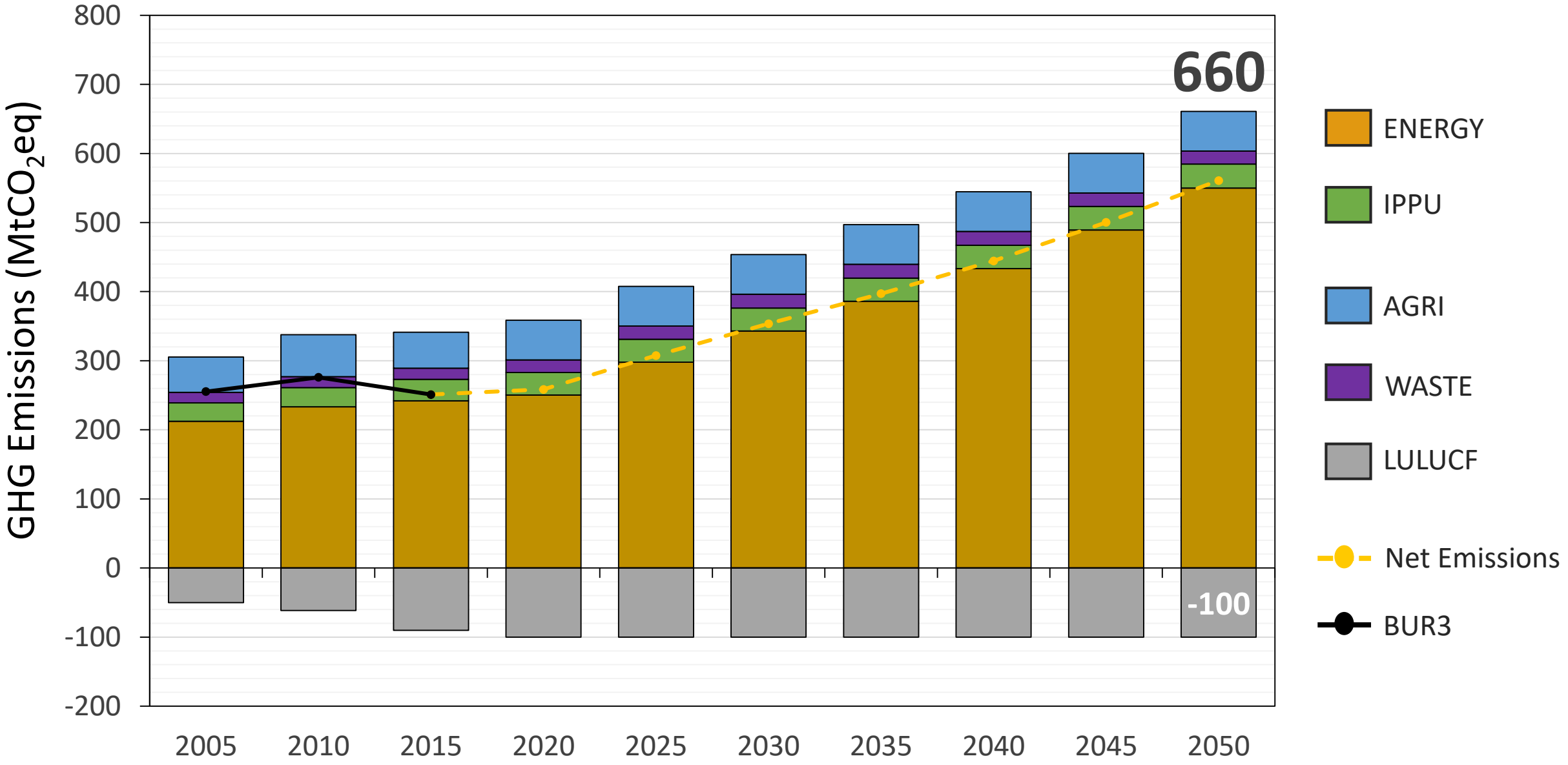
# Thailand 2-degree scenario

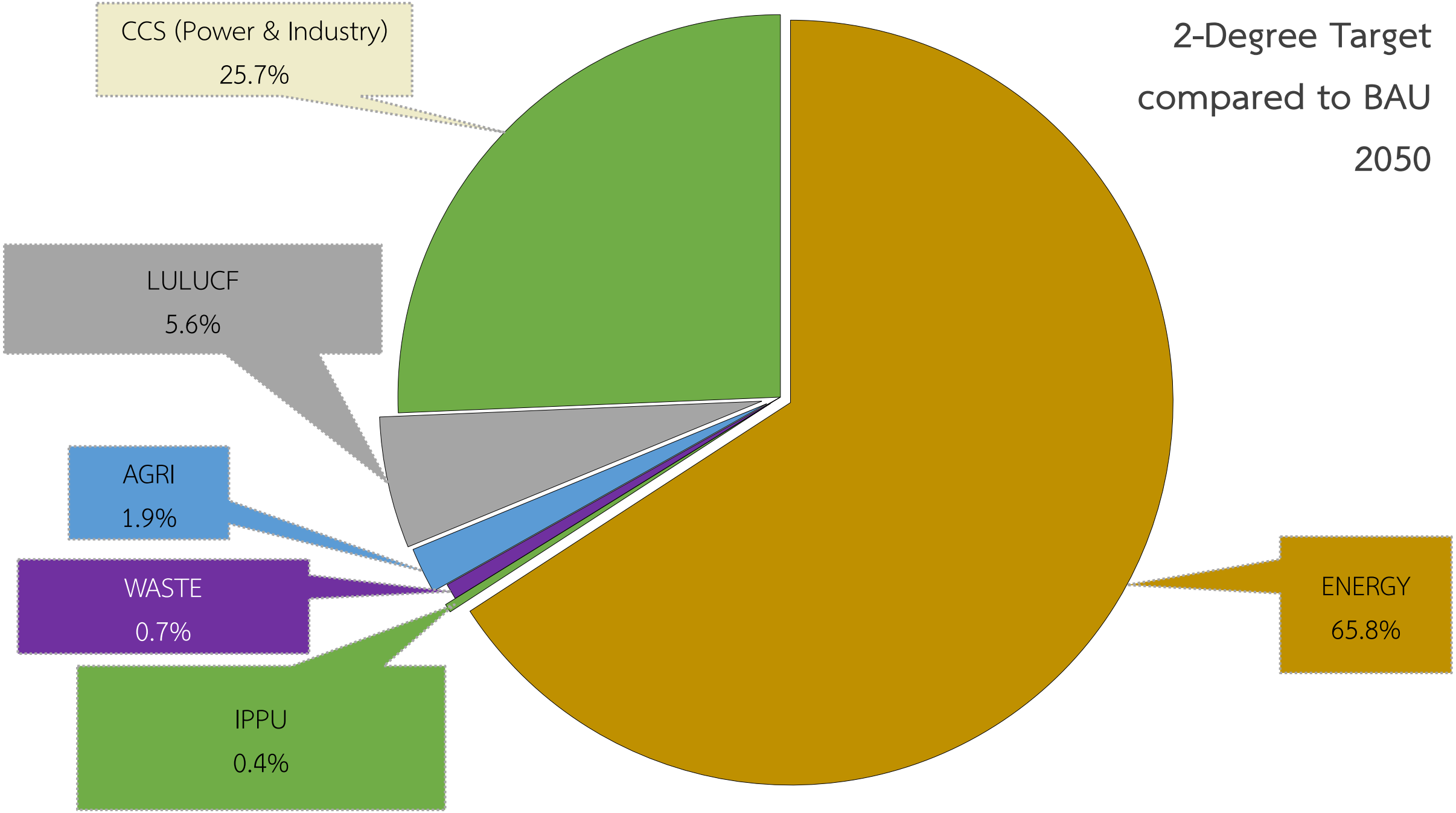


# GHG Emissions in Energy sector in BAU



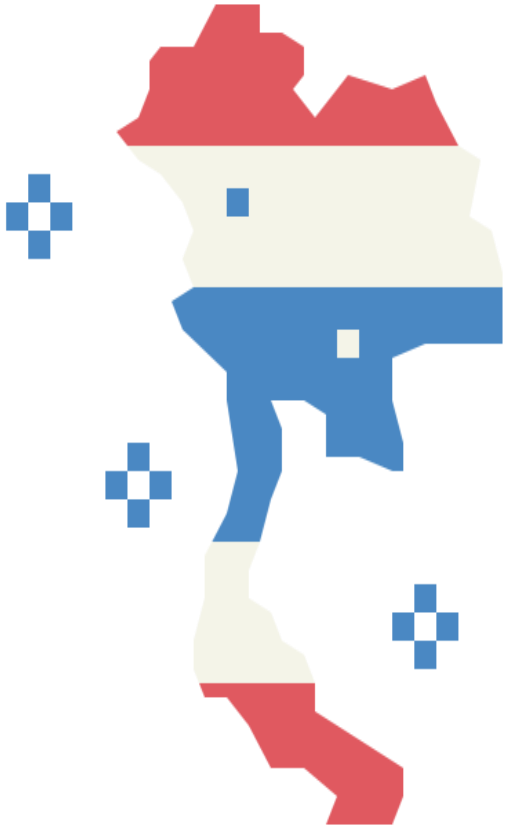
# GHG Emissions in BAU





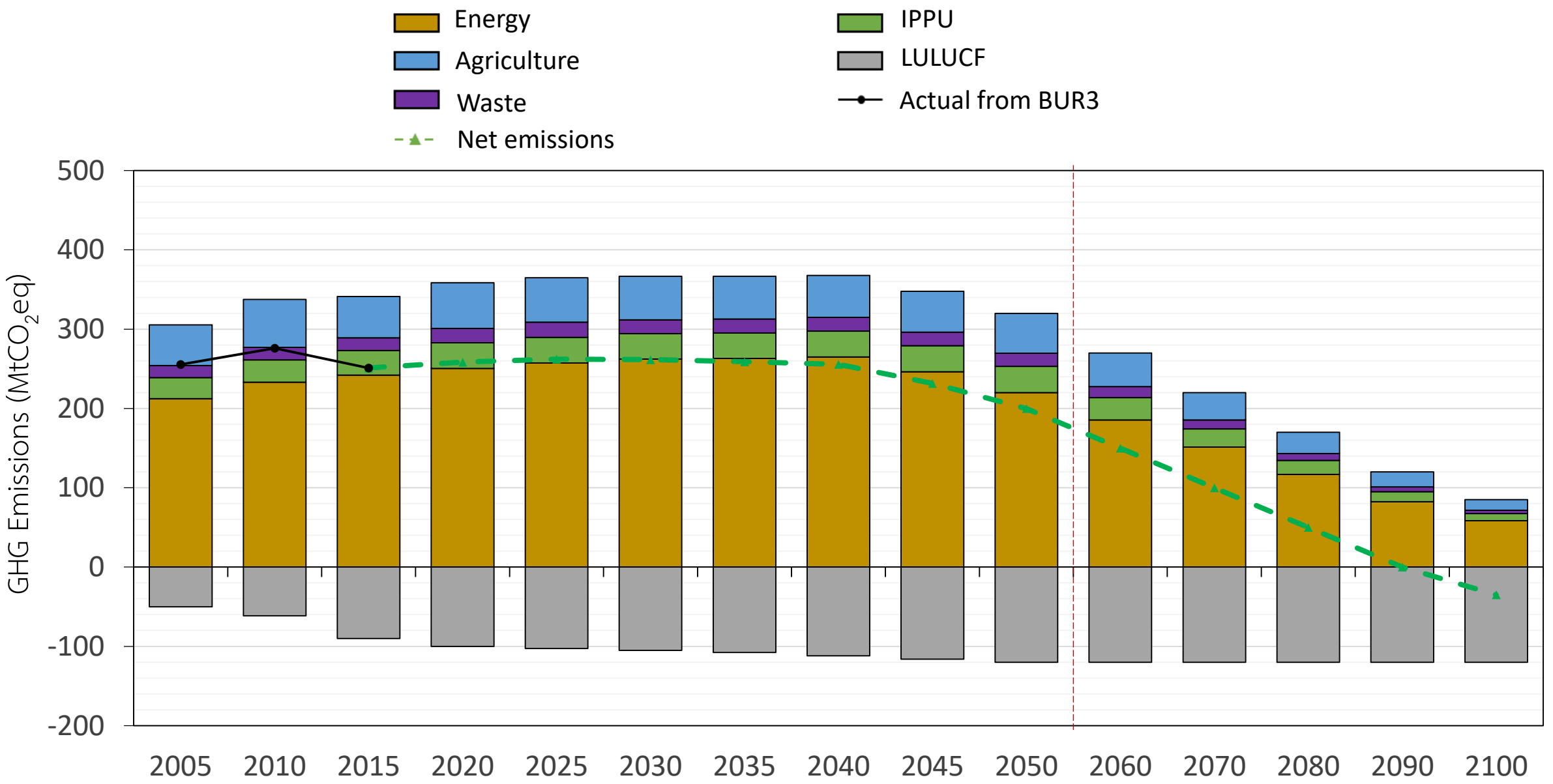

2-Degree Target
compared to BAU
2050

# CMs in Agriculture

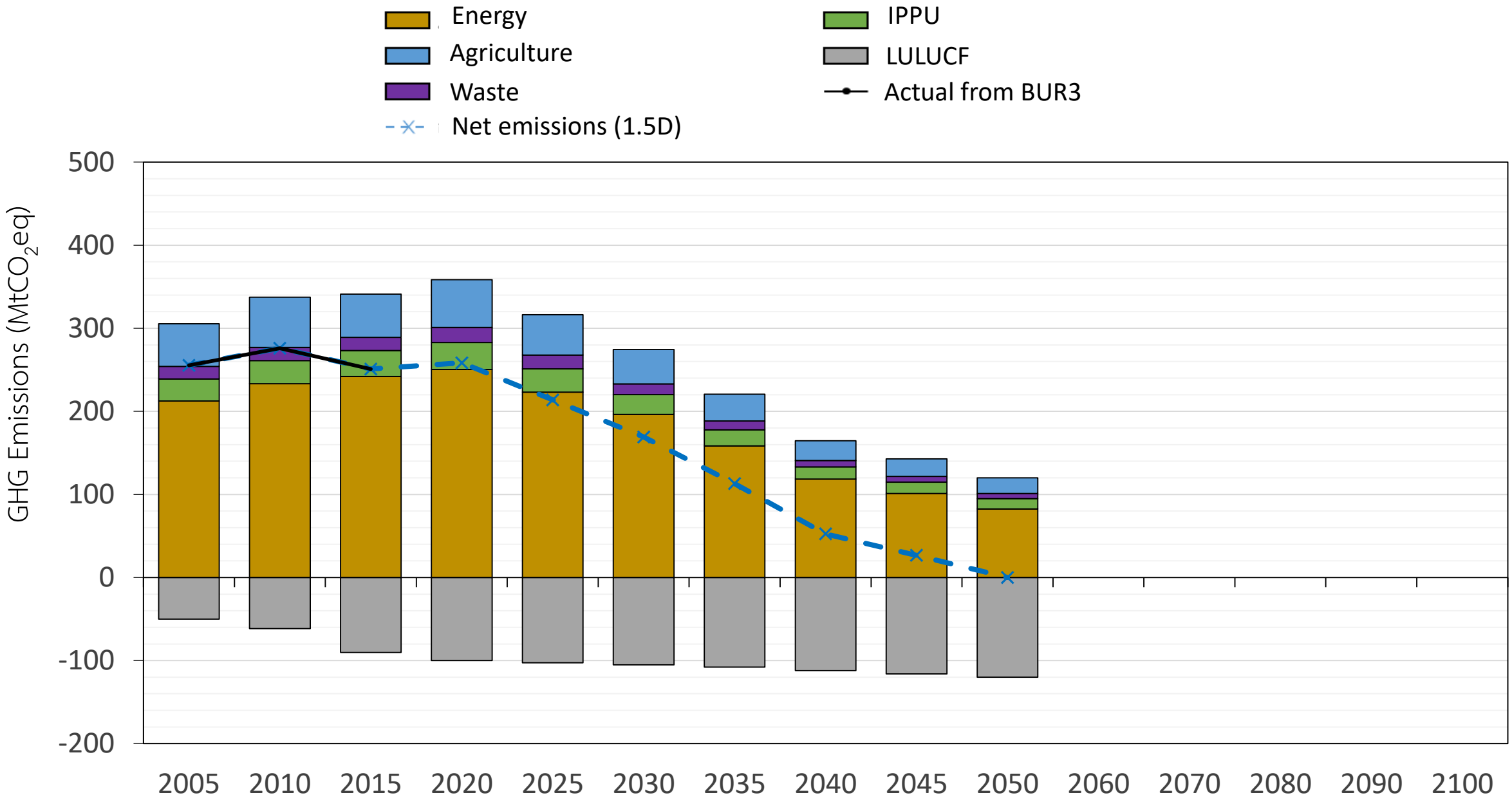


| Agriculture | GHG Mitigation ($tCO_2eq$/unit/year) | Sources |
|---|---|---|
| **Enteric Fermentation (head)** | | |
| Improved feeding | 0.45 | (Hoa, Hasegawa, & Matsuoka, 2014) |
| High genetic merit | 0.32 | (Hasegawa & Matsuoka, 2012) |
| **Manure Management (head)** | | |
| Dome digester | 0.62 | (Hoa, Hasegawa, & Matsuoka, 2014) |
| Daily spread of manure | 0.33 | |
| **Rice Cultivation (hectare)** | | |
| Midseason drainage | 0.39 | (Hoa, Hasegawa, & Matsuoka, 2014) |
| Rice straw management | 0.45 | |
| **Agricultural Soil (hectare)** | | |
| High efficiency fertilizer application | 0.65 | (Hoa, Hasegawa, & Matsuoka, 2014) |
| Slow-release fertilizer application | 0.76 | |
| Tillage and residue management | 0.08 | |

# Thailand's GHG Emissions in 2D Target Pathway



# Thailand's GHG Emissions in 1.5D Target Pathway



# Thailand's Long-erm Strategy in GHG Mitigation 2050

1. 2D Net Emissions in 2050 = 200 $MtCO_2eq$.
2. 2D Target in 2050
    - Energy = 220 $MtCO_2eq$
    - IPPU = 34 $MtCO_2eq$
    - Waste = 16 $MtCO_2eq$
    - Agri = 50 $MtCO_2eq$
    - LULUCF = -120 $MtCO_2eq$
3. Peak emissions at 370 $MtCO_2eq$ in 2030-2035.
4. Thailand's Net-zero emissions in 2090 following 2D pathways of IPCC.
5. The 1.5D for Net-zero emissions in 2050 is not feasible under given assumptions.

# GDP losses

| | GDP loss % | |
|---|---|---|
| | 2D | 1.5D |
| **2030** | -2.61 | -9.22 |
| **2040** | -6.60 | -6.04 |
| **2050** | -18.01 | -66.47 |

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# Shared socioeconomic pathways and long-term GHG mitigation towards 2050 in Thailand cement industry

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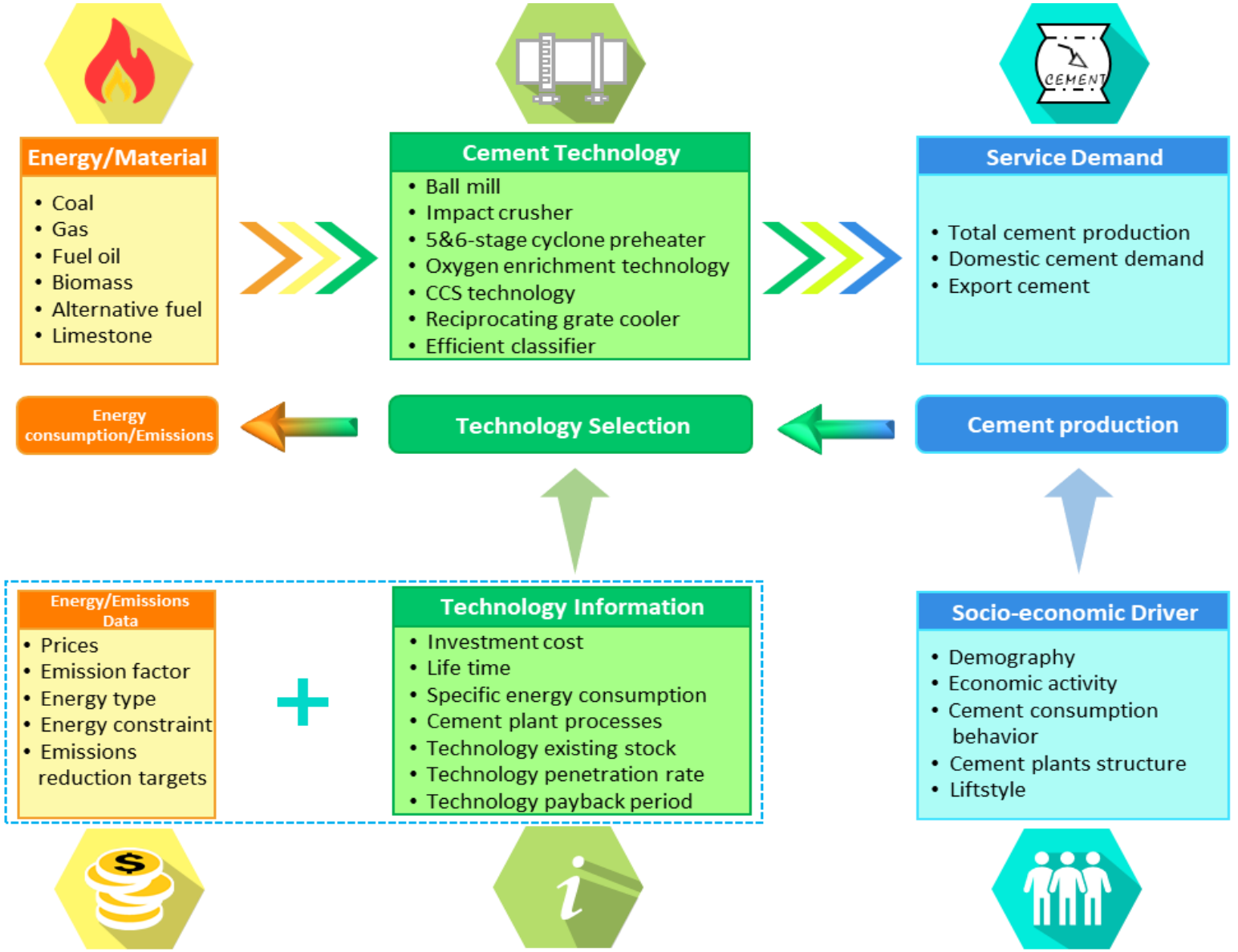
ARTICLE INFO

*Keywords:*
SSPs
Long-term GHG mitigation
AIM/Enduse
Cement industry
Thailand

ABSTRACT

Thailand's cement industry shows a significant share of energy consumption and GHG emissions in industries. Therefore, the industry will need to curb its emissions to meet the first national determined contribution (NDC). This study attempts to clarify two research questions: firstly, what is the cement demand under several scenarios of economic and demographic development pathways in Thailand's cement industry? Secondly, how Thailand's cement industry achieves the 1.5°. The scopes of this study focus on the per capita cement consumption in 2050, the energy consumption pathways, technology mix, and GHG emissions and other air pollutants. The scenarios include the cement industry target proposed in Thailand's first NDC and the perspective in 2050. The socio-economic indicators follow the SSPs narrative. The AIM/Enduse model used in this study is based on linear optimized bottom-up approach. Results show that the energy efficiency improvement and the increase of alternative energy in cement industry will reduce GHG emissions in 2050. To achieve the 1.5-degree pathway, the CCS technology will be deployed after 2022 with a carbon tax rate of US$ 500/t $CO_2$. The use of biomass, municipal solid waste, and sewage sludge will offer a variety of environmental, social, and economic advantages. However, other air pollutants will be increased. Therefore, the policy makers should provide alternative fuel use limitations. Additionally, the $CO_2$ transport and storage need to be assessed in the long-term climate policies.

# Thailand’s cement industry



# Conclusions

- By imposing $CO_2$ emission taxes in SSP scenarios, CCS technology will be selected from 2022 to 2031.
- Cumulative $CO_2$ reduction from CCS will range from 300 to 410 Mt $CO_2$.
- Carbon tax rate of US$ 500/t $CO_2$ will enforce the cement manufacturers to install the CCS in 2022 (SSP1), 2030 (SSP2) and 2031 (SSP3).

**Strategy 1**

**BECCS**

- Biomass co-firing in cement kilns

**Strategy 2**

**Stringent RE**

- Electricity generation
- Vehicle

**Strategy 3**

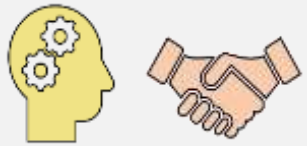
**$CO_2$ emission taxes**

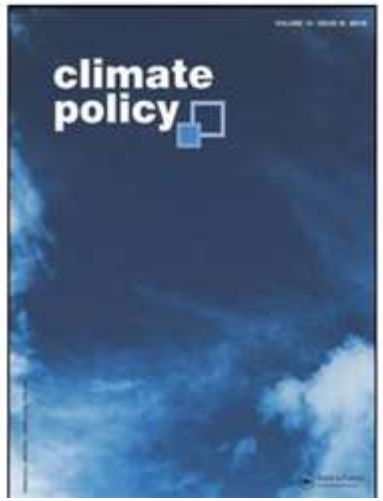
**Strategy 4**

**Climate change awareness**

**Strategy 5**

**Capacity building**






CLIMATE POLICY
https://doi.org/10.1080/14693062.2020.1857218

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RESEARCH ARTICLE

# Assessment of greenhouse gas mitigation pathways for Thailand towards achievement of the 2°C and 1.5°C Paris Agreement targets

Salony Rajbhandari and Bundit Limmeechokchai

Sirindhorn International Institute of Technology, Thammasat University, Pathum Thani, Thailand

**ABSTRACT**

This study performed scenario analysis using the MARKAL modelling framework to assess Thailand's greenhouse gas (GHG) emission pathways over the period 2010–2050, to explore the possibilities of achieving carbon neutrality of the energy system by 2060–2100, in pursuit of a maximum temperature rise of 2°C and 1.5°C by the end of the century. The shift from 2°C pathways to 1.5°C pathways would demand much more effort and pose greater challenges in terms of transformational changes required in the energy supply and demand sectors of Thailand. Carbon neutrality in the energy supply system would be achievable with negative emissions through the adoption of bioenergy with carbon capture and storage (BECCS). The strong deployment of renewable energy-based power generation would also aid in the rapid decarbonization of the energy supply sector. The demand sectors would face more challenges requiring rapid and extensive deployment of energy efficient and low carbon technologies. The commercial sector may need to undergo deep decarbonization in the 1.5°C scenarios by 2050 while the industrial and residential sectors will need to curb GHG emissions by a large amount even under 2°C scenarios. The transportation sector would face challenges in shifting from private to public modes of transport, including wide adoption of electric and biofuel vehicles, in order to achieve the 1.5°C target.

**ARTICLE HISTORY**
Received 17 June 2020
Accepted 24 November 2020

**KEYWORDS**
2°C; nationally determined contribution (NDC); energy system; greenhouse gas (GHG) emissions; MARKAL; Thailand

# Thailand's mid-century greenhouse gas emission pathways to achieve the 2°C target

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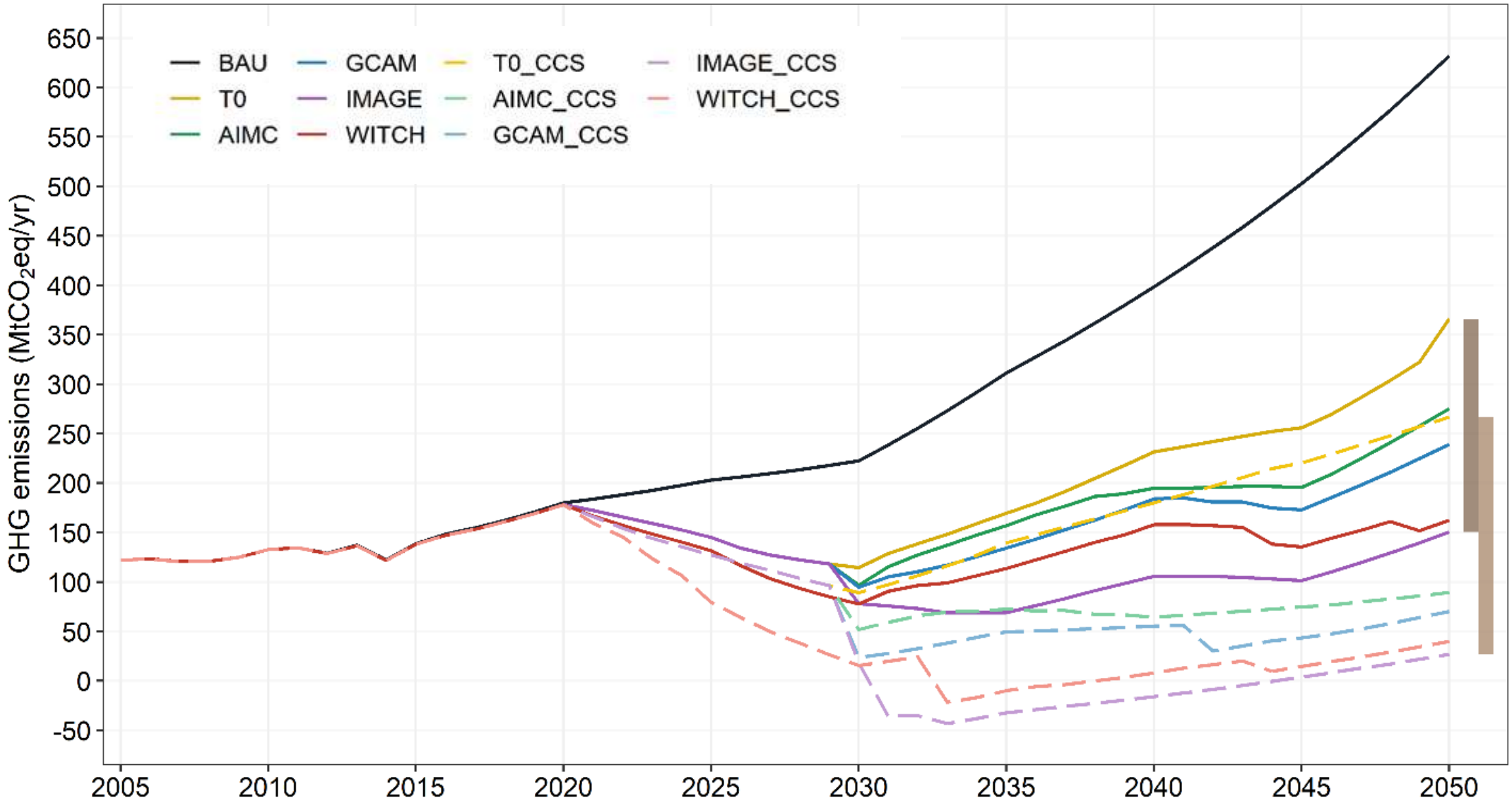
[2]National Institute for Environmental Studies, 16-2 Onogawa, Ibaraki, Tsukuba, 305-8506, Japan

| Scenario | | Low carbon technology | | Carbon prices in 2050 (2005 US$/tCO$_2$) |
|---|---|---|---|---|
| | | RE | CCS | |
| BAU | | ✓* | × | 0 |
| CT | T0 | ✓ | × | 0 |
| | AIMC | ✓ | × | 70.1 |
| | GCAM | ✓ | × | 185.5 |
| | IMAGE | ✓ | × | 925.4 |
| | WITCH | ✓ | × | 464.8 |
| CT_CCS | T0_CCS | ✓ | ✓ | 0 |
| | AIMC_CCS | ✓ | ✓ | 70.1 |
| | GCAM_CCS | ✓ | ✓ | 185.5 |
| | IMAGE_CCS | ✓ | ✓ | 925.4 |
| | WITCH_CCS | ✓ | ✓ | 464.8 |

Note: * The shares of RE and technology follow the historical patterns from 2005 to 2050.

# Thailand GHG emissions pathways including removals from LULUCF



# Thailand's long-term GHG emission strategy

**Thailand will achieve its peak greenhouse gas emissions in 2030 and the net-zero greenhouse gas emissions within the second half of this century or as early as possible.**

**....**

**Thailand will be the carbon neutral country by 2065...**

Thank you

Khob Khun Krub

Arigato