

Roadmap to Low Carbon THAILAND towards 2050



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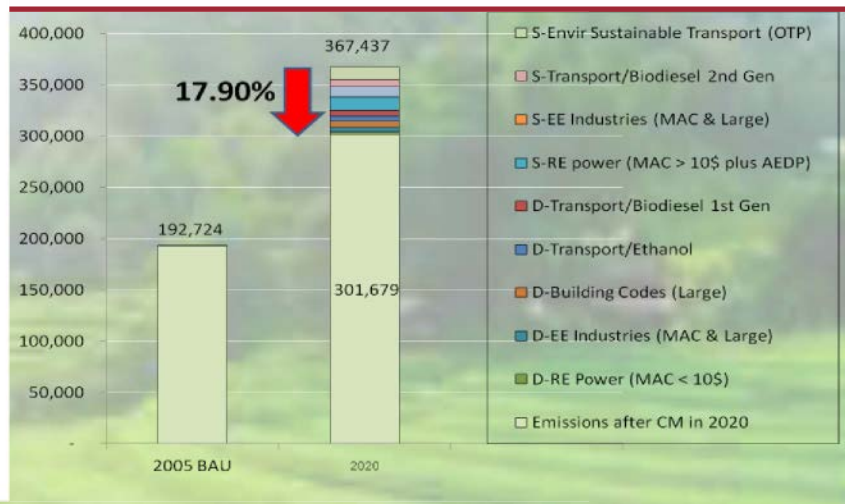
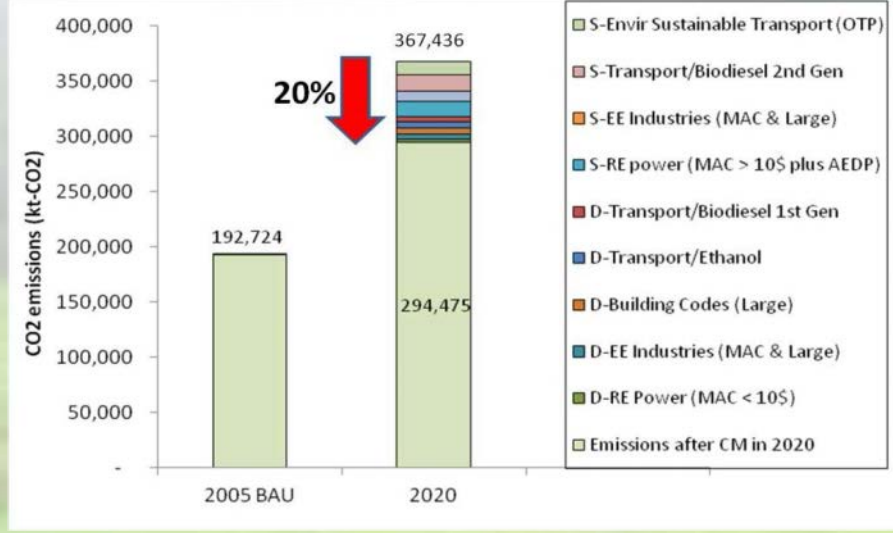
LCS Activities in Thailand -2012

- Appropriate (min) CO₂ reduction target in 2020**
- LCS Roadmap to Low Carbon Thailand 2050**

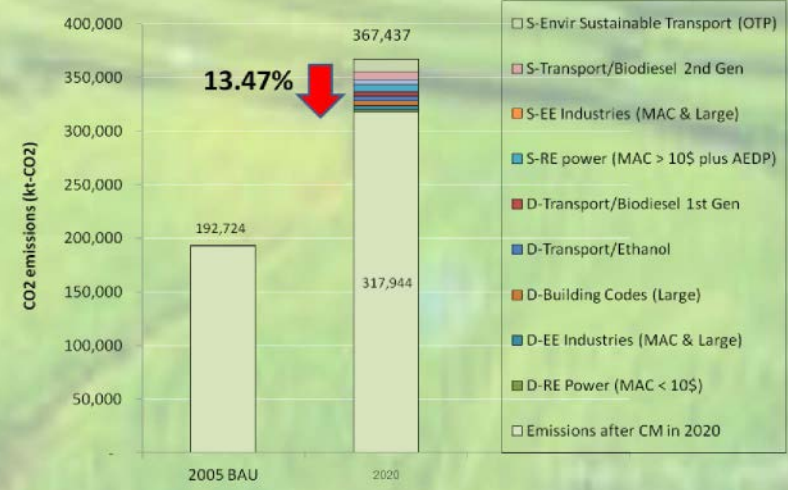
One of 3 scenarios going to be selected to target in 2020

High potential scenario : Potentials of CO₂ Countermeasures in 2020 at 20% (73 Mt-CO₂)

Low potential scenario : Potentials of CO₂ Countermeasures in 2020 at 17.90% (66 Mt-CO₂)



Low potential scenario : Potentials of CO₂ Countermeasures in 2020 at 13.47% (42 Mt-CO₂)



Sources: MONRE, ONEP, MOEN Thailand 2012

Low-Carbon Society Vision 2030

Thailand



November, 2010



Sirindhorn International Institute of Technology, Thammasat University
 Asian Institute of Technology
 National Institute for Environmental Studies
 Kyoto University
 Mizuho Information & Research Institute
 Asia-Pacific Integrated Model

1st LCS Scenario by AIM/ExSS

Roadmap to Low Carbon

Thailand towards 2050



A Roadmap to Low Carbon Growth



Sirindhorn International Institute of Technology, Thammasat University
 Asian Institute of Technology
 Asia Pacific Integrated Model (AIM)
 National Institute for Environmental Studies (NIES)
 Kyoto University
 Mizuho Information & Research Institute



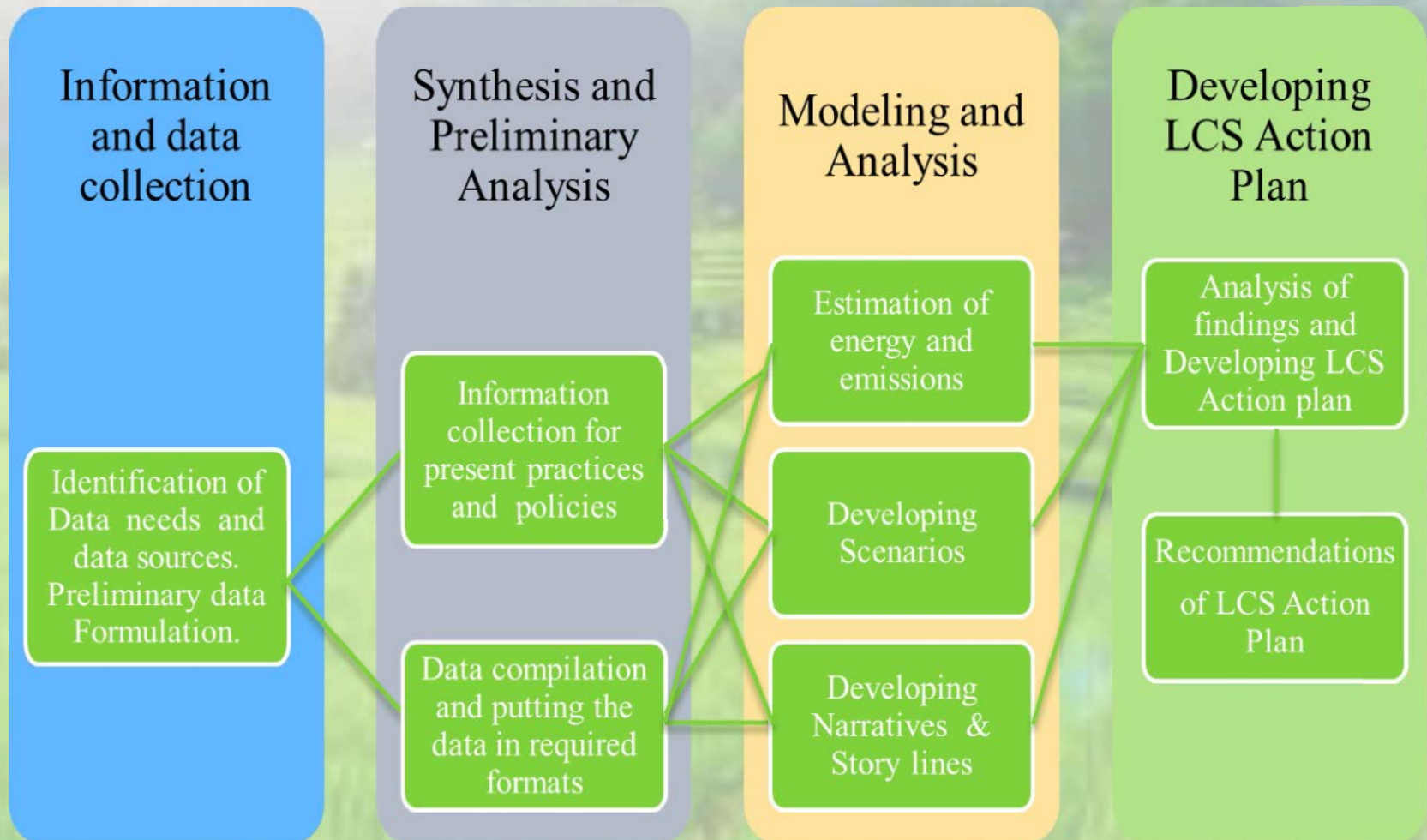
November, 2012

2nd LCS Roadmap by AIM/Enduse

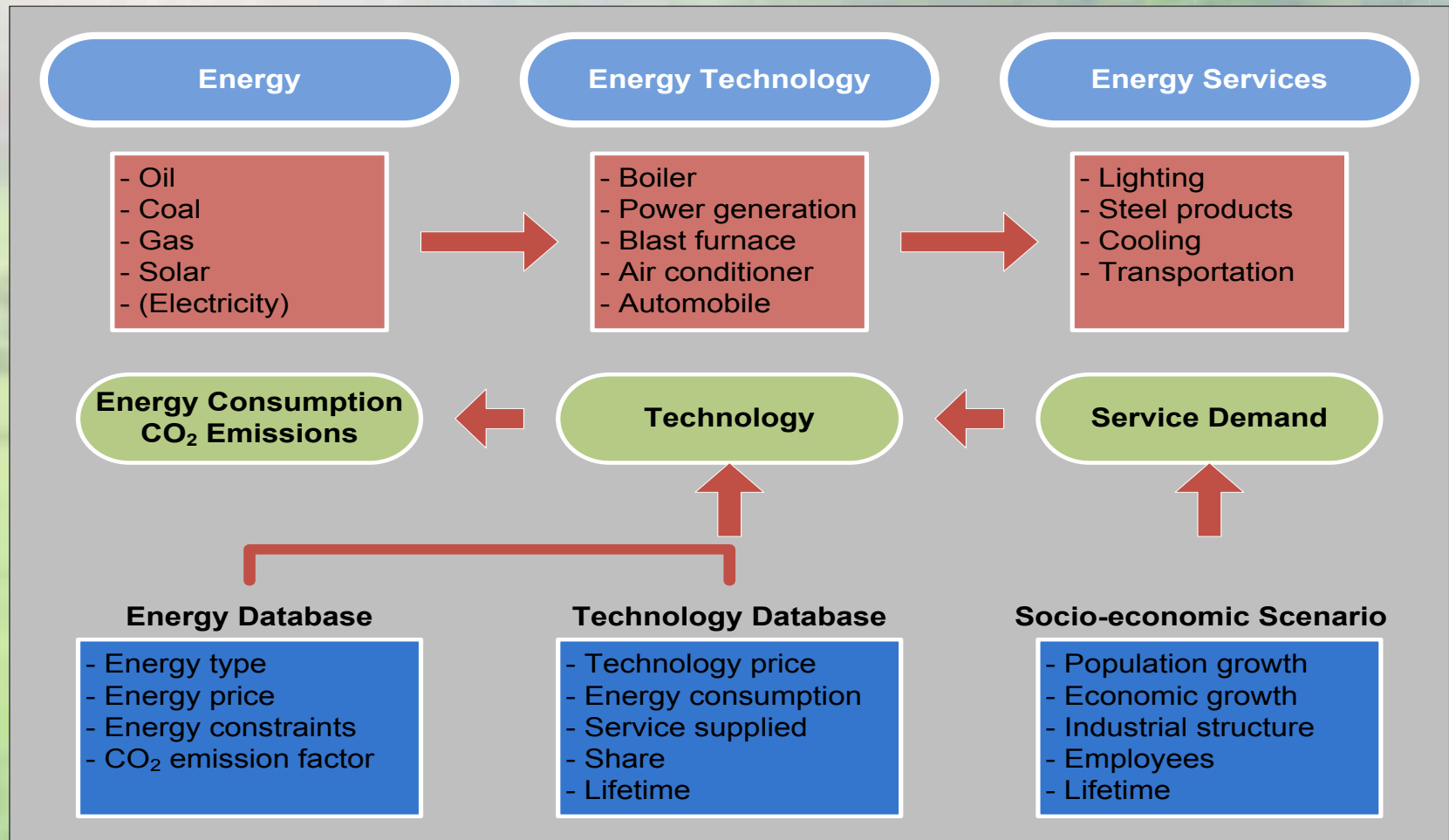
LCS Roadmap Objectives

- To construct a roadmap to low-carbon Thailand towards 2050 on the basis of low carbon scenarios by using AIM/Enduse.
- To create awareness among Thailand's authorities, government, stakeholders and communities for discussion on decisive actions to be taken to realize a robust growth and low-carbon Thailand.

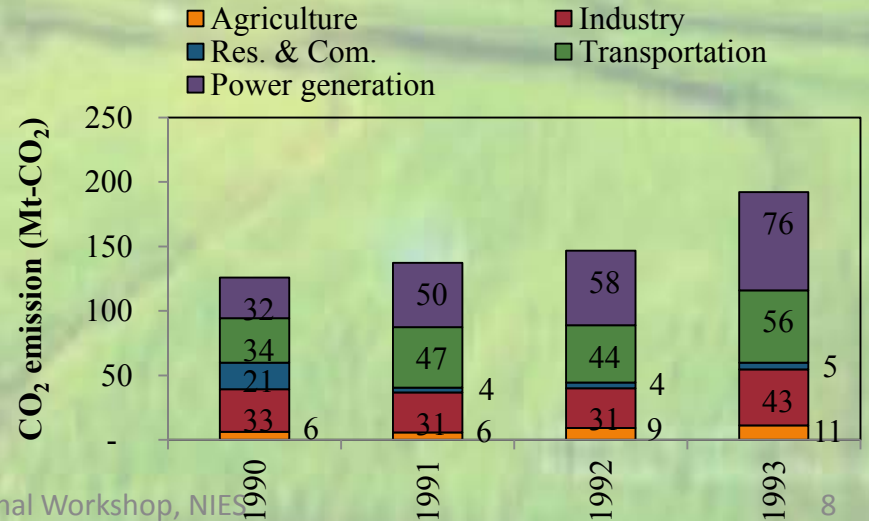
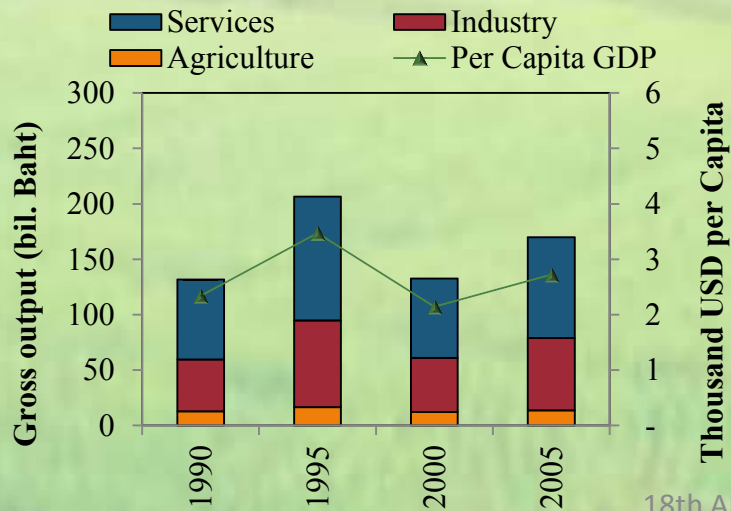
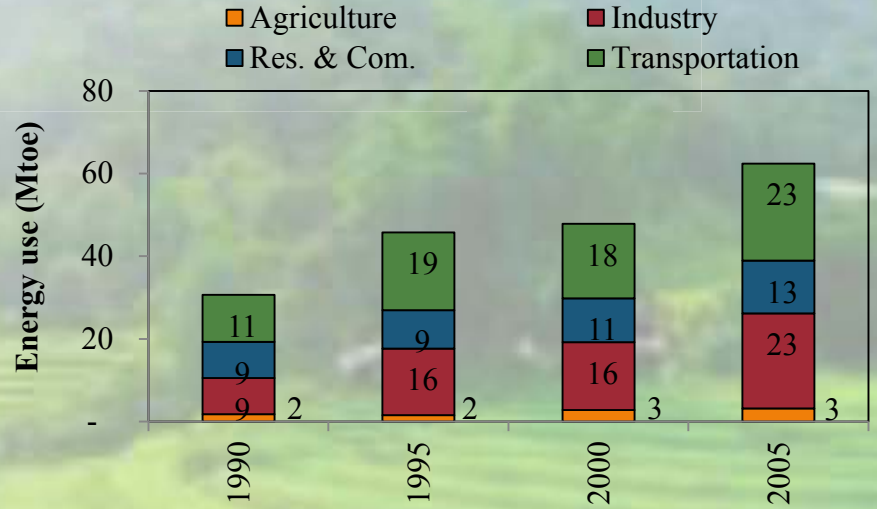
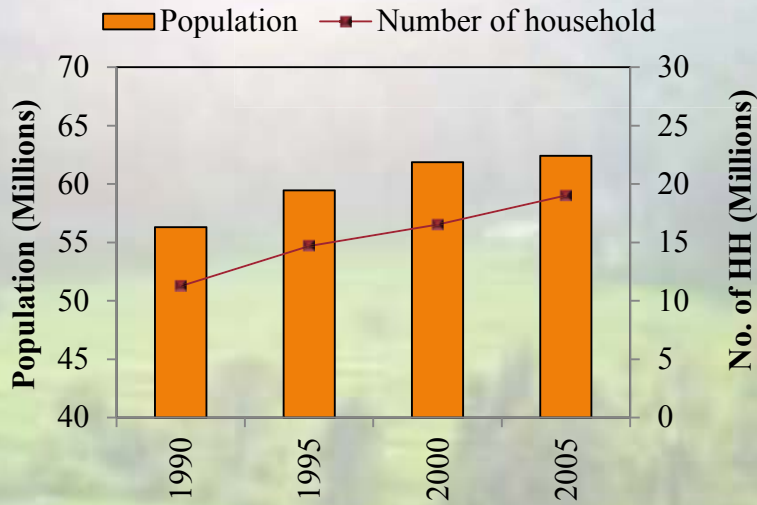
Methodology (LCS Action Plan)



Methodology (AIM/Enduse)



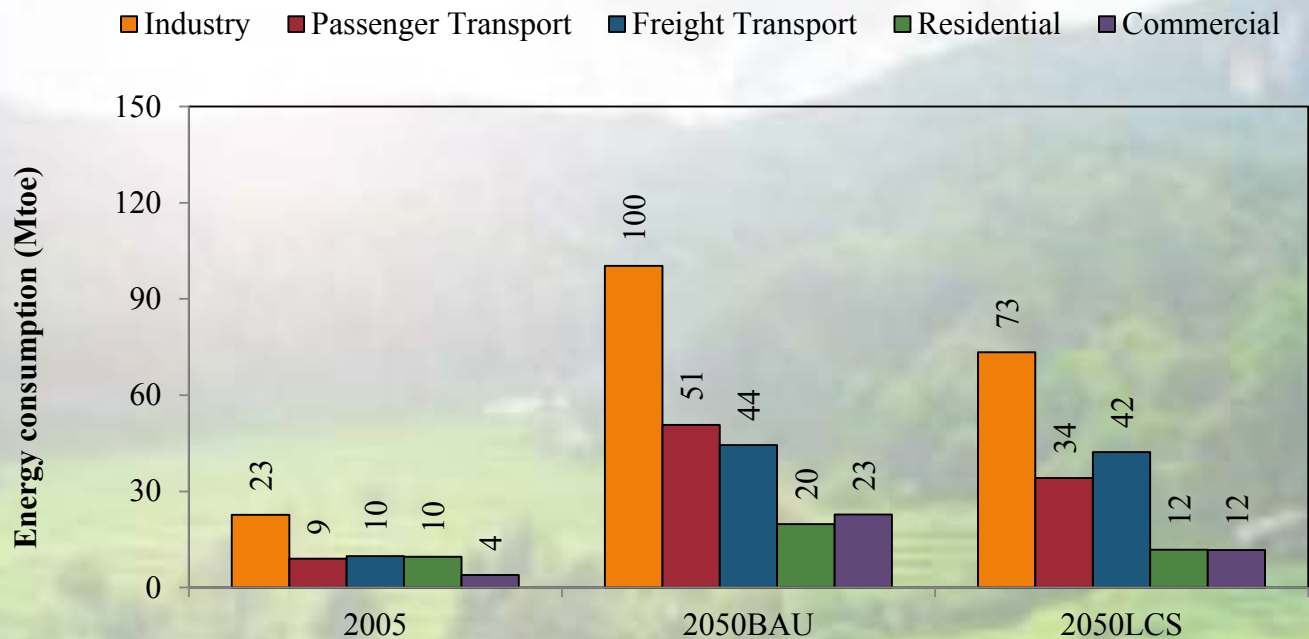
National Circumstance



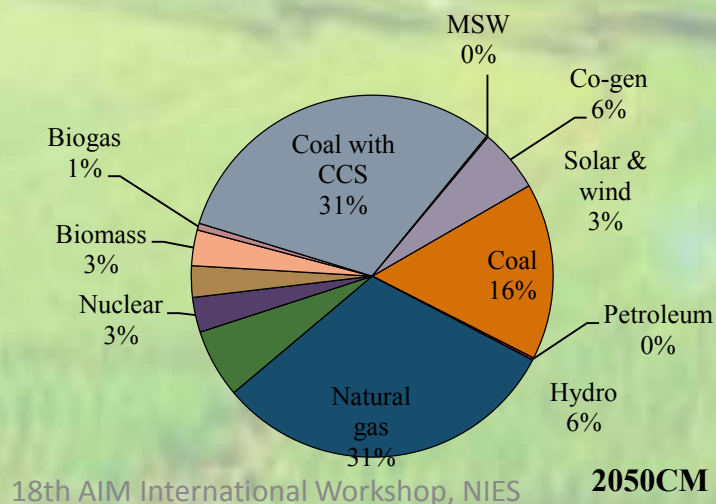
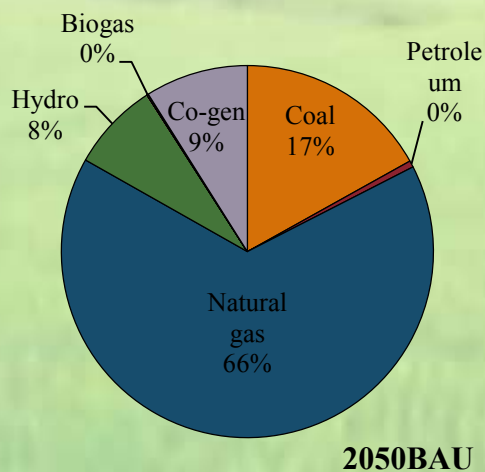
Demographic and Economic Assumptions

| | |
|------------------------------------|--|
| 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%) |

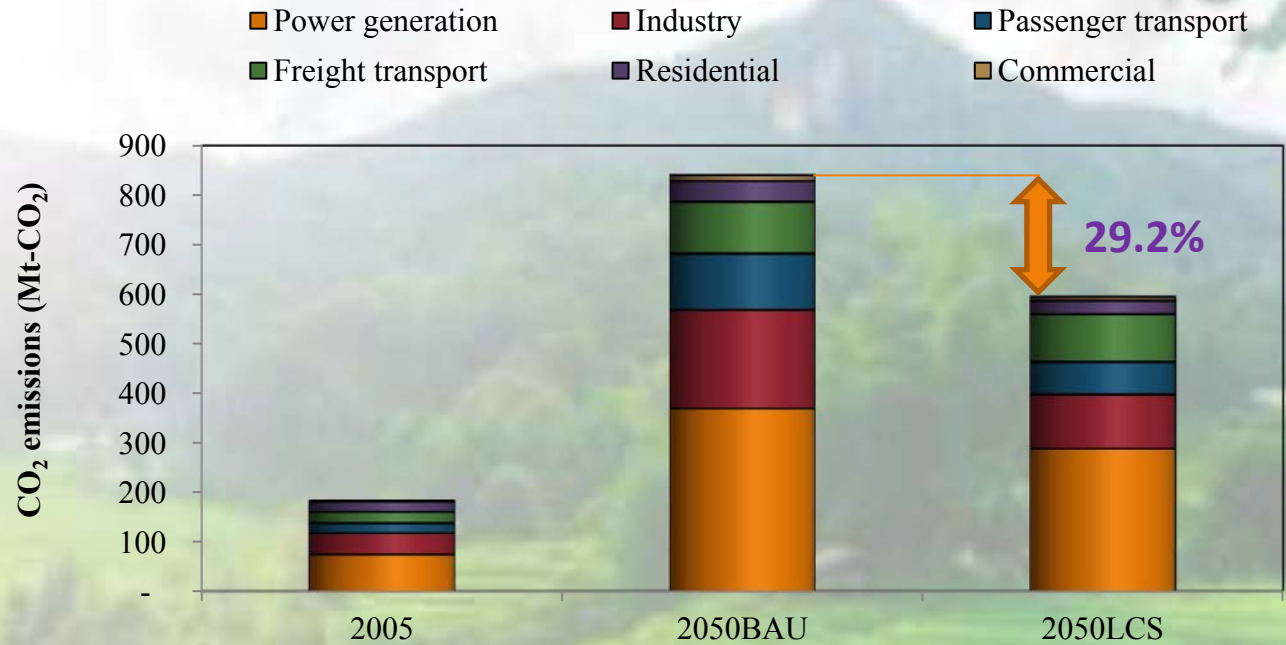
| Socio-economic indicators | 2005 | 2050 | 2050/2005 |
|--|------------|------------|-----------|
| Population (Person) | 62,418,054 | 78,071,984 | 1.25 |
| No. of Households | 19,016,784 | 67,478,570 | 3.55 |
| GDP (Million USD) | 169,870 | 1,247,449 | 7.34 |
| Gross output (Million USD) | 407,157 | 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 |



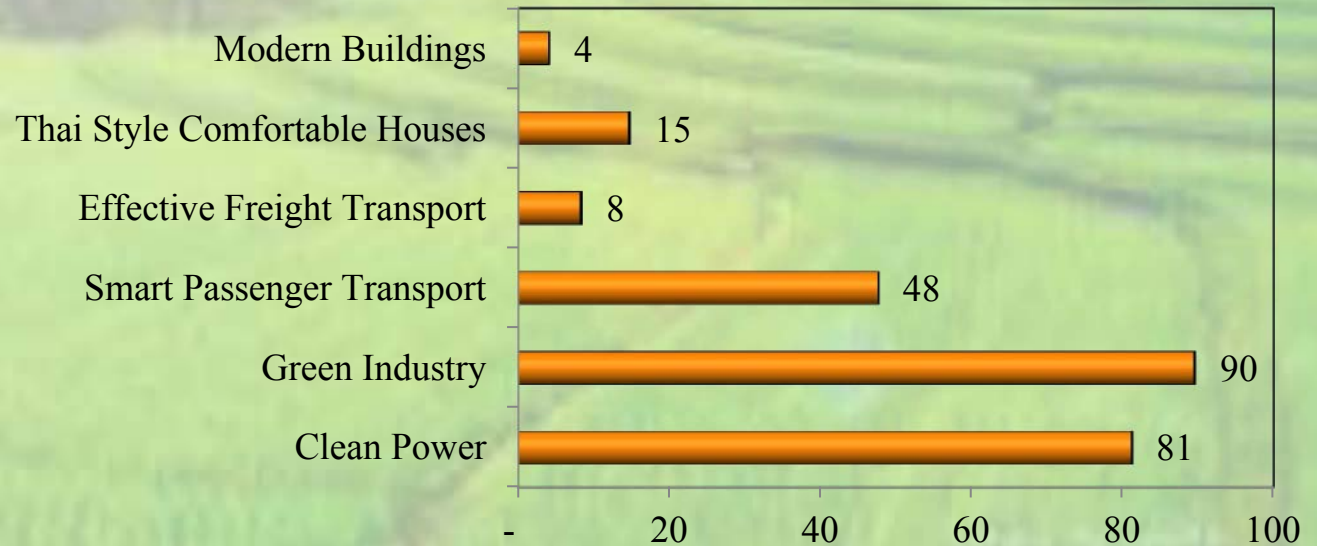
Final Energy Demand



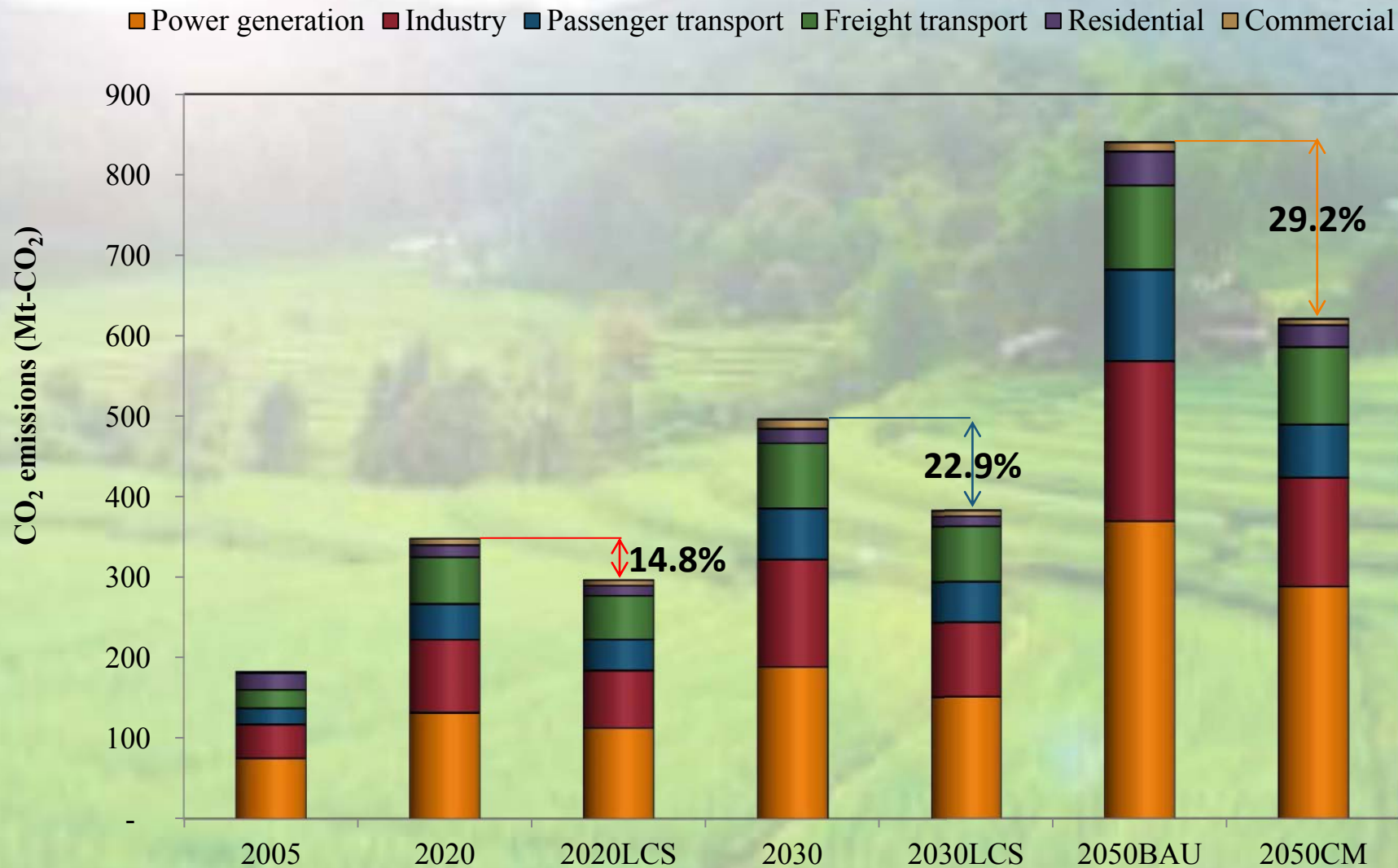
GHG Emissions in 2050



GHG Mitigation by 2050 Roadmap



GHG Emissions/Reductions



Policy Package for Roadmap to “LOW CARBON THAILAND”

POWER GENERATION

- Implementation of energy efficiency improvement
- Promotion of technology transfer
- Reduce own usage and transmission loss
- Promotion of alternative energy
- Promotion of renewable energy

INDUSTRY

- Implementation of energy efficiency improvement
- Promotion of technology transfer
- Promotion of alternative and renewable energy

PASSENGER TRANSPORT

- Implementation of energy efficiency improvement
- Promotion of technology transfer
- Promotion of alternative and renewable energy
- Promotion of mass transit system
- Promotion of new technology

FREIGHT TRANSPORT

- Implementation of energy efficiency improvement
- Promotion of new technology
- Promotion of alternative and renewable energy
- Promotion of mass transit system

RESIDENTIAL

- Building insulation
- Energy efficiency labeling
- Energy performance standard of equipment
- Promotion of new technology

COMMERCIAL

- Building codes
- Building insulation
- Energy efficiency labeling
- Energy performance standard of equipment
- Promotion of new technology

Incentive to introduce energy efficiency improvement and advanced technology

Mitigation of GHG emissions

Clean Power

Energy efficiency improvement

Large emitter programs

- Implementation of IGCC
- Improvement of transmission and distribution loss
- Implementation of large programs
- Diffusion of energy saving managing systems

Diffusion of new technology

Clean technology

- Implementation carbon capture storage (CCS) technology
- Implementation of nuclear technology

Promotion of Research & Development

- R&D of gasified biofuel development
- R&D of new technology
- Setting guideline of alternative fuel

Promotion of new & renewable energy

Power generation by renewable energy

- Power generation from solid waste incineration
- Operation of bio-methanol power generation
- Construction of bio-methanol plant

Power generation by alternative energy

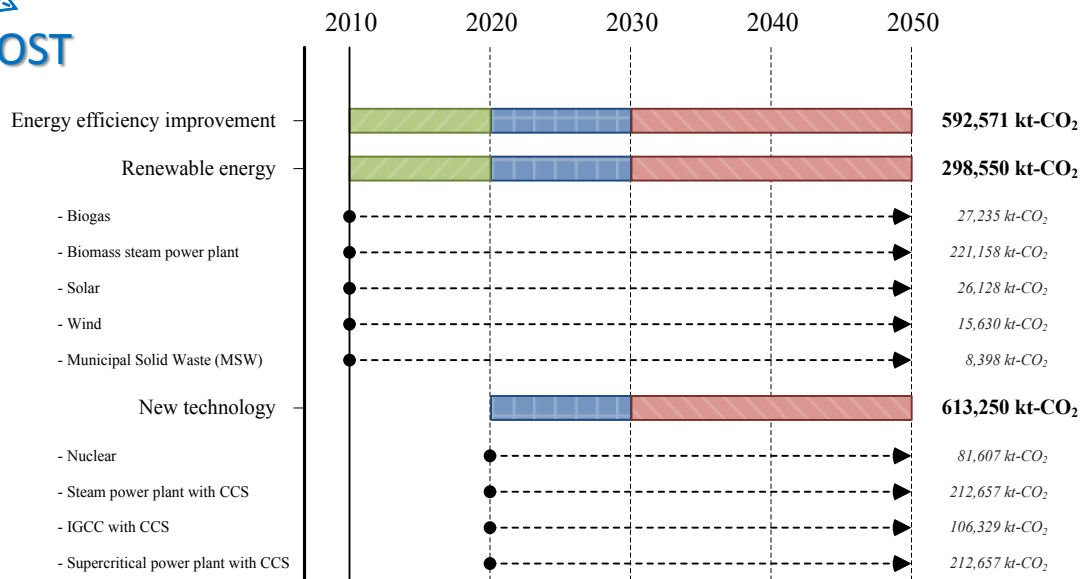
- Subsidy to alternative energy
- Planning of alternative energy

LCP-ABS Action 1: Clean Power

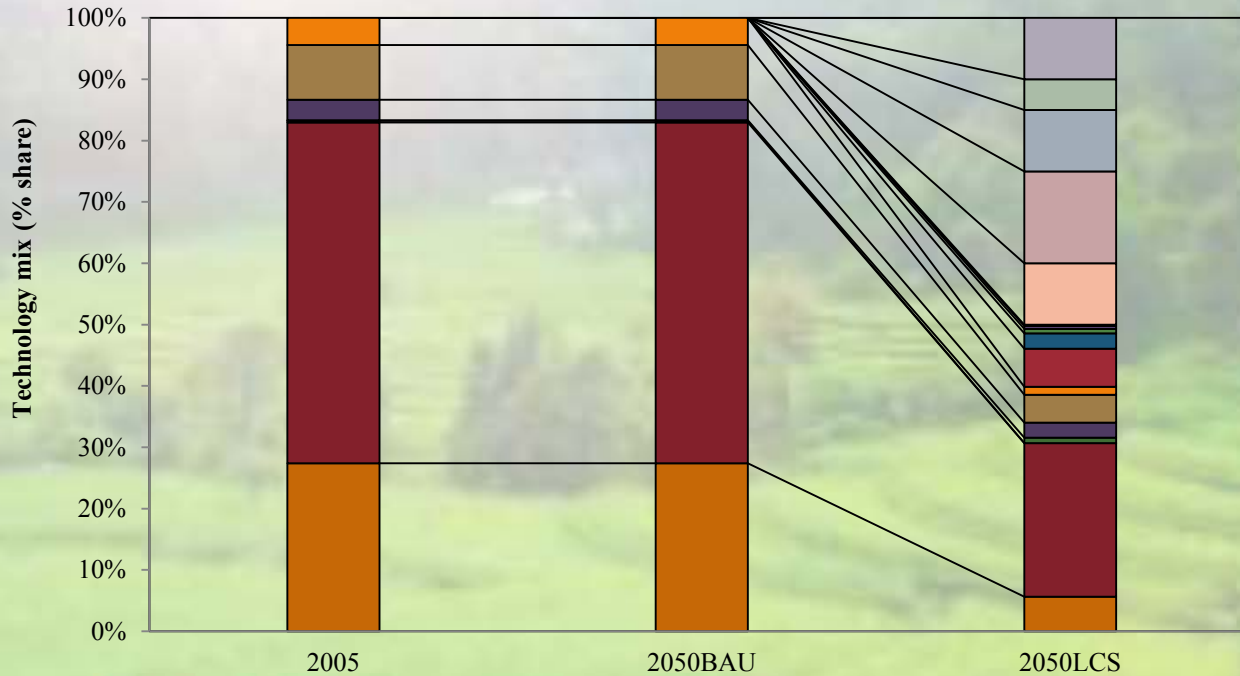
DEDE, EGAT



MOST



- Conventional steam power plant
- Gas turbine power plant
- Hydro power plant
- Imported hydro
- Nuclear
- Wind
- IGCC
- Steam power plant with CCS
- Combined cycle power plant
- Gas engine
- co generation
- Biomass steam power plant
- Solar
- Municipal solid waste
- Supercritical power plant
- IGCC with CCS

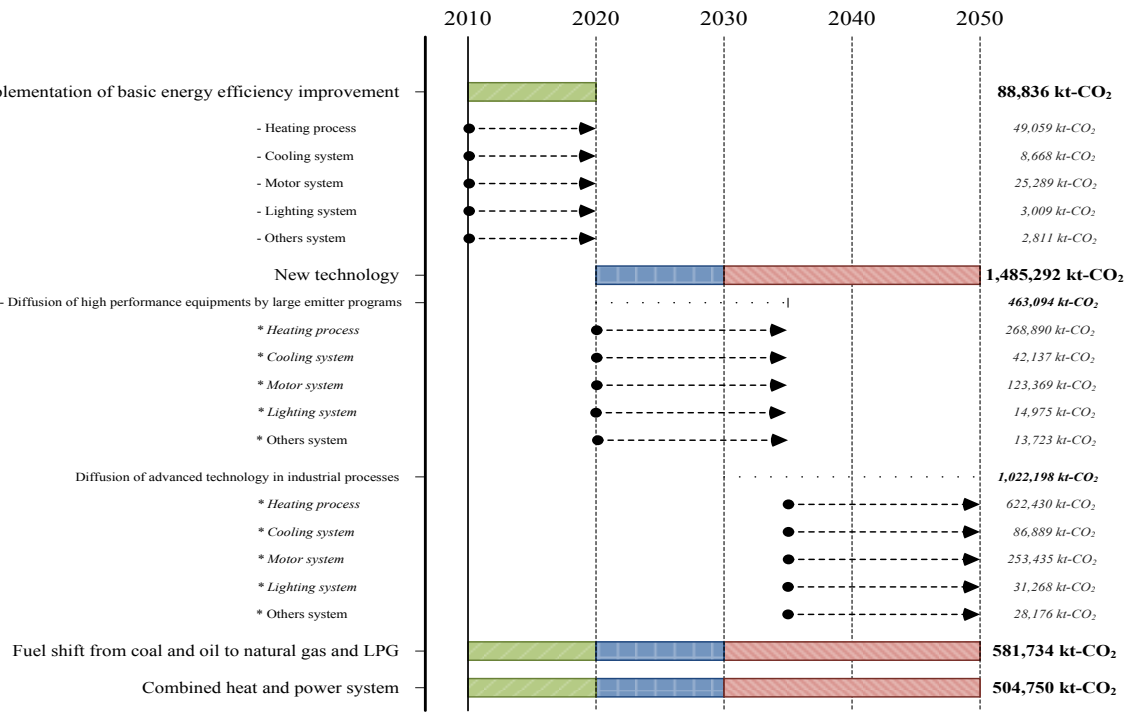


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Action 1: Clean Power



LCP-ABS ACTION 2: GREEN INDUSTRY



Green Industry

Energy efficiency improvement

Energy saving behavior

Diffusion of new technology

Environmental management system standard

Diffusion of energy saving management systems

Support for SMEs

Diffusion of high performance equipment

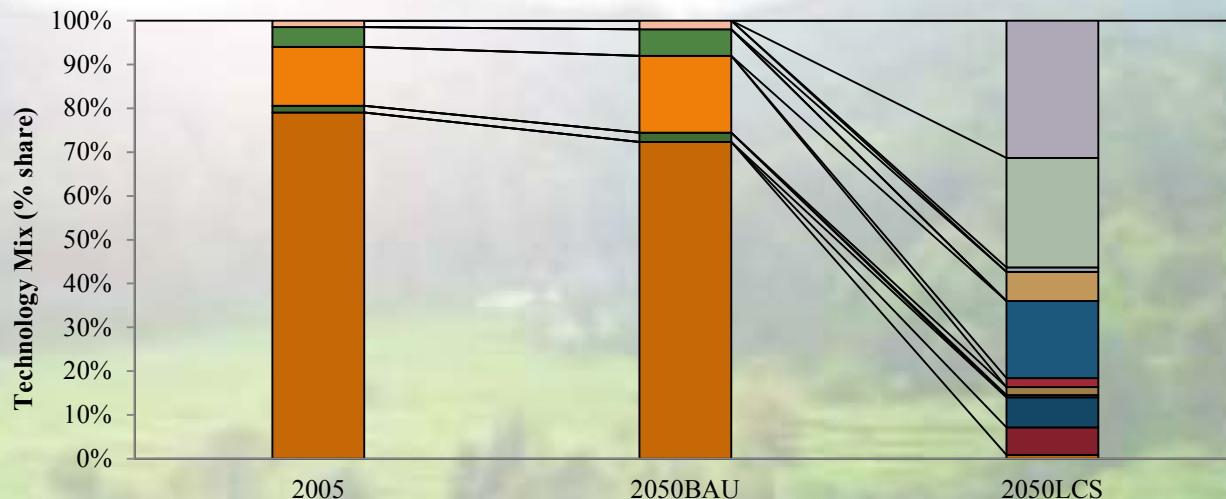
- Diffusion of environmental equipment standard

- Implementation of large emitter programs
- Diffusion of energy efficiency improvement equipment
- Improvement of industrial production technique
- Diffusion of energy saving behavior

- Subsidy to small businesses of energy saving management
- Planning of consultation system for energy efficient industries

- Implementation of advanced energy saving equipment
- Implementation of research and development in the nanocluster
- Improvement of research organization

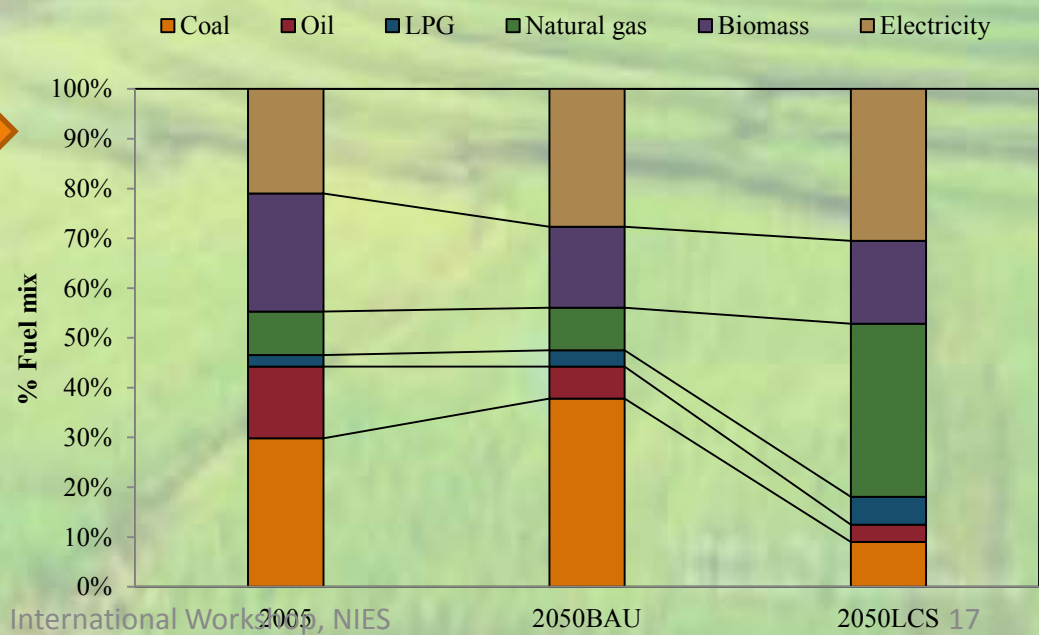
- Existing Heating
- High Efficient Heating
- New Heating
- Existing Lighting
- High Efficient Lighting
- New Lighting
- Existing Motors
- High Efficient Motors
- New Motors
- Existing Cooling
- High Efficient Cooling
- New Cooling
- Existing Others
- High Efficient Others
- New Others
- Fuel switching
- CHP



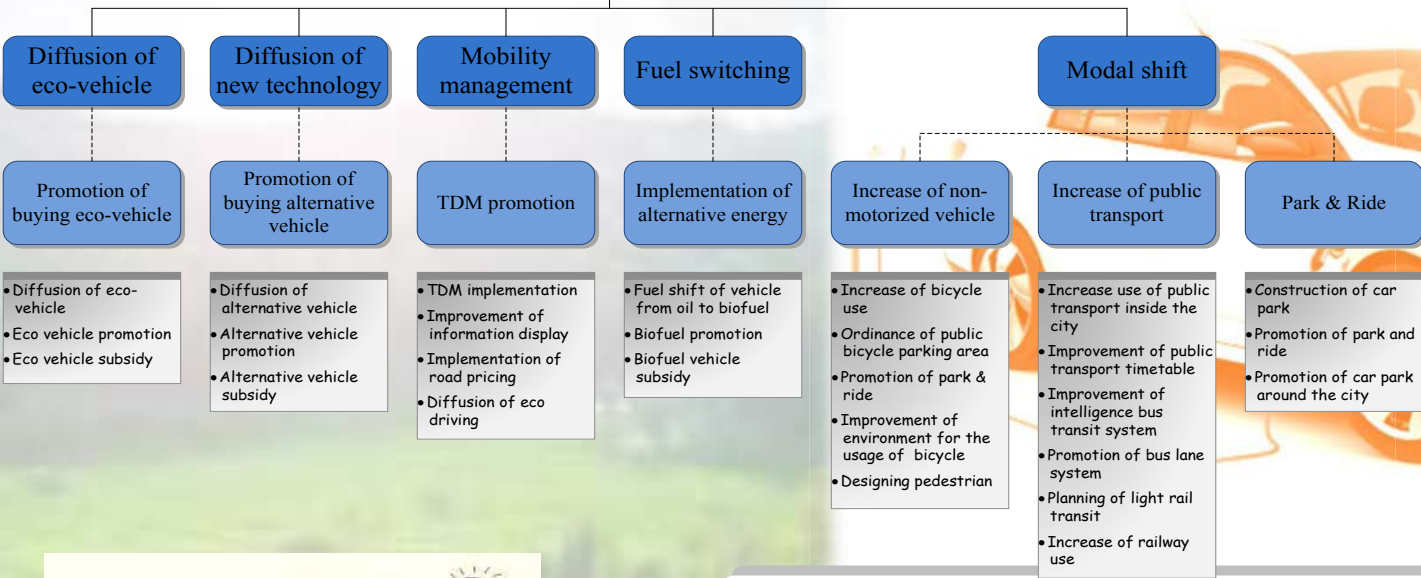
Technology Mix

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Action 2:
GREEN
INDUSTRY

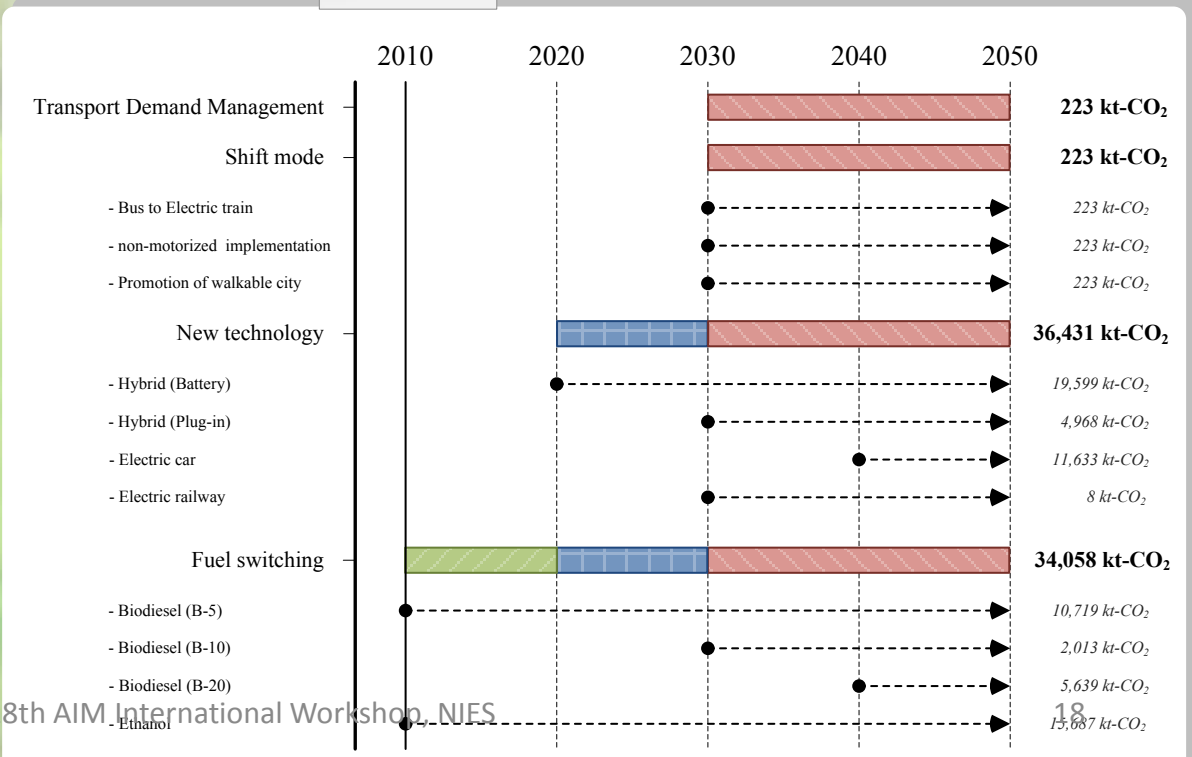
Fuel Mix



Smart Passenger Transport

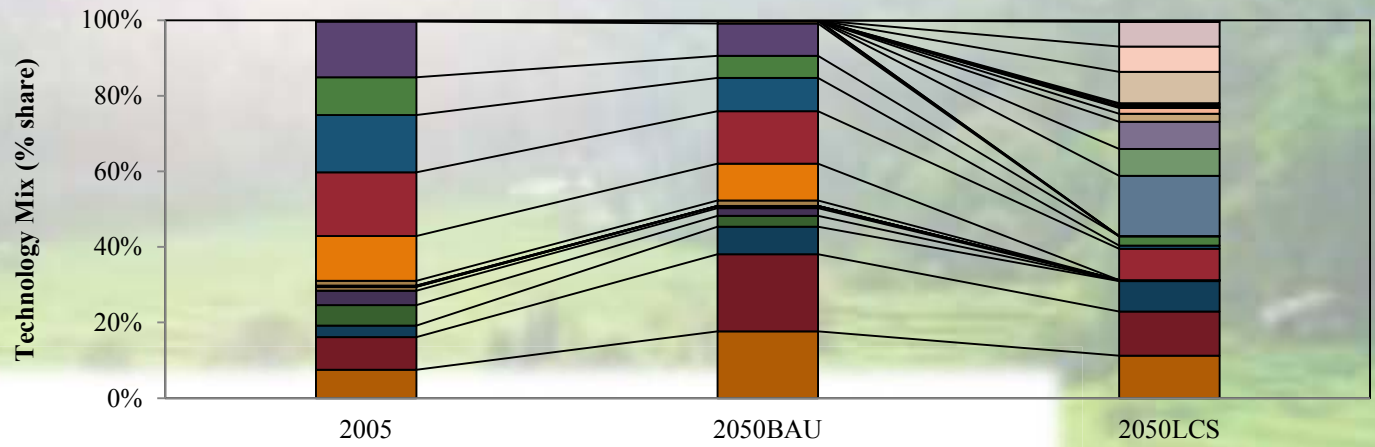


LCP-ABS Action 3: Smart Passenger Transport



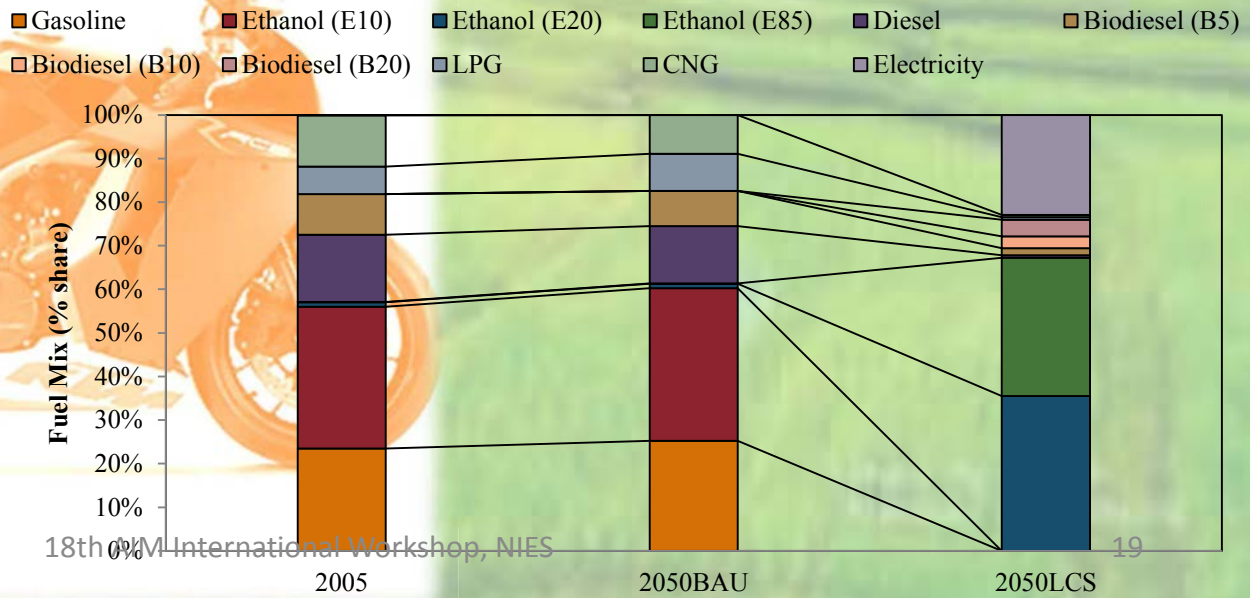
- Patrol sedan
- Gasohol/B5 sedan
- LPG/CNG sedan
- Patrol van
- Gasohol/B5 van
- LPG/CNG van
- Patrol tuktuk
- Gasohol/B5 tuktuk
- LPG/CNG tuktuk
- Patrol motorcycle
- Gasohol/B5 motorcycle
- LPG/CNG motorcycle
- Patrol taxi
- Gasohol/B5 taxi
- LPG/CNG taxi
- Patrol bus
- Gasohol/B5 bus
- LPG/CNG bus
- Patrol others
- Gasohol/B5 others
- LPG/CNG others
- Hybrid-Gasohol Sedan
- Plugin Hybrid-Gasohol Sedan
- Electric sedan
- Hybrid-Gasohol Van
- Plugin Hybrid-Gasohol Van
- Electric Van
- Hybrid-Gasohol Taxi
- Plugin Hybrid-Gasohol Taxi
- Electric Taxi
- Hybrid-Gasohol Motorcycle
- Plugin Hybrid-Gasohol Motorcycle
- Electric Motorcycle
- Electric Train
- Biodiesel Bus

Technology Mix

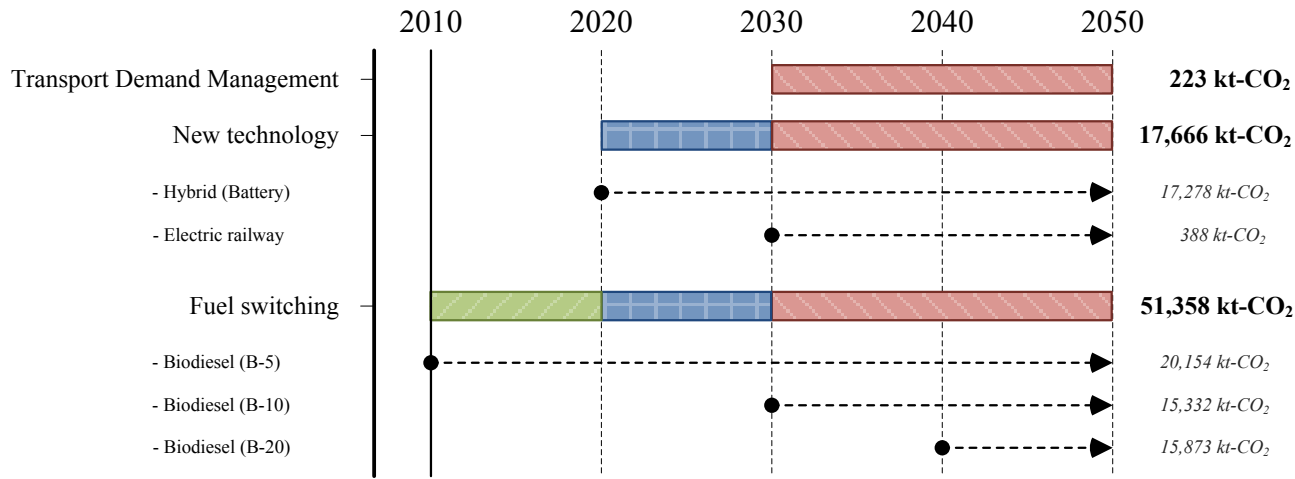


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Action 3:
Smart
Passenger
Transport



LCP-ABS Action 4: Effective Freight Transport



Effective Freight Transport

Diffusion of new technology

Fuel switching

Modal shift

Promotion of buying alternative vehicle

Implementation of alternative energy

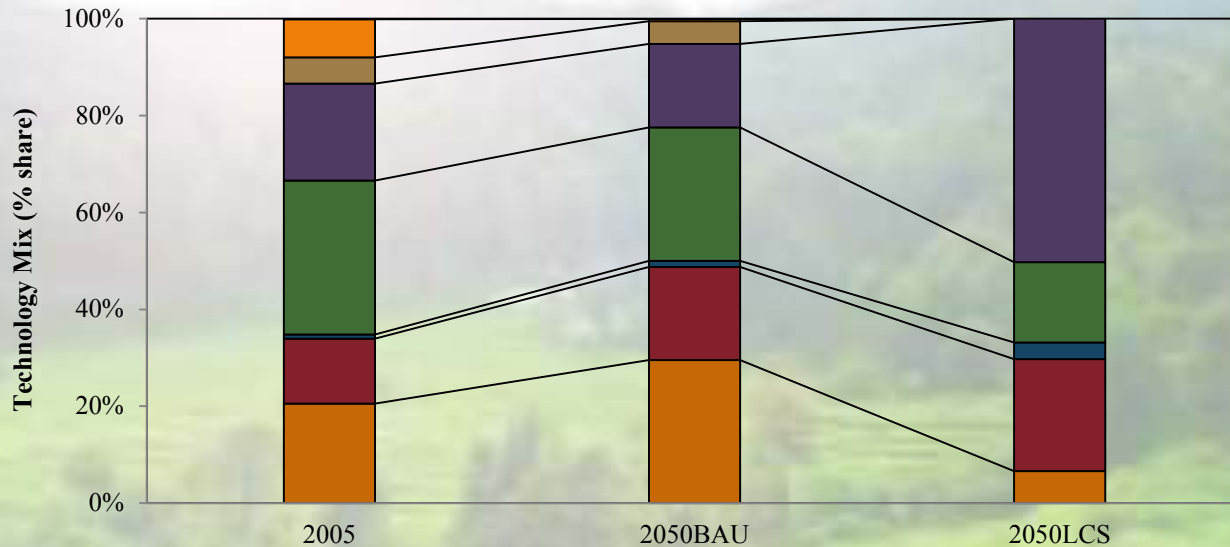
Increase of public transport

- Diffusion of alternative vehicle
- Alternative vehicle promotion
- Alternative vehicle subsidy

- Fuel shift of vehicle from oil to biofuel
- Biofuel promotion
- Biofuel vehicle subsidy

- Planning of light rail transit
- Increase of railway use

- Patrol Pickup
- Gasohol/B5 Pickup
- LPG/CNG Pickup
- Patrol Truck
- Gasohol/B5 Truck
- LPG/CNG Truck
- Diesel Freight Train
- Electric Freight Train
- Hybrid-Gasohol Pickup
- Biodiesel Pickup
- Biodiesel Truck

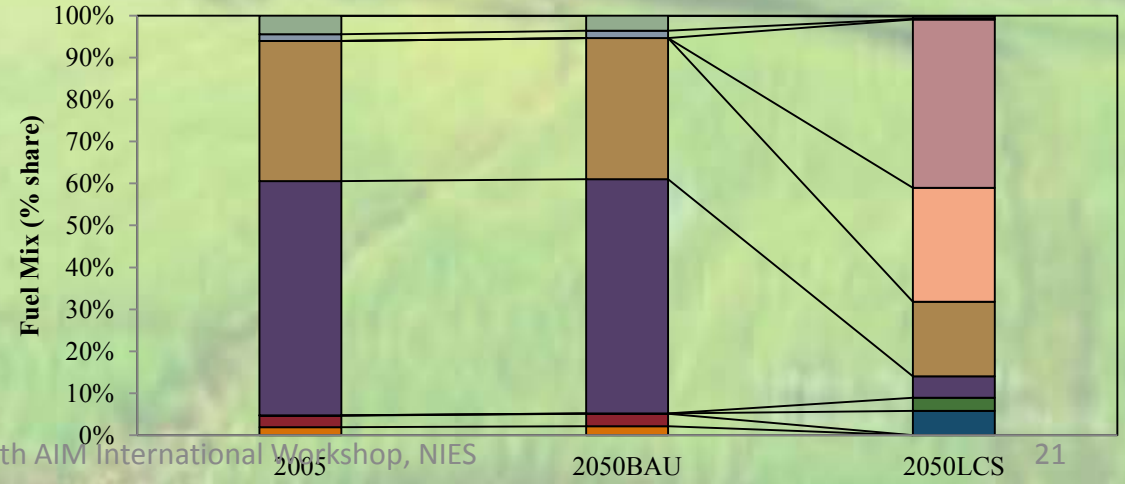


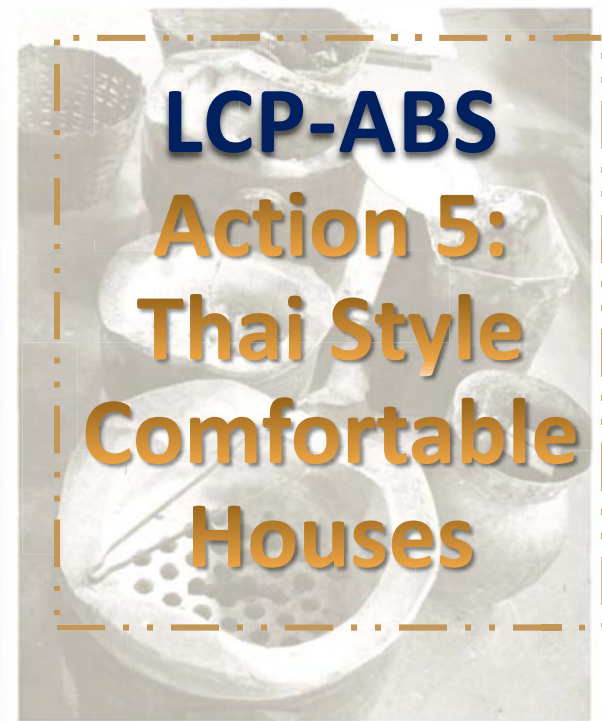
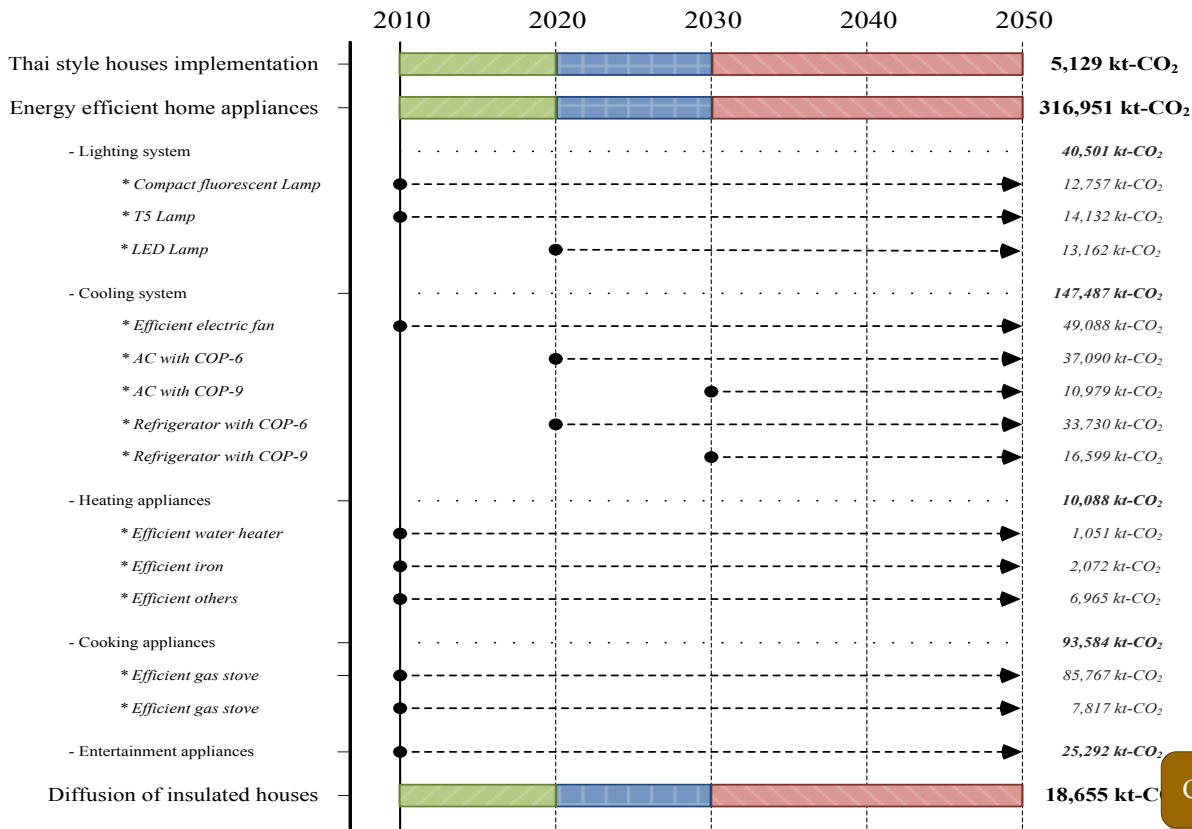
LCP Action 4: Effective Freight Transport

Technology Mix

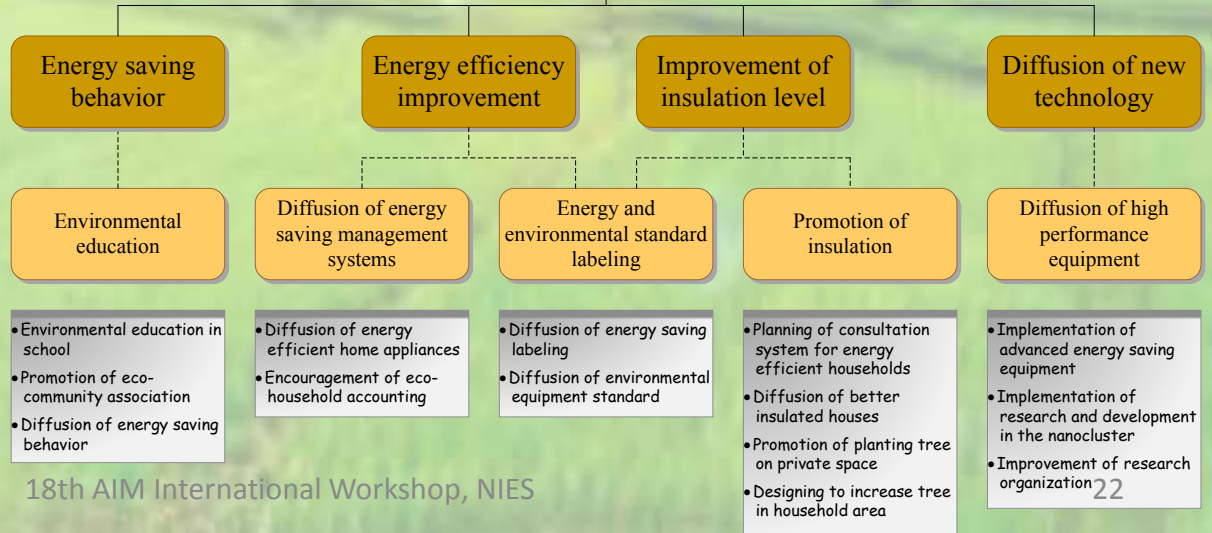
Fuel Mix

- Gasoline
- Diesel
- LPG
- Ethanol (E10)
- Biodiesel (B5)
- CNG
- Ethanol (E20)
- Biodiesel (B10)
- Electricity
- Ethanol (E85)
- Biodiesel (B20)





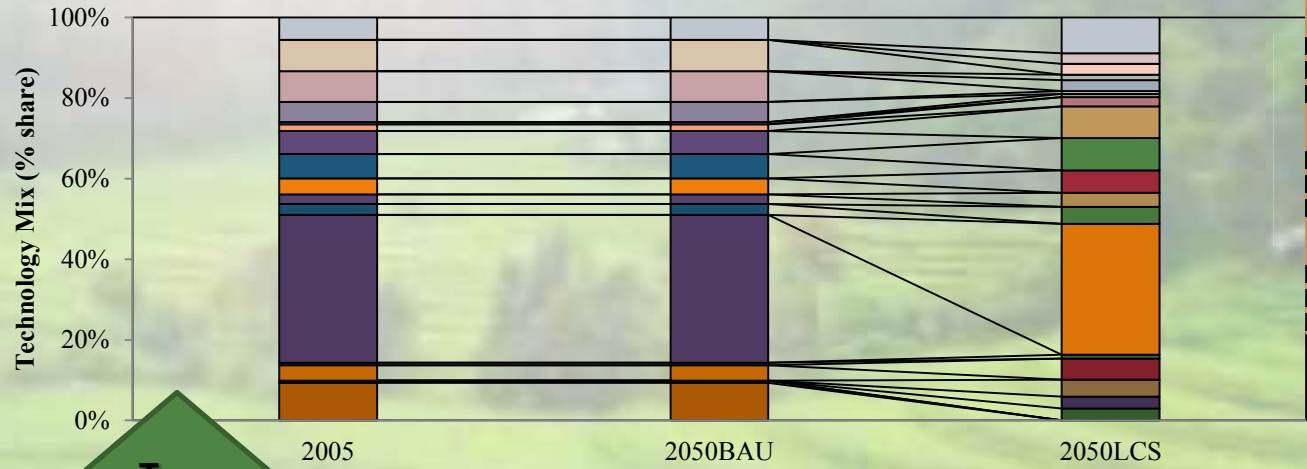
Comfort houses



- Fluorescent
- T5 lamp
- Electric pan
- Electric pot
- Iron
- Stereo set
- Telephone set
- Air conditioner
- Refrigerator with COP-6
- Incandescent
- LED lamp
- Efficient electric pan
- Efficient electric pot
- Efficient iron
- Efficient stereo set
- Efficient telephone set
- Air conditioner with COP-6
- Refrigerator with COP-9
- Kerosene lamp
- Rice cooker
- Gas stove
- Water heater
- Television set
- Computer set
- Electric fan
- Air conditioner with COP-9
- Other equipments
- Compact fluorescent
- Efficient rice cooker
- Efficient gas stove
- Efficient water heater
- LED television
- Efficient computer set
- Efficient electric fan
- Refrigerator

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Action 5: Thai Style Comfortable Houses



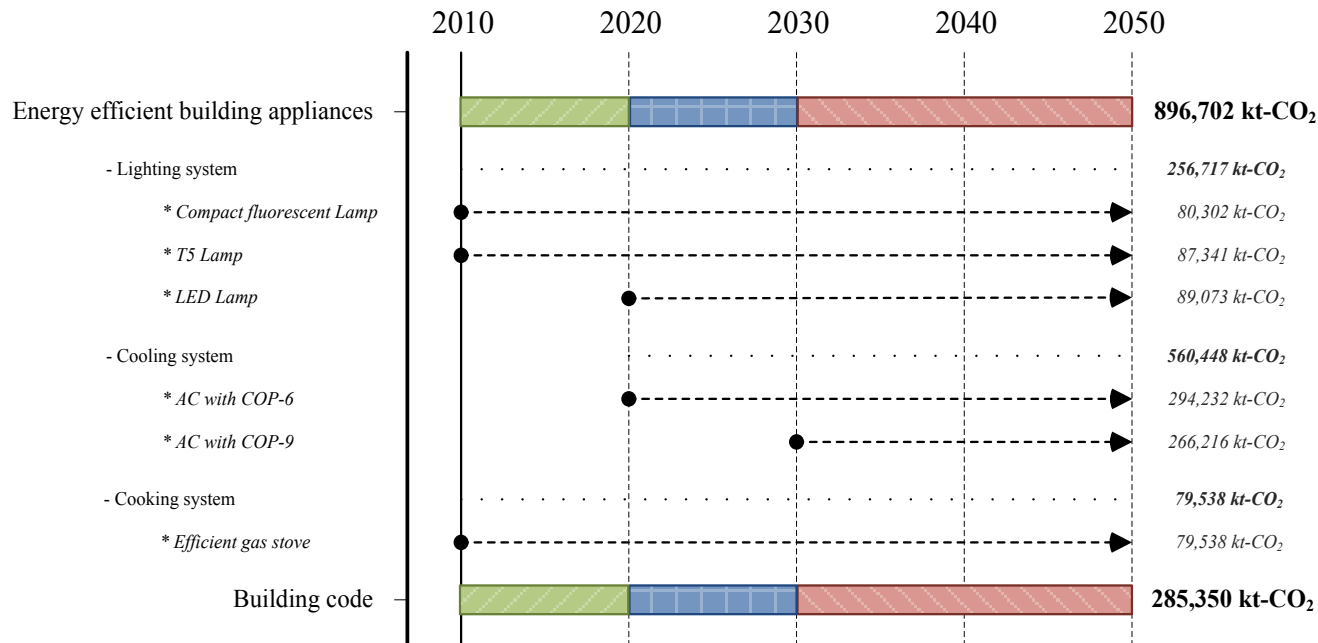
Technology

Fuel Mix

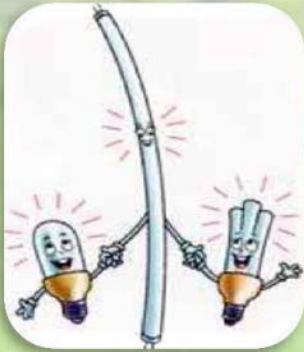
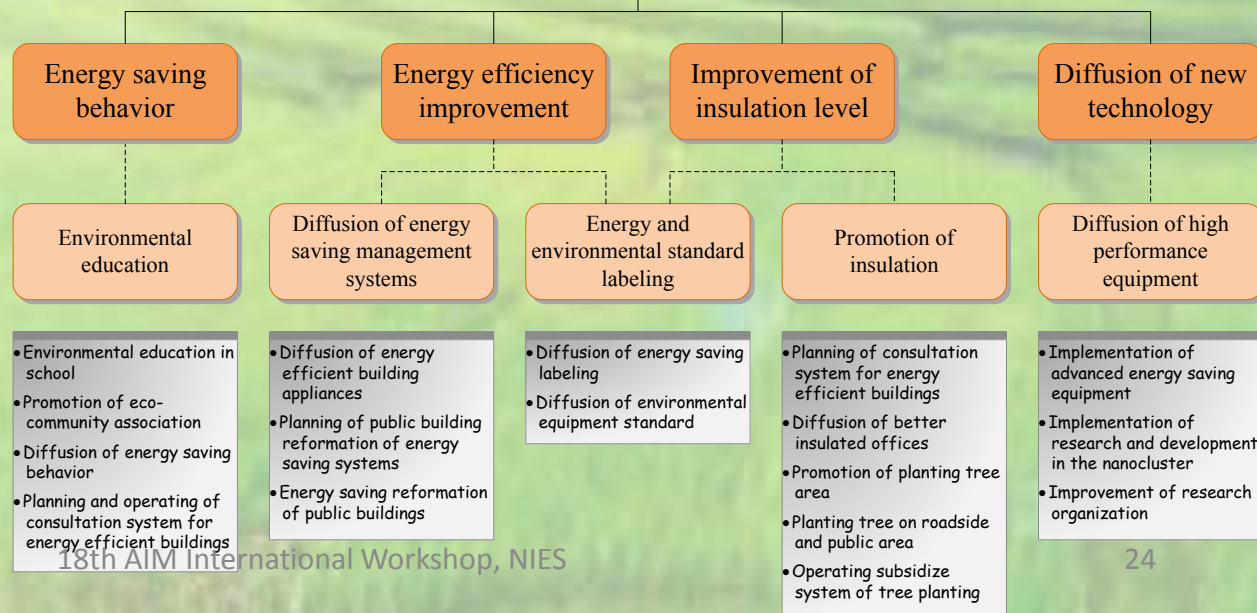


LCP-ABS

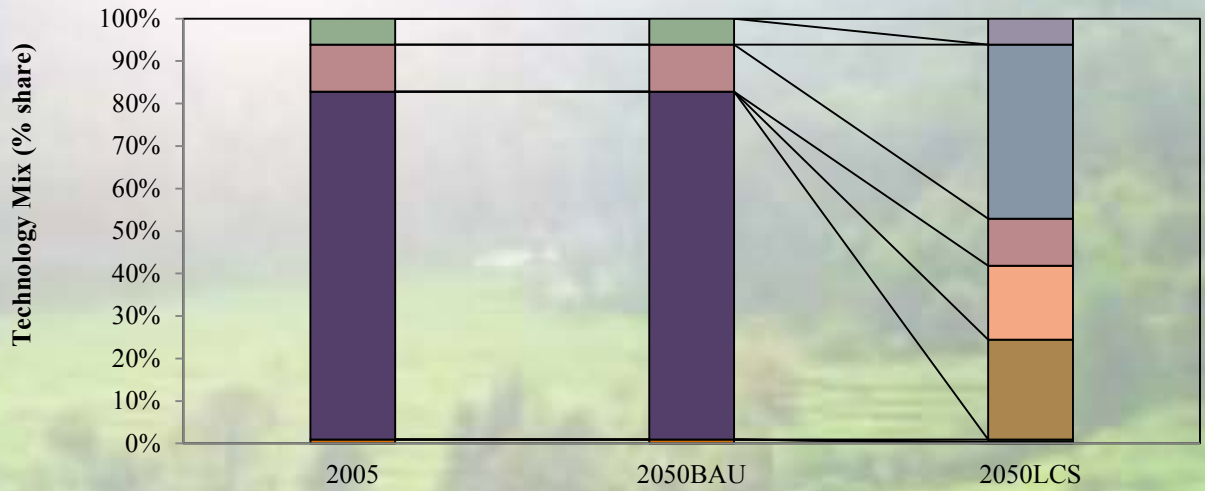
Action 6: Modern Buildings



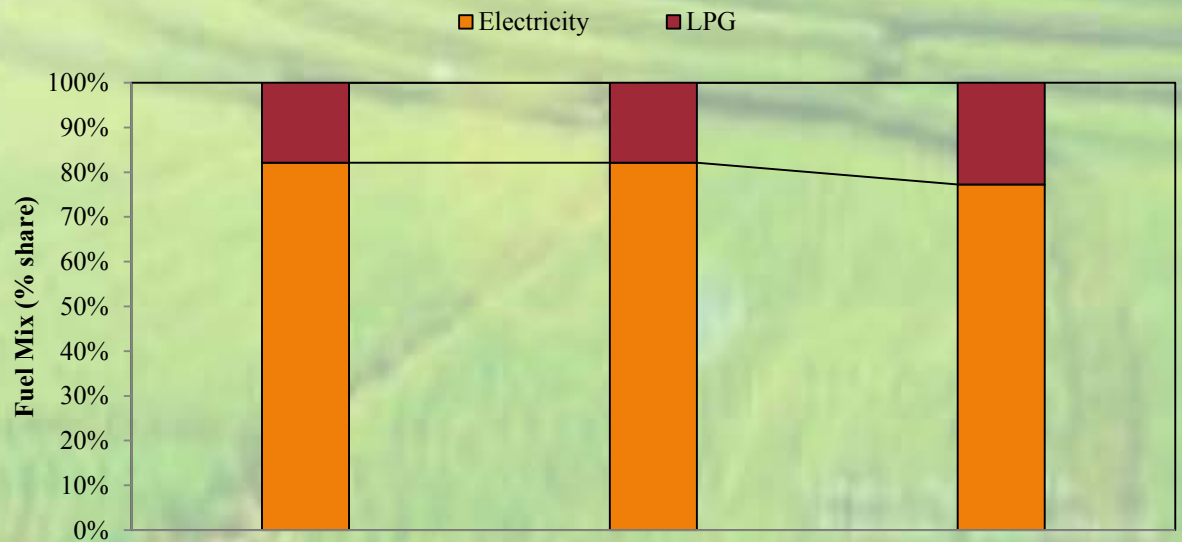
Modern buildings



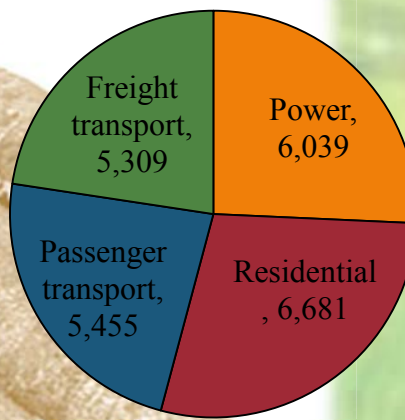
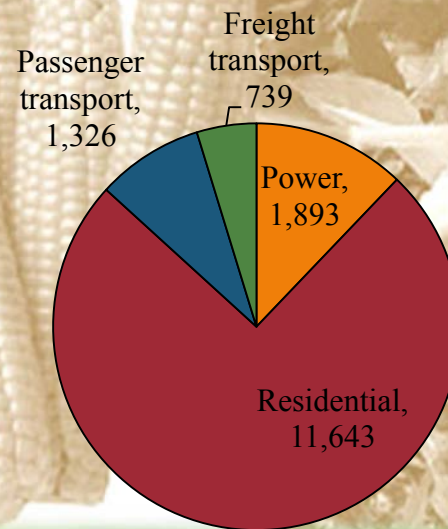
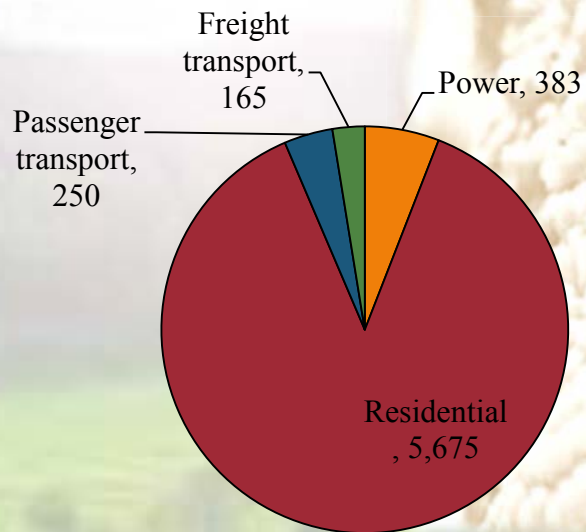
- Existing fluorescent ■ Compact fluorescent ■ T5 (Lighting) ■ LED (Lighting)
- Airconditioner ■ Airconditioner-COP 6 ■ Airconditioner-COP 9 ■ Others
- Building code ■ Stove ■ Efficient stove



LCP
Action 6:
Modern
Buildings



Renewable Energy Potentials

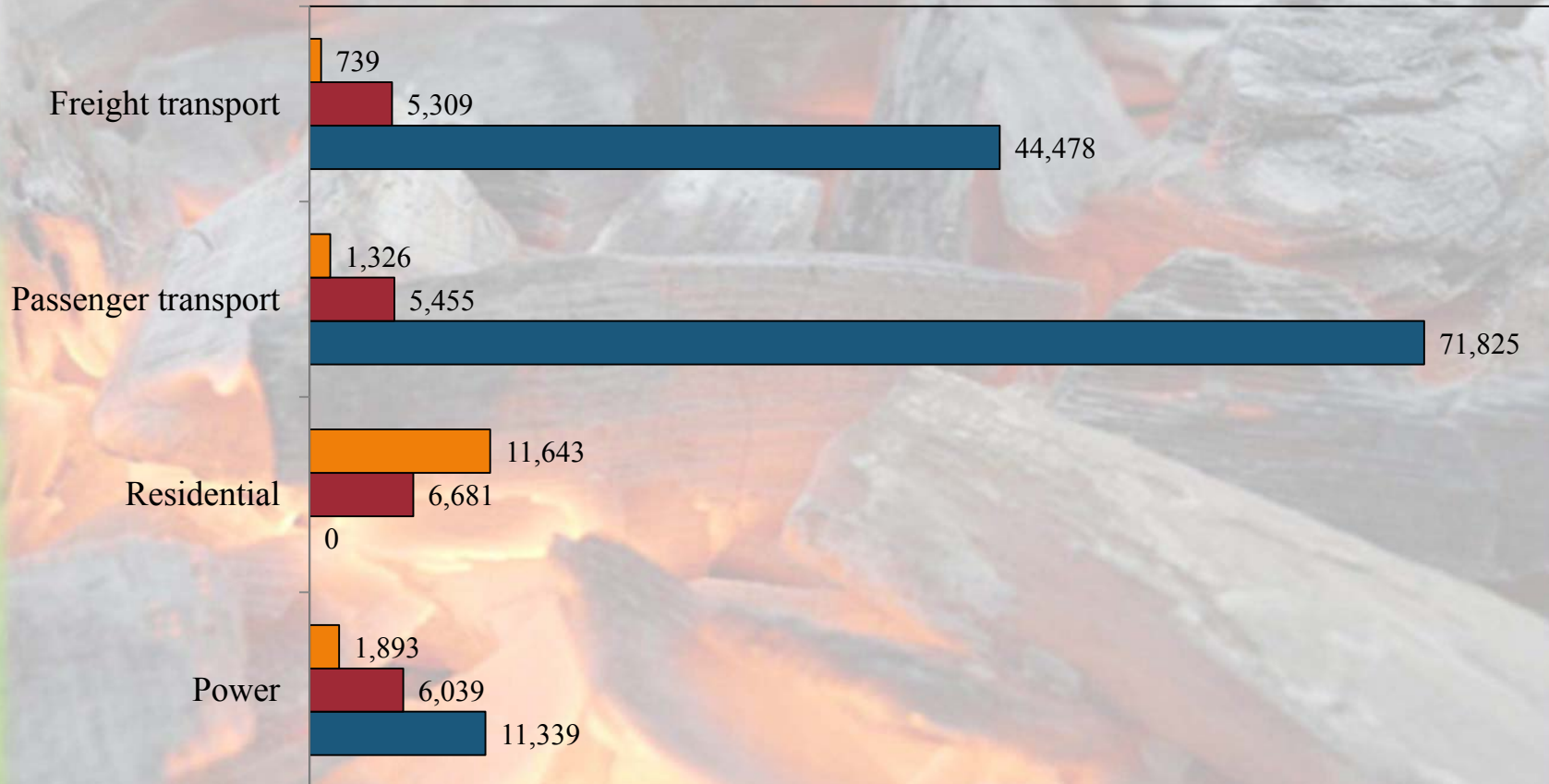


Renewable Energy Potentials

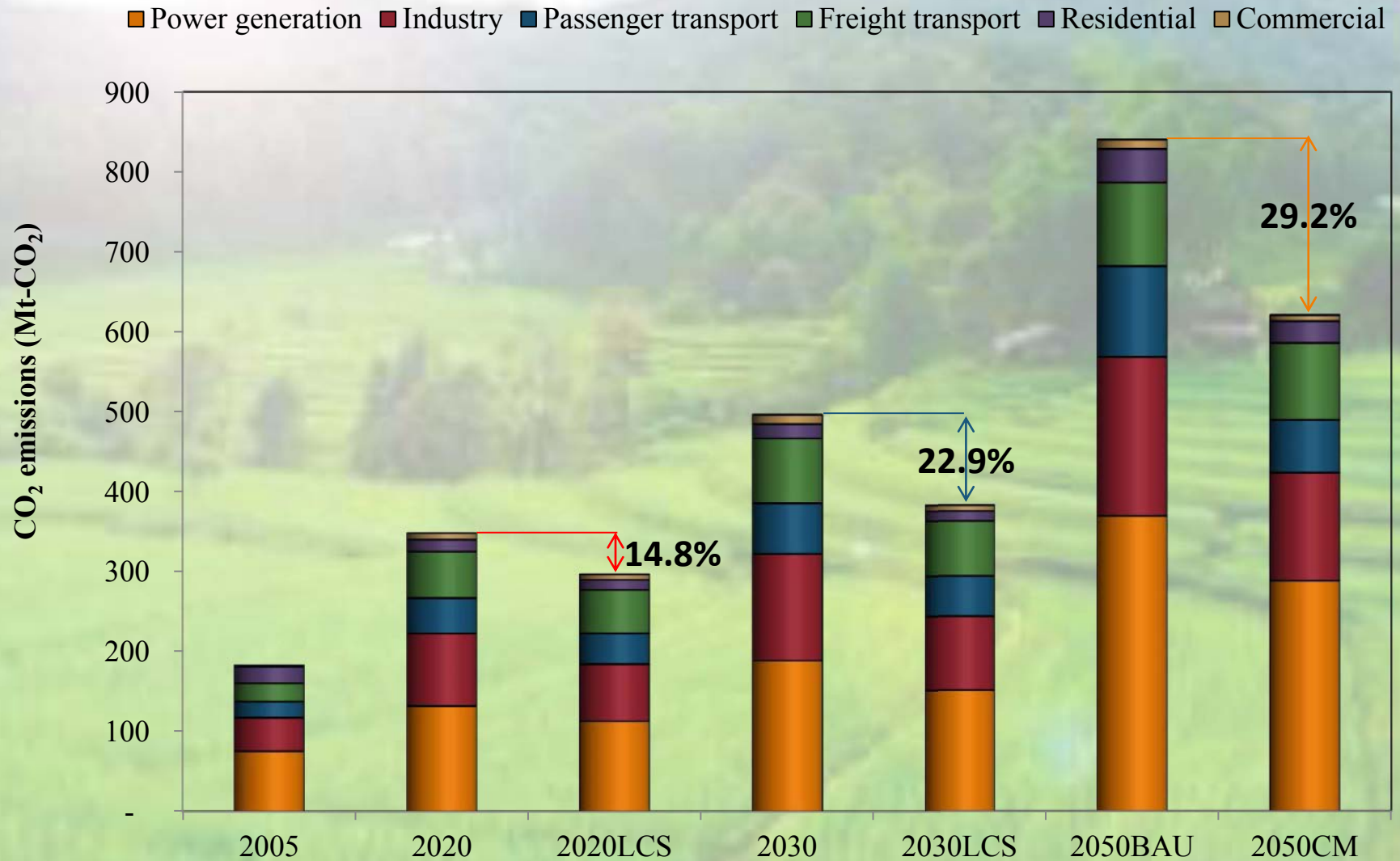
Renewable energy use in BAU

Renewable energy use in LCS

CO2 reduction



GHG Emissions/Reductions



What is the next for Thailand LCS after 2012?

Thailand's Future Plan

15th AIM International Workshop, NIES, Japan

Feb 20, 2010

- Low carbon society (within April 2010)
- AIM End-Use Model
- AIM-MARKAL Integrated Analysis
- Integrated analysis of RE & EE
- Evaluation of low carbon scenarios
- AIM/CGE for Policy Assessment



どうもありがとう

Thank You