DEVELOPMENT OF A LOW CARBON SCENARIO FOR WASTE SECTOR IN VIETNAM

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1. EXSS-WASTE MODEL
2. BACKGROUND OF THE STUDY
3. FRAMEWORK OF THE STUDY
4. WASTE GENERATION SCENARIO
5. POLICY AND GHG REDUCTION SCENARIOS

1. EXSS-WASTE MODEL

EXSS-WASTE MODEL (1)

An extended module of Extended Snapshot Tool (ExSS)

Describing waste generation, management and GHG emission

A time series model

Coverage of the model is basically corresponding to Waste sector in IPCC 2006 guideline.

EXSS-WASTE MODEL (2)

- Generation of solid waste from residential, commercial, industrial and construction sector
- Management of solid waste from the sectors above
- GHG generation from burning of fossil carbon in the incinerated waste
- GHG generation from decomposition of organic carbon in the disposal waste
- Generation of waste water from all sectors
- GHG generation from waste water treatment
- CH4 recovery and emission in the GHG above

TARGETED GHGS

Management	Relevant material	Main GHG
Disposal	Organic carbon in SW	CH4, N2O
Incineration	Fossil carbon in SW	CO2
Biological treatment	Organic carbon in SW and WW	CH4, N2O

SW: Solid waste
WW: Waste water

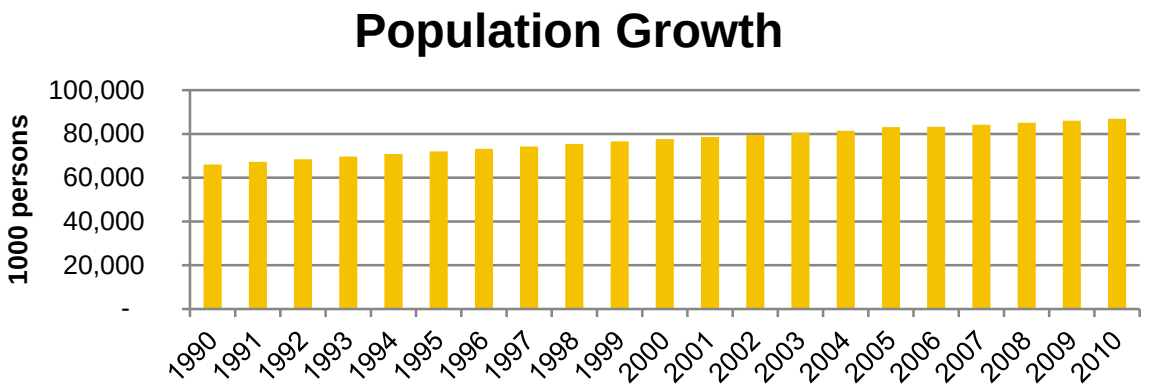
2. BACKGROUND OF THE STUDY

BACKGROUND OF THE STUDY

Population

Base year (2005): 83,106 mil.

2010: 86,933 mill

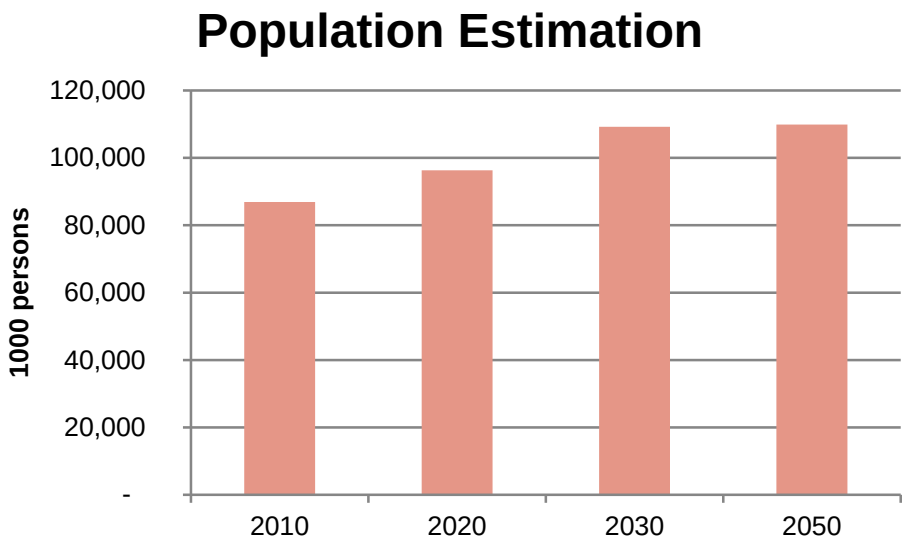


Growth rate is slowdown

2020: 96.3 mill

2030: 109,2 mill

2050: 109,9 mill



Source: GSO

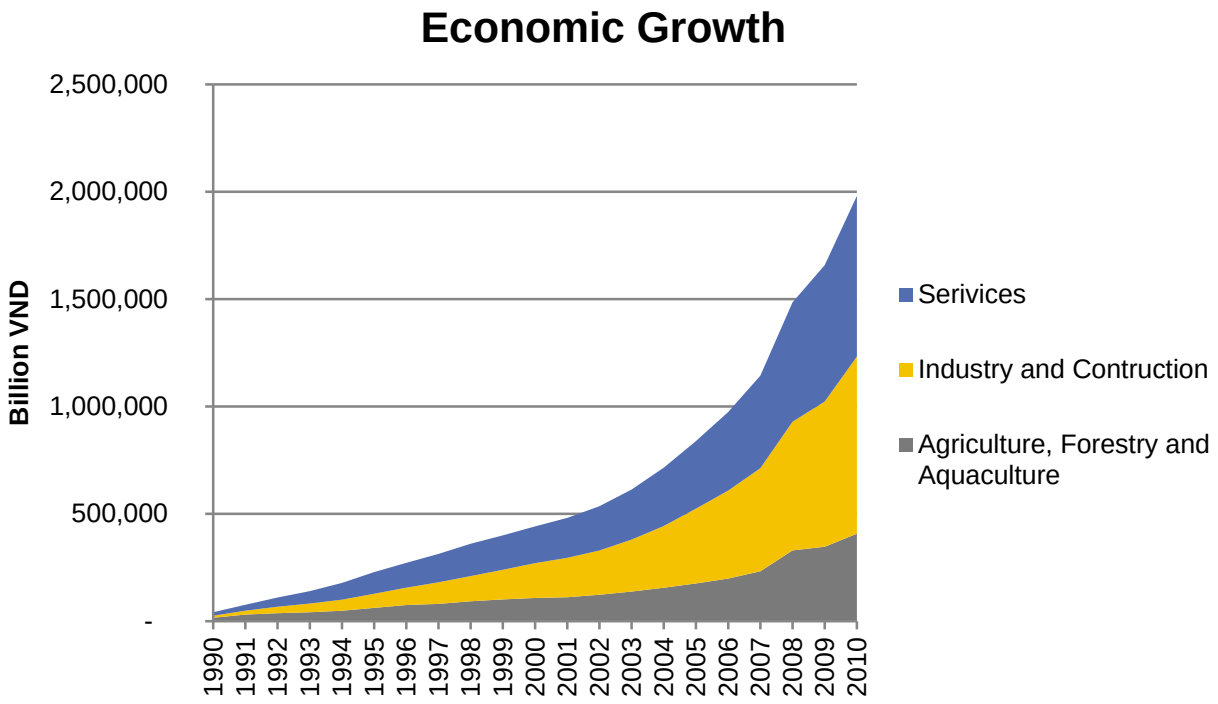
BACKGROUND OF THE STUDY

Economic growth

High growth rate (1990-2010)

Recent year is slowdown

Economic size in 2010 increase 47 times compare with 1990



Source: GSO (2011)

BACKGROUND OF THE STUDY

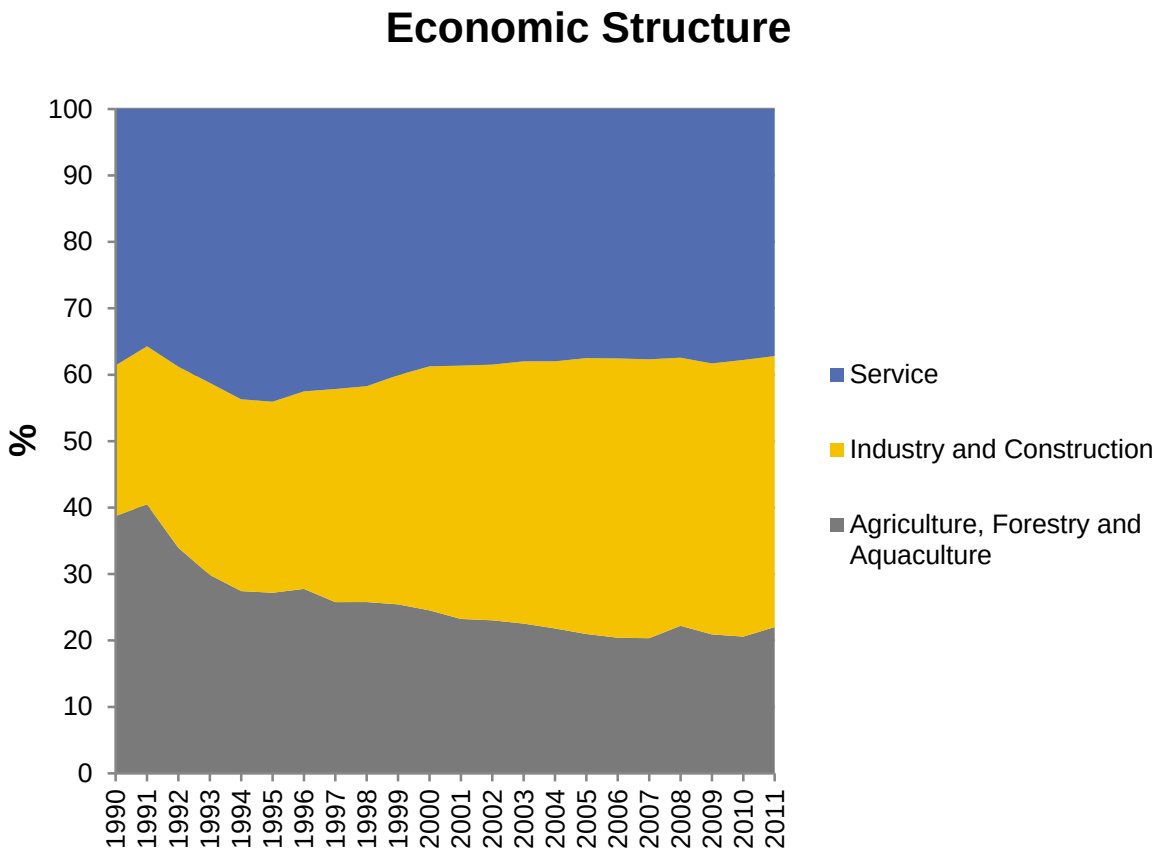
Economic growth

Economic structure change:

Increase industry and construction sector

Decrease Agriculture, Forestry and Aquaculture

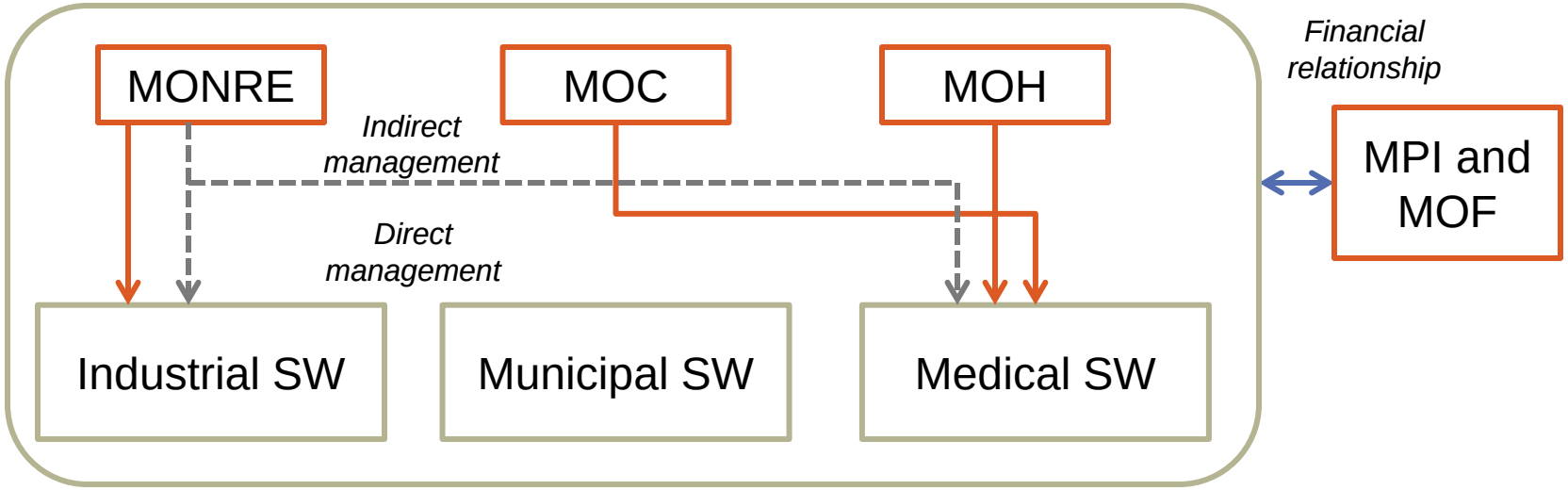
Decrease slightly Service



Source: GSO

BACKGROUND OF THE STUDY

General information



1. Ministry of Natural Resources and Environment (MONRE) – major state authority – responsible for environmental issues in general and waste in specific

2. Ministry of Construction (MOC) – responsible for planning and construction of treatment and disposal facilities

3. Urban environmental companies (URENCOs); key players in collection, treatment and disposal in urban areas of Vietnam

4. Other ministries and provincial People's Committee – waste management activities

5. Ministry of Planning and Investment and Ministry of Finance – Financial support

BACKGROUND OF THE STUDY

Legal document on Waste management

- The National Strategies set the target for the handling of **Solid waste** management in the target year of 2015, 2020 and 2025.
  - ”Decision No.2149/QD-TTG for National Strategy on Integrated Solid Waste Management (ISWM) up to 2025 and Vision 2050” with the joint work of MOC and MONRE in 2009.
  - Decision 1216/QD-TTg of September 05, 2012 for National Strategy on Environment Protection to 2020, with Visions to 2030
  - Decision No.1393/QD-TTG of September 25, 2012 for National strategy on green growth for the period 2011- 2020 with vision to 2050.
  - Decision 432/QĐ-TTg of April 12, 2012 for Viet Nam Sustainable Development Strategy for 2011-2020.

- The target for the handling of **Waste water** management in municipal and industry.
  - Decision 1930/QĐ-TTg of November 20, 2009 for orientations for development of water drainage in Vietnamese urban centers and industrial parks up to 2025. and a vision towards 2050.

BACKGROUND OF THE STUDY

Legal document on Waste management

- Economic instruments relating to Municipal waste include incentives such as subsidies, low-interest finance, tax exemption, and disincentives like fees, charges/fines.
  - Decree No. 174/2007/ND-CP dated 29 Nov. 2007 on Environmental Protection Fee for Solid Waste.
  - 205 Law on Environmental Protection, Decree No. 59/2007/ND-CP of April 9, 2007 for Solid waste management, Decree No. 04/2009/ND-CP of January 14, 2009 providing for incentives and supports for environmental protection activities.
  - Law on Environmental Protection 2005 outlines the incentives for environmental projects.
  - Decree No. 81/2006/ND-CP dated 09 Aug. 2006 on the Administrative Punishment of Violation in Environmental Protection → it has a Chapter on Violation in Solid Waste Management.
  - Decree No 50/2013/ND-CP dated 09-08-2013 on prescribing retrieval and disposal of discarded products.
  - Decree No 25/2013/ND-CP dated 29-03-2013 on Environmental Protection Fee for Waste Water

BACKGROUND OF THE STUDY

Legal document on Waste management

- Technology for Wastewater Management
  - Decision No.2139/QD-TTG dated 05/12/2011, National Strategy on Climate Change on applying of waste treatment advanced technology in urban and rural; enhancing the management, industrial and urban wastewater treatment.
- Methane recovery from the production facilities
  - Decision No.1474/QD-TTG dated 05/12/2011, National Action Plan on Climate Change for the period 2012-2020 with recovering methane by applying the modern technology.
  - Decision No.1775/QD-TTG dated 21/11/2012, Project of greenhouse gas emission management; management of carbon credit business activities to the world market.

3. FRAMEWORK OF THE STUDY

FRAMEWORK

Area: Vietnam

Sector: Waste (solid waste and wastewater)

Base year: 2005

Target year: 2020, 2030, 2050

History data from 1990

Target GHGs: CH_4: solid waste in disposal site, CH_4: wastewater

CO_2: incineration, CH4 & N2O: composted solid waste

Target sectors: Municipal, commercial, industry, construction,
Scenarios:

- Baseline: no countermeasure applied to reduce GHG emission
- CM: (Countermeasure) with countermeasures based on current national strategies on solid waste management for Vietnam

TARGETED GHG ESTIMATIONS AMONG IPCC, DRAFT REPORT INVENTORY 2005 AND THIS STUDY

IPCC guideline 2006			Draft report of inventory 2005			This study's estimation 2013		
Code	Waste	Target GHGs	Code	Waste	Target GHGs	Code	Waste	Target GHGs
4A	Solid Waste Disposal	CH4	6A	Solid Waste Disposal	CH4		Solid Waste (res, com)	CH4, N20, CO2
4B	Biological Treatment	CH4, N2O	6B	Human sewage	N2O			
4C	Incineration & Open-burning	CH4, N2O, CO2	6C	Incineration	CO2, N2O		Solid Waste (ind, cst)	CH4, N20
4D	Waste water	CH4, N2O	6B1, 6B2	Wastewater	CH4		Waste water (ind, mun)	CH4, N02

COLLECTED AND ESTIMATED DATA/PARAMETER

Solid waste

- Output of industry (PD)
  - Gross domestic product at constant 1994 prices (GDP)
  - Input – output table of Vietnam in 2005
- Solid waste generation
  - Per capita
  - Total of Vietnam
- Composition of sector and category of waste
- Composition of solid waste management
  - Recycle, incineration, composting, landfill
- Parameters of waste decomposition
  - Organic carbon fraction
  - Decay parameter
  - Oxidation factor
  - CH4 composition in generated gas
- Parameters of fossil carbon composition

Waste water

- Industrial and domestic waste water generation
- Parameters of CH4 generation from waste water

DATA SOURCE

Data	Source
Output of industry	- GDP at constant 1994 prices from 1995 to 2010 – Government Statistic Office (GSO) - Input – output table of Vietnam in 2005, Bui Trinh - Economic – social development strategy 2011-2020 - Economy of South Korea
Waste generation	- Ministry of Construction and Ministry of Environment and Natural Resources of Vietnam (2009): National strategy for integrated management of solid waste up to 2025 and vision towards 2050. - VN environmental monitoring 2004: Solid Waste (MONRE, 2004)
Population	Population and population growth rate– Government Statistic Office (GSO) www.gso.org.vn
Composition of sector and category of waste	- Draft report of inventory 2005 -JICA et al (2011): The study on Urban Environmental Management in Vietnam - Vol 6, study report on Solid Waste Management in Vietnam. - Data is estimated by expert in 2020, 2030 and 2050.
Composition of solid waste management	- Alexis et al. (2009) Sustainable recycling of municipal solid waste in developing countries, Waste Management 29 (2009) 915-923. - Thanh et al. (2009) Municipal solid waster management in Vietnam: Status and the strategic actions, International Journal Environmental Research, 5(2): 285-296. - With CM: “Ministry of Construction and Ministry of Environment and Natural Resources of Vietnam (2009): National strategy for integrated management of solid waste up to 2025 and vision towards 2050”
Parameters of waste decomposition	- IPCC (2006): 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan., Volume 5, Waste. - Draft report of inventory 2005
Waste water (municipal, industry)	-Draft report of inventory 2005 - Data is estimated by expert in 2020, 2030 and 2050

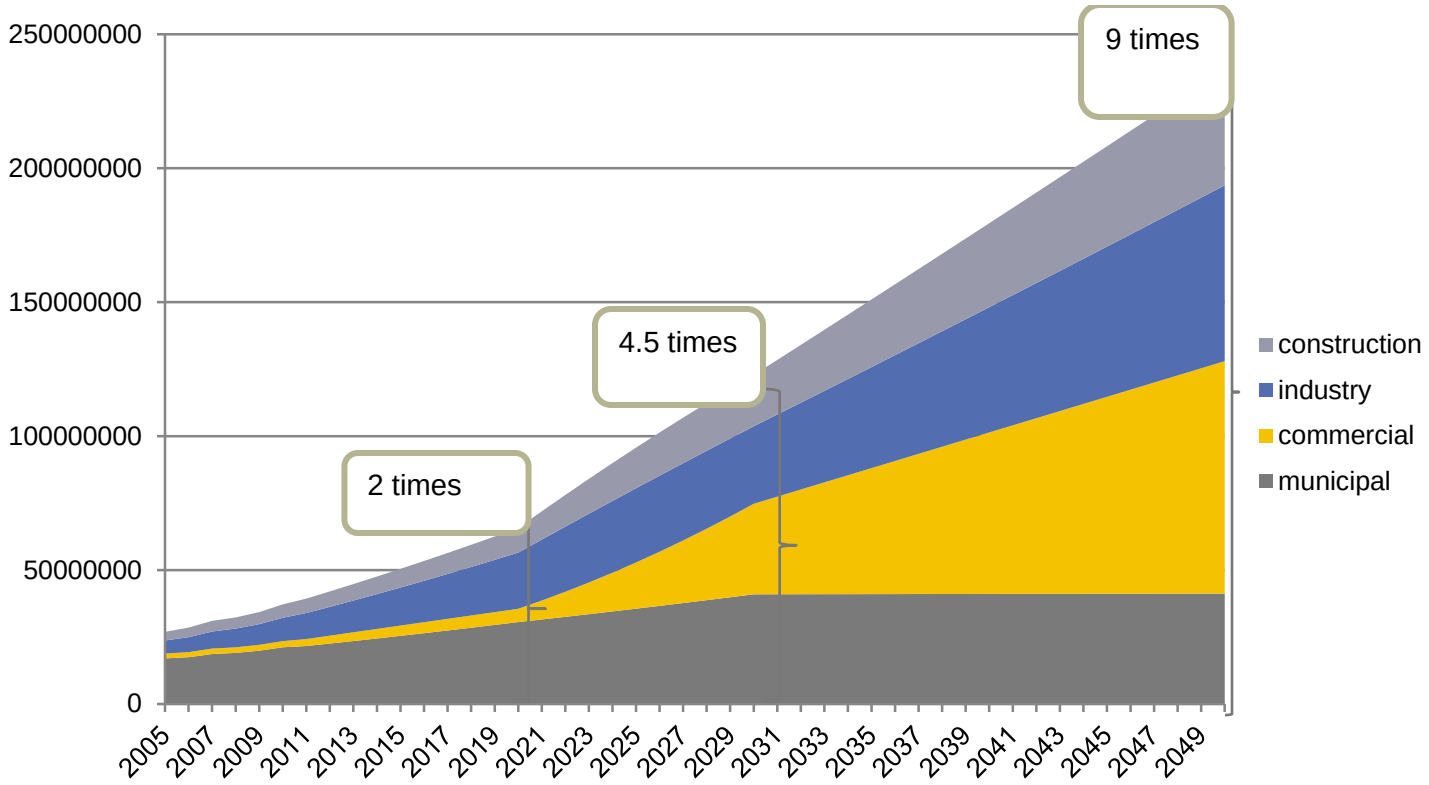
4. WASTE GENERATION SCENARIO

WASTE GENERATION

	Unit	2005(***)	2005 (*)	2007 (**)	2020(**)	2020(*)	2025(**)	2030(*)	2050 (*)
Population	1000	-	83106	85155	105585	96317	115599	109249	109902
Per capita waste generation	kg/day	0.7 (urban) 0.3 (rural)	0.22	0.25	0.56	0.63	0.76	0.63	0.96
Municipal	million ton/year	4.8 (disposal)	-	14.3	39.8	-	58.8	-	-
Residential		-	6.48	7.9	21.7	22.27	32.0	25.26	38.57
Commercial		-	1.82	1.8	5.0	3.62	7.3	29.75	81.30
Construction		-	3.22	3.2	9.2	7.37	13.4	17.25	43.57
Sludge		-	-	1.4	3.9	-	5.8	-	-
Industry		-	4.79	4.8	20.9	18.77	27.8	28.51	64.83
Rural		-	-	9.1	8.8	-	7.6	-	-
Village Craft		-	-	1.0	2.5	-	3.6	-	-
Medical		-	-	0.2	0.3	-	0.3	-	-
Hazardous		-	-	2.4	9.2	-	12.4	-	-
Total	million ton/year	-	16.31	31.7	81.4	52.03	110.3	100.77	228.67

(*): This study
(**)Ministry of Construction, 2009
(***) Draft report of inventory 2005

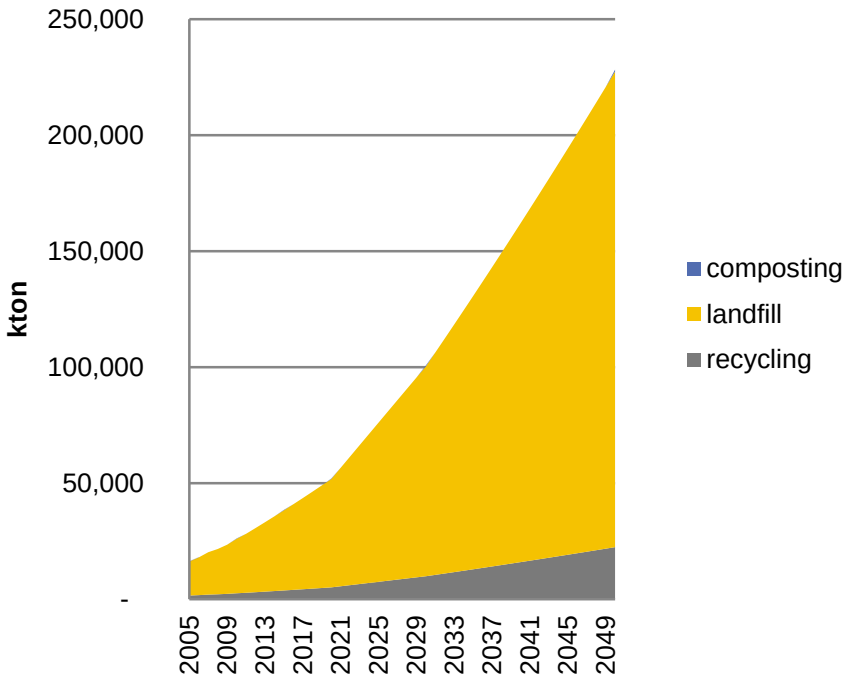
WASTE GENERATION



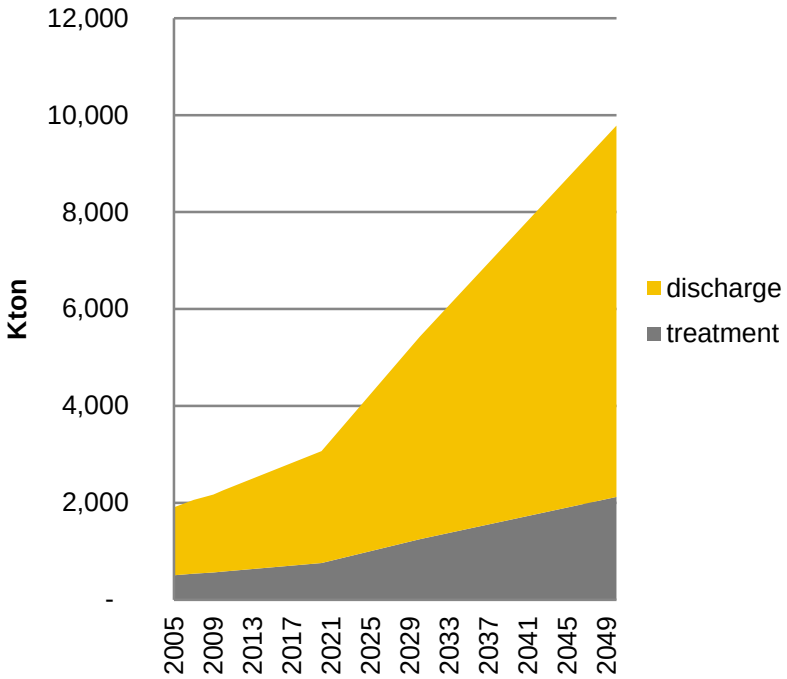
Waste generation was estimated by Population and Outputs of industries. Per capita waste generation in years between 2005, 2020, 2030 and 2050 was interpolated linearly.

WASTE GENERATION

Solid Waste Generation by Management options

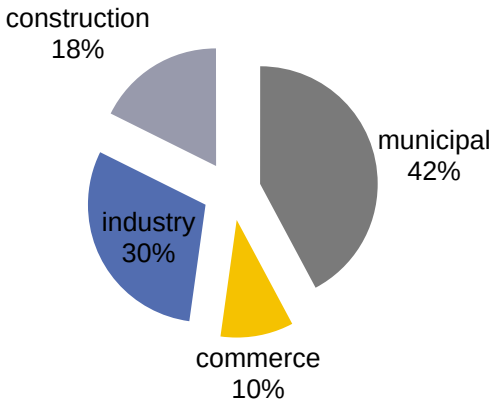


Waste Water Generation by Management Options

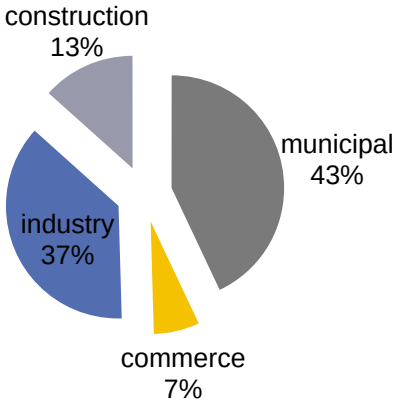


WASTE GENERATION BY SECTOR

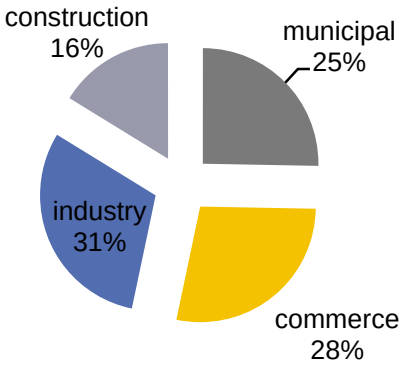
Waste Generation by Sector in 2005



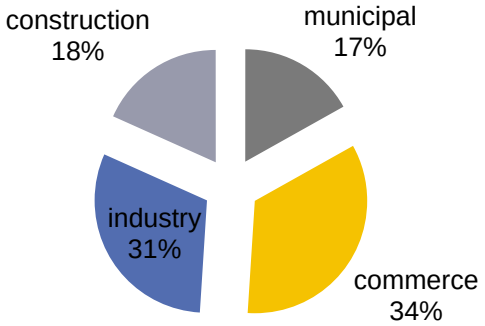
Waste Generation by Sector by 2020



Waste Generation by Sector in 2030



Waste Generation in 2050



5. POLICY AND GHG REDUCTION SCENARIOS

SCENARIOS AND MITIGATION OPTIONS

2 scenarios are simulated as below

Baseline: Without countermeasures to reduce GHG emission.

CM: With countermeasures which refer to National Strategies on Solid Waste Management in Vietnam (NSWM) and National Strategy for Environmental Protection in 2020 and vision toward 2030

Waste generation is common in both scenarios

Summary of ***Solid waste*** management options in National Strategies on Solid Waste Management in Vietnam

Sector	Management Option	2015	2020	2025	2050
Municipal (urban)	Collected	85.0%	90.0%	100.0%	100.0%
	Recycled, Composted, and Energy Recoverd	60.0%	85.0%	90.0%	100.0%
Municipal (rural)	Collected	36.0%	63.0%	81.0%	90.0%
	Treated	4.0%	7.0%	9.0%	10.0%
Municipal (for VN)	Collected	54.1%	73.0%	88.0%	93.7%
	Treated	24.7%	35.9%	39.0%	43.3%
Construction	Collected	50.0%	80.0%	90.0%	100.0%
	Recycled	30.0%	50.0%	60.0%	100.0%
Industry	Collected	80.0%	90.0%	100.0%	100.0%
	Recycled, Composted, and Energy Recovered	70%	75%	100%	100%
Source		NSWM	NSWM	NSWM	Resolution 24

SCENARIOS AND MITIGATION OPTIONS

Summary of ***Waste water*** management options in National Strategies on Solid Waste Management in Vietnam

Sector	Management Option	2015	2020	2050
Municipal waste water	Discharge	70%	30%	0%
	Treatment	30%	70%	100%
Industrial waste water	Discharge	25%	5%	0%
	Treatment	75%	95%	100%
Source		NEPS	NEPS	Resolution No 24

COMPOSITION OF WASTE MANAGEMENT

Summary of management options input to the model based on National Strategies

Municipal Waste

	Recycling	Incineration	Composting	Disposal
2015	22%	0%	4%	74%
2020	25%	1%	8%	65%
2025	27%	3%	11%	60%
2030	27%	6%	12%	56%

Construction Waste

	Recycling	Incineration	Composting	Disposal
2015	80%	0%	0%	20%
2020	85%	0%	0%	15%
2025	100%	0%	0%	0%
2050	100%	0%	0%	0%

COMPOSITION OF WASTE MANAGEMENT

Industrial waste

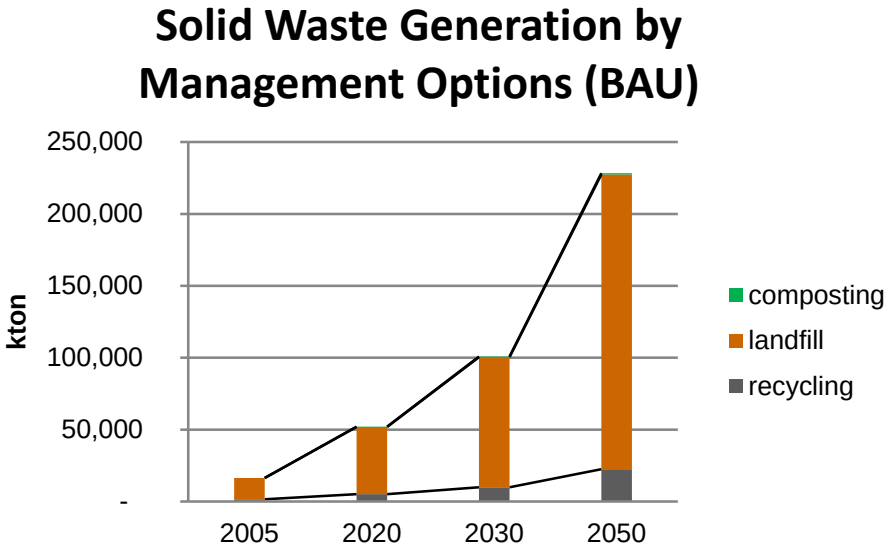
	Recycling	Incineration	Composting	Disposal
2015	55%	30%	0%	15%
2020	54%	32%	0%	14%
2025	65%	35%	0%	0%
2050	65%	35%	0%	0%

CH4 recovery rate from disposal gas and biogas generated from waste water

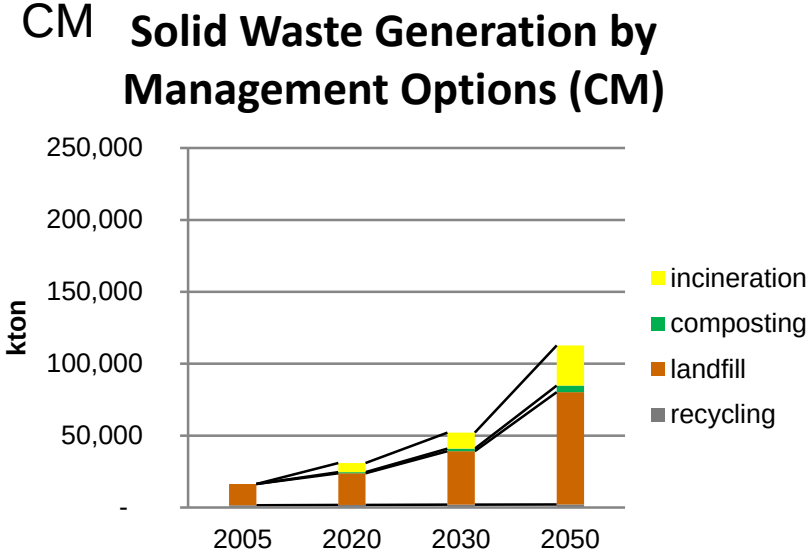
	Baseline		**CM**	
	Disposal	Waste water	Disposal	Waste water
2005	0%	0%	0%	0%
2015	0%	0%	0%	0%
2020	0%	5%	25%	25%
2050	0%	0%	50%	50%

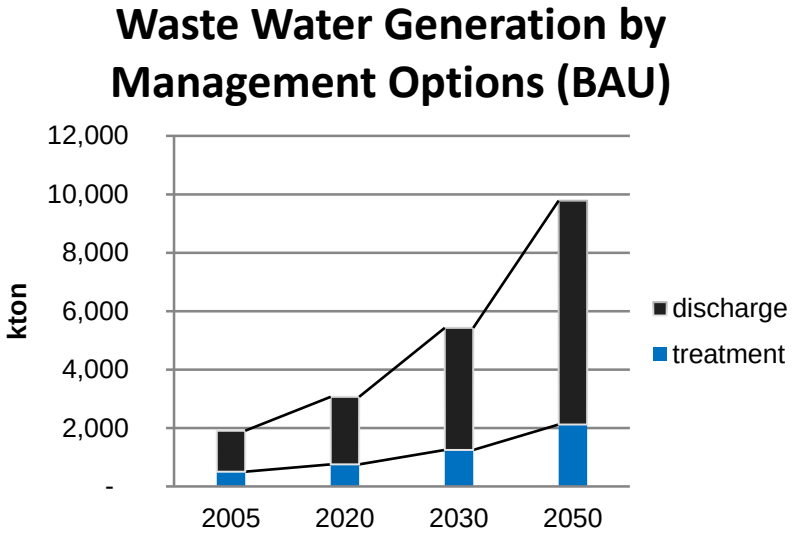
WASTE GENERATION BY MANAGEMENT OPTIONS

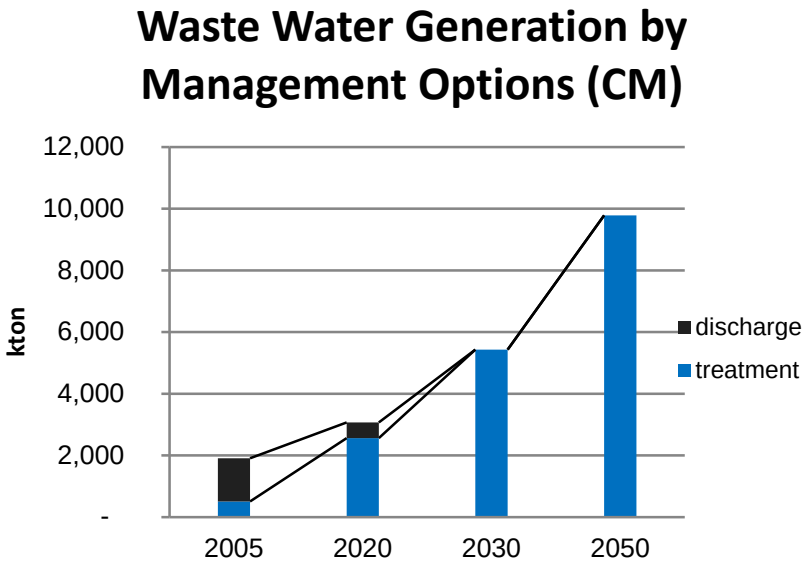
BAU



CM







PROJECTED GHG EMISSIONS (SOLID WASTE 1)

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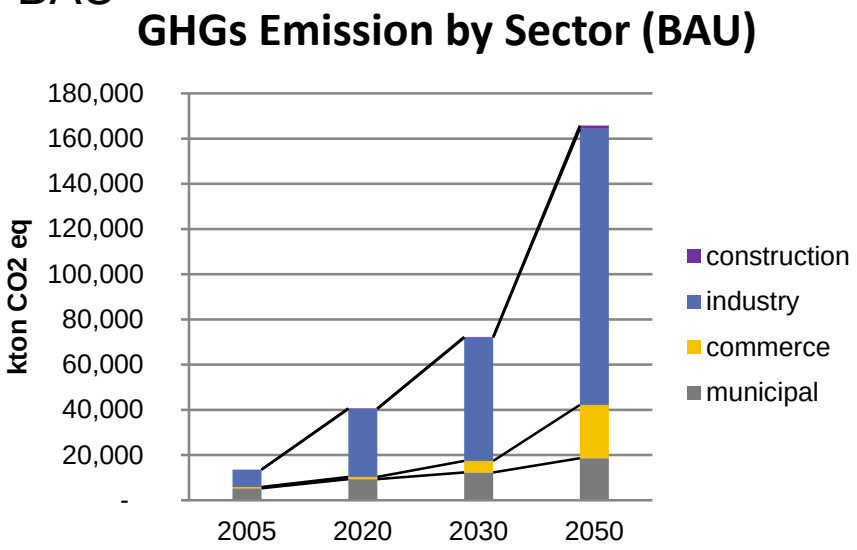

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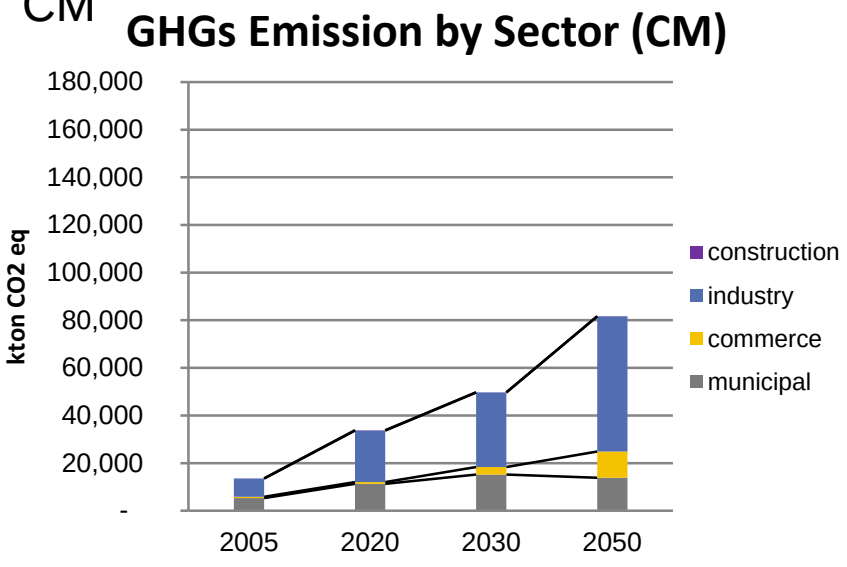
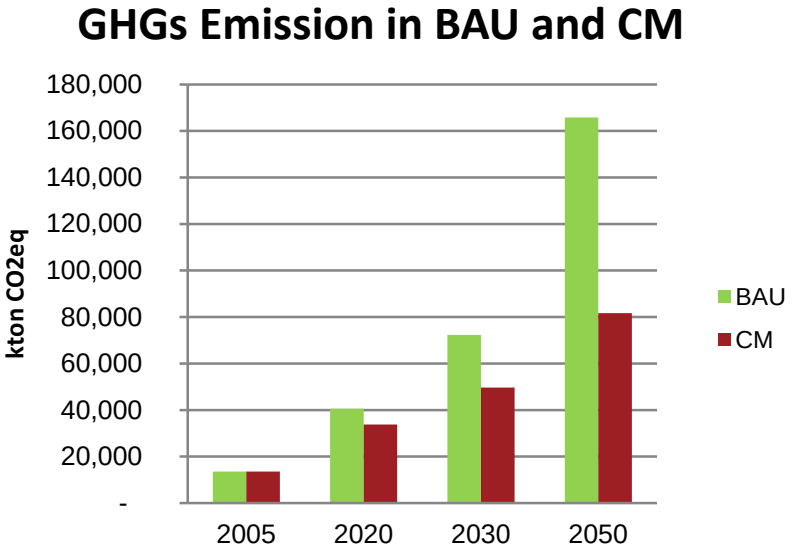
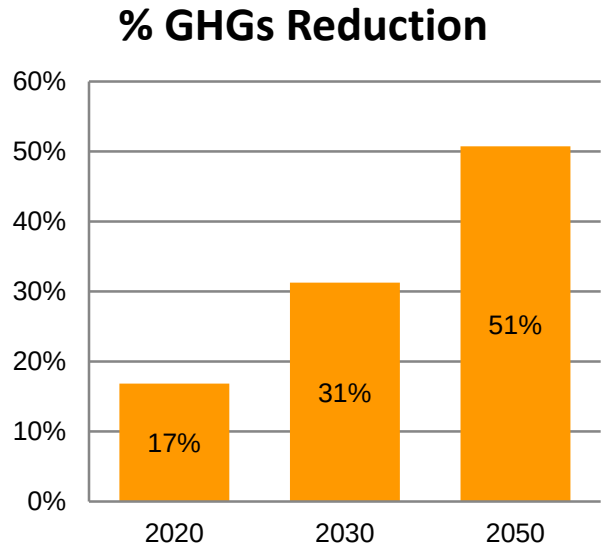
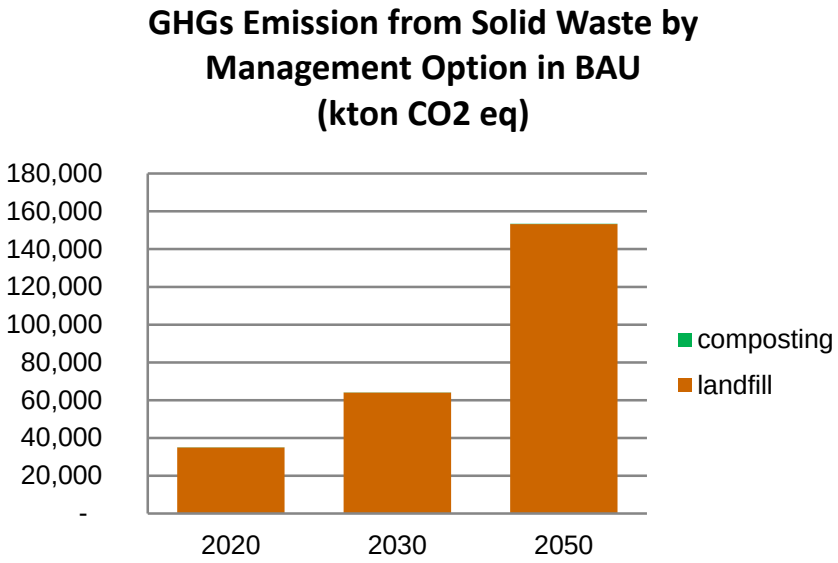




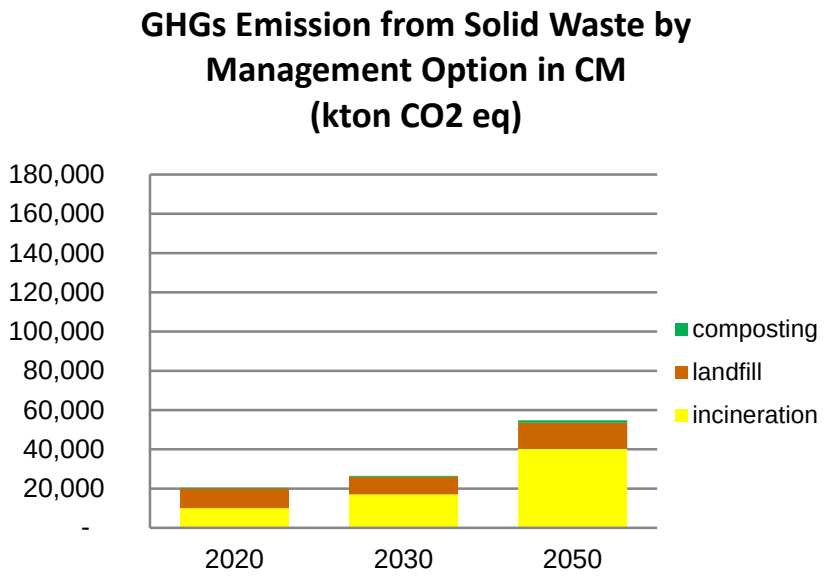


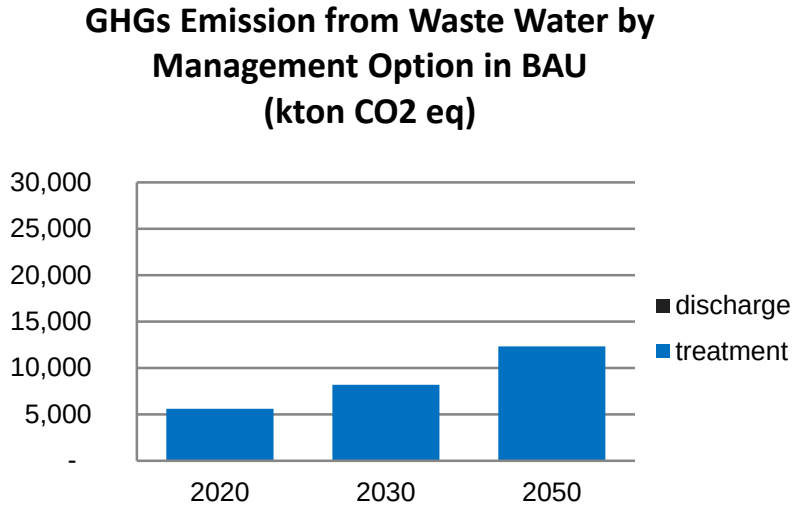
PROJECTED GHG EMISSION BY (SOLID WASTE 2)

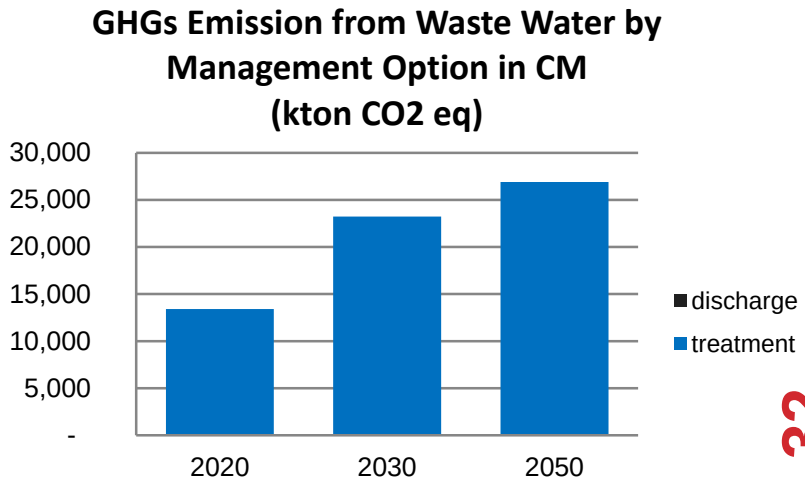
BAU



CM







CONCLUSION

Solid waste generate about 2 times, 4,5 times and 9 times in 2020, 2030 and 2050, respectively compared to 2005

GHG emission from Waste is expected to increase more than 2,9 times, 5,3 times and 12 times in 2020, 2030 and 2050, respectively compared to 2005

By applying current National Strategies from Vietnam, GHG emission is estimated to reduce by 16% in 2020 and 31% in 2030 and 51% in2050 compared to BaU

THANK YOU FOR YOUR ATTENTION