Thailand LCS Scenarios: A Roadmap to Peak CO_2

International Research Network for Low Carbon Societies (LCS-RNet)
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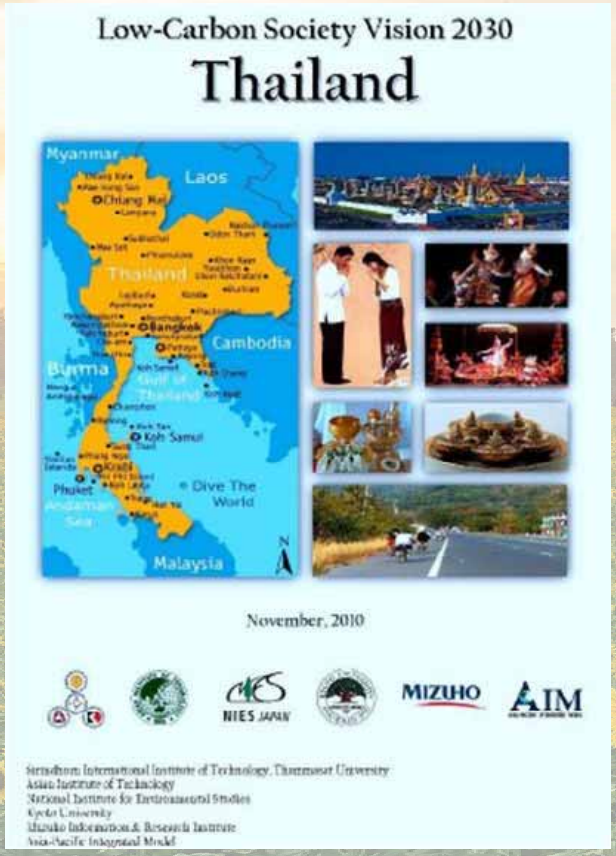
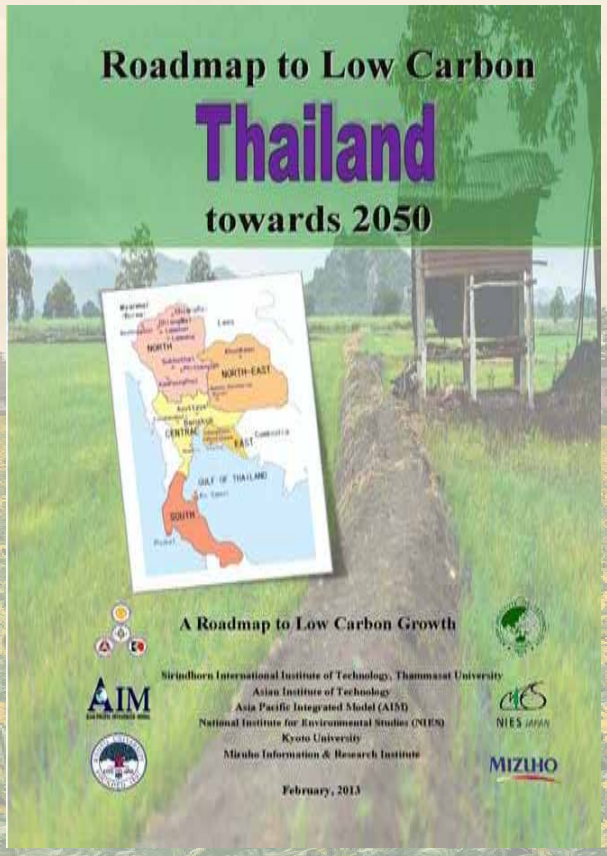


1st LCS Scenario by AIM/ExSS



2nd LCS Roadmap by AIM/Enduse

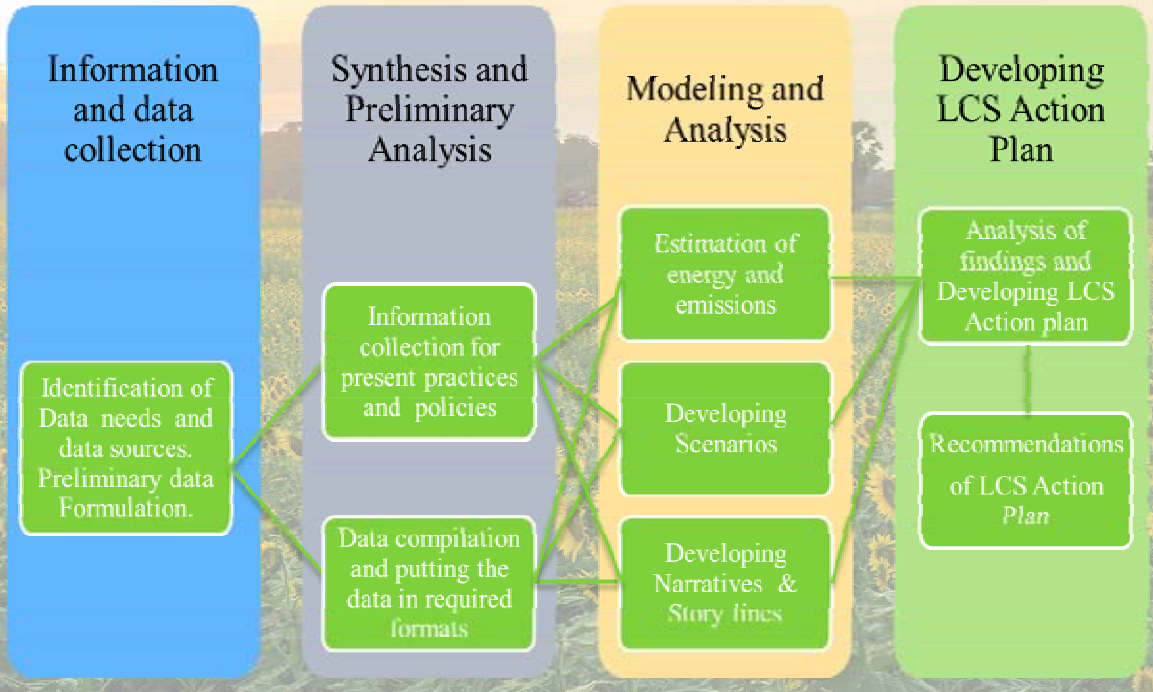
Objectives

- Appropriate CO_2 reduction target in 2020 (Thailand's NAMA has been proposed for CO_2 reduction upto 20%)

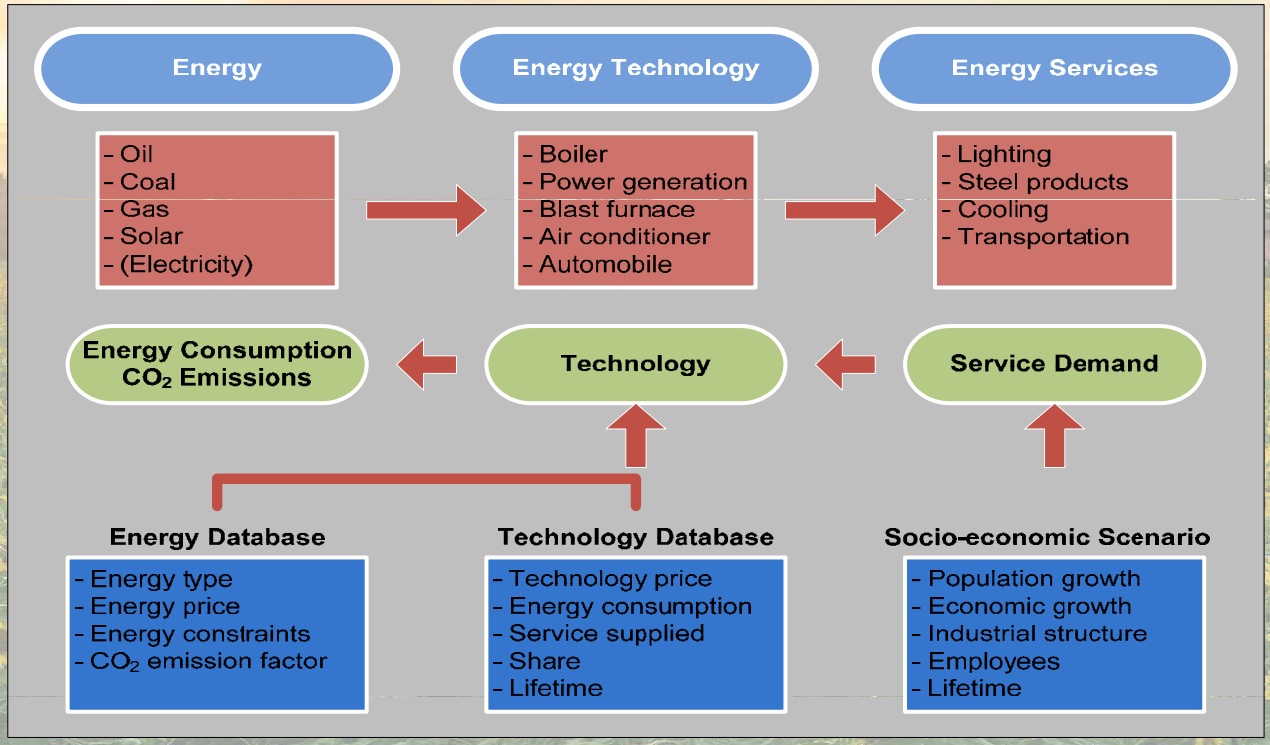
- LCS Roadmap to Low Carbon Thailand 2050 (CO_2 reduction upto 29.2%)

- Peak CO_2 Scenario within 2050 for Thailand (CO_2 reduction upto 60.2%)

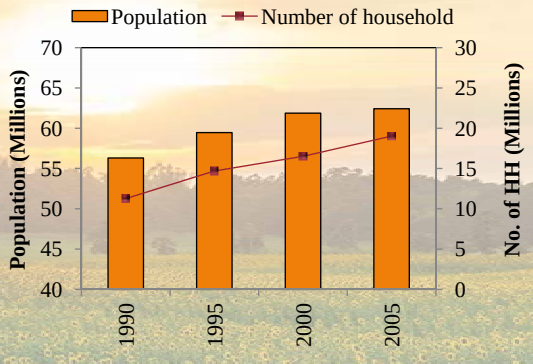
Methodology (LCS Action Plan)

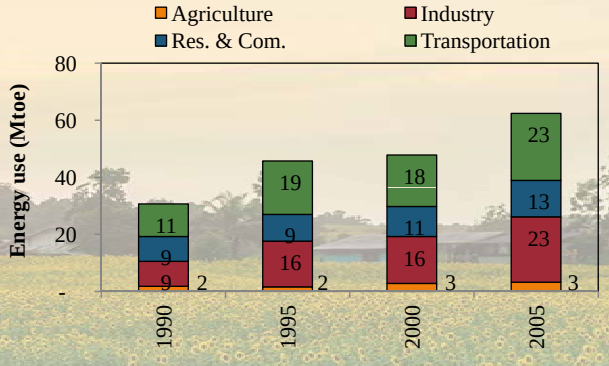


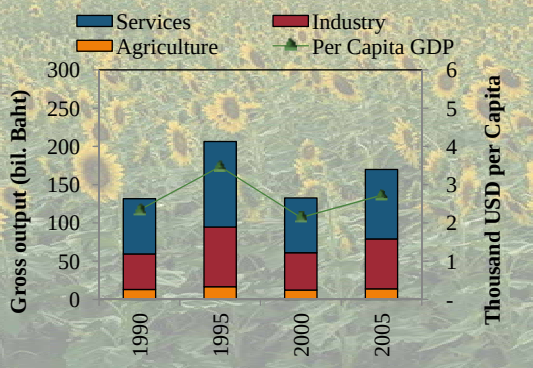
Methodology (AIM/Enduse), NIES

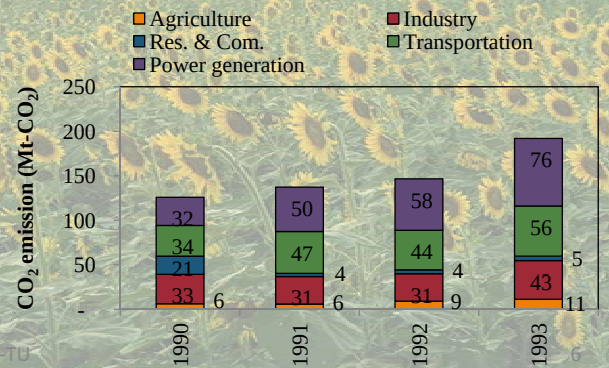


National Circumstance









Demographic and Economic Assumptions

Average population growth	Historical data (2006–2011) 0.51% p.a. increase (2012–2050)
Number of household	Historical data (2006–2011) 2.89% p.a. increase (2012–2050)
Floor space	4.02% p.a. increase
Gross Domestic Products (GDP)	Historical data (2006–2010) Follows PDP2010 (2011–2023) 3.92 p.a. increase (2024–2050)
GDP share by industry	Primary industry (9.68%) Secondary industry (37.37%) Tertiary industry (52.95%)
Modal share of passenger transport	Road (97.69%), Rail (0.25%), Air (2.06%)
Modal share of freight transport	Road (6.39%), Rail (0.01%), Water (91.85%), Air (1.76%)

Socio-economic indicators	2005	2050	2050/2005
Population (Person)	62,418,054	78,071,984	1.25
No. of Households	19,016,784	67,478,570	3.55
GDP (Million USD)	169,870	1,247,449	7.34
Gross output (Million USD)	407,157	2,939,643	7.23
Primary industry	43,286	284,499	6.57
Secondary industry	146,182	1,098,631	7.52
Tertiary industry	217,689	1,556,506	7.15
Per capita GDP (USD/Capita)	2,721	15,978	5.87
Floor space for commercial (Million m^2)	88	519	5.90
Passenger transport demand (Million passenger-km)	361,819	1,201,951	3.32
Freight transport demand (Million tone-km)	1,826,631	9,701,505	5.31

Demographic and Economic Assumptions

- **In 2010, Thailand's population was estimated about 63,723,953 (21st).**
- **Its national GDP (PPP) in 2008 was estimated about $547.060 billion (24th).**
- **In 2011, total energy supply in Thailand was 128,092 ktoe, and rose 3.0% from 2010, with the net import of 54,949 ktoe, i.e., 42.9% of the total energy supply, while the domestic production was 73,143 ktoe (i.e., 57.1%).**
- **In 2011, bio-fuel production was totaled 3,729 ktoe.**

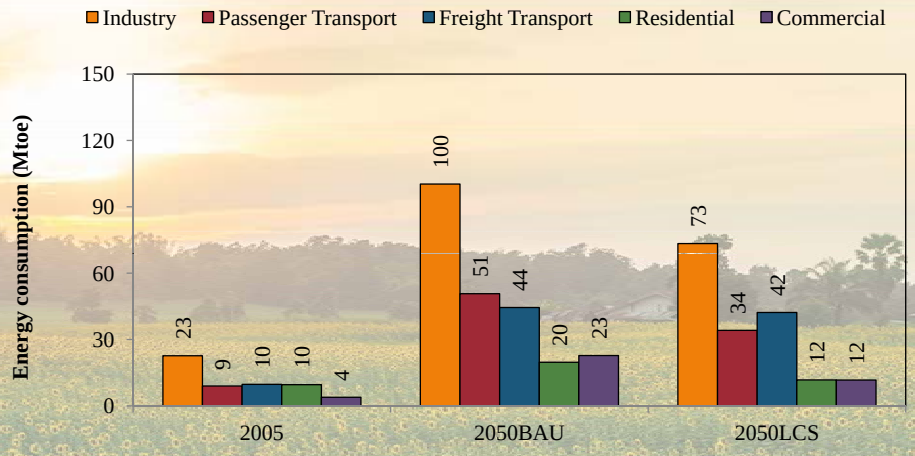
Demographic and Economic Assumptions

- In 2005, final energy consumption of the transportation sector was 23,491 ktoe or 37.6% of the total, followed by the industrial sector (22,920 ktoe; 36.7%), residential and commercial sector (12,779 ktoe; 20.5%), and agricultural sector (3,207 ktoe; 5.1%).
- Presently, this pattern has still unchanged.

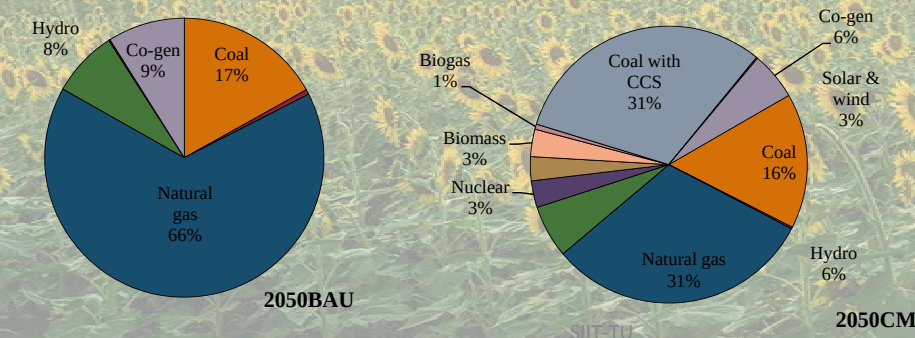
Demographic and Economic Assumptions

- In terms of greenhouse gas (GHG) emissions, the power generation sector was the highest CO_2 emissions sector with 75,956 kt-CO_2, accounting for about 39.6% of overall CO_2 emissions in Thailand, followed by the transport sector (56,318 kt-CO_2; 29.3%) and the industry sector (43,479 kt-CO_2; 22.6%) in 2005.

Roadmap to Low Carbon Thailand

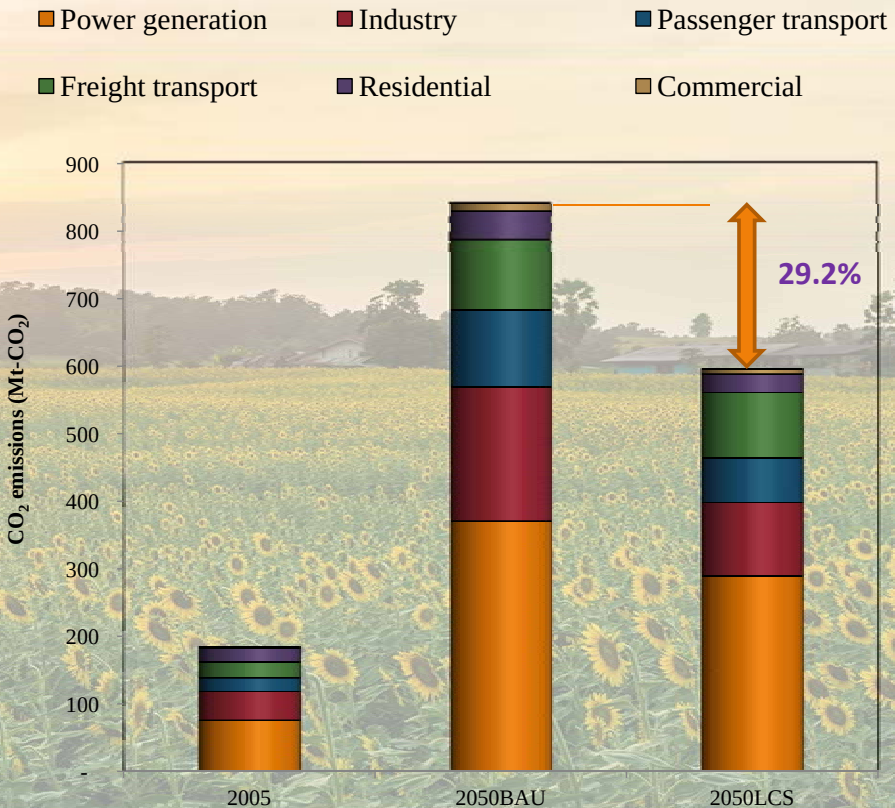


Final Energy Demand



Primary Energy Demand by fuel type in 2050

GHG Emissions in 2050 (LCS)

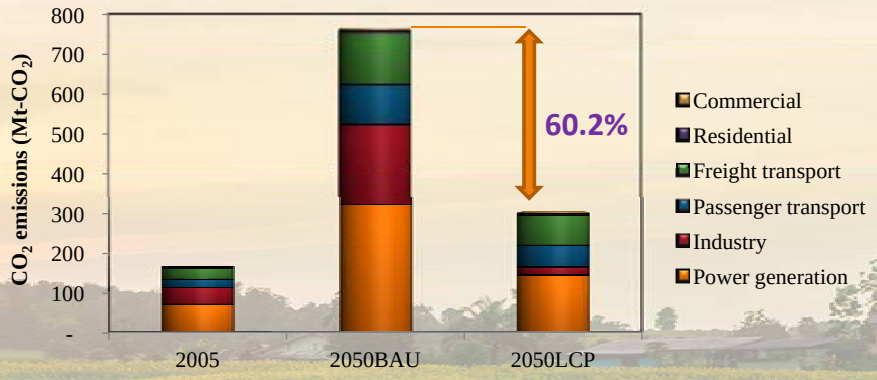


- In the 2050BAU scenario, the GHG emissions would increase to 769,896 kt-CO_2.
- That is 4.6 times higher than the base year 2005.
- According to the proposed LCS roadmap for sustainable Thailand towards 2050, and by adopting the selected feasible GHG mitigation measures available by 2020, 2030 and 2050, the GHG emissions in the 2050LCS scenario can be decreased by approximately 29.2% to 551,575 kt-CO_2.
- However, the Thailand's LCS roadmap, which is based on selected feasible GHG mitigation measures, could not achieve the 2 degree target.

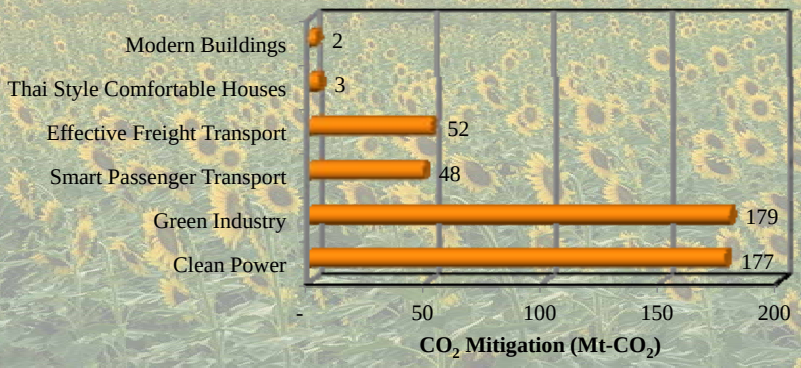
Peak CO_2 Scenario

- Rigorous LCS actions to achieve the 2 degree target within 2050 are proposed.
- Results from the AIM/Enduse analyses show that Thailand could meet the peak CO_2 emissions during 2035-2045 at 352,285 kt-CO_2.
- The peak CO_2 scenario shows that CO_2 can be reduced by approximately 60.2% to 303,497 kt-CO_2.

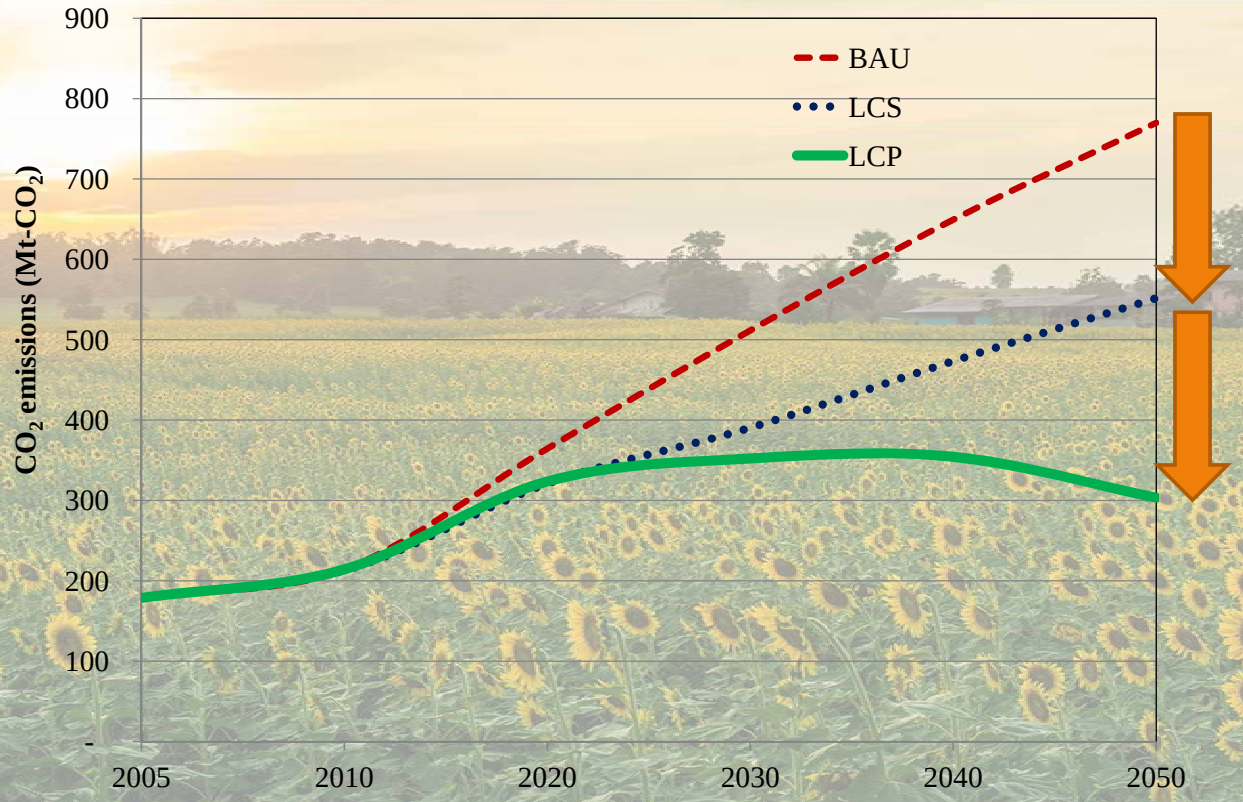
GHG Emissions in 2050 (Peak CO_2)



GHG Mitigation by 2050 (Peak CO_2)



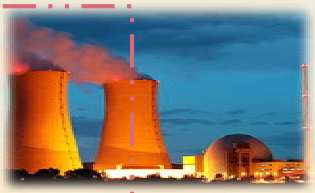
Total GHG Emissions 2005-2050 (Peak CO_2)

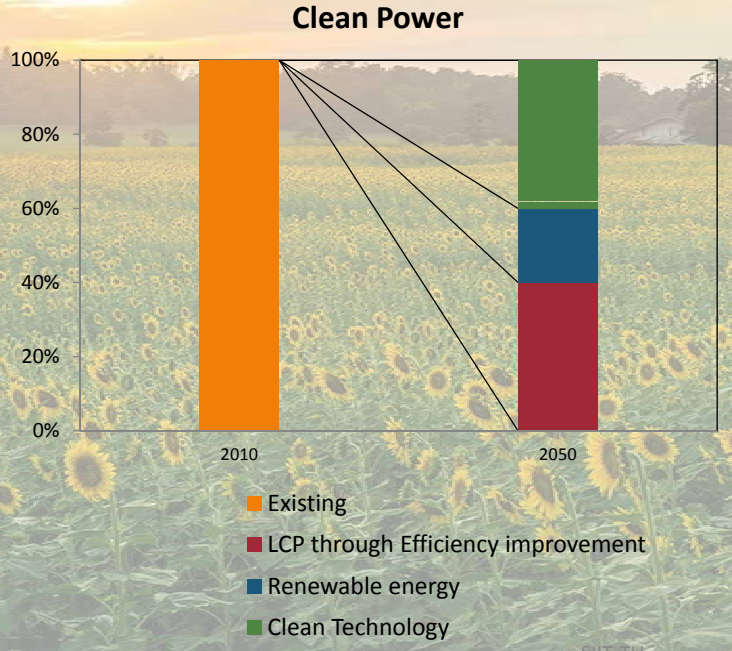


Thailand Low Carbon Peak Scenario

- These rigorous LCS actions include both supply-side and demand-side actions such as increasing the use of carbon capture storage (CCS) in power generation and industries, more utilization of bio-fuels, solar power, wind power, promoting modal shift in transportation, and increasing energy efficiency in buildings and industries.

Low Carbon Peak Action 1: Clean Power



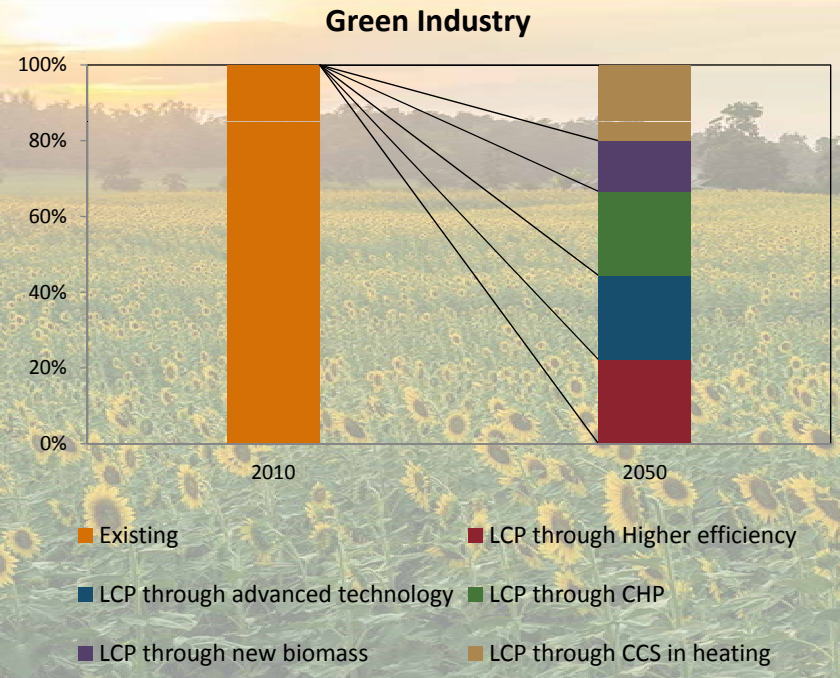


Clean technology
- Coal-fired with CCS
- IGCC with CCS
- Supercritical with CCS

Energy Efficiency

Renewable energy technology
- Solar
- Hydro
- Wind
- Biomass
- MSW
- Biogas

Low Carbon Peak
Action 2: GREEN INDUSTRY



Efficiency improvement
- Heating efficiency improvement
- Electrical efficiency improvement

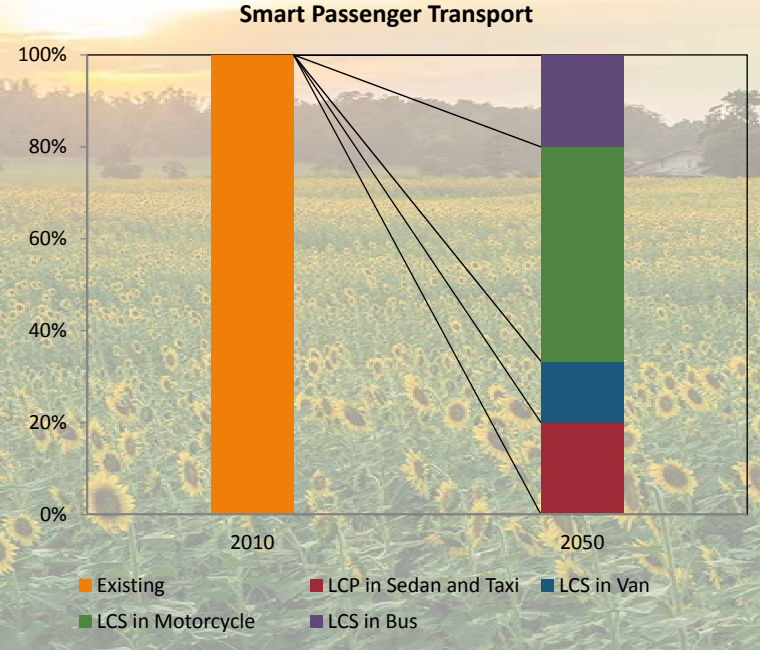
CCS

CHP

2nd and 3rd Generation Biomass

Advanced technologies
- Heating advanced technologies
- Advanced electrical technologies

Low Carbon Peak
Action 3: Smart Passenger Transport



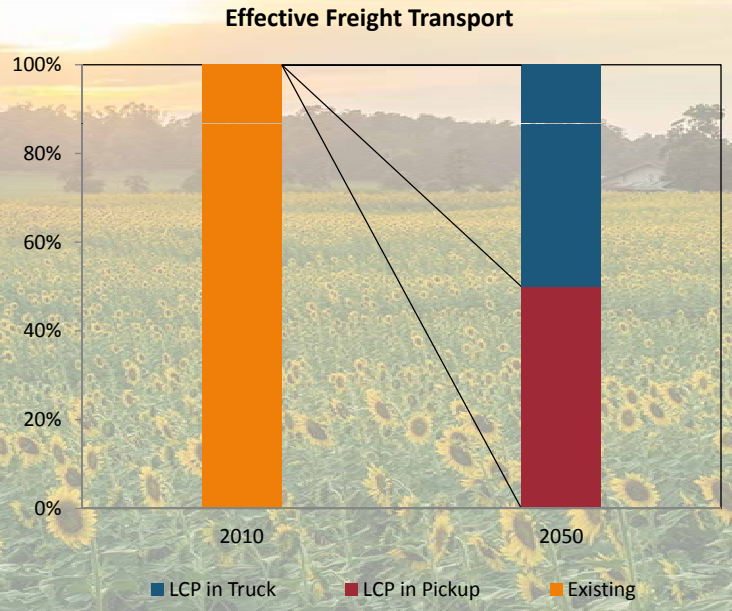
Bus sector by each technology
- Modal shift electric railway
- Fuel switching (E85, LPG,CNG)

Motorcycle
- EV

Passenger
- Hybrid (battery)
-Fuel switching (E85, LPG,CNG)

Sedan
- Hybrid (battery)
- Plug-in hybrid
- EV
- Fuel switching (E85, LPG,CNG)

Low Carbon Peak
Action 4: Effective Freight Transport

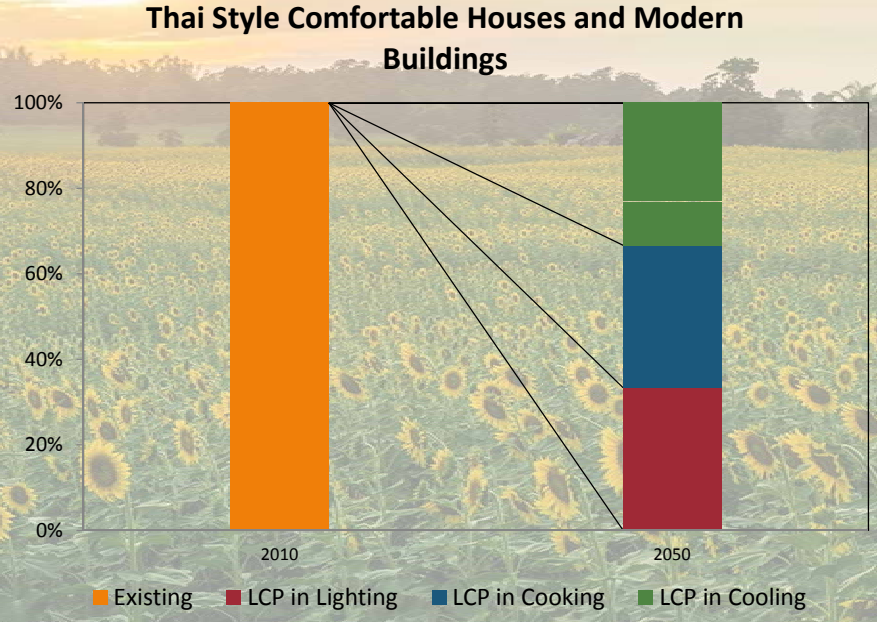


Pickup
- Diesel Hybrid (battery)
- Gasoline Hybrid (battery)
- Second generation bio-fuel (B10, B20)
- Fuel switching (E85, LPG,CNG)

Truck
-Second generation bio-fuel (B10, B20)
- Modal shift to Rail

Low Carbon Peak
Action 5: Thai Style Comfortable Houses

Low Carbon Peak
Action 6: Modern Buildings



Cooking
- Higher efficiency stove
- Renewable stove

Lighting
- Compact Fluorescent
- LED Lamp
- T5

Cooling
- A/C and refrigerator COP6
- A/C and refrigerator COP9
- Building codes

Conclusions

- These countermeasures will result in transformational changes in both supply and demand sides in Thailand.
- In order to achieve this GHG mitigation target for Thailand, i) the LCS capacity building, ii) the feed-in tariff scheme for renewable electricity, iii) enforcement of energy efficiency laws in buildings and industries, iv) co-funding of the LCS policies and projects are of necessity.
- The 2 degree target in the future years will not be achieved if these countermeasures are not planned for implementation in the early stage.

NIES JAPAN AIM ASIA-PACIFIC INTEGRATED MODEL MIZUHO

(S-6-1) MOE Japan

どうもありがとう

Thank You