

# Thailand's First Biennial Update Report

Under the United Nations Framework  
Convention on Climate Change



*December 2015*

## **Published by**

**Office of Natural Resources and Environmental Policy and Planning**  
60/1 Soi Phibunwattana 7, Rama 6 Road  
Samsennai, Phayathai District, Bangkok 10400  
THAILAND

## **In collaboration with**

**Ministry of Finance**  
**Ministry of Foreign Affairs**  
**Ministry of Agriculture and Cooperatives**  
**Ministry of Transport**  
**Ministry of Natural Resources and Environment**  
**Ministry of Information and Communication Technology**  
**Ministry of Energy**  
**Ministry of Commerce**  
**Ministry of Science and Technology**  
**Ministry of Public Health**  
**Ministry of Industry**  
**Ministry of Interior**  
**Bangkok Metropolitan Administration**



**Statement by H.E. General Prayut Chan-o-cha,  
Prime Minister of the Kingdom of Thailand  
At the General Debate of the 70th Session of the United Nations  
General Assembly  
New York, 29 September 2015**

“Climate change will pose a major challenge to the achievement of various SDGs. It is, therefore, our shared responsibility to ensure that the outcome of the COP 21 will be both ambitious and viable.”

“Sustainability requires that humankind must learn to live in harmony with nature and lead a balanced life in a green society. Today, the adverse impacts of climate change and natural disasters can reverse decades of sustainable development gains. It is, therefore, incumbent upon every person and every country to join hands in solving this pressing global challenge. On Thailand’s part, we reaffirm our commitment under the INDCs to reducing our greenhouse gas emissions between 20 and 25% by the year 2030.”

# Table of Contents

<b>Foreword .....</b>	<b>11</b>
<b>Section 1: National Circumstances.....</b>	<b>14</b>
Geographic Profile .....	14
Population Profile .....	16
Economic Profile .....	17
Urban.....	17
Energy .....	20
Transport .....	22
Agriculture and Forestry .....	23
Waste.....	25
Institutional Arrangements.....	24
<b>Section 2: National Greenhouse Gas Inventory for 2011.....</b>	<b>28</b>
Overview.....	28
Key Findings from the National Greenhouse Gas (GHG) Inventory for 2011.....	28
Energy .....	33
Industrial Processes.....	35
Agriculture .....	37
Land Use, Land-Use Change and Forestry (LULUCF).....	39
Waste.....	41
<b>Section 3: Mitigation Measures .....</b>	<b>44</b>
Overview.....	44
National Climate Change Master Plan (2015 – 2050).....	44
Progress toward NAMA Roadmap .....	47
Additional Domestic Mitigation Measures.....	51
<i>Gradual Reduction of Energy Subsidy.....</i>	<i>51</i>
<i>Environmental Sustainable Transport.....</i>	<i>51</i>
<i>Industrial Processes .....</i>	<i>51</i>
<i>Agriculture .....</i>	<i>53</i>
<i>LULUCF.....</i>	<i>53</i>
<i>Waste.....</i>	<i>55</i>
Voluntary Domestic Crediting Scheme .....	56
Carbon Footprint Reduction (CFR) Label .....	57
International Market Mechanisms .....	57
Information on Domestic MRV .....	58

<b>Section 4: Constraints and gaps, and Related Financial, Technical and Capacity Needs.....</b>	<b>60</b>
Description of the Support Received .....	61
Summary of Support Needs .....	62
Information on the Level of Support Received for the Preparation of the BUR .....	63
<b>References.....</b>	<b>64</b>
<b>Appendices</b>	
<b>Appendix 1: Additional Implemented Projects to Support Mitigation.</b>	<b>65</b>
<b>Appendix 2: List of Supported Climate Change Projects in Thailand .</b>	<b>73</b>

## List of Tables

Table 1: Primary Commercial Energy Consumption, Production and Imports in 2008-2013 .....	19
Table 2: Proportion and Costs of Different Transport Modes, 2013 .....	20
Table 3: New Vehicle Registration, 2008-2013 .....	20
Table 4: Fuel Consumption by Transport Modes, 2008-2013 .....	21
Table 5: Land Use in Thailand, 2008-2013 .....	22
Table 6: Municipal Solid Waste (MSW), Proportion of Properly Treated and Utilized MSW, and Per Capita MSW Generation, 2008-2013.....	23
Table 7: Total GHG Emissions and Removals from Sources and Sinks, 2011 .....	28
Table 8: GHG Emissions Contribution from the Various Sources to the Total GHG Emissions in Energy Sector, 2011 .....	32
Table 9: GHG Emissions Contribution from the Various Sources to the Total GHG Emissions in Industrial Processes Sector, 2011 .....	34
Table 10: GHG Emissions Contribution from the Various Sources to the Total GHG Emissions in Agriculture Sector, 2011 .....	36
Table 11: GHG Emissions Contribution from the Various Sources to the Total GHG Emissions and Removals in LULUCF Sector, 2011 .....	38
Table 12: GHG Emissions Contribution from the Various Sources to the Total GHG Emissions in Waste Sector, 2011 .....	40
Table 13: EEP: Energy Efficiency Potentials and 20-Year Target.....	46
Table 14: Description of NAMA Roadmap and Achievements in 2013 .....	47
Table 15: New Vehicle Excise Tax based on CO <sub>2</sub> Emission per Kilometer .....	49
Table 16: Municipal Solid Waste Management Roadmap .....	53

## List of Figures

Figure 1: Map of Kingdom of Thailand.....	13
Figure 2: Number and Annual Growth Rate of Population .....	14
Figure 3: Population Pyramids of Thailand, 2010 .....	15
Figure 4: Economic Development Target, by 2026.....	15
Figure 5: Thai Economy, Second Quarter 2015 .....	16
Figure 6: Urban Areas by Population, 2000 and 2010.....	17
Figure 7: Bangkok Urban Expansion 2000 and 2010.....	18
Figure 8: Annual Growth Rate of Commercial Energy Consumption, 2008-2013 .....	19
Figure 9: Agriculture Share of Gross Domestic Products, 2008-2014 .....	20
Figure 10: Structure of the National Committee on Climate Change Policy .....	24
Figure 11: Preparation Structure National Communication and Biennial Update Report.....	25
Figure 12: Total GHG Emissions (excluding LULUCF) by Sector, 2011 .....	27
Figure 13: Total GHG Emissions Trends with and without LULUCF Sector, 2000-2011 .....	29
Figure 14: GHG Emissions and Removals by Source Category, 2000 - 2011 .....	30
Figure 15: GHG Emissions in Energy Sector, 2011 .....	33
Figure 16: GHG Emissions in Industrial Processes Sector, 2011.....	35
Figure 17: GHG Emissions in Agriculture Sector, 2011 .....	37
Figure 18: GHG Emissions and Removals in LULUCF Sector, 2011 .....	39
Figure 19: GHG Emissions in Waste Sector, 2011.....	41
Figure 20: GHG Emission Trajectories under Business as Usual (BAU) and NAMA Roadmap, 2005-2020 .....	44
Figure 21: Map of Potential Rail Infrastructure Investment.....	50
Figure 22: Reduction of Deforestation and Forest Degradation Project in .....	
Tha Wang Pha District, Nan Province.....	52
Figure 23: GHG Emission Reduction Monitoring Structure according to the NAMA Roadmap .....	57

# Abbreviations

ADB	Asian Development Bank
AEDP	Alternative Energy Development Plan
ALRO	Agricultural Land Reform Office
ARW	Advanced Research WRF
AWD	Alternative Wet and Dry
BAU	Business as Usual Case
BCP	Bangchak Petroleum PCL
BMA	Bangkok Metropolitan Administration
BUR	Biennial Update Report
CCS	Carbon Capture and Storage
CDM	Clean Development Mechanism
CDM EB	CDM Executive Board
CDM-PoAs	CDM-Program of Activities
CERs	Certified Emission Reductions
CFR	Carbon Footprint Reduction
CTF	Clean Technology Fund
DCA	Department of Civil Aviation
DEDE	Department of Alternative Energy Development and Efficiency
DEQP	Department of Environmental Quality Promotion
DIO	Department of International Organization
DIW	Department of Industrial Works
DLA	Department of Local Administration
DLD	Department of Livestock Development
DMCR	Department of Marine and Coastal Resources
DMF	Department of Mineral Fuels
DNA	Designated National Authority
DNP	Department of National Parks, Wildlife and Plant Conservation
DOAE	Department of Agricultural Extension
DOC	Department of Customs
DOEB	Department of Energy Business
DOH	Department of Highway
DOLT	Department of Land Transport
DPIM	Department of Primary Industries and Mines
DPH	Department of Public Health
EEI	Electrical and Electronics Institute
EEP	Energy Efficiency Plan
EGAT	Electricity Generating Authority of Thailand



EPPPO	Energy Policy and Planning Office
ERC	Energy Regulatory Commission
FCPF	Forest Carbon Partnership Facility
FIO	Forest Industrial Organization
FiT	Feed-in Tariff
GAP	Good Agricultural Practice
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GISTDA	Geo-Informatics and Space Technology Development Agency
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GNI	Gross National Income
GWP	Global Warming Potential
ICT	Information and Communication Technology
IEA	International Energy Agency
IEAT	Industrial Estate Authority of Thailand
IMF	International Monetary Fund
INDCs	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
ISIT	Iron and Steel Institute of Thailand
LCOE	Levelized Cost of Electricity
LDD	Land Development Department
LoA	Letter of Approval
LULUCF	Land Use, Land-Use Change, and Forestry
MAS	Marker Assisted Selection
MEA	Metropolitan Electricity Authority
MFLF	Mae Fah Luang Foundation
NMT	Non-Motorized Transport
MNRE	Ministry of Natural Resources and Environment
MRV	Measurement, Reporting, and Verification
MSW	Municipal Solid Waste
MTEC	National Metal and Materials Technology Center
NAMA	Nationally Appropriate Mitigation Actions
NCCC	National Committee on Climate Change Policy
NGV	Natural Gas Vehicle
OAE	Office of Agricultural Economics
OECD	Organization for Economic Co-operation and Development
OIE	Office of Industrial Economics
ONEP	Office of Natural Resources and Environmental Policy and Planning
OPS	Office of the Permanent Secretary

OTP	Office of Transport and Traffic Policy and Planning
PAF	Pilot Auction Facility
PAT	Port Authority of Thailand
PCD	Pollution Control Department
PDP	Power Development Plan
PEA	Provincial Electricity Authority
PMR	Partnership for Market Readiness
PTIT	Petroleum Institute of Thailand
PTT	PTT Public Company Limited
RAT	Rubber Authority of Thailand
RD	Rice Department
RDF	Refuse Derived Fuel
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RFD	Royal Forest Department
RID	Royal Irrigation Department
RIDI	Royal Initiatives Discovery Institute
SCC	Siam Cement Company
SCCC	Siam City Cement Company
SEC	Specific Energy Consumption
SRT	State Railway Authority of Thailand
STI	Science Technology and Innovation Policy Office
TAI	Thailand Automobile Institute
TGO	Thailand Greenhouse Gas Management Organization
THB	Thai Baht
T-VER	Thailand Voluntary Emission Reduction
UNIDO	United Nations Industrial Development Organization
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WRF	Weather Research and Forecasting
ADB	Asian Development Bank
AEDP	Alternative Energy Development Plan
ARW	Advanced Research WRF
AWD	Alternative Wet and Dry
BAU	Business as Usual Case
BMA	Bangkok Metropolitan Authority
BUR	Biennial Updated Report
CCS	Carbon Capture and Storage
CDM	Clean Development Mechanism
CDM EB	CDM Executive Board

CDM-PoAs	CDM-Program of Activities
CERs	Certified Emission Reductions
CFR	Carbon Footprint Reduction
CTF	Clean Technology Fund
DEDE	Department of Alternative Energy Development and Efficiency
DEQP	Department of Environmental Quality Promotion
DEQP	Department of Environmental Quality Promotion
DIO	Department of International Organization
DIW	Department of Industrial Works
DLD	Department of Livestock Development
DMCR	Department of Marine and Coastal Resources
DMF	Department of Mineral Fuels
DNA	Designated National Authority
DNP	Department of National Parks, Wildlife and Plant Conservation
DNP	Department of National Parks Wildlife and Plants Conservation
DOA	Department of Agriculture
DOEB	Department of Energy Business
DPIM	Department of Primary Industries and Mines
EEI	Electrical and Electronics Institute
EEP	Energy Efficiency Plan
EGAT	Electricity Generating Authority of Thailand
EPPO	Energy Policy and Planning Office
FCPC	Forest Partnership Facility
FCPF	Forest Carbon Partnership Facility
FIO	Forest Industrial Organization
FiT	Feed-in-Tariff
GAP	Good Agricultural Practice
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GISTDA	Geo-Informatics and Space Technology Development Agency
GIZ	Gesellschaft für Internationale Zusammenarbeit
GNI	Gross National Income
GWP	Gobal Warming Potential
ICT	information and communication technologies
IEA	International Energy Agency
IEAT	Industrial Estate Authority of Thailand
IMF	International Monetary Fund
INDCs	Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change

ISIT	Iron and Steel Institute of Thailand
KU	Kasetsart University
LCOE	Levelized Cost of Electricity
LDD	Land Development Department
LoA	Letter of Approval
LULUCF	Land Use, Land-Use Change, and Forestry
MAS	Marker Assisted Selection
MFLF	Mae Fah Luang Foundation
MNRE	Ministry of Natural Resources and Environment
MRV	Measurement, Reporting, and Verification
MSW	Municipal Solid Waste
MTEC	National Metal and Materials Technology Center
NAMA	Nationally Appropriate Mitigation Actions
NCCC	National Committee on Climate Change
NGV	Natural Gas Vehicle
OAE	Office of Agricultural Economics
OECD	Organisation for Economic Co-operation and Development
OIE	Office of Industrial Economics
ONEP	Office of Natural Resources and Environmental Policy and Planning
OTP	Office of Transport and Traffic Policy and Planning
PAF	Pilot Auction Facility
PCD	Pollution Control Department
PDP	Power Development Plan
PMR	Partnership for Market Readiness
PTT	PTT Public Company Limited
RD	Rice Department
RDF	Refuse Derived Fuel
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RFD	Royal Forest Department
RID	Royal Irrigation Department
RIDI	Royal Initiatives Discovery Institute
RTG	Royal Thai Government
SEC	Specific Energy Consumption
STI	Science Technology and Innovation Policy Office
TAI	Thailand Automobile Institute
TGO	Thailand Greenhouse Gas Management Organization
THB	Thai Baht
T-VER	Thailand Voluntary Emission Reduction
UNDIO	United Nations Industrial Development Organization
UNDP	United Nation Development Programme

UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WRF	Weather Research and Forecasting

## Chemical Formula

CH <sub>4</sub>	Methane
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
N <sub>2</sub> O	Nitrous oxide
NMVOCs	Non-methane volatile organic compounds
NO <sub>x</sub>	Nitrogen oxide
SO <sub>x</sub>	Sulfur oxide

## Unit

°C	Degree Celsius
cc	Cubic centimeter
Gg	Gigagram
GgCO <sub>2</sub> eq	Gigagram of CO <sub>2</sub> equivalent
GWh	Gigawatt-hour
HP	Horse Power
KBD	Thousand barrels per day

km	Kilometer
kWh	Kilowatt-hour
L	Liter
MJ	Megajoule
MtCO <sub>2</sub> eq	Million ton of CO <sub>2</sub> equivalent
MTon	Million ton
MWh	Megawatt-hour
sq.km	Square kilometer

## Foreword

Thailand is pleased to submit its First Biennial Update Report (BUR). This report has been developed in accordance with the UNFCCC biennial update reporting guideline for Parties not included in Annex I to the Convention contained in Decision 2/CP.17 adopted by the Conference of the Parties on its seventeenth session.

In order to achieve sustainable development, part of strategies of the Eleventh National Economic and Social Development Plan 2012-2016 has been emphasized on a low carbon emission and climate-resilient society. In addition, the Thailand's Climate Change Master Plan 2015-2050 corresponds with the national strategies and policies. For greenhouse gas emission reduction policy, Thailand's contribution to a global approach by submitting its Nationally Appropriate Mitigation Actions (NAMA) to lower greenhouse gas emissions below business as usual by 2020 which is the medium-term target from master plan. In this aim, Thailand has been engaging national and subnational networks to achieve the target, including further developing and improving institutional and technical capacity for effective cooperation and management.

Thailand's First BUR states our progress of the NAMA implementation until 2013. Furthermore, it describes our national greenhouse gas inventory, as well as our finance, technology, capacity building needs and support received so far.

Climate change challenges all countries in the world. Thailand will cooperate with the international community to address this global issue.

## Section 1: National Circumstances

### Geographic Profile

Located in the heart of mainland Southeast Asia, Thailand is a country of mountains, hills, plains and a long coastline along the Gulf of Thailand (1,875 km) and the Andaman Sea (740 km), not including the coastlines of over 400 islands, most of them in the Andaman Sea.

Its continental co-ordinates are latitudes 20° 28' N and 5° 36' S and longitudes 105° 38' E and 97° 22' W. To the north Thailand borders the Lao PDR and Myanmar; to the east the Lao PDR and Cambodia; to the south Malaysia; and to the west Myanmar (**Figure 1**). The country's land-based maximum north-south extent is approximately 1,600 km, and its maximum east-west extent measures approximately 870 km.

The land area amounts to approximately 514,000 sq. km. The maritime economic zones cover 72,200 sq. km. in the Andaman Sea and 140,000 sq. km. in the Gulf of Thailand, totaling 212,200 sq. km.

Thailand's climate ranges from the sub-tropical to the tropical zones, with three distinct seasons: a hot and dry season from February to May, a monsoon season from June to October, and a cooler, dry season from November to January. Average seasonal temperatures vary between a low of 23.0 °C and a high of 32.2 °C.

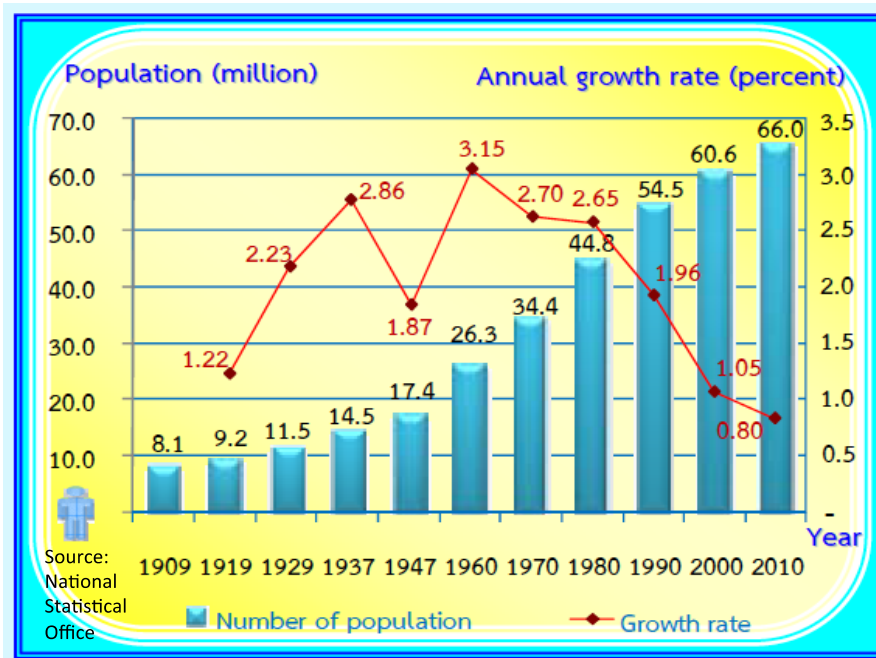


Figure 1: Map of Kingdom of Thailand



## Population Profile

As of the census date (September 1, 2010) there were 65,981,659 persons residing in Thailand: 32,355,032 were males and 33,626,627 were females. The gender ratio is 96.2, or 96 males per 100 females. Every region has more females than males. Although the number of population increased over time, the annual population growth rate has shown a significant decline since 1960. The annual population growth rate was 2.70% from 1960 to 1970, 1.05% from 1990 to 2000, and 0.80% from 2000 to 2010, which was the result of a dramatic and continually decreasing birth rate (**Figure 2**).



**Figure 2: Number and Annual Growth Rate of Population**

The Census also found that the age structure has significantly changed to reflect declining birth rate and increasing life expectancy. This is evident from widening of the top portion of the population pyramid indicating the increasingly aging society (**Figure 3**).

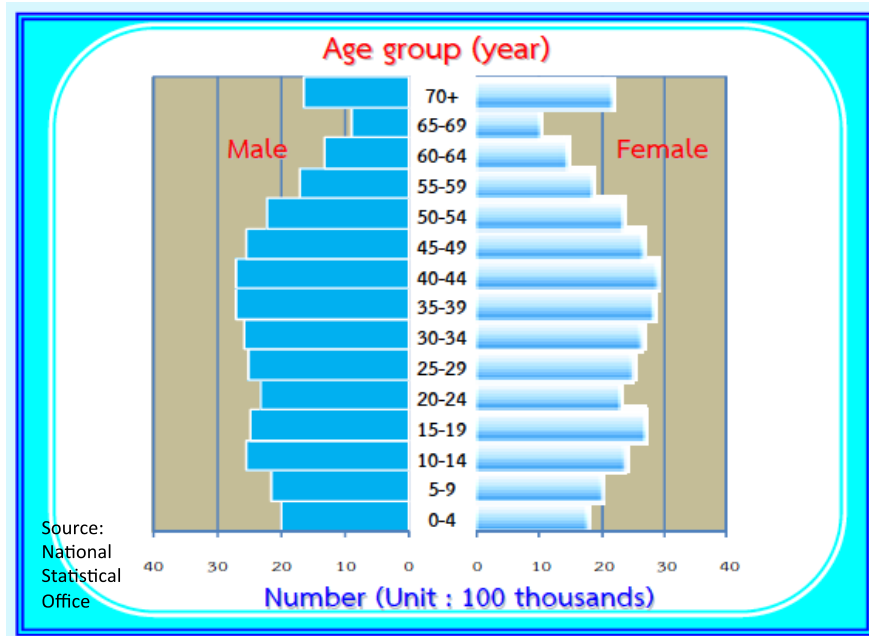


Figure 3: Population Pyramids of Thailand, 2010

## Economic Profile

The World Bank has upgraded Thailand’s income categorization from a lower-middle income economy to an upper-middle income economy this year. The World Bank annually revises its classification of the world’s economies based on gross national income (GNI) per capita estimates using the Atlas method. As of July 1, 2011, upper-middle-income economies are those with average incomes of US\$3,976 to US\$12,275 (Figure 4).

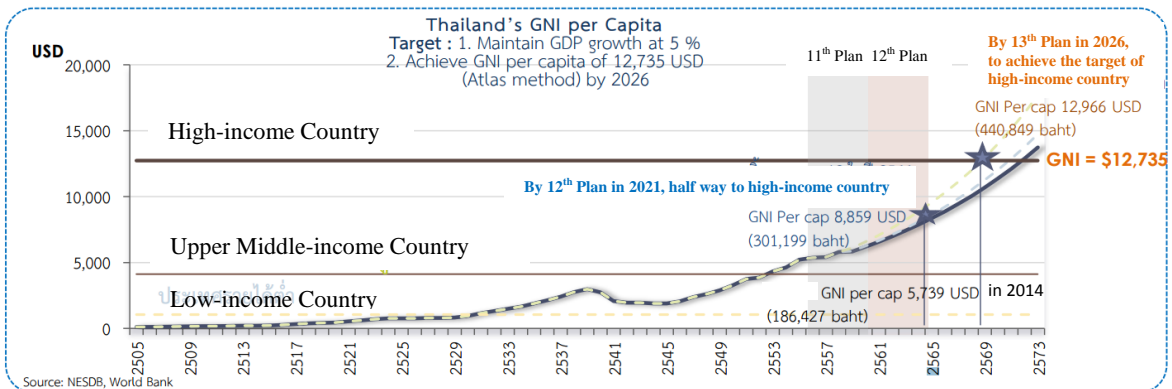
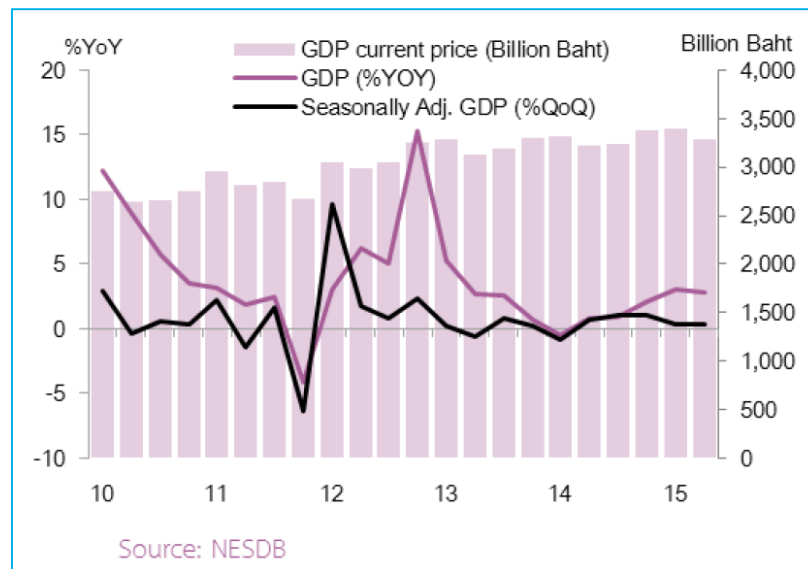


Figure 4: Economic Development Target, by 2026

For Thailand to sustain its growth and avoid the middle-income trap, it needs to pay attention to raising the productivity of not only the manufacturing, but also the agriculture and services sectors. Higher levels of education and skills as well as creativity, innovation, and competition will be necessary. These would not only promote higher growth but also inclusive growth, which will help reduce the persistent high-income inequality in Thailand.

Thai economy in the second quarter of 2015 expanded by 2.8%, compared with 3.0% growth in the first quarter of 2015. This is in line with the International Monetary Fund’s (IMF) and the World Bank’s annual GDP growth forecast of 3.7% and 3.5%, respectively, for 2015 (**Figure 5**).

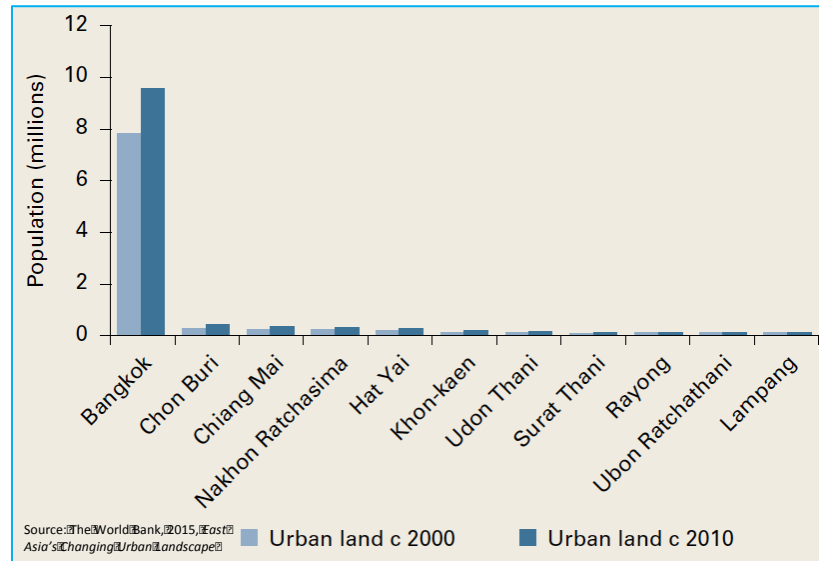


**Figure 5: Thai Economy, Second Quarter 2015**

The expenditure side was contributed by the strong growth of public investment, and export of services. Private and public consumption expenditure continued to grow, while export of goods was impacted by global economic slowdown. On the production side, hotels and restaurants, construction expanded well, and other service sectors continued to grow. Meanwhile, the agricultural sector was impacted by the drought and the export sector contracted as export fell. After seasonal adjustment, the Thai economy in the second quarter of 2015 expanded by 0.4% from the first quarter (%QoQ SA). In the first half of 2015, the Thai economy grew by 2.9%, improving from the 0.2% growth in the first half of 2014 and from 1.6% growth in the second half of 2014.

## Urban

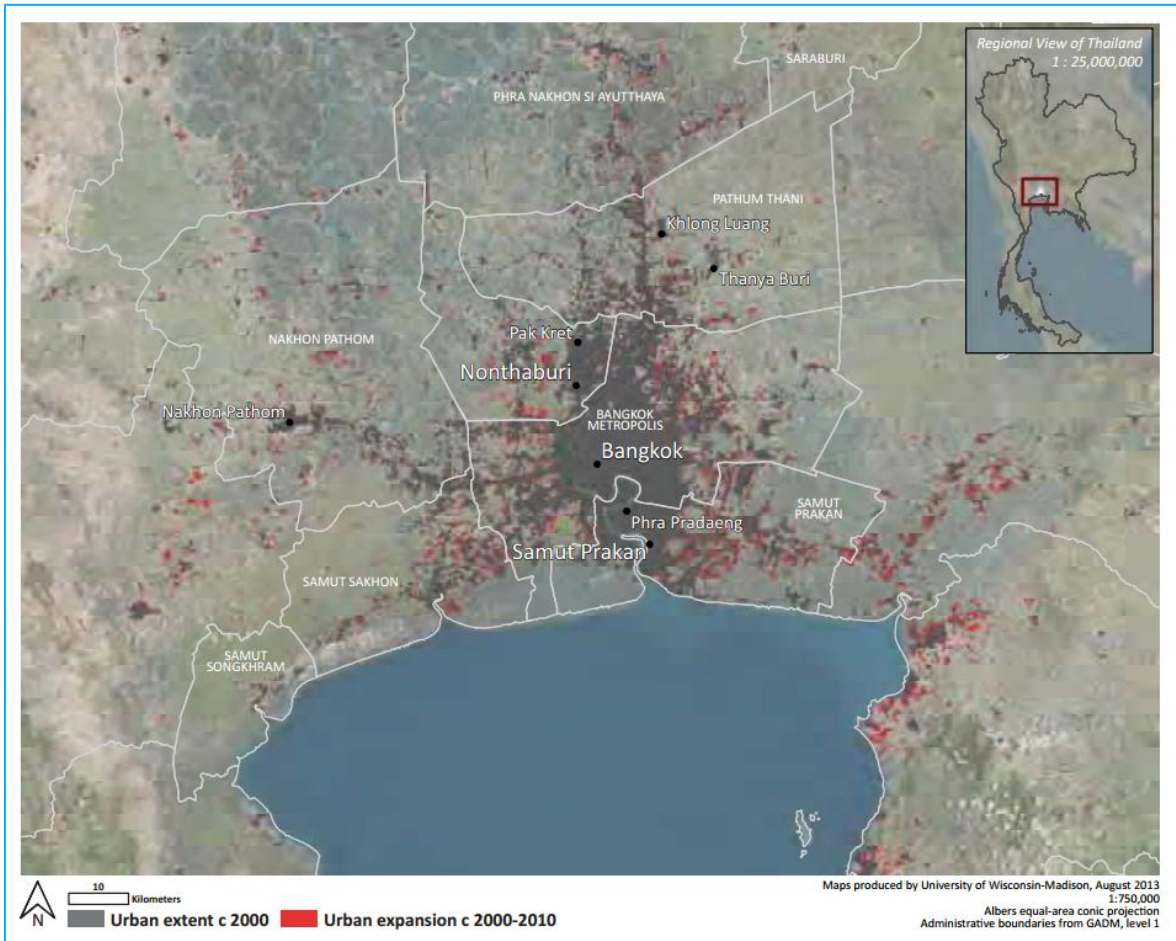
Over the last decade, urban population has grown substantially as shown in **Figure 6**. At the latest population census in 2010, about 30 million people or 44.2% of the populations are living in municipal areas, a 42% increase from the last census in 2000<sup>1</sup>. If this trend continues, about 63% of the total population will be residing in municipal areas, which will have significant impacts on multitude of issues such as quality of life, public services, and greenhouse gas emissions.



**Figure 6: Urban Areas by Population, 2000 and 2010**

Of all the urban areas in Thailand, Bangkok urban area is by far the largest and accounted for nearly 80% of the total urban area in Thailand. Bangkok urban area encompasses around 2,100 square kilometer, which is the fifth largest in East Asia region. In terms of population, no other urban areas in Thailand have more than 500,000 inhabitants other than Bangkok, which has 9.6 million people (**Figure 7**).

<sup>1</sup> Author's calculation from 2010 Population Census Data



Source: The World Bank, 2015

**Figure 7: Bangkok Urban Expansion 2000 and 2010**

## Energy

Total primary energy consumption in 2013 increased by 0.7% from that in 2012, or at a level of 2,001 thousand barrels per day (KBD) of crude oil equivalent. Natural gas accounted for the largest share of energy consumption, i.e. 46% or an increase of 2.0%, due to the increasing number of NGV vehicles. Oil consumption was the second largest, held a share of 36%, or an increase of 2.5% as some of gasoline and diesel consumption was replaced by NGV. As for coal and lignite, their consumption decreased by 3.2%; whereas the demand for hydropower and imported electricity decreased by 17.9%.

The total primary energy production in 2013 decreased by 0.4% from that in 2012, or at a level of 1,078 thousand barrels per day (KBD) of crude oil equivalent by the decrease in the production of lignite and hydropower. While energy net import increase 3.3% or at a level of 1,121 thousand barrels per day (KBD) of crude oil equivalent from the increase

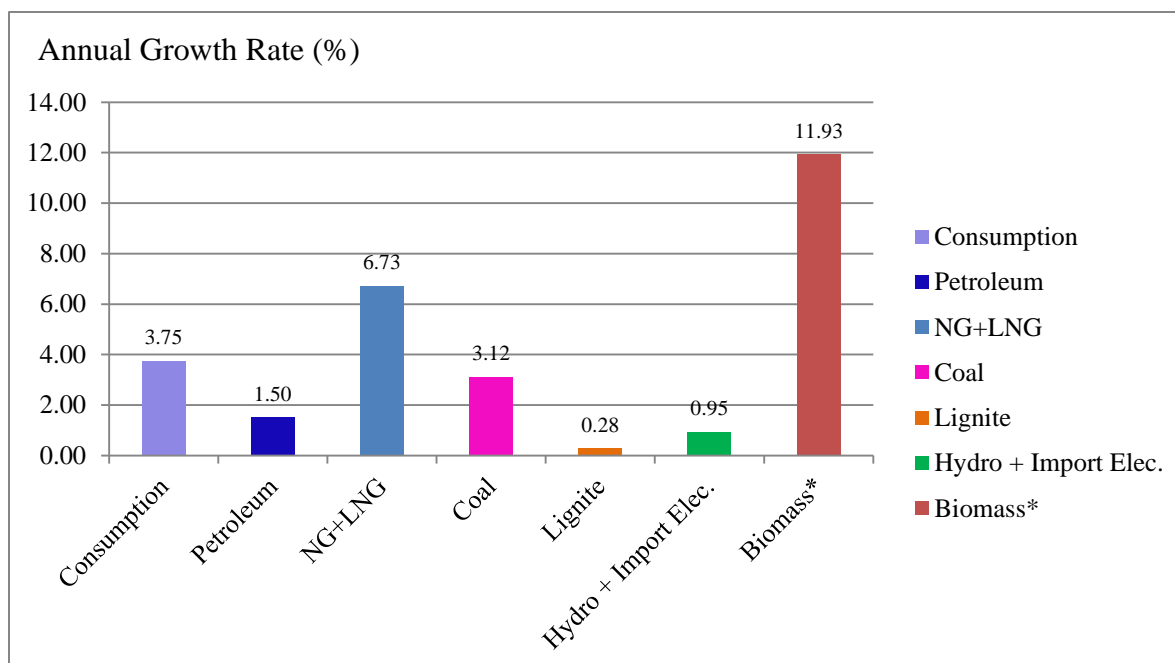
of imported crude oil, natural gas, natural gas liquids and electricity. Commercial energy imports (net) accounted for 56% of the primary commercial energy consumption. Annual growth rate of energy consumption by sources from 2008-2013 depicts strong growth of relatively cleaner fuel (natural gas and liquid natural gas and renewable biomass) consumption.

Details of primary commercial energy consumption, production and import during 2008-2013, and annual growth rate of commercial energy consumption during 2008-2013 are presented in **Table 1** and **Figure 8**.

**Table 1: Primary Commercial Energy Consumption, Production and Imports in 2008-2013**

Description	Consumption, Production, and Imports of Primary Commercial Energy Unit: KBD (Crude Oil Equivalent)					
	2008	2009	2010	2011	2012	2013
Consumption	1,618	1,663	1,782	1,854	1,981	2,001
Production	848	895	989	1,018	1,082	1,078
Import (Net)	952	922	1,001	1,018	1,082	1,121
Import/Consumption (%)	59	55	56	55	55	56

Source: Energy Statistics of Thailand 2014



Source: Calculated using data from Energy Statistic of Thailand

\*Biomass includes wooden fuel, husk, bagasse and unused agricultural products

**Figure 8: Annual Growth Rate of Commercial Energy Consumption, 2008-2013**

## Transport

Transport is a major sector of the Thai economy that consumes significant portion of fossil fuel, most of which are dependent on imports resulting in vulnerability to price fluctuation and availability. Furthermore, the nation's competitiveness is adversely affected if the transport and logistics costs are higher than other competitors. Currently, Thailand's total logistics cost per GDP is 14.3% half of which is the transport cost. The same logistics cost per GDP in a typical advance economy is lower than 10%, therefore, there are some rooms for improvement. Additionally, the transport mode with the lowest cost (measured by THB per ton-kilometer) has yet to receive correspondingly high volume of transport. For example, a relatively more expensive road transport (THB 2.12 per ton-km) is accounted for almost all of the total transport volume; whereas, only 1.4% of the total transport volume is using rail transport, which costs less than one THB per ton-kilometer, transported (**Table 2**).

**Table 2: Proportion and Costs of Different Transport Modes, 2013**

Domestic Transport Mode	Proportion from Total Transport (%)	Transport Cost (THB/ton-km)
Road	87.50	2.12
Rail	1.40	0.95
Water	11.08	0.65
Air	0.20	10.00

Source: Office of Transport Policy and Planning, 2013

High dependency on road transport is also reflected in an average annual growth of around 10% of new vehicle sales as shown in **Table 3**. Total number of registered vehicles increased from 34.6 million vehicles in 2013 to 35.8 million vehicles in 2014, or an increase of 3.50%.

**Table 3: New Vehicle Registration, 2008-2013**

Year	Passenger	Commercial	Motorcycle	Total
2008	225,751	388,333	1,749,000	2,363,084
2009	235,169	313,703	1,519,000	2,067,872
2010	340,129	390,904	1,870,000	2,601,033
2011	341,800	362,156	1,859,000	2,562,956
2012	658,460	691,399	2,300,000	3,649,859
2013	650,791	637,497	2,087,000	3,375,288

Source: Energy Statistic of Thailand, 2014

Total fuel consumption by transport mode is presented in the **Table 4**.



**Table 4: Fuel Consumption by Transport Modes, 2008-2013**

Unit: ktoe

Transport Mode	2008	2009	2010	2011	2012	2013
Land Transport	18,977	19,299	20,144	21,158	21,477	21,136
Road	18,886	19,211	20,057	21,072	21,385	21,056
Rail	91	88	87	86	92	80
Water Transport	1,532	1,443	1,175	911	920	1,159
Domestic	66	77	147	152	0	0
International	1,466	1,366	1,028	759	0	0
Aviation	3,623	3,852	4,150	4,162	4,546	4,506
Domestic	288	258	265	261	0	0
International	3,335	3,594	3,885	3,901	0	0
<b>Total</b>	<b>24,132</b>	<b>24,594</b>	<b>25,469</b>	<b>26,231</b>	<b>26,943</b>	<b>26,801</b>

Source: Thailand Transport Portal, Ministry of Transport

## Agriculture and Forestry

Land use in Thailand can be grouped into three major uses: forest, agriculture, and non-agriculture accounting for 32%, 46%, and 22%, respectively. It should be noted that the majority of land area (32% of the total land area or 68% of the total agricultural land) are used to cultivate only rice and other field crops (**Table 5**).

**Figure 9** shows the contribution from the agricultural sector to the real Gross Domestic Product (GDP). Although the total value of the sector has been steadily increasing over the period of 2011 – 2013, the proportion of the agricultural sector to the overall GDP has been in a declining trend since 2008.



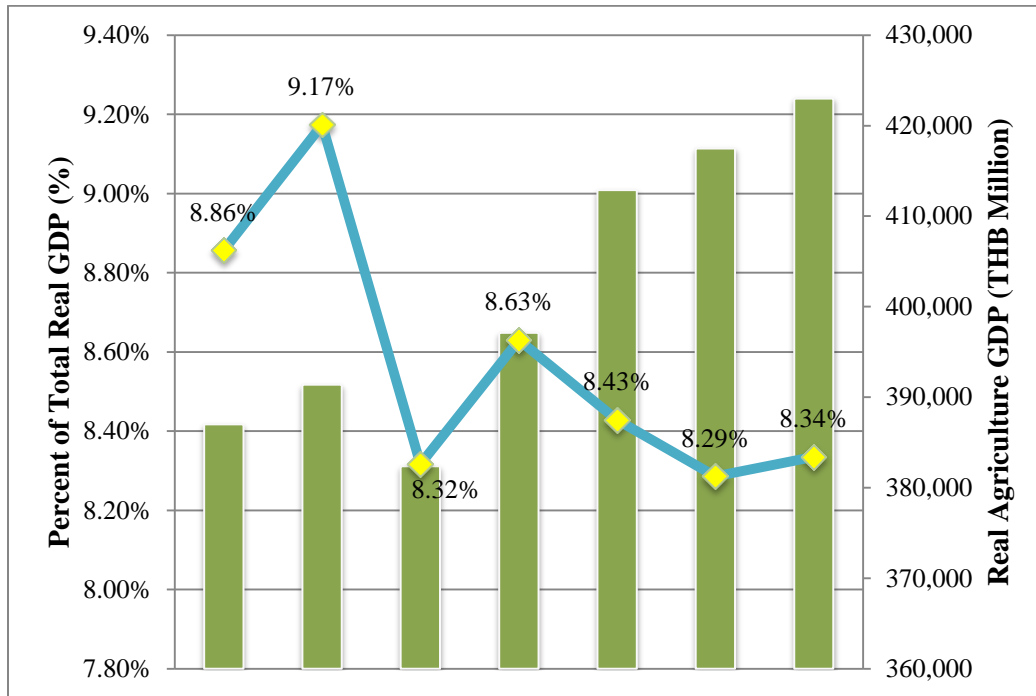
**Table 5: Land Use in Thailand, 2008-2013**

Unit: Hectare

Year	Total Land Area	Forest Land	Agricultural Land	Average Farm Size	Number of Farms	Agricultural Land					Non-Agricultural Land
						Rice	Other Field Crops	Fruit Orchard and Other Permanent Trees	Vegetable, Flower and Ornament Tree	Other Agricultural Land	
2013	51,311,502	16,339,126	23,877,797	4.04	944,656	11,194,378	4,984,640	5,586,444	223,741	1,888,594	11,094,579
2012	51,311,502	17,158,565	23,878,409	4.04	945,727	11,194,876	4,984,781	5,586,338	223,546	1,888,868	10,274,528
2011	51,311,502	17,158,565	23,879,428	4.07	939,368	11,197,705	4,983,901	5,585,189	223,149	1,889,483	10,273,509
2010	51,311,502	17,158,565	23,926,669	4.07	940,069	11,244,481	5,007,527	5,554,796	217,284	1,882,580	10,246,268
2009	51,311,502	17,158,565	23,951,019	4.08	938,356	11,296,605	5,040,893	5,498,302	215,090	1,900,129	10,201,918
2008	51,311,502	17,158,565	23,967,073	4.15	925,138	11,337,303	5,090,384	5,417,627	212,876	1,908,884	10,185,864

Source: Office of Agricultural Economics

Note: Forest Land area is available in a five-year interval reflecting in the unchanged figures from 2008-2012



Source: Author's calculation using NESDB Data

**Figure 9: Agriculture Share of Gross Domestic Products, 2008-2014**

## Waste

Thailand economy continues to progress so does the Municipal Solid Waste (MSW) generation. The latest data from 2008-2014, show an increasing trend of MSW generation from 23.93 million ton in 2008 to 26.19 ton by the end of 2014. This is represented by an average annual growth rate of around 1.36% per year. Although, the percentage of MSW that has been properly treated has also been increasing, there is room for further improvement. Additionally, the amount of MSW that have been utilized such as recycled and reused have hovered around one-fifth of total MSW generated each year (Table 6).

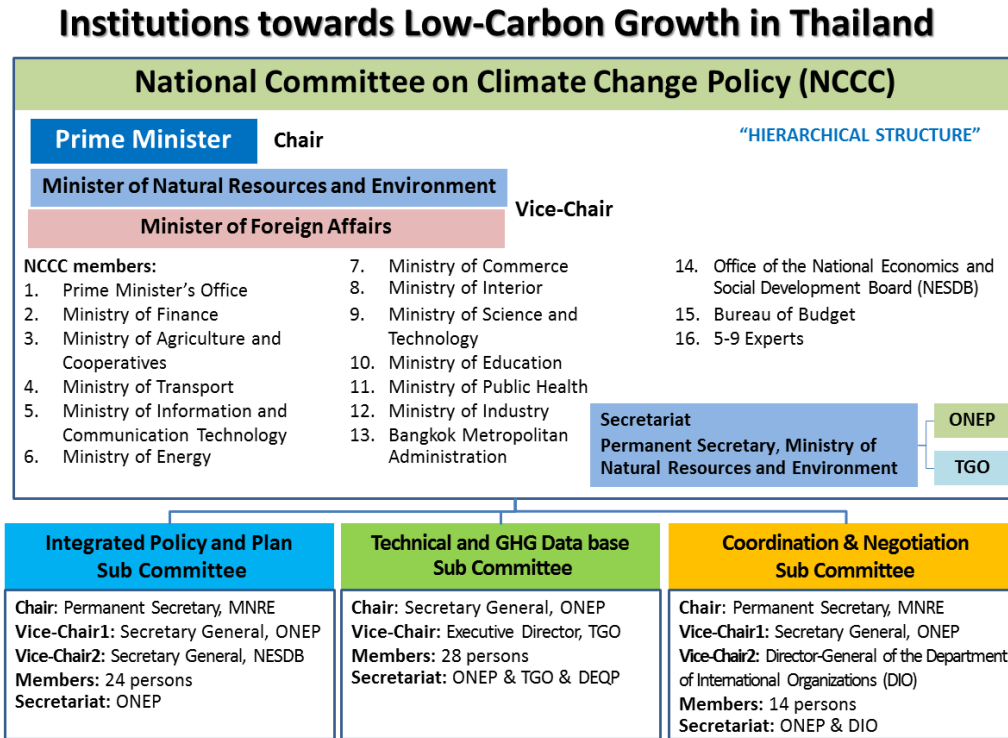
**Table 6: Municipal Solid Waste (MSW), Proportion of Properly Treated and Utilized MSW, and Per Capita MSW Generation, 2008-2013**

Year	MSW (Mton/year)	% MSW Treated Properly	% MSW being Utilized	Per Capita MSW Generation (kg/person/day)
2008	23.93	24	14	1.03
2009	24.11	25	16	1.04
2010	24.22	24	16	1.04
2011	25.35	22	16	1.08
2012	24.73	24	21	1.05
2013	26.77	27	19	1.15

Source: Pollution Control Department, Municipal Solid Waste Status, 2015

## Institutional Arrangements

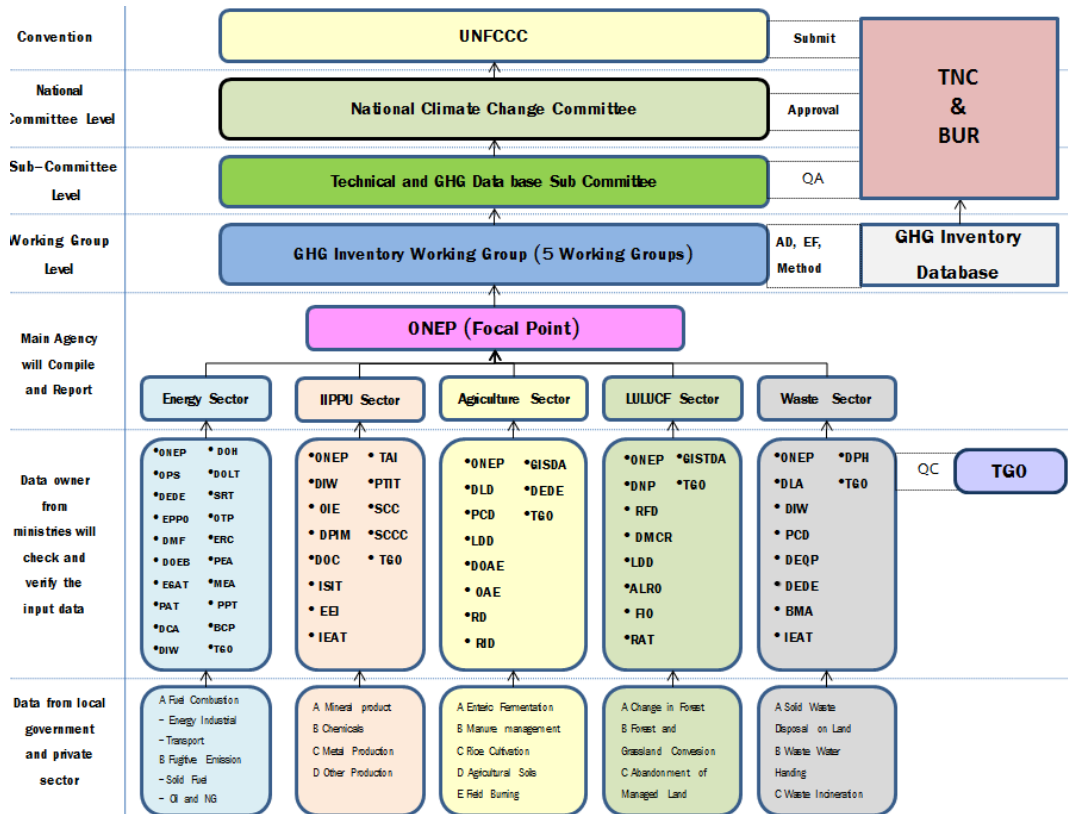
Thailand has recognized that climate change and its impacts could have serious adverse implications on the future economic and social development as well as eroded the success of the strong economic growth of the past few decades. As a result, the Government has put Climate Change as one of its national agenda and in 2007 established the National Committee on Climate Change Policy (NCCC), chaired by the Prime Minister. NCCC is primarily responsible for (i) formulating overall climate change policy and strategy; (ii) determining national position towards the international negotiations under the United Nations Framework Convention on Climate Change (UNFCCC) and any relevant international agreements; and (iii) monitoring and evaluating implementation results of government agencies as stated in the national policy and strategy. The NCCC organization structure is shown in **Figure 10**.



**Figure 10: Structure of the National Committee on Climate Change Policy**

To support the work of the NCCC, three sub-committees, namely, Integrated Policy and Plan Sub-Committee, Technical and GHG Database Sub-Committee, and Coordination and Negotiation Sub-Committee have been established. The Technical and GHG Database Sub-Committee is in charge of preparing the National Communications and Biennial Update Reports. Five Sectorial Working Groups have been set up to review activity data and their relevant emission factors used to calculate sectorial GHG emissions and removal as well as to provide recommendation on Measurement, Reporting, and Verification (MRV) system best suited to the country.

**Figure 11** demonstrates an Institutional Arrangement relevant to the preparation of GHG inventories.



**Figure 11: Preparation Structure National Communication and Biennial Update Report**

**List of Agencies:**

ALRO	Agricultural Land Reform Office	IEAT	Industrial Estate Authority of Thailand
BCP	Bangchak Petroleum PCL	ISIT	Iron and Steel Institute of Thailand
BMA	Bangkok Metropolitan Administration	LDD	Land Development Department
DCA	Department of Civil Aviation	MEA	Metropolitan Electricity Authority
DEDE	Department of Alternative Energy Development and Efficiency	OAE	Office of Agricultural Economics
DEQP	Department of Environmental Quality Promotion	OIE	Office of Industrial Economics
DIW	Department of Industrial Works	ONEP	Office of Natural Resources and Environmental Policy and Planning
DLA	Department of Local Administration	OPS	Office of the Permanent Secretary
DLI	Department of Livestock Development	OTP	Office of Transport and Traffic Policy and Planning
DMCR	Department of Marine and Coastal Resources	PAT	Port Authority of Thailand
DMF	Department of Mineral Fuels	PCD	Pollution Control Department
DNP	Department of National Parks, Wildlife and Plant Conservation	PEA	Provincial Electricity Authority
DOAE	Department of Agricultural Extension	PTIT	Petroleum Institute of Thailand
DOC	Department of Customs	PTT	PTT Public Company Limited
DOEB	Department of Energy Business	RAT	Rubber Authority of Thailand
DOH	Department of Harbor	RD	Rice Department
DOLT	Department of Land Transport	RFD	Royal Forest Department
DPIM	Department of Primary Industries and Mines	RID	Royal Irrigation Department
DPH	Department of Public Health	SCC	Siam Cement Company
EEI	Electrical and Electronics Institute	SCCC	Siam City Cement Company
EGAT	Electricity Generating Authority of Thailand	SRT	State Railway Authority of Thailand
EPPD	Energy Policy and Planning Office	TAI	Thailand Automobile Institute
ERC	Energy Regulatory Commission	TGO	Thailand Greenhouse Gas Management Organization
FIO	Forest Industrial Organization	UNFCCC	United Nations Framework Convention for Climate Change
GISTDA	Geo-Informatics and Space Technology Development Agency		

## Section 2: National Greenhouse Gas Inventory for 2011

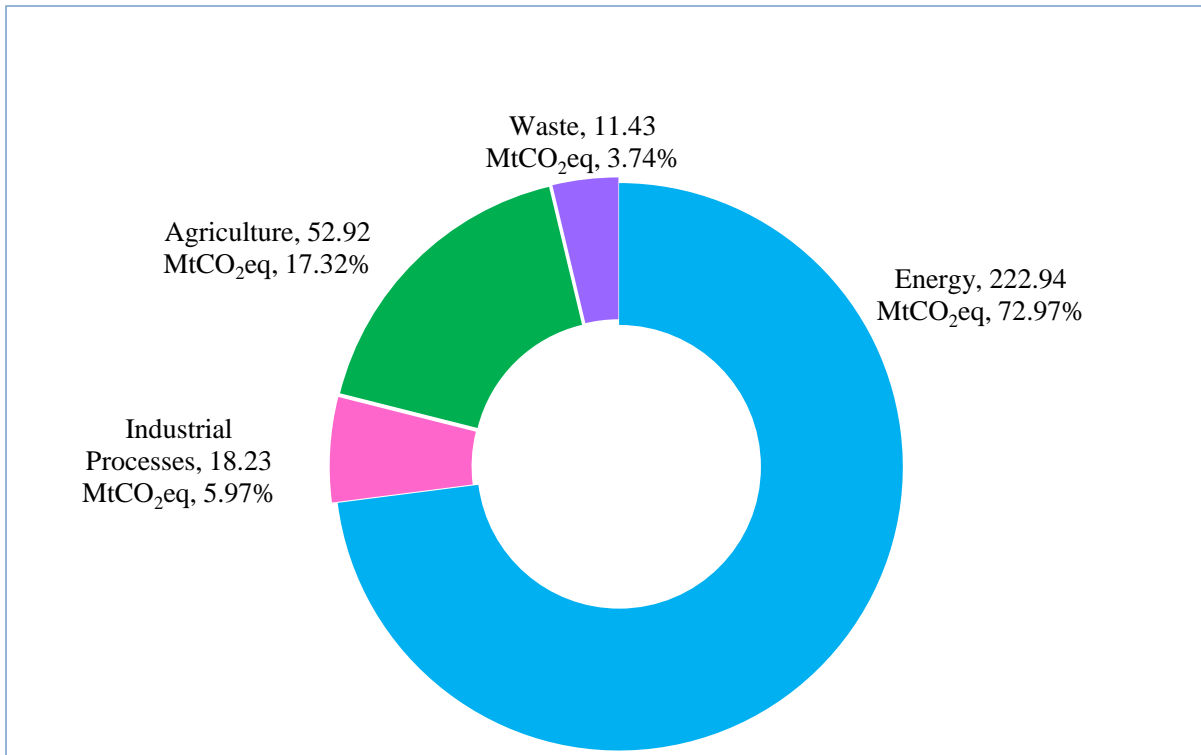
### Overview

The Eleventh National Economic and Social Development Plan has recognized the potential impacts of climate change as well as indicated responding measures in both climate change mitigation and adaptation as can be seen from the plan's vision "A *happy society with equity, fairness and resilience*." One of the Plan's four missions focuses on building secure natural resource and environmental bases through supporting community participation and improving resilience that will cushion impacts from climate change and disasters with the following targets: Environmental quality will be improved to meet international standards; reduction of greenhouse gas emissions will be more efficient; and forest areas will be expanded to restore balance to the ecology.

The National Greenhouse Gas (GHG) Inventory for 2011 will be finalized and become a part of the First Biennial Update Report submitted by Thailand to the UNFCCC. The First and Second National GHG Inventory Reports had been completed for the year 1994 and 2000, respectively. The National GHG Inventory is prepared according to the UNFCCC Guidelines for the national communication from Non-Annex-1 Parties as provided in Decision 17/CP.8. The Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, the 2000 IPCC Good Practice Guidance and Uncertainty Management in National GHG Inventories, and Good Practice Guidance for Land Use, Land-Use Change, and Forestry were used to estimate the national GHG inventory for 2011. The global warming potential (GWP) factors recommended by the Revised 1996 IPCC Guidelines were also used to derive emissions in CO<sub>2</sub> equivalent. Emission factors at Tier 1 and Tier 2 were derived using the default conversion factors from 1996 and 2006 IPCC Guidelines for National Greenhouse Gas Inventories. In the case of Thailand, activity data have been obtained from statistical reports from relevant agencies and reviewed by corresponding Working Groups of experts and practitioners.

### Key Findings from the National Greenhouse Gas (GHG) Inventory for 2011

Total GHG emissions in 2011 were amounted to 305.52 million ton of CO<sub>2</sub> equivalent (MtCO<sub>2</sub>eq). Total emissions can be categorized into the following Sectors: Energy, Industrial Processes, Agriculture, Land Use, Land-Use Change, and Forestry (LULUCF), and Waste. When the 43.19 MtCO<sub>2</sub>eq of GHG emissions and -114.13 MtCO<sub>2</sub>eq of removals from LULUCF were included, total GHG emissions reduced to 234.58 MtCO<sub>2</sub>eq due to the net removal of -70.94 MtCO<sub>2</sub>eq (**Figure 12**).



**Figure 12: Total GHG Emissions (excluding LULUCF) by Sector, 2011**

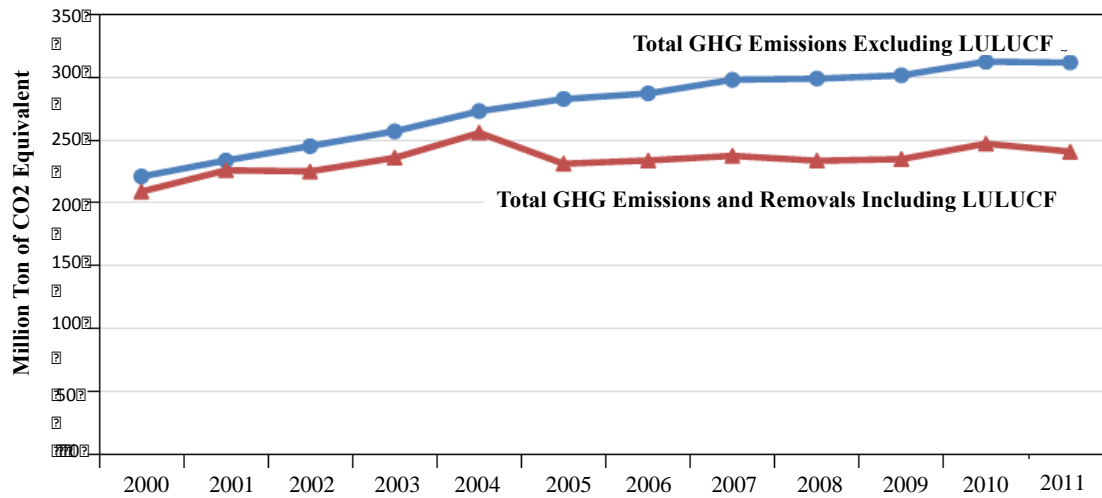
Based on GHG emissions by type of gas (**Table 7**), it is clear that carbon dioxide (CO<sub>2</sub>) was the highest, accounted for 75% of all GHGs emitted in 2011 while methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), contribution for Agriculture and Waste Sectors, accounted from 19% and 6%, respectively, over the same period.

**Table 7: Total GHG Emissions and Removals from Sources and Sinks, 2011**

<b>Sector</b>	<b>CO<sub>2</sub> Emission</b>	<b>CO<sub>2</sub> Removal</b>	<b>Total CO<sub>2</sub> Emission</b>	<b>CH<sub>4</sub> Emission</b>	<b>N<sub>2</sub>O Emission</b>	<b>Total Emissions</b>	<b>Total Emissions</b>	<b>National Total Percentage</b>
<b>Unit</b>	<b>GgCO<sub>2</sub></b>	<b>GgCO<sub>2</sub></b>	<b>GgCO<sub>2</sub></b>	<b>GgCO<sub>2</sub>eq</b>	<b>GgCO<sub>2</sub>eq</b>	<b>GgCO<sub>2</sub>eq</b>	<b>TgCO<sub>2</sub>eq (MtCO<sub>2</sub>eq)</b>	<b>%, excluding LULUCF</b>
<b>Energy</b>	210,404.91	NO	210,404.91	11,339.34	1,194.46	222,938.71	222.94	72.97
<b>Industrial Processes</b>	17,962.45	NO	17,962.45	0	270.28	18,232.73	18.23	5.97
<b>Agriculture</b>	NA	NO	NA	38,016.21	14,912.16	52,928.37	52.92	17.32
<b>LULUCF</b>	42,697.79	-114,127.46	-71,429.67	445.32	45.20	-70,939.15	-70.94	
<b>Waste</b>	82.22	NO	82.22	10,346.70	996.18	11,425.10	11.43	3.74
<b>Total Emissions (excluding LULUCF)</b>	228,449.58	0	228,449.58	59,702.05	17,373.08	305,523.28	305.52	100
<b>Total Emissions (including LULUCF)</b>	271,147.37	-114,127.46	157,019.91	60,147.37	17,418.08	234,584.13	234.58	

Remark: NA = Not Applicable    NO = Not Occurring

The GHG emission trends cover the period 2000-2011 is shown in **Figure 13**. Total GHG emissions (including LULUCF Sector) had increased over time during the period 2000-2004 with a decline in 2005, and then gradually increased thereafter.



**Figure 13: Total GHG Emissions Trends with and without LULUCF Sector, 2000-2011**

During the period 2000 to 2011, GHG emissions from the Energy Sector and Industrial Processes Sector have increased on average of 3.32% and 2.67% per year, respectively, which were lower than an average annual growth rate of the seasonally adjusted real Gross Domestic Product (GDP), which was 4.1% over the same period (**Figure 14**).



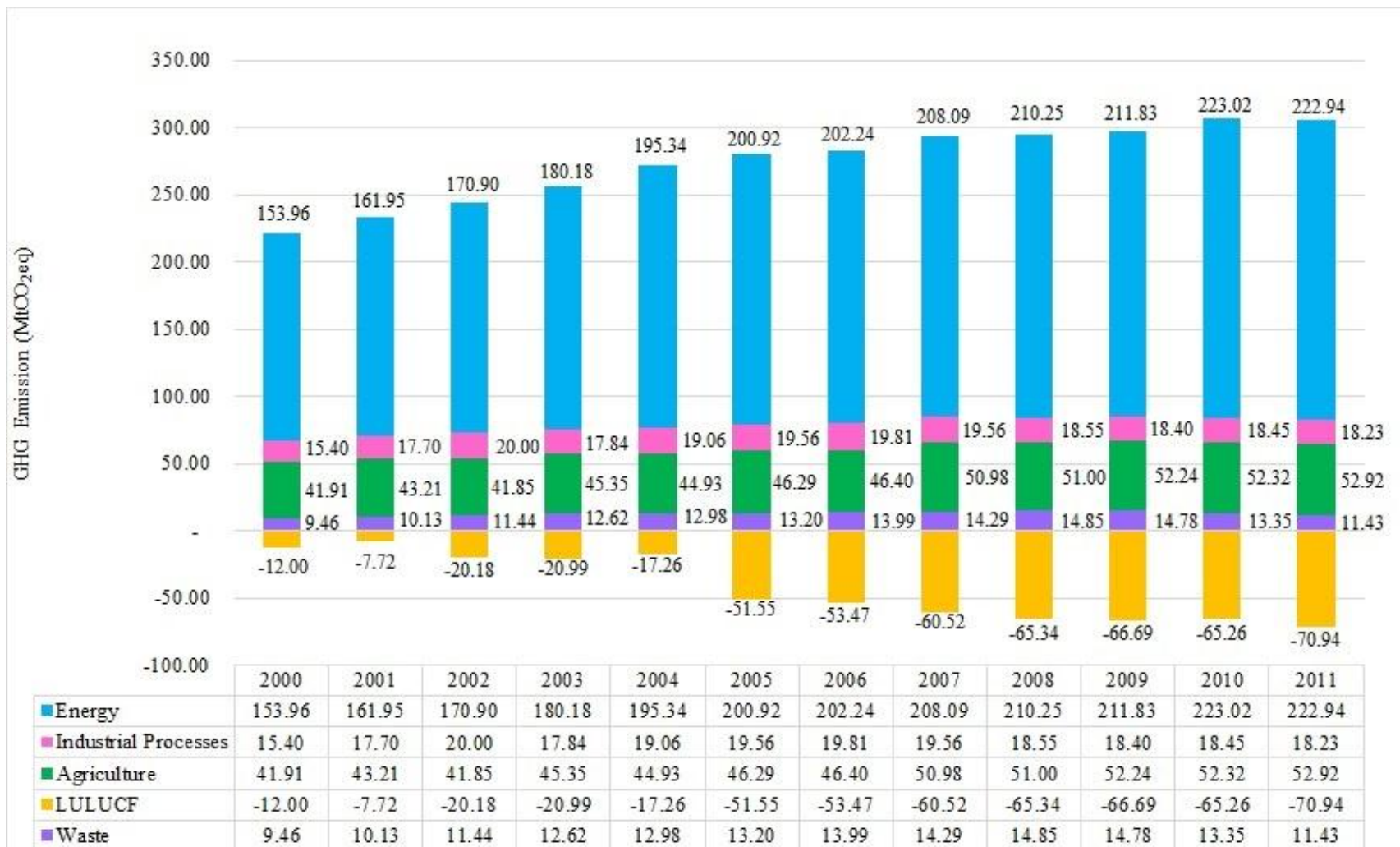


Figure 14: GHG Emissions and Removals by Source Category, 2000 - 2011

## Energy

The majority of GHG emissions in Energy Sector was generated by Fuel Combustion (1A), consisting mostly of Public Electricity and Heat Production (1A1) about 86.87 MtCO<sub>2</sub>eq or 39%. GHG emissions from Manufacturing and Construction (1A2) and Transport (1A3) were 44.52 MtCO<sub>2</sub>eq or 20% and 61.11 MtCO<sub>2</sub>eq or 27%, respectively. Fugitive Emissions from Fuels (1B) only emitted 9.29 MtCO<sub>2</sub>eq or a little over 4% of total GHG emissions from the Energy Sector. Detail of GHG emissions in Energy Sector by gas type and source in 2011 are presented in **Table 8** and **Figure 15**.

**Table 8: GHG Emissions Contribution from the Various Sources to the Total GHG Emissions in Energy Sector, 2011**

Greenhouse Gas Source and Sink Categories	CO <sub>2</sub>	CH <sub>4</sub>		N <sub>2</sub> O		NO <sub>x</sub>	CO	NMVOCs	SO <sub>x</sub>	Total	
	GgCO <sub>2</sub> eq	Gg	GgCO <sub>2</sub> eq	Gg	GgCO <sub>2</sub> eq	Gg	Gg	Gg	Gg	GgCO <sub>2</sub> eq	TgCO <sub>2</sub> eq (MtCO <sub>2</sub> eq)
<b>Total national emissions and removals</b>	210,404.91	539.97	11,339.34	3.85	1,194.46	1,231.39	5,249.51	574.25	642.73	222,938.71	222.94
<b>1. Energy</b>											
<b>1A Fuel Combustion</b>	210,404.91	97.69	2,051.55	3.85	1,194.46	1,231.39	5,249.51	574.25	642.73	213,650.92	213.65
<b>1A1 Public Electricity &amp; Heat Production</b>	86,513.22	3.83	80.45	0.88	273.10	251.12	109.04	10.65	57.14	86,866.77	86.87
<b>1A2 Manufacturing Industries and Construction</b>	43,739.00	12.58	264.13	1.68	520.59	160.37	1,173.58	21.84	522.58	44,523.71	44.52
<b>1A3 Transport</b>	60,684.84	13.32	279.72	0.46	142.38	601.66	2,245.40	418.18	7.07	61,106.93	61.11
<b>1A4 Other Sectors</b>	19,467.86	67.96	1,427.25	0.83	258.39	218.24	1,721.49	123.58	55.94	21,153.50	21.15
<b>1B Fugitive Emissions from Fuels</b>	NE	442.28	9,287.79	NE	NE	NE	NE	NE	NE	9,287.80	9.29
<b>1B1 Solid Fuels</b>	NE	38.59	810.31	NE	NE	NE	NE	NE	NE	810.31	0.81
<b>1B2 Oil and Natural Gas</b>	NE	403.69	8,477.49	NE	NE	NE	NE	NE	NE	8,477.49	8.48

Remark: NE = Not Estimated

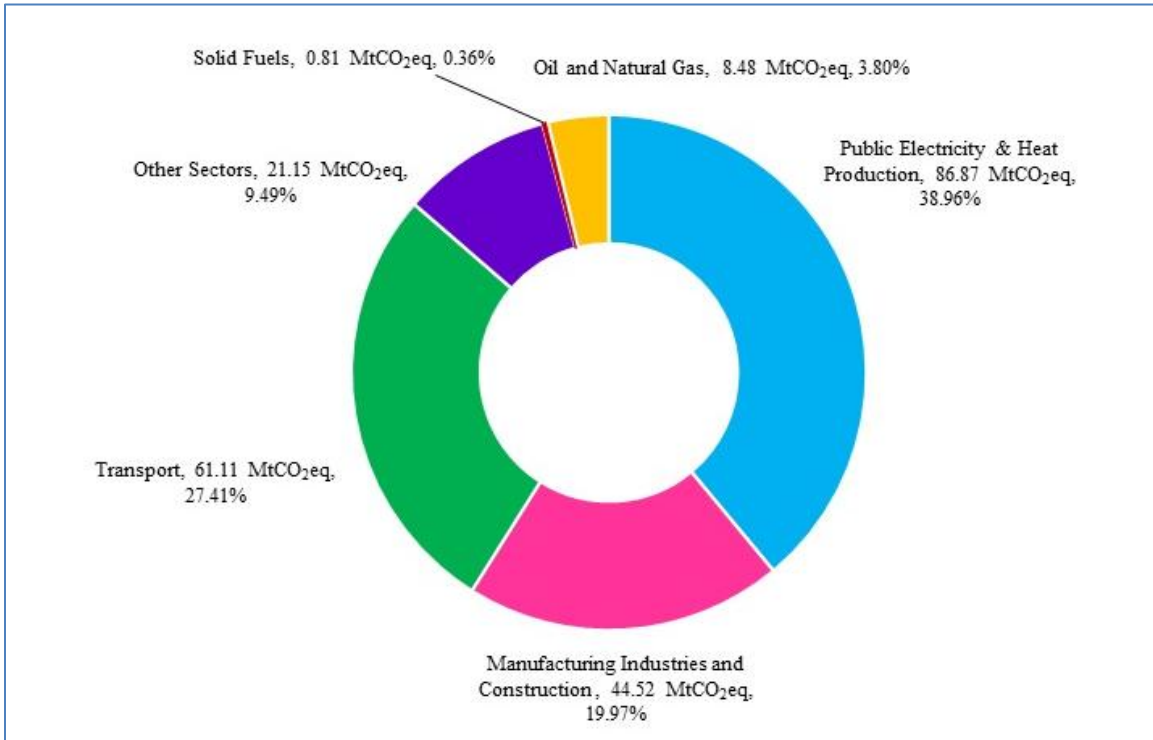


Figure 15: GHG Emissions in Energy Sector, 2011

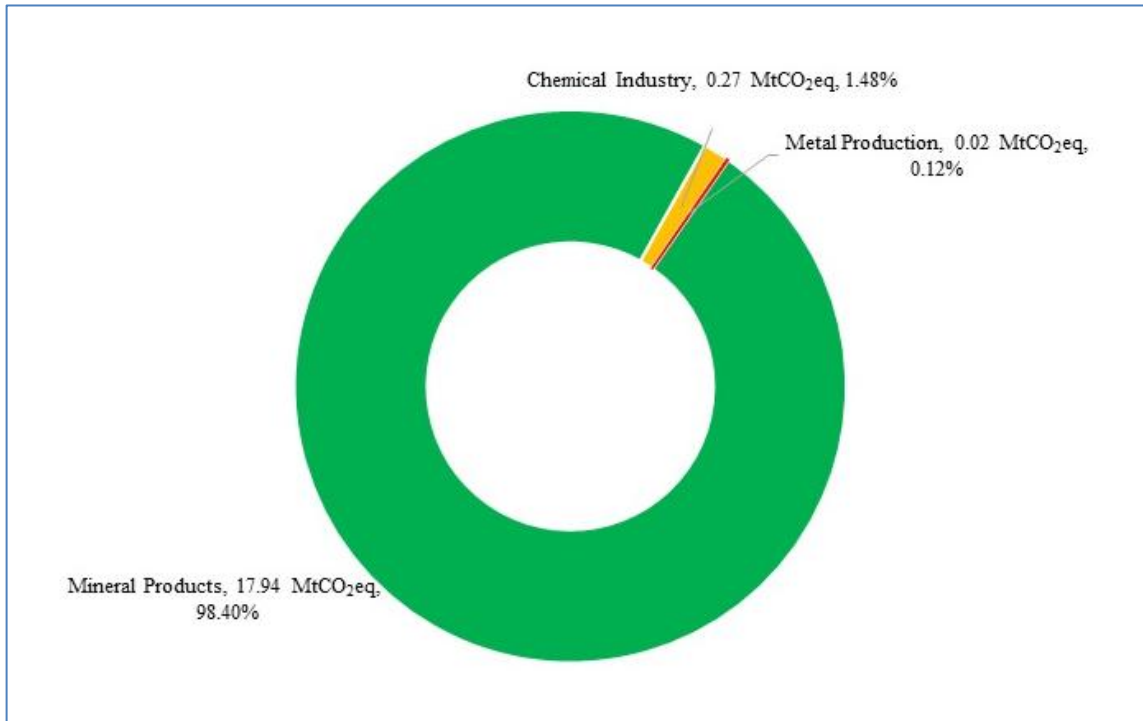
## Industrial Processes

The majority of GHG emissions from Industrial Processes Sector was mineral product (2A), which was equivalent to 17.94 MtCO<sub>2</sub>eq or 98% of total GHG emissions in this sector. The combination of Chemical Industry (2B) and Metal Production (2C) contributed less than 2% of GHG emissions in this sector. Detail of GHG emissions in Industrial Processes Sector by gas type and source in 2011 are presented in **Table 9** and **Figure 16**.

**Table 9: GHG Emissions Contribution from the Various Sources to the Total GHG Emissions in Industrial Processes Sector, 2011**

Greenhouse Gas Source and Sink Categories	CO <sub>2</sub>	CH <sub>4</sub>		N <sub>2</sub> O		NO <sub>x</sub>	CO	NMVOCs	SO <sub>x</sub>	Total	
	GgCO <sub>2</sub> eq	Gg	GgCO <sub>2</sub> eq	Gg	GgCO <sub>2</sub> eq	Gg	Gg	Gg	Gg	GgCO <sub>2</sub> eq	TgCO <sub>2</sub> eq (MtCO <sub>2</sub> eq)
<b>Total national emissions and removals</b>	17,962.45			0.87	270.28	1.35	4.06	169.12	16.78	18,232.73	18.23
<b>2. Industrial Process</b>											
<b>2A Mineral Product</b>	17,941.26	NO	NO	NO	NO	NO	NO	7.89	11.52	17,941.26	17.94
<b>2A1 Cement Production</b>	17,740.85	NO	NO	NO	NO	NO	NO	NO	11.52		
<b>2A4 Soda Ash Production and Use</b>	200.41	NO	NO	NO	NO	NO	NO	0.03	NO		
<b>2A7 Glass Production</b>	NO	NO	NO	NO	NO	NO	NO	7.86	NO		
<b>2B Chemical Industry</b>	NO	NO	NO	0.87	270.28	0.09	NO	NO	NO	270.28	0.27
<b>2B2 Nitric Acid Production</b>	NO	NO	NO	0.87	270.28	0.09	NO	NO	NO		
<b>2C Metal Production</b>	21.19	NO	NE	NO	NO	0.17	0.00	0.13	0.19	21.19	0.02
<b>2C1 Iron and Steel</b>	21.19	NO	NE	NO	NO	0.17	0.00	0.13	0.19		
<b>2D Other Production</b>	NO	NO	NO	NO	NO	1.09	4.06	161.11	5.07		
<b>2D1 Pulp and Paper</b>	NO	NO	NO	NO	NO	1.09	4.06	2.68	5.07		
<b>2D2 Food and Beverage</b>	NO	NO	NO	NO	NO	NO	NO	158.43	NO		

Remark: NE = Not Estimated      NO = Not Occurring



**Figure 16: GHG Emissions in Industrial Processes Sector, 2011**

## Agriculture

Total GHG emissions from Agriculture Sector in 2011 was equivalent to 52.92 MtCO<sub>2</sub>eq. Enteric Fermentation (4A) and Manure Management (4B) were equivalent to 8.30 MtCO<sub>2</sub>eq and 3.85 MtCO<sub>2</sub>eq, respectively, which accounted for a total of 23% GHG emissions in Agriculture Sector. Meanwhile, Rice Cultivation (4C) and Agricultural Soils (4D) were equivalent to 27.19 MtCO<sub>2</sub>eq and 11.82 MtCO<sub>2</sub>eq, respectively. Field Burning of Crop Residues (4F) represented the smallest GHG emissions at 1.76 MtCO<sub>2</sub>eq. Detail of GHG emissions in Agriculture Sector by gas type and source in 2011 are presented in **Table 10** and **Figure 17**.

**Table 10: GHG Emissions Contribution from the Various Sources to the Total GHG Emissions in Agriculture Sector, 2011**

Greenhouse Gas Source and Sink Categories	CO <sub>2</sub>	CH <sub>4</sub>		N <sub>2</sub> O		NO <sub>x</sub>	CO	NMVOCs	SO <sub>x</sub>	Total	
	GgCO <sub>2</sub> eq	Gg	GgCO <sub>2</sub> eq	Gg	GgCO <sub>2</sub> eq	Gg	Gg	Gg	Gg	GgCO <sub>2</sub> eq	TgCO <sub>2</sub> eq (MtCO <sub>2</sub> eq)
<b>Total national emissions and removals</b>		1,810.30	38,016.02	48.10	14,910.72	53.99	1,292.46			52,928.37	52.92
<b>4. Agriculture</b>											
<b>4A Enteric Fermentation</b>	NA	395.36	8,302.46	NA	NA	NO	NO	NO	NO	8,302.46	8.30
<b>4B Manure Management</b>	NA	58.39	1,226.14	8.48	2,627.75	NO	NO	NO	NO	3,853.89	3.85
<b>4C Rice Cultivation</b>	NA	1,295.00	27,194.96	NA	NA	NO	NO	NO	NO	27,194.96	27.19
<b>4D Agricultural Soils</b>	NA	NA	NA	38.13	11,819.91	NO	NO	NO	NO	11,819.91	11.82
<b>4F Field Burning of Agricultural Residues</b>	NA	61.55	1,292.46	1.49	463.06	53.99	1,292.46	NA	NA	1,755.52	1.76

Remark: NA = Not Applicable      NO = Not Occurring

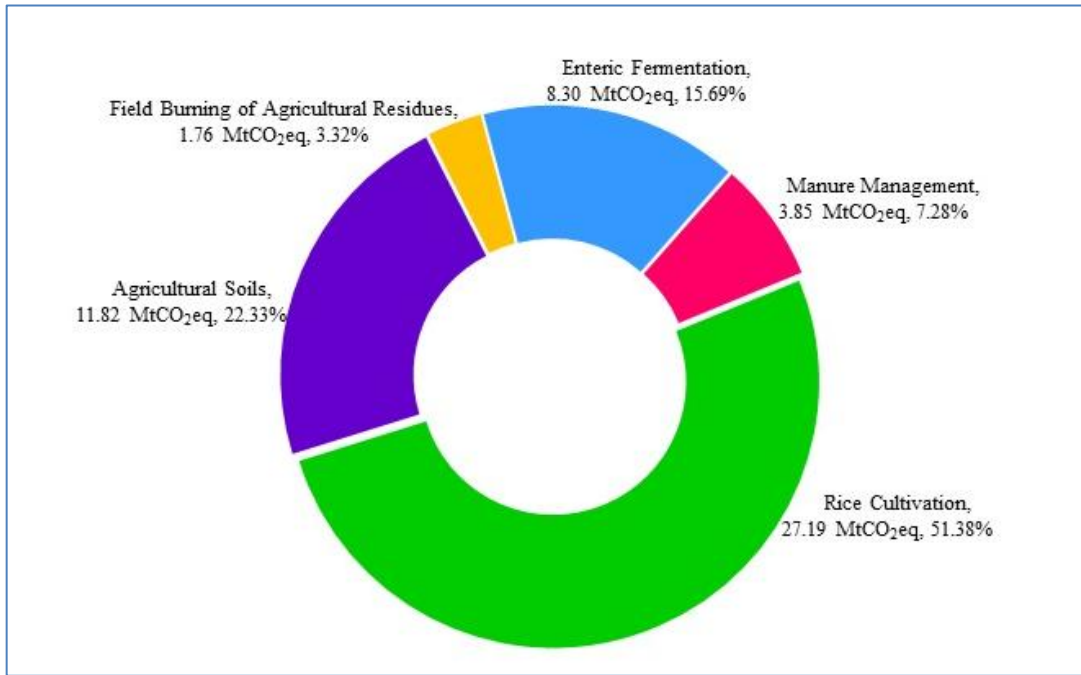


Figure 17: GHG Emissions in Agriculture Sector, 2011

## Land Use, Land-Use Change and Forestry (LULUCF)

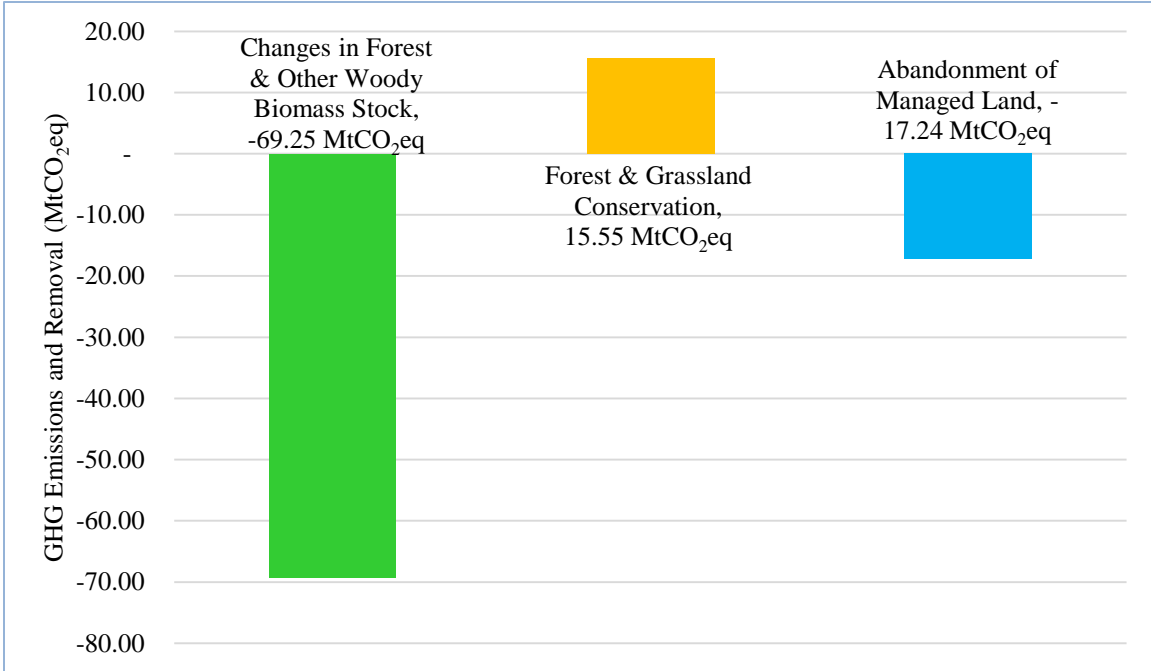
Improvement in data collection and research has led to recalculation of GHG emissions and removals for the year 2000 so that it could be compared with the data in 2011. Significant amount of removal in 2011 in Changes in Forest and Other Woody Biomass Stocks (5A) was due to inclusion of rubber plantation as well as other permanent tree species. As a result, LULUCF Sector vitally contributed to a net removal of GHG by 70.94 MtCO<sub>2</sub>eq per year, signifying the importance of forest conservation, plantation, and better management of land resources. On the other hand, if forest and grassland conversion rate is accelerating, the opposite outcome in term of net GHG emission from LULUCF Sector could be anticipated. Detail of GHG emissions in LULUCF Sector by gas type and source in 2011 are presented in **Table 11** and **Figure 18**.



**Table 11: GHG Emissions Contribution from the Various Sources to the Total GHG Emissions and Removals in LULUCF Sector, 2011**

Greenhouse Gas Source and Sink Categories	CO <sub>2</sub> emission	CO <sub>2</sub> removal	CH <sub>4</sub>		N <sub>2</sub> O		NO <sub>x</sub>	CO	NMVOCs	SO <sub>x</sub>	Total	
	GgCO <sub>2</sub> eq	GgCO <sub>2</sub> eq	Gg	GgCO <sub>2</sub> eq	Gg	GgCO <sub>2</sub> eq	Gg	Gg	Gg	Gg	GgCO <sub>2</sub> eq	TgCO <sub>2</sub> eq (MtCO <sub>2</sub> eq)
<b>Total national emissions and removals</b>	42,697.79	-114,127.46	21.21	445.32	0.15	45.20	2.29	185.55			-70,939.15	-70.94
<b>5. Land Use Change and Forestry</b>												
<b>5A Change in Forest and Other Woody Biomass Stocks</b>	27,634.38	-96,881.02	NE	NE	NE	NE	NE	NE	NO	NO	-69,246.64	-69.25
<b>5B Forest and Grassland Conservation</b>	15,063.41	NO	21.21	445.32	0.15	45.20	2.29	185.55	NO	NO	15,553.93	15.55
<b>5C Abandonment of Managed Land</b>	NO	-17,246.44	NO	NO	NO	NO	NO	NO	NO	NO	-17,246.44	-17.24
<b>5D Change in Soil Carbon</b>	NE	NE	NE	NE	NE	NE	NE	NE	NO	NO	NE	NE

Remark: NE = Not Estimated      NO = Not Occurring



**Figure 18: GHG Emissions and Removals in LULUCF Sector, 2011**

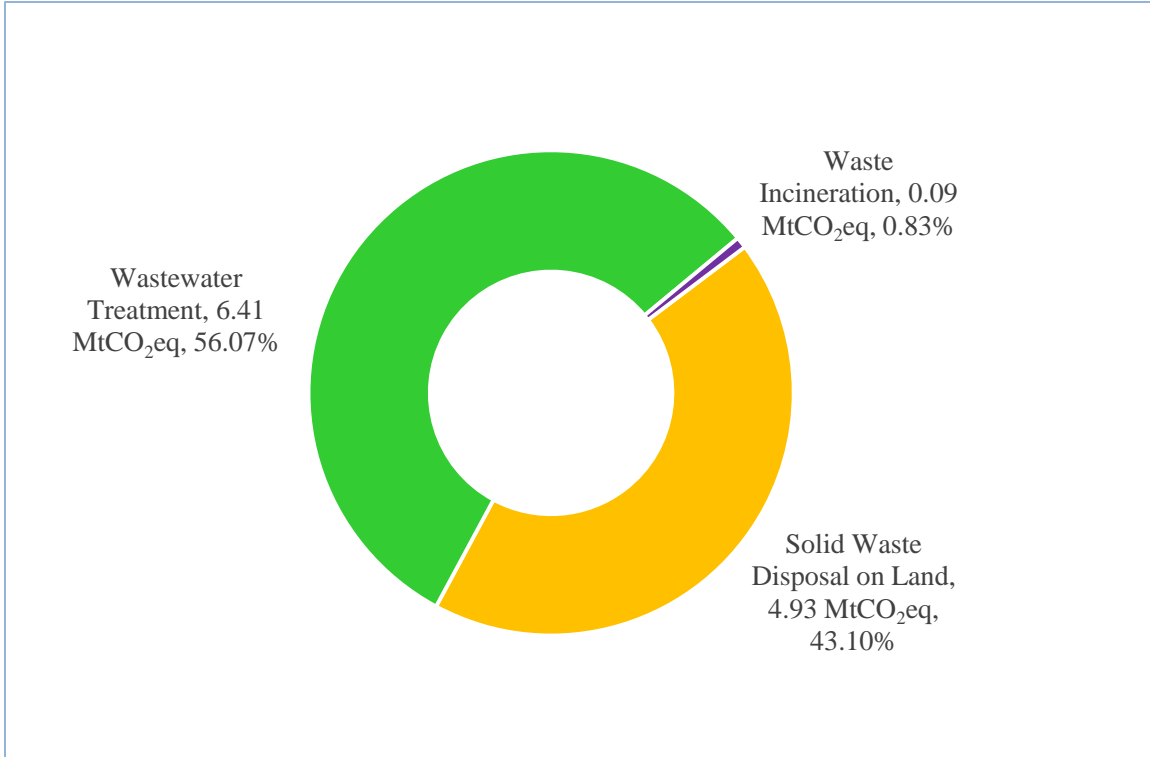
## Waste

Almost of total GHG emissions in the waste sector contributed from Wastewater Treatment (6B) which was equivalent to 6.41 MtCO<sub>2</sub>eq or 56.07% and Solid Waste Disposal on Land (6A) which was equivalent to 4.93 MtCO<sub>2</sub>eq or 43.10%. Waste Incineration (6C) was equivalent to 0.09 MtCO<sub>2</sub>eq which was the least proportion, accounted for 0.83% of total GHG emissions in this sector. Detail of GHG emissions in Waste Sector by gas type and source in 2011 are presented in **Table 12** and **Figure 19**.

**Table 12: GHG Emissions Contribution from the Various Sources to the Total GHG Emissions in Waste Sector, 2011**

Greenhouse Gas Source and Sink Categories	CO <sub>2</sub>	CH <sub>4</sub>		N <sub>2</sub> O		NO <sub>x</sub>	CO	NMVOCs	SO <sub>x</sub>	Total	
	GgCO <sub>2</sub> eq	Gg	GgCO <sub>2</sub> eq	Gg	GgCO <sub>2</sub> eq	Gg	Gg	Gg	Gg	GgCO <sub>2</sub> eq	TgCO <sub>2</sub> eq (MtCO <sub>2</sub> eq)
<b>Total national emissions and removals</b>	82.22	234.74	10,346.70	3.21	996.18					11,425.10	11.43
<b>6. Waste</b>											
<b>6A Solid Waste Disposal on Land</b>	NA	234.74	4,929.50	NA	NA	NO	NO	NA	NO	4,929.50	4.93
<b>6A1 Landfill Site</b>	NA	195.01	4,095.12	NA	NA	NO	NO	NA	NO		
<b>6A2 Open Dump</b>	NA	39.73	834.38	NA	NA	NO	NO	NA	NO		
<b>6B Wastewater Handling</b>	NA	257.96	5,417.20	3.21	993.55	NO	NO	NA	NO	6,410.76	6.41
<b>6B1 Industrial Wastewater</b>	NA	151.17	3,174.64	NA	NA	NO	NO	NA	NO		
<b>6B2 Domestic Wastewater</b>	NA	106.79	2,242.57	3.21	993.55	NO	NO	NA	NO		
<b>6C Waste Incineration</b>	82.22	NA	NA	0.01	2.62	NA	NA	NA	NA	84.85	0.09

Remark: NA = Not Applicable    NO = Not Occurring



**Figure 19: GHG Emissions in Waste Sector, 2011**

## Section 3: Mitigation Measures

### Overview

Since the submission of the Second National Communication Report in 2011, several climate change mitigation policies and measures have been put in place, at the national level, to fulfill Thailand's drive toward sustainable development including low carbon and resilient society as visibly stated in the 11<sup>th</sup> National Economic and Social Development Plan 2012 – 2016. One of the key objectives of the Plan is *“to develop an efficient and sustainable economy by upgrading production and services based on technology, innovation and creativity using effective regional links, by improving food and energy security, and by upgrading eco-friendly production and consumption toward a low-carbon society.”* As one of the Plan's targets, *“Environmental quality will be improved to meet international standards, reduction of greenhouse gas emissions will be more efficient, and forest areas will be expanded to restore balance to the ecology.”*

### National Climate Change Master Plan (2015 – 2050)

On July 14, 2015, the Royal Thai Government has currently endorsed the National Climate Change Master Plan (2015 -2050) with the following Vision, Missions, and Targets:

**Vision:** Thailand will achieve sustainable low carbon growth and climate change resilience by 2050

**Missions:**

- Building climate resilient into national development policy by integrating directions and measures in all sectors at both national and sub-national levels to ensure country's adaptability to climate change;
- Creating mechanisms to reduce GHG emissions, and leading to sustainable low carbon growth;
- Building readiness of master plan implementation by enhancing potential and awareness of all development partners; and
- Developing database, knowledge, and technology to support climate change adaptation and sustainable low carbon growth.

**Mitigation Targets:**

**Short-Term, by 2016:**

1. Developing medium-term and long-term GHG emission reduction targets and readiness of roadmap implementation by sectors; and
2. Establishing appropriate domestic mechanism using both legal and economic approaches to encourage low carbon development.

**Medium-Term, by 2020:**

1. Depending on the level of international support, GHG emissions from energy and transport sectors would be reduced by 7-20% in 2021 compared to the BAU scenario in 2005 as a base year;
2. By 2021, at least 25% of the energy consumption would be supplied from renewable energy sources; and
3. Ratio of municipalities with more than 10 m<sup>2</sup> of green space per capita to be increased by 2020.

**Long-Term, by 2050:**

1. Energy intensity would be reduced by at least 25% over the BAU by 2030;
2. Proportion of trips made by public transportation system would be increased;
3. Proportion of GHG emissions from land transport would be reduced.
4. Proportion of investment in low carbon and environmental friendly industries would be increased;
5. Open waste dumping area would be reduced;
6. Proportion of agriculture areas that comply with (i) Good Agricultural Practice (GAP) and (ii) Organic Agricultural Practices would be increased;
7. Proportion of open burning in agriculture areas would be reduced; and
8. Proportion of GHG emissions to Gross Domestic Product (GDP) would be reduced.

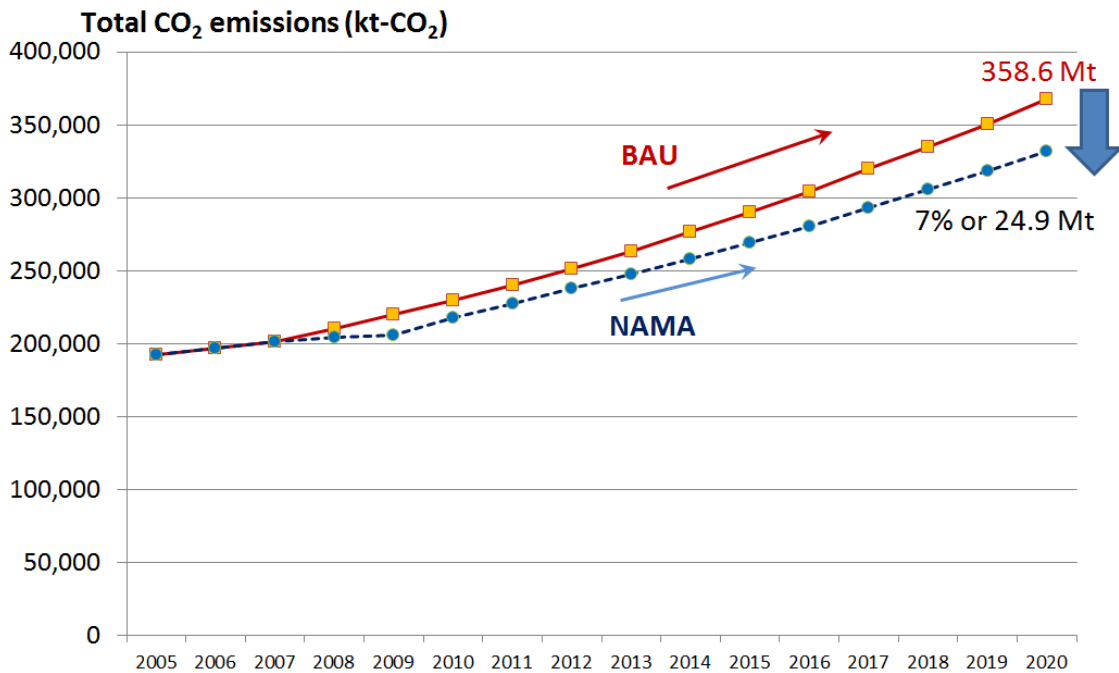
Thailand is on its way to achieve the short-term target of the National Climate Change Master Plan by 2016. Firstly, the NAMA Roadmap targeting GHG emission reduction for energy and transportation sectors have already been prepared and endorsed by the NCCC and communicated to UNFCCC on 29 December 2014. In the first communication, it could be summarized that Thailand has put the efforts, along with given international supports, to reduce GHG emission in the range of 7-20% below the BAU particularly in energy and transportation sector in 2020. Measures to be implemented for GHG emission reduction include:

- Development of renewable and alternative energy sources;
- Energy efficiency improvement in industries, buildings, transportation and power generation;
- Bio-fuels in transport; and
- Environmentally sustainable transport system.

In addition, Intended Nationally Determined Contributions (INDCs) and relevant information was submitted to UNFCCC on 1 October 2015 to restate that GHG emission would be reduced by 20% from BAU level by 2030, and up to 25% if supported by international organization.

Secondly, under the National Committee on Climate Change Policy structure, the NCCC has established the Integrated Policy and Plan Sub-Committee, which is tasked to prepare and propose mitigation mechanisms and measures encompassing legal, economic, fiscal, and social instruments required to translate into the policy, strategy, and work plan to achieve the medium-term and long-term mitigation targets.

Based on the Master Plan as well as the National Appropriate Mitigation Actions (NAMA), Thailand GHG emission trajectories until 2020 in a Business as Usual Case (BAU) and 7% reduction in GHG emissions can be illustrated below. With sufficient international support, Thailand aims to bend the low carbon trajectory even further down to 20% below the BAU case by the same target year. (Figure 20)



Source: ONEP, Appropriate GHG Emission Reduction Measures Development Project, Study Report

**Figure 20: GHG Emission Trajectories under Business as Usual (BAU) and NAMA Roadmap, 2005-2020**

## Progress toward NAMA Roadmap

By September 2015, the Coordination and Negotiation Sub-Committee has reviewed and accepted the progress report of the NAMA Roadmap implementation. Overall, Thailand has achieved a 4% reduction in GHG emissions (14.34 MtCO<sub>2</sub>eq) from the BAU, which is well on its way to meet the 7% GHG emission reduction target by 2020.

The NAMA Roadmap is based on key energy strategies that are periodically updated. There are two energy master plans developed for GHG emissions reduction; Alternative Energy Development Plan (AEDP) and Energy Efficiency Plan (EEP). Other relevant plans include Power Development Plan (PDP) 2015 and Electricity Generating Authority of Thailand (EGAT)'s Medium-Term (2012-2018) Generation and Maintenance Plan. Presently, Thailand has been improving the target of renewable energy development as 30% of the final energy consumption in 2036, as well as 30% reduction of energy intensity in 2036 (compared with 2010). In the Energy Sector, the Royal Thai Government has been focusing on (i) energy security and availability to satisfy fuel diversification; (ii) alternative energy development to be in line with local potential and energy demand; and (iii) increasing of energy production and consumption efficiency to improve energy sources utilization as well as to reduce environmental impacts from fossil fuel combustion. Brief summaries of these plans are described below.

To further drive the achievement of the AEDP, the government plans to implement the system of **Feed-in Tariff (FiT)**, which will focus on economic efficiency of the competing renewable energy technology, taking into account of declining pricing trends of renewable and alternative energy. For example, FiT of renewable technology other than solar and wind is such that the tariff will be determined by a competitive bidding process to ensure economic efficiency. Levelized Cost of Electricity (LCOE) i.e., THB/kWh of energy provided, will play a key role in the bidding process. After the winning tariff is determined it will be fixed for the period of 20 years, which will provide a robust incentive to attract private investment in renewable and alternative energy. The FiT, once implemented, will replace the “Adder” scheme for renewable and alternative electricity generation, which was especially successful in driving early private investment renewable electricity generation employing solar photovoltaic and wind technology.

The **Energy Efficiency Plan (EEP)** has been formulated with a target of 30% energy intensity reduction by 2036. The EEP is projected to conserve 51,700 ktoe by the end of the plan. The sectors with priority to undertake energy conservation are transportation sector and industry sector as well as commercial/government buildings and residence with target energy saving of 30,213 ktoe, 14,515 ktoe, 4,819 ktoe and 2,153 ktoe, respectively by 2036 (**Table 13**).



**Table 13: EEP: Energy Efficiency Potentials and 20-Year Target**

Unit: ktoe

Economic Sector Mitigation	Industry	Commercial Building/ Government Building	Residence	Transportation	Total
A. Final Energy Demand in 2036 (Normal Case)					<b>187,142</b>
B. Result of Implemented Energy Efficiency so that EI in 2013 decreased, and energy can be saved					<b>4,442</b>
C. Energy Efficiency Target as per EEP during 2015-2036	14,515	4,819	2,153	30,213	<b>51,700</b>
1) Enforcement of Energy Efficiency Standard in Buildings	4,388	768	-	-	<b>5,156</b>
2) Enforcement of Energy Efficiency Standard for New Buildings Construction	-	1,166	-	-	<b>1,166</b>
3) Determination of Energy Efficiency Standard and Labeling for Equipment and Material	749	1,648	1,753	-	<b>4,149</b>
4) Enforcement of Energy Efficiency Regulation for Energy Producer and Seller	202	184	114	-	<b>500</b>
5) Energy Efficiency Supporting/ Contribution	8,895	629	-	-	<b>9,524</b>
6) LED Use Promotion for Energy Efficiency	281	424	286	-	<b>991</b>
7) Energy Efficiency for Transportation	-	-	-	30,213	<b>30,213</b>
8) Research and Development for Energy Efficiency Technology and Innovation	-	-	-	-	-
9) Development of Energy Efficiency's Personnel	-	-	-	-	-
10) Energy Efficiency Encouragement Campaign	-	-	-	-	-
D. Total Energy Demand Reduction (B+C)					<b>56,142</b>
E. Energy Demand in 2036 (A-D), in case EE <sup>2015</sup>					<b>131,000</b>
F. % Energy Demand Reduction					<b>30</b>

Source: Energy Efficiency Plan, 2015

The recent Power Development Plan (PDP 2015), a long-term (15-20 years) electricity generation plan, has taken the targets from AEDP and EEP into account, which will reflect in reducing load demand forecast and increasing proportion of electricity generation from renewable energy sources. Electricity Generating Authority of Thailand (EGAT)'s Medium-Term (2012 – 2018) Generation and Maintenance Plan primarily focuses on increasing efficiency of electricity generation, particularly the efficiency of Specific Energy Consumption (SEC).

Detail of NAMA Roadmap and current achievement for the energy sector and transport sector are presented in **Table 14**.

**Table 14: Description of NAMA Roadmap and Achievements in 2013**

<b>Mitigation Measures and Description</b>	<b>GHG</b>	<b>Target</b>	<b>Indicators</b>	<b>Methodology to Calculate GHG Reductions</b>	<b>Mitigation Policy</b>	<b>Achieved Outcome by 2013</b>	<b>Estimated Emission Reduction by 2013 (MtCO<sub>2</sub>eq)</b>
<b>Electricity Generation from Natural Renewable Energy (solar, wind, and small hydropower) to substitute of fossil fuel</b>	CO <sub>2</sub>	Increase the ratio of electricity generation from renewable energy to 20% of total electricity generation by 2036	Electricity generation from renewable energy in GWh	Calculated from net power generation from renewable energy and multiplied with national grid emission factor	<ul style="list-style-type: none"> <li>• Focus on power generations from waste, biomass and biogas as priority</li> <li>• Tariff support through “new Feed-in tariff (FIT)” mechanism</li> <li>• Promote community to reduce fossil fuel usage</li> </ul>	1,713.4 GWh of electricity was generated from natural renewable energy from solar, wind, and small hydropower	0.98
<b>Electricity Generation from Bio-renewable Energy (biomass and biogas) to substitute of fossil fuel</b>						14,024.20 GWh of electricity was generated from bio-renewable energy from biomass and biogas	8.04

Mitigation Measures and Description	GHG	Target	Indicators	Methodology to Calculate GHG Reductions	Mitigation Policy	Achieved Outcome by 2013	Estimated Emission Reduction by 2013 (MtCO <sub>2</sub> eq)
<b>Biodiesel Generation to substitute diesel in transport sector</b>		Biodiesel to substitute diesel 14 million L per day by 2036	Biodiesel consumption in million L	Calculated from quantity of biodiesel consumption and multiplied with Net Calorific Value and emission factors of diesel	<ul style="list-style-type: none"> <li>• Legal requirement to blend 7% biodiesel with diesel since 2014</li> <li>• Lower tax on biodiesel than diesel</li> <li>• Provide training and capacity building support to produce biodiesel at community level</li> </ul>	1,050 million L per year of biodiesel consumption (2.9 million L per day)	2.83
<b>Ethanol Generation to substitute gasoline in transport sector</b>		Ethanol to substitute gasoline 11.3 million L per day by 2036	Ethanol consumption to substitute gasoline in million L	Calculated from quantity of ethanol consumption and multiplied with Net Calorific Value and emission factors of gasoline	<ul style="list-style-type: none"> <li>• Cancellation of gasoline with 91 octane since 2013</li> <li>• Using price mechanism to promote gasohol usage (E10 E20 and E85) both in consumers and car producers</li> </ul>	949 million L per year of ethanol consumption (2.6 million L per day)	2.07
<b>Energy Efficiency for Existing EGAT Power Plants by Improving efficiency of Specific Energy Consumption (SEC)</b>		GHG Emission Reduction of approximately 1.0 MtCO <sub>2</sub> eq by 2020	Specific Energy Consumption (SEC)	Calculated from the different of SEC before and after improvement and multiplied with net power generation and GHG emission factor of fossil fuel	Medium-Term Generation and Maintenance Plan (2012-2018), Electricity Generation Authority of Thailand (EGAT)	After energy efficiency improvement of Mae Moh Power Plant, SEC has been reduced to 475 MJ/MWh per unit on average	0.42
						<b>Total</b>	<b>14.34</b>

## Additional Domestic Mitigation Measures

### Gradual Reduction of Energy Subsidy

Furthermore, the Government also recognizes that the energy subsidy i.e., the difference between cost the consumers pay and the actual cost of energy especially fossil fuel subsidy (including environmental and health costs of air pollution and GHG emissions) might have adverse impacts on environment, health, energy inefficiency, fiscal status as well as opportunity cost that the foregone government budget could be used to finance other sustainable development agenda. However, a sudden removal of a long standing subsidy might cause business disruption, unfavorable impacts on low income population, and political and social tension, the Government has successfully adopted a step-by-step approach and taking advantage of declining global prices of fossil fuel.

### Environmental Sustainable Transport

The Government has been planning and implementing a Master Plan for Sustainable Transport System and Mitigation of Climate Change Impacts, which consists of two large-scale policies and measures to achieve greater climate change mitigation outcome in transport sector:

- (i) **Fiscal Policy** to reduce GHG emissions from new vehicle by designing a carbon based vehicle excise tax, which will be calculated on the amount of the GHG emission per kilometer and the engine size. The new excise tax structure (**Table 15**) was initiated in 2010, endorsed by the cabinet in 2011, announced in 2013 and would be effectively starting in 2016. In a medium to long-term, it is anticipated that consumers would adjust their buying behavior to favor smaller vehicles with greater fuel efficiency, which would then lead to fuel efficiency improvement by automobile manufacturers.

**Table 15: New Vehicle Excise Tax based on CO<sub>2</sub> Emission per Kilometer**

Vehicle Type	New Tax Rate, Effective date on Jan 1, 2016				Existing Tax Rate			
	Engine Capacity	CO <sub>2</sub> Emission (g/km)				Vehicle Type	Engine Capacity	Existing Tax Rate (%)
		< 100	< 150	150-200	> 200			
		New Tax Rate (%)						
Passenger Car	< 3,000 cc		30	35	Passenger Car	< 2,000 cc	30	
	E85/NGV-OEM		25	30		2,000 - 2,500 cc	35	
	> 3,000 cc	50				2,500 - 3,000 cc	40	
Hybrid	< 3,000 cc	10	20	25	30	Hybrid	> 3,000 cc	50
	> 3,000 cc	50					Any	10
Eco-Car	1,300 - 1,400 cc	14	17			Eco-Car	Any	17
	E85	12				E20	Any	-5
Vehicle Type	Engine Capacity	CO <sub>2</sub> Emission (g/km)						
		< 200	> 200					
		New Tax Rate (%)						
	Pickup with no cap	< 3,250 cc	3			5	PPV	Any
Pickup with space cap	< 3,250 cc	5			7			
Pickup double cap	< 3,250 cc	12			15			
Pickup Passenger Vehicle (PPV)	< 3,250 cc	25			30			
Pickup/PPV	> 3,250 cc			50				

Source: Ministry of Finance

(ii) **Rail Infrastructure** As shown in **Figure 21**, key projects include upgrading and adding second rail tracks to existing single tracks, building high-speed train network between major cities, replacing equipment, and significantly enlarging Bangkok’s mass rapid transit network (from today’s 100 kilometers to 509 kilometers by 2029). It was anticipated that these investments would lead to a reduction of annual logistics costs and energy bill by about 2% and 1% of GDP a year, respectively. Furthermore, the projects would also lead to decreasing travel times, enhancing productivity and connectivity between Bangkok and the provinces, and facilitating greater cross-border trade, which should strengthen Thailand’s position as the region’s connectivity and logistics hub.



Source: Ministry of Transport

**Figure 21: Map of Potential Rail Infrastructure Investment**

## Industrial Processes

Since 2011, the Ministry of Industry has been embarking on the implementation of Green Industry as a part of its balanced sustainable development strategy. The Green Industry project has so far attracted more than 11,000 participating installations signifying the awareness and concrete actions by entrepreneurs to move toward a more sustainable business practices. The Green Industry project is separated into five Green Steps: (i) Green Commitment; (ii) Green Activity; (iii) Green System; (iv) Green Culture; and (v) Green Network. The participants in the Green Industry project are not only getting direct benefits in terms of lower costs, higher productivity, improved relationship with their employees, customers, and local communities, and enhanced competitiveness through green product innovation but also contributing to reduced overall pollutions including GHG emissions.

## Agriculture

Recognizing that Field Burning of Agricultural Residues has caused serious harm to human health as well as contributed to GHG emissions, the Ministry of Agriculture and Cooperatives has been promoting recycle and reuse of rice straw and other agriculture residues by converting them to organic fertilizer and/or soil conditioner to redeposit carbon and natural nutrients back into agricultural land. Awareness raising, capacity training, building network of farmers, and pilot programs have been successful launched by relevant authorities, leading to more than 1,000 trained farmers and ending field burning of agriculture residues in the area of 108,945 hectares.

In anticipation to potential climate variability especially prolong period of drought, the Rice Department (RD) has been conducting research into Alternate Wet and Dry (AWD) cultivation practice that depends on less water than the traditional practice. The results have been encouraging. RD has been able to achieve 20-50% reduction in water usage depending on soil type and condition as well as weather condition. The AWD cultivation practice could have significant potential to reduce GHG emissions as well as enhance resilient toward possible prolong period of drought. Furthermore, the Ministry has also been promoting the deployment of precise fertilizer practice, which depending on the type of soil, crop, and stage of crop growth, suitable type and quantity of fertilizer as well as how to apply the fertilizer would be provided to the farmers. The precise fertilizer practice would optimize the use of fertilizer; reduce contamination through run-off; and lower farmer's expenses.

## LULUCF

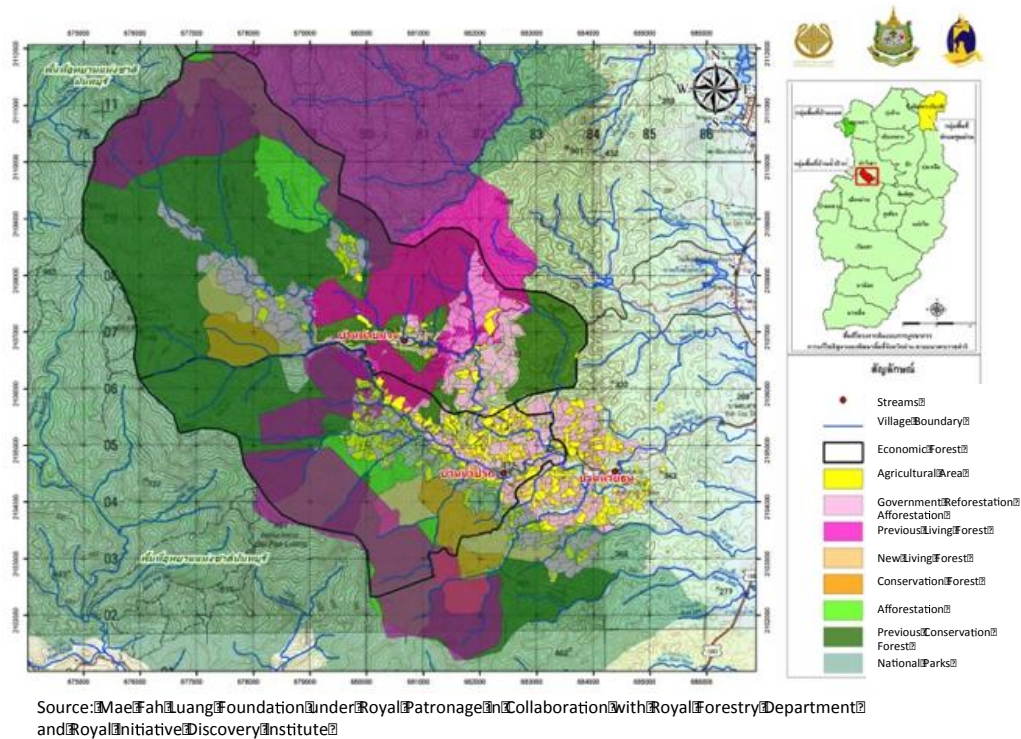
The Department of National Parks Wildlife and Plants Conservation (DNP) has been actively participating in the REDD+ readiness preparation program supported by the Forest Carbon Partnership Facility (FCPF). The program plans to prepare the National REDD+ Strategy, Safeguard Framework, develop appropriate reference levels, benefit-sharing framework, information sharing and networking, and capacity building and



awareness rising. Forest Industrial Organization (FIO) and Royal Forestry Department (RFD) have been implementing several measures to increase carbon stock by afforestation and reforestation as well as allowing for natural regrowth of the forest by leaving the forest area undisturbed and capacity building and awareness raising of local communities to protect the forest. Consequently, more than 9,000 community forests are thriving under the management of local communities, promoted and supported by RFD. Furthermore, RFD has been conducting a research program on tree improvement to develop tree that could sequester more carbon from atmosphere than its native counterpart.

Traditionally, one of the major drivers that lead to deforestation and forest degradation is land conversion to agriculture or other uses due to the economic hardship of population that reside in or around forest. Therefore, without attacking the root cause of the problem, success can be limited and unsustainable. As a result, the Government has been involve in pursuing a more balance and participatory approach to stabilize the deforestation and forest degradation.

Adopting HM the King’s “Sufficiency Economy” Philosophy, Process, and Practice, a critically endangered and impoverished watershed of Nan river basin (**Figure 22**) has been selected by the Government in partnership with Mae Fah Luang Foundation (MFLF) under Royal Patronage, Royal Forestry Department, and Royal Initiatives Discovery Institute (RID) to sustainably prevent further deforestation and forest degradation in the area of around 40,000 hectares.



**Figure 22: Reduction of Deforestation and Forest Degradation Project in Tha Wang Pha District, Nan Province**

The project is working in strong collaboration with local community to improve their livelihood and enhance the productivity of their farming practices. Once, their earnings per farming area have been increased due to better soil management, water availability from small own-pond, and high yield seeds, the farmers have been able to reallocate some parts of their land to reforestation and afforestation activities. Several fallow lands (land that is left unused for a period of time so that soil nutrients can be accumulated) have been permanently left as regrowth forest. Forest fires have been under control by strict rules established by the local community themselves resulting in more 98% reduction in forest fire incident.

Ultimately, the project is able to end further deforestation and restore the conservation forest area to around 60% from 40% while enhancing the community’s livelihood and reducing GHG emissions from forest conservation, reforestation and afforestation, sustainable forest management, and increased carbon stock activities within the project site. Currently, the project is going to be submitted to Thailand Greenhouse Gas Management Organization (TGO) for registration under Thailand Voluntary Emission Reduction (T-VER) scheme.

The project is in line with the national effort led by the Ministry of Natural Resources and Environment, aiming to stop deforestation, rehabilitate degraded forest land, and increase the forest area in 13 priority provinces in the Northern region with serious deforestation and forest degradation issues.

## Waste

By adopting the Municipal Solid Waste (MSW) Management Roadmap in August 2014, the current government has put strong emphasis on addressing the cumulative problems resulting from lack of proper treatment and disposal of municipal solid waste. The MSW Roadmap focuses on four critical steps with immediate (6 months), medium-term (1 year), and long-term (more than 1 year) strategies and targets. A summary of the MSW Roadmap is presented in **Table 16**.

**Table 16: Municipal Solid Waste Management Roadmap**

Step	Strategy	Target
1. Eradicate cumulative MSW from key existing waste disposal sites	<ul style="list-style-type: none"> <li>• Site assessment to prepare closure or rehabilitation plan</li> <li>• Close of improve disposal sites according to technical guideline</li> <li>• Transform cumulated MSW into energy e.g., in a form of Refuse Derived Fuel (RDF) for utilization at appropriate industrial plants or dedicated MSW treatment facilities</li> </ul>	<p><b>Immediate Term (6 months)</b></p> <ul style="list-style-type: none"> <li>• Target Areas: 6 high priority provinces</li> <li>• Reduce 29% (11.05 MTon) of the total cumulated MSW of 28 MTon</li> </ul> <p><b>Medium-Term (1 year)</b></p> <ul style="list-style-type: none"> <li>• Target Areas: 20 priority provinces</li> <li>• Reduce 41% (11.40 MTon) of the total cumulated MSW of 28 MTon</li> </ul>



Step	Strategy	Target
		<p><b>Long-Term (More than 1 year)</b></p> <ul style="list-style-type: none"> <li>• Target Areas: 47 provinces</li> <li>• Reduce 9% (2.50 Mton) of the total cumulated MSW of 28 Mton</li> </ul>
<p>2. Design effective MSW and Hazardous Waste Management System</p> <ul style="list-style-type: none"> <li>• Focus on reduce and recycle at source</li> <li>• Centralized MSW Management</li> <li>• Explore waste-to-energy option</li> </ul>	<p>Piloting effective MSW Management System by grouping disposal sites into Small (less than 50 ton of waste per day), Medium (between 50 – 300 ton of waste per day), and Large (greater than 300 ton per day).</p>	<p><b>Immediate Term (6 months)</b></p> <ul style="list-style-type: none"> <li>• Large: 6 sites</li> <li>• Medium: 2 sites</li> <li>• Small: 5 sites</li> </ul> <p><b>Medium-Term (1 year)</b> 26 provinces</p> <p><b>Long-Term (More than 1 year)</b> 46 provinces</p>
<p>3. Update MSW and Hazardous Waste Management Regulations and Procedures</p>	<p>Modernize and strengthen MSW and Hazardous Waste management regulations and procedures</p>	<p><b>Immediate Term (6 months)</b></p> <ul style="list-style-type: none"> <li>• Prepare National MSW Management Master Plan with appropriate technology for different scale of treatment and disposal sites</li> <li>• Revise existing and/or issue new ministerial decree on related waste management fee and fine</li> <li>• Issue Local Government Regulation requiring waste separation at source</li> </ul> <p><b>Medium-Term (1 year)</b> 26 provinces</p> <p><b>Long-Term (More than 1 year)</b> 46 provinces</p>
<p>4. Build Public Awareness and Incentive to Comply with Regulation</p>	<ul style="list-style-type: none"> <li>• Build Public Awareness of good waste management practice, especially for children and youth</li> <li>• Strengthen legal enforcement focusing on illegal disposal of hazardous and infectious waste</li> </ul>	<p>This step will be implemented nationwide and</p>

## Voluntary Domestic Crediting Scheme

Thailand Greenhouse Gas Management Organization (TGO) has developed a voluntary domestic GHG crediting mechanism called Thailand Voluntary Emission Reduction Program (T-VER), using “baseline and credit” approach to calculate GHG emission reduction from projects that reduce GHG emissions.

T-VER aims to encourage the public and private sector to reduce GHG emissions while enhancing sustainable development.

As of October 2015, 20 projects were registered under the T-VER program with TGO. The total expected annual GHG emission reductions are 704,413 tCO<sub>2</sub>eq. So far, the total T-VERs of 399,538 tCO<sub>2</sub>eq have been issued to the seven registered T-VER projects. Most of the registered projects are in energy sector (energy efficiency and renewable energy) followed by projects in the waste management and forest sector. The implementation of T-VER program not only supports the GHG emission reductions in Thailand but it also has created numerous economic, social, and environment co-benefits.

## Carbon Footprint Reduction (CFR) Label

In 2014, TGO and the National Metal and Materials Technology Center (MTEC) have developed a Carbon Footprint Reduction (CFR) label or global warming reduction label for products that have reduced their carbon footprint overtime through calculation of their product lifecycle.

CFR's assessment is based on the concept of product life cycle like raw material acquisition, transportation and distribution, production, usage and end of life disposal. Products will conform with the CFR label requirements if they achieve present year reduction of 2% or more compared to their base year's carbon footprint. Products can also achieve the reduction label if they conform to the benchmark threshold of footprint set by TGO for the respective product's category.

As of 15 October 2015, 112 products from 29 companies including ceramic tiles, wall and floor tiles, dish cleaner, textiles, cement, cooking oil and others are registered for CFR label which can reduce emissions equivalent to 121,474 tCO<sub>2</sub>eq.

Additional implemented projects to support mitigation are also presented in **Appendix 1**.

## International Market Mechanisms

Thailand has been an active participation in international market mechanism including Clean Development Mechanism (CDM). Thailand Greenhouse Gas Management Organization (TGO), serving as a Designated National Authority (DNA) for CDM, has so far issued Letter of Approval (LoA) to 222 projects (consisting of 212 single & bundled CDM projects, 7 CDM-Program of Activities (CDM-PoAs) projects and 3 transboundary projects) with a total expected Certified Emission Reductions (CERs) of 12.71 MtCO<sub>2</sub>eq per year. 153 projects that were issued LoA from TGO have been registered with the CDM Executive Board (CDM EB), with total expected CERs of 7.41 MtCO<sub>2</sub>eq per year. These registered projects include all 7 CDM-PoAs. Furthermore, 54 registered projects have been issued "Certified Emission Reductions (CERs)" of 9,136,639 CERs. Most of the registered CDM projects are based on the utilization of renewable energy in the form

of biogas (57.18%) and biomass (16.14%) to replace fossil fuel to generate electricity and heat.

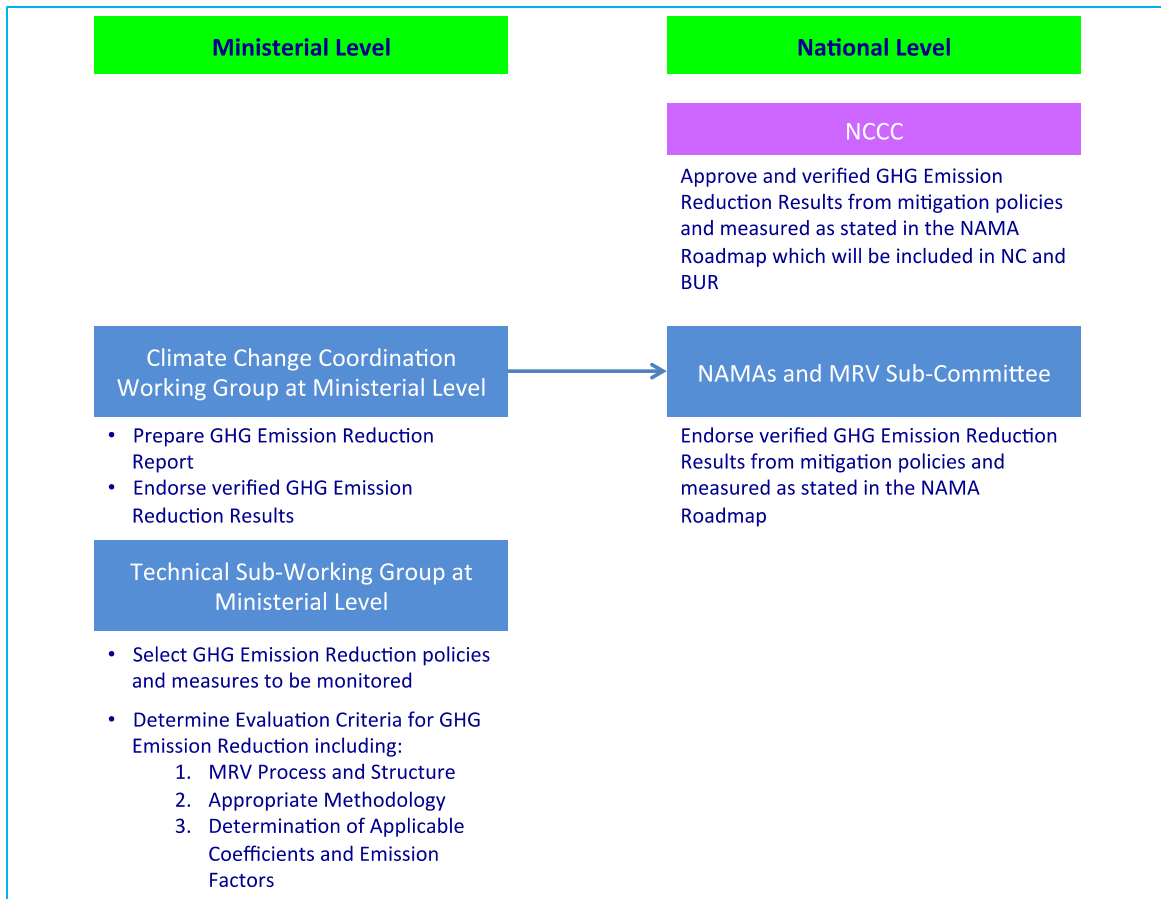
Thailand is also working with international development partners to explore future international and domestic market mechanisms to encourage further investment in mitigation activities such as Partnership for Market Readiness (PMR) and Forest Carbon Partnership Facility (FCPF). Recently, S.P.M. Feed Mill as a company in Thailand have participated in a GHG emission reduction project i.e. the Pilot Auction Facility for Methane and Climate Change Mitigation (PAF) which is an innovative climate finance model developed by the World Bank Group to stimulate investment in projects that reduce greenhouse gas emissions while maximizing the impact of public funds and leveraging private sector financing. PAF gives a guaranteed price insurance to project developers, providing them with a unique opportunity to sell their carbon credits in the future (Put Option). It was developed to stimulate investment in projects that reduce greenhouse gas emissions, while maximizing the impact of public funds and leveraging private sector financing. The auction bought price guarantees for 8.7 MtCO<sub>2</sub>eq of ERs to cut methane emissions at a clearing price of \$2.40 per t. S.P.M Feed Mill, along with winners from other countries will surrender CER credits to PAF in 2016.

## Information on Domestic MRV

To monitor the implementation progress of the NAMA Roadmap, Thailand has developed domestic MRV system for the sectors and included in the NAMA Roadmap as mentioned earlier. The domestic MRV system typically involves the following process:

- Measuring activity data is carried out according to specific GHG emission reduction methodology by responsible installations (e.g., power plants and liquid fuel production plants);
- Reporting of the activity data by responsible installations to corresponding authority (e.g., Energy Regulatory Commission, Department of Energy Business, and EGAT); and
- Verification is undertaken by the authorized agencies such as Department of Alternative Energy Development and Efficiency.

The GHG Emission Reduction Monitoring Structure according to the domestic NAMA is illustrated in **Figure 23**.



**Figure 23: GHG Emission Reduction Monitoring Structure according to the NAMA Roadmap**

## **Section 4: Constraints and Gaps, and Related Financial, Technical and Capacity Needs**

It is important to incorporate concerns that several of the proposed measures and actions in these mitigation plans are subject to very high upfront investment and recurring operating costs. Particularly costs of technologies and infrastructures, which can become an important barrier to successful implementation of the mitigation plans.

Some of the key barriers for the energy sector include, for instance, limitation of grid connection due to inadequate capacity of transmission lines, lack of support by financial institutions for energy efficiency and renewable energy investments, lack of domestic technological and technical resources and negative public perception particularly against waste-to-energy and biomass power plants.

Several measures require a high level of technical capacity and effective coordination across different sectorial agencies, whereas such technical capacity and effective coordination in a developing country like Thailand is currently in progress.

For renewable energy development in particular, the International Energy Agency (IEA) also cited some of the above-mentioned barriers as common barriers for renewable energy deployment in developing countries. Domestically, Thailand has launched several support mechanisms such as Feed-in Tariff (FiT), tax incentives and access to investment grants and venture capital to promote renewable energy. However, to achieve ambitious and more rapid renewable energy deployment, incentives have to be created for technology developers to cooperate and share technology knowledge to enable technology transfer on a larger scale.

International financial support mechanisms such as technical assistance and technology transfer funds for purchasing intellectual property rights for a free distribution of clean energy technologies would be very valuable to accelerate diffusion of renewable energy technologies for developing countries<sup>2</sup>.

Furthermore, efforts are needed to inform the public, through lessons-learned and experience sharing from other countries, as well as showcasing success stories from pilot or demonstration projects. It is therefore crucial that international cooperation through the UNFCCC focus on these cooperative attempts to unlock the potentials of developing countries in their contributions towards the global solutions to climate change by addressing these important identified barriers, making technological solutions more affordable for developing countries and strengthening the capacity of developing countries to implement these solutions more effectively and more sustainably. Successful

---

<sup>2</sup> International Energy Agency (IEA), 2011, Renewable Energy. Policy Considerations for Deploying Renewables, OECD/IEA, Paris.

implementation of these ambitious mitigation plans in Thailand, in addition to our domestic efforts, will be subject to adequate and predictable access to enhanced means of implementation agreed under the UNFCCC.

## Description of the Support Received

Thailand received numerous international and bilateral supports from development partners but mostly for capacity building of both mitigation and adaptation which can be described in **Appendix 2**.

Thailand and United Nations Partnership Framework 2012 – 2016 covers the following three main pillars:

- (i) Climate Change Adaptation and Disaster Risk Reduction A project supported under this Pillar include Strengthening Thailand's Capacity to Link Climate Policy and Public Finance (UNDP)
- (ii) Low Carbon and Green Economy Projects under this theme are NAMA Development in Building Sector (UNEP and GIZ), Thailand's Domestic Preparation for Post-2020 (UNDP), Industrial Energy Efficiency, Small Scale Biomass Power Plants in Rural Thailand, and Clean tech Program for SMEs in Thailand (UNIDO)
- (iii) Coordination and Knowledge Management includes project such as Thailand National Climate Change Database Web Site and Southeast Asian Network on Climate Change (UNEP) and Third National Communication and Biennial Update Report and Low Emission Capacity Building (UNDP).

Thailand has been working with the ADB and the World Bank Group to access Clean Technology Fund (CTF) to support low carbon investment by private sectors.

On future market mechanism, Thailand has been accessing the Partnership for Market Readiness and Forest Carbon Partnership Facility, which will pave the way for the country to explore the potential of market instruments as well as benefit/cost of such instruments.

## Summary of Support Needs

The National Science Technology and Innovation Policy Office (STI) with support from GEF and UNEP and in collaboration with relevant government agencies, private sector, and other stakeholder prepared Technology Needs Assessments for Climate Change Mitigation/Adaptation in Thailand, which was completed in 2012. The report concluded that mitigation technology was needed for energy efficiency and the renewable energy sector while adaptation technology was needed for the agricultural sector, water resources management, and modeling sector.

For the climate change mitigation, the following 5 technology options from the 4 groups of technology needs in the energy sector have been prioritized:

- Energy Supply
  - **Smart Grid:** A modernized electricity generation and delivery system, which integrated with information and communication technologies (ICT).
- Renewable Energy Technology
  - **Waste:** Waste-to-Energy to be promoted for reduction of fossil-fuel power generation
  - **Advanced Biofuels:** The biofuel is produced from non-food feedstock to avoid affecting the human food supply chain.
- Energy Efficiency Improvement
  - **High Efficiency Boiler:** Designed technology to control the burner output to match the boilers variable load requirements and a special type of water-tube boiler composed of tubes.
- Other Energy Sector
  - **Carbon Capture and Storage (CCS):** Technology and process for capturing CO<sub>2</sub> from large point source, such as fossil fuel power plants, transporting it to a storage site depositing it where it will not enter the atmosphere.

For climate change adaptation, technology needs are categorized into three sectors as follow:

- **Agriculture:** Three groups of technology needs are identified: (i) forecasting and early warning systems in order to reduce the risk of damage from extreme climate events and pest/ disease outbreaks as well as to increase the ability to select the right crops based on specific planting time and crop cycle; (ii) crop improvement for climate-resilient [Marker Assisted Selection (MAS) and genetic engineering] to reduce the risk of yield loss while increasing resource efficiency; and (iii) precision farming technologies in order to enable farmers to make informed decisions concerning their farming operations as well as to reduce inputs while maintaining maximum productivity and minimizing the effects on the environment.

- **Water Resource Management**: The high-impact technologies that have been prioritized as technology needs include: (i) networking (via pipes or canals) and management of infrastructures (including zoning); (ii) seasonal climate prediction as a part of weather and hydrological modeling; and (iii) sensor web using observation and/or modeling data as a part of an early warning.
- **Modeling**: The expert groups and other stakeholder have identified the following technology as high priority: (i) the national data center; (ii) national data collection, transfer, and management process; and (iii) integrated modeling i.e., Weather Research and Forecasting (WRF) and Advanced Research WRF (ARW).

In addition to the identified mitigation and adaptation Technology Needs, the government is currently in a process of discussing with international development partners to prepare a strategic plan to access global funds such as Green Climate Fund (GCF). ONEP is coordinating with other government agencies and private sector to identify both mitigation and adaptation project concepts that could be further developed into GCF project. The government is also considering the GCF's accreditation requirements to get direct access to the fund.

## **Information on the Level of Support Received for the Preparation of the BUR**

Global Environment Facility (GEF) has provided grant through the United Nations Development Programme (UNDP) to prepare the Third National Communication (TNC) and Biennial Update Reports (BURs) under the project Third National Communication and Biennial Update Report (TNC-BUR), started in early 2014. The government has provided counterpart support both in-kind and in-cash in order to fulfill its obligations under the UNFCCC requirement. The project is under an oversight of the Technical and GHG Database Sub-Committee of the NCCC. Five sectorial Working Groups have been established to facilitate data collection as well as review draft National GHG Inventory Report, which is a part of the TNC and BUR.



## References

- ❖ Office of the National Economic and Social Development Board (2015), *Gross Domestic Product Q4/2014*.
- ❖ The World Bank (2015), *East Asia's Changing Urban Landscape*.
- ❖ Pollution Control Department (2015), *Municipal Solid Waste Status 2015*.
- ❖ Office of Natural Resources and Environmental Policy and Planning (2015), *National Climate Change Master Plan (2015-2050)*.
- ❖ Office of Natural Resources and Environmental Policy and Planning (2015), *Appropriate GHG Emission Reduction Measures Development Project, Study Report*.
- ❖ Ministry of Energy (2015), *Alternative Energy Development Plan (AEDP) 2012-2021*.
- ❖ Ministry of Energy (2015), *Energy Efficiency Plan (EEP) 2015*.
- ❖ Electricity Generating Authority of Thailand (2015), *Power Development Plan (PDP) 2015*.
- ❖ Energy Policy and Planning Office (2014), *Energy Statistics of Thailand 2014*.
- ❖ Pollution Control Department (2014), *Municipal Solid Waste (MSW) Management Roadmap in August 2014*.
- ❖ Electricity Generating Authority of Thailand (2012), *Medium-Term Generation and Maintenance Plan (2012-2018)*.
- ❖ National Science Technology and Innovation Policy Office (2012), *Thailand's Technology Needs Assessment Report for Climate Change – Adaptation and Mitigation*. Office of Natural Resources and Environmental Policy and Planning (2011), *National GHG Inventory 2011*.

## Appendix 1: Additional Implemented Projects to Support Mitigation

Project Name and Description	Sector	Quantitative Goals/Objectives	Indicator	Steps Taken/Envisaged	Outcomes	Status
<p><b>Green-agriculture City (Carbon Footprint):</b></p> <p>To develop potential province with dominant agricultural products to be Green-agriculture City. The purpose is to promote eco agricultural production and industry to be in line with local culture and intelligence, as well as to promote agro-tourism.</p>	Agriculture	To develop potential province with dominant agricultural products to be Green-agriculture City. The purpose is to promote eco agricultural production and industry to be in line with local culture and intelligence, as well as to promote agro-tourism.	Number of farmer groups and local enterprise groups which have been registered for Carbon Footprint	<ul style="list-style-type: none"> <li>-GHG life-cycle evaluation for agricultural production</li> <li>-Climate Change and Carbon Footprint Training Program for farmers.</li> <li>-Promotion of Carbon Footprint Registration by farmer groups and local enterprise groups.</li> </ul>	Carbon Footprint registration to the 6 agricultural products	Completed
<p><b>Agriculture Green Project for Livestock Sector 2015 – 2014:</b></p> <p>To promote biogas for pig farming.</p>	Agriculture	To reduce GHG emissions from pig farming.	Number of pig farms equipped with biogas system	<ul style="list-style-type: none"> <li>- Training about biogas system and use of biogas to be organized for farmers.</li> <li>- Brochure and poster to be prepared to promote and educate benefits of waste reuse/recycling.</li> <li>- Monetary supported partially by government to equip biogas system in pig farms.</li> </ul>	40 Pig farms equipped with biogas system	On-going
<p><b>Green Agriculture City:</b></p>	Agriculture	Number of farms participating in Green Agriculture City	Number of farmers and officers who	-Data of farmers in Green Agriculture City to be ready for traceability process.	1,500 Farmers and officers who have been trained about traceability	On-going

Project Name and Description	Sector	Quantitative Goals/Objectives	Indicator	Steps Taken/Envisaged	Outcomes	Status
To promote good aqua-culture production. Production should be systematically conducted by zero-waste farming process. Given products would be processed by clean-technology for Green Agricultural Economy. Carbon Credit and Carbon Footprint also shall be provided.		Project. Traceability and data collection process of 2,750 farms to be implemented in order to evaluate carbon emission performance.	have been trained about traceability process	-Data collection to be conducted.  -Zero-waste demonstration to be conducted.	process	
<b>GHG Emission Reductions for Agriculture Production Practice:</b>  To study GHG emission, CO <sub>2</sub> and NO <sub>2</sub> , from agriculture production, carbon sink in soil from agriculture plantation, and approaches of GHG emission best practices.	Agriculture	To reduce GHG emissions, CO <sub>2</sub> and NO <sub>2</sub> , from economic agriculture production.	Result of best agriculture practices	- To evaluate GHG emissions from agriculture production practice.  - To establish Carbon Bank in economic agriculture area.  - To study good practices in order to mitigate climate change impact	Best practices for economic agriculture, and consequently for GHG emission reductions	On-going
<b>Management Information System of GHG Emission from Petroleum Manufacturing:</b>  GHG database of petroleum exploration and production in Thailand to be provided for GHG emission reductions plan.	Energy	Management Information System of GHG Emission from Thailand's Petroleum Manufacturing. It would be applied for GHG emission reductions plan.	-% complete of GHG emission data input (2013-2014)  -Completion of Carbon Intensity Preparation	GHG emission data in 2014 has been input.	On-going	On-going

Project Name and Description	Sector	Quantitative Goals/Objectives	Indicator	Steps Taken/Envisaged	Outcomes	Status
<p><b>Upgrading Program for Competitive Ability by Productivity Cost Reduction and Carbon Label for Thai Food Industry:</b></p> <p>To upgrade knowledge of personnel in food industry, and to prepare readiness for economic recovery and trade barriers in relation to global warming in the near future.</p>	Industry	<ul style="list-style-type: none"> <li>- To reinforce Thai food industry in order to increase competitive ability in world market.</li> <li>- To reduce productivity cost, in particular water and energy.</li> <li>- To reduce productive loss e.g. raw material use.</li> <li>- Be part of World Community to reduce GHG emissions and global warming.</li> </ul>	<ul style="list-style-type: none"> <li>-Number of upgraded factories</li> <li>-Number of educated personnel</li> <li>-Number of factories with Carbon Label registration</li> </ul>	<ul style="list-style-type: none"> <li>-Integration of personnel's technical knowledge and skill in food industry.</li> <li>-Upgrading of personnel's knowledge in food industry.</li> </ul>	<p><u>2011</u></p> <p>20 upgraded factories 60 knowledge-upgraded personnel ≥ 10 Carbon Label registered factories</p> <p><u>2012</u></p> <p>50 upgraded factories 200 knowledge-upgraded personnel ≥ 30 Carbon Label registered factories</p> <p><u>2013</u></p> <p>50 upgraded factories 200 knowledge-upgraded personnel ≥ 30 Carbon Label registered factories</p> <p><u>2013</u></p> <p>50 upgraded factories 200 knowledge-upgraded personnel ≥ 30 Carbon Label registered factories</p>	Completed
<p><b>Waste Management and Environmental Quality Enhancement in University (Green University):</b></p> <p>To encourage waste management and</p>	Energy/ Waste	Waste management and environmental quality enhancement to be studied and trained in University.	Number of universities which data have been recorded.	Training for university's personnel about data record and GHG calculation in term of energy use, waste management and green zone management.	4 Universities where data i.e. electricity use, fuel use, water use, weight of each type of wastes and green zone extension have been recorded for GHG calculation.	Completed

Project Name and Description	Sector	Quantitative Goals/Objectives	Indicator	Steps Taken/Envisaged	Outcomes	Status
environmental quality enhancement in University						
<b>Waste-to-Public Benefits:</b>  To promote waste management at the origin and waste reuse/recycling.	Waste	To educate people about waste management, domestic waste reduction, waste segregation, waste reuse/ recycling.	Number of communities and schools where waste management and waste reuse/recycling have been implemented.	-Zero-waste Community and Zero waste School Promotional Program  -Seminar and reward for Zero-waste Community and Zero-waste School, including workshop of discussion and experience sharing.	-87 Zero-waste Communities, and 19.93 ton/day or 35.70% of wastes have been reused and recycled.  -59 Zero-waste Schools, and 14.25 ton/day or 76.54% of wastes have been reused and recycled.	Completed
<b>GHG Emission Reductions by Motivation and Participation Process in Forest Sector:</b>  To prepare readiness for REDD+ Mechanism	Forest	-Officers and relevant parties in Forest Sector understand GHG emission reductions and REDD+ Mechanism.  -At least 20 Pilot Sites in 5 regions of Thailand to be established for REDD+ Mechanism and increasing of carbon sink potential.  -Pilot Sites to be established for REDD+ Mechanism and increasing of carbon sink potential in the forest conservation area.  -Pilot sites to be established in each	-Number of Pilot Sites for REDD+ Mechanism and increasing of carbon sink potential the in forest conservation area  - Pilot Sites to be established for surveillance and evaluation of forest ecosystem and carbon sink in each region of Thailand.	-Training, exhibition, educational document and VDO presentation to be provided and distributed for educating communities and people.  -Meeting of public hearing and participation about GHG emission reductions in forest factor (REDD+) to be organized.  -Data and land use map in community to be collected as database for development of land utilization for all Pilot Sites.  -2 REDD+ Mechanism Coordination and Learning Centers to be established.	-7 Pilot Sites.  -8 Pilot Sites to study and evaluate carbon sink.	On-going

Project Name and Description	Sector	Quantitative Goals/Objectives	Indicator	Steps Taken/Envisaged	Outcomes	Status
		region of Thailand to study, surveillance and evaluate carbon sink.		-Participation between officer and community in site selection and identification process.		
<b>Participation in Carbon Sink and Biodiversity in Community Forest:</b>  To promote public participation in Carbon Sink and Biodiversity Conservation	Forest	To evaluate carbon sink and biodiversity in the community forest, and consequently sustainability of forest management to be achieved.	Number of community forest where permanent pilot sites for sampling and carbon sink and biodiversity data analysis have been identified.	-Training, including guideline of carbon sink and biodiversity data sampling and analysis in the community forest and guideline of carbon sink and biodiversity data surveillance in the community forest to be prepared.  - Permanent pilot sites for carbon sink and biodiversity data sampling and analysis in the community forest to be identified.	26 Community forest with permanent pilot sites for carbon sink and biodiversity data sampling and analysis	On-going
<b>Reforestation for Ecosystem Rehabilitation and Global Warming Mitigation:</b>  To rehabilitate ecosystem in the forest areas where are under FIO responsibility.	Forest	To rehabilitate forest abundance, quality of life and socio- economic of people who live around 1m,000 rai of reforestation area, including to promote public participation in forest and wildlife conservation, and particularly to mitigate global warming.	≥ 90% survived trees in reforestation area.	- 1,000 rai of reforestation area completed.  - CO <sub>2</sub> emission reduction in 1,000 rai of reforestation area calculated.	-> 90% survived trees in reforestation area  -Public participation in reforestation and conservation	Completed
<b>Management of Conservation Area in the FIO's Economic</b>	Forest	78 Buffer zones to be established for the FIO's forest	Forest area with natural rehabilitation	- Supplementary plantation of local species with natural rehabilitation.	Natural rehabilitation	Completed

Project Name and Description	Sector	Quantitative Goals/Objectives	Indicator	Steps Taken/Envisaged	Outcomes	Status
<p><b>Forest Preservation Zone in Northern Region:</b></p> <p>Buffer zoning for the FIO's forest preservation area as conservation area for GHG sink in northern region of Thailand.</p>		<p>preservation area in northern region of Thailand, equivalent to 68,374.06 rai, for GHG sink by supplementary plantation of local species with diversification and natural rehabilitation for wildlife habitat.</p>		<p>- Calculation of GHG sink in the implemented area.</p>		
<p><b>Non-Motorized Transport (NMT) Promotional Program and Improvement of Mass Transit Route Connection for Sustainable and Eco Transportation</b></p>	<p>Transportation and Infrastructure</p>	<p>- To integrate the concepts and participation of relevant parties and people for NMT Promotional Program and improvement of Mass Transit Route Connection.</p> <p>- To establish NMT Promotional Program and Improvement of Mass Transit Route Connection to be in line with sustainable public transport requirement.</p> <p>- To encourage and communicate people about NMT and Mass Transit Improvement.</p>	<p>Study Report</p>	<p>-Review of existing study results, NMT Promotional Programs and Improvement of Mass Transport Route Connection which have been successfully implemented in Thailand and other countries, then appropriate measures for Thailand's current status to be initially proposed.</p> <p>-To study transport requirement in BMA, in particular utilization at mass transit stations in order to identify essential infrastructure and utility requirements.</p> <p>-To study essential infrastructure and utility requirements for users, in particular users of electrical mass transit system.</p>	<p>Final Report of NMT Promotional Program and Improvement of Mass Transit Route Connection for Sustainable and Eco Transportation.</p> <p>The report contains:</p> <ul style="list-style-type: none"> <li>-Short-term, Medium-term and Long-term Planning for Bicycle Lane Development in BMA, totally 140 points connected to mass transit system</li> <li>-Pitsanulok Bicycle Town Development Master Plan, categorizing into 4 stages; pilot route development, short-term route development, medium-term route development and long-term route development.</li> </ul>	<p>Planned</p>

Project Name and Description	Sector	Quantitative Goals/Objectives	Indicator	Steps Taken/Envisaged	Outcomes	Status
				<p>-To study traffic condition in the project area. Existing traffic data from relevant parties to be collected and additional surveillance on routes and intersections to be conducted.</p> <p>-To review BMA land utilization and relevant projects that would affect direction of development in the future.</p> <p>-To forecast transportation requirement in BMA by a traffic and transportation model “eBUM”.</p> <p>-To prepare recommendation/measure for NMT Promotional Program and Improvement of Mass Transit Route Connection in BMA, at least 10 prioritized and high potential points.</p> <p>-To prepare description of NMT Promotional Program and Mass Transit Route Connection Improvement.</p> <p>- To prepare detailed design in order to develop 3 Practical Projects or Demonstration</p>		



Project Name and Description	Sector	Quantitative Goals/Objectives	Indicator	Steps Taken/Envisaged	Outcomes	Status
				<p>Areas in BMA with different land use condition.</p> <p>-To study on “Bicycle Town Project” in order to establish a Pilot Bicycle Town Project in selected province.</p> <p>-To promote stakeholder participation in the consideration, screening and planning process.</p>		

## Appendix 2: List of Supported Climate Change Project in Thailand

Project Name	Project Type	Project Start	Project End	Source of Fund	Amount of Budget (In cash)	Amount of Budget (In kind)
Promoting Energy Efficiency in Commercial Buildings (PEECB) in Thailand	Mitigation	April 2012	December 2015	Global Environment Facility (GEF)	3,637,273 USD	Government (cash and In-kind): 6,500,000 USD  Private Sector (cash and In-kind): 5,767,500 USD
Strengthening Thailand's Capacity to Link Climate Policy and Public Finance	Capacity Building	June 2013	December 2015	UNDP/SIDA	SIDA: 250,275 USD TRAC: 300,000 USD	-
Low Emission Capacity Building Programme (LECB) in Thailand	Mitigation	May 2014	December 2015	The Government of Australia	930,900 USD	-
Third National Communication and Biennial Update Report (TNC-BUR) Project	Adaptation	April 2014	April 2018	GEF Funding	852,000 USD from GEF funding	700,000 USD from host government
Integrated Community-based forest and Catchment Management through an Ecosystem Service Approach (CBFCM)	Adaptation	2013	2016	Global Environmental Facility(GEF)	1.75 MILLION USD (Biodiversity: 1,323,636 USD / Climate change: 434,556 USD)	-

Project Name	Project Type	Project Start	Project End	Source of Fund	Amount of Budget (In cash)	Amount of Budget (In kind)
Thailand's Domestic Preparation for Post-2020 Contributions	Adaptation			Global Environmental Facility(GEF)	0.22 MILLION USD	-
GEF ID: 4037 OVERCOMING POLICY, MARKET AND TECHNOLOGICAL BARRIERS TO SUPPORT TECHNOLOGICAL INNOVATION AND SOUTH-SOUTH TECHNOLOGY TRANSFER "THE PILOT CASE OF ETHANOL PRODUCTION FROM CASSAVA"	Adaptation	June 2012	June 2016	GEF (2.6m US\$)	34,223,000 USD In Cash and In Kind	-
GEF: 3786 Industrial Energy Efficiency (IEE) Project	Mitigation	March 2012	March 2017	Facility (GEF)	3,620,000 USD	-
GEF: 4184 Promoting small scale biomass power plants in the rural area of Thailand for sustainable renewable energy management and community involvement	Mitigation	Q1/ 2013	Q1/2016	GEF (975,000 \$)	2,986,800 USD	320,000 USD
Climate Technology Centre and Network – Phase 1	Adaptation	October 2013	June 2015	UNEP	3,900,000 THB	-
Technology Needs Assessment –Asia (Adaptation and Mitigation)	Technology Assessment	September 2010	May 2013	UNEP	17,500,000 THB	-
Measurement, Reporting and Verification Capacity Building Program	Capacity Building	September 2012	Until 2016	Australian Government	-	-
Increasing Community's Resilience through the introduction of Climate Smart Agriculture and Participatory Watershed Management of Highland Ethnic Communities in Northern Thailand	Adaptation	January 2014	April 2016	AXA partnership	525,000 EUR	-
National Agro-economic zoning for major crops in Thailand	Adaptation	May 2013	June 2015	FAO	260,000 USD	-

Project Name	Project Type	Project Start	Project End	Source of Fund	Amount of Budget (In cash)	Amount of Budget (In kind)
Sustainable Palm Oil Production for Bioenergy	Mitigation	January 2009	August 2012	BMUB/IKI	3,699,485.00 EUR	-
Climate Protection in Nature-Based Tourism	Adaptation	November 2008	1/6/2013	BMUB/IKI	1,391,682.87 EUR	-
Improving the Energy Efficiency of Small and Medium-Sized Businesses	Mitigation	February 2009	February 2012	BMUB/IKI	1,324,526.10 EUR	-
Programme for the Development and Implementation of Climate Policy	Adaptation	February 2009	January 2014	BMUB/IKI	2,200,000.00 EUR	-
Thai German Programme on Energy Efficiency Development Plan (TGP-EEDP)	Mitigation	February 2012	April 2015	BMUB/IKI	3,029,857.65 EUR	-
Support to the Development and Implementation of the Thai Climate Change Policy	Adaptation	January 2014	January 2017	BMUB/IKI	2,800,000.00 EUR	-
Improved management of extreme events through ecosystem-based adaptation in watersheds (ECOSWat)	Adaptation	June 2013	July 2016	BMUB/IKI	2,800,000.00 EUR	-
Sectoral Study on Climate and Refrigeration Technology in Developing Countries and the Development of Methods and Instruments for Identifying Reduction Potential and Implementing NAMA	Mitigation	November 2010	October 2014	BMUB/IKI	1,935,001.00 EUR	-
Sustainable Consumption and Production: Policy Support Component	Adaptation	October 2011	December 2014	EU	1.999 million EUR	-
Enhancing low-carbon development by greening the economy	Mitigation	September 2011	October 2014	BMUB/IKI	3.000.000 EUR Budget for global project	-

Project Name	Project Type	Project Start	Project End	Source of Fund	Amount of Budget (In cash)	Amount of Budget (In kind)
Industry GHG reduction to support the implementation of Thailand's Climate Change Master Plan	Mitigation	Aug 2014	Jan 2016	German Government - BMU	1.0 EUR	-
Development and Scaling up of a Climate Change Community-Based Adaptation (CC CBA) Model for Food Security in Thailand	Adaptation	March 2011	September 2013	EU	317,486.00 EUR	-
Promotion of Community Rights on Coastal Resource Management for Sustainable Livelihoods of Coastal Communities	Adaptation	January 2012	January 2015	EU	500,000.00 EUR	-
Enhancing Food Security for Smallholder Farmers through Participatory Knowledge Creation and Multi-Sector Collaboration on Sustainable Agriculture and Natural Resource Management	Adaptation	March 2012	February 2016	EU	322,901.41 EUR	-
The Promotion of Low Carbon City across Municipalities in Celebration of His Majesty the King's 84th birthday	Mitigation	February 2012	January 2015	EU	477,064.00 EUR	-
Geodetic Earth Observation Technologies for Thailand: Environmental Change Detection and Investigation (GEO2TECDI)	Adaptation	January 2009	July 2010	EU	92,539.28 EUR	-



Office of Natural Resources and Environmental Policy and Planning  
60/1 Soi Pibunwattana 7 Rama 6 Road Samsennai  
Phayathai District Bangkok 10400 THAILAND  
Tel/Fax : 662 265-6692