Current Approaches, Challenges, and The Way Forward

Sectoral Challenges: Agriculture and Energy Sectors

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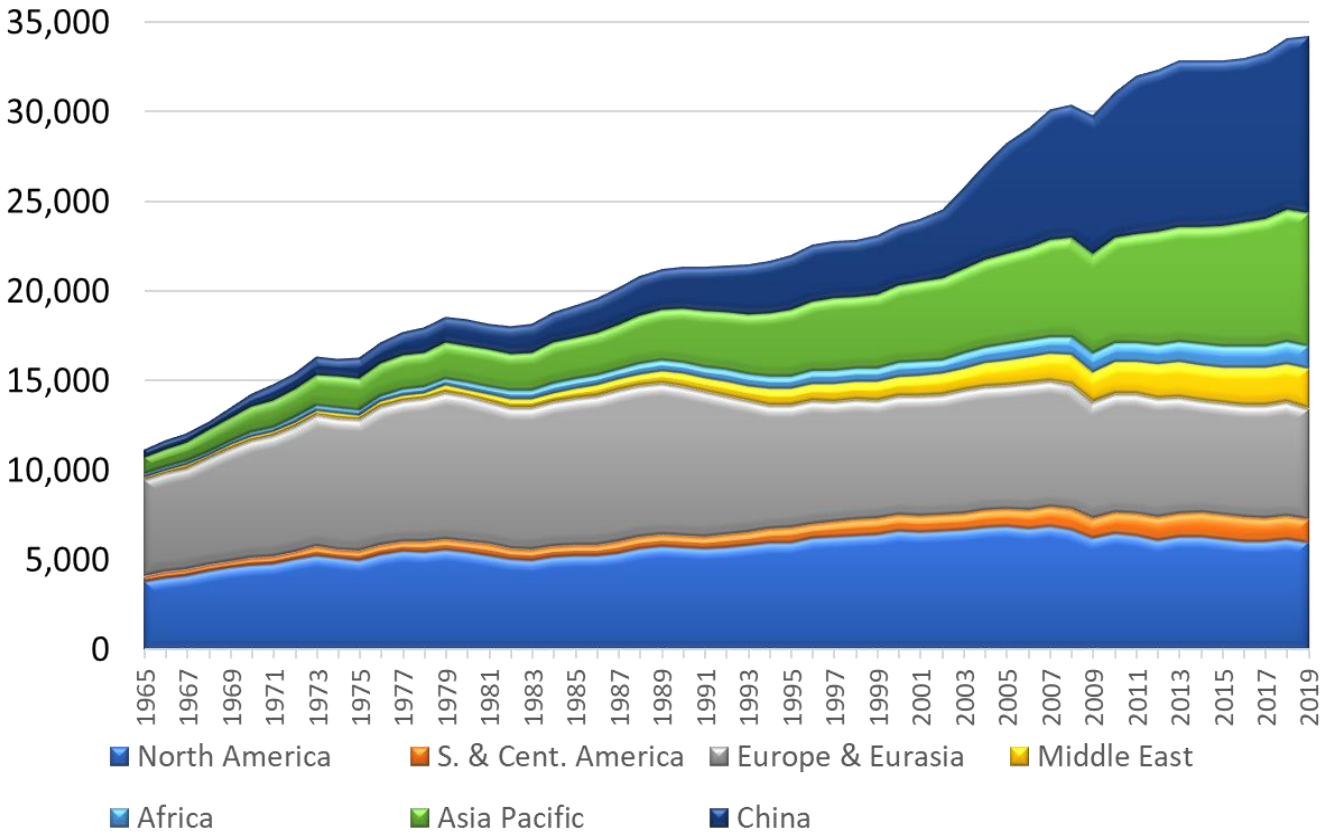
Policy Forum “Thailand’s Sustainable Green Growth: Embedding Resilience”
May 19, 2021
Bank of Thailand

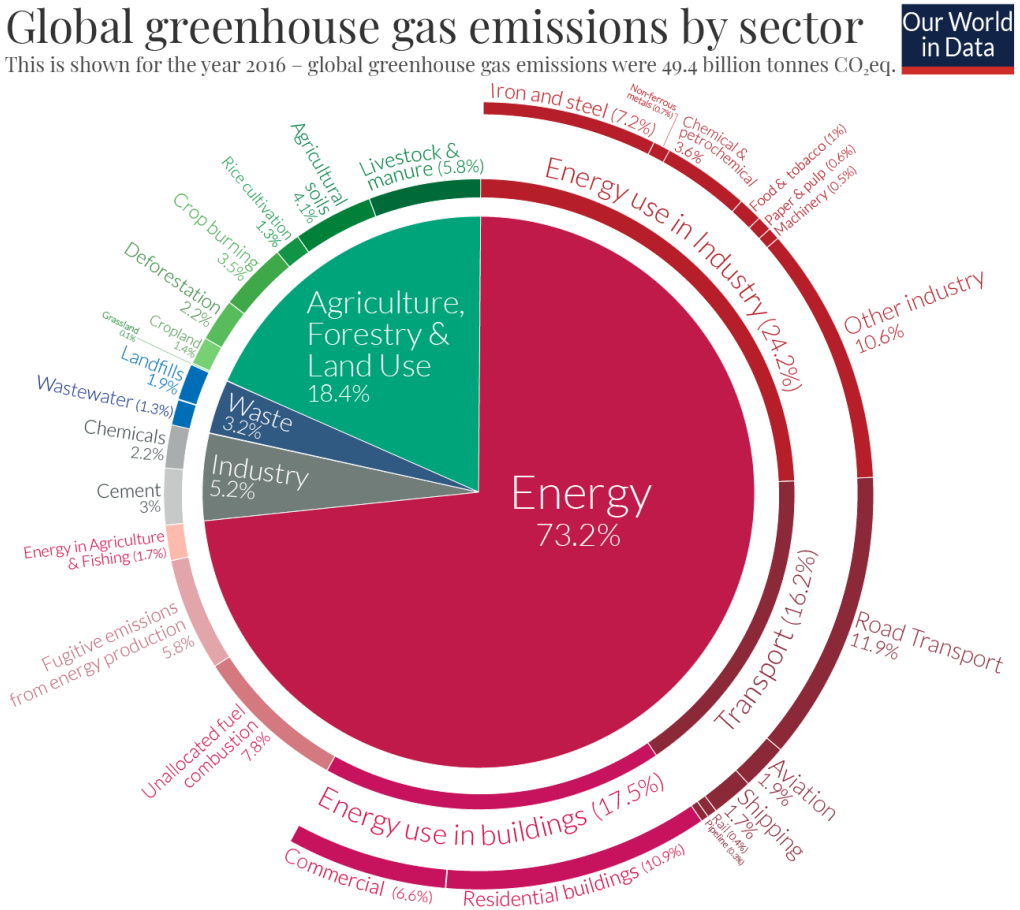
Introduction
Status of Greenhouse Gas Emission

GHG emission has increased over time!

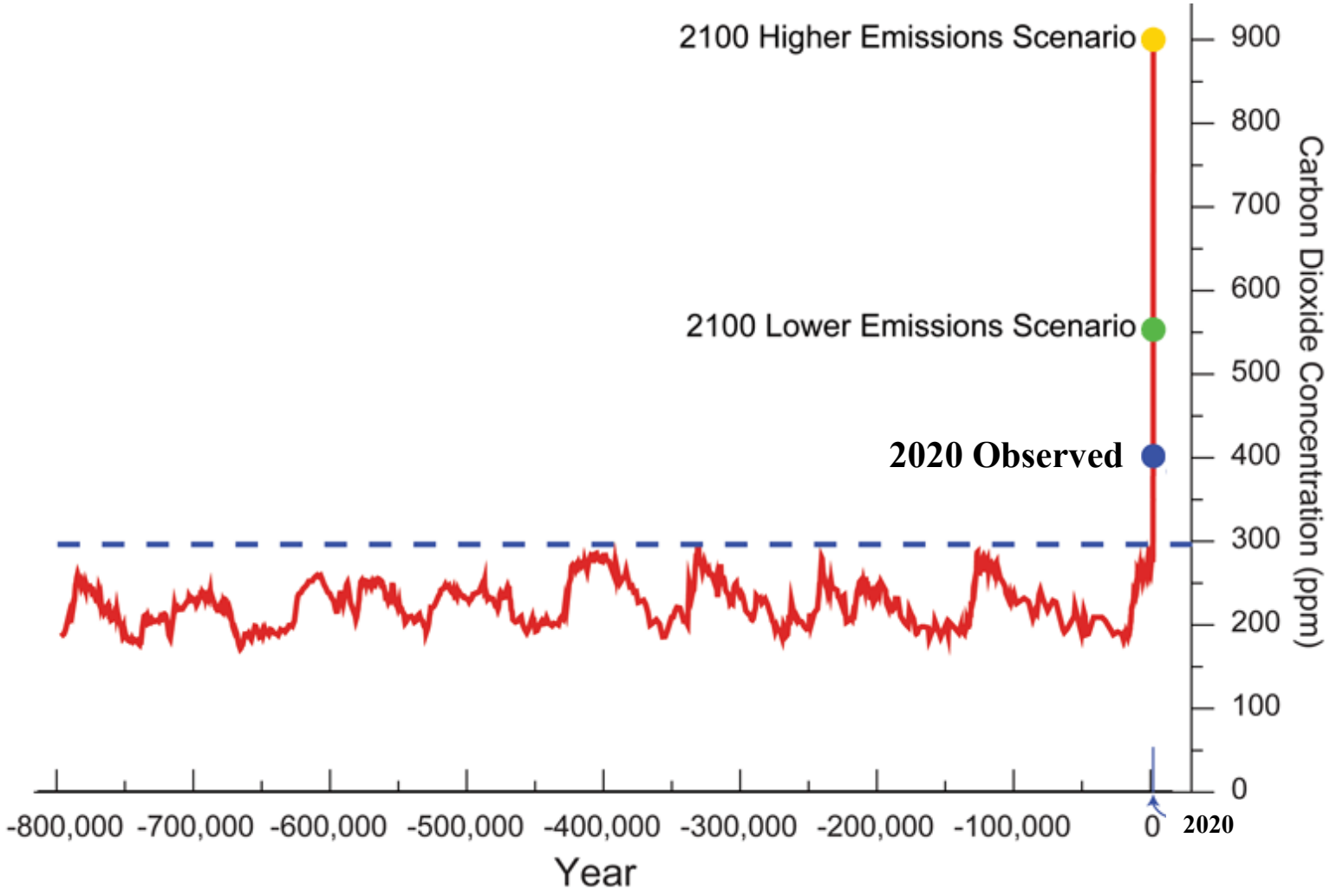


Source: BP Statistical Review of World Energy (2020)

Energy & Agricultural sectors are major sources of GHG emission



Introduction
Status of Atmospheric CO_2 Concentration



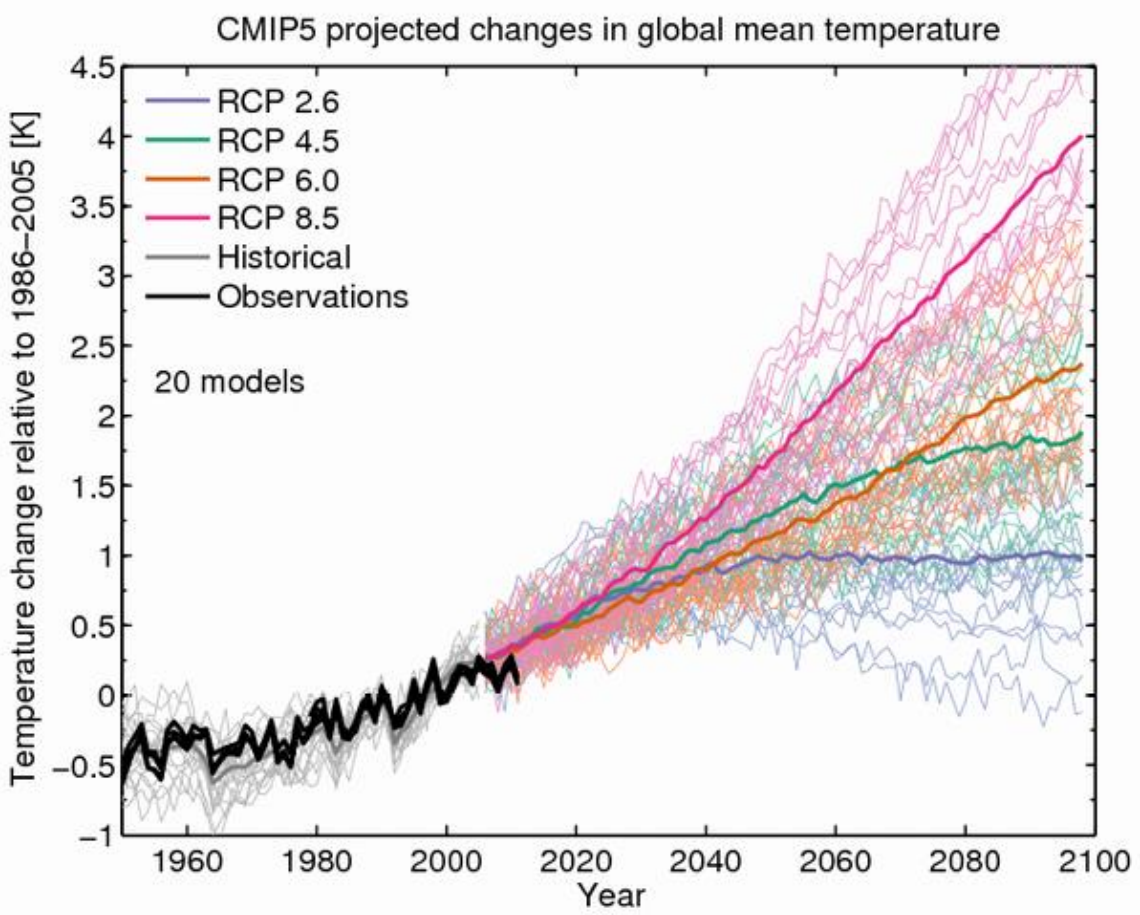
Source: Adapt from IPCC (2013)

Current and expected atmospheric CO_2 concentrations exceed the historic levels !!!

Impacts may be bigger than the history of the mankind !!!

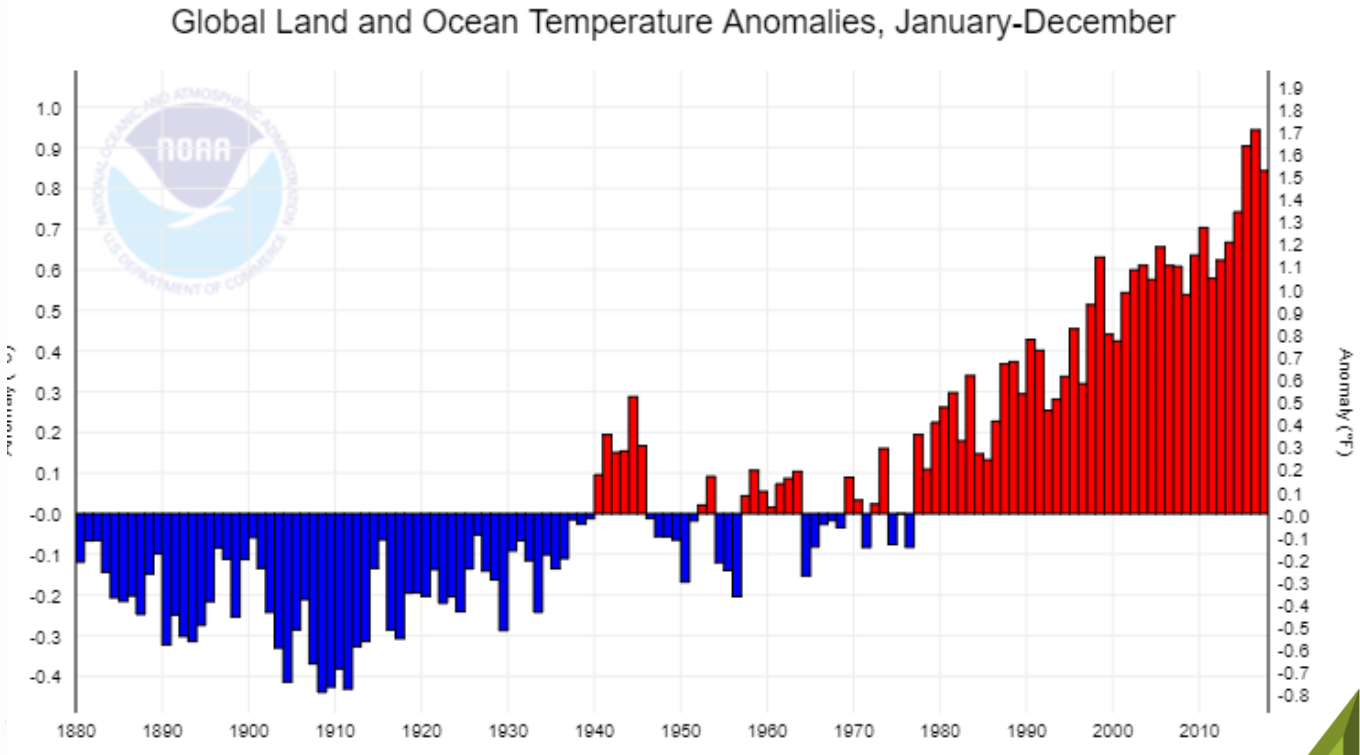
Introduction
Effect of Climate Change on Temperature

Average global surface temperature is projected to increase 1 - 4°C in 2100



Source: KNMI Climate Change Atlas

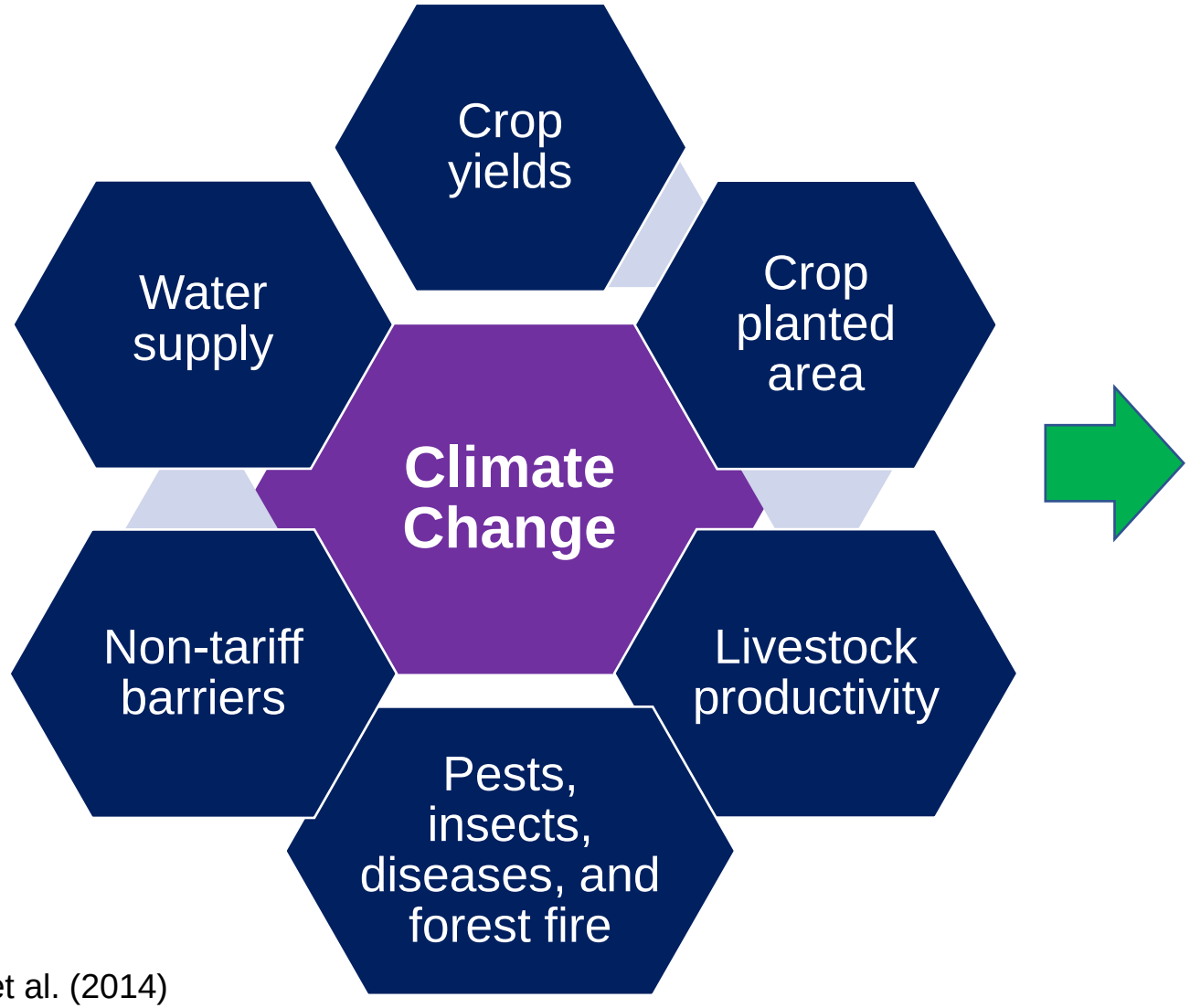
- 43rd consecutive year (since 1977) annual temp above 20th century average
- The 6 hottest years in the world happened in the past 6 years (2015-2020)
- 2020 was the second warmest year in NOAA's 139-year series



Source: NOAA

Challenges in Agriculture Sector

Challenges in Agriculture Sector
Impacts of Climate Change on Agriculture



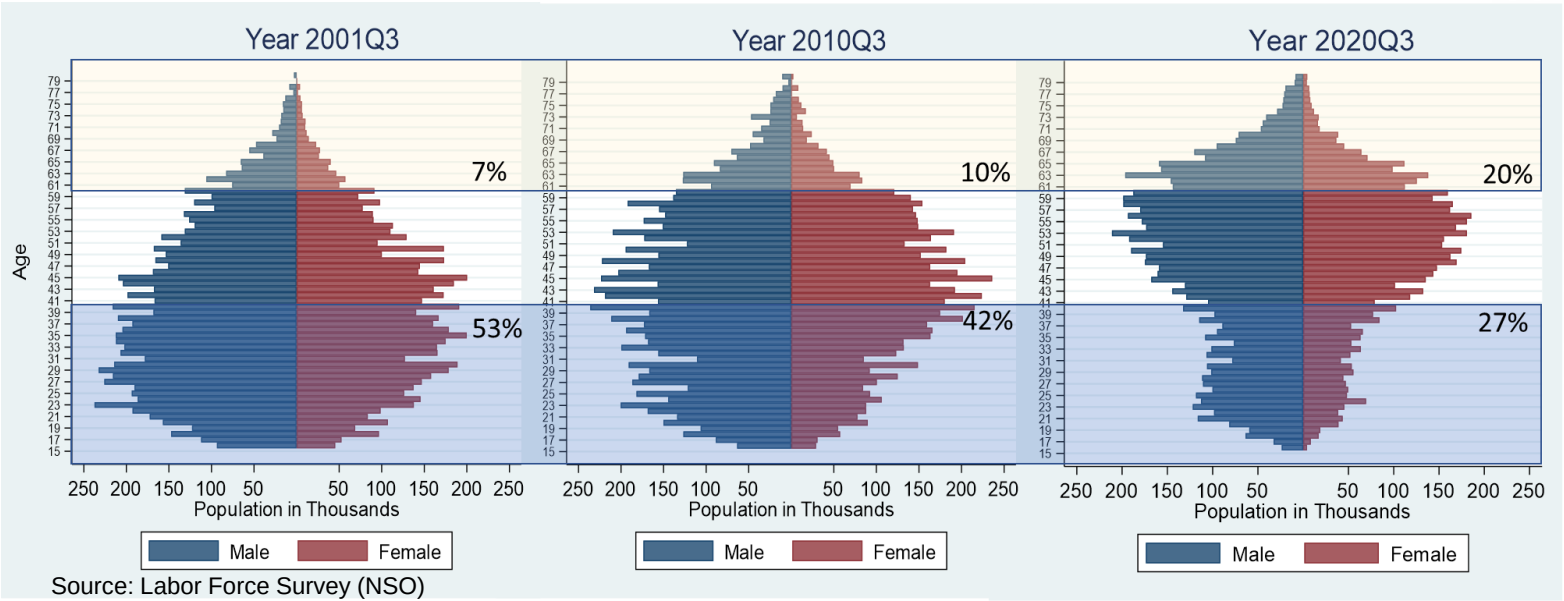
Source: McCarl et al. (2014)

Challenges in Agriculture Sector
Impacts of Climate Change on Agriculture

Agriculture plays a crucial role in Thailand:
- 8.1 million households (OAE, 2021)
- 34.1% of total labor force (NSO, 2020)
- 9.1% of GDP

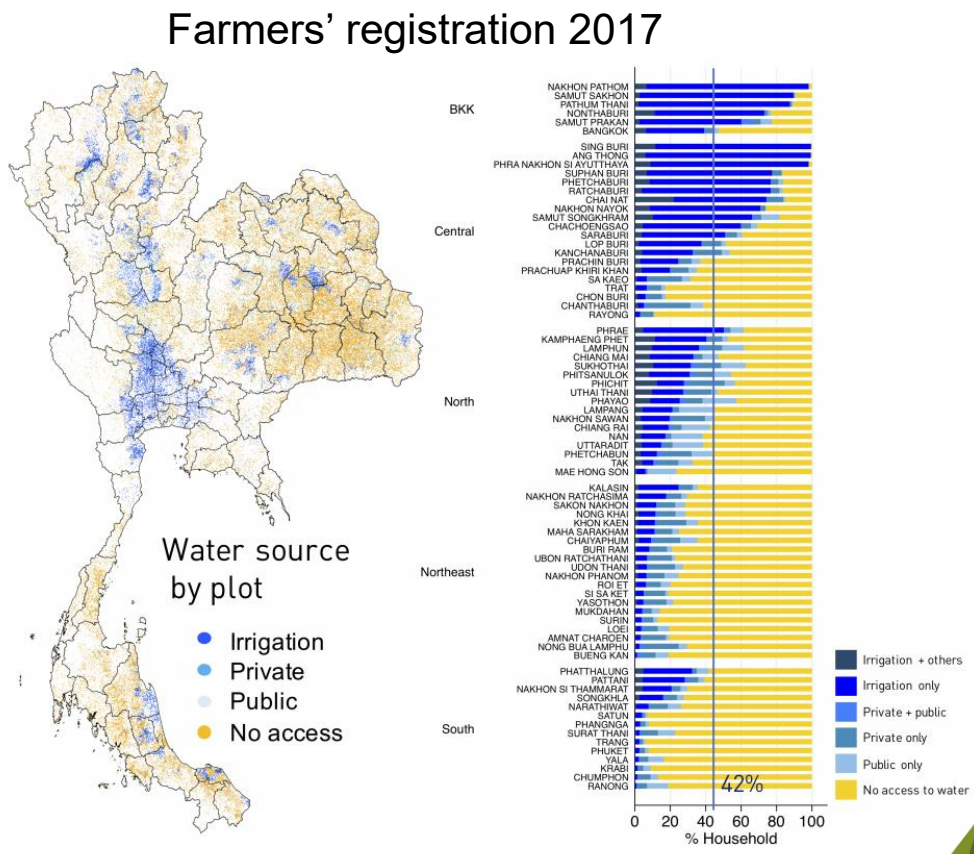
It has likely been affected by climate change…
- Low education (4.46% of farmers graduated at least grade 12)
- Most of the farmers are smallholders

- Thai agriculture is facing the aging problem



Source: Labor Force Survey (NSO)

- Only 26% of the agricultural households could access irrigation systems



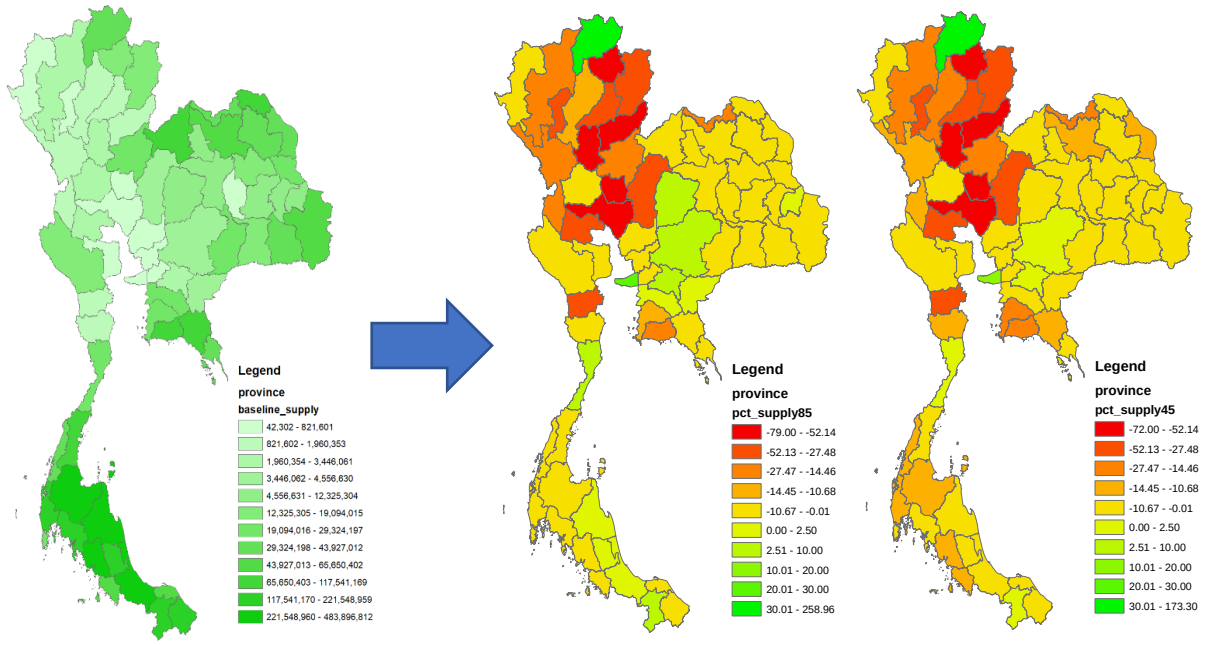
Source: Attavanich et al. (2019)

Challenges in Agriculture Sector
Impacts of Climate Change on Paddy Production

Rubber and all types of rice's production will be negatively affected by climate change

% changes of total production in 2046-2055 under scenarios from the baseline 1992-2016

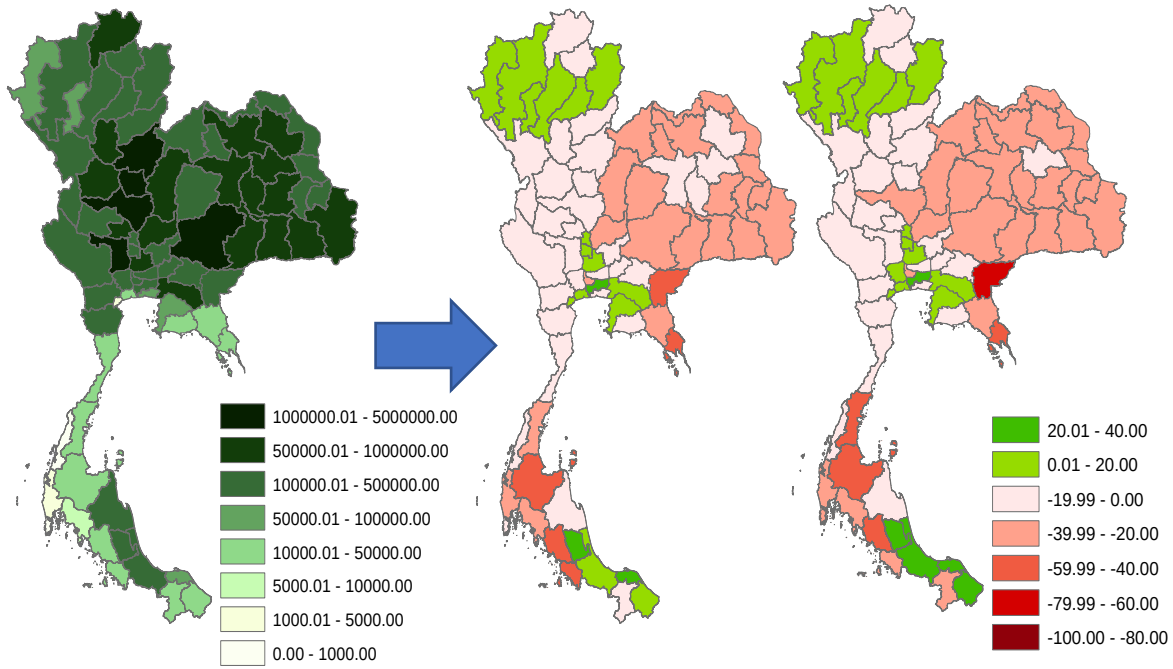
Rubber



Baseline production (MT) | % change of production with RCP 4.5 | % change of production with RCP 8.5

Source: Attavanich (2019)

All types of rice



Baseline production (MT) | % change of production with RCP 4.5 | % change of production with RCP 8.5

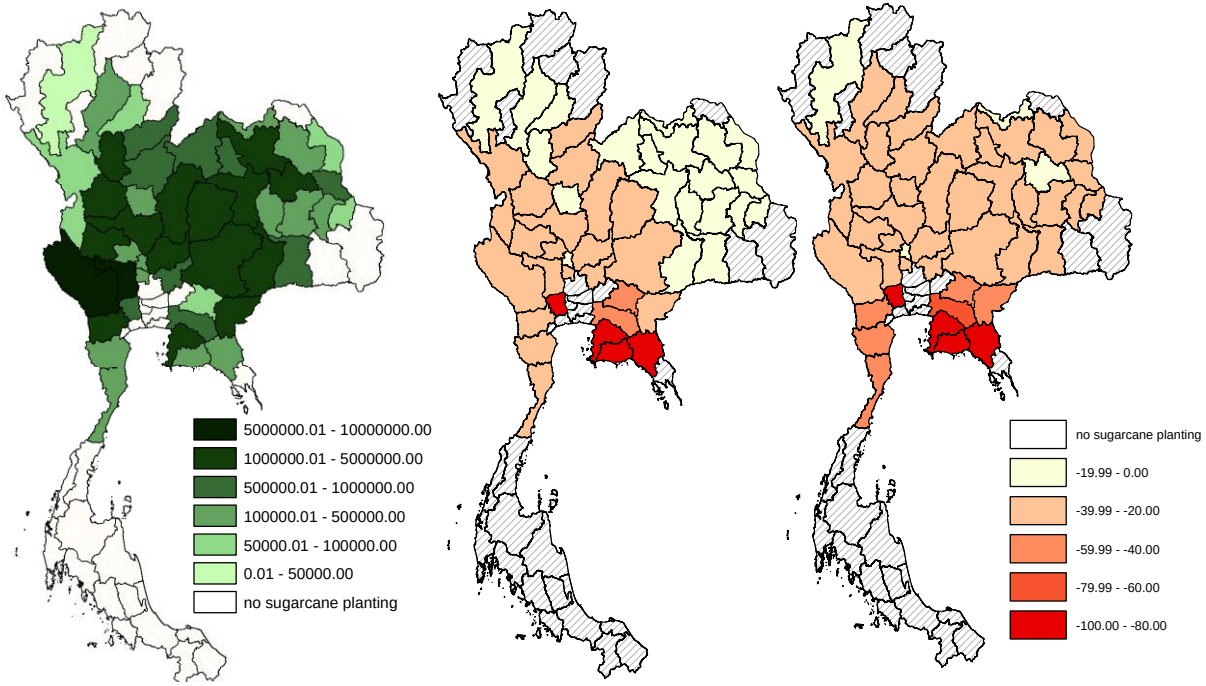
Source: Pipitpukdee and Attavanich (2020a)

Challenges in Agriculture Sector
Impacts of Climate Change on Production of Sugarcane & Cassava

Production of sugarcane and cassava will be adversely affected by climate change

% changes of total production in 2046-2055 under scenarios from the baseline 1992-2016

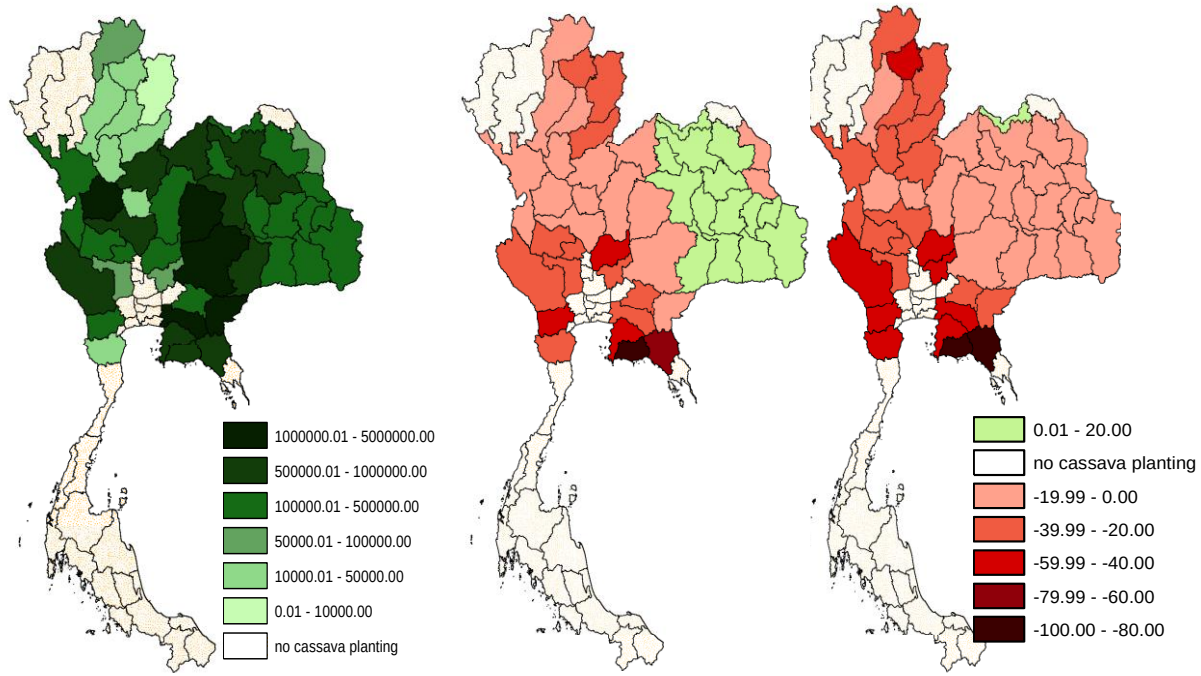
Sugarcane



Baseline production (MT) | % change of production with RCP 4.5 | % change of production with RCP 8.5

Source: Pipitpukdee and Attavanich (2020b)

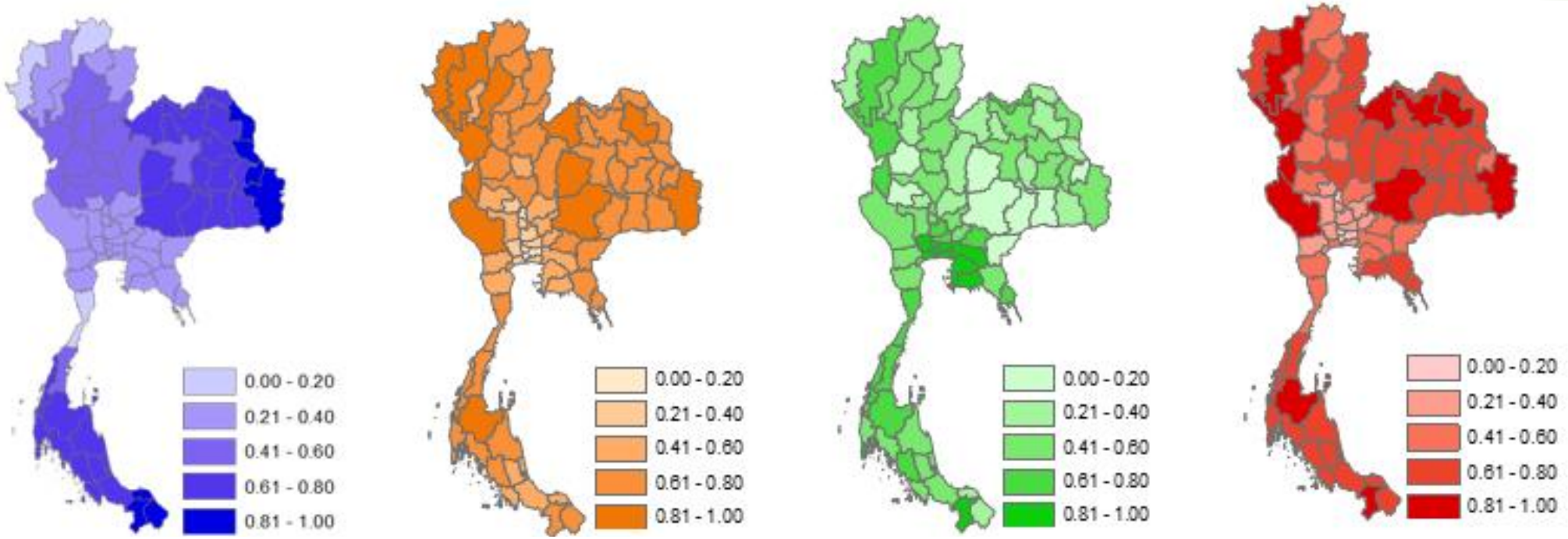
Cassava



Baseline production (MT) | % change of production with RCP 4.5 | % change of production with RCP 8.5

Source: Pipitpukdee and Attavanich (2020c)

Challenges in Agriculture Sector
Impacts of Climate Change on Vulnerability of Food Security



a. Exposure b. Sensitivity c. Adaptive Capacity d. Vulnerability

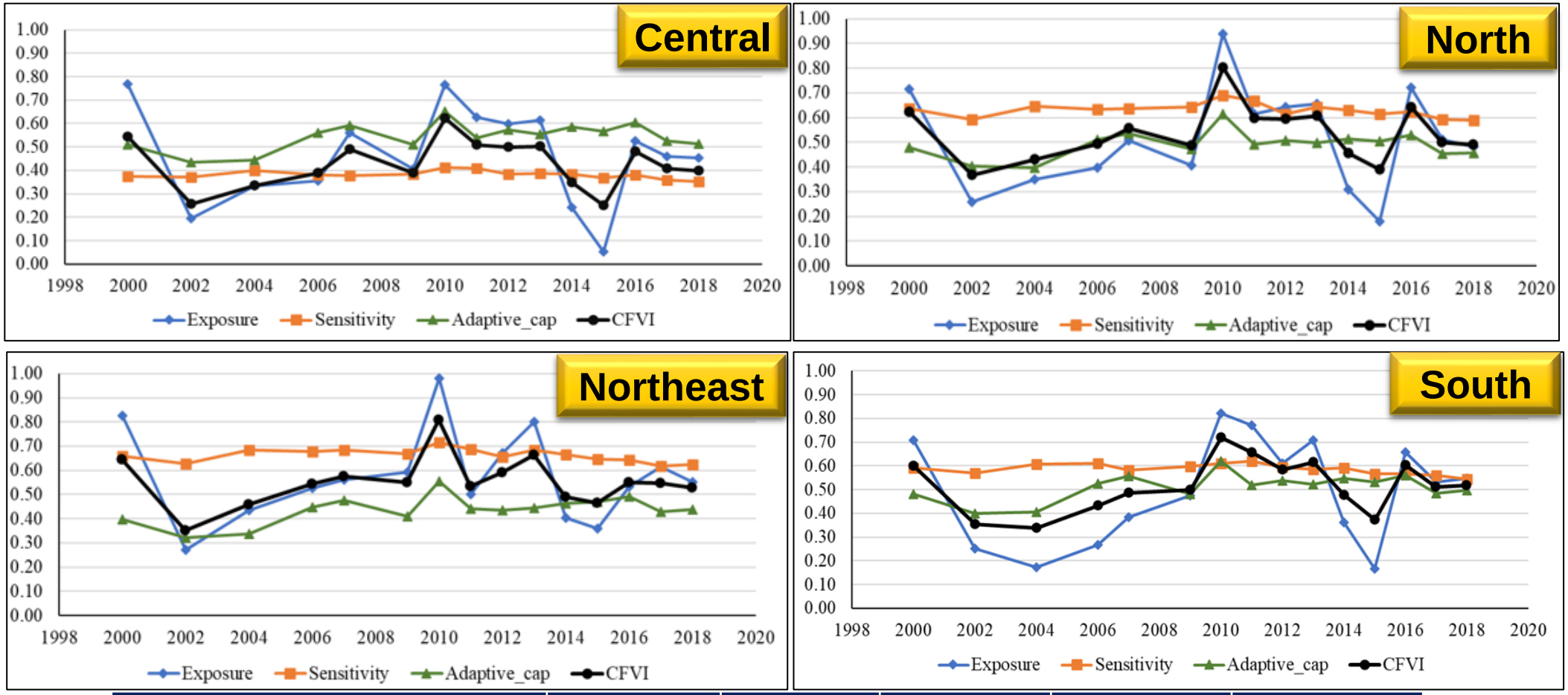
The components and climate-induced food insecurity vulnerability status of year 2018

- **Exposure** : NE & S exposed with climate than other regions
- **Sensitivity** : Border provinces in N and some provinces in NE & S were more sensitive than other regions
- **Adaptive Capaci**ty : Lower N & NE had low adaptive capacity
- **CFVI** : Border provinces and some provinces in NE & S had very high vulnerability

Source: Pipitpukdee (2020)

Challenges in Agriculture Sector
Impacts of Climate Change on Vulnerability of Food Security

The average score of components and CFVI status from 2000-2018



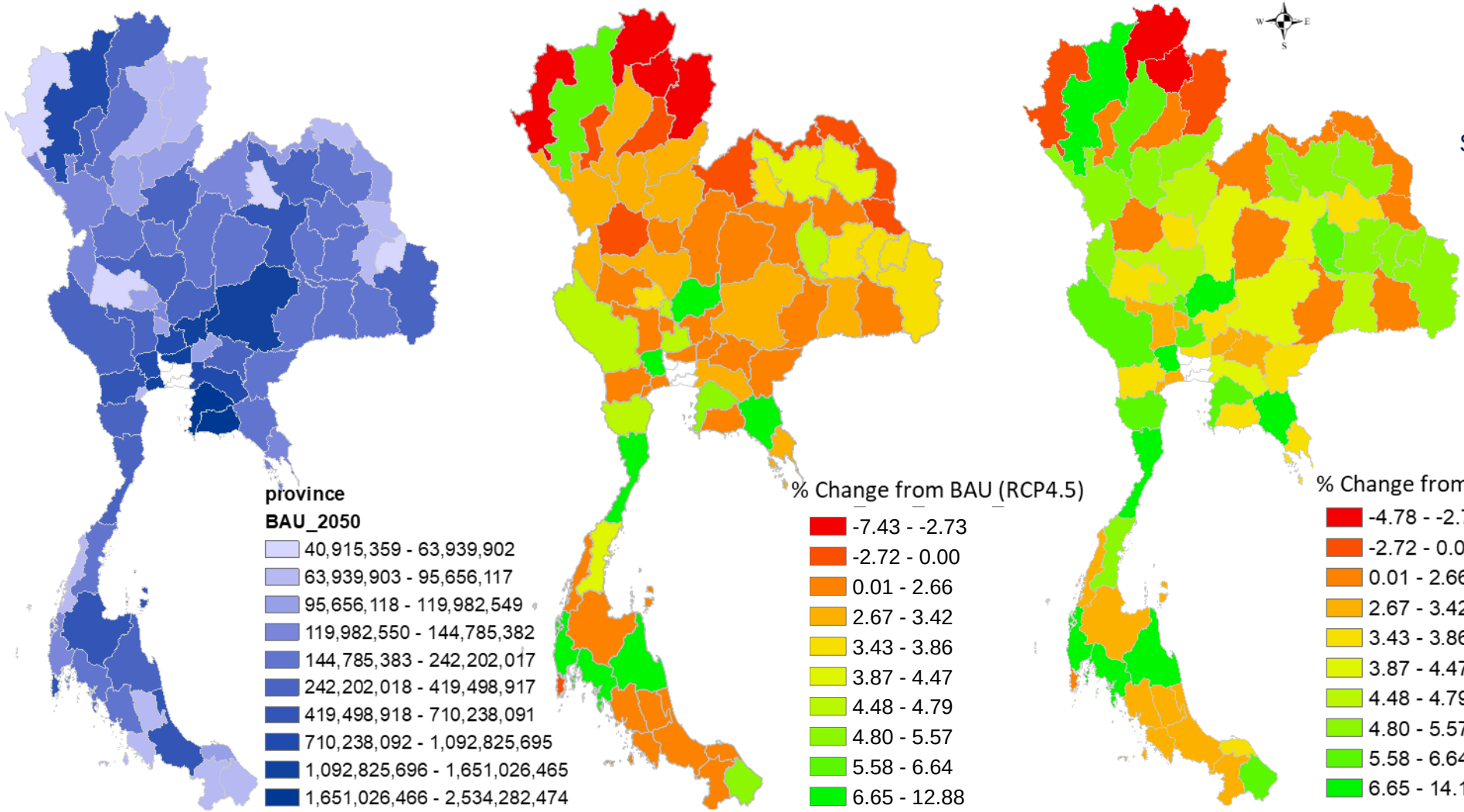
Index	0-0.2	0.2-0.4	0.4-0.6	0.6-0.8	0.8-1.0
Severity of Vulnerability	Very low	Low	Medium	High	Very High

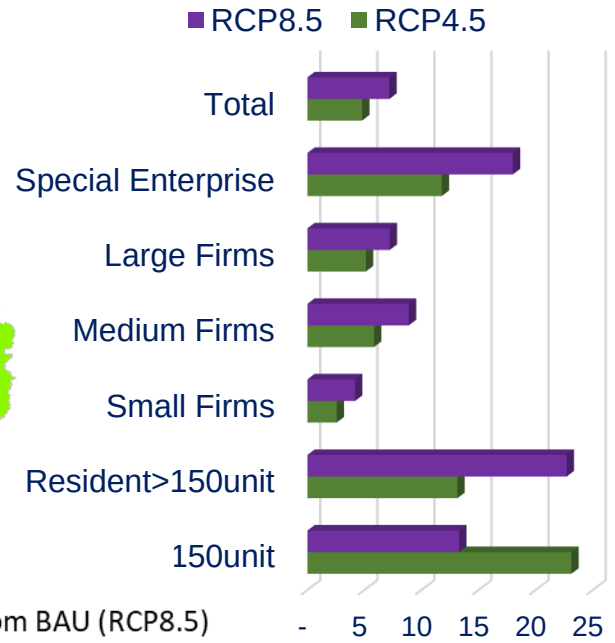
Source: Pipitpukdee (2020)

Challenges in Energy Sector

Challenges in Energy Sector
Impacts of Climate Change on Energy Demand

Climate change will increase the PEA electricity demand with heterogeneous effects across provinces & users





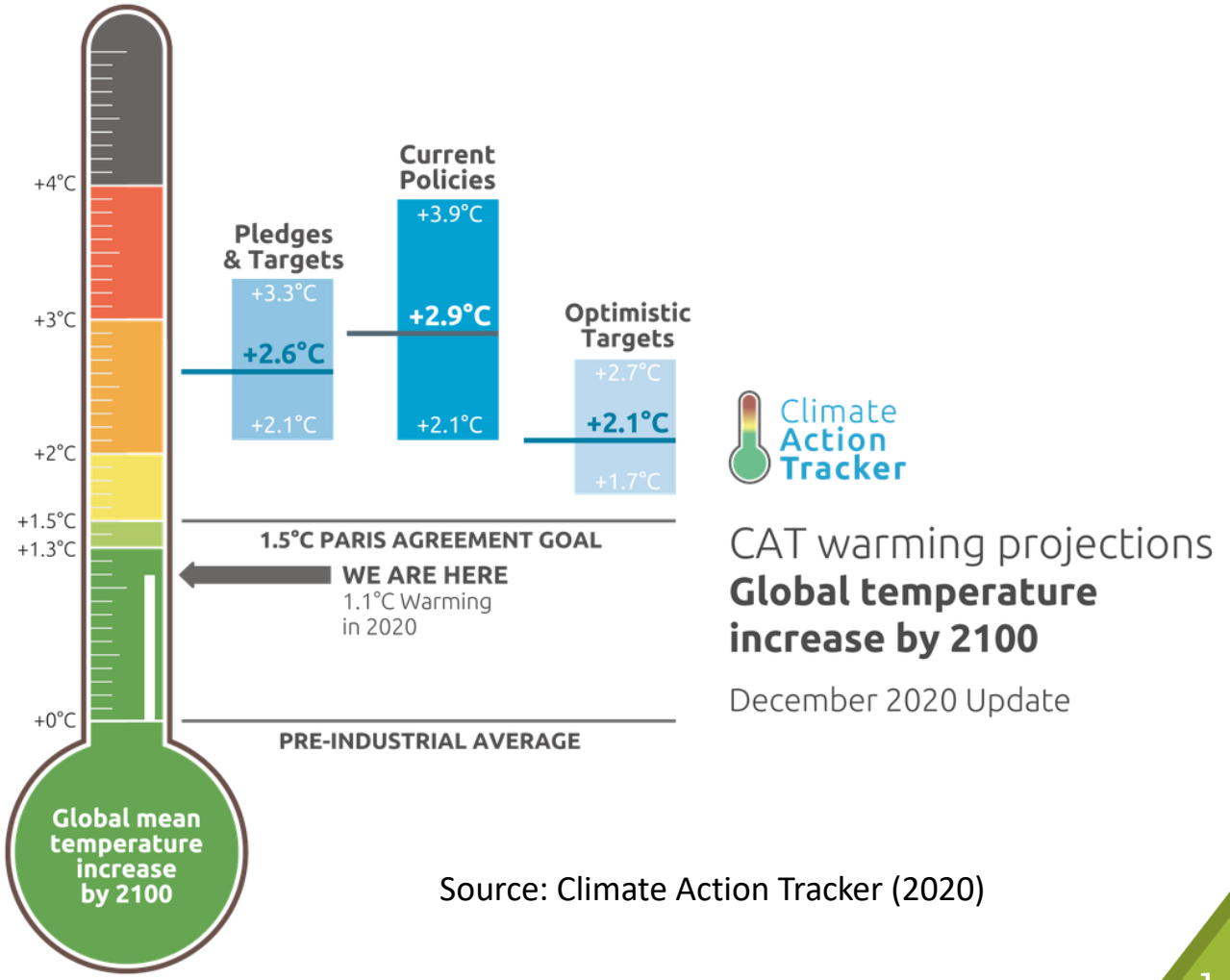
Source: Vichiansathaporn and Attavanich (2021)

International Pressures:

7 AFFORDABLE AND CLEAN ENERGY

SUSTAINABLE DEVELOPMENT GOALS

UNITED NATIONS
PARIS CLIMATE AGREEMENT
SIGNING CEREMONY
22 APRIL 2016

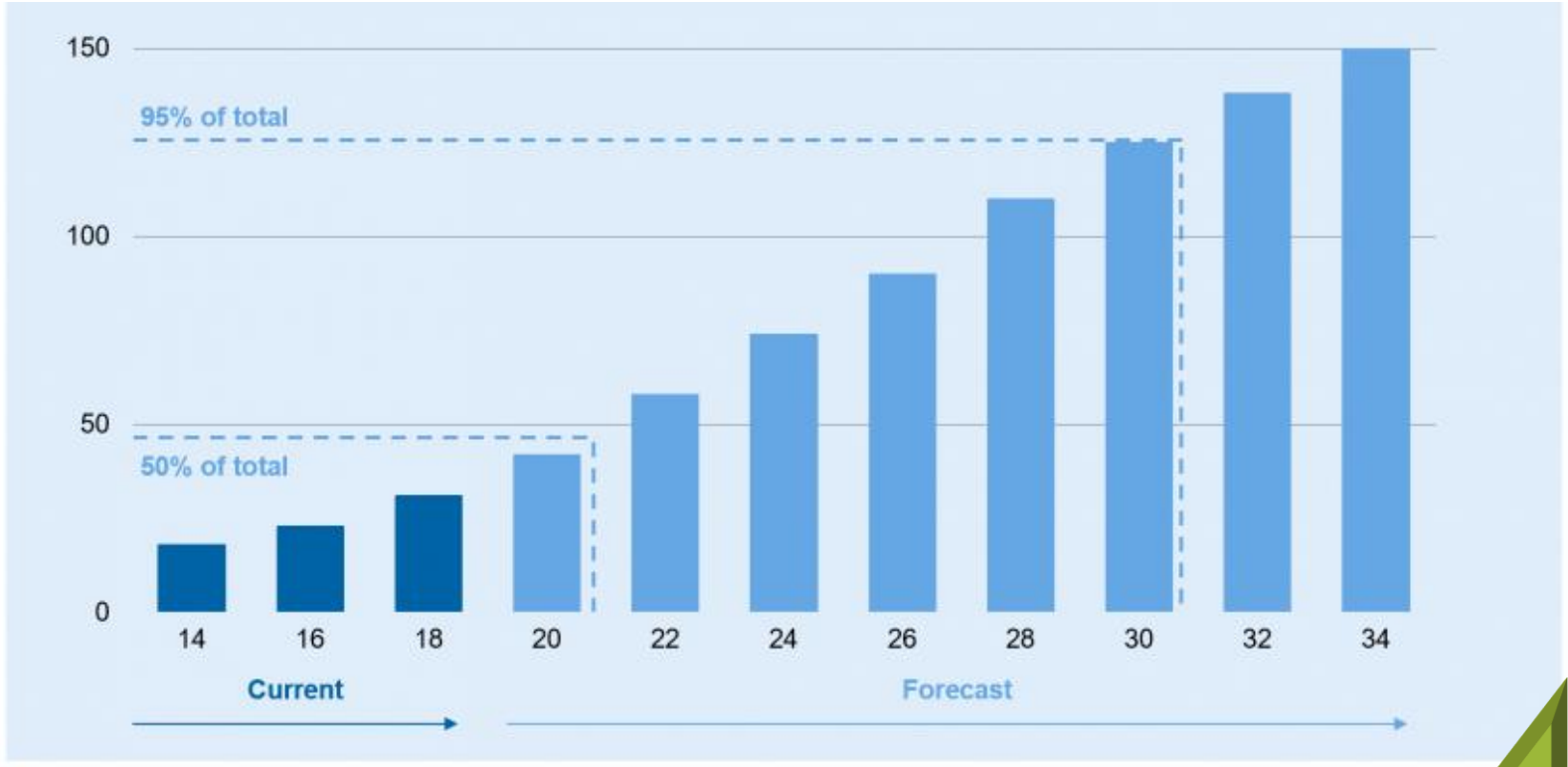


Source: Climate Action Tracker (2020)

Megatrend

ESG investing is rapidly becoming one of the most durable megatrends in the financial community

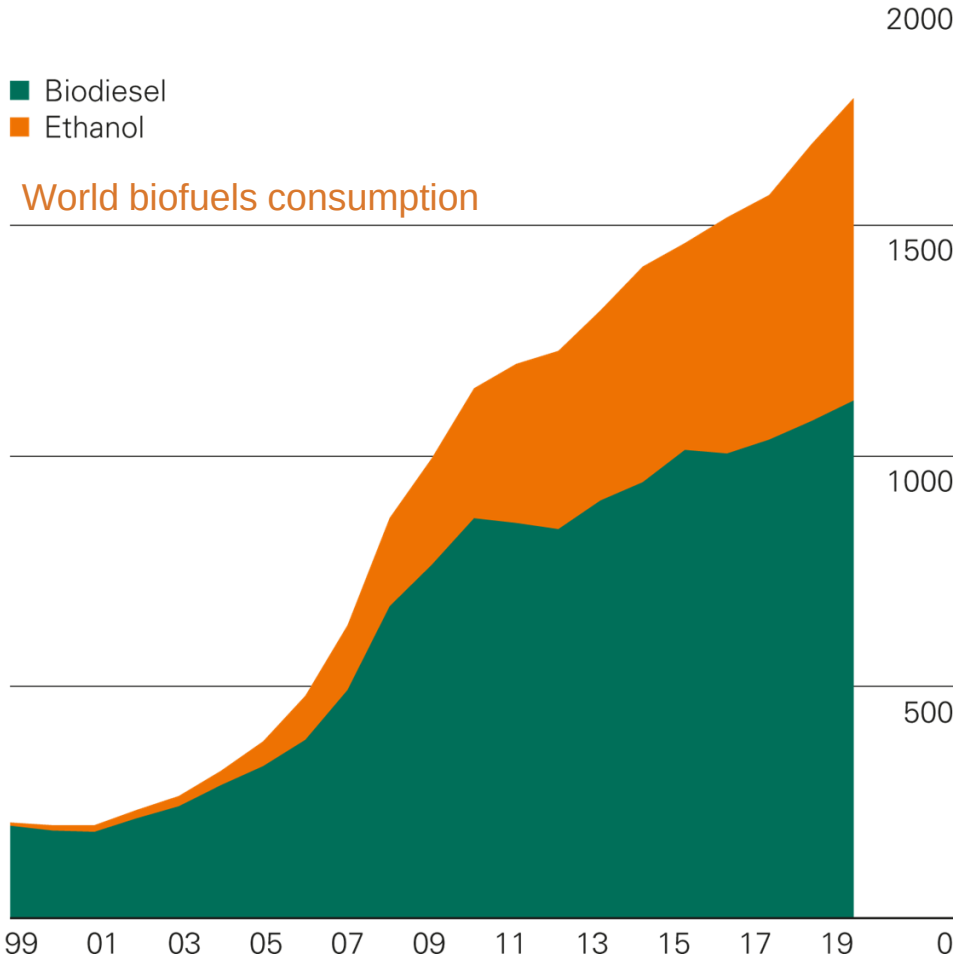
https://sustainability-academy.org

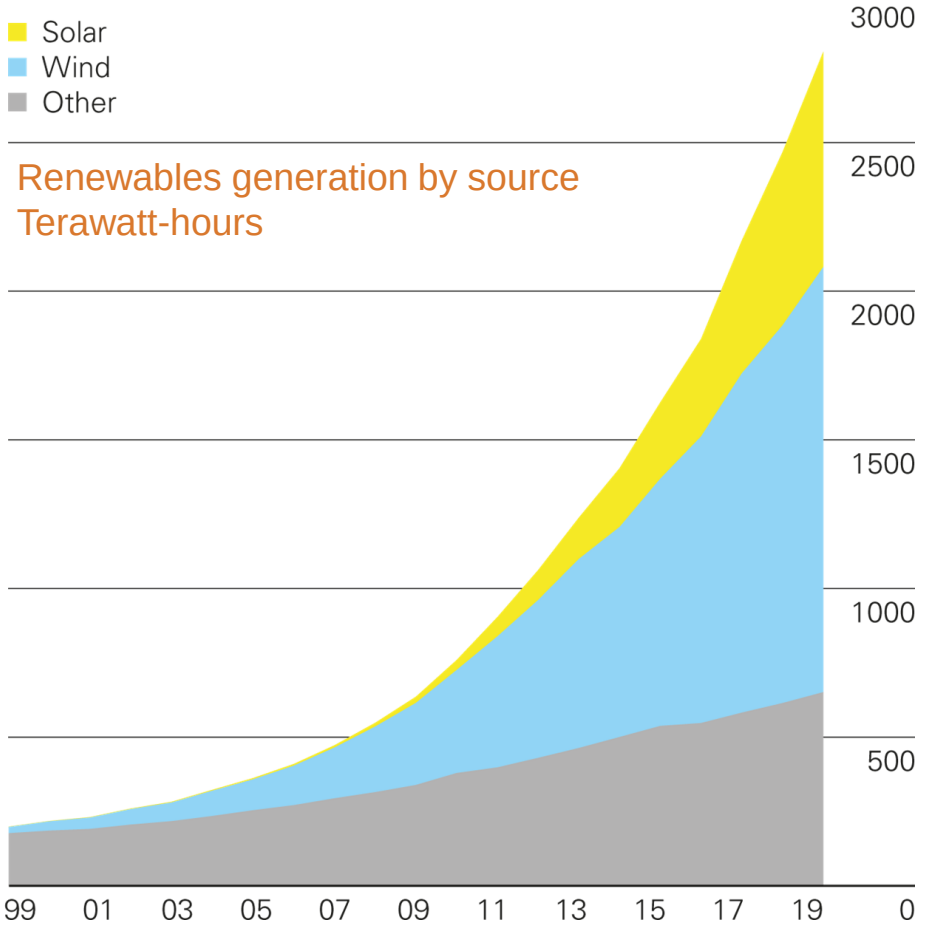


Source: Deutsche Bank, Global Sustainable Investment Alliance, zeb research

Challenges in Energy Sector
Transition from Fossil Fuels to Renewable Energy

Renewable energy has been increasingly produced and consumed overtime



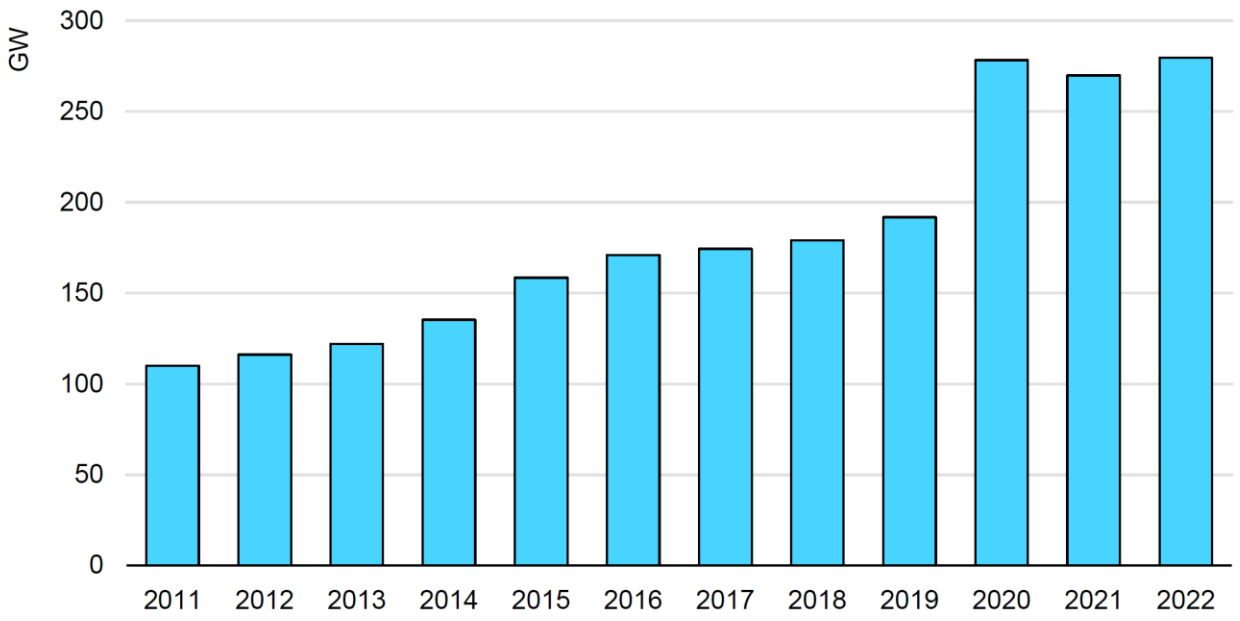


Source: BP Statistical Review of World Energy (2020)

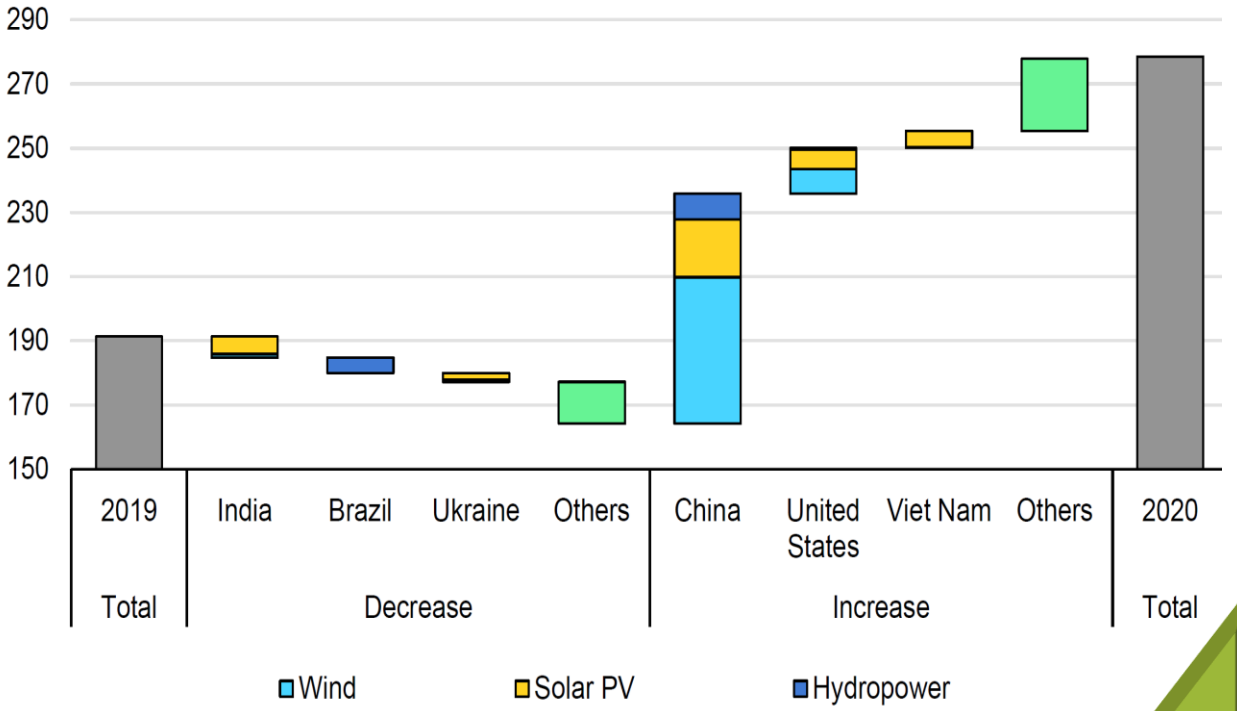
Challenges in Energy Sector
Transition from Fossil Fuels to Renewable Energy

- Renewables were the only energy source for which demand increased in 2020 despite the pandemic, while consumption of all other fuels declined
- Exceptionally high capacity additions become the “new normal” in 2021 and 2022, with renewables accounting for 90% of new power capacity expansion globally

Net renewable capacity additions, 2011-2022



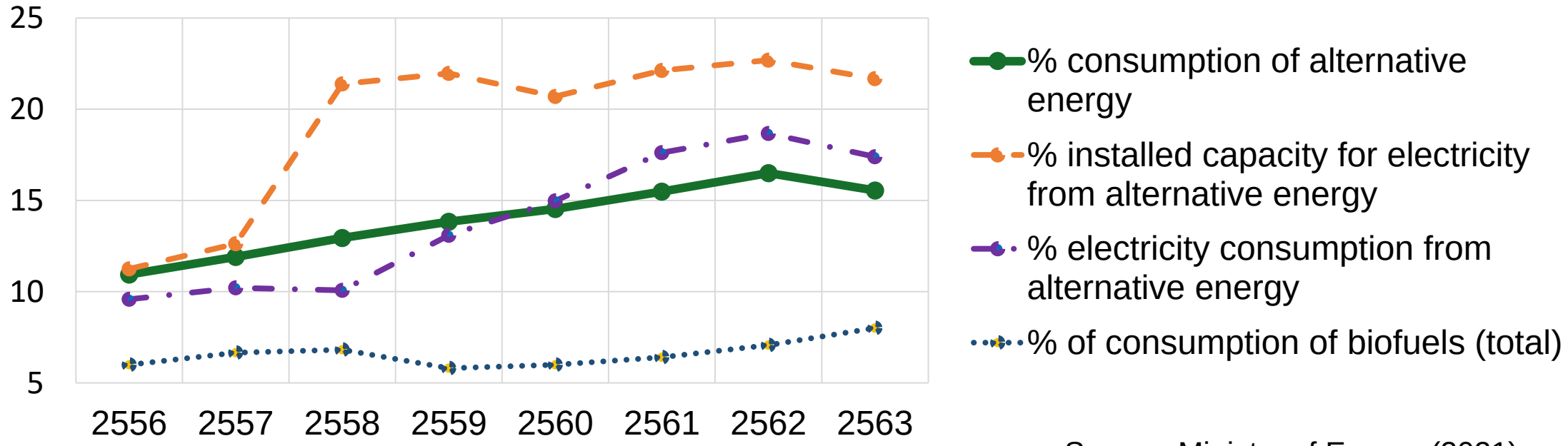
Renewable capacity addition changes from 2019 to 2020



Source: IEA (2021)

Challenges in Energy Sector
Transition from Fossil Fuels to Renewable Energy

- Policy implementation for the renewable energy in Thailand has been slower since the beginning of COVID-19 crisis (IEA, 2021)
  - Pandemic's disruption of fuel demand,
  - Government prioritization of COVID-19 concerns,
  - Drop in fossil fuel costs relative to biofuels,
  - High prices of biodiesel feedstocks (i.e., palm oil) relative to fossil diesel



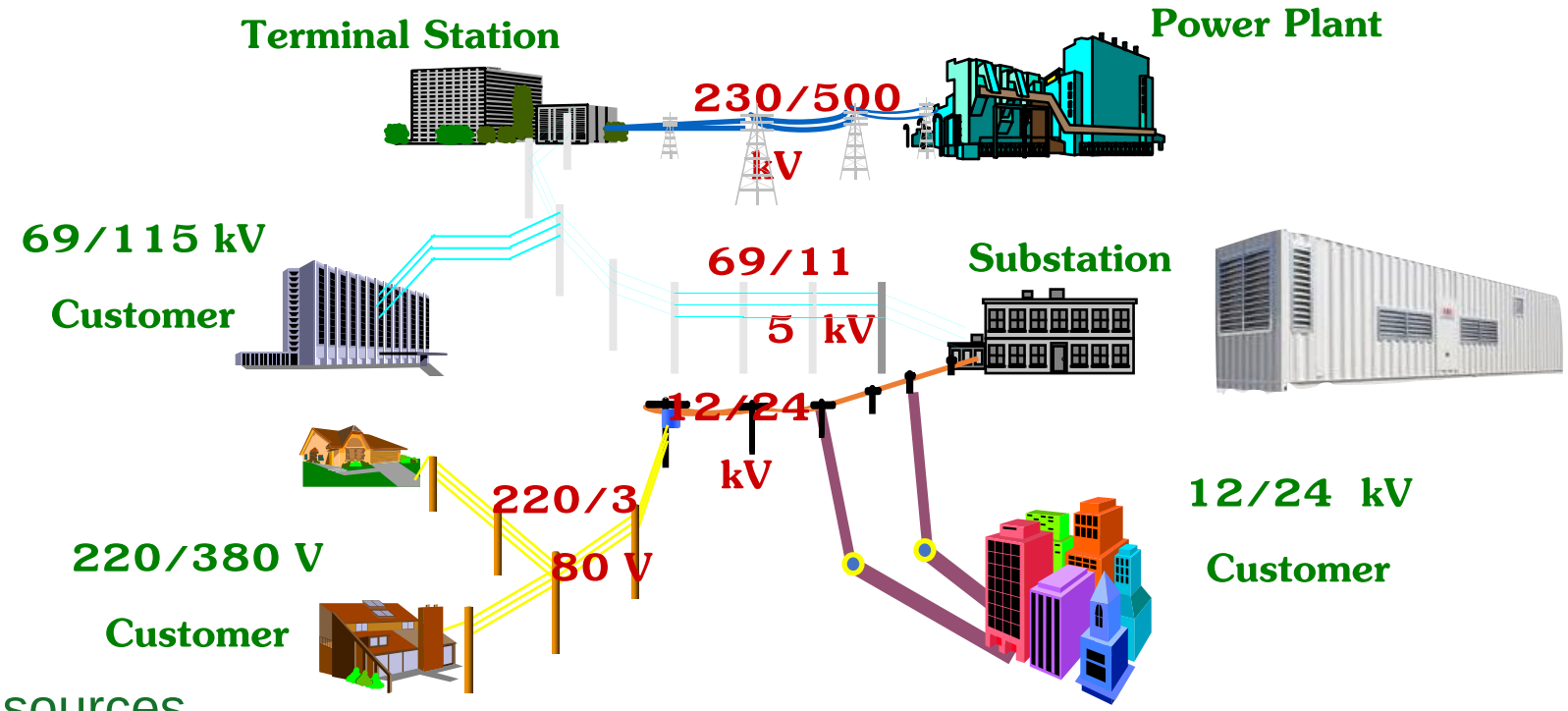
Source: Ministry of Energy (2021)

Challenges in Energy Sector
Transition from Fossil Fuels to Renewable Energy

Due to the high cost of technology, many green energy projects are not feasible to invest if the policymakers consider only the financial perspective and exclude the social and environmental perspectives

Indicators	Financial Feasibility	Economic Feasibility
NPV	-37.83 MB	3.3 MB
BCR	0.81	5.98
IRR	-22.72%	11.47%

Installation of Energy Storage System



External Benefits

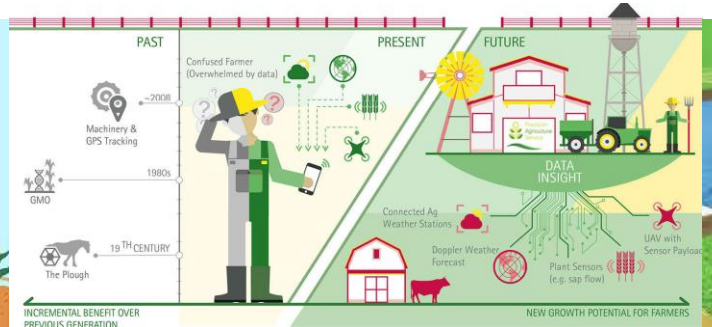
- Reduce greenhouse gases
- Reduce air pollution
- Reduce the use of depletable resources
- Reduce the outage cost

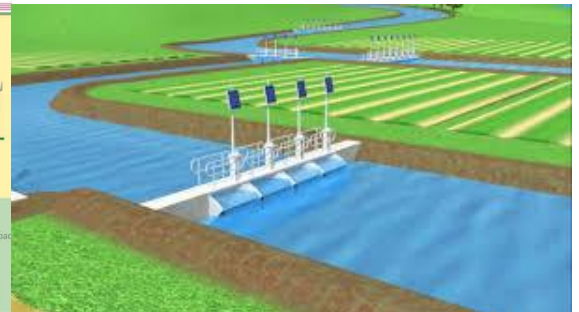
Source: Sunthonkarun and Attavanich (2019)

Policy Recommendations
Agricultural Sector

- Raise awareness to farmers in the affected areas
- Promote high potential young labors to do more farming
- Encourage small farmers to access to modern technology and innovation
- Invest in expanding irrigation areas and promote the efficient use of water

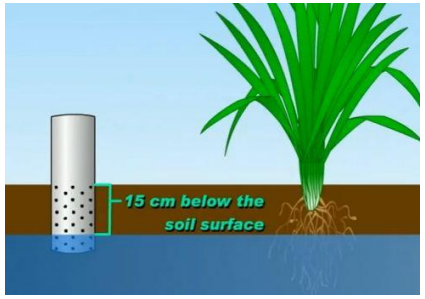
- Provide knowledge of risk management and accelerate development of risk management systems
- Promote mitigation and adaptation practices such as alternative wet and dry for rice production





Policy Recommendations
Agricultural Sector

Option 1: AWD

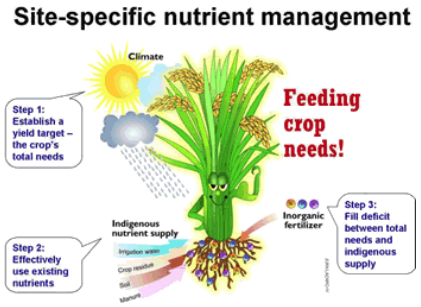


	Percent change from BAU (%)		
	Low	Medium	High
2020	-0.37	-0.73	-1.10
2025	-1.17	-2.31	-3.42
2030	-2.32	-4.54	-6.33

Option 2: Reduced Burning

	Percent change from BAU (%)		
	Low	Medium	High
2020	-5.37	-10.93	-22.00
2025	-13.15	-26.49	-44.68
2030	-22.22	-44.28	-66.47

Option 3: SSNM



	Percent change from BAU (%)		
	Low	Medium	High
2020	-0.55	-0.26	0.38
2025	-0.13	0.56	0.84
2030	0.14	0.58	0.99

Option 4: Improve feed

	Percent change from BAU (%)		
	Low	Medium	High
2020	-0.30	-0.38	-0.46
2025	-0.47	-0.59	-0.72
2030	-0.83	-1.05	-1.28

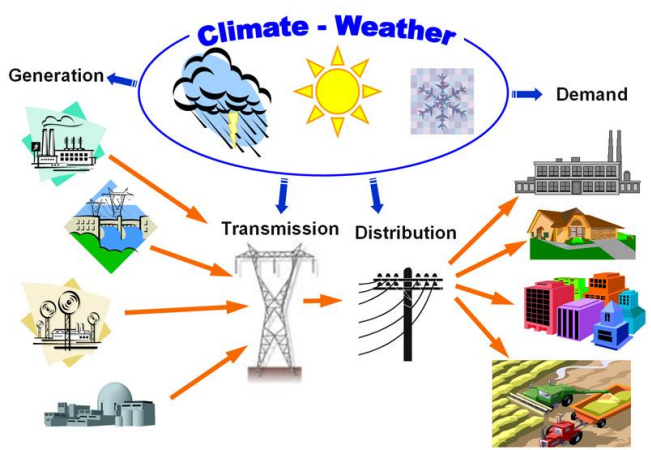
Option 5: Biogas + Manure Management

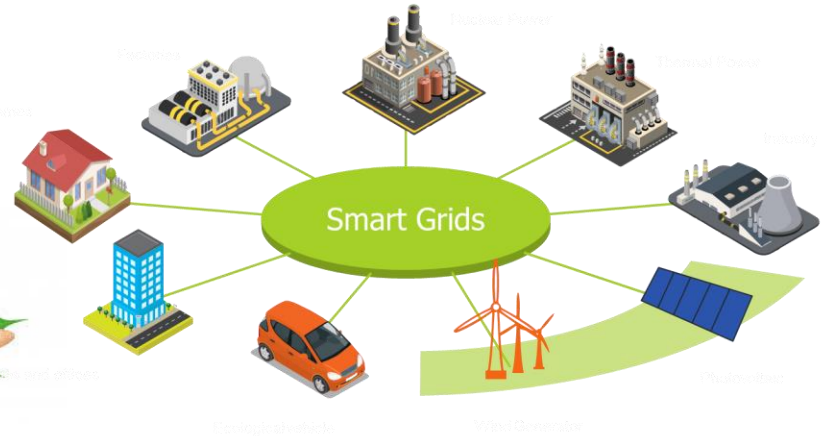
	Percent change from BAU (%)		
	Low	Medium	High
2020	-1.03	-1.40	-1.77
2025	-2.62	-3.58	-4.55
2030	-5.78	-7.83	-9.88

Source: Attavanich and Pengthamkeerati (2018)

Policy Recommendations
Energy Sector

- **Take into account climate-induced shifts in electricity demand in addition to socio-economic factors when making investment decisions**
- **Go beyond basic financial values generated through business conduct by integrating Environmental, Social and Governance (ESG) ratings into the investment process**
  → True earning (net environmental impact + net social benefit + net income)
- **Enhance the productivity of bio-fuel feedstock production**
  → Oil palm, sugarcane and cassava
- **Promote renewable-based electric vehicles**
- **Promote the use of Smart Grid to support the creation of the renewable energy market**



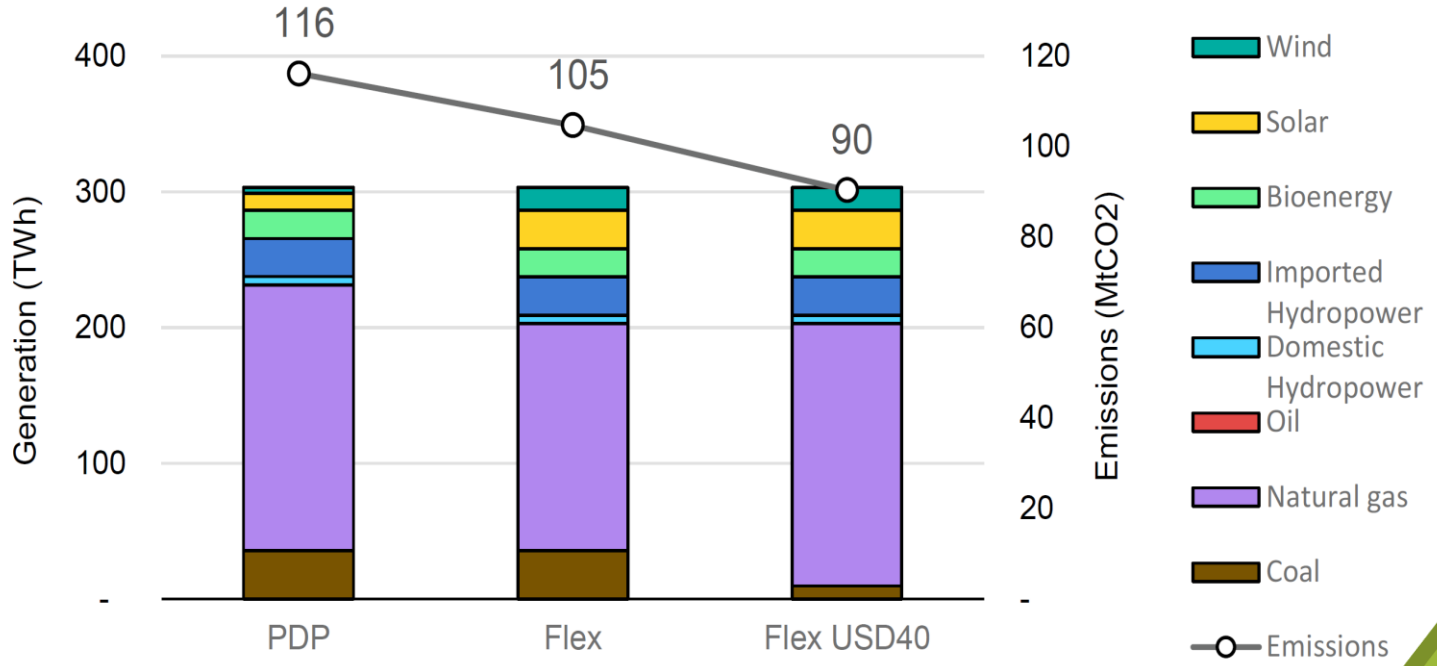


Policy Recommendations
Energy Sector

- **Internalize the cost of carbon to shift away from fossil fuel-based electricity accounting for 38% of energy-related CO_2 emissions in Thailand**
- **Effectively use carbon revenues to accelerate a clean energy transition and reduce the impact on the economy of carbon pricing**

Combining a carbon price ≥ USD 30/t CO_2 with more variable renewable energy (VRE) capacity and system flexibility would enable an effective shift from coal to VRE

Thailand's generation mix and CO_2 emissions in the PDP and Flex Scenarios 2030

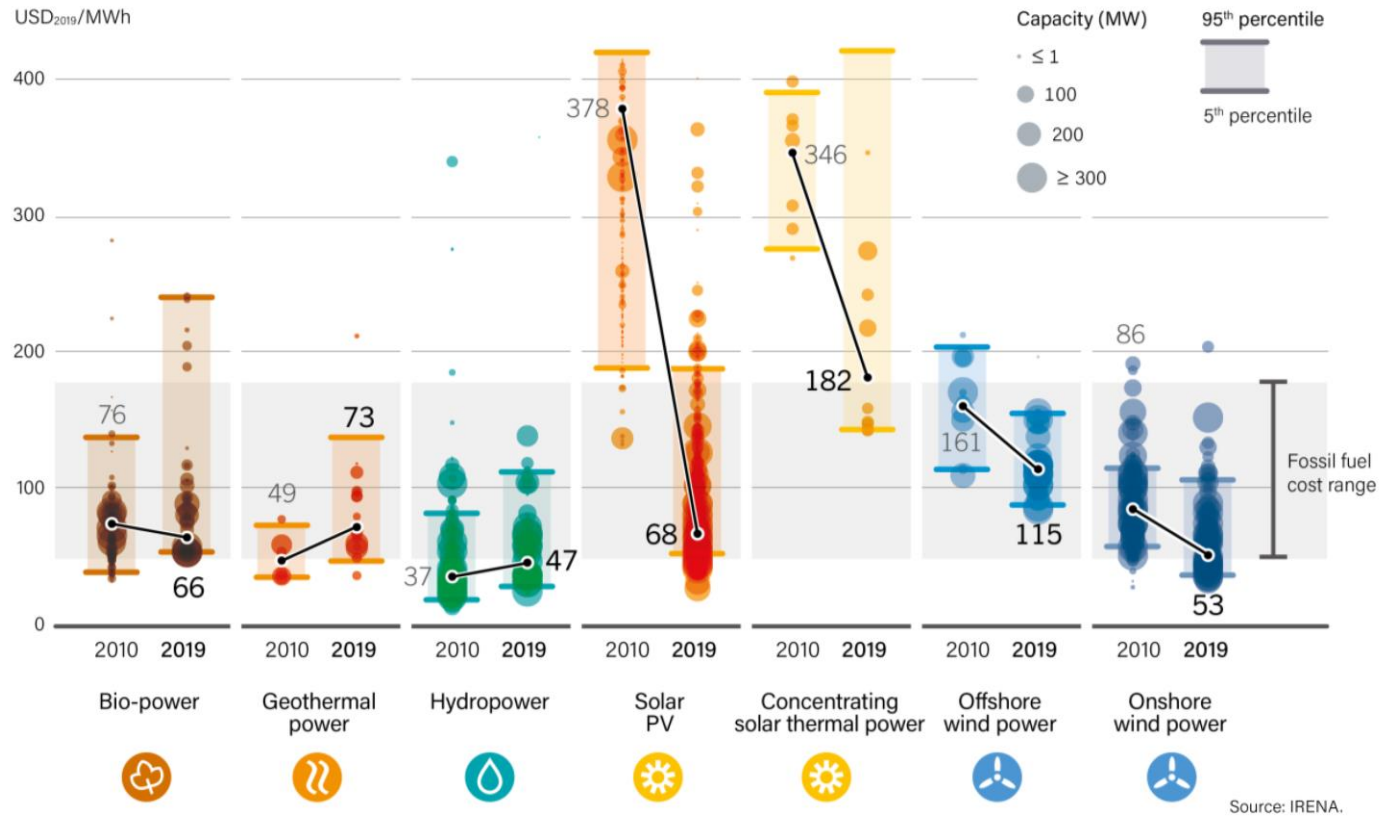


Source: IEA (2021)

Policy Recommendations
Energy Sector

- **Impose aggressive incentives such as production and investment tax credits, feed in tariff, net-metering, competitive auction and corporate power purchase Agreement (PPA)**

Renewable power costs keep falling



Global Levelised Cost of Electricity from Newly Commissioned, Utility-scale Renewable Power Generation Technologies, 2010-2019

Costs for solar PV and CSP as well as onshore and offshore wind have **fallen sharply over the past decade.**

Source: REN21 (2021)

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